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Foreword

Established in 1995 by the Renal Association, the UK Renal Registry (UKRR) currently collects data from 71 adult and 13 paediatric kidney centres. The annual report, funded by a small capitation fee, provides a snapshot of centre performance across the UK and is used as a source document for audit and benchmarking against quality of care standards. The collection, validation, analysis and publication of these data requires a great deal of work by the UKRR team and we are indebted to all the staff for their contributions to this 18th Annual Report. This report primarily covers activities in 2014, with centre comparisons including survival data de-anonymised.

When I last wrote the introduction for the UKRR report four years ago, I commented on the growing range of activities that the UKRR was supporting, including the National Registry for Rare Diseases (RaDaR), PatientView (PV), the Acute Kidney Injury Programme ('Think Kidneys') and The UK Renal Data Collaboration (UK RDC). These projects have continued to develop under the watchful eye of Ron Cullen, Chief Executive with support and strategic input from Fergus Caskey, Medical Director, Hilary Doxford, Head of Business and Development and Karen Thomas, Head of Programmes. This growth beyond the 'core business' continues apace with the UKRR now contributing to research studies such as the Surveying People Experiencing young Adult Kidney failure (SPEAK) project. There are also plans for the UKRR to provide follow-up data on patients recruited into cohort studies and clinical trials in the near future.

Having made an important contribution to data collection over the last 20 years, it seems logical that the UKRR should become involved in the Kidney Quality Improvement Partnership (KQuIP). This multi-professional initiative, agreed by the whole renal community in the Kidney Health: Delivering Excellencedocument, aims to improve the quality of care delivered, reduce variation and improve patient outcomes by spreading best practice. As a key partner, the UKRR will act as the data and analysis resource, providing logistic support and a learning platform.

Although the UKRR has secured grant funding for some of these additional activities, long-term sustainability will require an increase in regular income from capitation fees. For the past five years the capitation fee has been £21.50 per patient, levied as separate fees for the UKRR and PatientView on dialysis and transplant patients and representing less than 0.08% of the average annual cost of treating these patients. An increase to £30 per patient has recently been proposed and agreed by NHS England, thus securing the UKRR's contribution to these important projects into the future.

David Wheeler
Chair, UK Renal Registry Renal Information Governance Board

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UK Renal Registry 18th Annual Report: Introduction

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Activity since the last Annual Report

Registries have the potential to improve the health of the population in so many ways. Their data can be used to generate and refine hypotheses that require testing, to inform optimal study design, to provide the evidence of need for the research to help secure funding, to provide an efficient framework for sampling and data collection in trials, to track changes in practice and finally and most importantly to monitor changes in population health outcomes (figure 1). We believe we have a responsibility to work across this translational public health spectrum [1], achieving the maximal benefit from observational data as well as interventional trials, and developing methods to cover the full range of complexity of interventions that are required in health care. We believe we have made a little more progress towards doing this over the last 12 months.

The UK Renal Data Collaboration

Essential for the progress of the UK Renal Registry (UKRR) is an upgrade in the basic mechanisms by which data is collected. As information technology continues to advance, this is going to be a journey rather than a single step or leap. In the introduction to last year's report we set out the proposed new data collection infrastructure for the UK Renal Data Collaboration

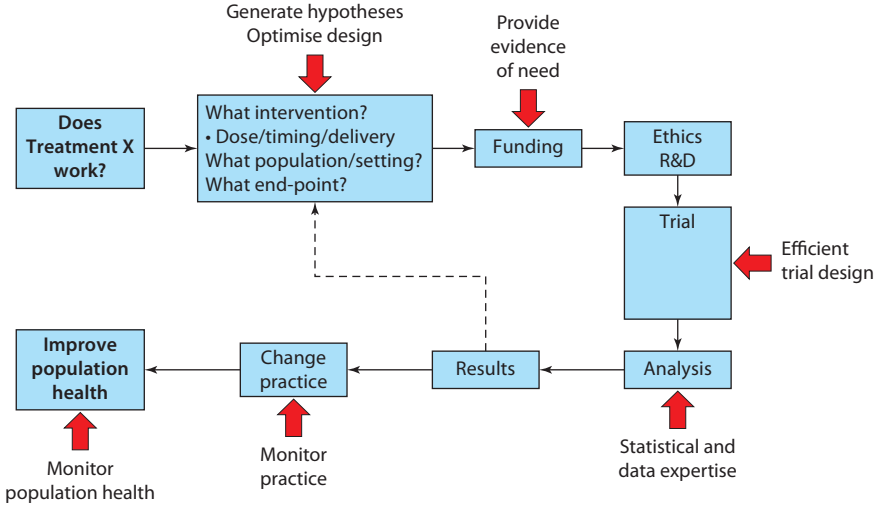

Fig. 1. Translational Public Health Research: block arrows show the potential role of registries at various stages

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(UKRDC), a partnership between seven of the main UK renal organisations – The UK Renal Registry, The Scottish Renal Registry, The British Association of Paediatric Nephrology, PatientView, The UK Registry for Rare Kidney Diseases (RaDaR), The Northern Ireland Nephrology Forum and The Welsh Renal Clinical Network.

There has been major progress with the UKRDC over the last 12 months. The schema for transmitting data has been published and a range of sites have expressed an interest in piloting the extraction and transmission of UKRR data. PatientView data is now flowing through the UKRDC, with plans for this to feed RaDaR in early 2016, demonstrating the ability of the UKRDC to capture real-time data from renal centres – a huge advance for the UKRR. Further evidence of the opportunities this creates is provided by the fact that for the first time the UKRR is able to support an efficient randomised controlled trial (SIMPLIFIED) by providing daily feeds of laboratory data for patients consented into the trial.

Changes in eligibility for reporting to the UKRR and the dataset: dialysis and plasma exchange for AKI and CKD stages 4 and 5

From January 2015, renal centres in England were required to submit data to the UKRR on all cases of dialysis or plasma exchange (PEx) for acute kidney injury (AKI). The first files containing this data started to be uploaded in late 2015. Over the coming months we will be reporting compliance with reporting these data at the renal centre level and we hope to publish some of the initial data on dialysis or plasma exchange for AKI in the 2016 Report.

The requirement for English renal centres to submit data on dialysis or PEx for AKI was set out by the National Clinical Director for renal services and the chair of the Clinical Reference Group for dialysis in England. However, it then became part of the UKRR's core data set from January 2016 (version 4) and so applies to adult and paediatric renal centres in Wales, Scotland and Northern Ireland from this date. Also new in this data set is the requirement to submit data on patients known to renal centres with an estimated eGFR of less than 30 ml/min/1.73 m^2. This will allow the UKRR to identify a cohort of pre-dialysis patients with stage 4 or 5 chronic kidney disease whose care and outcomes can be audited including their decision to receive conservative care or their transition onto dialysis. With the acute dialysis data, this should for the first time allow us to report on quality of care and outcomes during a very high risk period for patients.

National Programmes working with NHS England

Data on cases of AKI in primary and secondary care are now flowing from 70 of the approximately 120 laboratories in England as part of the Acute Kidney Injury National Programme being run in collaboration with NHS England. This work is being managed through the measurement work stream of the National Programme and is part of a range of activities including education, risk assessment and commissioning. The first analyses of these data should become available in 2016.

The other collaboration with NHS England is called 'Transforming Participation – CKD'. It aims to pilot the routine collection of patient reported outcomes, initially in 10 renal centres but scaling up to 23 renal centres over 12 months. Renal centres are being encouraged to test various ways to collect the data from patients on all forms of treatment – CKD, dialysis and transplant. The NHS England sponsored work is focussed on quality of life and patient activation. Closely linked to this is a piece of worked supported by the British Kidney Patient Association to measure and report the patient experience.

For more details on either of these programmes please visit the Think Kidneys website www.thinkkidneys.nhs.uk.

Research

There has been some exciting progress with research. Dr Thomas Hiemstra of Cambridge Clinical Trials Unit has obtained funding from the NIHR HTA for the UKRR's first registry trial – where all follow up is being carried out remotely with linkage to routine databases. The trial is called SIMPLIFIED and tests the hypothesis that ordinary vitamin D given to dialysis patients reduces all-cause mortality. What is particularly novel about this collaboration is that the UKRDC is providing daily reports back to the Clinical Trials Unit on all calcium laboratory results reported for participating patients, providing an efficient mechanism for serious adverse event monitoring.

More challenging has been the evolving information governance landscape. Permissions for the UKRR to undertake research and linkage with data have had to be (re-) established and it has become clear that research ethics committee approval is needed for all work that is not audit or quality assurance, holding up several analyses this year.

Output since the last Annual Report

The UKRR is keen to become formally included in research grant applications, with early involvement to ensure appropriate integration in the study design and consideration of its costs. In the last 12 months it has been a co-applicant on four grant applications:

- NIHR HTA: the SIMPLIFIED trial, led by Dr Thomas Hiemstra of Cambridge, an individual level randomised controlled trial of ergocalciferol versus placebo in dialysis patients.
- Health Foundation: Tackling AKI, led by Dr Nick Selby of Derby, a stepped wedge cluster randomised controlled trial of a complex intervention to reduce harm from acute kidney injury.
- NIHR HTA: BisCKD, led by Dr Daniel Prieto Alhambra of Oxford, a linkage study exploring the risks and benefits of bisphosphonate use in patients with chronic kidney disease.
- NIHR HS&DR: Risk modelling in the critically ill, led by Dr David Harrison of the Intensive Care National Audit and Research Centre London, to develop risk prediction models for quality improvement.

A number of requests for data sharing have been approved in the past 12 months (table 1) and a number of projects previously approved remain open. Data are shared for specific analyses only and securely destroyed at the end of the agreed period. For further details or to enquire about accessing UKRR data please visit the UKRR's website (www.renalreg.org).

Completeness of data returns from UK renal centres

Data completeness has improved over recent years for returns on ethnic origin, primary renal diagnosis and date first seen by a nephrologist (table 2). Comorbidity at the start of RRT remains poorly returned, with almost half (29/62) of the adult renal centres in England, Wales and Northern Ireland having less than 75% completeness for comorbidity data. For a number of centres this limits the UKRR's ability to adjust their survival for casemix, something that is particularly relevant to outlying centres [2]. The UKRR and the Health and Social Care Information Centre (HSCIC) have agreed that there could be considerable benefits for patients from routine linkage with Hospital Episode Statistics [3], although as with everything linked to the HSCIC the delivery of this will depend on the outcome of the ongoing inquiry by the House of Commons Health Select Committee on Handling of NHS Patient Data [4] and the work programme arising from the Partridge Review [5].

Interpretation of centre-specific clinical measures and survival comparisons

The UKRR continues to advise caution in the interpretation of the comparisons of centre-specific attainment of clinical performance measures provided in this report. In general terms, the UKRR has not tested for a 'significant difference' between the highest achiever of a standard and the lowest achiever, as centres were not identified in advance of looking at the data and statistically this approach can be invalid. As in previous reports, the arbitrary 95% confidence interval is shown for compliance with a guideline. The calculation of this confidence interval (based on the binomial distribution) and the width of the confidence interval depends on the number of values falling within the standard and the number of patients with reported data. However for many of these analyses no adjustment can be made for the range of factors known to influence the measured variable.

For a number of years de-anonymised centre specific reports on survival of RRT patients have been published. The Francis and Keogh Enquiries and the ongoing CQC inspections of patient care and outcomes at a number of hospital trusts highlight the ongoing need for such transparency. In 2011 (2010 data) the UKRR sent letters to six centres with lower than expected survival at one year after 90 days for incident patients starting on RRT; in 2012 (2011 data) this was required for only three centres; in 2013 (2012 data) two centres, and; in 2014 (2013 data) four centres. This year (2014 data) only one centre had to be contacted because of lower than expected survival in patients starting dialysis, although their results may

Table 1. Data sharing projects commenced during 2015

Originator: name and organisation	Aims and objectives	Dates			
		Original application	Data shared	End	Funding?
Ken Farrington Lister Hospital, Stevenage[b]	Ethnicity and End of Life Care in Haemodialysis Population	Jan 15	Jan 15	N/A – only aggregated data provided	None
Rishi Pruthi on behalf of the ATTOM Group[b]	Access to Transplantation and Transplant Outcome Measures (ATTOM) – Linkage with UKRR	Jan 15	April 15	According to ethics permissions	NIHR PGfAR
Cecily Hollingworth, NHS England	Information on late-referred in West Midlands 2012–2013 incident patients	Feb 15	March 15	N/A – only aggregated data provided	None
Jay Nath, Queen Elizabeth Hospital NHS Trust[b]	Does Cold Ischaemia Time matter in live donor renal transplantation?	Feb 15	June 15	Dec 16	None
Richard Fluck, Royal Derby Hospital	Plot of home therapies (Home HD + PD) by % urbanisation of catchment population by centre	March 15	March 15	N/A – only aggregated data provided	None
Andrew Bentall, Queen Elizabeth Hospital Birmingham[b]	Differentiating waiting/dialysis time for transplant outcomes in kidney transplants with immunological barriers	March 15	June 15	Sept 16	None
Maria Hernandez-Fuentes, King's College London[b]	DECISIONS study – information on previous haemodialysis	April 15	Sept 15	Apr 17	None
Neil Ashman, NHS England (London Region)	Pan London Peer Review	Jun 15	June 15	N/A – only aggregated data provided	None
Tamara Mallett, Bristol Children's Hospital[a]	Trends in PRDs in children starting RRT from 1995 onwards	Aug 15	Sept 15	N/A – only aggregated data provided	None
Bernadette Li, London School of Hygiene and Tropical Medicine[b]	Analysis of survival for historical cohort of patients on the transplant waiting list as part of the Access to Transplantation and Transplant Outcome Measures (ATTOM) study	Aug 15	Dec 15	Dec 17	NIHR PGfAR
Jenny McKinley, Queen's University Belfast[c]	Trace element abundance and renal disease	Aug 15	Nov 15	Sept 20	Department for Employment and Learning
Charlotte Sarmouk, NHS England	Percentage of dialysis patients who were receiving dialysis in the home	Nov 15	Feb 16	N/A – only aggregated data provided	None
James Hollingshead, Public Health England	Incidence rates and standardised rate ratios, modality usage and other information for CCG profiles	Dec 13	Feb 16	Annual	None

[a]UKRR will perform most of the analysis and the write up
[b]no input from the UKRR after supplying the data
[c]some support with statistics and interpretation required from the UKRR

Table 2. Percentage completeness of data returns for ethnicity, primary renal diagnosis, date first seen by a nephrologist, comorbidity at start of RRT (incident patients 2014) and cause of death (for deaths in 2014 amongst prevalent patients on 31/12/13)

Centre	Ethnicity	Primary diagnosis	Date first seen	Comorbidity	Cause of death	Average completeness	Country
L Kings	100.0	100.0	100.0	100.0	98.7	99.7	England
Leeds	100.0	100.0	99.4	100.0	99.2	99.7	England
Antrim	100.0	100.0	97.1	100.0	100.0	99.4	N Ireland
Bradfd	98.8	100.0	100.0	100.0	98.0	99.4	England
Nottm	100.0	100.0	97.3	95.5	98.9	98.3	England
Sund	100.0	96.8	100.0	95.2	97.4	97.9	England
Middlbr	100.0	99.0	98.1	97.1	95.1	97.9	England
Dorset	100.0	100.0	98.7	100.0	90.6	97.8	England
Hull	100.0	99.0	95.3[b]	100.0	91.7	97.2	England
West NI	97.1	100.0	97.0	97.1	93.9	97.0	N Ireland
Ulster	100.0	100.0	94.7	100.0	90.0	96.9	N Ireland
B QEH	100.0	99.6	97.9	96.7	90.4	96.9	England
Newry	100.0	100.0	94.7	94.7	93.3	96.6	N Ireland
Swanse	100.0	100.0	100.0	100.0	82.6	96.5	Wales
Wrexm	100.0	97.6	97.6	100.0	87.0	96.4	Wales
Cardff	100.0	99.4	95.8	89.9	96.7	96.4	Wales
Kent	94.7	96.7	100.0	100.0	86.6	95.6	England
Exeter	97.8	97.1	91.9	93.5	96.5	95.4	England
York	93.8	98.4	90.5[b]	95.3	97.4	95.1	England
Basldn	95.7	100.0	95.7	89.1	90.0	94.1	England
Donc	100.0	100.0	98.2	70.4	96.8	93.1	England
Oxford	76.2	97.4	97.9	95.2	98.3	93.0	England
Derby	98.7	98.7	97.3	94.7	73.7	92.6	England
Redng	93.5	99.1	97.2	92.5	79.7	92.4	England
Dudley	95.1	87.8	95.1	87.8	95.5	92.3	England
Bristol	100.0	85.1	95.2	84.5	90.0	91.0	England
Chelms	71.2	100.0	98.1	92.3	85.7	89.4	England
Newc	100.0	100.0	98.1	97.2	51.8	89.4	England
B Heart	100.0	83.7	92.8	99.0	65.6	88.2	England
Carlis	100.0	100.0	92.1	55.3	92.0	87.9	England
Sthend	63.3	100.0	100.0	76.7	95.7	87.1	England
Bangor	100.0	81.8	90.9	59.1	95.0	85.4	Wales
Belfast	100.0	95.2	91.9	77.8	51.1	83.2	N Ireland
Prestn	99.3	99.4	97.4	4.6	95.2	79.2	England
Clwyd	89.7	79.3	78.3[b]	55.2	90.0	78.5	Wales
L West	99.7	100.0	98.6	0.3	93.8	78.5	England
Truro	100.0	94.9	97.4	0.0	97.1	77.9	England
Wolve	100.0	87.3	92.4	16.5	85.2	76.3	England
Stoke	97.3	57.1	90.1	81.3	53.5	75.9	England
Sheff	96.7	99.3	98.7	78.8	0.9	74.9	England
Leic	93.7	78.0	98.0	42.9	55.2	73.6	England
Wirral	98.2	73.2	96.4	30.4	68.5	73.4	England
Glouc	100.0	96.1	66.7	15.7	88.1	73.3	England
Colchr	78.9	64.2[a]	44.7	100.0	77.3	73.0	England
Liv Ain	98.5	100.0	98.5	56.7	0.0	70.7	England
L Barts	99.4	82.6	28.7	55.2	82.7	69.7	England
Liv Roy	94.2	85.4	97.8	48.2	19.0	68.9	England
Norwch	77.2	93.7	49.9 [b]	43.0	74.0	67.6	England
L Rfree	94.8	96.1	96.1	22.3	15.9	65.0	England
Shrew	98.5	90.8	98.4	18.5	0.0	61.2	England
Brightn	93.2	100.0	98.6	11.6	0.9	60.9	England
Ports	84.9	86.7	59.5	26.7	38.8	59.3	England
Covnt	98.4	88.0	84.8	15.2	6.7	58.6	England
L St.G	86.8	75.8	24.2	42.9	57.1	57.4	England

Table 2. Continued

Centre	Ethnicity	Primary diagnosis	Date first seen	Comorbidity	Cause of death	Average completeness	Country
Stevng	90.1	80.3	94.1	0.7	9.3	54.9	England
Camb	86.6	57.3[a]	68.5	4.7	42.3	51.9	England
L Guys	93.7	64.8	81.5	1.9	0.0	48.4	England
Ipswi	0.0	61.2[a]	90.9	0.0	83.3	47.1	England
M RI	93.2	59.5	43.4	34.2	1.4	46.3	England
Plymth	100.0	32.1	26.9	41.5	24.5	45.0	England
Salford	99.3	98.6	0.7	0.0	0.0	39.7	England
Carsh	87.9	23.8	41.4	11.4	16.3	36.2	England
Abrdn		100.0			67.7		Scotland
Airdrie		100.0			97.6		Scotland
D & Gall		100.0			100.0		Scotland
Dundee		100.0			52.8		Scotland
Edinb		100.0			96.2		Scotland
Glasgw		100.0			100.0		Scotland
Inverns		100.0			100.0		Scotland
Klmarnk		100.0			100.0		Scotland
Krkcldy		100.0			92.3		Scotland

[a]Data from these centres included a high proportion of patients whose primary renal diagnosis was 'uncertain'. In some cases, this appears to have been because software in these centres was defaulting missing values to 'uncertain'. The value given for the completeness has been reduced in proportion to the amount by which the percentage of non-missing diagnoses being 'uncertain' exceeded 40%

[b]For these centres 10% or more of the dates returned were identical to the date of start of RRT. Whilst it is possible to start RRT on the day of presentation, comparison with the data returned from other centres raises the possibility, requiring further investigation, of incorrect data entry or extraction from these centres. The value given for completeness has been reduced in proportion to the amount by which the percentage exceeded 10%

reflect the comorbidity of their patients which we remain unable to adjust for in the main survival analysis due to missing data from many other centres (as discussed above).

For the present, centres are asked to report their outlying status internally at trust level and follow up with robust mortality and morbidity meetings. The UKRR has no statutory powers. However, the fact that the UKRR provides centre-specific de-anonymised analyses of important clinical outcomes, including survival, makes it important to define how the UKRR responds to apparent under-performance. The senior management team of the UKRR communicate survival outlier status with the renal centres in advance of publication of this finding. The centres are asked to provide evidence that the Clinical Governance department, the Chief Executive of the Trust housing the service and their commissioner have been informed. In the event that no such evidence is provided, the Chief Executive Officer or Medical Director of the UKRR would inform the President of the Renal Association, who would then take action to ensure that the findings were properly investigated.

Information governance

The UKRR operates within a comprehensive governance framework which concerns data handling, reporting and research, including data linkages and sharing agreements. The Chair of the Renal Association Renal Information Governance Board is the person responsible for ensuring good governance, with the UKRR Chief Executive Officer as the accountable officer responsible for day to day management of governance compliance and the Head of Business Development and Support as the operational information governance lead. The framework is based on good practice, as described in the Information Governance Framework [6] and the Research Governance Framework for Health and Social Care (2005). The UKRR has temporary exemption, granted by the Secretary of State for Health under section 251 of The National Health Service Act (2006), to hold patient identifiable data. This exemption is reviewed annually. The UKRR has successfully completed the Connecting for Health information governance toolkit to a satisfactory standard.

Conclusion

It has been a very exciting twelve months at the UKRR with the receipt of new patient reported outcomes data and also AKI data beginning to flow directly from hospital laboratories. The first benefits are beginning to be seen from investments in the UK Renal Data Collaboration, with the real-time reporting of routine laboratory data to support an NIHR funded efficient randomised controlled trial. The mission for the next twelve months is to further demonstrate the potential of the UK Renal Data Collaboration and the unique opportunities that the UK Renal Registry offers to continue to underpin improvements in care for people with kidney disease.

Conflicts of interest: the authors declare no conflicts of interest

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UK Renal Registry 18th Annual Report: Chapter 1 UK Renal Replacement Therapy Incidence in 2014: National and Centre-specific Analyses

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Key Words

Acceptance rates · Clinical Commissioning Group · Comorbidity · Diabetes · Dialysis · End stage renal disease · End stage renal failure · Established renal failure · Glomerulonephritis · Haemodialysis · Incidence · Peritoneal dialysis · Registries · Renal replacement therapy · Transplantation · Treatment modality

Summary

- The incidence rate in the UK increased from 109 per million population (pmp) in 2013 to 115 pmp in 2014 reflecting renal replacement therapy (RRT) initiation for 7,411 new patients.
- The increase in incidence rate from 2013 to 2014 was seen in England and Scotland (although rates in Scotland have fluctuated around this level since 2008) but not Wales and Northern Ireland.
- The median age of all incident patients was 64.8 years but this was highly dependant on ethnicity (66.4 for White incident patients; 58.7 for non-White patients).
- Diabetic renal disease remained the single most common cause of renal failure (26.9%).
- By 90 days, 66.3% of patients were on haemodialysis, 19.1% on peritoneal dialysis, 9.7% had a functioning transplant and 4.8% had died or stopped treatment. By contrast, in 2007, at 90 days 67% were on HD, 21% PD and only 5% were transplanted.
- The percentage of patients still on RRT at 90 days who had a functioning transplant at 90 days varied between centres from 0% to 33% (between 7% and 33% for transplanting centres and between 0% and 21% for non-transplanting centres).
- The mean eGFR at the start of RRT was 8.6 ml/min/1.73 m^2 similar to the previous four years.
- Late presentation (<90 days) fell from 23.9% in 2006 to 17.8% in 2014.

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Introduction

This chapter contains analyses of adult patients starting renal replacement therapy (RRT) in the UK in 2014. The methodology and results for these analyses are in three separate sections: geographical variations in incidence rates, the demographic and clinical characteristics of patients starting RRT and analyses of late presentation and delayed referral.

Definitions

The definition of incident patients is given in detail in appendix B: Definitions and Analysis Criteria (www.renalreg.org). In brief, it is all patients over 18 who commenced RRT in the UK in 2014 and who did not recover renal function within 90 days. Note that this does not include those with a failed renal transplant who returned to dialysis. There has been a change to the definition for this report. Previously if a person had a recovery lasting more than 90 days (which began more than 90 days after starting RRT) and then restarted RRT then they were counted as an incident patient twice. Under the new definition, they are only counted at their second/final start point. This change had only a small effect on the numbers of incident patients.

Differences may be seen in the 2009 to 2013 numbers now quoted when compared with previous publications because of retrospective updating of data in collaboration with renal centres, in particular for patients who were initially thought to have acute renal failure. Where applicable and possible, pre-emptive transplant patients were allocated to their work up centre rather than their transplant centre. However, this was not possible for all such patients and consequently some patients probably remain incorrectly allocated to the transplanting centre. The term established renal failure (ERF) as used within this chapter is synonymous with the terms end stage renal failure/disease (ESRF or ESRD).

UK Renal Registry coverage

The UK Renal Registry (UKRR) received individual patient level data from all 71 adult renal centres in the UK (five renal centres in Wales, five in Northern Ireland, nine in Scotland, 52 in England). Data from centres in Scotland were obtained from the Scottish Renal Registry. Data on children and young adults can be found in chapter 4: Demography of the UK Paediatric Renal Replacement Therapy population in 2014.

Renal Association Guidelines

Table 1.1 lists the relevant items from the Renal Association Guidelines on the Planning, Initiating and Withdrawal of Renal Replacement Therapy [1]. Many of the audit measures are not audited by the UKRR; mainly due to a high proportion of incomplete data or because, at the time, the relevant data item(s) was not within the specified UKRR dataset. Over time it is planned to work with the renal community to improve reporting across the range of these measures.

1. Geographical variation in incidence rates

Introduction

Over the years there have been wide variations in incidence rates between renal centres. Equity of access to RRT is an important aim but hard to assess as the need for RRT depends on many variables including medical, social and demographic factors such as underlying conditions, age, gender, social deprivation and ethnicity. Thus, comparison of crude incidence rates by geographical area can be misleading. This year's report again uses age and gender standardisation of Clinical Commissioning Group/Health Board (CCG/HB) rates as well as showing crude rates. It also gives the ethnic minority percentage for each area as this influences incidence rates.

Methods

CCG/HB level

Crude incidence rates per million population (pmp) and age/gender standardised incidence ratios were calculated as detailed in appendix D: Methodology used for Analyses (www.renalreg.org).

Centre level

For the methodology used to estimate catchment populations see appendix E: Methodology for Estimating Catchment Populations (www.renalreg.org).

Results

Overall

In 2014, the number of adult patients starting RRT in the UK was 7,411 equating to an incidence rate of 115 pmp (table 1.2), compared with 109 pmp in 2013. Wales remained the country with the highest incidence rate with Northern Ireland the lowest (119 vs. 93 pmp, figure 1.1). For England, incidence rates had been stable

Table 1.1. Summary of Renal Association audit measures relevant to RRT incidence

RA audit measure	Reported	Reason for non-inclusion/comment
Percentage of patients commencing RRT referred <3 months and <12 months before date of starting RRT	Yes	UKRR dataset allows reporting on time elapsed between date first seen and start of RRT
Percentage of incident RRT patients followed up for >3 months in dedicated pre-dialysis or low clearance clinic	No	Not in UKRR dataset
Proportion of incident patients on UK transplant waiting list at RRT initiation	No	Not in UKRR dataset
Proportion of incident RRT patients transplanted pre-emptively from living donors and cadaveric donors	Yes	
Mean eGFR at time of pre-emptive transplantation	No	Numbers with data will be small, the UKRR will consider doing a combined years analysis in future reports
Proportion of incident patients commencing peritoneal or home haemodialysis	Partly	See appendix F for proportion starting on PD and see table 1.12 for proportion on PD at 90 days. Not reported for home HD due to small numbers
Proportion of patients who have undergone a formal education programme prior to initiation of RRT	No	Not in UKRR dataset
Proportion of haemodialysis patients who report that they have been offered a choice of RRT modality	No	Not in UKRR dataset
Proportion of patients who have initiated dialysis in an unplanned fashion who have undergone formal education by three months	No	Not in UKRR dataset
Evidence of formal continuing education programme for patients on dialysis	No	Not in UKRR dataset
Proportion of incident patients known to nephrology services for three months or more prior to initiation (planned initiation).	Yes	
Proportion of planned initiations with established access or pre-emptive transplantation	Yes	See appendix F for proportion of incident patients having pre–emptive transplantation, and see chapter 11 for dialysis access
Inpatient/outpatient status of planned initiations	No	Not in UKRR dataset
Mean eGFR at start of renal replacement therapy	Partly	Reported but not at centre level due to poor data completeness

for the previous eight years but have now increased (from 111 pmp to 117 pmp from 2013 to 2014). There continued to be very marked gender differences in incidence rates which were 148 pmp (95% CI 143–152) in males and 83 pmp (95% CI 80–86) in females.

The denominators used for these rates were the entire population i.e. they include under 18 year olds. When incident patients aged under 18 were included in the numerator the UK rate was 117 pmp. The exclusion of under 18s in this chapter at least partly explains the

Table 1.2. Number of new adult patients starting RRT in the UK in 2014

	England	N Ireland	Scotland	Wales	**UK**
Number starting RRT	6,330	172	542	367	**7,411**
Total estimated population mid-2014 (millions)[a]	54.3	1.8	5.3	3.1	**64.6**
Incidence rate (pmp)	117	93	101[b]	119	**115**
(95% CI)	*(114–119)*	*(79–107)*	*(93–110)*	*(107–131)*	***(112–117)***

[a]Data from the Office for National Statistics, National Records of Scotland and the Northern Ireland Statistics and Research Agency – based on the 2011 census

[b]The RRT incidence rate published in the Scottish Renal Registry report for the same period is slightly higher at 105 pmp. This is explained by slight differences in the definition of incident RRT patients between the two registries and the inclusion of under 18s in the Scottish Renal Registry analyses

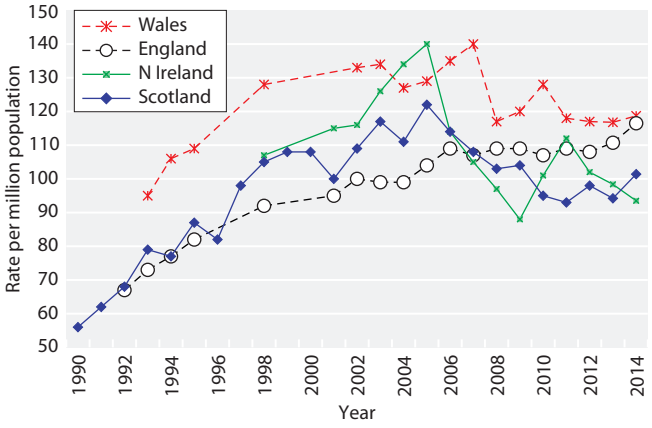

Fig. 1.1. RRT incidence rates in the countries of the UK 1990–2014

higher RRT incidence rate reported using the same data for the same period by the Scottish Renal Registry (105 pmp).

CCG/HB level

Table 1.3 shows incidence rates and standardised incidence ratios for CCG/HBs. There were wide variations between areas. From the analysis using all six years, out of a total of 237 areas, 47 areas had notably high ratios and 69 notably low. The standardised incidence ratios ranged from 0.61 to 2.37 (IQR 0.82, 1.08). The crude rates ranged from 71 pmp to 205 pmp (IQR 93 pmp, 117 pmp). As previously reported, urban areas with high percentages of non-White residents tended to have high incidence rates. Figure 1.2 shows the strong positive correlation between the standardised incidence ratio and the percentage of the CCG/HB population that was non-White.

Centre level

The number of new patients starting RRT at each renal centre from 2009 to 2014 is shown in table 1.4. The table also shows centre level incidence rates (per million population) for 2014. For most centres there was a lot of variability in the numbers of incident patients from one year to the next making it hard to see any underlying trend. Some centres have had an increase in new patients over time and others have fallen. The variation may reflect chance fluctuation, the introduction of new centres, changes in catchment populations or in completeness of reporting. Variation over time may also be due to changing incidence of established renal failure (increases in underlying disease prevalence, survival from comorbid conditions and recognition of ERF), changes to treatment thresholds such as a greater emphasis on pre-emptive transplantation or the introduction of conservative care programmes. Analysis of CKD stage 5 patients not yet on RRT is required to explore some of these underlying mechanisms for centre level incidence rate changes.

There was an increase of 11.2% in new patients for England between 2009 and 2014. Across all four countries the change between 2009 and 2014 was an increase of 9.8%.

2. Demographics and clinical characteristics of patients starting RRT

Methods

Age, gender, primary renal disease, ethnic origin and treatment modality were examined for patients starting RRT. A mixture of old and new (2012) ERA-EDTA codes for primary diagnoses [2] were received from centres. The split was about 50 : 50 for 2014 incident patients. For those people without an old code, new codes (where available) were mapped back to old codes using the mapping available on the ERA-EDTA website. As recommended in the notes for users in the ERA-EDTA's PRD code list document this mapping is provided for guidance only and has not been validated; therefore care must be taken not to over interpret data from this mapping. The codes were grouped into the same eight categories as in previous reports, the details are given in appendix H: Ethnicity and ERA-EDTA Coding (www.renalreg.org).

Most centres electronically upload ethnicity coding to their renal information technology (IT) system from the hospital Patient Administration System (PAS). Ethnicity coding in these PAS systems is based on self-reported ethnicity. For the remaining centres, ethnicity coding is performed by clinical staff and recorded directly into the renal IT system (using a variety of coding systems). For all these analyses, data on ethnic origin were grouped into White, South Asian, Black, Chinese or Other. The details of regrouping of the PAS codes into the above ethnic categories are provided in appendix H: Ethnicity and ERA-EDTA Coding (www.renalreg.org). Chi-squared, Fisher's exact, ANOVA and Kruskal Wallis tests were used as appropriate.

Estimated glomerular filtration rate (eGFR) at the start of RRT was studied amongst patients with eGFR data within 14 days before the start of RRT. The eGFR was calculated using the abbreviated 4 variable MDRD study equation [3]. For the purpose of the eGFR calculation, patients who had missing ethnicity but a valid serum creatinine measurement were classed as White. The eGFR values were log transformed due to their skewed distribution.

Results

Incidence rates had plateaued in the nine years before this report but they have increased in 2014 (figure 1.3).

Table 1.3. Crude adult incidence rates (pmp) and age/gender standardised incidence ratios 2009–2014

CCG/HB – CCG in England, Health and Social Care Areas in Northern Ireland, Local Health Boards in Wales and Health Boards in Scotland
O/E – standardised incidence ratio
LCL – lower 95% confidence limit
UCL – upper 95% confidence limit
pmp – per million population
* – per year
Areas with notably low incidence ratios over six years are italicised in greyed areas, those with notably high incidence ratios over six years are bold in greyed areas – for the full methodology see appendix D
Confidence intervals are not given for the crude rates per million population but figures D1 and D2 in appendix D can be used to determine if a CCG/HB falls within the 95% confidence interval around the national average rate
Mid-2013 population data from the Office for National Statistics, National Records of Scotland and the Northern Ireland Statistics and Research Agency – based on the 2011 census
% non-White – percentage of the CCG/HB population that is non-White, from 2011 census

								2014		2009–2014				
UK area	CCG/HB	Total population (2013)	2009 O/E	2010 O/E	2011 O/E	2012 O/E	2013 O/E	O/E	Crude rate pmp	O/E	LCL	UCL	Crude rate pmp*	% non-White
Cheshire, Warrington and Wirral	*NHS Eastern Cheshire*	*195,500*	*0.75*	*0.86*	*0.75*	*0.70*	*0.64*	*0.76*	*102*	*0.74*	*0.61*	*0.90*	*93*	*3.7*
	NHS South Cheshire	*177,200*	*0.70*	*0.71*	*0.74*	*0.59*	*1.14*	*0.99*	*124*	*0.82*	*0.67*	*0.99*	*95*	*2.9*
	NHS Vale Royal	102,000	0.88	0.81	0.88	0.78	1.27	0.16	20	0.79	0.61	1.03	90	2.1
	NHS Warrington	*205,100*	*1.01*	*0.61*	*0.46*	*0.86*	*0.70*	*1.00*	*117*	*0.78*	*0.64*	*0.94*	*85*	*4.1*
	NHS West Cheshire	229,000	0.90	1.19	1.04	0.81	0.94	0.85	109	0.95	0.81	1.11	114	2.8
	NHS Wirral	*320,300*	*0.82*	*0.90*	*0.95*	*0.59*	*1.00*	*0.67*	*84*	*0.82*	*0.71*	*0.95*	*96*	*3.0*
Durham, Darlington and Tees	NHS Darlington	105,400	0.95	0.97	0.94	1.28	0.83	0.55	66	0.92	0.72	1.17	103	3.8
	NHS Durham Dales, Easington and Sedgefield	272,900	0.99	1.04	1.10	0.84	1.00	0.95	121	0.99	0.86	1.14	117	1.2
	NHS Hartlepool and Stockton-on-Tees	285,900	0.70	0.81	0.92	1.07	0.85	0.93	108	0.88	0.76	1.03	96	4.4
	NHS North Durham	*243,100*	*0.52*	*0.49*	*0.55*	*1.28*	*0.64*	*0.54*	*66*	*0.67*	*0.56*	*0.81*	*76*	*2.5*
	NHS South Tees	273,900	0.78	1.08	0.94	0.97	1.20	0.83	99	0.97	0.83	1.12	106	6.7
Greater Manchester	NHS Bolton	280,100	0.85	1.41	0.94	0.90	0.88	0.64	71	0.93	0.80	1.09	96	18.1
	NHS Bury	186,500	0.82	0.68	0.71	1.36	0.79	1.12	129	0.92	0.76	1.11	98	10.8
	NHS Central Manchester	**182,200**	**1.81**	**2.09**	**1.12**	**1.71**	**2.21**	**2.34**	**170**	**1.88**	**1.60**	**2.22**	**129**	**48.0**
	NHS Heywood, Middleton & Rochdale	212,100	1.14	0.78	1.22	1.26	1.18	1.26	137	1.14	0.97	1.34	116	18.3
	NHS North Manchester	**170,700**	**1.68**	**0.93**	**1.49**	**1.50**	**1.46**	**1.46**	**123**	**1.42**	**1.19**	**1.71**	**112**	**30.8**
	NHS Oldham	227,300	0.86	0.84	1.03	0.71	0.96	1.24	132	0.94	0.79	1.12	94	22.5
	NHS Salford	239,000	0.97	1.36	0.74	0.87	1.10	0.81	84	0.97	0.82	1.15	94	9.9
	NHS South Manchester	161,500	0.83	1.00	1.18	1.19	1.23	0.90	80	1.05	0.85	1.30	89	19.6
	NHS Stockport	*285,000*	*0.53*	*0.93*	*0.87*	*0.65*	*0.51*	*0.89*	*109*	*0.73*	*0.62*	*0.86*	*84*	*7.9*
	NHS Tameside and Glossop	253,700	0.87	0.93	0.97	0.59	1.08	0.86	99	0.88	0.75	1.04	95	8.2
	NHS Trafford	230,200	1.09	1.29	0.50	1.15	1.12	0.84	96	1.00	0.85	1.17	106	14.5
	NHS Wigan Borough	*319,700*	*0.58*	*0.74*	*1.01*	*0.77*	*0.72*	*0.87*	*103*	*0.78*	*0.67*	*0.91*	*87*	*2.7*
Lancashire	NHS Blackburn with Darwen	147,400	0.89	0.98	1.46	1.23	0.92	0.74	75	1.03	0.83	1.27	97	30.8
	NHS Blackpool	141,400	1.00	0.64	0.86	1.47	1.13	1.13	141	1.04	0.86	1.27	121	3.3
	NHS Chorley and South Ribble	169,500	1.30	0.55	0.96	0.74	1.29	0.88	106	0.96	0.79	1.16	107	2.9
	NHS East Lancashire	*372,300*	*0.83*	*0.75*	*0.92*	*0.54*	*0.87*	*1.07*	*126*	*0.83*	*0.73*	*0.96*	*91*	*11.9*
	NHS Fylde & Wyre	*165,800*	*0.87*	*0.70*	*0.54*	*0.77*	*0.79*	*0.96*	*139*	*0.77*	*0.64*	*0.94*	*105*	*2.1*
	NHS Greater Preston	*201,700*	*0.68*	*0.55*	*0.53*	*1.00*	*0.84*	*0.88*	*99*	*0.75*	*0.61*	*0.92*	*79*	*14.7*
	NHS Lancashire North	*159,500*	*0.62*	*0.57*	*1.00*	*0.66*	*0.59*	*0.62*	*75*	*0.68*	*0.54*	*0.85*	*77*	*4.0*
	NHS West Lancashire	*111,300*	*0.62*	*0.56*	*0.85*	*0.76*	*0.67*	*0.64*	*81*	*0.68*	*0.52*	*0.89*	*81*	*1.9*

Table 1.3. Continued

UK area	CCG/HB	Total population (2013)	2009 O/E	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2014 Crude rate pmp	2009–2014 O/E	2009–2014 LCL	2009–2014 UCL	2009–2014 Crude rate pmp*	% non-White
Merseyside	NHS Halton	126,000	1.07	0.86	1.52	0.97	0.95	1.04	119	1.07	0.87	1.32	114	2.2
	NHS Knowsley	146,100	0.73	0.87	1.11	1.29	0.69	1.68	192	1.07	0.88	1.30	114	2.8
	NHS Liverpool	470,800	1.20	0.86	1.09	1.20	1.00	1.19	125	1.09	0.98	1.22	107	11.1
	NHS South Sefton	**158,900**	**0.78**	**1.30**	**1.37**	**1.04**	**1.27**	**1.36**	**170**	**1.19**	**1.00**	**1.41**	**138**	**2.2**
	NHS Southport and Formby	114,300	0.81	0.62	0.94	0.73	1.36	0.86	122	0.89	0.72	1.11	118	3.1
	NHS St Helens	*176,200*	*0.70*	*0.93*	*0.75*	*0.89*	*0.63*	*0.96*	*119*	*0.81*	*0.66*	*0.99*	*94*	*2.0*
Cumbria, Northumberland, Tyne and Wear	*NHS Cumbria*	*504,100*	*0.61*	*0.74*	*0.57*	*0.62*	*0.91*	*0.80*	*109*	*0.71*	*0.63*	*0.80*	*90*	*1.5*
	NHS Gateshead	*200,000*	*0.91*	*0.79*	*0.76*	*0.89*	*0.52*	*0.70*	*85*	*0.76*	*0.62*	*0.92*	*86*	*3.7*
	NHS Newcastle North and East	143,900	1.03	0.88	0.85	0.70	0.45	0.79	76	0.78	0.61	1.01	71	10.7
	NHS Newcastle West	142,900	0.88	0.67	0.86	0.86	0.91	1.13	119	0.89	0.71	1.12	87	18.3
	NHS North Tyneside	*202,200*	*0.89*	*0.91*	*0.66*	*0.88*	*0.94*	*0.65*	*79*	*0.82*	*0.68*	*0.99*	*93*	*3.4*
	NHS Northumberland	*315,800*	*0.62*	*0.61*	*0.82*	*0.76*	*0.62*	*0.89*	*120*	*0.72*	*0.62*	*0.84*	*91*	*1.6*
	NHS South Tyneside	148,500	1.32	0.74	1.07	0.53	0.75	0.60	74	0.83	0.67	1.03	95	4.1
	NHS Sunderland	*276,100*	*0.96*	*1.05*	*0.75*	*0.88*	*0.60*	*0.90*	*109*	*0.85*	*0.73*	*1.00*	*96*	*4.1*
North Yorkshire and Humber	*NHS East Riding of Yorkshire*	*314,600*	*0.93*	*0.69*	*0.72*	*0.72*	*0.46*	*0.73*	*102*	*0.71*	*0.61*	*0.82*	*92*	*1.9*
	NHS Hambleton, Richmondshire and Whitby	153,600	0.91	0.76	0.69	1.20	0.92	0.82	111	0.88	0.73	1.07	111	2.7
	NHS Harrogate and Rural District	158,200	1.02	0.66	0.96	0.95	0.51	1.07	139	0.86	0.71	1.05	104	3.7
	NHS Hull	257,600	1.02	0.95	0.76	0.76	0.93	1.00	105	0.90	0.76	1.07	89	5.9
	NHS North East Lincolnshire	159,800	0.85	0.70	1.35	0.67	0.82	0.98	119	0.90	0.74	1.10	101	2.6
	NHS North Lincolnshire	168,800	0.73	0.70	1.50	1.13	1.05	0.48	59	0.93	0.77	1.12	108	4.0
	NHS Scarborough and Ryedale	*110,100*	*0.94*	*0.59*	*0.57*	*0.92*	*0.69*	*0.78*	*109*	*0.75*	*0.59*	*0.96*	*97*	*2.5*
	NHS Vale of York	*349,100*	*0.65*	*0.69*	*1.08*	*0.92*	*0.77*	*0.83*	*100*	*0.82*	*0.72*	*0.95*	*93*	*4.0*
South Yorkshire and Bassetlaw	NHS Barnsley	235,800	0.89	1.19	0.81	1.03	1.04	1.30	157	1.05	0.90	1.22	117	2.1
	NHS Bassetlaw	113,700	0.68	0.93	0.82	1.04	1.23	0.89	114	0.93	0.75	1.17	111	2.6
	NHS Doncaster	303,600	1.04	0.94	1.06	0.81	1.14	1.33	158	1.06	0.93	1.21	117	4.7
	NHS Rotherham	258,700	0.95	1.12	0.70	0.83	0.74	0.83	101	0.86	0.73	1.01	97	6.4
	NHS Sheffield	560,100	1.30	1.04	0.99	1.22	0.95	0.95	102	1.07	0.97	1.19	107	16.3
West Yorkshire	*NHS Airedale, Wharfedale and Craven*	*158,500*	*1.04*	*0.56*	*0.49*	*0.65*	*0.84*	*1.15*	*145*	*0.79*	*0.64*	*0.98*	*94*	*11.1*
	NHS Bradford City	**82,700**	**0.38**	**3.33**	**1.88**	**2.65**	**2.59**	**3.19**	**218**	**2.34**	**1.87**	**2.94**	**151**	**72.2**
	NHS Bradford Districts	334,600	0.97	1.18	1.08	1.39	1.05	1.14	117	1.14	0.99	1.30	108	28.7
	NHS Calderdale	*206,400*	*0.97*	*0.52*	*0.59*	*0.77*	*1.05*	*0.63*	*73*	*0.76*	*0.62*	*0.92*	*82*	*10.3*
	NHS Greater Huddersfield	240,400	0.72	0.82	0.91	1.10	0.92	1.02	116	0.92	0.78	1.08	98	17.4
	NHS Leeds North	*199,900*	*0.74*	*0.66*	*0.82*	*0.77*	*0.84*	*0.88*	*105*	*0.79*	*0.65*	*0.95*	*88*	*17.4*
	NHS Leeds South and East	*241,000*	*0.63*	*0.73*	*0.93*	*0.75*	*0.94*	*0.98*	*100*	*0.83*	*0.69*	*1.00*	*79*	*18.3*
	NHS Leeds West	*320,500*	*0.93*	*0.60*	*0.58*	*0.72*	*1.13*	*0.69*	*69*	*0.78*	*0.66*	*0.92*	*72*	*10.8*
	NHS North Kirklees	187,900	1.42	1.06	1.24	0.48	1.46	0.85	90	1.08	0.91	1.29	108	25.3
	NHS Wakefield	329,700	0.59	0.89	0.88	1.09	0.85	0.99	118	0.88	0.77	1.02	99	4.6
Arden, Herefordshire and Worcestershire	**NHS Coventry and Rugby**	**431,200**	**1.57**	**1.33**	**1.45**	**1.76**	**1.30**	**1.13**	**118**	**1.42**	**1.28**	**1.57**	**140**	**22.2**
	NHS Herefordshire	186,100	1.14	0.72	0.82	0.90	0.80	0.79	107	0.86	0.72	1.03	108	1.8
	NHS Redditch and Bromsgrove	179,300	1.31	0.98	0.80	1.23	0.72	0.73	89	0.95	0.80	1.14	109	6.0
	NHS South Warwickshire	*259,200*	*0.80*	*0.75*	*1.02*	*0.65*	*0.57*	*0.85*	*108*	*0.77*	*0.66*	*0.91*	*92*	*7.0*
	NHS South Worcestershire	*294,500*	*0.86*	*0.67*	*0.71*	*0.84*	*0.77*	*0.91*	*119*	*0.80*	*0.68*	*0.92*	*97*	*3.7*
	NHS Warwickshire North	188,100	0.96	1.62	1.09	0.80	0.73	1.53	186	1.12	0.95	1.32	128	6.5
	NHS Wyre Forest	98,400	1.16	0.93	1.07	0.89	0.63	1.43	193	1.02	0.82	1.28	129	2.8

Table 1.3. Continued

UK area	CCG/HB	Total population (2013)	2009 O/E	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2014 Crude rate pmp	2009–2014 O/E	2009–2014 LCL	2009–2014 UCL	2009–2014 Crude rate pmp*	% non-White
Birmingham and the Black Country	**NHS Birmingham CrossCity**	**725,400**	**1.54**	**1.36**	**1.61**	**1.48**	**1.44**	**1.47**	**145**	**1.48**	**1.37**	**1.61**	**136**	**35.2**
	NHS Birmingham South and Central	**201,200**	**1.87**	**1.49**	**1.83**	**1.55**	**1.63**	**1.81**	**169**	**1.70**	**1.47**	**1.97**	**148**	**40.4**
	NHS Dudley	314,400	1.39	0.81	0.84	1.20	1.20	0.90	111	1.06	0.93	1.20	121	10.0
	NHS Sandwell and West Birmingham	**480,100**	**2.03**	**1.83**	**1.67**	**1.46**	**1.54**	**1.73**	**167**	**1.71**	**1.56**	**1.87**	**154**	**45.3**
	NHS Solihull	208,900	1.35	0.99	0.67	1.00	0.89	0.88	110	0.96	0.82	1.14	112	10.9
	NHS Walsall	**272,200**	**1.09**	**1.95**	**1.22**	**1.35**	**1.59**	**0.96**	**110**	**1.35**	**1.19**	**1.54**	**145**	**21.1**
	NHS Wolverhampton	**251,600**	**1.14**	**1.48**	**1.16**	**1.51**	**1.05**	**1.54**	**171**	**1.31**	**1.15**	**1.51**	**136**	**32.0**
Derbyshire and Notting-hamshire	NHS Erewash	94,900	1.36	0.89	1.15	1.33	1.30	0.70	84	1.12	0.89	1.41	125	3.2
	NHS Hardwick	*109,300*	*1.03*	*0.41*	*0.71*	*0.86*	*0.76*	*0.79*	*101*	*0.76*	*0.59*	*0.98*	*90*	*1.8*
	NHS Mansfield & Ashfield	193,900	1.09	0.92	0.75	0.83	0.81	1.03	124	0.91	0.76	1.08	101	2.5
	NHS Newark & Sherwood	117,000	0.95	0.97	1.30	0.93	0.49	0.73	94	0.89	0.71	1.12	107	2.4
	NHS North Derbyshire	*272,200*	*0.49*	*0.69*	*0.94*	*0.78*	*0.76*	*0.61*	*81*	*0.71*	*0.60*	*0.84*	*88*	*2.5*
	NHS Nottingham City	**310,800**	**1.29**	**1.59**	**1.11**	**1.23**	**1.27**	**1.28**	**116**	**1.29**	**1.13**	**1.48**	**109**	**28.5**
	NHS Nottingham North & East	*147,600*	*1.16*	*0.87*	*0.78*	*0.72*	*0.70*	*0.55*	*68*	*0.79*	*0.63*	*0.98*	*90*	*6.2*
	NHS Nottingham West	111,200	1.11	0.97	0.55	1.09	1.21	0.86	108	0.96	0.77	1.21	112	7.3
	NHS Rushcliffe	112,800	0.78	0.95	1.15	0.38	1.04	0.42	53	0.78	0.61	1.00	92	6.9
	NHS Southern Derbyshire	518,200	1.09	0.97	1.03	1.13	0.87	*0.94*	110	*1.00*	*0.90*	*1.12*	*109*	*11.0*
East Anglia	*NHS Cambridgeshire and Peterborough*	*855,000*	*1.07*	*0.78*	*0.91*	*0.67*	*1.06*	*0.79*	*90*	*0.88*	*0.80*	*0.96*	*93*	*9.5*
	NHS Great Yarmouth & Waveney	213,800	0.86	1.07	1.15	0.96	0.94	*0.79*	108	*0.96*	*0.82*	*1.12*	*122*	*2.7*
	NHS Ipswich and East Suffolk	*396,100*	*0.84*	*0.68*	*0.62*	*0.89*	*0.91*	*0.71*	*91*	*0.78*	*0.68*	*0.89*	*93*	*5.6*
	NHS North Norfolk	*168,500*	*0.47*	*0.78*	*0.51*	*0.76*	*0.82*	*0.85*	*131*	*0.70*	*0.58*	*0.85*	*100*	*1.5*
	NHS Norwich	195,000	1.19	1.16	1.12	0.88	0.76	0.91	103	1.00	0.84	1.19	106	7.3
	NHS South Norfolk	*237,400*	*0.59*	*0.67*	*0.96*	*0.82*	*0.96*	*0.72*	*97*	*0.79*	*0.67*	*0.93*	*98*	*2.6*
	NHS West Norfolk	*171,500*	*0.68*	*0.83*	*0.63*	*0.67*	*0.61*	*0.86*	*122*	*0.71*	*0.59*	*0.87*	*94*	*2.6*
	NHS West Suffolk	*223,800*	*0.87*	*0.85*	*0.70*	*0.89*	*0.83*	*0.61*	*76*	*0.79*	*0.66*	*0.94*	*92*	*4.6*
Essex	NHS Basildon and Brentwood	252,800	0.90	0.88	1.03	1.25	0.89	1.02	119	0.99	0.85	1.16	108	7.1
	NHS Castle Point, Rayleigh and Rochford	*172,500*	*0.57*	*0.87*	*0.75*	*0.69*	*1.17*	*0.73*	*99*	*0.80*	*0.66*	*0.97*	*100*	*3.0*
	NHS Mid Essex	*381,500*	*0.87*	*0.84*	*0.98*	*0.81*	*0.72*	*0.81*	*100*	*0.84*	*0.73*	*0.96*	*96*	*4.4*
	NHS North East Essex	316,300	0.89	1.02	1.25	0.95	0.85	1.13	145	1.01	0.89	1.15	122	5.5
	NHS Southend	175,800	0.64	0.65	0.84	0.94	1.12	0.72	85	0.82	0.67	1.00	90	8.4
	NHS Thurrock	160,800	0.47	1.17	1.20	0.79	0.90	1.10	112	0.94	0.76	1.16	89	14.1
	NHS West Essex	293,200	0.83	0.62	0.72	1.19	1.03	1.10	130	0.92	0.79	1.07	101	8.2
Hertfordshire and the South Midlands	NHS Bedfordshire	425,900	0.85	0.87	0.73	0.97	1.01	0.96	110	0.90	0.79	1.02	97	11.2
	NHS Corby	64,200	1.31	1.34	1.13	0.80	0.62	1.04	109	1.04	0.76	1.42	101	4.5
	NHS East and North Hertfordshire	546,300	0.70	0.89	1.06	0.70	1.09	1.06	119	0.92	0.82	1.03	97	10.4
	NHS Herts Valleys	575,800	0.93	0.84	0.78	0.88	0.90	1.10	122	0.91	0.81	1.01	94	14.6
	NHS Luton	**208,000**	**1.07**	**1.09**	**1.39**	**1.22**	**2.00**	**1.54**	**144**	**1.39**	**1.19**	**1.63**	**122**	**45.3**
	NHS Milton Keynes	261,400	0.90	1.05	0.97	1.13	0.90	1.20	119	1.03	0.87	1.20	94	19.6
	NHS Nene	626,600	0.81	0.75	0.90	1.08	0.98	0.96	110	0.92	0.83	1.02	98	9.1
Leicestershire and Lincolnshire	*NHS East Leicestershire and Rutland*	*321,900*	*0.54*	*0.71*	*0.72*	*0.98*	*0.90*	*0.78*	*99*	*0.77*	*0.67*	*0.90*	*92*	*9.8*
	NHS Leicester City	**333,800**	**1.51**	**1.72**	**1.80**	**1.62**	**1.72**	**1.21**	**111**	**1.59**	**1.42**	**1.79**	**136**	**49.5**
	NHS Lincolnshire East	*229,400*	*0.69*	*0.78*	*0.88*	*0.75*	*1.08*	*0.57*	*83*	*0.79*	*0.67*	*0.93*	*107*	*2.0*
	NHS Lincolnshire West	*229,600*	*0.59*	*0.64*	*0.74*	*0.42*	*0.79*	*0.57*	*70*	*0.63*	*0.51*	*0.76*	*71*	*3.0*
	NHS South Lincolnshire	142,600	0.81	1.18	0.97	0.91	0.66	0.68	91	0.86	0.70	1.06	108	2.3
	NHS South West Lincolnshire	122,800	0.97	0.92	0.96	0.68	0.86	0.50	65	0.81	0.64	1.02	98	2.3
	NHS West Leicestershire	377,300	0.94	1.11	0.91	0.52	0.81	1.01	122	0.88	0.78	1.01	99	6.9

Table 1.3. Continued

UK area	CCG/HB	Total population (2013)	2009 O/E	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2014 Crude rate pmp	2009–2014 O/E	2009–2014 LCL	2009–2014 UCL	2009–2014 Crude rate pmp*	% non-White
Shropshire and Staffordshire	NHS Cannock Chase	133,600	0.48	1.12	1.15	0.81	1.18	0.75	90	0.91	0.73	1.13	102	2.4
	NHS East Staffordshire	124,600	0.66	1.51	0.95	0.72	1.13	0.87	104	0.97	0.78	1.21	108	9.0
	NHS North Staffordshire	214,400	1.12	0.69	1.10	0.59	0.88	1.01	131	0.90	0.76	1.06	108	3.5
	NHS Shropshire	308,600	0.69	0.92	0.97	0.76	1.02	0.89	120	0.88	0.76	1.01	110	2.0
	NHS South East Staffs and Seisdon and Peninsular	*224,500*	*0.81*	*0.71*	*0.99*	*0.72*	*0.63*	*0.77*	*98*	*0.77*	*0.64*	*0.92*	*91*	*3.6*
	NHS Stafford and Surrounds	151,700	1.10	1.13	0.82	0.92	0.90	0.85	112	0.95	0.78	1.15	116	4.7
	NHS Stoke on Trent	**258,400**	**1.40**	**1.39**	**1.04**	**0.85**	**1.12**	**1.44**	**163**	**1.21**	**1.05**	**1.39**	**127**	**11.0**
	NHS Telford & Wrekin	**168,500**	**1.24**	**1.39**	**1.11**	**1.22**	**1.24**	**1.29**	**142**	**1.25**	**1.05**	**1.48**	**129**	**7.3**
London	**NHS Barking & Dagenham**	**194,400**	**1.42**	**1.39**	**1.67**	**2.06**	**1.62**	**2.11**	**175**	**1.72**	**1.47**	**2.01**	**134**	**41.7**
	NHS Barnet	**369,100**	**1.25**	**1.77**	**1.44**	**1.52**	**1.26**	**1.36**	**135**	**1.43**	**1.28**	**1.60**	**133**	**35.9**
	NHS Camden	**229,700**	**1.39**	**1.69**	**1.17**	**1.22**	**1.39**	**1.23**	**113**	**1.35**	**1.15**	**1.57**	**116**	**33.7**
	NHS City and Hackney	**265,000**	**1.90**	**1.63**	**1.77**	**2.13**	**1.93**	**2.30**	**177**	**1.95**	**1.71**	**2.22**	**142**	**44.6**
	NHS Enfield	**320,500**	**1.34**	**1.38**	**1.99**	**1.63**	**1.63**	**1.58**	**153**	**1.60**	**1.42**	**1.80**	**144**	**39.0**
	NHS Haringey	**263,400**	**1.01**	**1.48**	**1.76**	**2.37**	**2.31**	**1.73**	**148**	**1.78**	**1.57**	**2.03**	**144**	**39.5**
	NHS Havering	242,100	0.70	0.36	1.19	1.06	0.81	0.95	112	0.85	0.72	1.00	93	12.3
	NHS Islington	**215,700**	**1.50**	**1.54**	**1.59**	**2.13**	**1.55**	**1.16**	**97**	**1.57**	**1.35**	**1.83**	**124**	**31.8**
	NHS Newham	**318,200**	**2.13**	**2.37**	**2.27**	**2.05**	**2.30**	**2.51**	**185**	**2.27**	**2.03**	**2.55**	**158**	**71.0**
	NHS Redbridge	**288,300**	**1.77**	**1.53**	**1.39**	**2.18**	**2.05**	**1.51**	**142**	**1.74**	**1.54**	**1.96**	**153**	**57.5**
	NHS Tower Hamlets	**272,900**	**1.75**	**1.51**	**1.77**	**2.07**	**2.23**	**2.47**	**172**	**1.98**	**1.73**	**2.26**	**131**	**54.8**
	NHS Waltham Forest	**265,800**	**1.40**	**1.24**	**1.84**	**1.28**	**1.70**	**2.14**	**188**	**1.61**	**1.41**	**1.84**	**133**	**47.8**
	NHS Brent	**317,300**	**2.23**	**2.71**	**2.13**	**2.49**	**1.99**	**2.66**	**246**	**2.37**	**2.14**	**2.62**	**205**	**63.7**
	NHS Central London (Westminster)	**162,700**	**1.39**	**1.36**	**1.37**	**1.24**	**1.46**	**1.15**	**117**	**1.33**	**1.11**	**1.58**	**126**	**36.2**
	NHS Ealing	**342,500**	**2.34**	**2.02**	**1.92**	**2.27**	**1.66**	**1.84**	**172**	**2.00**	**1.81**	**2.22**	**176**	**51.0**
	NHS Hammersmith and Fulham	**178,700**	**1.32**	**1.57**	**1.44**	**1.51**	**1.00**	**1.47**	**129**	**1.38**	**1.16**	**1.65**	**114**	**31.9**
	NHS Harrow	**243,400**	**2.05**	**2.14**	**2.24**	**1.59**	**1.06**	**1.56**	**164**	**1.76**	**1.56**	**2.00**	**174**	**57.8**
	NHS Hillingdon	**286,800**	**1.24**	**1.51**	**1.49**	**1.52**	**1.45**	**1.03**	**101**	**1.37**	**1.20**	**1.56**	**126**	**39.4**
	NHS Hounslow	**262,400**	**1.62**	**1.85**	**1.87**	**1.77**	**2.07**	**1.32**	**122**	**1.75**	**1.54**	**1.98**	**151**	**48.6**
	NHS West London (Kensington and Chelsea, Queen's Park and Paddington)	**219,800**	**1.19**	**1.28**	**1.23**	**0.93**	**1.00**	**1.56**	**155**	**1.20**	**1.02**	**1.41**	**112**	**33.4**
	NHS Bexley	236,700	1.30	1.37	1.20	0.86	1.04	1.03	114	1.13	0.97	1.32	117	18.1
	NHS Bromley	317,900	0.99	1.14	0.69	0.71	0.84	1.02	116	0.90	0.78	1.04	96	15.7
	NHS Croydon	**372,800**	**1.64**	**1.44**	**1.27**	**2.02**	**1.97**	**1.90**	**188**	**1.71**	**1.54**	**1.90**	**158**	**44.9**
	NHS Greenwich	**264,000**	**1.36**	**2.12**	**1.07**	**1.25**	**2.47**	**1.29**	**114**	**1.59**	**1.39**	**1.82**	**131**	**37.5**
	NHS Kingston	166,800	0.93	0.88	0.98	1.11	1.15	1.15	114	1.04	0.85	1.27	96	25.5
	NHS Lambeth	**314,200**	**1.84**	**1.41**	**1.81**	**1.73**	**1.44**	**1.94**	**156**	**1.70**	**1.50**	**1.92**	**129**	**42.9**
	NHS Lewisham	**286,200**	**2.28**	**1.49**	**1.83**	**1.91**	**1.52**	**1.54**	**133**	**1.76**	**1.55**	**1.99**	**143**	**46.5**
	NHS Merton	**203,200**	**1.40**	**1.21**	**1.55**	**1.76**	**1.24**	**1.39**	**133**	**1.42**	**1.22**	**1.67**	**128**	**35.1**
	NHS Richmond	191,400	0.81	0.89	0.70	0.80	0.99	0.79	84	0.83	0.68	1.02	82	14.0
	NHS Southwark	**298,500**	**1.53**	**1.89**	**2.04**	**1.82**	**2.32**	**1.94**	**157**	**1.93**	**1.71**	**2.17**	**147**	**45.8**
	NHS Sutton	**195,900**	**0.99**	**1.45**	**1.30**	**1.54**	**0.80**	**1.72**	**184**	**1.30**	**1.11**	**1.53**	**130**	**21.4**
	NHS Wandsworth	**310,500**	**1.99**	**1.50**	**1.23**	**1.35**	**0.96**	**1.58**	**132**	**1.44**	**1.25**	**1.64**	**113**	**28.6**
Bath, Gloucestershire, Swindon and Wiltshire	NHS Bath and North East Somerset	180,100	1.24	0.63	0.56	0.92	0.94	0.71	83	0.83	0.68	1.01	92	5.4
	NHS Gloucestershire	*605,700*	*1.14*	*0.90*	*0.89*	*1.18*	*0.71*	*0.63*	*79*	*0.90*	*0.82*	*1.00*	*106*	*4.6*
	NHS Swindon	219,300	1.07	1.04	1.15	1.23	0.93	1.18	128	1.10	0.93	1.29	111	10.0
	NHS Wiltshire	*479,600*	*0.78*	*0.81*	*0.64*	*0.47*	*0.78*	*0.82*	*102*	*0.72*	*0.63*	*0.82*	*83*	*3.4*

Table 1.3. Continued

UK area	CCG/HB	Total population (2013)	2009 O/E	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2014 Crude rate pmp	2009–2014 O/E	2009–2014 LCL	2009–2014 UCL	2009–2014 Crude rate pmp*	% non-White
Bristol, North Somerset, Somerset and South Gloucestershire	**NHS Bristol**	**437,500**	**1.26**	**1.50**	**1.42**	**1.22**	**1.36**	**1.09**	**105**	**1.30**	**1.17**	**1.46**	**118**	**16.0**
	NHS North Somerset	206,100	0.97	0.99	0.88	1.03	1.04	1.06	141	1.00	0.85	1.17	123	2.7
	NHS Somerset	*538,100*	*1.07*	*1.08*	*0.85*	*0.68*	*0.56*	*0.85*	*113*	*0.84*	*0.76*	*0.94*	*105*	*2.0*
	NHS South Gloucestershire	*269,100*	*0.66*	*1.09*	*0.61*	*0.81*	*1.16*	*0.69*	*82*	*0.84*	*0.71*	*0.98*	*92*	*5.0*
Devon, Cornwall and sles of Scilly	*NHS Kernow*	*543,600*	*1.07*	*0.90*	*0.81*	*0.95*	*0.84*	*0.81*	*110*	*0.89*	*0.81*	*0.99*	*113*	*1.8*
	NHS North, East, West Devon	874,300	1.06	1.00	0.92	1.00	0.83	0.90	117	0.95	0.88	1.03	115	3.0
	NHS South Devon and Torbay	275,000	0.87	1.27	0.89	1.11	1.00	0.84	120	0.99	0.87	1.13	132	2.1
Kent and Medway	NHS Ashford	121,700	0.93	0.95	0.84	1.29	1.11	0.98	115	1.02	0.82	1.26	111	6.3
	NHS Canterbury and Coastal	202,400	1.08	0.96	0.84	0.57	0.94	1.18	143	0.93	0.78	1.11	105	5.9
	NHS Dartford, Gravesham and Swanley	251,900	1.15	0.98	0.87	0.98	1.47	0.94	107	1.07	0.92	1.24	113	13.0
	NHS Medway	271,100	0.91	0.74	0.90	0.78	1.12	0.97	103	0.91	0.77	1.06	90	10.4
	NHS South Kent Coast	203,600	0.70	0.92	1.02	0.61	0.79	1.08	142	0.86	0.72	1.02	105	4.5
	NHS Swale	109,600	1.30	1.06	0.60	1.36	0.83	1.10	128	1.04	0.83	1.31	112	3.8
	NHS Thanet	136,800	1.19	1.47	0.86	1.04	1.62	0.97	124	1.19	0.99	1.42	143	4.5
	NHS West Kent	*467,500*	*0.81*	*0.71*	*0.86*	*0.60*	*0.70*	*0.93*	*111*	*0.77*	*0.68*	*0.87*	*86*	*4.9*
Surrey and Sussex	NHS Brighton & Hove	278,100	1.10	0.84	0.93	1.16	0.79	1.15	115	1.00	0.85	1.17	93	10.9
	NHS Coastal West Sussex	*480,200*	*0.69*	*0.50*	*0.65*	*0.79*	*0.79*	*0.98*	*137*	*0.74*	*0.66*	*0.83*	*96*	*3.8*
	NHS Crawley	109,000	1.42	1.97	0.50	0.80	1.07	1.30	128	1.17	0.93	1.48	109	20.1
	NHS East Surrey	177,900	0.69	1.31	0.74	1.26	0.92	0.83	96	0.95	0.79	1.15	103	8.3
	NHS Eastbourne, Hailsham and Seaford	*183,500*	*0.51*	*0.61*	*0.84*	*1.05*	*1.19*	*0.74*	*104*	*0.82*	*0.69*	*0.99*	*108*	*4.4*
	NHS Guildford and Waverley	*207,800*	*1.00*	*0.69*	*0.71*	*1.16*	*0.52*	*0.78*	*91*	*0.81*	*0.67*	*0.98*	*88*	*7.2*
	NHS Hastings & Rother	*181,800*	*0.62*	*0.76*	*0.96*	*0.78*	*1.22*	*0.64*	*88*	*0.83*	*0.69*	*1.00*	*106*	*4.6*
	NHS High Weald Lewes Havens	*169,100*	*0.74*	*0.65*	*0.68*	*0.91*	*0.61*	*0.98*	*130*	*0.77*	*0.63*	*0.94*	*95*	*3.1*
	NHS Horsham and Mid Sussex	*225,300*	*0.76*	*0.74*	*0.80*	*0.51*	*0.77*	*0.84*	*102*	*0.74*	*0.61*	*0.89*	*84*	*4.9*
	NHS North West Surrey	340,200	0.83	1.14	1.29	0.90	0.93	1.22	141	1.05	0.93	1.20	114	12.5
	NHS Surrey Downs	284,700	1.09	0.96	0.96	0.86	1.04	0.96	119	0.98	0.85	1.13	113	9.1
	NHS Surrey Heath	*94,400*	*1.16*	*0.79*	*0.77*	*0.76*	*0.46*	*0.44*	*53*	*0.72*	*0.54*	*0.97*	*81*	*9.3*
Thames Valley	*NHS Aylesbury Vale*	*199,500*	*0.57*	*0.98*	*1.04*	*0.75*	*0.68*	*0.78*	*90*	*0.80*	*0.66*	*0.97*	*86*	*9.7*
	NHS Bracknell and Ascot	134,400	0.77	1.03	0.76	0.38	1.18	0.98	104	0.85	0.67	1.08	84	9.5
	NHS Chiltern	*319,400*	*1.15*	*0.68*	*0.68*	*0.73*	*0.96*	*0.78*	*94*	*0.83*	*0.72*	*0.96*	*93*	*15.8*
	NHS Newbury and District	105,700	1.09	0.65	0.63	0.71	1.13	0.91	104	0.86	0.66	1.11	91	4.4
	NHS North & West Reading	*99,900*	*0.28*	*0.29*	*0.94*	*0.93*	*0.63*	*1.03*	*120*	*0.69*	*0.52*	*0.93*	*75*	*10.4*
	NHS Oxfordshire	652,300	1.01	0.90	1.01	0.98	0.88	0.84	95	0.94	0.85	1.04	99	9.3
	NHS Slough	**143,000**	**1.88**	**2.03**	**2.22**	**1.77**	**1.81**	**1.73**	**147**	**1.90**	**1.60**	**2.26**	**151**	**54.3**
	NHS South Reading	**109,000**	**1.31**	**1.34**	**1.17**	**1.18**	**2.41**	**1.65**	**138**	**1.52**	**1.21**	**1.89**	**119**	**30.5**
	NHS Windsor, Ascot and Maidenhead	139,900	1.17	0.92	1.23	0.61	1.32	1.20	136	1.08	0.88	1.32	114	14.7
	NHS Wokingham	157,900	0.78	0.80	1.32	0.47	0.81	0.77	89	0.82	0.66	1.02	89	11.6
Wessex	*NHS Dorset*	*754,500*	*0.63*	*0.61*	*0.72*	*0.71*	*0.71*	*0.71*	*97*	*0.68*	*0.62*	*0.76*	*87*	*4.0*
	NHS Fareham and Gosport	197,100	1.10	1.13	0.79	0.78	1.01	1.08	137	0.98	0.83	1.16	116	3.4
	NHS Isle of Wight	*138,400*	*0.11*	*0.63*	*0.77*	*0.87*	*1.28*	*0.86*	*123*	*0.76*	*0.61*	*0.94*	*101*	*2.7*
	NHS North East Hampshire and Farnham	207,500	0.90	0.87	0.84	1.16	1.17	0.90	101	0.97	0.82	1.16	102	9.7
	NHS North Hampshire	*217,800*	*0.53*	*0.72*	*0.70*	*0.47*	*0.71*	*1.00*	*115*	*0.69*	*0.57*	*0.84*	*74*	*6.4*
	NHS Portsmouth	207,500	0.64	0.54	1.30	1.10	1.12	0.92	92	0.94	0.78	1.14	88	11.6

Table 1.3. Continued

UK area	CCG/HB	Total population (2013)	2009 O/E	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2014 Crude rate pmp	2009–2014 O/E	2009–2014 LCL	2009–2014 UCL	2009–2014 Crude rate pmp*	% non-White
Wessex cont.	NHS South Eastern Hampshire	209,900	1.04	1.06	0.75	0.63	0.96	1.09	143	0.92	0.78	1.09	113	3.1
	NHS Southampton	242,100	0.80	1.24	1.15	0.88	0.63	0.99	95	0.95	0.79	1.13	85	14.1
	NHS West Hampshire	*548,000*	*0.66*	*0.47*	*0.67*	*0.62*	*0.66*	*0.75*	*99*	*0.64*	*0.57*	*0.72*	*78*	*3.9*
Wales	Betsi Cadwaladr University	692,000	0.96	0.98	0.82	1.00	0.90	1.06	137	0.95	0.87	1.04	115	2.5
	Powys Teaching	132,700	1.04	0.71	1.26	1.25	0.72	0.58	83	0.92	0.76	1.12	123	1.6
	Hywel Dda	383,900	0.77	1.12	1.23	0.89	1.07	1.13	151	1.04	0.93	1.16	129	2.2
	Abertawe Bro Morgannwg University	**520,700**	**1.53**	**1.51**	**1.17**	**1.43**	**1.05**	**0.74**	**90**	**1.23**	**1.12**	**1.35**	**139**	**3.9**
	Cwm Taf	295,100	1.26	1.00	1.44	0.90	1.12	1.12	132	1.14	1.00	1.30	125	2.6
	Aneurin Bevan	**579,100**	**0.96**	**1.30**	**1.20**	**1.17**	**1.04**	**1.17**	**142**	**1.14**	**1.04**	**1.25**	**128**	**3.9**
	Cardiff and Vale University	478,900	1.15	1.31	1.01	1.01	1.11	0.91	96	1.08	0.97	1.21	106	12.2
Scotland	Ayrshire and Arran	372,200	0.89	1.12	0.82	0.94	0.98	0.83	107	0.93	0.82	1.05	112	1.2
	Borders	*113,900*	*0.91*	*1.07*	*0.55*	*0.55*	*0.47*	*0.57*	*79*	*0.68*	*0.53*	*0.88*	*88*	*1.3*
	Dumfries and Galloway	*150,300*	*1.09*	*0.59*	*0.57*	*1.02*	*0.45*	*1.14*	*160*	*0.81*	*0.67*	*0.99*	*106*	*1.2*
	Fife	366,900	1.22	1.25	1.16	0.86	1.01	0.95	117	1.07	0.95	1.21	123	2.4
	Forth Valley	299,700	0.98	1.04	0.82	0.84	1.00	0.92	110	0.93	0.81	1.08	104	2.2
	Grampian	*579,200*	*0.85*	*0.85*	*0.82*	*0.83*	*0.91*	*0.76*	*88*	*0.84*	*0.75*	*0.93*	*91*	*4.0*
	Greater Glasgow and Clyde	1,137,900	1.03	0.90	1.09	1.12	0.91	0.95	107	1.00	0.93	1.08	105	7.3
	Highland	*321,000*	*0.73*	*0.64*	*0.51*	*0.61*	*0.67*	*0.54*	*72*	*0.61*	*0.52*	*0.72*	*76*	*1.3*
	Lanarkshire	652,600	0.82	0.94	0.83	1.07	0.94	0.90	106	0.92	0.83	1.01	100	2.0
	Lothian	*849,700*	*0.83*	*0.62*	*0.72*	*0.75*	*0.60*	*0.76*	*84*	*0.71*	*0.64*	*0.79*	*74*	*5.6*
	Orkney	21,600	1.14	0.39	0.00	1.86	0.73	0.00	0	0.68	0.38	1.22	85	0.7
	Shetland	23,200	0.78	0.40	0.77	0.00	0.75	1.06	129	0.63	0.34	1.18	72	1.5
	Tayside	412,200	1.26	1.02	1.18	0.67	0.86	0.93	116	0.98	0.87	1.10	115	3.2
	Western Isles	27,400	0.87	1.48	0.00	0.00	1.11	1.58	219	0.85	0.53	1.34	109	0.9
Northern Ireland	Belfast	349,600	0.78	1.31	1.06	1.65	1.15	0.82	86	1.12	0.99	1.28	110	3.2
	Northern	466,700	0.83	1.09	1.24	1.13	1.04	1.01	111	1.05	0.94	1.18	109	1.2
	Southern	365,700	0.77	1.03	1.29	0.81	0.85	0.76	77	0.92	0.79	1.05	87	1.2
	South Eastern	*350,800*	*0.66*	*0.71*	*0.93*	*0.78*	*0.92*	*0.73*	*83*	*0.79*	*0.68*	*0.92*	*84*	*1.3*
	Western	296,900	1.25	0.87	0.99	0.59	0.99	1.07	111	0.96	0.82	1.12	93	1.0

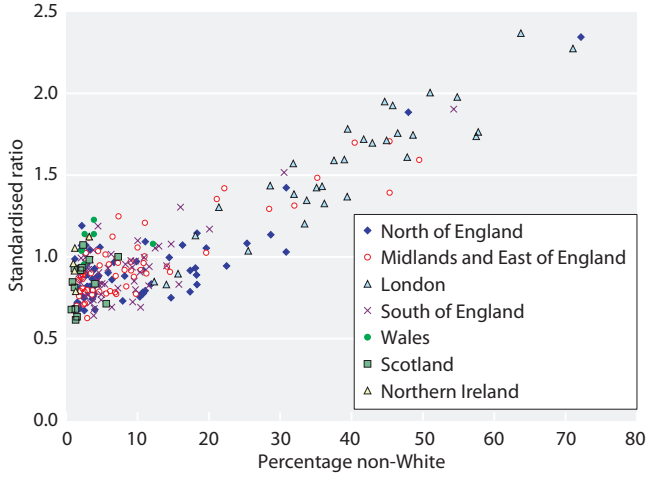

Fig. 1.2. Age/gender standardised incidence ratio (2009–2014) by percentage non-White

Figure 1.4 shows RRT incidence rates for 2014 by age group and gender. For both men and women, the peak rate was in the 75–79 age group. Showing numbers starting RRT (rather than rates); figure 1.5 shows that the 65–74 age group contained the most incident patients for both HD and PD.

Age

In 2014, the median age of patients starting renal replacement therapy was 64.8 years (table 1.5) and this has changed little over the last seven years. Per modality, the median age at start was 67.1 years for patients starting on HD, 61.4 for patients starting on PD and 49.9 for those having a pre-emptive transplant (table 1.6). For those starting on PD the median age at start increased by 1.7 years from the 59.7 years seen for those starting in

Table 1.4. Number of patients starting RRT by renal centre 2009–2014

Centre	Year						Catchment population (millions)	2014 crude rate pmp[a]	(95% CI)
	2009	2010	2011	2012	2013	2014			
England									
B Heart	99	94	113	101	99	98	0.74	133	(106–159)
B QEH	253	196	213	213	200	242	1.70	142	(124–160)
Basldn	28	35	44	53	33	46	0.42	111	(79–143)
Bradfd	56	66	60	70	63	83	0.65	127	(100–155)
Brightn	116	105	119	133	139	147	1.30	113	(95–132)
Bristol	156	168	141	148	173	148	1.44	103	(86–119)
Camb	134	105	122	123	136	127	1.16	110	(91–129)
Carlis	28	22	27	19	42	38	0.32	118	(81–156)
Carsh	202	216	207	244	229	273	1.91	143	(126–160)
Chelms	51	45	48	46	46	52	0.51	102	(74–130)
Colchr	23	32	44	29	29	38	0.30	127	(87–167)
Covnt	114	113	111	114	91	125	0.89	140	(116–165)
Derby	78	79	75	80	74	75	0.70	107	(83–131)
Donc	40	45	42	41	60	54	0.41	132	(97–167)
Dorset	73	72	79	73	72	76	0.86	88	(68–108)
Dudley	67	43	43	56	51	41	0.44	93	(64–121)
Exeter	144	139	112	135	100	139	1.09	128	(106–149)
Glouc	79	61	58	76	53	51	0.59	87	(63–111)
Hull	98	86	109	95	91	98	1.02	96	(77–115)
Ipswi	38	33	29	44	40	33	0.40	83	(54–111)
Kent	126	131	121	115	146	151	1.22	123	(104–143)
L Barts	236	200	250	268	286	310	1.83	169	(151–188)
L Guys	172	142	121	128	133	159	1.08	147	(124–170)
L Kings	125	144	138	124	167	148	1.17	126	(106–147)
L Rfree	169	203	220	235	226	229	1.52	151	(131–170)
L St.G	110	85	72	94	84	91	0.80	114	(91–137)
L West	356	364	364	354	302	357	2.40	149	(133–164)
Leeds	146	125	155	154	184	169	1.67	101	(86–116)
Leic	226	243	266	235	289	254	2.44	104	(91–117)
Liv Ain	38	48	58	63	65	67	0.48	138	(105–172)
Liv Roy	109	98	111	104	95	137	1.00	137	(114–160)
M RI	145	159	154	161	200	190	1.53	124	(106–142)
Middlbr	96	100	101	120	111	103	1.00	103	(83–122)
Newc	97	91	98	103	92	107	1.12	95	(77–114)
Norwch	71	85	86	75	77	79	0.79	100	(78–123)
Nottm	131	116	114	100	113	111	1.09	102	(83–121)
Oxford	174	164	177	170	166	189	1.69	112	(96–128)
Plymth	57	56	60	55	64	53	0.47	113	(82–143)
Ports	147	147	187	159	195	225	2.02	111	(97–126)
Prestn	145	122	139	146	150	153	1.49	102	(86–119)
Redng	94	89	103	73	117	107	0.91	118	(95–140)
Salford [b]	125	145	131	134	114	146	1.49	98	(82–114)
Sheff	148	141	135	156	136	151	1.37	110	(93–128)
Shrew	48	57	61	58	59	65	0.50	130	(98–161)
Stevng	98	105	110	109	156	152	1.20	126	(106–146)
Sthend	23	27	29	26	42	30	0.32	95	(61–129)
Stoke	108	95	91	74	105	112	0.89	126	(103–149)
Sund	64	54	57	71	51	63	0.62	102	(77–127)
Truro	58	46	39	49	44	39	0.41	94	(65–124)
Wirral	63	60	60	44	66	56	0.57	98	(72–124)
Wolve	65	106	77	87	91	79	0.67	118	(92–144)
York	43	38	51	53	36	64	0.49	130	(98–162)

Table 1.4. Continued

Centre	Year						Catchment population (millions)	2014 crude rate pmp[a]	(95% CI)
	2009	2010	2011	2012	2013	2014			
N Ireland									
Antrim	22	38	29	25	29	35	0.29	119	(79–158)
Belfast	59	70	68	93	72	63	0.64	99	(74–123)
Newry	19	21	36	17	23	19	0.26	73	(40–105)
Ulster	13	20	36	28	30	20	0.27	75	(42–108)
West NI	37	27	35	22	30	35	0.35	99	(67–132)
Scotland									
Abrdn	55	51	50	53	58	53	0.60	88	(65–112)
Airdrie	47	56	48	60	52	52	0.55	94	(69–120)
D & Gall	17	10	10	18	9	21	0.15	141	(81–202)
Dundee	68	50	59	38	42	49	0.46	106	(76–135)
Edinb	96	69	76	80	72	89	0.96	92	(73–111)
Glasgw	172	153	177	184	174	182	1.62	112	(96–128)
Inverns	20	27	12	16	21	22	0.27	81	(47–116)
Klmarnk	39	43	33	40	40	36	0.36	100	(67–132)
Krkcldy	33	45	43	30	38	38	0.32	120	(82–158)
Wales									
Bangor	30	26	20	21	24	22	0.22	101	(59–143)
Cardff	175	182	186	170	171	168	1.42	118	(100–136)
Clwyd	25	21	17	22	17	29	0.19	153	(97–209)
Swanse	113	134	118	117	110	106	0.89	120	(97–143)
Wrexm	19	25	26	34	38	42	0.24	175	(122–228)
							% change since 2009		
England	**5,690**	**5,541**	**5,732**	**5,790**	**5,983**	**6,330**	**11.2**		
N Ireland	**150**	**176**	**204**	**185**	**184**	**172**	**14.7**		
Scotland	**547**	**504**	**508**	**519**	**506**	**542**	**— 0.9**		
Wales	**362**	**388**	**367**	**364**	**360**	**367**	**1.4**		
UK	**6,749**	**6,609**	**6,811**	**6,858**	**7,033**	**7,411**	**9.8**		

[a]pmp – per million population
[b]Subsequent to closing the 2014 database one centre reported a notable variation to the numbers returned for 2014. Tables 1.2 and 1.4 (but not the remainder of this chapter) reflect this revision (Salford (+6))

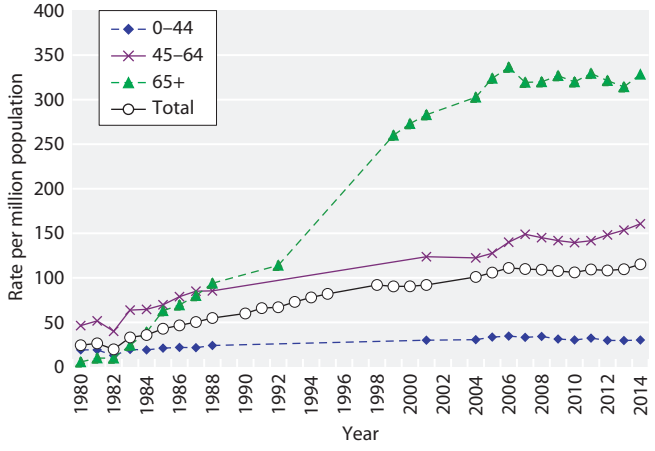

Fig. 1.3. RRT incidence rates between 1980 and 2014

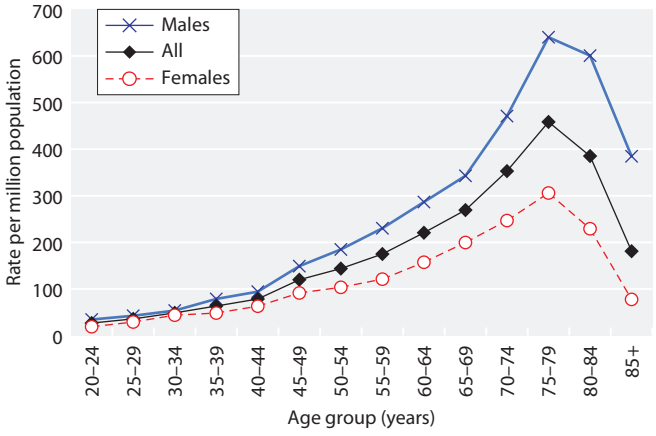

Fig. 1.4. RRT incidence rates in 2014 by age and gender

Table 1.5. Median, inter-quartile range and 90% range of the age of patients starting renal replacement therapy in 2014 by country

Country	Median	IQR	90% range
England	64.8	(51.4–74.8)	(31.7–84.1)
N Ireland	67.1	(53.0–77.4)	(31.7–83.8)
Scotland	62.1	(49.0–71.7)	(30.0–81.8)
Wales	68.2	(57.2–76.5)	(38.0–83.7)
UK	**64.8**	**(51.4–74.9)**	**(31.7–84.0)**

Table 1.6. Median, inter-quartile range and 90% range of the age of patients starting renal replacement therapy in 2014 by initial treatment modality

Treatment	Median	IQR	90% range
HD	67.1	(54.7–76.3)	(34.7–84.6)
PD	61.4	(48.0–71.9)	(30.1–82.3)
Transplant	49.9	(40.3–59.7)	(24.6–70.3)

2013. The median age at start of non-White patients increased from 57.0 years for 2013 starters to 58.7 but was still considerably lower than that for White patients (66.4 years) reflecting CKD differences and the younger age distribution of ethnic minority populations in general compared with the White population (in the 2011 census data for England and Wales 5.3% of ethnic minorities were over 65 years old compared to 18.3% of Whites) [4]. The median age of new patients with diabetes was similar to the overall median and has not varied greatly over the last six years.

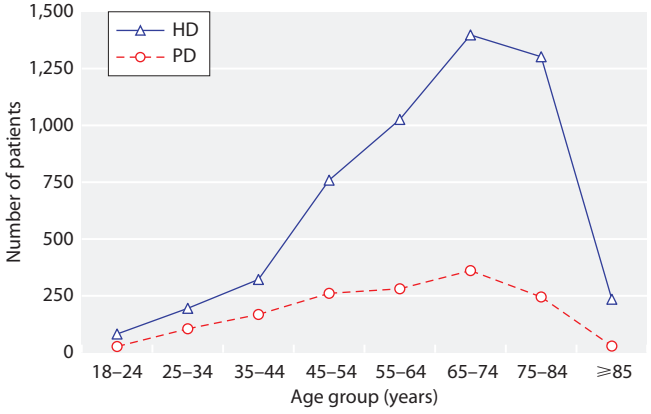

Fig. 1.5. Number of incident dialysis patients in 2014, by age group and initial dialysis modality

There were large differences between centres in the median age of incident patients (figure 1.6) reflecting differences in the age and ethnic structure of the catchment populations and also, particularly in smaller centres, chance fluctuations. The median age of patients starting treatment at transplant centres was 63.5 years (IQR 50.0, 74.0) and at non-transplanting centres 66.0 years (IQR 52.7, 75.5).

There has been recent interest in the access of older patients to RRT and this has again been explored this year. Averaged over 2009–2014, crude CCG/HB incidence rates in the over 75 years age group varied from 89 per million age related population (pmarp) in Borders to 1,036 pmarp in NHS Brent (IQR 254 pmarp, 401 pmarp). The wide range of treatment rates suggests that there was geographical variation in the prevalence of comorbid and predisposing renal conditions as well as

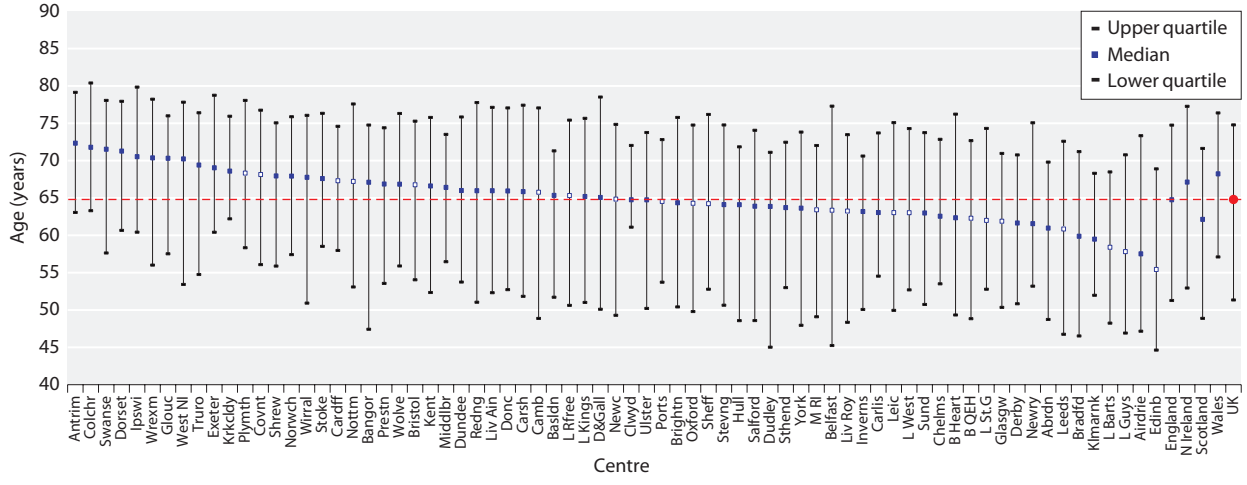

Fig. 1.6. Median age of incident RRT patients by centre in 2014
White points indicate transplant centres

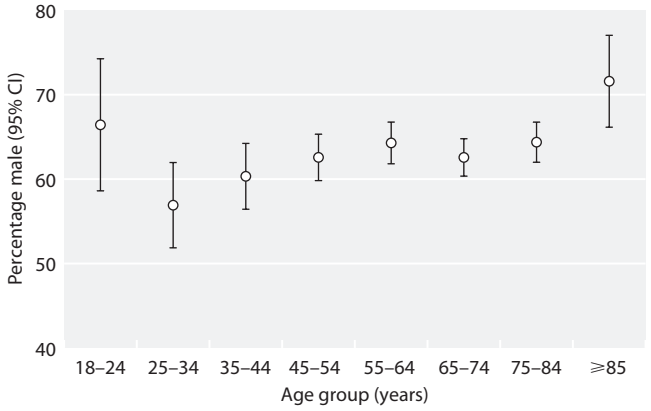

Fig. 1.7. Percentage of patients starting RRT in 2014 who were male, by age group

uncertainty within the renal community about the suitability of older patients for dialysis. The variation in rates between CCG/HBs seen in the over 75s was much greater than the variation seen in the overall analysis although some of this difference is likely to be due to the smaller numbers included in the over 75 analysis.

Gender

As before and as widely reported by all registries there continued to be more men than women starting RRT in every age group (figure 1.7). The overall breakdown was 63.2% male, 36.8% female equating to a M : F ratio of 1.72.

Ethnicity

As in previous reports, Scotland is not included in this section as completeness of ethnicity data was low. Across centres in England, Wales and Northern Ireland the average completeness was 94.8% – similar to the 95.2% seen last year. For 2013 starters, completeness was 80% or more for all but one centre (Carshalton), for 2014 starters, completeness for Carshalton improved to 87.9%. However, completeness has fallen below 80% for six centres; Chelmsford (71.2%), Colchester (78.9%), Ipswich (0%), Norwich (77.2), Oxford (76.2) and Southend (63.3%). Completeness was 80% or more for all the other centres (table 1.7) and was over 90% for 51 of the 62 centres. Eight centres reported that 100% of patients (with ethnicity data) were White whilst some London centres reported that over 50% of patients with data were non-White.

Primary renal diagnosis

The breakdown of primary renal diagnosis (PRD) by centre is shown in table 1.8. The information was missing for 10.9% of patients. Fifty-one centres provided data on over 90% of incident patients and 29 of these centres had 100% completeness. These numbers are lower than the 58 and 36 centres respectively that were at these levels for 2013. There was only a small amount of missing data for Wales, Northern Ireland and Scotland, whilst England had 12.6% missing (up from 11.0% for 2013 and 7.4% for 2012). The overall percentage missing was up on 2013 and 2012 (10.9% from 9.5% from 6.3%) and was similar

Table 1.7. Percentage of incident RRT patients (2014) in different ethnic groups by centre

Centre	% data not available	*N* with data	Percentage in each ethnic group				
			White	South Asian	Black	Chinese	Other
England							
B Heart	0.0	98	64.3	29.6	6.1		
B QEH	0.0	242	65.3	22.3	9.5		2.9
Basldn	4.3	44	88.6	2.3	4.5		4.5
Bradfd	1.2	82	59.8	37.8	2.4		
Brightn	6.8	137	91.2	3.7	0.7	0.7	3.7
Bristol	0.0	148	95.3	2.0	2.0		0.7
Camb	13.4	110	94.5	3.6		1.8	
Carlis	0.0	38	100.0				
Carsh	12.1	240	70.0	11.7	9.6	1.7	7.1
Chelms	28.8	37	91.9		5.4	2.7	
Colchr	21.1	30	93.3	6.7			
Covnt	1.6	123	79.7	17.9	2.4		
Derby	1.3	74	81.1	13.5	4.1		1.4
Donc	0.0	54	96.3	1.9	1.9		
Dorset	0.0	76	98.7	1.3			
Dudley	4.9	39	82.1	10.3	2.6	2.6	2.6

Table 1.7. Continued

Centre	% data not available	*N* with data	Percentage in each ethnic group				
			White	South Asian	Black	Chinese	Other
Exeter	2.2	136	98.5	0.7			0.7
Glouc	0.0	51	94.1	5.9			
Hull	0.0	98	100.0				
Ipswi	100.0	0					
Kent	5.3	143	93.7	1.4	0.7	1.4	2.8
L Barts	0.6	308	36.4	29.9	32.5	0.3	1.0
L Guys	6.3	149	54.4	8.7	30.9		6.0
L Kings	0.0	148	54.1	10.1	34.5	0.7	0.7
L Rfree	5.2	217	54.4	21.7	17.1	1.4	5.5
L St.G	13.2	79	45.6	19.0	22.8	3.8	8.9
L West	0.3	356	44.4	33.1	18.0	2.0	2.5
Leeds	0.0	169	81.7	13.6	3.6		1.2
Leic	6.3	238	79.4	13.4	3.8	1.3	2.1
Liv Ain	1.5	66	98.5				1.5
Liv Roy	5.8	129	89.9	3.9	1.6	1.6	3.1
M RI	6.8	177	72.3	11.3	13.0	1.7	1.7
Middlbr	0.0	103	99.0	1.0			
Newc	0.0	107	87.9	6.5	1.9	2.8	0.9
Norwch	22.8	61	98.4	1.6			
Nottm	0.0	111	83.8	11.7	3.6		0.9
Oxford	23.8	144	83.3	7.6	2.8	0.7	5.6
Plymth	0.0	53	96.2				3.8
Ports	15.1	191	93.7	3.7	2.1		0.5
Prestn	0.7	152	87.5	10.5	2.0		
Redng	6.5	100	75.0	19.0	3.0	2.0	1.0
Salford	0.7	139	79.1	16.5	1.4		2.9
Sheff	3.3	146	88.4	5.5	3.4	1.4	1.4
Shrew	1.5	64	95.3	1.6	1.6	1.6	
Stevng	9.9	137	80.3	10.2	8.8		0.7
Sthend	36.7	19	84.2	5.3	10.5		
Stoke	2.7	109	89.9	5.5	2.8		1.8
Sund	0.0	63	96.8	3.2			
Truro	0.0	39	100.0				
Wirral	1.8	55	96.4	1.8		1.8	
Wolve	0.0	79	69.6	21.5	8.9		
York	6.3	60	100.0				
N Ireland							
Antrim	0.0	35	100.0				
Belfast	0.0	63	98.4	1.6			
Newry	0.0	19	100.0				
Ulster	0.0	20	95.0		5.0		
West NI	2.9	34	100.0				
Wales							
Bangor	0.0	22	95.5	4.5			
Cardff	0.0	168	96.4	2.4		0.6	0.6
Clwyd	10.3	26	92.3	7.7			
Swanse	0.0	106	100.0				
Wrexm	0.0	42	95.2		2.4		2.4
England	**5.6**	**5,968**	**77.0**	**12.2**	**8.0**	**0.7**	**2.0**
N Ireland	**0.6**	**171**	**98.8**	**0.6**	**0.6**		
Wales	**0.8**	**364**	**97.0**	**1.9**	**0.3**	**0.3**	**0.5**
E, W & NI	**5.2**	**6,503**	**78.7**	**11.3**	**7.4**	**0.7**	**1.8**

Blank cells – no reported patients

Table 1.8. Distribution of primary renal diagnosis by centre in the 2014 incident RRT cohort

Centre	% data not available	*N* with data	Percentage							
			Uncertain aetiology	Diabetes	Glomerulo-nephritis	Hyper-tension	Other	Polycystic kidney	Pyelo-nephritis	Renal vascular disease
England										
B Heart	16.3	82	9.8	42.7	14.6	2.4	20.7	4.9	2.4	2.4
B QEH	0.4	241	24.1	21.6	12.5	5.0	18.3	5.4	4.2	9.1
Basldn	0.0	46	4.4	32.6	19.6	2.2	4.4	4.4	15.2	17.4
Bradfd	0.0	83	21.7	31.3	13.3	6.0	10.8	3.6	6.0	7.2
Brightn	0.0	147	21.1	23.8	15.0	6.1	18.4	6.1	4.8	4.8
Bristol	14.9	126	11.9	27.0	15.1	4.0	18.3	12.7	6.4	4.8
Camb[a]	23.6	97	65.0							
Carlis	0.0	38	5.3	21.1	18.4	13.2	15.8	2.6	2.6	21.1
Carsh[b]	76.2	65								
Chelms	0.0	52	9.6	40.4	15.4	3.9	25.0	0.0	5.8	0.0
Colchr[a]	18.4	31	61.3							
Covnt	12.0	110	12.7	19.1	19.1	17.3	10.9	4.6	5.5	10.9
Derby	1.3	74	4.1	28.4	21.6	2.7	25.7	2.7	10.8	4.1
Donc	0.0	54	25.9	24.1	18.5	7.4	16.7	3.7	3.7	0.0
Dorset	0.0	76	5.3	31.6	7.9	9.2	15.8	9.2	5.3	15.8
Dudley	12.2	36	36.1	22.2	13.9	2.8	13.9	5.6	0.0	5.6
Exeter	2.9	135	14.1	17.8	14.8	8.9	20.7	3.7	5.2	14.8
Glouc	3.9	49	34.7	20.4	10.2	2.0	16.3	6.1	4.1	6.1
Hull	1.0	97	23.7	18.6	15.5	5.2	21.7	4.1	7.2	4.1
Ipswi[a]	0.0	33	78.8							
Kent	3.3	146	22.6	25.3	17.1	7.5	11.6	6.2	3.4	6.2
L Barts	17.4	256	12.9	35.6	9.4	9.8	18.0	3.1	7.8	3.5
L Guys[b]	35.2	103								
L Kings	0.0	148	13.5	39.2	6.8	18.9	12.8	2.0	4.1	2.7
L Rfree	3.9	220	8.2	31.4	9.6	9.6	25.0	4.6	5.5	6.4
L St.G	24.2	69	20.3	30.4	17.4	7.3	11.6	7.3	4.4	1.5
L West	0.0	357	10.1	37.5	9.8	2.8	22.1	8.7	5.3	3.6
Leeds	0.0	169	8.9	22.5	20.1	7.7	17.2	8.3	10.7	4.7
Leic	22.1	198	23.7	22.2	13.1	6.6	12.6	7.1	8.6	6.1
Liv Ain	0.0	67	9.0	17.9	7.5	9.0	22.4	3.0	13.4	17.9
Liv Roy	0.0	117	2.6	21.4	17.1	21.4	23.1	6.0	6.8	1.7
M RI[b]	40.5	113								
Middlbr	1.0	102	19.6	27.5	12.8	8.8	16.7	4.9	6.9	2.9
Newc	0.0	107	13.1	28.0	10.3	4.7	15.9	10.3	7.5	10.3
Norwch	6.3	74	25.7	24.3	14.9	1.4	10.8	12.2	5.4	5.4
Nottm	0.0	111	22.5	27.9	9.0	0.9	22.5	5.4	6.3	5.4
Oxford	2.7	184	12.5	29.9	18.5	6.0	17.9	7.6	4.9	2.7
Plymth[b]	67.9	17								
Ports	13.3	195	7.2	30.3	13.3	6.2	18.0	9.2	5.6	10.3
Prestn	0.7	152	15.8	23.7	15.8	11.8	19.1	5.9	5.3	2.6
Redng	0.9	106	23.6	25.5	11.3	2.8	17.0	6.6	6.6	6.6
Salford	1.4	138	10.9	37.7	9.4	10.9	13.8	9.4	5.1	2.9
Sheff	0.7	150	14.7	22.0	18.0	6.0	10.7	12.0	7.3	9.3
Shrew	9.2	59	32.2	17.0	6.8	5.1	27.1	5.1	1.7	5.1
Stevng	19.7	122	24.6	22.1	13.1	1.6	26.2	4.9	3.3	4.1
Sthend	0.0	30	23.3	33.3	6.7	6.7	13.3	6.7	6.7	3.3
Stoke[b]	42.9	64								
Sund	3.2	61	3.3	19.7	19.7	13.1	21.3	9.8	4.9	8.2
Truro	5.1	37	16.2	29.7	21.6	2.7	18.9	5.4	0.0	5.4
Wirral[b]	26.8	41								
Wolve	12.7	69	14.5	10.1	11.6	4.4	53.6	0.0	4.4	1.5
York	1.6	63	7.9	22.2	11.1	7.9	27.0	9.5	11.1	3.2

Table 1.8. Continued

Centre	% data not available	*N* with data	Percentage							
			Uncertain aetiology	Diabetes	Glomerulo-nephritis	Hyper-tension	Other	Polycystic kidney	Pyelo-nephritis	Renal vascular disease
N Ireland										
Antrim	0.0	35	34.3	17.1	8.6	0.0	25.7	8.6	2.9	2.9
Belfast	4.8	60	15.0	21.7	8.3	5.0	21.7	15.0	8.3	5.0
Newry	0.0	19	21.1	26.3	5.3	0.0	21.1	5.3	10.5	10.5
Ulster	0.0	20	30.0	35.0	10.0	0.0	10.0	10.0	0.0	5.0
West NI	0.0	35	11.4	22.9	8.6	25.7	14.3	5.7	8.6	2.9
Scotland										
Abrdn	0.0	53	3.8	35.9	20.8	5.7	18.9	1.9	7.6	5.7
Airdrie	0.0	52	7.7	26.9	19.2	3.9	13.5	9.6	13.5	5.8
D & Gall	0.0	21	0.0	33.3	9.5	28.6	19.1	0.0	0.0	9.5
Dundee	0.0	49	10.2	32.7	8.2	14.3	18.4	10.2	2.0	4.1
Edinb	0.0	89	9.0	28.1	19.1	1.1	28.1	9.0	2.3	3.4
Glasgw	0.0	182	8.2	30.2	14.8	1.1	19.8	12.1	5.0	8.8
Inverns	0.0	22	18.2	18.2	18.2	0.0	13.6	18.2	4.6	9.1
Klmarnk	0.0	36	8.3	36.1	8.3	0.0	22.2	11.1	0.0	13.9
Krkcldy	0.0	38	26.3	21.1	10.5	0.0	15.8	7.9	2.6	15.8
Wales										
Bangor	18.2	18	38.9	22.2	16.7	0.0	5.6	11.1	0.0	5.6
Cardff	0.6	167	20.4	25.2	17.4	0.0	15.6	7.8	6.6	7.2
Clwyd	20.7	23	26.1	30.4	17.4	8.7	8.7	0.0	8.7	0.0
Swanse	0.0	106	4.7	29.3	19.8	0.9	13.2	4.7	7.6	19.8
Wrexm	2.4	41	7.3	24.4	7.3	7.3	17.1	12.2	9.8	14.6
England	**12.6**	**5,517**	**16.2**	**26.7**	**13.2**	**7.1**	**18.6**	**6.4**	**5.8**	**6.0**
N Ireland	**1.7**	**169**	**20.7**	**23.1**	**8.3**	**7.1**	**19.5**	**10.1**	**6.5**	**4.7**
Scotland	**0.0**	**542**	**9.4**	**29.7**	**15.1**	**3.9**	**19.9**	**9.6**	**4.6**	**7.8**
Wales	**3.3**	**355**	**15.5**	**26.5**	**16.9**	**1.7**	**14.1**	**7.0**	**7.0**	**11.3**
UK	**10.9**	**6,583**	**15.7**	**26.9**	**13.4**	**6.5**	**18.5**	**6.8**	**5.8**	**6.4**
Min			**0.0**	**10.1**	**5.3**	**0.0**	**4.4**	**0.0**	**0.0**	**0.0**
Max			**38.9**[c]	**42.7**	**21.6**	**28.6**	**27.1**	**12.7**	**15.2**	**21.1**

The percentage in each category has been calculated after excluding those patients with data not available
[a]For those centres judged to have high % uncertain aetiology, the percentages in the other diagnostic categories have not been calculated and these centres have not been included in the country and UK averages or the min/max values
[b]For those centres with >25% missing primary diagnoses, the percentages in the diagnostic categories are not shown
[c]Maximum not including the centres with very high values

in under and over 65 year olds (10.7% and 11.1% respectively). Six centres had missing PRD for more than 25% of incident patients and for these centres the percentages in the diagnostic categories are not shown in table 1.8.

The UKRR continues to be concerned about centres with apparently very high data completeness for PRD but also very high rates of 'uncertain' diagnoses (EDTA code 00: Chronic renal failure; aetiology uncertain). It is accepted that there will inevitably be a number of patients with uncertain aetiology and that the proportion of these patients will vary between clinicians and centres as the definitions of e.g. renal vascular disease and hypertensive renal disease remain relatively subjective. Many of the new ERA-EDTA PRD codes allow clinicians to indicate the basis for the diagnosis of the renal disease (e.g. based on histology or not). Adoption of these new codes should therefore reduce the coding of PRD as uncertain. There was again a lot of variability between centres but, as in previous years, a small number of centres had far higher percentages with 'uncertain' diagnosis than other centres. This year, there were three centres with diagnosis 'uncertain' for over 45% of their incident patients – Cambridge (65%), Colchester (61%) and Ipswich (79%). As the numbers with the specific

PRDs are likely to be falsely low in these centres, the breakdown into these categories has not been shown in table 1.8 or been used in the country and UK averages. These centres have also been excluded where PRD is used to stratify analyses.

As in previous years, there was a lot of variability between centres in the percentages with the specific diagnoses (partly due to the reasons mentioned above). For example, the percentage with diabetes as PRD varied from about 10% to almost 43% of incident patients.

The overall UK distribution of PRDs is shown in table 1.9. Diabetic nephropathy was the most common renal diagnosis in both the under and over 65 year age groups, accounting for 27% of all (non-missing) incident diagnoses. Glomerulonephritis and autosomal dominant polycystic kidney disease (ADPKD) made up much higher proportions of the younger than the older incident cohorts (18% vs. 9% and 10% vs. 4% respectively), whilst patients with renal vascular disease comprised a much higher percentage of the older rather than the younger patients (11% vs. 2%). Uncertainty about the underlying diagnosis was also much more likely in the older rather than the younger cohort (19% vs. 12%).

For all primary renal diagnoses except ADPKD and 'Other', the male to female ratio was 1.4 or greater. This gender difference may relate to factors such as smoking, hypertension, atheroma and renal vascular disease, which are more common in males and may influence the rate of progression of renal failure.

Table 1.10 shows the incidence rates for each PRD per million population for the 2014 cohort. As there were some missing data, the rates for at least some of the diagnoses will be underestimates.

Table 1.9. Percentage distribution of primary renal diagnosis by age in the 2014 incident RRT cohort

	Percentage with diagnosis		
Diagnosis	Age <65	Age ⩾65	All patients
Diabetes	29.1	24.6	26.9
Glomerulonephritis	17.7	9.0	13.4
Pyelonephritis	5.1	6.5	5.8
Hypertension	4.9	8.3	6.5
Polycystic kidney	9.5	4.0	6.8
Renal vascular disease	2.3	10.6	6.4
Other	19.0	17.8	18.5
Uncertain aetiology	12.4	19.2	15.7

Percentages calculated after excluding those patients with data not available

First established treatment modality

In 2014, the first treatment recorded, irrespective of any later change, was haemodialysis in 71.8% of patients, peritoneal dialysis in 20.0% and pre-emptive transplant in 8.2%. The previous year on year fall seen prior to six years ago in the proportion of patients starting on PD levelled off during the last six years (table 1.11). The percentage having a pre-emptive transplant has continued to rise (up by 44% from 2009). Table F.1.3 in appendix F: Additional Data Tables for 2014 New and Existing Patients gives the treatment breakdown at start of RRT by centre.

Many patients undergo a brief period of HD before switches to other modalities are, or can be, considered. Therefore, the established modality at 90 days is more representative of the elective first modality and this modality was used for the remainder of this section. For

Table 1.10. Primary renal diagnosis RRT incidence rates (2014) per million population (unadjusted)

Diagnosis	England	N Ireland	Scotland	Wales	UK
Diabetes	27.4	21.2	30.1	30.4	27.6
Glomerulonephritis	13.5	7.6	15.3	19.4	13.8
Pyelonephritis	5.9	6.0	4.7	8.1	5.9
Hypertension	7.3	6.5	3.9	1.9	6.7
Polycystic kidney	6.6	9.2	9.7	8.1	7.0
Renal vascular disease	6.1	4.3	7.9	12.9	6.5
Other	19.0	17.9	20.2	16.2	19.0
Uncertain aetiology	16.7	19.0	9.5	17.8	16.2
Data not available	14.8	1.6	0.0	3.9	12.6
All	**117**	**93**	**101**	**119**	**115**

The overall rates per country may be slightly different to those in table 1.2 as those centres whose PRD data has not been used have been excluded from both the numerator and the denominator here

Table 1.11. Treatment at start and at 90 days by year of start

Start	HD (%)	PD (%)	Transplant (%)
Day 0 treatment			
2009	76.3	18.0	5.7
2010	74.5	18.6	6.9
2011	72.7	20.4	6.9
2012	72.9	19.6	7.6
2013	72.0	19.4	8.7
2014	71.8	20.0	8.2
Day 90 treatment			
Oct 2008 to end Sept 2009	73.9	19.2	7.0
Oct 2009 to end Sept 2010	72.6	19.4	8.0
Oct 2010 to end Sept 2011	70.7	20.6	8.7
Oct 2011 to end Sept 2012	70.7	20.2	9.1
Oct 2012 to end Sept 2013	69.8	20.0	10.1
Oct 2013 to end Sept 2014	69.7	20.1	10.2

these analyses, the incident cohort from 1st October 2013 to 30th September 2014 was used so that follow up to 90 days was possible for all patients. By 90 days, 4.6% of incident patients had died and a further 0.2% had stopped treatment, leaving 95.1% of the original cohort still on RRT. Table 1.12 shows the percentages on each treatment modality at 90 days both as percentages of all of those starting RRT and then of those still on treatment at 90 days. Expressed as percentages of the whole incident cohort, 66.3% were on HD at 90 days, 19.1% were on PD and 9.7% had received a transplant. Expressed as percentages of those still receiving RRT at 90 days, 69.7% were on HD, 20.1% on PD and 10.2% had received a transplant.

Figure 1.8 shows the modality breakdown with the HD patients further subdivided. Of those still on RRT at 90 days, 41% were treated with hospital HD, 29% with satellite HD, and only 0.6% were receiving home HD at this early stage. The 0.6% on home HD consisted of 43 patients across 16 centres. This was an increase from the 0.2%

Table 1.12. RRT modality at 90 days by centre (incident cohort 1/10/2013 to 30/09/2014)

		Status at 90 days of all patients who started RRT (%)					Status at 90 days of only those patients still on RRT (%)		
Centre	*N*	HD	PD	Tx	Recovered/ discontinued	Died	HD	PD	Tx
England									
B Heart	117	77.8	12.8	5.1	0.0	4.3	81.3	13.4	5.4
B QEH	234	70.5	17.5	7.7	0.4	3.9	73.7	18.3	8.0
Basldn	35	74.3	17.1	0.0	2.9	5.7	81.3	18.8	0.0
Bradfd	75	77.3	5.3	13.3	0.0	4.0	80.6	5.6	13.9
Brightn	137	67.9	21.9	5.8	0.0	4.4	71.0	22.9	6.1
Bristol	139	62.6	16.6	15.1	0.7	5.0	66.4	17.6	16.0
Camb	131	59.5	12.2	24.4	0.0	3.8	61.9	12.7	25.4
Carlis	41	48.8	39.0	9.8	0.0	2.4	50.0	40.0	10.0
Carsh	267	66.7	18.7	5.6	0.8	8.2	73.3	20.6	6.2
Chelms	55	76.4	23.6	0.0	0.0	0.0	76.4	23.6	0.0
Colchr	36	91.7	0.0	2.8	0.0	5.6	97.1	0.0	2.9
Covnt	122	51.6	32.0	9.0	0.0	7.4	55.8	34.5	9.7
Derby	61	55.7	39.3	3.3	0.0	1.6	56.7	40.0	3.3
Donc	54	72.2	24.1	0.0	0.0	3.7	75.0	25.0	0.0
Dorset	80	65.0	30.0	5.0	0.0	0.0	65.0	30.0	5.0
Dudley	52	59.6	40.4	0.0	0.0	0.0	59.6	40.4	0.0
Exeter	131	70.2	22.9	3.1	0.8	3.1	73.0	23.8	3.2
Glouc	62	64.5	32.3	1.6	1.6	0.0	65.6	32.8	1.6
Hull	96	59.4	26.0	10.4	0.0	4.2	62.0	27.2	10.9
Ipswi	36	61.1	33.3	2.8	0.0	2.8	62.9	34.3	2.9
Kent	147	68.0	21.1	8.8	0.0	2.0	69.4	21.5	9.0
L Barts	298	63.4	26.5	6.4	0.3	3.4	65.9	27.5	6.6
L Guys	153	70.6	7.8	19.6	0.7	1.3	72.0	8.0	20.0
L Kings	157	65.0	26.8	5.7	0.0	2.6	66.7	27.5	5.9
L Rfree	231	55.8	29.0	10.0	0.0	5.2	58.9	30.6	10.5
L St.G	90	68.9	16.7	11.1	1.1	2.2	71.3	17.2	11.5
L West	337	81.9	6.5	9.8	0.0	1.8	83.4	6.7	10.0

Table 1.12. Continued

		Status at 90 days of all patients who started RRT (%)					Status at 90 days of only those patients still on RRT (%)		
Centre	*N*	HD	PD	Tx	Recovered/ discontinued	Died	HD	PD	Tx
Leeds	164	54.9	9.8	28.1	0.0	7.3	59.2	10.5	30.3
Leic	268	63.4	17.2	12.7	0.0	6.7	68.0	18.4	13.6
Liv Ain	59	54.2	25.4	5.1	0.0	15.3	64.0	30.0	6.0
Liv Roy	129	50.4	20.9	19.4	0.0	9.3	55.6	23.1	21.4
M RI	189	51.9	21.7	20.6	0.0	5.8	55.1	23.0	21.9
Middlbr	100	73.0	6.0	16.0	0.0	5.0	76.8	6.3	16.8
Newc	101	66.3	21.8	6.9	0.0	5.0	69.8	22.9	7.3
Norwch	81	80.3	8.6	3.7	1.2	6.2	86.7	9.3	4.0
Nottm	104	51.0	26.9	15.4	1.0	5.8	54.6	28.9	16.5
Oxford	180	58.3	23.3	15.0	0.0	3.3	60.3	24.1	15.5
Plymth	58	55.2	17.2	12.1	1.7	13.8	65.3	20.4	14.3
Ports	226	69.5	14.2	14.6	0.0	1.8	70.7	14.4	14.9
Prestn	141	72.3	17.0	7.8	0.0	2.8	74.5	17.5	8.0
Redng	103	53.4	32.0	4.9	0.0	9.7	59.1	35.5	5.4
Salford	127	66.1	22.8	3.2	0.0	7.9	71.8	24.8	3.4
Sheff	145	77.2	11.0	7.6	0.0	4.1	80.6	11.5	7.9
Shrew	66	59.1	28.8	4.6	1.5	6.1	63.9	31.2	4.9
Stevng	148	73.7	12.2	8.1	0.0	6.1	78.4	13.0	8.6
Sthend	32	59.4	31.3	0.0	0.0	9.4	65.5	34.5	0.0
Stoke	102	69.6	25.5	2.0	0.0	2.9	71.7	26.3	2.0
Sund	67	85.1	10.5	4.5	0.0	0.0	85.1	10.5	4.5
Truro	39	59.0	20.5	12.8	0.0	7.7	63.9	22.2	13.9
Wirral	58	56.9	20.7	6.9	0.0	15.5	67.4	24.5	8.2
Wolve	78	61.5	29.5	3.9	0.0	5.1	64.9	31.1	4.1
York	51	47.1	27.5	19.6	0.0	5.9	50.0	29.2	20.8
N Ireland									
Antrim	30	90.0	3.3	6.7	0.0	0.0	90.0	3.3	6.7
Belfast	59	54.2	8.5	30.5	3.4	3.4	58.2	9.1	32.7
Newry	17	70.6	17.7	0.0	0.0	11.8	80.0	20.0	0.0
Ulster	21	76.2	19.1	0.0	0.0	4.8	80.0	20.0	0.0
West NI	26	73.1	19.2	3.9	0.0	3.9	76.0	20.0	4.0
Scotland									
Abrdn	55	72.7	25.5	0.0	0.0	1.8	74.1	25.9	0.0
Airdrie	58	87.9	6.9	1.7	0.0	3.5	91.1	7.1	1.8
D & Gall	20	40.0	55.0	0.0	0.0	5.0	42.1	57.9	0.0
Dundee	46	73.9	19.6	6.5	0.0	0.0	73.9	19.6	6.5
Edinb	91	72.5	8.8	13.2	0.0	5.5	76.7	9.3	14.0
Glasgw	178	70.8	9.6	16.3	0.0	3.4	73.3	9.9	16.9
Inverns	19	63.2	26.3	10.5	0.0	0.0	63.2	26.3	10.5
Klmarnk	38	68.4	26.3	0.0	0.0	5.3	72.2	27.8	0.0
Krkcldy	36	75.0	13.9	0.0	0.0	11.1	84.4	15.6	0.0
Wales									
Bangor	21	71.4	23.8	0.0	0.0	4.8	75.0	25.0	0.0
Cardff	166	66.9	17.5	9.0	0.0	6.6	71.6	18.7	9.7
Clwyd	32	68.8	18.8	6.3	0.0	6.3	73.3	20.0	6.7
Swanse	111	75.7	16.2	4.5	0.0	3.6	78.5	16.8	4.7
Wrexm	32	71.9	21.9	3.1	3.1	0.0	74.2	22.6	3.2
England	**6,190**	**65.4**	**19.7**	**9.9**	**0.2**	**4.7**	**68.8**	**20.8**	**10.4**
N Ireland	**153**	**69.3**	**11.8**	**13.7**	**1.3**	**3.9**	**73.1**	**12.4**	**14.5**
Scotland	**541**	**72.1**	**15.3**	**8.7**	**0.0**	**3.9**	**75.0**	**16.0**	**9.0**
Wales	**362**	**70.4**	**18.0**	**6.4**	**0.3**	**5.0**	**74.3**	**19.0**	**6.7**
UK	**7,246**	**66.3**	**19.1**	**9.7**	**0.2**	**4.6**	**69.7**	**20.1**	**10.2**

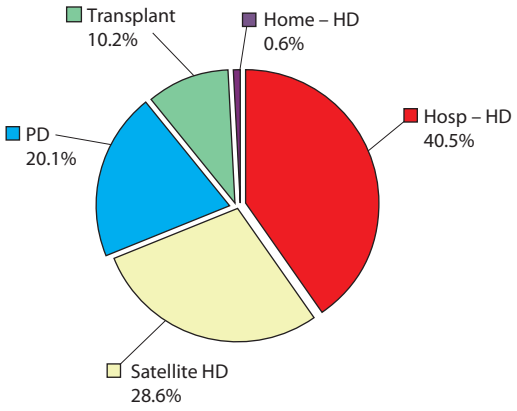

Fig. 1.8. RRT modality at 90 days (incident cohort 1/10/2013 to 30/09/2014)

(13 patients across seven centres) seen for 2013. Chapter 2: UK Renal Replacement Therapy Prevalence in 2014 shows that 4.3% of all dialysis patients were receiving home HD.

The percentage of incident patients who had died by 90 days varied considerably between centres (0% to 16%). The ongoing observation that in some centres no patients die by 90 days is difficult to explain clinically. Differences in the definition of whether patients have acute or chronic renal failure and when they then report patients to the UKRR (with a period of time between start of RRT and reporting to the UKRR in which they have by definition survived – immortal time bias) may be a factor in this apparent variation along with possible differences in clinical practice.

The percentage of patients still on RRT at 90 days who had a functioning transplant at 90 days varied between centres from 0% to 33% (between 7% and 33% for transplanting centres and between 0% and 21% for non-transplanting centres). The mean percentage of the incident cohort with a functioning transplant at 90 days was greater in transplanting compared to non-transplanting centres (13.3% vs. 6.4%). One possible reason could be that some patients transplanted pre-emptively were attributed to the incident cohort of the transplanting centre rather than that of the referring centre.

Table 1.13 gives the HD/PD breakdown for those incident patients on dialysis at 90 days. The breakdown

Table 1.13. Modality split of patients on dialysis at 90 days (incident cohort 1/10/2013 to 30/09/2014)

		Age <65 (%)		Age ⩾65 (%)		All patients (%)	
Centre	*N*	HD	PD	HD	PD	HD	PD
England							
B Heart	106	80.0	20.0	92.2	7.8	85.8	14.2
B QEH	206	74.4	25.6	88.9	11.1	80.1	19.9
Basldn	32	88.2	11.8	73.3	26.7	81.3	18.8
Bradfd	62	92.5	7.5	95.5	4.5	93.5	6.5
Brightn	123	73.7	26.3	77.3	22.7	75.6	24.4
Bristol	110	76.6	23.4	81.0	19.0	79.1	20.9
Camb	94	88.2	11.8	80.0	20.0	83.0	17.0
Carlis	36	52.9	47.1	57.9	42.1	55.6	44.4
Carsh	228	71.8	28.2	83.9	16.1	78.1	21.9
Chelms	55	69.7	30.3	86.4	13.6	76.4	23.6
Colchr	33	100.0	0.0	100.0	0.0	100.0	0.0
Covnt	102	54.5	45.5	67.2	32.8	61.8	38.2
Derby	58	40.6	59.4	80.8	19.2	58.6	41.4
Donc	52	71.4	28.6	79.2	20.8	75.0	25.0
Dorset	76	66.7	33.3	69.4	30.6	68.4	31.6
Dudley	52	50.0	50.0	69.2	30.8	59.6	40.4
Exeter	122	65.7	34.3	79.3	20.7	75.4	24.6
Glouc	60	50.0	50.0	76.3	23.7	66.7	33.3
Hull	82	66.7	33.3	71.7	28.3	69.5	30.5
Ipswi	34	75.0	25.0	61.5	38.5	64.7	35.3
Kent	131	70.2	29.8	79.8	20.2	76.3	23.7
L Barts	268	70.4	29.6	70.7	29.3	70.5	29.5
L Guys	120	90.1	9.9	89.8	10.2	90.0	10.0
L Kings	144	69.6	30.4	72.3	27.7	70.8	29.2
L Rfree	196	60.6	39.4	70.6	29.4	65.8	34.2
L St.G	77	82.6	17.4	77.4	22.6	80.5	19.5

Table 1.13. Continued

Centre	*N*	Age <65 (%)		Age ⩾65 (%)		All patients (%)	
		HD	PD	HD	PD	HD	PD
L West	298	94.1	5.9	91.0	9.0	92.6	7.4
Leeds	106	80.3	19.7	91.1	8.9	84.9	15.1
Leic	216	75.7	24.3	81.7	18.3	78.7	21.3
Liv Ain	47	58.3	41.7	78.3	21.7	68.1	31.9
Liv Roy	92	68.2	31.8	72.9	27.1	70.7	29.3
M RI	139	62.7	37.3	79.7	20.3	70.5	29.5
Middlbr	79	84.0	16.0	96.3	3.7	92.4	7.6
Newc	89	72.3	27.7	78.6	21.4	75.3	24.7
Norwch	72	79.2	20.8	95.8	4.2	90.3	9.7
Nottm	81	40.5	59.5	86.4	13.6	65.4	34.6
Oxford	147	63.6	36.4	77.8	22.2	71.4	28.6
Plymth	42	76.5	23.5	76.0	24.0	76.2	23.8
Ports	189	78.6	21.4	86.7	13.3	83.1	16.9
Prestn	126	79.4	20.6	82.5	17.5	81.0	19.0
Redng	88	55.0	45.0	68.8	31.3	62.5	37.5
Salford	113	72.4	27.6	76.4	23.6	74.3	25.7
Sheff	128	85.5	14.5	89.0	11.0	87.5	12.5
Shrew	58	53.6	46.4	80.0	20.0	67.2	32.8
Stevng	127	77.4	22.6	93.8	6.2	85.8	14.2
Sthend	29	73.3	26.7	57.1	42.9	65.5	34.5
Stoke	97	56.8	43.2	83.3	16.7	73.2	26.8
Sund	64	81.8	18.2	96.8	3.2	89.1	10.9
Truro	31	61.5	38.5	83.3	16.7	74.2	25.8
Wirral	45	58.3	41.7	90.5	9.5	73.3	26.7
Wolve	71	60.0	40.0	73.2	26.8	67.6	32.4
York	38	50.0	50.0	72.7	27.3	63.2	36.8
N Ireland							
Antrim	28	100.0	0.0	95.0	5.0	96.4	3.6
Belfast	37	72.7	27.3	92.3	7.7	86.5	13.5
Newry	15	75.0	25.0	85.7	14.3	80.0	20.0
Ulster	20	63.6	36.4	100.0	0.0	80.0	20.0
West NI	24	88.9	11.1	73.3	26.7	79.2	20.8
Scotland							
Abrdn	54	61.3	38.7	91.3	8.7	74.1	25.9
Airdrie	55	93.9	6.1	90.9	9.1	92.7	7.3
D & Gall	19	44.4	55.6	40.0	60.0	42.1	57.9
Dundee	43	81.0	19.0	77.3	22.7	79.1	20.9
Edinb	74	91.5	8.5	85.2	14.8	89.2	10.8
Glasgw	143	87.5	12.5	88.6	11.4	88.1	11.9
Inverns	17	70.0	30.0	71.4	28.6	70.6	29.4
Klmarnk	36	70.0	30.0	75.0	25.0	72.2	27.8
Krkcldy	32	62.5	37.5	91.7	8.3	84.4	15.6
Wales							
Bangor	20	57.1	42.9	84.6	15.4	75.0	25.0
Cardff	140	71.0	29.0	85.9	14.1	79.3	20.7
Clwyd	28	78.6	21.4	78.6	21.4	78.6	21.4
Swanse	102	73.0	27.0	87.7	12.3	82.4	17.6
Wrexm	30	55.6	44.4	85.7	14.3	76.7	23.3
England	**5,271**	**72.4**	**27.6**	**81.0**	**19.0**	**76.8**	**23.2**
N Ireland	**124**	**78.7**	**21.3**	**89.6**	**10.4**	**85.5**	**14.5**
Scotland	**473**	**80.7**	**19.3**	**84.3**	**15.7**	**82.5**	**17.5**
Wales	**320**	**70.5**	**29.5**	**85.9**	**14.1**	**79.7**	**20.3**
UK	**6,188**	**73.1**	**26.9**	**81.8**	**18.2**	**77.6**	**22.4**

is given by age group and overall. The percentage on PD at 90 days was about 50% higher in patients aged under 65 years than in older patients (26.9 vs. 18.2). This difference was somewhat smaller than the difference for 2013 (a 65% difference – 27.8% vs. 17.1%)). In both age groups there was a lot of variability between centres in the percentage on PD.

The median age at start for those on HD at 90 days was 67.0 years compared with 61.3 years for PD. There were thirteen centres where the percentage of patients treated with PD was the same as or higher in the over 65s than the under 65s (a higher number than the eight centres for 2013, 10 centres for 2012 and 11 centres for 2011). This reflects the increasing use of assisted PD programmes – a feature of note and one that is valued by the patients and their families.

Modality change over time

Table 1.14 gives the breakdown of status/treatment modality at four subsequent time points by initial treatment type for patients starting RRT in 2009. Fifty-four percent of patients who started on HD had died within five years of starting. This compared to 35% and 6% for those starting on PD or transplant respectively. Of those patients starting on PD, 90% were on PD at 90 days but this percentage dropped sharply at the later time points. In contrast, 90% of patients starting with a transplant were also transplant patients at the five year time point.

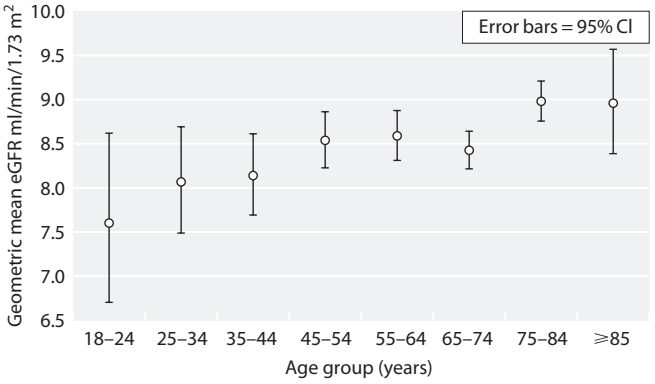

Fig. 1.9. Geometric mean eGFR at start of RRT (2014) by age group

Renal function at the time of starting RRT

The mean eGFR at initiation of RRT in 2014 was 8.6 ml/min/1.73 m^2. This is shown by age group in figure 1.9.

Figure 1.10 shows serial data from centres reporting annually to the UKRR since 2005. For the six years before 2011 there was higher average eGFR at start of RRT for PD than HD patients but, on average, the values were more similar between treatments for 2011 to 2014.

Some caution should be applied to the analyses of eGFR at the start of RRT as data were only available for less than half of the incident patients (approximately 3,000 for 2014) and almost half of these came from

Table 1.14. Initial and subsequent modalities for patients starting RRT in 2009

			Percentage			
First treatment	*N*	Later modality	90 days	1 year	3 years	5 years
HD	5,151	HD	88.8	73.0	47.4	29.0
		PD	2.4	3.0	1.6	0.6
		Transplant	0.8	3.4	10.8	15.1
		Recovered/discontinued	0.3	0.9	1.0	0.9
		Died	7.7	19.7	39.1	54.4
PD	1,212	HD	6.2	14.2	19.7	15.8
		PD	89.9	67.2	28.8	11.6
		Transplant	2.0	10.6	29.2	37.3
		Recovered/discontinued	0.1	0.2	0.4	0.2
		Died	1.8	7.7	21.9	35.1
Transplant	386	HD	0.5	0.8	2.6	3.9
		PD	0.5	0.8	0.5	0.5
		Transplant	98.7	97.4	93.0	89.9
		Died	0.3	1.0	3.9	5.7

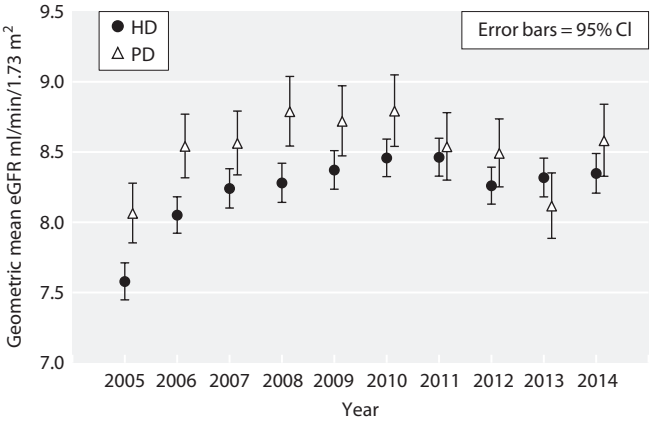

Fig. 1.10. eGFR on starting RRT 2005 to 2014, PD and HD (restricted to centres reporting since 2005)

only 10 centres. Three-quarters of the values came from 21 centres. Further caution should be applied as a review of pre-RRT biochemistry in nine renal centres revealed that up to 18% of patients may have had an incorrect date of starting RRT allocated and thus, the eGFR used for analysis may have been taken whilst they were already receiving RRT. For details see the 12th Annual Report chapter 13: The UK Renal Registry Advanced CKD Study 2009 [5]. From 2016, the UKRR hopes to address this and related timeline anomalies by prospectively capturing data on patients attending renal centres from eGFR 30 ml/min/1.73 m^2 and by more frequent data downloads.

3. Late presentation and delayed referral of incident patients

Introduction

Late presentation to a nephrologist is regarded as a negative aspect in renal care. It can be defined in a number of ways as it has a range of possible causes. There are many patients with chronic kidney disease who are regularly monitored in primary or secondary care and whose referral to nephrology services is delayed (delayed or late referral). In contrast, other patients present late to medical services due to no particular deficiency in the service; those with either such slowly progressive disease as to have remained asymptomatic for many years or the opposite – those with rapidly progressive CKD. The main analyses presented here do not differentiate between these groups and include any patient first seen by renal services within 90 days of starting RRT as 'late presentation'. One analysis attempts to capture 'late referrals': it shows the percentage presenting within 90 days of starting RRT after excluding an acute renal disease group.

Methods

Date first seen by a nephrologist has not been collected from the Scottish Renal Registry and so Scottish centres were excluded from these analyses. Data were included for incident patients in English, Welsh or Northern Irish centres in the years 2013 to 2014. This two year cohort was used for most of the analyses in order to make the late presentation percentages more reliably estimated and to allow these to be shown for subgroups of patients. The date first seen in a renal centre and the date of starting RRT were used to define the late presenting cohort. A small amount of data was excluded because of actual or potential inconsistencies. Patients who had recovered function and then restarted RRT ($n = 116$) have been included elsewhere in this chapter and will be included in the late presentation analyses in future years. By definition these patients will be known to a nephrologist for more than 90 days. Only data from those centres with 75% or more completeness for the relevant year were used. Data were excluded if 10% or more of the patients were reported to have started RRT on the same date as the first presentation. This was because investigation has shown that this is likely due to misunderstanding on the part of the renal centres resulting in incorrect recording of data. After these exclusions, data on 9,987 patients were available for analysis. Presentation times of 90 days or more before start were defined as early presentation and times of less than 90 days were defined as late presentation.

Estimated glomerular filtration rate (eGFR) at the start of RRT was studied amongst patients with eGFR data within 14 days before the start of RRT. The eGFR was calculated using the abbreviated 4 variable MDRD study equation [3]. For the purpose of the eGFR calculation, patients who had missing ethnicity but a valid serum creatinine measurement were classed as White. The eGFR values were log transformed due to their skewed distribution.

A mixture of old and new (2012) ERA-EDTA codes for primary diagnoses were received from centres. For those people without an old code, new codes (where available) were mapped back to old codes using the mapping available on the ERA-EDTA website. As recommended in the notes for users in the ERA-EDTA's PRD code list document this mapping is provided for guidance only and has not been validated; therefore care must be taken not to over interpret data from this mapping. New codes were received for about 20% of incident patients for 2013 and for about 50% of incident patients for 2014. These codes were grouped into the same eight categories as in previous reports, the details are given in appendix H: Ethnicity and ERA-EDTA Coding (www.renalreg.org).

The 'acute' group was made up of those people with conditions likely to present with rapidly deteriorating renal function: crescentic (extracapillary) glomerulonephritis (type I, II, III), nephropathy (interstitial) due to cis-platinum, renal vascular disease due to malignant hypertension, renal vascular disease due to polyarteritis, Wegener's granulomatosis, cryoglobulinemic glomerulonephritis, myelomatosis/light chain deposit disease, Goodpasture's syndrome,

systemic sclerosis (scleroderma), haemolytic ureaemic syndrome, multi-system disease – other, tubular necrosis (irreversible) or cortical necrosis, Balkan nephropathy, kidney tumour(s), and traumatic or surgical loss of kidney(s).

Results

Data completeness

Table 1.15 shows the percentage completeness of data for 2013 and 2014. The overall average completeness fell to about 81% in 2014 with four centres droping below the inclusion criteria (75%).

Late presentation by centre

Figure 1.11 shows that late presentation varied between centres from 5% to 34% in patients starting RRT in 2013 to 2014. The overall rate of late presentation was 18.0% and was 13.3% once those people with diseases likely to present acutely were excluded. Table 1.16 shows the overall percentage presenting late for the combined 2013/2014 incident cohort, the percentages presenting late amongst those patients defined as not having an 'acute diagnosis' and the percentages amongst non-diabetics (as PRD).

Table 1.15. Percentage completeness of time of presentation data (2013 and 2014 incident RRT patients) by centre

	N		Percentage completeness	
Centre	2013	2014	2013	2014
England				
B Heart	99	97	95.0	92.8
B QEH	196	239	99.0	97.9
Basldn	33	46	100.0	95.7
Bradfd	62	82	100.0	100.0
Brightn	135	144	98.5	98.6
Bristol	173	145	54.3	95.2
Camb	136	127	89.0	68.5
Carlis	41	38	100.0	92.1
Carsh	228	273	70.6	41.4
Chelms	46	52	100.0	98.1
Colchr	29	38	100.0	44.7
Covnt	90	125	97.8	84.8
Derby	74	74	98.7	97.3
Donc	60	54	91.7	98.2
Dorset	72	76	100.0	98.7
Dudley	51	41	100.0	95.1
Exeter	100	136	98.0	91.9
Glouc	52	51	96.2	66.7
Hull	88	96	97.7	*
Ipswi	40	33	92.5	90.9
Kent	145	149	100.0	100.0
L Barts	285	310	1.8	28.7
L Guys	130	157	53.1	81.5
L Kings	166	148	98.8	100.0
L Rfree	226	229	98.7	96.1
L St.G	84	91	51.2	24.2
L West	301	354	99.0	98.6
Leeds	180	168	98.3	99.4
Leic	288	254	96.9	98.0
Liv Ain	65	66	96.9	98.5
Liv Roy	90	135	100.0	97.8
M RI	199	189	98.5	43.4
Middlbr	111	103	99.1	98.1
Newc	92	106	97.8	98.1
Norwch	77	79	*	*
Nottm	111	109	97.3	97.3
Oxford	165	186	96.4	97.9
Plymth	64	52	68.8	26.9
Ports	192	222	86.5	59.5
Prestn	148	151	99.3	97.4
Redng	117	106	99.2	97.2
Salford	114	139	3.5	0.7
Sheff	131	149	99.2	98.7
Shrew	59	64	100.0	98.4
Stevng	156	152	99.4	94.1
Sthend	42	30	100.0	100.0
Stoke	104	111	78.9	90.1
Sund	51	63	94.1	100.0
Truro	44	39	100.0	97.4
Wirral	65	56	98.5	96.4
Wolve	90	79	98.9	92.4
York	36	64	*	*
N Ireland				
Antrim	29	35	96.6	97.1
Belfast	72	62	95.8	91.9
Newry	23	19	100.0	94.7
Ulster	29	19	100.0	94.7
West NI	30	33	100.0	97.0
Wales				
Bangor	24	22	95.8	90.9
Cardff	169	165	97.6	95.8
Clwyd	17	29	82.4	*
Swanse	103	104	100.0	100.0
Wrexm	38	42	97.4	97.6
England	**5,933**	**6,277**	**84.3**	**80.0**
N Ireland	**183**	**168**	**97.4**	**94.4**
Wales	**351**	**362**	**97.3**	**92.2**
E, W & NI	**6,467**	**6,807**	**85.5**	**81.1**

*data not shown as >10% of patients reported as starting RRT on the same date as first presentation

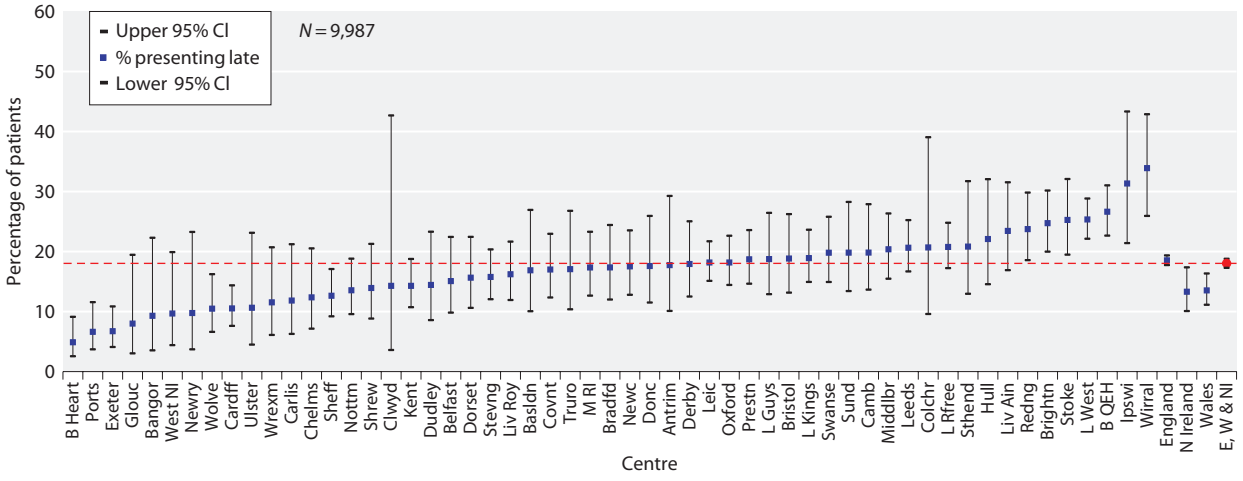

Fig. 1.11. Percentage presenting late (2013/2014)

Considerable differences exist between centres in late presentation rates. One centre (Birmingham Heartlands) attained a late presentation rate below 5% for the first time ever across the UK. Five centres (Birmingham QEH, Ipswich, London Royal Free, Stoke, Wirral) reported that over 40% of their incident patients were only seen within a year of commencement of RRT. These differences have implications for their regions and referral pathways.

Late presentation in 2014 and the trend over time

There has been a steady decline nationally in the proportion of patients presenting late to renal services, with some centres achieving <10% late presentation

Table 1.16. Percentage of patients presenting to a nephrologist less than 90 days before RRT initiation and percentage presenting less than a year before initiation (2013/2014 incident patients) by centre

		Percentage presenting <90 days before start				Percentage presenting <1 year before start[b]	
Centre	*N* with data	Overall	(95% CI)	Non-acute[a]	Non-diab PRD		(95% CI)
England							
B Heart	184	4.9	(2.6–9.1)	4.7	6.5	9.2	(5.8–14.4)
B QEH	428	26.6	(22.7–31.0)	22.8	27.2	44.2	(39.5–48.9)
Basldn	77	16.9	(10.1–26.9)	15.8	22.6	32.5	(23.0–43.7)
Bradfd	144	17.4	(12.0–24.4)	11.4	22.9	30.6	(23.6–38.6)
Brightn	275	24.7	(20.0–30.2)	20.0	28.3	35.6	(30.2–41.5)
Bristol	138	18.8	(13.2–26.2)	8.2	22.1	27.5	(20.7–35.6)
Camb	121	19.8	(13.7–27.9)			33.1	(25.3–41.9)
Carlis	76	11.8	(6.3–21.2)	10.6	10.9	19.7	(12.3–30.2)
Chelms	97	12.4	(7.2–20.5)	10.0	17.9	26.8	(18.9–36.5)
Colchr	29	20.7	(9.6–39.1)			34.5	(19.7–53.1)
Covnt	194	17.0	(12.4–23.0)	9.9	21.0	32.0	(25.8–38.8)
Derby	145	17.9	(12.5–25.0)	12.1	22.3	29.0	(22.2–36.9)
Donc	108	17.6	(11.5–25.9)	15.2	20.2	25.0	(17.7–34.0)
Dorset	147	15.7	(10.6–22.5)	14.7	17.9	24.5	(18.2–32.1)
Dudley	90	14.4	(8.6–23.3)	8.8	16.9	21.1	(13.9–30.8)
Exeter	223	6.7	(4.1–10.9)	4.5	8.1	24.2	(19.0–30.3)
Glouc	50	8.0	(3.0–19.5)	6.3	7.7	14.0	(6.8–26.6)
Hull	86	22.1	(14.6–32.1)	14.5	23.9	36.1	(26.6–46.7)
Ipswi	67	31.3	(21.4–43.3)			61.2	(49.1–72.1)
Kent	294	14.3	(10.7–18.8)	11.6	17.7	26.5	(21.8–31.9)
L Guys	128	18.8	(12.9–26.5)			30.5	(23.1–39.0)

Table 1.16. Continued

Centre	*N* with data	Percentage presenting <90 days before start				Percentage presenting <1 year before start[b]	
		Overall	(95% CI)	Non-acute[a]	Non-diab PRD		(95% CI)
L Kings	312	18.9	(14.9–23.6)	15.6	24.7	30.5	(25.6–35.8)
L Rfree	443	20.8	(17.2–24.8)	17.5	24.8	40.4	(35.9–45.1)
L West	647	25.4	(22.1–28.8)	20.7	29.5	38.2	(34.5–42.0)
Leeds	344	20.6	(16.7–25.2)	14.7	23.3	30.8	(26.2–35.9)
Leic	528	18.2	(15.1–21.7)	12.7	20.9	32.0	(28.2–36.1)
Liv Ain	128	23.4	(16.9–31.5)	17.1	28.7	32.0	(24.5–40.6)
Liv Roy	222	16.2	(11.9–21.7)	11.9	18.4	28.4	(22.8–34.7)
M RI	196	17.4	(12.7–23.3)	13.4	20.9	38.8	(32.2–45.8)
Middlbr	211	20.4	(15.5–26.4)	14.4	22.5	32.2	(26.3–38.8)
Newc	194	17.5	(12.8–23.5)	8.3	22.8	26.8	(21.0–33.5)
Nottm	214	13.6	(9.6–18.8)	11.7	17.8	23.8	(18.6–30.0)
Oxford	341	18.2	(14.4–22.6)	12.0	23.9	29.3	(24.7–34.4)
Ports	166	6.6	(3.7–11.6)	2.8	7.0	13.9	(9.4–20.0)
Prestn	294	18.7	(14.7–23.6)	13.7	22.6	28.2	(23.4–33.7)
Redng	219	23.7	(18.6–29.8)	17.4	29.8	33.8	(27.8–40.3)
Sheff	277	12.6	(9.2–17.1)	9.0	14.4	24.9	(20.2–30.3)
Shrew	122	13.9	(8.8–21.3)	11.2	15.8	34.4	(26.6–43.3)
Stevng	298	15.8	(12.1–20.4)	11.7	18.9	22.2	(17.8–27.2)
Sthend	72	20.8	(13.0–31.7)	17.7	24.6	34.7	(24.7–46.4)
Stoke	182	25.3	(19.5–32.1)			48.4	(41.2–55.6)
Sund	111	19.8	(13.4–28.3)	11.8	22.6	29.7	(22.0–38.9)
Truro	82	17.1	(10.4–26.8)	12.2	22.0	35.4	(25.8–46.3)
Wirral	118	33.9	(25.9–42.9)	30.0	31.1	53.4	(44.4–62.2)
Wolve	162	10.5	(6.6–16.2)	8.1	11.3	22.8	(17.0–29.9)
N Ireland							
Antrim	62	17.7	(10.1–29.3)	11.1	22.0	30.7	(20.5–43.1)
Belfast	126	15.1	(9.8–22.4)	9.1	17.0	27.0	(20.0–35.4)
Newry	41	9.8	(3.7–23.3)	5.3	12.9	19.5	(10.1–34.4)
Ulster	47	10.6	(4.5–23.1)	10.6	12.1	25.5	(15.1–39.8)
West NI	62	9.7	(4.4–19.9)	5.6	12.8	24.2	(15.1–36.3)
Wales							
Bangor	43	9.3	(3.5–22.3)	10.3	12.9	18.6	(9.6–33.0)
Cardff	323	10.5	(7.6–14.4)	6.6	12.2	25.1	(20.7–30.1)
Clwyd	14	14.3	(3.6–42.7)	16.7	20.0	14.3	(3.6–42.7)
Swanse	207	19.8	(14.9–25.8)	14.4	22.8	30.9	(25.0–37.5)
Wrexm	78	11.5	(6.1–20.7)	10.0	12.1	28.2	(19.4–39.2)
England	**8,984**	**18.5**	**(17.8–19.4)**	**13.7**	**21.2**	**31.4**	**(30.4–32.3)**
N Ireland	**338**	**13.3**	**(10.1–17.4)**	**8.6**	**16.1**	**26.0**	**(21.6–31.0)**
Wales	**665**	**13.5**	**(11.1–16.4)**	**9.9**	**15.6**	**26.6**	**(23.4–30.1)**
E, W & NI	**9,987**	**18.0**	**(17.3–18.8)**	**13.3**	**20.7**	**30.9**	**(30.0–31.8)**
Min		**4.9**		**2.8**	**6.5**	**9.2**	
Quartile 1		**13.1**		**9.3**	**14.7**	**24.7**	
Quartile 3		**20.1**		**14.7**	**22.8**	**33.4**	
Max		**33.9**		**30.0**	**31.1**	**61.2**	

Blank cells – data for PRD not used due to high % with missing data or high % with uncertain aetiology

[a]Non-acute group excludes crescentic (extracapillary) glomerulonephritis (type I, II, III), nephropathy (interstitial) due to cis-platinum, renal vascular disease due to malignant hypertension, renal vascular disease due to polyarteritis, Wegener's granulomatosis, cryoglobulinemic glomerulonephritis, myelomatosis/light chain deposit disease, Goodpasture's syndrome, systemic sclerosis (scleroderma), haemolytic ureaemic syndrome, multi-system disease – other, tubular necrosis (irreversible) or cortical necrosis, Balkan nephropathy, kidney tumour(s), and traumatic or surgical loss of kidney(s)

[b]The remaining patients starting RRT therefore presented over 1 year beforehand

rates. This may be a consequence of the National CKD guidelines published by the Medical and GP Royal Colleges [6], the Quality and Outcomes Framework (QOF) initiative (www.dh.gov.uk) raising awareness of CKD amongst non-nephrologists and the introduction of estimated GFR reporting. The Health Foundation is currently funding a quality improvement initiative rolling out a computer programme that flags people with declining kidney function to laboratory staff who in turn flag these people to the GP to ensure they are aware of the decline and have considered referral to a nephrologist. Nineteen renal centres are participating in this initiative (ASSIST-CKD) which is being managed through Kidney Research UK and the UKRR is leading the stepped-wedge evaluation to establish effectiveness [7].

In 2014, 69.4% of incident patients presented to nephrology services over a year before they started RRT. The remaining patients presented within a year of start, with 7.6% of patients presenting within the 6–12 month window before RRT, 5.1% within 3–6 months and 17.8% within three months of RRT start. Figure 1.12 shows this breakdown by year for those 28 centres supplying data over 75% complete for each of the last six years. The figure shows an increase over time in the percentage of patients presenting a year or more before starting RRT. As shown in previous reports this increase was most marked in the years just before those shown in the figure. In 2005, only 52.6% of incident patients presented over a year before they started RRT.

Characteristics of patients presenting late versus those presenting early

In the combined 2013/2014 incident cohort, the median age was similar in those presenting late and those presenting early (table 1.17). There was also little difference in the male:female ratio. There were however large differences in the percentages starting on PD and in haemoglobin and eGRF at start with all three of these being lower in late presenters than in early presenters. The difference for haemoglobin may reflect inadequate pre-dialysis care with limited anaemia management, but alternatively those presenting late may be more likely to have anaemia because of multisystem disease or inter-current illness. More detailed analyses of haemoglobin at start of RRT and late presentation can be found in chapter 7: Haemoglobin, Ferritin and Erythropoietin amongst UK Adult Dialysis Patients in 2014. The finding of lower average eGFR in those presenting late is in contrast to some of the studies in the literature but many of those studies pre-date the era of routine use of eGFR [8, 9]. A recent Cochrane review [10] has shown that eGFR was indeed lower in RRT patients referred late (mean difference of 0.42 ml/min/1.73 m^2) compared to those presenting early (definition: more than six months before starting RRT) consistent with UKRR data.

In the 2013/2014 cohort, the percentage of South Asian and Black patients presenting late (<90 days) was somewhat lower than in Whites (16.2% vs. 17.9%: $p = 0.08$). The median duration of pre-RRT care did not vary greatly with age group except perhaps for the two youngest age groups (figure 1.13).

Primary renal disease and late presentation

In the 2013/2014 cohort, there were large differences in late presentation rates between primary renal diagnoses (Chi-squared test $p < 0.0001$) (table 1.18). Patients in the acute group or with data not available had high rates of late presentation as anticipated. Those with diabetes and adult polycystic kidney disease or pyelonephritis had low rates in keeping with their longer natural histories of CKD progression. There was a notable

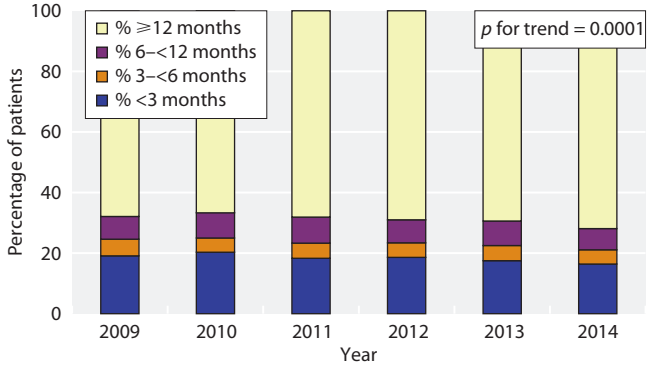

Fig. 1.12. Late presentation rate by year (2009–2014)
Restricted to centres reporting continuous data for 2009–2014

Table 1.17. Patient characteristics amongst patients presenting late (<90 days) compared with those presenting early (⩾90 days) (2013/2014 incident patients)

	<90 days	⩾90 days	*p*-value
Median age	65.0	64.9	0.4
Male : female ratio (% male)	1.89 (65%)	1.74 (64%)	0.14
Percentage starting on PD	9.9	22.2	<0.0001
Percentage on PD at 90 days	13.3	21.7	<0.0001
Mean haemoglobin at RRT start (g/L)	90	101	<0.0001
Geometric mean eGFR at RRT start (ml/min/1.73 m^2)	7.7	8.7	<0.0001

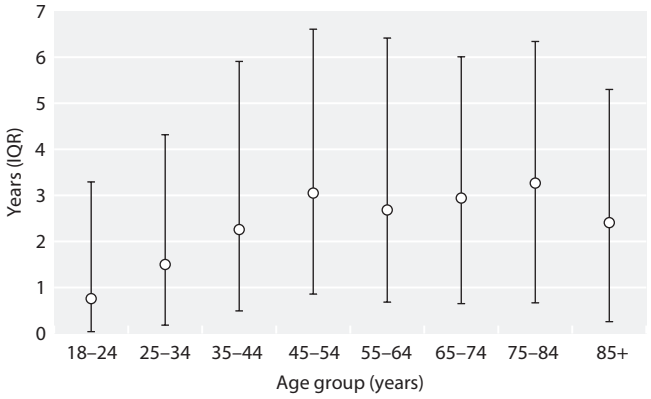

Fig. 1.13. Median duration of pre-RRT care by age group (incident patients 2013/2014)

decline in the proportion of diabetics presenting late up until 2007. Since then the proportion has been stable. The decline seen earlier likely reflects national initiatives to screen patients with diabetes for proteinuria and falling GFR.

Comorbidity and late presentation

In the 2013/2014 cohort, the percentage of patients who were recorded as having no comorbidity was similar in those who presented late as in those presenting earlier (48.1% vs. 50.2%: $p = 0.2$). That said however, there were differences in those with comorbidities: liver disease and malignancy were more common in those presenting late compared to those presenting early (table 1.19) perhaps reflecting underlying causes of CKD and its progression. Cardiovascular disease was less common in those presenting late. This is in keeping with other findings [11].

Table 1.18. Late presentation by primary renal diagnosis (2013/2014 incident patients)

Diagnosis	Total *N*	Late presentation *N*	Late presentation %
Uncertain aetiology	1,255	275	21.9
Diabetes	2,430	220	9.1
Glomerulonephritis	1,248	177	14.2
Other identified category	979	181	18.5
Polycystic kidney or pyelonephritis	1,247	91	7.3
Renal vascular disease	1,112	154	13.8
Acute group	836	467	55.9
Data not available	299	96	32.1

Unlike elsewhere in the report, the RVD group includes hypertension and polycystic kidney and pyelonephritis are grouped together. Acute group includes crescentic (extracapillary) glomerulonephritis (type I, II, III), nephropathy (interstitial) due to cis-platinum, renal vascular disease due to malignant hypertension, renal vascular disease due to polyarteritis, Wegener's granulomatosis, cryoglobulinemic glomerulonephritis, myelomatosis/light chain deposit disease, Goodpasture's syndrome, systemic sclerosis (scleroderma), haemolytic ureaemic syndrome, multi-system disease – other, tubular necrosis (irreversible) or cortical necrosis, Balkan nephropathy, kidney tumour(s), and traumatic or surgical loss of kidney(s)

Table 1.19. Percentage prevalence of specific comorbidities amongst patients presenting late (<90 days) compared with those presenting early (⩾90 days) (2013/2014 incident patients)

Comorbidity	<90 days	⩾90 days	*p*-value
Ischaemic heart disease	14.3	21.4	<0.0001
Cerebrovascular disease	8.8	11.5	0.01
Peripheral vascular disease	8.5	12.3	0.001
Diabetes (not a cause of ERF)	11.1	10.0	0.3
Liver disease	5.0	2.9	0.001
Malignancy	21.9	12.3	<0.0001
COPD	8.6	7.6	0.3
Smoking	13.3	11.8	0.2

International comparisons

Figure 1.14 shows the crude RRT incidence rates (including children) for 2013 for various countries. The data is from the USRDS [12]; 2013 was the latest year available at time of writing. The UK incidence rate was similar to those in many other Northern European countries, Australia and New Zealand but remained markedly lower than in some other countries, most notably Greece, Japan and the USA. There are numerous reasons for these differences which have been documented and explored in other ecological studies and summarised by this review [13].

Survival of incident patients

See chapter 5: Survival and Causes of Death of UK Adult Patients on Renal Replacement Therapy in 2014.

Conclusions

Across the UK, as a whole, the renal replacement therapy (RRT) incidence rate for 2014 was higher than

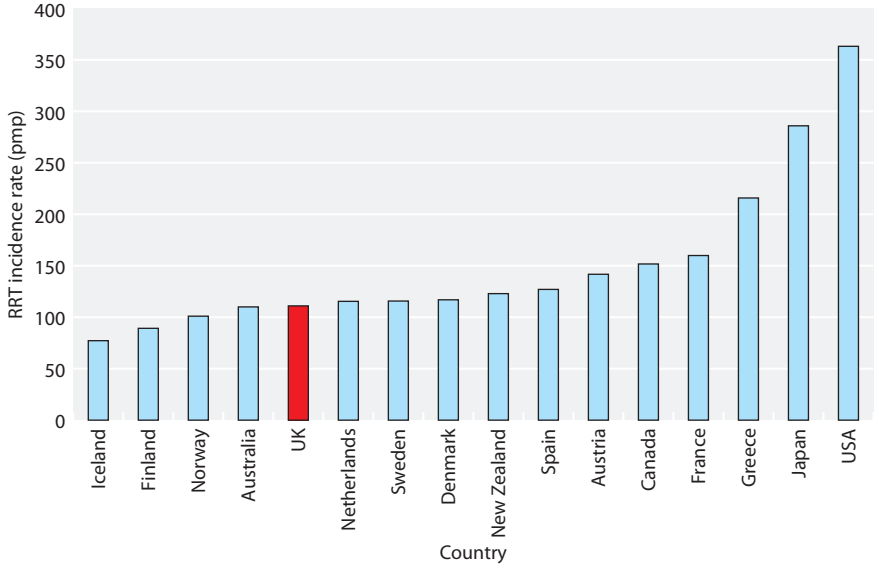

Fig. 1.14. International comparison of RRT incidence rates in 2013
Data from USRDS [12]

for 2013 and 2012. Partly because of the smaller numbers involved, rates have been more variable over the last few years for Northern Ireland, Scotland and Wales compared with England. Wales continues to have the highest incidence rate and there remained large between centre variation in incidence rates for RRT some of which is likely explained by population differences in ethnicity and age structure. There was a lot of variation between CCG/HBs in the rates of older people (>75) starting RRT and also substantial between centre variation in use of different types of RRT modality some of which suggests inefficient use of cheaper and more effective forms of treatment. Although large numbers of patients continue to present late to renal centres this proportion has dropped substantially in the last decade. Some centres' lower rates (<10%) suggest that local factors may be worth exploring with the aim of improving this aspect of renal care and one example of this is the ASSIST-CKD Study being funded by the Health Foundation. Plans for prospectively capturing data on patients attending renal centres from eGFR 30 ml/min/1.73 m^2 and more frequent and more detailed data downloads will hopefully allow the UKRR to explore these areas of variation in advanced CKD care.

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Conflicts of interest: the authors declare no conflicts of interest

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UK Renal Registry 18th Annual Report: Chapter 2 UK Renal Replacement Therapy Prevalence in 2014: National and Centre-specific Analyses

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Key Words

Chronic kidney disease · Clinical Commissioning Group · Comorbidity · Diabetes · Dialysis · End stage renal disease · Established renal failure · Ethnicity · Haemodialysis · Peritoneal dialysis · Prevalence · Renal replacement therapy · Transplantation · Treatment modality

Summary

- There were 58,968 adult patients receiving renal replacement therapy (RRT) in the UK on 31st December 2014, an absolute increase of 4.0% from 2013.
- The actual number of patients increased 2.0% for haemodialysis (HD), 5.3% for those with a functioning transplant but decreased 0.7% for peritoneal dialysis (PD).
- The UK adult prevalence of RRT was 913 per million population (pmp). The reported prevalence in 2000 was 523 pmp.
- The number of patients receiving home HD increased by 6.7% from 1,113 patients in 2013 to 1,188 patients in 2014.
- The median age of prevalent patients was 59 years (HD 67 years, PD 64 years, transplant 53 years). In 2000, the median age was 55 years (HD 63 years, PD 58 years, transplant 48 years). In 2014, the percentage of RRT patients aged greater than 75 years was 16.0%.
- For all ages, the prevalence rate in men exceeded that in women, peaking in age group 75–79 years at 3,100 pmp in men and for women at 1,600 pmp in age group 70–74 years.
- The most common identifiable renal diagnosis was glomerulonephritis (19%), followed by diabetes (16%) and aetiology uncertain (16%).
- Transplantation continued as the most common treatment modality (53%), HD was used in 41% and PD in 6% of RRT patients.
- Prevalence rates in patients aged ⩾85 years continued to increase between 2013 and 2014 (1,021 per million age related population (pmarp) to 1,060 pmarp).

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Introduction

This chapter presents data on all adult patients on RRT in the UK at the end of 2014. The UK Renal Registry (UKRR) received data returns for 2014 from all five renal centres in Wales, all five in Northern Ireland and all 52 in England. Data from all nine centres in Scotland were obtained from the Scottish Renal Registry. Demographic data on children and young adults can be found in chapter 4.

These analyses of prevalent RRT patients are performed annually to aid clinicians and policy makers in planning future RRT requirements in the UK. It is important to understand national, regional and centre level variation in numbers of prevalent patients as part of the capacity planning process. In addition, knowledge about variation in case mix is also reported to improve understanding of where resources should be focussed to improve equity of provision of RRT in the UK.

The term established renal failure (ERF) used within this chapter is synonymous with the terms 'end stage renal failure' and 'end stage renal disease', which are in more widespread international usage. Patients have disliked the term 'end stage' which reflects the inevitable outcome of this disease.

Methods

Crude prevalence rates were calculated per million population (pmp) and age/gender standardised prevalence ratios were calculated as detailed in appendix D: Methodology used for Analyses of Clinical Commissioning Group (CCG)/Health Board (HB) Incidence and Prevalence Rates and of Standardised Ratios (www.renalreg.org).

Throughout this chapter, haemodialysis refers to all modes of HD treatment, including haemodiafiltration (HDF). Several centres reported significant numbers of patients on HDF, but other centres did not differentiate this treatment type in their UKRR returns. Where joint care of renal transplant recipients between the referring centre and the transplant centre occurred, the patient was usually allocated to the referring centre (see appendix B: Definitions and Analysis Criteria for the allocation procedure). Thus the number of patients allocated to a transplant centre is often lower than that recorded by the centre itself and as a converse pre-emptively transplanted patients are sometimes allocated to the transplanting centre rather than the referring centre if no transfer out code had been sent through. Queries and updated information are welcomed by the UKRR at any point during the year if this occurs.

Prevalent patients on RRT in 2014 were examined by time on RRT, age group, gender, ethnic origin, primary renal disease, presence of diabetes and treatment modality (see appendix H: Coding) (www.renalreg.org). In the analysis of prevalence, only adult patients on RRT contributed to the numerator.

Time on RRT was defined as median time on treatment and was calculated from the most recent start date. Patients without an accurate start date were excluded from this calculation.

Analyses were done for the UK as a whole, by UK country, at centre level and split by treatment modality when appropriate.

Chi-squared test, Fisher's exact test, linear regression and Kruskal Wallis tests were used as appropriate to test for significant differences between groups. The data were analysed using SAS 9.3.

Results

Prevalent patient numbers and changes in prevalence

The number of patients for each country (table 2.1) was calculated by adding the number of patients in each renal centre located in the country. As some centres treat patients across national boundaries, these numbers differ marginally from those quoted elsewhere in this report when patients are allocated to geographical areas by their individual postcodes.

There were 58,968 adult patients receiving RRT in the UK at the end of 2014, giving an adult UK population

Table 2.1 Prevalence of adult RRT in the UK on 31/12/2014

	England	N Ireland	Scotland[b]	Wales	UK
Number of prevalent patients	49,842	1,608	4,676	2,842	58,968
Total estimated population, mid-2014 (millions)[a]	54.3	1.8	5.3	3.1	64.6
Prevalence rate HD (pmp)	379	344	346	361	374
Prevalence rate PD (pmp)	58	34	40	62	56
Prevalence rate dialysis (pmp)	437	378	386	423	430
Prevalence rate transplant (pmp)	481	496	488	496	482
Prevalence rate total (pmp)	918	874	874	919	913
95% confidence intervals total (pmp)	*910–926*	*831–916*	*849–899*	*885–953*	*905–920*

[a]Data from the Office for National Statistics, National Records of Scotland and the Northern Ireland Statistics and Research Agency – based on the 2011 census

[b]The RRT prevalent number published in the Scottish Renal Registry report for the same period is slightly higher. This is explained at least in part by the inclusion of under 18s in the Scottish Renal Registry analyses

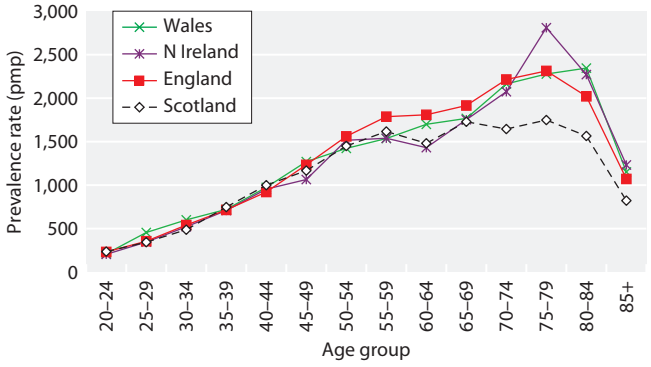

Fig. 2.1. Prevalence rates per million population by age group and UK country on 31/12/2014

prevalence of 913 pmp (table 2.1) compared with 888 pmp in 2013. Prevalence rates increased in all of the UK countries in 2014. While the prevalent dialysis rate increased slightly in the UK to 430 pmp in 2014 compared with 427 pmp in 2013, there was a small decrease in PD prevalence. A decline in PD prevalence in the UK has been noted since 1997 and, after a brief plateau in 2011 and 2012, there was further decline to 57 pmp in 2013 and then 56 pmp in 2014. Conversely, the UK prevalence of transplanted patients continued to increase from 462 pmp in 2013 to 482 pmp in 2014. In analyses stratified by country and age group, Northern Ireland exhibited a higher RRT prevalence rate for patients aged 75–79 years compared with the other UK countries (figure 2.1). In the UK, the RRT prevalence rate in patients aged 80–84 continued to rise over time from 1,922 per million age related population (pmarp) in 2013 to 2,006 pmarp in 2014 and in patients aged $\geqslant$85 years from 1,021 pmarp in 2013 to 1,060 pmarp in 2014. This aging of the prevalent population is likely due in part to improving patient survival.

Prevalent patients by RRT modality and centre

There was a marked variation in the number of prevalent patients across renal centres and the distribution of their treatment modalities varied widely (table 2.2).

Changes in prevalence

The prevalent UK RRT population grew by 4.0% between 2013 and 2014 (table 2.3), an annual growth rate which has been fairly consistent over the last 10–15 years (figure 2.2). The increases in prevalence in England and Northern Ireland were similar at 4.1% and 4.3% respectively. For Northern Ireland, this represented a larger one-year increase than that experienced between 2012 and 2013 (2.0%). Scotland and Wales also experienced greater changes in prevalence since 2013 (3.1% and 2.3% respectively) as compared with 2012–2013 (1.5% change in Scotland and 1.7% change in Wales). The changes reported here between 2012 and 2013 will differ from those presented in the 17th Annual Report as the current report includes data updates made subsequent to publication of the 17th Annual Report.

After a slight reduction in prevalent HD patients between 2012 and 2013 (0.1% pmp decrease), the number of prevalent HD patients increased by 1.3% in 2014 compared to 2013 (table 2.4). There continued to be an increase in prevalent transplant patients (4.5% pmp) and, as seen in previous years, there was a decrease in prevalent PD patients (1.5% pmp decrease). Notably, the decline observed between 2013 and 2014 was smaller than that observed between 2012 and 2013 (4.6% pmp decrease).

The average annual change in prevalent patients between 2010 and 2014 was a 1.0% pmp increase in HD, 2.3% pmp fall in PD, and 5.0% pmp growth in prevalent transplant patients (table 2.4). In the same period there was an average annual 15.8% pmp growth in the use of home haemodialysis (data not shown).

The long-term (1997– 2014) UK prevalence pattern by treatment modality is shown in figure 2.2. The steady growth in transplant numbers was maintained in 2014. The increase in home haemodialysis patient numbers has been associated with just over a doubling in the prevalence rate, from 2.0% of the dialysis population in 2005 ($n = 450$) to 4.3% in 2014 ($n = 1{,}188$). In contrast PD has fallen by 5.9% between 2005 and 2014.

Prevalence of RRT in Clinical Commissioning Groups in England (CCGs), Health and Social Care Areas in Northern Ireland (HBs), Local Health Boards in Wales (HBs) and Health Boards in Scotland (HBs)

The need for RRT depends on many factors such as predisposing conditions but also on social and demographic factors such as age, gender, social deprivation and ethnicity. Hence, comparison of crude prevalence rates by geographical area can be misleading. This section, as in previous reports, uses age and gender standardisation to compare RRT prevalence rates. The ethnic minority profile is also provided to help understand the differences in standardised prevalence ratios (SPRs).

There were substantial variations in the crude CCG/HB prevalence rates pmp, from 560 pmp (Shetland, population 23,200) to 1,680 pmp (NHS Brent, population 317,300). There were similar variations in the standardised prevalence ratios (ratio of observed:expected prevalence rate given the age/gender breakdown of

Table 2.2 Number of prevalent RRT patients by treatment modality and centre on 31/12/2014

Centre	*N*					Catchment populations (millions)	2014 crude rate pmp	*(95% CI)*
	HD	PD	Dialysis	Transplant	RRT			
England								
B Heart	415	34	449	189	638	0.74	864	*(797–932)*
B QEH[a]	952	143	1,095	1,042	2,137	1.70	1,258	*(1,204–1,311)*
Basldn	174	28	202	78	280	0.42	675	*(596–754)*
Bradfd	223	21	244	305	549	0.65	842	*(772–912)*
Brightn	430	65	495	421	916	1.30	706	*(661–752)*
Bristol[a]	531	67	598	862	1,460	1.44	1,014	*(962–1,066)*
Camb[a]	367	31	398	845	1,243	1.16	1,073	*(1,014–1,133)*
Carlis	74	28	102	148	250	0.32	779	*(683–876)*
Carsh	793	136	929	636	1,565	1.91	818	*(778–859)*
Chelms	135	27	162	101	263	0.51	515	*(453–578)*
Colchr	119	0	119	0	119	0.30	398	*(326–469)*
Covnt[a]	367	91	458	504	962	0.89	1,078	*(1,010–1,147)*
Derby	240	86	326	193	519	0.70	739	*(675–802)*
Donc	183	27	210	75	285	0.41	695	*(614–776)*
Dorset	278	51	329	336	665	0.86	772	*(713–830)*
Dudley	176	54	230	75	305	0.44	690	*(613–768)*
Exeter	416	94	510	440	950	1.09	872	*(817–928)*
Glouc	211	43	254	175	429	0.59	731	*(661–800)*
Hull	330	77	407	397	804	1.02	788	*(733–842)*
Ipswi	127	31	158	211	369	0.40	925	*(831–1,019)*
Kent	409	66	475	544	1,019	1.22	832	*(781–883)*
L Barts[a]	964	231	1,195	1,041	2,236	1.83	1,222	*(1,171–1,272)*
L Guys[a]	654	30	684	1,240	1,924	1.08	1,778	*(1,698–1,857)*
L Kings	541	91	632	393	1,025	1.17	875	*(821–929)*
L Rfree[a]	712	143	855	1,155	2,010	1.52	1,324	*(1,266–1,382)*
L St.G[a]	308	49	357	440	797	0.80	999	*(930–1,068)*
L West[a]	1,416	64	1,480	1,764	3,244	2.40	1,352	*(1,306–1,399)*
Leeds[a]	521	63	584	916	1,500	1.67	898	*(853–943)*
Leic[a]	907	121	1,028	1,123	2,151	2.44	883	*(846–920)*
Liv Ain	162	41	203	15	218	0.48	450	*(391–510)*
Liv Roy[a]	370	60	430	882	1,312	1.00	1,312	*(1,241–1,383)*
M RI[a]	519	78	597	1,218	1,815	1.53	1,185	*(1,131–1,240)*
Middlbr	338	15	353	505	858	1.00	854	*(797–912)*
Newc[a]	287	52	339	644	983	1.12	877	*(822–932)*
Norwch	326	35	361	330	691	0.79	878	*(813–944)*
Nottm[a]	365	84	449	617	1,066	1.09	980	*(921–1,039)*
Oxford[a]	464	82	546	1,112	1,658	1.69	981	*(934–1,028)*
Plymth[a]	137	38	175	335	510	0.47	1,086	*(991–1,180)*
Ports[a]	617	79	696	899	1,595	2.02	788	*(749–827)*
Prestn	565	58	623	548	1,171	1.49	784	*(739–829)*
Redng	294	73	367	396	763	0.91	838	*(779–898)*
Salford	411	88	499	470	969	1.49	650	*(609–691)*
Sheff[a]	581	62	643	717	1,360	1.37	992	*(939–1,044)*
Shrew	193	32	225	124	349	0.50	697	*(624–770)*
Stevng	488	27	515	267	782	1.20	650	*(604–695)*
Sthend	116	20	136	102	238	0.32	751	*(656–847)*
Stoke	337	83	420	356	776	0.89	872	*(811–934)*
Sund	211	18	229	223	452	0.62	731	*(664–798)*
Truro	149	21	170	210	380	0.41	920	*(827–1,012)*
Wirral	205	23	228	18	246	0.57	430	*(376–484)*
Wolve	314	79	393	182	575	0.67	860	*(790–930)*
York	143	29	172	289	461	0.49	937	*(851–1,022)*

Table 2.2 Continued

Centre	*N*					Catchment populations (millions)	2014 crude rate pmp	*(95% CI)*
	HD	PD	Dialysis	Transplant	RRT			
N Ireland								
Antrim	123	13	136	93	229	0.29	777	*(676–878)*
Belfast[a]	204	15	219	531	750	0.64	1,178	*(1,093–1,262)*
Newry	92	16	108	100	208	0.26	796	*(688–904)*
Ulster	99	4	103	46	149	0.27	560	*(470–650)*
West NI	116	14	130	142	272	0.35	773	*(681–865)*
Scotland								
Abrdn	212	28	240	275	515	0.60	858	*(784–933)*
Airdrie	185	9	194	205	399	0.55	723	*(652–794)*
D & Gall	49	17	66	67	133	0.15	896	*(744–1,048)*
Dundee	178	24	202	212	414	0.46	894	*(808–980)*
Edinb[a]	278	23	301	457	758	0.96	786	*(730–842)*
Glasgw[a]	592	43	635	1,006	1,641	1.62	1,011	*(962–1,059)*
Inverns	71	16	87	140	227	0.27	841	*(731–950)*
Klmarnk	141	37	178	128	306	0.36	847	*(752–942)*
Krkcldy	146	17	163	120	283	0.32	894	*(789–998)*
Wales								
Bangor[b]	83	16	99	0	99	0.22	454	*(364–543)*
Cardff[a]	495	81	576	1,017	1,593	1.42	1,122	*(1,067–1,177)*
Clwyd	91	12	103	62	165	0.19	870	*(737–1,003)*
Swanse	333	54	387	317	704	0.89	795	*(736–854)*
Wrexm	113	30	143	138	281	0.24	1,170	*(1,033–1,306)*
England	**20,565**	**3,169**	**23,734**	**26,108**	**49,842**			
N Ireland	**634**	**62**	**696**	**912**	**1,608**			
Scotland	**1,852**	**214**	**2,066**	**2,610**	**4,676**			
Wales	**1,115**	**193**	**1,308**	**1,534**	**2,842**			
UK	**24,166**	**3,638**	**27,804**	**31,164**	**58,968**			

Centres prefixed 'L' are London centres

The numbers of patients calculated for each country quoted above differ marginally from those quoted elsewhere in this report when patients are allocated to areas by their individual post codes, as some centres treat patients across national boundaries

[a]Transplant centre

[b]Bangor shares the care of its transplant patients with Liverpool Royal. Previously these patients were all reported by Liverpool Royal. For 2014 data, a small number of these patients were reported by Bangor and, in tables 2.1–2.3 only, these patients have been re-allocated to Liverpool Royal

the CCG/HB) from 0.58 (Shetland) to 2.15 (Brent) (table 2.5). Confidence intervals are not presented for the crude rates per million population for 2014 but figures D3 and D4 in appendix D (www.renalreg.org) can be used to determine if a CCG/HB falls within the range representing the 95% confidence limit of the national average prevalence rate.

Factors associated with variation in standardised prevalence ratios in Clinical Commissioning Groups in England, Health and Social Care Trust Areas in Northern Ireland, Local Health Boards in Wales and Health Boards in Scotland

In 2014, there were 75 CCGs/HBs with a significantly low standardised prevalence ratio (SPR), 113 with a 'normal' SPR and 49 with a significantly high SPR (table 2.5). They tend to reflect the demographics of the regions in question such that urban, ethnically diverse populations in areas of high social deprivation have the highest prevalence rates of renal replacement therapy. For example, the association with the level of ethnic diversity is illustrated by the fact that mean SPRs were significantly higher in the 90 CCGs/HBs with an ethnic minority population greater than 10% than in those with lower ethnic minority populations ($p < 0.001$). There was a strong, positive correlation between the SPR and percentage of the population that are non-White ($r = 0.9$ $p < 0.001$). In 2014, for each 10% increase in ethnic minority population, the standardised prevalence ratio increased by 0.17 (equates to ~17%). The relationship between the ethnic composition of a CCG/HB and its SPR is demonstrated in figure 2.3.

Table 2.3 Number of prevalent patients on RRT by centre at year end 2010–2014

Centre	Date					% change 2013–2014	% annual change 2010–2014
	31/12/2010	31/12/2011	31/12/2012	31/12/2013	31/12/2014		
England							
B Heart	635	665	668	655	638	−2.6	0.1
B QEH	1,826	1,909	1,969	2,044	2,137	4.5	4.0
Basldn	209	231	258	270	280	3.7	7.6
Bradfd	453	466	504	520	549	5.6	4.9
Brightn	764	777	829	871	916	5.2	4.6
Bristol	1,264	1,317	1,337	1,423	1,460	2.6	3.7
Camb	1,004	1,075	1,111	1,191	1,243	4.4	5.5
Carlis	206	215	216	227	250	10.1	5.0
Carsh	1,330	1,368	1,454	1,480	1,565	5.7	4.2
Chelms	237	217	225	240	263	9.6	2.6
Colchr	115	119	117	115	119	3.5	0.9
Covnt	838	875	899	930	962	3.4	3.5
Derby	427	465	474	467	519	11.1	5.0
Donc	222	248	261	259	285	10.0	6.4
Dorset	585	587	609	627	665	6.1	3.3
Dudley	303	287	315	311	305	−1.9	0.2
Exeter	784	809	843	888	950	7.0	4.9
Glouc	374	381	416	410	429	4.6	3.5
Hull	717	755	782	814	804	−1.2	2.9
Ipswi	316	340	339	355	369	3.9	4.0
Kent	795	862	918	961	1,019	6.0	6.4
L Barts	1,761	1,873	1,952	2,097	2,236	6.6	6.2
L Guys	1,627	1,684	1,738	1,830	1,924	5.1	4.3
L Kings	829	872	917	965	1,025	6.2	5.4
L Rfree	1,614	1,727	1,842	1,925	2,010	4.4	5.6
L St.G	679	705	706	755	797	5.6	4.1
L West	2,873	3,010	3,088	3,130	3,244	3.6	3.1
Leeds	1,375	1,421	1,413	1,464	1,500	2.5	2.2
Leic	1,804	1,922	1,975	2,069	2,151	4.0	4.5
Liv Ain	162	190	194	190	218	14.7	7.7
Liv Roy	1,227	1,244	1,237	1,267	1,312	3.6	1.7
M RI	1,557	1,650	1,711	1,855	1,815	−2.2	3.9
Middlbr	711	754	789	832	858	3.1	4.8
Newc	903	919	946	962	983	2.2	2.1
Norwch	616	610	622	690	691	0.1	2.9
Nottm	1,012	1,022	1,012	1,075	1,066	−0.8	1.3
Oxford	1,423	1,451	1,532	1,565	1,658	5.9	3.9
Plymth	462	464	458	502	510	1.6	2.5
Ports	1,330	1,392	1,442	1,547	1,595	3.1	4.6
Prestn	970	1,018	1,078	1,089	1,171	7.5	4.8
Redng	627	688	672	731	763	4.4	5.0
Salford	815	832	880	883	969	9.7	4.4
Sheff	1,248	1,256	1,299	1,329	1,360	2.3	2.2
Shrew	344	345	354	338	349	3.3	0.4
Stevng	607	639	664	755	782	3.6	6.5
Sthend	207	208	213	220	238	8.2	3.6
Stoke	659	695	699	724	776	7.2	4.2
Sund	368	388	422	421	452	7.4	5.3
Truro	335	355	375	371	380	2.4	3.2
Wirral	224	233	225	247	246	−0.4	2.4
Wolve	533	512	524	568	575	1.2	1.9
York	340	340	396	409	461	12.7	7.9

Table 2.3 Continued

Centre	Date					% change 2013–2014	% annual change 2010–2014
	31/12/2010	31/12/2011	31/12/2012	31/12/2013	31/12/2014		
N Ireland							
Antrim	218	225	223	224	229	2.2	1.2
Belfast	680	683	702	726	750	3.3	2.5
Newry	179	189	188	199	208	4.5	3.8
Ulster	114	136	145	155	149	−3.9	6.9
West NI	258	270	253	237	272	14.8	1.3
Scotland							
Abrdn	463	477	504	517	515	−0.4	2.7
Airdrie	327	346	389	389	399	2.6	5.1
D & Gall	115	122	127	117	133	13.7	3.7
Dundee	383	397	395	398	414	4.0	2.0
Edinb	711	696	716	733	758	3.4	1.6
Glasgw	1,484	1,471	1,537	1,586	1,641	3.5	2.5
Inverns	234	227	220	216	227	5.1	−0.8
Klmarnk	284	298	301	296	306	3.4	1.9
Krkcldy	263	278	278	284	283	−0.4	1.8
Wales							
Bangor	113	109	105	99	99	0.0	−3.3
Cardff	1,476	1,531	1,544	1,583	1,593	0.6	1.9
Clwyd	138	137	173	152	165	8.6	4.6
Swanse	636	658	662	693	704	1.6	2.6
Wrexm	219	236	248	251	281	12.0	6.4
England	**42,646**	**44,387**	**45,919**	**47,863**	**49,842**	4.1	4.0
N Ireland	**1,449**	**1,503**	**1,511**	**1,541**	**1,608**	4.3	2.6
Scotland	**4,264**	**4,312**	**4,467**	**4,536**	**4,676**	3.1	2.3
Wales	**2,582**	**2,671**	**2,732**	**2,778**	**2,842**	2.3	2.4
UK	**50,941**	**52,873**	**54,629**	**56,718**	**58,968**	4.0	3.7

Only three of the 147 CCGs/HBs with ethnic minority populations of less than 10% had high SPRs: Abertawe Bro Morgannwg University, Aneurin Bevin and Cwm Taf in Wales. Forty-six (51.1%) of the 90 CCGs/HBs with ethnic minority populations at 10% or greater had high SPRs, whereas nine (10%) (NHS Airedale, Wharfedale and Craven, NHS Chiltern, NHS Havering, NHS East and North Hertfordshire, NHS Leeds North, NHS Leeds West, NHS Richmond, NHS Solihull, NHS Trafford) had low SPRs. Some of the CCGs/HBs with a high (>15%) ethnic minority population had a normal expected RRT prevalence rate (e.g. NHS Bolton, NHS Oldham, NHS North and South Manchester).

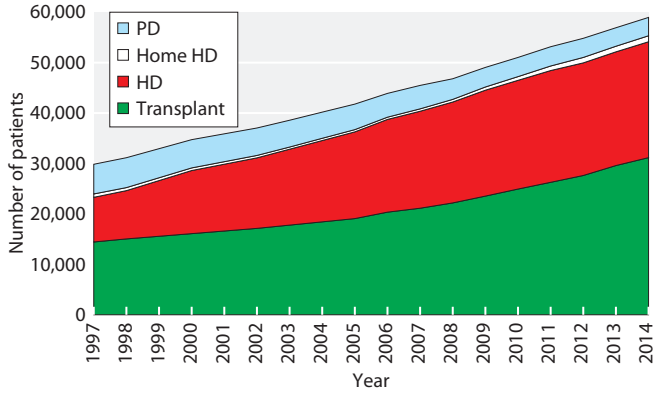

Fig. 2.2. Growth in prevalent patient numbers by treatment modality at the end of each year 1997–2014

The age and gender standardised prevalence ratios (which do not take into account variation in ethnicity) in each region of England and in Wales, Northern Ireland and Scotland are presented in table 2.6. Wales and Northern Ireland previously had higher than expected prevalence rates but in more recent years were similar to their expected rates. Scotland had lower than expected prevalence rates of RRT as did North and South England. The rate in London remained higher than expected.

Case mix in prevalent RRT patients

Time on RRT (vintage)

Table 2.7 shows the median time, in years, since starting RRT of prevalent RRT patients on 31st December

Table 2.4 Change in RRT prevalence rates pmp 2010–2014 by modality*

	Prevalence					% growth in prevalence pmp				
Year	HD pmp	PD pmp	Dialysis pmp	Transplant pmp	RRT pmp	HD	PD	Dialysis	Tx	RRT
2010	359	62	421	397	818					
2011	365	60	426	416	841	1.7	−2.2	1.1	4.7	2.9
2012	370	60	430	436	866	1.3	−0.9	1.0	5.0	3.0
2013	369	57	427	462	888	−0.1	−4.6	−0.8	5.8	2.5
2014	374	56	430	482	913	1.3	−1.5	0.9	4.5	2.8
Average annual growth 2010–2014						1.0	−2.3	0.6	5.0	2.8

pmp – per million population
Tx – Transplant
*Differences in the figures for dialysis and RRT prevalence and the sum of the separate modalities are due to rounding

2014. Median time on RRT for all prevalent patients remained fairly static at 6.1 years. Patients with functioning transplants had survived a median of 10.1 years on RRT whilst the median time on RRT of HD and PD patients was significantly less (3.4 and 1.6 years respectively).

The median time on HD was more than double that on PD and this could reflect early transplantation in the latter as well as higher technique failure rates for PD. Time on transplant is the same as observed in 2013, but decreased slightly since 2008 (median 10.4 years) which may reflect increased use of donation after cardiac death (DCD) donors and transplantation of more marginal and older candidates.

Age

The median age of prevalent UK patients on RRT at 31st December 2014 (58.7 years) (table 2.8) has remained stable over recent years although significantly higher than in 2005 when it was 55 years. As observed previously, there were marked differences between modalities; the median age of HD patients (67.2 years) was greater than that of those on PD (64.2 years) and substantially higher than that of transplanted patients (53.3 years). Half of the UK prevalent RRT population was in the 40–64 year age group (table 2.9). The proportion of patients aged 75 years and older varied between countries and was highest in Wales (18.5%) and lowest in Scotland (13.3%) (table 2.9). Within countries there were large differences in the proportion of patients aged over 75, within England these ranged between 8.6% (Liverpool Royal Infirmary) and 40.3% (Colchester). In most centres the prevalent PD population was younger than the HD population.

Between-centre differences in the median age of prevalent patients by treatment modality can reflect differing demographics of the catchment populations as well as differing approaches to treatment modalities. For example, Colchester had the highest median age (71.0 years), whilst Belfast the lowest (54.5 years) (table 2.8). This could possibly reflect variation in the catchment populations or follow-up of younger transplant patients (as observed in Belfast). The median age of the non-White dialysis population was lower than the overall dialysis population (61.4 vs. 66.8 years, data not shown). The differing age distributions of the transplant and dialysis populations are illustrated in figure 2.4, demonstrating that the age peak for prevalent dialysis patients was 24 years later than for prevalent transplant patients.

In the UK on 31st December 2014, 65.9% of patients aged less than 65 years on RRT had a functioning transplant (table 2.15), compared with only 30.2% aged 65 years and over. There was a similar pattern in all four UK countries.

Gender

The age distributions of males and females were very similar (data not shown). Standardising the age of the UK RRT prevalent patients by using the age and gender distribution of the UK population by CCG/HB (from mid-2013 population estimates), allowed estimation of crude prevalence rates by age and gender (figure 2.5). This shows a progressive increase in prevalence rate with age, peaking at 2,274 pmp (a slight increase from 2,218 pmp in 2013) in the age group 75–79 years then a rapid decline thereafter. Crude prevalence rates in males exceeded those of females for all age groups. The differences were smallest in younger patients and were greatest from the age of 70 years onwards. The prevalence rate in males was highest in the 75–79 years group (3,100 pmp) and for females in the 70–74 age group

Table 2.5 Prevalence of RRT and age/gender standardised prevalence ratios in CCG/HB areas

CCG/HB – Clinical Commissioning Groups (CCG) in England, Health and Social Care Areas in Northern Ireland, Local Health Boards in Wales and Health Boards in Scotland
O/E – standardised prevalence ratio. Ratio of observed : expected rate of RRT given the age and gender breakdown of the area
LCL – lower 95% confidence limit
UCL – upper 95% confidence limit
pmp – per million population
Areas with significantly low prevalence ratios in 2014 are italicised in greyed areas, those with significantly high prevalence ratios in 2014 are bold in greyed areas
Mid-2013 population data from the Office for National Statistics, National Records of Scotland and the Northern Ireland Statistics and Research Agency – based on the 2011 census
% non-White – percentage of the CCG/HB population that is non-White, from 2011 census

UK area	CCG/HB	Total population	2009 O/E	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2014 95% LCL	2014 95% UCL	Crude rate pmp	% non-White
Cheshire, Warrington and Wirral	*NHS Eastern Cheshire*	*195,500*	*0.71*	*0.76*	*0.77*	*0.81*	*0.79*	*0.79*	*0.68*	*0.92*	*824*	*3.7*
	NHS South Cheshire	177,200	0.94	0.93	0.90	0.87	0.89	0.93	0.80	1.08	914	2.9
	NHS Vale Royal	*102,000*	*0.78*	*0.75*	*0.76*	*0.71*	*0.77*	*0.71*	*0.57*	*0.90*	*696*	*2.1*
	NHS Warrington	205,100	0.94	0.85	0.82	0.83	0.85	0.91	0.78	1.05	848	4.1
	NHS West Cheshire	229,000	0.96	0.98	0.99	0.95	0.96	0.94	0.82	1.08	939	2.8
	NHS Wirral	*320,300*	*0.84*	*0.82*	*0.81*	*0.79*	*0.81*	*0.73*	*0.64*	*0.83*	*718*	*3.0*
Durham, Darlington and Tees	NHS Darlington	105,400	0.86	0.82	0.78	0.82	0.82	0.82	0.66	1.01	778	3.8
	NHS Durham Dales, Easington and Sedgefield	272,900	0.94	0.94	0.98	0.94	0.98	0.97	0.86	1.10	971	1.2
	NHS Hartlepool and Stockton-on-Tees	285,900	0.87	0.85	0.88	0.92	0.91	0.94	0.83	1.06	868	4.4
	NHS North Durham	*243,100*	*0.78*	*0.77*	*0.76*	*0.84*	*0.80*	*0.80*	*0.69*	*0.92*	*765*	*2.5*
	NHS South Tees	273,900	1.08	1.06	1.09	1.08	1.08	1.04	0.92	1.17	968	6.7
Greater Manchester	NHS Bolton	280,100	0.95	1.05	1.09	1.07	1.04	1.00	0.88	1.13	889	18.1
	NHS Bury	186,500	0.93	0.90	0.91	0.92	0.91	0.94	0.81	1.10	869	10.8
	NHS Central Manchester	**182,200**	**1.46**	**1.54**	**1.50**	**1.53**	**1.64**	**1.74**	**1.51**	**2.00**	**1,092**	**48.0**
	NHS Heywood, Middleton & Rochdale	212,100	1.02	0.95	1.00	1.01	1.05	1.06	0.92	1.22	933	18.3
	NHS North Manchester	170,700	1.08	1.07	1.08	1.12	1.09	1.12	0.95	1.33	803	30.8
	NHS Oldham	227,300	0.95	0.93	0.93	0.92	0.95	0.94	0.82	1.09	809	22.5
	NHS Salford	239,000	0.82	0.85	0.83	0.86	0.88	0.86	0.74	1.00	728	9.9
	NHS South Manchester	161,500	0.88	0.91	0.90	0.94	0.96	0.96	0.80	1.15	724	19.6
	NHS Stockport	*285,000*	*0.84*	*0.87*	*0.89*	*0.89*	*0.82*	*0.82*	*0.72*	*0.93*	*793*	*7.9*
	NHS Tameside and Glossop	253,700	0.93	0.94	0.93	0.92	0.92	0.89	0.78	1.02	828	8.2
	NHS Trafford	*230,200*	*0.75*	*0.86*	*0.82*	*0.84*	*0.85*	*0.86*	*0.74*	*1.00*	*786*	*14.5*
	NHS Wigan Borough	319,700	0.84	0.85	0.91	0.95	0.97	0.97	0.87	1.09	923	2.7
Lancashire	**NHS Blackburn with Darwen**	**147,400**	**1.26**	**1.24**	**1.29**	**1.27**	**1.26**	**1.22**	**1.04**	**1.43**	**1,011**	**30.8**
	NHS Blackpool	141,400	0.86	0.79	0.78	0.88	0.99	1.05	0.89	1.23	1,025	3.3
	NHS Chorley and South Ribble	169,500	0.82	0.79	0.84	0.90	0.95	0.94	0.80	1.10	897	2.9
	NHS East Lancashire	372,300	1.02	0.99	1.00	0.95	0.96	0.97	0.87	1.08	905	11.9
	NHS Fylde & Wyre	*165,800*	*0.85*	*0.82*	*0.82*	*0.83*	*0.83*	*0.83*	*0.71*	*0.97*	*905*	*2.1*
	NHS Greater Preston	201,700	0.88	0.88	0.84	0.89	0.88	0.87	0.75	1.02	783	14.7
	NHS Lancashire North	*159,500*	*0.70*	*0.70*	*0.73*	*0.73*	*0.68*	*0.68*	*0.56*	*0.83*	*646*	*4.0*
	NHS West Lancashire	*111,300*	*0.88*	*0.88*	*0.85*	*0.81*	*0.77*	*0.75*	*0.60*	*0.93*	*737*	*1.9*
Merseyside	NHS Halton	126,000	0.92	0.95	1.07	1.03	1.01	1.02	0.85	1.22	937	2.2
	NHS Knowsley	146,100	1.05	0.96	0.95	0.99	0.93	0.96	0.81	1.14	876	2.8
	NHS Liverpool	470,800	1.08	1.05	1.05	1.03	1.01	1.01	0.92	1.11	858	11.1
	NHS South Sefton	158,900	0.85	0.87	0.95	0.95	0.95	0.99	0.84	1.16	969	2.2
	NHS Southport and Formby	*114,300*	*0.77*	*0.79*	*0.84*	*0.76*	*0.79*	*0.80*	*0.66*	*0.98*	*857*	*3.1*
	NHS St Helens	176,200	0.90	0.91	0.90	0.91	0.86	0.86	0.73	1.01	840	2.0

Table 2.5 Continued

UK area	CCG/HB	Total population	2009 O/E	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2014 95% LCL	2014 95% UCL	Crude rate pmp	% non-White
Cumbria, Northumberland, Tyne and Wear	*NHS Cumbria*	*504,100*	*0.73*	*0.73*	*0.72*	*0.72*	*0.74*	*0.74*	*0.67*	*0.82*	*782*	*1.5*
	NHS Gateshead	*200,000*	*0.87*	*0.85*	*0.83*	*0.85*	*0.77*	*0.78*	*0.66*	*0.91*	*745*	*3.7*
	NHS Newcastle North and East	143,900	1.01	0.97	1.00	0.94	0.91	0.90	0.74	1.10	709	10.7
	NHS Newcastle West	142,900	0.96	0.87	0.81	0.87	0.85	0.83	0.68	1.01	700	18.3
	NHS North Tyneside	202,200	0.98	0.98	0.92	0.93	0.96	0.89	0.77	1.04	866	3.4
	NHS Northumberland	*315,800*	*0.80*	*0.75*	*0.75*	*0.75*	*0.73*	*0.77*	*0.68*	*0.87*	*807*	*1.6*
	NHS South Tyneside	148,500	1.10	1.01	1.03	0.97	0.92	0.85	0.71	1.01	828	4.1
	NHS Sunderland	276,100	0.99	1.00	0.95	0.97	0.92	0.93	0.82	1.05	887	4.1
North Yorkshire and Humber	*NHS East Riding of Yorkshire*	*314,600*	*0.87*	*0.83*	*0.82*	*0.80*	*0.78*	*0.77*	*0.68*	*0.87*	*820*	*1.9*
	NHS Hambleton, Richmondshire and Whitby	*153,600*	*0.63*	*0.62*	*0.65*	*0.67*	*0.72*	*0.73*	*0.61*	*0.87*	*755*	*2.7*
	NHS Harrogate and Rural District	158,200	0.87	0.84	0.82	0.87	0.84	0.88	0.75	1.04	891	3.7
	NHS Hull	257,600	1.04	1.01	0.99	0.95	0.96	1.01	0.89	1.15	862	5.9
	NHS North East Lincolnshire	159,800	1.02	0.99	1.08	1.04	1.01	0.95	0.81	1.12	901	2.6
	NHS North Lincolnshire	168,800	0.80	0.76	0.85	0.89	0.96	0.90	0.77	1.06	883	4.0
	NHS Scarborough and Ryedale	*110,100*	*0.92*	*0.86*	*0.82*	*0.84*	*0.81*	*0.81*	*0.66*	*0.99*	*853*	*2.5*
	NHS Vale of York	349,100	0.84	0.88	0.90	0.94	0.94	0.92	0.82	1.02	874	4.0
South Yorkshire and Bassetlaw	NHS Barnsley	235,800	1.11	1.12	1.10	1.06	1.03	1.03	0.90	1.17	984	2.1
	NHS Bassetlaw	113,700	0.82	0.80	0.80	0.86	0.81	0.82	0.67	1.00	827	2.6
	NHS Doncaster	303,600	0.97	0.93	0.97	0.96	0.92	0.95	0.85	1.07	896	4.7
	NHS Rotherham	258,700	1.08	1.12	1.06	1.05	1.04	1.03	0.91	1.17	986	6.4
	NHS Sheffield	**560,100**	**1.11**	**1.14**	**1.11**	**1.13**	**1.12**	**1.09**	**1.00**	**1.19**	**934**	**16.3**
West Yorkshire	*NHS Airedale, Wharfedale and Craven*	*158,500*	*0.83*	*0.83*	*0.79*	*0.78*	*0.80*	*0.84*	*0.70*	*0.99*	*827*	*11.1*
	NHS Bradford City	**82,700**	**1.78**	**1.89**	**1.84**	**1.95**	**1.97**	**2.13**	**1.76**	**2.58**	**1,269**	**72.2**
	NHS Bradford Districts	**334,600**	**1.10**	**1.13**	**1.15**	**1.24**	**1.21**	**1.18**	**1.06**	**1.32**	**983**	**28.7**
	NHS Calderdale	206,400	1.08	1.10	1.03	0.96	0.91	0.86	0.74	1.00	804	10.3
	NHS Greater Huddersfield	240,400	0.91	0.96	0.94	0.98	0.96	0.98	0.85	1.11	894	17.4
	NHS Leeds North	*199,900*	*0.97*	*0.97*	*0.96*	*0.93*	*0.88*	*0.86*	*0.73*	*1.00*	*805*	*17.4*
	NHS Leeds South and East	241,000	0.96	0.97	0.99	0.98	0.99	1.02	0.89	1.17	838	18.3
	NHS Leeds West	*320,500*	*0.85*	*0.84*	*0.81*	*0.79*	*0.84*	*0.87*	*0.76*	*0.99*	*699*	*10.8*
	NHS North Kirklees	**187,900**	**1.20**	**1.18**	**1.20**	**1.15**	**1.24**	**1.22**	**1.07**	**1.41**	**1059**	**25.3**
	NHS Wakefield	*329,700*	*0.81*	*0.81*	*0.83*	*0.85*	*0.84*	*0.83*	*0.73*	*0.93*	*789*	*4.6*
Arden, Herefordshire and Worcestershire	**NHS Coventry and Rugby**	**431,200**	**1.19**	**1.25**	**1.27**	**1.32**	**1.30**	**1.25**	**1.14**	**1.37**	**1,058**	**22.2**
	NHS Herefordshire	*186,100*	*0.83*	*0.77*	*0.78*	*0.80*	*0.78*	*0.78*	*0.67*	*0.91*	*811*	*1.8*
	NHS Redditch and Bromsgrove	179,300	0.94	0.92	0.91	0.95	0.90	0.89	0.76	1.04	859	6.0
	NHS South Warwickshire	*259,200*	*0.94*	*0.91*	*0.92*	*0.89*	*0.88*	*0.88*	*0.77*	*1.00*	*872*	*7.0*
	NHS South Worcestershire	*294,500*	*0.79*	*0.80*	*0.81*	*0.84*	*0.80*	*0.81*	*0.71*	*0.92*	*818*	*3.7*
	NHS Warwickshire North	188,100	1.10	1.12	1.09	1.01	1.01	1.01	0.88	1.17	978	6.5
	NHS Wyre Forest	98,400	0.94	0.91	0.93	0.89	0.88	0.96	0.79	1.17	996	2.8
Birmingham and the Black Country	**NHS Birmingham CrossCity**	**725,400**	**1.50**	**1.44**	**1.45**	**1.45**	**1.43**	**1.41**	**1.32**	**1.51**	**1,126**	**35.2**
	NHS Birmingham South and Central	**201,200**	**1.64**	**1.63**	**1.66**	**1.71**	**1.72**	**1.70**	**1.51**	**1.92**	**1,288**	**40.4**
	NHS Dudley	314,400	0.97	0.95	0.88	0.94	0.94	0.92	0.82	1.03	881	10.0
	NHS Sandwell and West Birmingham	**480,100**	**1.84**	**1.80**	**1.76**	**1.73**	**1.71**	**1.69**	**1.57**	**1.83**	**1,335**	**45.3**
	NHS Solihull	*208,900*	*0.99*	*0.96*	*0.91*	*0.88*	*0.86*	*0.83*	*0.71*	*0.97*	*809*	*10.9*
	NHS Walsall	**272,200**	**1.27**	**1.35**	**1.33**	**1.30**	**1.32**	**1.30**	**1.17**	**1.46**	**1,176**	**21.1**
	NHS Wolverhampton	**251,600**	**1.26**	**1.22**	**1.13**	**1.15**	**1.15**	**1.16**	**1.03**	**1.31**	**1,026**	**32.0**

Table 2.5 Continued

UK area	CCG/HB	Total population	2009 O/E	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2014 95% LCL	2014 95% UCL	Crude rate pmp	% non-White
Derbyshire and Nottingham-shire	NHS Erewash	94,900	0.99	0.96	0.99	0.96	0.91	0.86	0.69	1.08	822	3.2
	NHS Hardwick	*109,300*	*0.92*	*0.85*	*0.78*	*0.78*	*0.74*	*0.75*	*0.61*	*0.93*	*751*	*1.8*
	NHS Mansfield & Ashfield	193,900	0.98	0.96	0.95	0.91	0.92	0.93	0.80	1.08	887	2.5
	NHS Newark & Sherwood	117,000	1.06	1.05	1.11	1.07	1.03	0.99	0.82	1.18	992	2.4
	NHS North Derbyshire	*272,200*	*0.80*	*0.80*	*0.81*	*0.80*	*0.79*	*0.77*	*0.67*	*0.88*	*797*	*2.5*
	NHS Nottingham City	**310,800**	**1.16**	**1.24**	**1.17**	**1.16**	**1.17**	**1.17**	**1.04**	**1.32**	**872**	**28.5**
	NHS Nottingham North & East	*147,600*	*0.85*	*0.85*	*0.87*	*0.87*	*0.83*	*0.77*	*0.64*	*0.93*	*752*	*6.2*
	NHS Nottingham West	111,200	1.10	1.13	1.06	1.09	1.14	1.13	0.95	1.35	1,115	7.3
	NHS Rushcliffe	*112,800*	*0.91*	*0.86*	*0.86*	*0.77*	*0.80*	*0.74*	*0.59*	*0.91*	*727*	*6.9*
	NHS Southern Derbyshire	518,200	1.05	1.04	1.03	0.99	0.98	1.00	0.91	1.09	926	11.0
East Anglia	*NHS Cambridgeshire and Peterborough*	*855,000*	*0.90*	*0.91*	*0.94*	*0.91*	*0.94*	*0.92*	*0.85*	*0.99*	*833*	*9.5*
	NHS Great Yarmouth & Waveney	213,800	0.93	0.98	0.96	0.93	0.95	0.93	0.81	1.06	959	2.7
	NHS Ipswich and East Suffolk	*396,100*	*0.85*	*0.84*	*0.83*	*0.81*	*0.85*	*0.84*	*0.75*	*0.94*	*838*	*5.6*
	NHS North Norfolk	168,500	0.98	0.94	0.90	0.86	0.95	0.93	0.80	1.08	1,057	1.5
	NHS Norwich	195,000	0.92	0.90	0.84	0.82	0.89	0.89	0.76	1.04	795	7.3
	NHS South Norfolk	*237,400*	*0.85*	*0.81*	*0.81*	*0.84*	*0.90*	*0.86*	*0.75*	*0.98*	*880*	*2.6*
	NHS West Norfolk	*171,500*	*0.90*	*0.84*	*0.79*	*0.76*	*0.74*	*0.73*	*0.62*	*0.87*	*781*	*2.6*
	NHS West Suffolk	*223,800*	*0.78*	*0.83*	*0.81*	*0.80*	*0.79*	*0.76*	*0.65*	*0.88*	*733*	*4.6*
Essex	NHS Basildon and Brentwood	252,800	0.95	0.95	0.98	0.94	1.03	1.03	0.91	1.17	957	7.1
	NHS Castle Point, Rayleigh and Rochford	172,500	0.89	0.86	0.81	0.80	0.84	0.88	0.75	1.03	916	3.0
	NHS Mid Essex	*381,500*	*0.87*	*0.84*	*0.84*	*0.81*	*0.85*	*0.85*	*0.77*	*0.95*	*828*	*4.4*
	NHS North East Essex	316,300	0.91	0.89	0.92	0.90	0.88	0.92	0.82	1.03	907	5.5
	NHS Southend	175,800	0.97	0.94	0.95	0.95	0.99	0.94	0.81	1.11	882	8.4
	NHS Thurrock	160,800	0.97	0.99	1.02	1.02	1.03	1.04	0.88	1.22	870	14.1
	NHS West Essex	293,200	0.72	0.75	0.74	0.84	0.88	0.94	0.83	1.06	880	8.2
Hertford-shire and the South Midlands	NHS Bedfordshire	425,900	0.87	0.91	0.89	0.92	0.93	0.95	0.86	1.06	885	11.2
	NHS Corby	64,200	0.84	0.83	0.90	0.90	0.82	0.88	0.67	1.17	763	4.5
	NHS East and North Hertfordshire	*546,300*	*0.83*	*0.84*	*0.88*	*0.86*	*0.88*	*0.91*	*0.83*	*0.99*	*820*	*10.4*
	NHS Herts Valleys	575,800	0.97	0.98	0.95	0.94	0.93	0.95	0.87	1.03	849	14.6
	NHS Luton	**208,000**	**1.25**	**1.28**	**1.36**	**1.37**	**1.46**	**1.47**	**1.29**	**1.67**	**1,130**	**45.3**
	NHS Milton Keynes	261,400	0.88	0.90	0.93	0.93	0.95	1.03	0.91	1.18	857	19.6
	NHS Nene	*626,600*	*0.92*	*0.91*	*0.92*	*0.90*	*0.90*	*0.90*	*0.83*	*0.98*	*832*	*9.1*
Leicester-shire and Lincolnshire	*NHS East Leicestershire and Rutland*	*321,900*	*0.82*	*0.81*	*0.80*	*0.80*	*0.80*	*0.80*	*0.71*	*0.90*	*792*	*9.8*
	NHS Leicester City	**333,800**	**1.66**	**1.67**	**1.70**	**1.71**	**1.72**	**1.72**	**1.56**	**1.89**	**1,303**	**49.5**
	NHS Lincolnshire East	*229,400*	*0.84*	*0.83*	*0.84*	*0.86*	*0.87*	*0.82*	*0.72*	*0.94*	*898*	*2.0*
	NHS Lincolnshire West	229,600	0.88	0.85	0.88	0.82	0.86	0.87	0.76	1.00	832	3.0
	NHS South Lincolnshire	*142,600*	*0.66*	*0.72*	*0.74*	*0.76*	*0.72*	*0.72*	*0.60*	*0.87*	*744*	*2.3*
	NHS South West Lincolnshire	*122,800*	*0.66*	*0.73*	*0.76*	*0.76*	*0.74*	*0.71*	*0.57*	*0.87*	*716*	*2.3*
	NHS West Leicestershire	377,300	0.90	0.91	0.92	0.90	0.91	0.90	0.81	1.01	864	6.9
Shropshire and Stafford-shire	NHS Cannock Chase	133,600	0.97	0.92	0.97	0.88	0.95	0.94	0.79	1.13	906	2.4
	NHS East Staffordshire	*124,600*	*0.73*	*0.78*	*0.75*	*0.76*	*0.77*	*0.78*	*0.64*	*0.96*	*747*	*9.0*
	NHS North Staffordshire	214,400	0.93	0.90	0.95	0.91	0.92	0.89	0.77	1.02	891	3.5
	NHS Shropshire	*308,600*	*0.91*	*0.86*	*0.85*	*0.83*	*0.78*	*0.78*	*0.69*	*0.88*	*807*	*2.0*
	NHS South East Staffs and Seisdon and Peninsular	*224,500*	*0.97*	*0.97*	*0.98*	*0.90*	*0.88*	*0.87*	*0.75*	*1.00*	*869*	*3.6*
	NHS Stafford and Surrounds	151,700	0.77	0.82	0.84	0.84	0.82	0.86	0.72	1.01	877	4.7
	NHS Stoke on Trent	258,400	1.13	1.13	1.13	1.09	1.07	1.13	1.00	1.27	1,014	11.0
	NHS Telford & Wrekin	168,500	1.04	1.04	1.03	1.00	1.03	0.99	0.84	1.16	885	7.3

Table 2.5 Continued

UK area	CCG/HB	Total population	2009 O/E	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2014 95% LCL	2014 95% UCL	Crude rate pmp	% non-White
London	**NHS Barking & Dagenham**	**194,400**	**1.21**	**1.30**	**1.42**	**1.47**	**1.49**	**1.54**	**1.34**	**1.76**	**1,086**	**41.7**
	NHS Barnet	**369,100**	**1.37**	**1.43**	**1.43**	**1.48**	**1.46**	**1.46**	**1.33**	**1.60**	**1,195**	**35.9**
	NHS Camden	**229,700**	**1.15**	**1.19**	**1.20**	**1.19**	**1.19**	**1.18**	**1.03**	**1.35**	**914**	**33.7**
	NHS City and Hackney	**265,000**	**1.31**	**1.43**	**1.47**	**1.53**	**1.55**	**1.60**	**1.42**	**1.79**	**1,098**	**44.6**
	NHS Enfield	**320,500**	**1.39**	**1.42**	**1.51**	**1.54**	**1.53**	**1.54**	**1.40**	**1.70**	**1,235**	**39.0**
	NHS Haringey	**263,400**	**1.37**	**1.37**	**1.49**	**1.59**	**1.64**	**1.66**	**1.49**	**1.85**	**1,245**	**39.5**
	NHS Havering	*242,100*	*0.86*	*0.83*	*0.88*	*0.90*	*0.85*	*0.85*	*0.73*	*0.98*	*785*	*12.3*
	NHS Islington	**215,700**	**1.21**	**1.26**	**1.33**	**1.46**	**1.49**	**1.47**	**1.29**	**1.67**	**1,080**	**31.8**
	NHS Newham	**318,200**	**1.45**	**1.63**	**1.74**	**1.79**	**1.89**	**1.97**	**1.79**	**2.17**	**1,292**	**71.0**
	NHS Redbridge	**288,300**	**1.31**	**1.39**	**1.37**	**1.43**	**1.49**	**1.51**	**1.36**	**1.68**	**1,183**	**57.5**
	NHS Tower Hamlets	**272,900**	**1.24**	**1.30**	**1.33**	**1.44**	**1.53**	**1.63**	**1.45**	**1.83**	**1,022**	**54.8**
	NHS Waltham Forest	**265,800**	**1.35**	**1.42**	**1.50**	**1.45**	**1.50**	**1.61**	**1.44**	**1.80**	**1,215**	**47.8**
	NHS Brent	**317,300**	**1.99**	**2.10**	**2.10**	**2.12**	**2.10**	**2.15**	**1.97**	**2.34**	**1,680**	**63.7**
	NHS Central London (Westminster)	**162,700**	**1.03**	**1.06**	**1.14**	**1.11**	**1.19**	**1.22**	**1.05**	**1.42**	**1,039**	**36.2**
	NHS Ealing	**342,500**	**1.83**	**1.87**	**1.86**	**1.93**	**1.90**	**1.91**	**1.75**	**2.08**	**1,515**	**51.0**
	NHS Hammersmith and Fulham	**178,700**	**1.27**	**1.27**	**1.28**	**1.29**	**1.23**	**1.26**	**1.09**	**1.46**	**957**	**31.9**
	NHS Harrow	**243,400**	**1.76**	**1.83**	**1.88**	**1.88**	**1.79**	**1.77**	**1.60**	**1.96**	**1,516**	**57.8**
	NHS Hillingdon	**286,800**	**1.33**	**1.34**	**1.43**	**1.46**	**1.48**	**1.49**	**1.34**	**1.65**	**1,206**	**39.4**
	NHS Hounslow	**262,400**	**1.39**	**1.44**	**1.50**	**1.52**	**1.62**	**1.61**	**1.45**	**1.80**	**1,265**	**48.6**
	NHS West London (Kensington and Chelsea, Queen's Park and Paddington)	**219,800**	**1.20**	**1.21**	**1.24**	**1.23**	**1.22**	**1.28**	**1.13**	**1.46**	**1,078**	**33.4**
	NHS Bexley	**236,700**	**1.24**	**1.26**	**1.25**	**1.25**	**1.24**	**1.26**	**1.12**	**1.42**	**1,120**	**18.1**
	NHS Bromley	317,900	0.99	1.02	1.00	0.97	0.98	0.99	0.88	1.11	906	15.7
	NHS Croydon	**372,800**	**1.35**	**1.34**	**1.38**	**1.44**	**1.49**	**1.52**	**1.39**	**1.67**	**1,250**	**44.9**
	NHS Greenwich	**264,000**	**1.13**	**1.25**	**1.26**	**1.24**	**1.38**	**1.42**	**1.27**	**1.60**	**1,072**	**37.5**
	NHS Kingston	166,800	1.15	1.13	1.14	1.14	1.08	1.10	0.94	1.29	905	25.5
	NHS Lambeth	**314,200**	**1.59**	**1.56**	**1.62**	**1.69**	**1.72**	**1.79**	**1.63**	**1.98**	**1,286**	**42.9**
	NHS Lewisham	**286,200**	**1.59**	**1.57**	**1.61**	**1.64**	**1.65**	**1.64**	**1.48**	**1.82**	**1,233**	**46.5**
	NHS Merton	**203,200**	**1.26**	**1.26**	**1.28**	**1.33**	**1.32**	**1.38**	**1.21**	**1.57**	**1,112**	**35.1**
	NHS Richmond	*191,400*	*0.76*	*0.78*	*0.77*	*0.76*	*0.78*	*0.78*	*0.66*	*0.93*	*685*	*14.0*
	NHS Southwark	**298,500**	**1.63**	**1.71**	**1.78**	**1.83**	**1.89**	**1.92**	**1.75**	**2.12**	**1,387**	**45.8**
	NHS Sutton	**195,900**	**1.17**	**1.19**	**1.20**	**1.21**	**1.16**	**1.18**	**1.03**	**1.35**	**1,031**	**21.4**
	NHS Wandsworth	**310,500**	**1.31**	**1.32**	**1.28**	**1.21**	**1.20**	**1.28**	**1.14**	**1.44**	**937**	**28.6**
Bath, Gloucestershire, Swindon and Wiltshire	*NHS Bath and North East Somerset*	*180,100*	*0.84*	*0.85*	*0.81*	*0.81*	*0.83*	*0.82*	*0.69*	*0.97*	*755*	*5.4*
	NHS Gloucestershire	*605,700*	*0.88*	*0.87*	*0.88*	*0.90*	*0.89*	*0.87*	*0.80*	*0.95*	*857*	*4.6*
	NHS Swindon	219,300	0.88	0.91	0.94	0.96	0.97	0.99	0.86	1.14	875	10.0
	NHS Wiltshire	*479,600*	*0.75*	*0.75*	*0.76*	*0.73*	*0.74*	*0.74*	*0.66*	*0.82*	*717*	*3.4*
Bristol, North Somerset, Somerset and South Gloucestershire	**NHS Bristol**	**437,500**	**1.25**	**1.22**	**1.24**	**1.27**	**1.31**	**1.30**	**1.19**	**1.43**	**1,035**	**16.0**
	NHS North Somerset	206,100	0.92	0.91	0.92	0.95	0.95	0.95	0.83	1.09	970	2.7
	NHS Somerset	*538,100*	*0.84*	*0.86*	*0.87*	*0.84*	*0.82*	*0.83*	*0.76*	*0.91*	*851*	*2.0*
	NHS South Gloucestershire	269,100	0.91	0.97	0.93	0.92	0.97	0.94	0.83	1.07	888	5.0
Devon, Cornwall and Isles of Scilly	NHS Kernow	543,600	1.02	1.00	0.97	0.96	0.96	0.94	0.87	1.03	984	1.8
	NHS North, East, West Devon	*874,300*	*0.94*	*0.94*	*0.93*	*0.93*	*0.92*	*0.92*	*0.86*	*0.98*	*914*	*3.0*
	NHS South Devon and Torbay	275,000	0.99	1.04	1.01	1.00	1.05	1.05	0.94	1.17	1,131	2.1
Kent and Medway	NHS Ashford	121,700	1.08	1.07	1.05	1.07	1.03	1.02	0.85	1.23	953	6.3
	NHS Canterbury and Coastal	202,400	0.98	0.98	0.96	0.96	0.99	1.06	0.92	1.22	993	5.9
	NHS Dartford, Gravesham and Swanley	251,900	1.07	1.06	1.04	1.05	1.08	1.11	0.98	1.25	1008	13.0

Table 2.5 Continued

UK area	CCG/HB	Total population	2009 O/E	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2014 95% LCL	2014 95% UCL	Crude rate pmp	% non-White
Kent and Medway cont.	NHS Medway	271,100	0.88	0.88	0.89	0.91	0.95	0.94	0.83	1.08	823	10.4
	NHS South Kent Coast	*203,600*	*0.80*	*0.82*	*0.85*	*0.82*	*0.78*	*0.82*	*0.71*	*0.96*	*835*	*4.5*
	NHS Swale	109,600	1.01	1.01	1.04	1.13	1.14	1.10	0.92	1.33	1,022	3.8
	NHS Thanet	136,800	0.90	1.02	1.03	1.08	1.14	1.10	0.93	1.29	1,082	4.5
	NHS West Kent	*467,500*	*0.82*	*0.78*	*0.80*	*0.82*	*0.80*	*0.83*	*0.75*	*0.92*	*785*	*4.9*
Surrey and Sussex	NHS Brighton & Hove	278,100	0.87	0.84	0.83	0.87	0.83	0.89	0.77	1.02	737	10.9
	NHS Coastal West Sussex	*480,200*	*0.86*	*0.84*	*0.80*	*0.82*	*0.81*	*0.82*	*0.74*	*0.90*	*864*	*3.8*
	NHS Crawley	109,000	1.04	1.17	1.07	1.00	0.96	0.94	0.76	1.17	780	20.1
	NHS East Surrey	*177,900*	*0.80*	*0.85*	*0.78*	*0.84*	*0.90*	*0.84*	*0.71*	*0.99*	*781*	*8.3*
	NHS Eastbourne, Hailsham and Seaford	*183,500*	*0.76*	*0.80*	*0.76*	*0.82*	*0.83*	*0.83*	*0.71*	*0.97*	*872*	*4.4*
	NHS Guildford and Waverley	*207,800*	*0.70*	*0.68*	*0.65*	*0.69*	*0.66*	*0.66*	*0.56*	*0.79*	*611*	*7.2*
	NHS Hastings & Rother	*181,800*	*0.76*	*0.78*	*0.76*	*0.75*	*0.80*	*0.79*	*0.67*	*0.93*	*825*	*4.6*
	NHS High Weald Lewes Havens	*169,100*	*0.73*	*0.67*	*0.66*	*0.73*	*0.71*	*0.73*	*0.61*	*0.87*	*751*	*3.1*
	NHS Horsham and Mid Sussex	*225,300*	*0.75*	*0.72*	*0.76*	*0.71*	*0.72*	*0.71*	*0.60*	*0.83*	*683*	*4.9*
	NHS North West Surrey	340,200	0.98	0.97	0.97	0.97	0.96	0.99	0.89	1.11	923	12.5
	NHS Surrey Downs	*284,700*	*0.91*	*0.91*	*0.92*	*0.89*	*0.90*	*0.86*	*0.76*	*0.97*	*839*	*9.1*
	NHS Surrey Heath	94,400	1.00	1.00	0.97	0.98	0.90	0.83	0.66	1.04	795	9.3
Thames Valley	NHS Aylesbury Vale	199,500	0.97	0.97	0.95	0.95	0.93	0.91	0.79	1.06	852	9.7
	NHS Bracknell and Ascot	134,400	0.85	0.87	0.85	0.84	0.94	0.97	0.81	1.17	856	9.5
	NHS Chiltern	*319,400*	*0.90*	*0.88*	*0.85*	*0.84*	*0.88*	*0.86*	*0.76*	*0.97*	*817*	*15.8*
	NHS Newbury and District	105,700	1.03	0.94	0.99	0.93	0.97	1.01	0.83	1.23	937	4.4
	NHS North & West Reading	99,900	0.90	0.87	0.86	0.85	0.87	0.88	0.71	1.09	821	10.4
	NHS Oxfordshire	*652,300*	*0.87*	*0.89*	*0.91*	*0.92*	*0.91*	*0.90*	*0.83*	*0.98*	*817*	*9.3*
	NHS Slough	**143,000**	**1.73**	**1.78**	**1.87**	**1.90**	**1.90**	**1.88**	**1.64**	**2.16**	**1,377**	**54.3**
	NHS South Reading	**109,000**	**1.57**	**1.53**	**1.42**	**1.34**	**1.49**	**1.54**	**1.29**	**1.84**	**1,101**	**30.5**
	NHS Windsor, Ascot and Maidenhead	139,900	0.94	0.96	0.97	0.98	1.01	1.07	0.90	1.27	972	14.7
	NHS Wokingham	157,900	0.91	0.86	0.93	0.90	0.91	0.86	0.72	1.02	798	11.6
Wessex	*NHS Dorset*	*754,500*	*0.86*	*0.84*	*0.81*	*0.81*	*0.79*	*0.80*	*0.74*	*0.86*	*823*	*4.0*
	NHS Fareham and Gosport	197,100	0.85	0.86	0.86	0.83	0.89	0.88	0.76	1.02	873	3.4
	NHS Isle of Wight	*138,400*	*0.57*	*0.58*	*0.62*	*0.67*	*0.77*	*0.76*	*0.63*	*0.92*	*824*	*2.7*
	NHS North East Hampshire and Farnham	207,500	0.84	0.85	0.84	0.86	0.90	0.91	0.78	1.06	824	9.7
	NHS North Hampshire	*217,800*	*0.70*	*0.72*	*0.69*	*0.69*	*0.71*	*0.76*	*0.65*	*0.89*	*707*	*6.4*
	NHS Portsmouth	207,500	0.89	0.87	0.91	0.94	0.98	0.94	0.80	1.10	762	11.6
	NHS South Eastern Hampshire	209,900	0.88	0.89	0.88	0.83	0.86	0.87	0.75	1.00	877	3.1
	NHS Southampton	242,100	0.91	0.96	0.99	1.03	1.00	0.99	0.85	1.14	776	14.1
	NHS West Hampshire	*548,000*	*0.80*	*0.77*	*0.77*	*0.77*	*0.76*	*0.75*	*0.68*	*0.83*	*763*	*3.9*
Wales	*Betsi Cadwaladr University*	*692,000*	*0.94*	*0.91*	*0.87*	*0.88*	*0.81*	*0.84*	*0.77*	*0.91*	*837*	*2.5*
	Powys Teaching	*132,700*	*0.95*	*0.90*	*0.87*	*0.86*	*0.83*	*0.77*	*0.64*	*0.93*	*836*	*1.6*
	Hywel Dda	383,900	0.99	0.93	0.94	0.89	0.93	0.93	0.84	1.03	951	2.2
	Abertawe Bro Morgannwg University	**520,700**	**1.24**	**1.27**	**1.26**	**1.23**	**1.18**	**1.11**	**1.02**	**1.20**	**1,058**	**3.9**
	Cwm Taf	**295,100**	**1.37**	**1.30**	**1.36**	**1.28**	**1.26**	**1.22**	**1.09**	**1.36**	**1,138**	**2.6**
	Aneurin Bevan	**579,100**	**1.09**	**1.12**	**1.11**	**1.10**	**1.08**	**1.09**	**1.01**	**1.18**	**1,041**	**3.9**
	Cardiff and Vale University	478,900	1.07	1.07	1.05	1.03	1.04	0.99	0.89	1.09	837	12.2
Scotland	Ayrshire and Arran	372,200	1.08	1.07	1.01	0.99	0.94	0.94	0.85	1.04	951	1.2
	Borders	113,900	1.02	1.05	0.96	0.91	0.87	0.85	0.70	1.03	913	1.3
	Dumfries and Galloway	*150,300*	*0.90*	*0.88*	*0.87*	*0.86*	*0.79*	*0.82*	*0.69*	*0.97*	*885*	*1.2*
	Fife	366,900	0.93	0.94	0.99	0.96	0.95	0.91	0.81	1.01	883	2.4

Table 2.5 Continued

UK area	CCG/HB	Total population	2009 O/E	2010 O/E	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2014 95% LCL	2014 95% UCL	2014 Crude rate pmp	2014 % non-White
Scotland cont.	*Forth Valley*	*299,700*	*0.90*	*0.92*	*0.87*	*0.84*	*0.84*	*0.85*	*0.75*	*0.96*	*814*	*2.2*
	Grampian	*579,200*	*0.92*	*0.92*	*0.92*	*0.95*	*0.94*	*0.89*	*0.82*	*0.98*	*837*	*4.0*
	Greater Glasgow and Clyde	1,137,900	1.06	1.04	1.03	1.05	1.03	1.02	0.96	1.08	925	7.3
	Highland	*321,000*	*1.00*	*0.95*	*0.87*	*0.84*	*0.81*	*0.80*	*0.71*	*0.90*	*826*	*1.3*
	Lanarkshire	652,600	0.94	0.94	0.92	0.97	0.95	0.95	0.87	1.03	895	2.0
	Lothian	*849,700*	*0.87*	*0.84*	*0.80*	*0.81*	*0.79*	*0.79*	*0.73*	*0.85*	*708*	*5.6*
	Orkney	21,600	0.96	0.87	0.74	0.76	0.83	0.62	0.37	1.04	649	0.7
	Shetland	*23,200*	*0.53*	*0.57*	*0.50*	*0.48*	*0.51*	*0.58*	*0.33*	*0.99*	*560*	*1.5*
	Tayside	412,200	1.05	1.02	1.01	0.96	0.93	0.94	0.85	1.04	922	3.2
	Western Isles	27,400	0.66	0.79	0.65	0.55	0.50	0.65	0.41	1.01	693	0.9
Northern Ireland	Belfast	349,600	1.12	1.12	1.10	1.12	1.11	1.10	0.99	1.23	932	3.2
	Northern	466,700	1.04	1.00	1.03	1.02	1.00	1.00	0.91	1.10	891	1.2
	Southern	365,700	0.96	0.98	1.00	0.95	0.96	0.96	0.86	1.08	801	1.2
	South Eastern	*350,800*	*0.93*	*0.86*	*0.88*	*0.86*	*0.83*	*0.81*	*0.71*	*0.91*	*735*	*1.3*
	Western	296,900	1.11	1.10	1.06	0.96	0.94	1.00	0.88	1.13	852	1.0

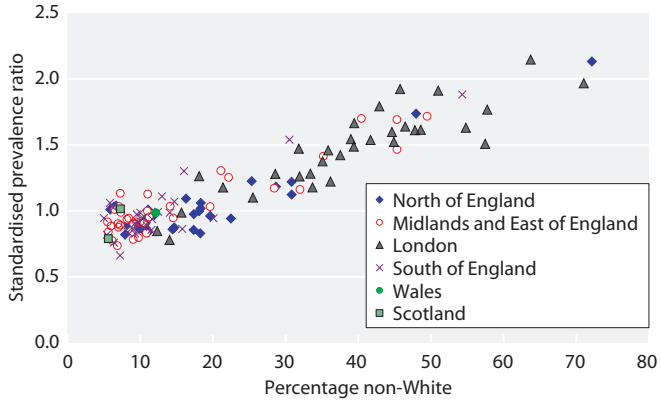

Fig. 2.3. Standardised prevalence ratios for CCG/HB areas by percentage non-White on 31/12/2014 (excluding areas with <5% ethnic minorities)

Table 2.7 Median time on RRT of prevalent patients on 31/12/2014

Modality	*N*	Median time treated (years)
Haemodialysis	23,703	3.4
Peritoneal dialysis	3,595	1.6
Transplant	29,848	10.1
All RRT	**57,146**	**6.1**

For patients who recovered for >90 days and then subsequently restarted RRT the median time from the start of RRT was calculated from the most recent start date
Patients with an initial treatment modality of transferred in or transferred out were excluded from the calculation of median time on RRT since their treatment start date was not accurately known

Table 2.6 Standardised prevalence rate ratio of RRT for each region in England and for Wales, Scotland and Northern Ireland in 2014

UK area	Total population	O/E	95% LCL	95% UCL	Crude rate pmp
North England	15,198,200	0.92	0.91	0.94	859.1
Midlands and East of England	16,342,200	0.98	0.97	1.00	916.2
London	**8,416,500**	**1.49**	**1.46**	**1.52**	**1,164.8**
South England	13,908,900	0.90	0.88	0.92	861.8
Wales	3,082,400	0.99	0.96	1.03	955.7
Scotland	5,327,700	0.90	0.88	0.93	858.5
Northern Ireland	1,829,700	0.97	0.92	1.02	844.9

O/E – observed/expected prevalence rate ratio given the age/gender breakdown of each region
Bold – higher than expected prevalence rate ratio

Table 2.8 Median age of prevalent RRT patients by treatment modality in renal centres on 31/12/2014

	Median age					Median age			
Centre	HD	PD	Transplant	RRT	Centre	HD	PD	Transplant	RRT
England					Prestn	65.9	64.4	53.3	59.6
B Heart	67.0	64.0	52.0	62.9	Redng	69.8	65.8	57.1	61.6
B QEH	63.9	60.5	52.3	57.6	Salford	63.1	60.5	52.2	58.1
Basldn	66.7	61.7	53.6	63.2	Sheff	66.7	65.1	52.9	58.7
Bradfd	60.5	53.7	51.8	54.7	Shrew	68.0	56.9	55.2	62.5
Brightn	67.2	65.3	54.4	60.9	Stevng	68.3	68.6	53.2	61.7
Bristol	70.3	63.9	54.2	59.3	Sthend	70.1	67.4	55.8	63.8
Camb	73.3	74.5	52.8	58.6	Stoke	67.7	68.0	51.3	59.5
Carlis	67.6	68.3	54.0	59.9	Sund	64.4	61.9	55.0	58.2
Carsh	69.6	65.5	54.2	61.7	Truro	70.9	70.4	57.2	63.0
Chelms	68.6	68.7	60.2	64.1	Wirral	67.6	63.7	56.9	66.3
Colchr	71.0			71.0	Wolve	66.1	63.6	51.4	60.4
Covnt	68.1	64.6	52.1	58.3	York	67.8	61.4	53.3	57.9
Derby	67.6	58.5	54.4	61.1	**N Ireland**				
Donc	66.5	64.2	56.9	64.0	Antrim	73.0	66.4	53.1	63.7
Dorset	73.0	72.6	57.2	65.5	Belfast	67.9	71.3	51.1	54.5
Dudley	67.9	58.3	56.9	64.5	Newry	65.3	67.7	54.1	60.1
Exeter	73.0	67.3	54.3	63.2	Ulster	73.5	60.0	52.2	66.7
Glouc	71.6	63.3	54.0	65.4	West NI	70.8	71.7	52.0	59.2
Hull	67.8	60.1	53.0	58.9	**Scotland**				
Ipswi	66.8	68.5	55.9	61.2	Abrdn	65.4	55.8	51.1	56.9
Kent	71.1	69.2	54.2	61.3	Airdrie	64.4	51.2	52.7	56.8
L Barts	61.0	62.0	51.1	55.7	D & Gall	67.0	68.1	53.1	59.5
L Guys	61.5	63.4	51.1	54.6	Dundee	67.1	64.5	52.7	60.3
L Kings	63.3	63.3	54.5	58.8	Edinb	59.4	67.6	53.0	55.1
L Rfree	68.6	65.5	52.4	57.5	Glasgw	66.7	58.4	52.9	56.9
L St.G	65.2	70.3	54.9	60.4	Inverns	68.5	56.4	49.7	55.8
L West	65.9	69.1	54.9	59.3	Klmarnk	66.2	62.3	53.4	58.3
Leeds	64.4	56.1	53.7	56.6	Krkcldy	69.8	62.8	53.2	61.5
Leic	67.7	65.2	53.0	59.3	**Wales**				
Liv Ain	70.0	56.6	47.5	66.4	Bangor	68.1	66.9	42.7	67.9
Liv Roy	62.2	62.3	53.1	55.4	Cardff	68.5	64.8	53.1	57.8
M RI	63.8	62.7	51.8	55.0	Clwyd	65.6	74.0	57.1	64.5
Middlbr	67.7	66.1	54.0	58.2	Swanse	71.5	65.4	56.9	64.0
Newc	63.5	64.9	54.9	56.7	Wrexm	73.2	61.9	54.5	59.9
Norwch	70.0	64.8	54.9	61.0	**England**	**67.0**	**64.2**	**53.4**	**58.8**
Nottm	70.5	64.5	52.7	57.9	**N Ireland**	**70.0**	**67.2**	**51.8**	**58.1**
Oxford	66.5	66.9	52.7	56.3	**Scotland**	**66.1**	**61.7**	**52.6**	**57.1**
Plymth	70.0	64.5	55.7	60.4	**Wales**	**69.6**	**65.6**	**54.0**	**60.3**
Ports	66.7	65.7	54.0	58.7	**UK**	**67.2**	**64.2**	**53.3**	**58.7**

Blank cells indicate no patients on that treatment modality attending that centre when data were collected

at 1,600 pmp. Survival on RRT by gender is described in chapter 5.

Ethnicity

Key to understanding differences in RRT prevalence between regions is understanding the ethnic diversity of the patient groups. As such, the completeness of ethnicity data provided by renal centres is important. Sixty-two of the 71 centres (87.3%) provided ethnicity data that were at least 90% complete (table 2.10), an improvement compared with 61 of 71 centres (85.9%) in 2013 and only 36 centres in 2006. Overall ethnicity completeness for prevalent RRT patients continued to improve with 93.6% data completeness for the UK in 2014 compared to 92.8% in 2013. Data completeness differed between countries with 98.7% ethnicity completeness in England, 99.9% completeness in Wales and 99.8% in Northern Ireland. Completeness of ethnicity data from Scotland

Table 2.9 Percentage of prevalent RRT patients in each age group by centre on 31/12/2014

		Percentage of patients			
Centre	*N*	18–39 years	40–64 years	65–74 years	75+ years
England					
B Heart	638	11.8	43.7	21.0	23.5
B QEH	2,137	14.6	52.9	18.4	14.1
Basldn	280	11.8	41.8	23.6	22.9
Bradfd	549	20.9	51.0	17.5	10.6
Brightn	916	10.9	47.9	21.9	19.2
Bristol	1,460	14.6	46.8	21.6	17.1
Camb	1,243	14.6	49.0	20.2	16.2
Carlis	250	12.4	50.8	20.0	16.8
Carsh	1,565	9.5	45.7	23.3	21.5
Chelms	263	8.7	44.5	23.2	23.6
Colchr	119	7.6	21.8	30.3	40.3
Covnt	962	12.9	50.3	20.4	16.4
Derby	519	12.5	46.4	25.6	15.4
Donc	285	9.5	43.2	21.8	25.6
Dorset	665	9.6	39.8	26.3	24.2
Dudley	305	7.9	44.9	22.6	24.6
Exeter	950	10.7	43.2	24.0	22.1
Glouc	429	9.3	40.1	26.3	24.2
Hull	804	14.2	49.6	20.3	15.9
Ipswi	369	10.0	49.9	24.4	15.7
Kent	1,019	11.8	46.4	24.1	17.7
L Barts	2,236	15.9	56.2	17.0	10.9
L Guys	1,924	19.4	54.1	16.5	10.0
L Kings	1,025	11.1	51.7	19.2	18.0
L Rfree	2,010	16.1	49.4	18.7	15.8
L St.G	797	12.3	51.7	19.9	16.1
L West	3,244	12.0	52.9	20.7	14.4
Leeds	1,500	16.7	51.5	19.4	12.5
Leic	2,151	13.3	48.3	22.2	16.2
Liv Ain	218	7.3	39.9	21.1	31.7
Liv Roy	1,309	16.7	56.7	18.1	8.6
M RI	1,815	17.0	54.5	18.8	9.7
Middlbr	858	14.6	48.4	21.6	15.5
Newc	983	14.1	53.4	20.0	12.4
Norwch	691	11.0	45.2	22.7	21.1
Nottm	1,066	15.9	48.1	19.5	16.4
Oxford	1,658	14.1	54.5	18.1	13.3
Plymth	510	12.5	48.6	23.7	15.1
Ports	1,595	12.7	50.6	21.1	15.5
Prestn	1,171	11.9	50.0	23.8	14.3
Redng	763	9.6	48.6	23.3	18.5
Salford	969	13.8	52.7	19.5	13.9
Sheff	1,360	13.6	51.1	19.2	16.1
Shrew	349	10.0	45.3	24.4	20.3
Stevng	782	9.1	45.9	20.8	24.2
Sthend	238	10.5	41.6	24.8	23.1
Stoke	776	13.3	47.6	20.1	19.1
Sund	452	12.4	52.4	22.8	12.4
Truro	380	11.3	42.1	22.6	23.9
Wirral	246	7.7	39.4	25.6	27.2
Wolve	575	10.3	50.3	18.6	20.9
York	461	17.1	48.4	19.3	15.2

Table 2.9 Continued

Centre	*N*	Percentage of patients			
		18–39 years	40–64 years	65–74 years	75+ years
N Ireland					
Antrim	229	8.3	43.7	22.3	25.8
Belfast	750	19.1	52.7	15.5	12.8
Newry	208	13.0	50.0	21.2	15.9
Ulster	149	8.7	36.9	21.5	32.9
West NI	272	13.2	45.6	23.9	17.3
Scotland					
Abrdn	515	19.4	50.5	16.9	13.2
Airdrie	399	14.8	51.6	19.0	14.5
D & Gall	133	12.8	44.4	21.8	21.1
Dundee	414	9.7	50.5	21.3	18.6
Edinb	758	15.0	57.3	18.2	9.5
Glasgw	1,641	13.9	55.3	19.2	11.6
Inverns	227	11.0	60.8	15.9	12.3
Klmarnk	306	9.5	54.2	22.2	14.1
Krkcldy	283	11.7	44.9	23.3	20.1
Wales					
Bangor	102	10.8	31.4	29.4	28.4
Cardff	1,593	13.9	51.9	20.5	13.8
Clwyd	165	10.3	41.2	27.9	20.6
Swanse	704	10.8	41.6	22.9	24.7
Wrexm	281	15.7	43.1	16.4	24.9
England	**49,839**	**13.5**	**49.9**	**20.6**	**16.0**
N Ireland	**1,608**	**14.8**	**48.4**	**19.2**	**17.7**
Scotland	**4,676**	**13.8**	**53.6**	**19.3**	**13.3**
Wales	**2,845**	**13.0**	**47.1**	**21.4**	**18.5**
UK	**58,968**	**13.5**	**50.0**	**20.5**	**16.0**
Range (Min : Max)		**(7.3 : 20.9)**	**(21.8 : 60.8)**	**(15.5 : 30.3)**	**(8.6 : 40.3)**

was low at 33.2% although this marks a large improvement on 24% in 2013. Completeness of ethnicity data was highest in prevalent transplant patients. This is likely to reflect improved data recording during the intensive work-up for transplantation.

In 2014, 21.5% of the prevalent UK RRT population (with ethnicity assigned) were from ethnic minorities (23.7% in England). The proportion of the prevalent UK RRT population (with ethnicity assigned) from ethnic minorities in Wales, Scotland and Northern Ireland were very small, although it should be noted that there

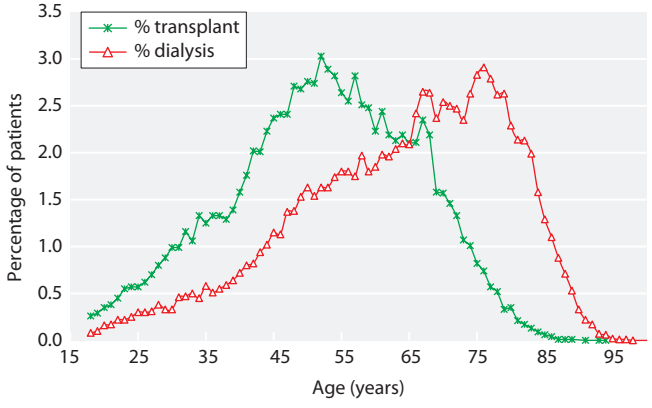

Fig. 2.4. Age profile of prevalent RRT patients by modality on 31/12/2014

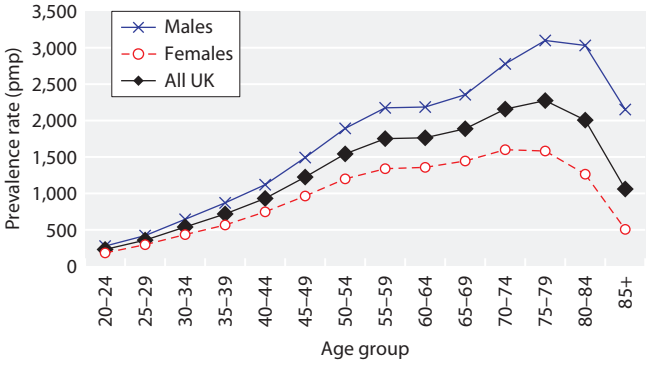

Fig. 2.5. Prevalence rate of RRT patients per million population by age and gender on 31/12/2014

Table 2.10 Ethnicity of prevalent RRT patients by centre on 31/12/2014

Centre	Percentage data not available	*N* with data	Percentage in each ethnic group*				
			White	Black	S Asian	Chinese	Other
England							
B Heart	0.0	638	59.2	7.8	31.0	0.8	1.1
B QEH	0.0	2,137	62.2	10.1	24.8	0.7	2.2
Basldn	0.7	278	86.7	6.1	4.7	0.7	1.8
Bradfd	0.2	548	56.2	2.0	40.9	0.5	0.4
Brightn	2.0	898	92.0	2.3	3.7	0.2	1.8
Bristol	0.1	1,459	89.7	4.5	3.9	0.3	1.6
Camb	2.3	1,215	91.9	1.6	4.9	0.5	1.1
Carlis	0.0	250	98.4	0.4	0.8	0.0	0.4
Carsh	2.4	1,528	70.6	9.3	14.5	1.5	4.1
Chelms	9.5	238	92.0	3.8	1.3	1.3	1.7
Colchr	5.0	113	95.6	0.0	2.7	0.9	0.9
Covnt	0.5	957	79.8	3.9	15.7	0.6	0.0
Derby	0.0	519	81.1	3.3	13.7	0.4	1.5
Donc	0.0	285	95.1	1.4	2.5	0.0	1.1
Dorset	0.0	665	97.7	0.2	0.9	0.3	0.9
Dudley	1.0	302	85.4	2.6	9.6	0.7	1.7
Exeter	0.2	948	98.9	0.4	0.3	0.1	0.2
Glouc	0.0	429	94.4	1.6	3.0	0.0	0.9
Hull	1.6	791	96.8	0.4	1.5	0.3	1.0
Ipswi	10.0	332	93.4	3.6	2.7	0.3	0.0
Kent	1.1	1,008	94.9	1.0	2.3	0.3	1.5
L Barts	0.0	2,235	38.4	33.8	26.0	1.3	0.4
L Guys	1.2	1,900	63.8	23.5	7.4	1.2	4.2
L Kings	0.0	1,025	49.1	35.7	10.6	1.7	2.9
L Rfree	2.3	1,963	48.3	23.0	20.0	1.5	7.2
L St.G	4.9	758	47.6	22.8	21.2	2.2	6.1
L West	0.1	3,241	43.5	18.4	34.2	1.2	2.7
Leeds	0.2	1,497	80.4	4.8	13.7	0.5	0.6
Leic	2.4	2,100	75.9	3.7	18.6	0.5	1.4
Liv Ain	0.9	216	95.8	1.4	1.4	0.5	0.9
Liv Roy	1.8	1,285	92.6	2.2	1.9	1.2	2.1
M RI	1.4	1,790	76.6	8.2	12.4	0.9	1.8
Middlbr	0.0	858	94.5	0.2	4.5	0.5	0.2
Newc	0.1	982	92.4	1.1	4.9	0.9	0.7
Norwch	2.2	676	97.3	0.7	0.6	1.2	0.1
Nottm	0.2	1,064	86.2	4.9	7.0	0.1	1.9
Oxford	5.4	1,569	82.7	4.1	9.4	0.8	2.9
Plymth	0.0	510	97.1	0.4	0.6	0.4	1.6
Ports	2.9	1,548	94.1	1.1	3.3	0.0	1.6
Prestn	0.1	1,170	86.1	0.9	12.6	0.0	0.4
Redng	3.5	736	72.4	5.2	20.2	0.5	1.6
Salford	0.0	969	81.9	1.8	14.7	0.5	1.1
Sheff	0.7	1,350	90.6	2.3	4.3	0.9	1.9
Shrew	0.0	349	94.6	1.4	3.2	0.3	0.6
Stevng	1.7	769	72.2	10.1	15.7	0.5	1.4
Sthend	4.6	227	84.6	3.5	4.0	2.2	5.7
Stoke	0.5	772	93.1	1.2	4.1	0.1	1.4
Sund	0.0	452	96.7	0.4	2.7	0.2	0.0
Truro	0.0	380	99.5	0.0	0.3	0.0	0.3
Wirral	0.0	246	96.7	0.0	2.0	1.2	0.0
Wolve	0.2	574	70.2	8.7	20.4	0.5	0.2
York	1.1	456	97.4	0.7	1.3	0.2	0.4

Table 2.10 Continued

Centre	Percentage data not available	*N* with data	Percentage in each ethnic group*				
			White	Black	S Asian	Chinese	Other
N Ireland							
Antrim	0.0	229	99.1	0.4	0.4	0.0	0.0
Belfast	0.1	749	98.1	0.3	1.2	0.3	0.1
Newry	0.0	208	99.5	0.0	0.0	0.5	0.0
Ulster	0.0	149	96.0	0.7	2.0	1.3	0.0
West NI	0.7	270	98.9	0.4	0.4	0.4	0.0
Scotland							
Abrdn	59.4	209					
Airdrie	31.1	275	98.5	0.7	0.7	0.0	0.0
D & Gall	76.7	31					
Dundee	59.2	169					
Edinb	77.8	168					
Glasgw	80.4	322					
Inverns	27.3	165	97.6	0.0	1.8	0.0	0.6
Klmarnk	53.6	142					
Krkcldy	74.6	72					
Wales							
Bangor	0.0	102	98.0	0.0	1.0	0.0	1.0
Cardff	0.0	1,593	93.5	1.1	4.3	0.6	0.6
Clwyd	1.2	163	98.2	0.6	1.2	0.0	0.0
Swanse	0.0	704	97.7	0.3	1.7	0.0	0.3
Wrexm	0.0	281	97.9	0.7	0.7	0.4	0.4
England	**1.3**	**49,205**	**76.3**	**8.5**	**12.6**	**0.7**	**1.9**
N Ireland	**0.2**	**1,605**	**98.4**	**0.3**	**0.9**	**0.4**	**0.1**
Scotland	**66.8**	**1,553**					
Wales	**0.1**	**2,843**	**95.4**	**0.8**	**3.0**	**0.4**	**0.5**
UK	**6.4**	**55,206**	**78.5**	**7.6**	**11.4**	**0.7**	**1.7**

Percentage breakdown is not shown for centres with less than 50% data completeness, but these centres are included in national averages
*See appendix H for ethnicity coding

was a high level of missing ethnicity data in Scotland as described above. The ONS estimates that approximately 14% of the UK general population are designated as belonging to an ethnic minority [1]. The relative proportion of patients reported to the UKRR as receiving RRT and belonging to an ethnic minority has increased from 14.9% in 2007 to 21.5% in 2014 which may reflect improvements in coding and reporting of ethnicity data as well as an increasing incidence of ERF and increased referral rates in these populations.

Amongst the centres with more than 50% returns there was wide variation in the proportion of patients from ethnic minorities, ranging from 0.5% in Truro and Newry to over 55% in London Barts (61.6%) and London West (56.5%).

Primary renal diagnosis

Primary renal diagnosis (PRD) is associated with patient outcomes. As PRD data could be used for case-mix adjustment, high level of data completeness is important. Data for PRD were not complete for 3.4% of patients (table 2.11), but there exists a marked inter-centre difference in completeness of data returns. Only one centre had $\geqslant$40% primary renal diagnosis data coded as uncertain and has been excluded from the between centre analysis and other analyses where PRD is included in the case-mix adjustment (Colchester, 47% uncertain PRD); the UK and national totals have been appropriately adjusted. The percentage of patients with uncertain aetiology for the remaining 70 centres ranged between 4.2% and 35.0%, which is comparable to 2013. Completeness of PRD data has also continued to improve and no centre had >30% missing data in 2014.

As observed in previous years, glomerulonephritis (GN) is the most common primary renal diagnosis in the 2014 prevalent cohort at 18.9% (table 2.11). Diabetes accounted for 16.1% of renal disease in prevalent patients on RRT, although it was more common in the $\geqslant$65 year age group compared to the younger group (17.8% vs.

Table 2.11. Primary renal diagnosis in prevalent RRT patients by age and gender on 31/12/2014

Primary diagnosis*	N	% all patients	Intercentre range %	Age <65		Age ⩾65		M:F ratio
				N	%	N	%	
Aetiology uncertain	9,272	15.8	4.2–35.0	5,186	13.9	4,086	19.1	1.6
Glomerulonephritis	11,137	18.9	7.7–25.8	7,991	21.3	3,146	14.7	2.1
Pyelonephritis	6,242	10.6	4.1–20.5	4,605	12.3	1,637	7.6	1.1
Diabetes	9,456	16.1	10.5–26.1	5,638	15.1	3,818	17.8	1.7
Polycystic kidney	5,791	9.8	3.2–16.0	3,738	10.0	2,053	9.6	1.1
Hypertension	3,580	6.1	1.3–17.0	1,938	5.2	1,642	7.7	2.4
Renal vascular disease	1,747	3.0	0.5–11.9	379	1.0	1,368	6.4	1.9
Other	9,632	16.4	8.8–30.7	6,725	18.0	2,907	13.6	1.3
Not sent	1,992	3.4	0.0–23.5	1,229	3.3	763	3.6	1.6

*See appendix H: ERA-EDTA coding
Excluded centre: ⩾40% primary renal diagnosis aetiology uncertain (Colchester)

15.1%). This contrasted with incident patients where diabetes was the predominant diagnostic code in 26.9% of new RRT patients. Younger patients tended to have different PRDs compared to older patients; patients aged less than 65 years were more likely to have GN (21.3%) or diabetes (15.1%) and less likely to have renal vascular disease (1.0%) or hypertension (5.2%) as the cause of their renal failure. Among older patients (⩾65 years) uncertain aetiology (19.1%) was the most common cause.

As described in previous years, the male:female ratio was greater than unity for all primary renal diagnoses (table 2.11).

In individuals aged less than 65 years, the renal transplantation to dialysis ratio was greater than one in all PRD groups except diabetes and renovascular disease. In those aged ⩾65 years, dialysis was more prevalent than renal transplantation in all PRD groups except polycystic kidney disease (PKD) (table 2.12).

Diabetes

Diabetes included all prevalent patients with type 1 or type 2 diabetes as the primary renal diagnosis (ERA-EDTA coding) and did not include patients with diabetes as a comorbidity. This analysis did not differentiate between type 1 and type 2 diabetes as this distinction was not made in the data submitted by most centres.

The number of prevalent patients with diabetes as a primary renal diagnosis increased by 4.5% to 9,456 in 2014, from 9,052 in 2013, representing 16.1% of all prevalent patients (compared with 13.5% in 2006) (table 2.13). The male:female ratio for diabetes as PRD was 1.7. The median age at start of RRT for patients with diabetes (56 years) was nine years higher than those without diabetes (47 years), although the median age at the end of 2014 for prevalent diabetic patients was only three years higher than for individuals without diabetes. This reflects reduced survival for patients with diabetes compared with patients without diabetes on RRT. This is also demonstrated by the lower median time on RRT for patients with diabetes (3.6 years vs. 7.2 years for those without diabetes) and this difference in survival has not changed over the last five years (3.1 years vs. 6.4 years in 2009). The age at starting RRT in those with diabetes was four years younger in Scotland compared with the UK average (data not shown).

There were large differences in the distribution of treatment modalities in those with diabetes compared to those without. Fifty eight percent of patients with diabetes as primary renal diagnosis were undergoing

Table 2.12. Transplant:dialysis ratios by age and primary renal disease in the prevalent RRT population on 31/12/2014

Primary diagnosis*	Transplant : dialysis ratio	
	<65	⩾65
Aetiology uncertain	2.1	0.4
Glomerulonephritis	2.5	0.9
Pyelonephritis	2.9	0.6
Diabetes	0.9	0.1
Polycystic kidney	3.0	1.7
Hypertension	1.4	0.3
Renal vascular disease	0.9	0.1
Other	2.1	0.4
Not sent	1.2	0.2

*See appendix H ERA-EDTA coding
Excluded centre: ⩾40% primary renal diagnosis aetiology uncertain (Colchester)

Table 2.13. Age relationships in patients with diabetes and patients without diabetes and modality in prevalent RRT patients on 31/12/2014

	Patients with diabetes[a]	Patients without diabetes[b]
N	9,456	47,401
M : F ratio	1.65	1.55
Median age on 31/12/14	61	58
Median age at start of RRT[cd]	56	47
Median years on RRT[d]	3.6	7.2
% HD	58	37
% PD	8	6
% transplant	34	57

Excluded centre: ⩾40% primary renal diagnosis aetiology uncertain (Colchester)
[a]Patients with diabetes: patients with a primary renal disease code of diabetes
[b]Patients without diabetes: all patients excluding patients with diabetes as a PRD and patients with a missing primary renal disease code
[c]Median age at start of RRT was calculated from the most recent RRT start date
[d]Patients with an initial treatment modality of transferred in or transferred out were excluded from the calculation of median age at start of RRT and median years on RRT, since their treatment start date was not accurately known

HD compared to just 37% of patients with any other primary renal diagnosis (table 2.13). The percentage of patients with a functioning transplant was much lower in prevalent patients with diabetes than in prevalent patients without diabetes (34% vs. 57%). However, the proportion of patients with diabetes as PRD with a functioning transplant has increased since 2005 when only 26.9% of patients with diabetes had a functioning transplant. For older patients with diabetes (age ⩾65 years), only 12.9% had a functioning transplant compared with 34.9% of their peers without diabetes (table 2.14). In Northern Ireland, 30.0% of prevalent patients with diabetes had a functioning transplant compared with the UK average of 33.9% (data not shown). A higher proportion of prevalent dialysis patients without diabetes (18.1%) were on home dialysis therapies (home HD and PD) compared with prevalent dialysis patients with diabetes (14.8%).

Modalities of treatment

Transplantation was the most common treatment modality (52.8%) for prevalent RRT patients in 2014, followed closely by centre-based HD (39.0%) in either hospital centre (18.2%) or satellite unit (20.8%) (figure 2.6). Satellite HD was again more prevalent than in-centre, a trend first noted in 2012. Home therapies made up the remaining 8.2% of treatment modalities, largely PD in its different formats (6.2%) which followed a similar pattern in 2012 and 2013. The proportion on continuous ambulatory peritoneal dialysis (CAPD) and automated PD (APD) was 2.7% and 3.4% respectively, although the proportion on APD may be an underestimate due to centre level coding issues which mean the UKRR cannot always distinguish between these therapies.

Table 2.14. Treatment modalities by age and diabetes status on 31/12/2014

	<65		⩾65	
	Diabetes[a]	All other causes[b]	Diabetes[a]	All other causes[b]
N	5,638	30,562	3,818	16,839
% HD	44.1	26.0	77.8	57.4
% PD	7.7	4.4	9.4	7.7
% transplant	48.1	69.6	12.9	34.9

Excluded centre with ⩾40% PRD aetiology uncertain (Colchester)
[a]Patients with diabetes are patients with a primary renal disease code of diabetes
[b]Patients without diabetes are calculated as all patients excluding patients with diabetes as a PRD and patients with a missing primary renal disease code

As mentioned earlier, treatment modality was related to patient age. Younger patients (age <65 years), were more likely to have a functioning transplant (65.9%) when compared with patients aged 65 years and over (30.2%) (table 2.15). HD was the principal modality in the older patients (61.7%).

Figure 2.7 shows the distribution of RRT modalities by age group. From the age of 44 years, transplant prevalence declines as HD prevalence increases. The

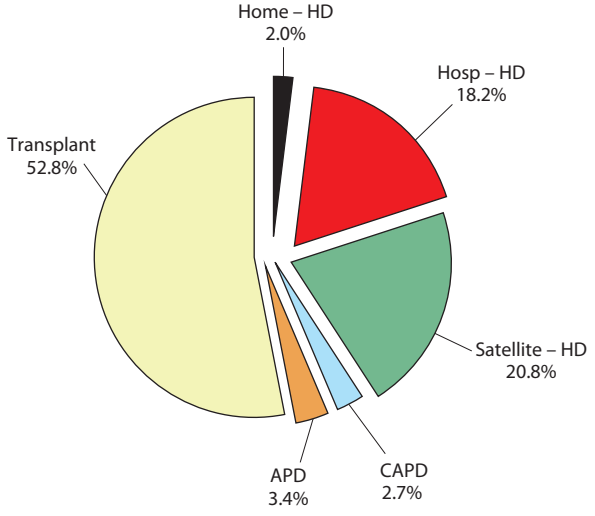

Fig. 2.6. Treatment modality in prevalent RRT patients on 31/12/2014

Table 2.15. Percentage of prevalent RRT patients by dialysis and transplant modality by UK country on 31/12/2014

	<65 years				⩾65 years			
UK country	*N*	% HD	% PD	% transplant	*N*	% HD	% PD	% transplant
England	31,588	29.5	5.2	65.2	18,251	61.6	8.3	30.1
N Ireland	1,016	23.5	2.7	73.8	592	66.7	5.9	27.4
Scotland	3,151	28.2	3.8	68.0	1,525	63.1	6.2	30.6
Wales	1,709	26.2	5.4	68.4	1,136	58.8	8.8	32.4
UK	**37,464**	**29.1**	**5.0**	**65.9**	**21,504**	**61.7**	**8.1**	**30.2**

proportion of each age group treated by PD remained relatively stable.

As the HD prevalence varied by age group, the proportion of prevalent dialysis patients receiving HD varied between centres ranging from 72.5% in Carlisle to 100% in Colchester (table 2.16).

Of the dialysis population, 44.0% received their treatment at a satellite haemodialysis unit in 2014. This figure remains stable compared to last year, but represents an increase from 39.9% in 2010 (data not shown). In 2014, the number of centres that had more than 50% of their haemodialysis activity taking place in satellite units was 26 (figure 2.8). Although there are satellite units in Scotland, the data provided for 2014 did not distinguish between main centre and satellite unit haemodialysis. As such, it is difficult to accurately assess access to satellite haemodialysis across the UK as a whole.

There was also wide variation between centres in the proportion of dialysis patients being managed with APD, ranging from 0% to 21% (table 2.16). While in Northern Ireland the majority of PD patients were on APD, across the UK six of the 70 centres with a PD programme did not report having any patients on APD.

Home haemodialysis

In 2014, the percentage of dialysis patients receiving home HD varied from 0% in five centres, to greater than 5% in 24 centres (table 2.16). In the UK, the overall percentage of dialysis patients receiving home haemodialysis increased from 3.4% in 2011 to 4.3% in 2014.

The proportion of dialysis patients receiving home haemodialysis was greatest in Wales at 7.2%, compared with 3.3% in Northern Ireland, 4.3% in England and 2.9% in Scotland (figure 2.8, table 2.16). The proportion on home haemodialysis has increased in each of the four countries except Northern Ireland since 2011. Forty-seven renal centres across the UK had an increase in the proportion of individuals on home haemodialysis compared with 2011. By comparison, in 2007, the proportion of patients receiving home haemodialysis was 2% in each of the four UK countries.

Some patients are sent by their parent renal centre to centres known to have a strong programme for home HD. In order to avoid the possibility of the parent renal centre being wrongly penalised, the proportion of patients on home HD by centre was measured by assigning the patients to a given centre based on the patient postcode, rather than to the centre returning the data

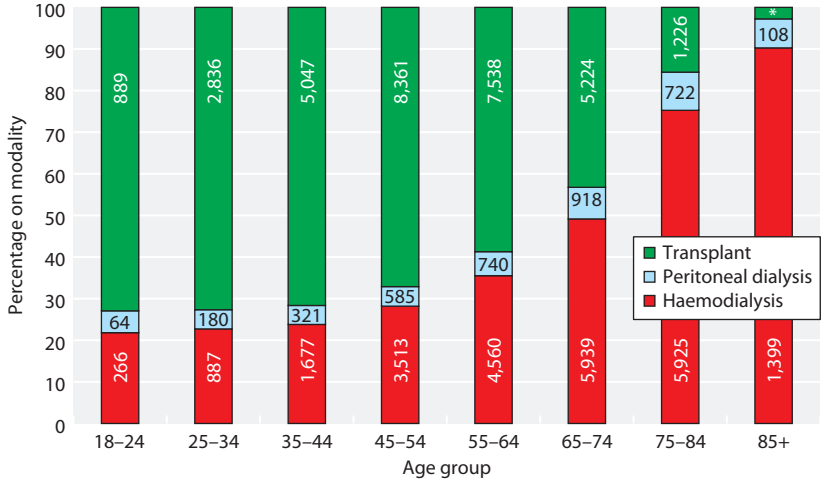

Fig. 2.7. Treatment modality distribution by age in prevalent RRT patients on 31/12/2014
*$N = 43$

Table 2.16. Percentage of prevalent dialysis patients by dialysis modality and centre on 31/12/2014

		% haemodialysis					% peritoneal dialysis	
Centre	*N*	Total	Home	Geo-HHD[c]	Hospital	Satellite	CAPD	APD
England								
B Heart	449	92.4	4.0	3.9	81.7	6.7	4.7	2.9
B QEH	1,095	86.9	4.8	4.0	11.7	70.5	4.7	8.4
Basldn	202	86.1	0.0	0.5	82.7	3.5	5.9	7.9
Bradfd	244	91.4	2.5	4.0	74.2	14.8	2.5	6.2
Brightn	495	86.9	10.1	10.7	36.6	40.2	8.9	4.2
Bristol	598	88.8	3.9	2.9	17.4	67.6	5.7	5.5
Camb	398	92.2	5.3	5.0	43.5	43.5	0.0	0.0
Carlis	102	72.5	0.0	0.0	50.0	22.6	12.8	14.7
Carsh	929	85.4	2.7	2.5	22.0	60.7	3.7	10.6
Chelms	162	83.3	0.6	1.8	82.7	0.0	10.5	4.9
Colchr	119	100.0	0.0	0.0	100.0	0.0	0.0	0.0
Covnt	458	80.1	2.6	2.2	77.5	0.0	19.9	0.0
Derby	326	73.6	10.7	10.5	62.9	0.0	19.0	7.4
Donc	210	87.1	3.8	6.9	43.8	39.5	1.4	11.4
Dorset	329	84.5	1.8	2.7	18.8	63.8	4.3	10.6
Dudley	230	76.5	7.0	8.1	50.0	19.6	17.4	6.1
Exeter	510	81.6	0.8	0.8	10.8	70.0	8.8	9.6
Glouc	254	83.1	1.6	3.6	64.6	16.9	3.2	13.8
Hull	407	81.1	2.5	2.2	38.1	40.5	10.1	8.9
Ipswi	158	80.4	2.5	2.0	65.8	12.0	8.2	11.4
Kent	475	86.1	3.8	4.4	26.3	56.0	11.6	2.3
L Barts	1,195	80.7	1.3	1.3	39.3	40.1	3.4	15.9
L Guys	684	95.6	7.9	3.3	12.6	75.2	1.9	2.5
L Kings	632	85.6	1.7	4.4	17.9	66.0	5.4	9.0
L Rfree	855	83.3	1.9	2.0	2.9	78.5	6.1	10.6
L St.G	357	86.3	1.4	3.1	37.0	47.9	3.9	9.0
L West	1,480	95.7	1.3	1.2	22.1	72.3	2.4	1.9
Leeds	584	89.2	3.3	2.3	17.1	68.8	0.7	10.1
Leic	1,028	88.2	6.6	6.6	17.2	64.4	3.5	8.3
Liv Ain	203	79.8	4.9	6.0	6.4	68.5	3.0	17.2
Liv Roy	430	86.0	7.4	6.7	37.4	41.2	10.5	3.5
M RI	597	86.9	8.4	7.1	27.1	51.4	5.2	7.9
Middlbr	353	95.8	3.7	3.9	27.2	64.9	4.3	0.0
Newc	339	84.7	6.5	6.0	78.2	0.0	1.2	14.2
Norwch	361	90.3	8.3	8.0	48.2	33.8	8.6	0.8
Nottm	449	81.3	7.4	7.8	40.3	33.6	6.7	12.0
Oxford	546	85.0	3.7	2.6	32.4	48.9	3.1	11.9
Plymth	175	78.3	4.0	4.6	72.6	1.7	6.9	14.9
Ports	696	88.6	6.5	6.2	19.4	62.8	11.4	0.0
Prestn	623	90.7	6.1	6.1	21.2	63.4	1.6	7.7
Redng	367	80.1	1.9	3.7	37.3	40.9	13.1	6.5
Salford	499	82.4	3.4	4.5	29.1	49.9	6.6	11.0
Sheff	643	90.4	6.7	6.1	37.2	46.5	9.6	0.0
Shrew	225	85.8	6.7	7.5	49.8	29.3	11.1	3.1
Stevng	515	94.8	5.2	6.0	24.3	65.2	5.2	0.0
Sthend	136	85.3	0.7	0.7	84.6	0.0	14.7	0.0
Stoke	420	80.2	7.9	7.8	46.4	26.0	2.4	12.1
Sund	229	92.1	0.4	0.9	61.1	30.6	3.1	4.8
Truro	170	87.6	5.3	5.3	42.4	40.0	5.9	6.5
Wirral	228	89.9	3.5	3.9	41.2	45.2	0.4	9.7
Wolve	393	79.9	4.8	6.6	37.4	37.7	11.2	6.1
York	172	83.1	6.4	7.0	33.7	43.0	13.4	3.5

Table 2.16. Continued

Centre	*N*	% haemodialysis					% peritoneal dialysis	
		Total	Home	Geo-HHD[c]	Hospital	Satellite	CAPD	APD
N Ireland								
Antrim	136	90.4	0.7	0.7	89.7	0.0	0.7	8.8
Belfast	219	93.2	5.9	6.0	87.2	0.0	0.9	5.9
Newry	108	85.2	1.9	1.9	83.3	0.0	0.0	14.8
Ulster	103	96.1	3.9	3.8	92.2	0.0	0.0	3.9
West NI	130	89.2	2.3	2.3	86.9	0.0	0.0	10.0
Scotland								
Abrdn	240	88.3	2.5	2.5	85.8	0.0	5.0	6.7
Airdrie	194	95.4	0.0	1.5	95.4	0.0	2.6	2.1
D & Gall	66	74.2	3.0	3.1	71.2	0.0	18.2	7.6
Dundee	202	88.1	2.0	2.1	86.1	0.0	6.9	5.0
Edinb	301	92.4	2.0	2.1	90.4	0.0	2.0	5.7
Glasgw	635	93.2	4.4	4.0	88.8	0.0	1.6	5.2
Inverns	87	81.6	3.5	3.5	78.2	0.0	12.6	5.8
Klmarnk	178	79.2	6.2	5.7	73.0	0.0	1.7	19.1
Krkcldy	163	89.6	0.0	0.0	89.6	0.0	0.6	9.8
Wales								
Bangor	99	83.8	13.1	13.1	42.4	28.3	8.1	8.1
Cardff	576	85.9	6.1	6.1	12.9	67.0	9.6	4.3
Clwyd	103	88.3	4.9	4.0	83.5	0.0	5.8	5.8
Swanse	387	86.0	10.3	10.1	43.4	32.3	10.9	3.1
Wrexm	143	79.0	0.7	0.7	65.7	12.6	0.0	21.0
England	**23,734**	**86.6**	**4.3**		**33.2**	**49.2**	**6.0**	**7.0**
N Ireland[a]	**696**	**91.1**	**3.3**		**87.8**	**0.0**	**0.4**	**8.3**
Scotland[b]	**2,066**	**89.6**	**2.9**		**86.7**	**0.0**	**3.6**	**6.8**
Wales	**1,308**	**85.2**	**7.2**		**35.5**	**42.6**	**8.5**	**6.2**
UK	**27,804**	**86.9**	**4.3**		**38.6**	**44.0**	**5.8**	**7.0**

[a]No satellite units in Northern Ireland
[b]All haemodialysis patients in Scotland are shown as receiving treatment at home or in centre as no data were available regarding satellite dialysis
[c]Geo-HHD: Home haemodialysis presented by the centre closest to the patient's home postcode rather than the centre returning the data to the UKRR

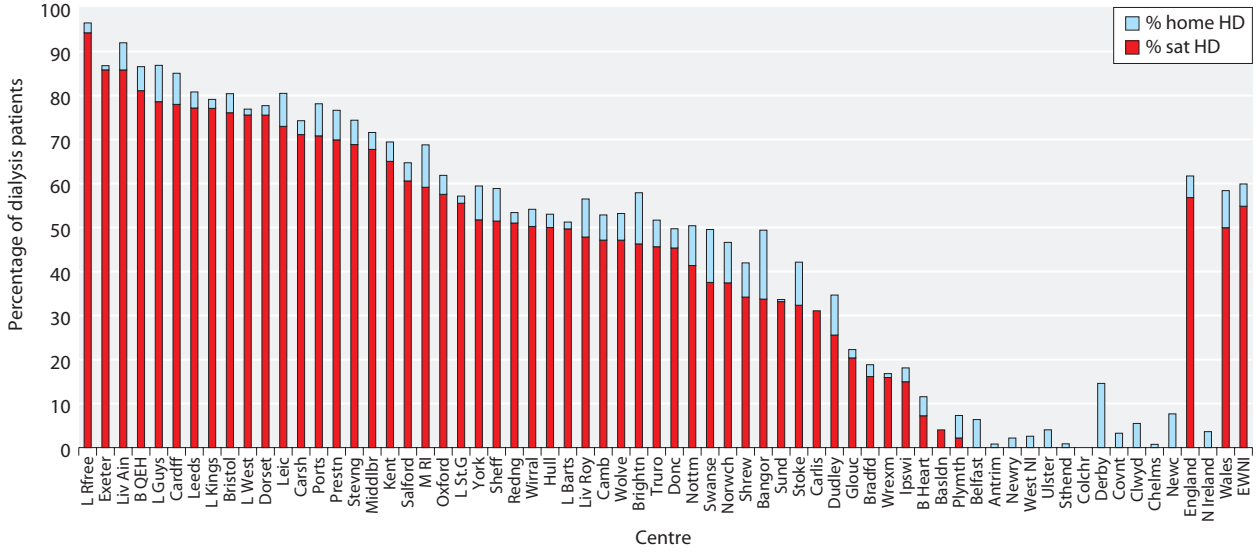

Fig. 2.8. Percentage of prevalent haemodialysis patients treated with satellite or home haemodialysis by centre on 31/12/2014
Scottish centres excluded as information on satellite HD was not available. No centres in Northern Ireland have satellite dialysis units

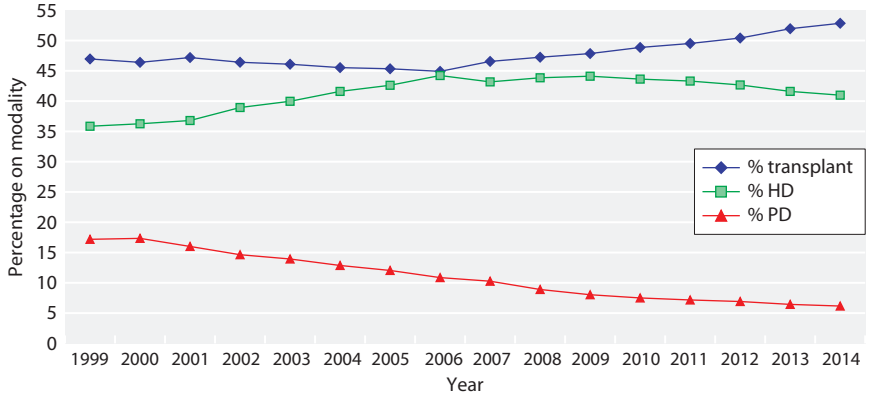

Fig. 2.9. Modality changes in prevalent RRT patients from 1999–2014

to the UKRR (table 2.16 – Geo-HHD). This showed an increase in the prevalence of home HD of >1% for some centres (Bradford, Chelmsford, Doncaster, Dudley, Gloucester, London Kings, London St George's, Liverpool Aintree, Reading, Salford, Wolverhampton and Airdrie).

Change in modality

The relative proportion of RRT modalities in prevalent patients has changed dramatically over the past 15 years. The main features are depicted in figure 2.9, which describes a year on year decline in the proportion of patients treated by PD since 2000 and a drop of 6.7% over the last 10 years. The absolute number of patients on PD decreased from 5,185 patients in 2004 to 3,638 patients in 2014. Time on PD has decreased over the last five years, from a median of 2.0 years in 2009 to 1.6 years in 2014 probably reflecting increased transplantation rates in this largely younger patient group and reduced technique survival rates. The percentage of patients undergoing PD for more than seven years has significantly reduced over time (2.3% PD patients starting in 2000 to 0.7% patients starting in 2006) which might reflect both an increased awareness of complications associated with long PD use and increased rates of transplantation for many patients on PD.

The proportion of patients treated with HD has declined slightly over the last four years from 43.3% to 41.0%. The downward trend seen in the proportion of patients with a functioning transplant has reversed since 2007 and has increased from 52.0% in 2013 to 52.8% in 2014, possibly reflecting continued increases in living organ and non-heart beating donation [2].

Figure 2.10 depicts in more detail the modality changes in the prevalent dialysis population during this time. The data show a clear reduction in patients treated by CAPD over time and an increase in satellite HD coupled with a reduction in hospital HD.

International comparisons

There are marked differences in RRT prevalence rates between countries (figure 2.11). Rates in Northern

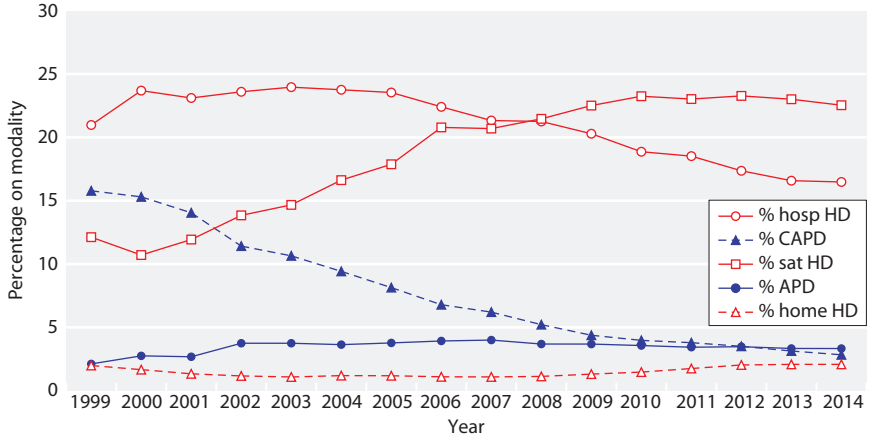

Fig. 2.10. Detailed dialysis modality changes in prevalent RRT patients from 1999–2014
Scottish centres excluded as information on satellite HD was not available

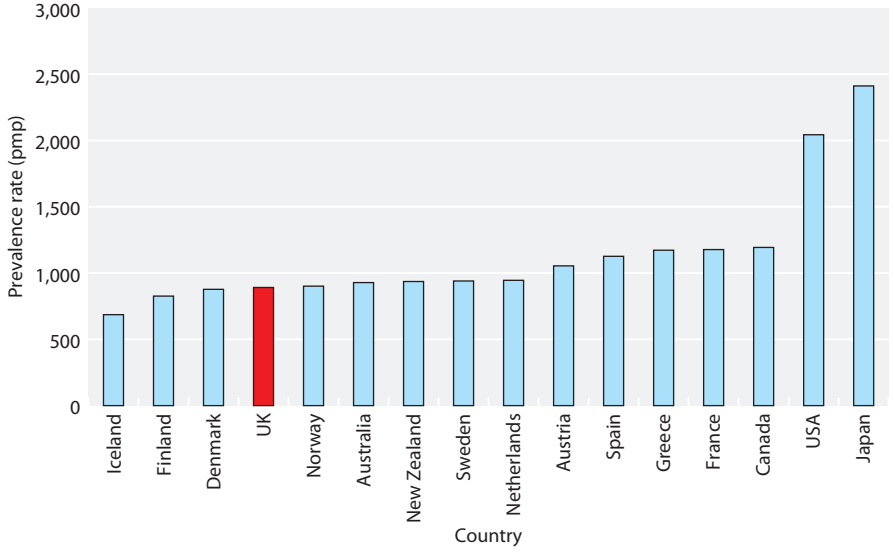

Fig. 2.11. RRT Prevalence rates (pmp) by country in 2013
Non-UK data from USRDS available at http://www.usrds.org/2015/view/v2_13.aspx
The UK data include paediatric patients to agree with the data from the other countries. All rates unadjusted. Japan is dialysis only. Data for France include 22 regions in 2013. Data for Spain include 18 of 19 regions.

European countries (including the UK) are lower than in Southern Europe and these are lower than in the USA. Identifying the source of these differences is complicated by differences in healthcare systems, approaches to conservative care and incidence rates in these countries.

Conclusions

The population of adults undergoing RRT continued to grow across all countries in the UK with an increase of 4% on 2013 UK numbers. Incidence rates of RRT have stabilised in recent years and so this growth in prevalent patients is largely due to improving survival predominantly as a result of increasing transplantation. A similar pattern is seen across Europe [3] and the US [4] although the contribution of transplanted patients is less marked outside the UK.

Whilst half of all patients on RRT continued to be aged 40–64 years, the prevalent population is becoming more elderly with 16.0% of patients being over 75 years old compared to 14.6% in 2009. This applies most dramatically to transplant patients where in 2014 30.2% of over 65 year old patients had a transplant compared to 22.5% in 2009.

The proportion of patients using peritoneal dialysis has been falling since the early 1990's and was at just 6% in 2014. Incidence of PD has levelled off over the last seven years and so ongoing reductions in the prevalence of PD are due to decreasing technique survival (median time on treatment in 2014 1.7 years vs. 2.0 years in 2009). In most centres the PD population was younger than the HD population. This is in contrast to data from Australia where PD patients were older on average than HD patients [5]. This variation highlights the lack of consensus concerning which patients are potentially best treated with PD.

There are large variations in prevalence rates between CCG/HB across the UK. This variation will largely be determined by the number of patients needing RRT but also by the clinical care delivered by renal centres. Many factors unrelated to clinical care will also have contributed to these differences such as geography, local population density, age distribution, ethnic composition, prevalence of diseases predisposing to kidney disease and the social deprivation index of that population. Survival whilst on RRT may vary between centres because of differences in the clinical care provided as well as differing practices surrounding which patients are offered dialysis and these will also affect the prevalence rate. Access to high quality health care for the comorbid conditions seen in these patients may also influence survival and therefore the prevalence rate.

The percentage of CCG/HB areas with prevalence rates as expected for the age and gender distribution of each area has increased over the last five years with fewer areas having higher than expected rates. The reorganisations seen in healthcare areas over this same time period make interpretation of this finding more difficult. There remain large variations in the numbers of patients receiving RRT in each health area in the UK and the effects of centralising specialist commissioning arrangements in England on this variation will be seen in subsequent years.

Acknowledgement

The non-UK data reported in the section on International comparisons have been supplied by the United States Renal Data System (USRDS). The interpretation and reporting of these data are the responsibility of the author(s) and in no way should be seen as an official policy or interpretation of the U.S.

Conflicts of interest: the authors declare no conflicts of interest

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UK Renal Registry 18th Annual Report: Chapter 3 Demographic and Biochemistry Profile of Kidney Transplant Recipients in the UK in 2014: National and Centre-specific Analyses

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Key Words

Blood pressure · Bone metabolism · Chronic kidney disease · Clinical Commissioning Group · Deceased donor · eGFR · Epidemiology · Ethnicity · Graft function · Haemoglobin · Live donor · Outcomes · Renal transplantation · Survival

Summary

- There was a 2% fall in overall renal transplant numbers in 2014, with a significant fall in kidney donation from donors after circulatory death (10%).
- In 2014, death-censored renal transplant failure rates in prevalent patients were similar to previous years at 2.4% per annum. Transplant patient death rates remained stable at 2.3 per 100 patient years.
- The median age of incident and prevalent renal transplant patients in the UK was 50.6 and 53.3 years respectively.
- The median eGFR of prevalent renal transplant recipients was 52.5 ml/min/1.73 m^2.
- The median eGFR of patients one year after transplantation was 57.4 ml/min/1.73 m^2 post live transplant, 53.6 ml/min/1.73 m^2 post brainstem death transplant and 50.1 ml/min/1.73 m^2 post circulatory death transplant.
- In 2014, 13% of prevalent transplant patients had eGFR <30 ml/min/1.73 m^2.
- The median decline in eGFR slope beyond the first year after transplantation was -0.48 ml/min/1.73 m^2/year.
- In 2014, malignancy (26%) and infection (24%) remained the commonest causes of death in patients with a functioning renal transplant.

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Introduction

This chapter includes independent analyses regarding renal transplant activity and survival data from the UK Transplant Registry, held by the Organ Donation and Transplantation Directorate (ODT) of NHS Blood and Transplant (NHSBT). The UK Renal Registry (UKRR) has performed additional analyses of renal transplant recipient follow-up data examining demographics, clinical and biochemical variables. NHSBT records all the information regarding the episode of transplantation (donor and recipient details) and the UKRR holds additional information on key clinical and biochemical variables in renal transplant recipients. The co-operation between these two organisations results in a comprehensive database describing the clinical care delivered to renal transplant patients within the UK. This further allows for the comparison of key outcomes between centres and provides insight into the processes involved in the care of such patients in the UK.

This chapter is divided into six sections: (1) transplant activity, waiting list and survival data; (2) transplant demographics; (3) clinical and laboratory outcomes; (4) analysis of prevalent patients by chronic kidney disease (CKD) stage; (5) eGFR slope analysis; and (6) cause of death in transplant recipients. Methodology, results and conclusions of these analyses are discussed in detail for all six sections separately.

The UKRR methodology is described elsewhere [1]. The UKRR collects quarterly clinical data via an electronic data extraction process from hospital based renal IT systems on all patients receiving renal replacement therapy. Throughout the chapter, the number preceding the centre name in each figure indicates the percentage of missing data for that centre for that variable.

Unless otherwise specified, prevalent transplant patients were defined as patients with a functioning renal transplant on the 31st December 2014.

A list of the recommended audit measures from the Renal Association which are relevant to the transplant population are given in appendix 1 of this chapter. Several of the audit measures are not currently reported by the UKRR in the annual report; the reasons behind this are varied, but predominantly relate to a high proportion of incomplete data or that the relevant variable is not currently within the specified UKRR dataset. Over time it is hoped to work with the renal community to improve reporting across the range of recommended standards.

Transplant activity, waiting list activity and survival data

Introduction

NHSBT prospectively collects donor and recipient data around the episode of transplantation. They also request that transplant centres provide an annual paper based data return on the status of the recipient's graft function. This enables ODT to generate comprehensive analyses of renal transplant activity and graft survival statistics.

NHSBT attributes a patient to the centre that performed the transplant operation irrespective of where the patient was cared for before or after the procedure and hence only reports on transplant centre performance.

Methods

In 2014, there were 23 UK adult renal transplant centres, 19 in England, two in Scotland and one each in Northern Ireland and Wales.

Comprehensive information from 1999 onwards concerning the number of patients on the transplant waiting list, the number of transplants performed, the number of deceased kidney donors (donor after brainstem death and donor after circulatory death), living kidney donors, patient survival and graft survival is available on the NHSBT website (http://www.organdonation.nhs.uk/ukt/statistics/statistics.asp).

Results

During 2014, 3,200 kidney or kidney plus other organ transplants were performed. The absolute number of living kidney donors showed little change in 2014 representing 34.3% of all transplants performed whilst donor after brainstem death transplants continued to increase and comprised 37.7% of all kidney transplants performed. A 10% fall in the number of transplants from donors after circulatory death was also noted in 2014 (table 3.1).

There were small differences in one and five year risk-adjusted patient and graft survival rates amongst UK renal transplant centres (table 3.2). These graft survival rates include grafts with primary non-function (which are excluded from analysis by some countries).

Using data from the UKRR on prevalent renal transplant patients on 1st January 2014, the death rate during 2014 was 2.3 per 100 patient years (CI 2.1–2.5) when censored for return to dialysis and 2.4 per 100 patient years (CI 2.2–2.6) without censoring for dialysis. These death rates are similar to those observed over the last few years and have not shown any impact of the increasing age of the transplanted cohort.

Table 3.1. UK kidney and kidney plus other organ transplant numbers in the UK (including paediatric), 1/1/2012–31/12/2014

Organ	2012	2013	2014	% change 2013–2014
Donor after brainstem death[a]	967	1,160	1,205	4
Donor after circulatory death[b]	708	794	713	−10
Living donor kidney	1,034	1,104	1,097	−1
Kidney and liver[c]	17	11	12	9
Kidney and heart	3	1	1	0
Kidney and pancreas[d]	172	190	171	−10
Kidney and lung	0	0	1	
Small bowel (inc kidney)	0	1	0	
Total kidney transplants	**2,901**	**3,261**	**3,200**	**−2**

[a]Includes en bloc kidney transplants (4 in 2012, 4 in 2013, 3 in 2014) and double kidney transplants (7 in 2012, 18 in 2013, 22 in 2014)
[b]Includes en bloc kidney transplants (4 in 2012, 6 in 2013, 4 in 2014) and double kidney transplants (52 in 2012, 53 in 2013, 51 in 2014)
[c]Includes DCD transplants (2 in 2013)
[d]Includes DCD transplants (35 in 2012, 36 in 2013, 47 in 2014)

Table 3.2. Risk-adjusted first adult kidney transplant only, graft and patient survival percentage rates for UK centres*

	Deceased donor 1 year survival		Deceased donor 5 year survival		Living kidney donor 1 year survival		Living kidney donor 5 year survival	
Centre	Graft	Patient	Graft	Patient	Graft	Patient	Graft	Patient
B QEH	91	97	81	89	96	100	89	95
Belfast	96	94	91	88	96	100	88	92
Bristol	92	94	86	86	98	99	95	95
Camb	93	96	86	92	99	99	94	98
Cardff	97	96	87	89	97	98	89	98
Covnt	87	90	92	90	93	99	86	95
Edin	92	94	83	87	96	98	86	93
Glasgw	95	97	88	89	97	97	92	96
L Barts	88	89	89	85	96	98	93	97
L Guys	93	97	82	90	96	98	93	95
L Rfree	94	96	90	94	98	99	96	97
L St.G	94	99	86	93	98	100	93	96
L West	94	98	88	91	96	99	84	94
Leeds	94	96	86	91	94	100	91	98
Leic	92	98	87	78	97	97	92	95
Liv Roy	92	94	83	90	95	100	90	95
M RI	95	96	88	88	99	98	94	95
Newc	93	96	82	87	100	99	90	97
Nottm	96	96	82	83	100	100	90	94
Oxford	93	96	91	88	95	97	97	95
Plymth	88	96	84	90	97	100	90	94
Ports	94	94	83	87	99	99	84	96
Sheff	94	94	85	95	97	100	94	98
All centres	**93**	**96**	**86**	**89**	**97**	**99**	**91**	**95**

Cohorts for survival rate estimation: 1 year survival: 1/4/2009 – 31/03/2013; 5 year survival: 1/4/2004 – 31/03/2009; first grafts only – re-grafts excluded for patient survival estimation. Since the cohorts to estimate 1- and 5-year survival are different, some centres may appear to have 5 year survival better than 1 year survival
*Information courtesy of NHSBT: number of transplants, patients and 95% CI for each estimate; statistical methodology for computing risk-adjusted estimates can be obtained from the NHSBT website (see http://www.odt.nhs.uk/pdf/organ_specific_report_kidney_2014.pdf)

During 2014, 2.4% of prevalent transplant patients experienced graft failure (excluding death as a cause of graft failure) maintaining the fall in graft failure rates noted over the last couple of years. Whilst it might be premature to assume that graft failure rates are falling in the UK the 0.5% fall noted in the last five years is certainly encouraging.

Conclusions

In 2014, there was a 2% fall in overall renal transplant numbers, with a significant fall in kidney donation from donors after circulatory death (10%). The graft failure rate of 2.4% per annum and patient death rate of 2.3 per 100 patient years were similar to those noted in 2013.

Transplant demographics

Introduction

Since 2008, all UK renal centres have established electronic linkage to the UKRR or Scottish Renal Registry, giving the UKRR complete coverage of individual patient level data across the UK.

The following sections need to be interpreted in the context of variable repatriation policies; some transplant centres continue to follow up and report on all patients they transplant, whereas others refer patients back to non-transplant centres for most or all ongoing post-transplant care. Some transplant centres only refer back patients when their graft is failing. The time post-transplantation that a patient is referred back to their local centre varies between transplant centres. The UKRR is able to detect duplicate patients (being reported from both transplant and referring centres) and in such situations care is usually attributed to the referring centre (see appendix B2 for allocation procedure). This process may result in some discrepancies in transplant numbers particularly in Oxford/Reading and Clywd/Liverpool Royal.

Methods

As Colchester did not have any transplant patients they were excluded from some of the analyses, though their dialysis patients were included in the relevant dialysis population denominators.

For the analysis of primary renal diagnosis (PRD) in transplant recipients, a few centres were excluded from some of the take-on years because of concerns relating to the reliability of PRD coding (with these centres submitting a high percentage of uncertain or missing aetiology codes).

Information on patient demographics (age, gender, ethnicity and PRD) for patients in a given renal centre was obtained from UKRR patient registration data fields. Individual patients were assigned to the centre that returned data for them during 2014. The prevalence of transplant patients in areas covered by individual Clinical Commissioning Groups (CCG) or Health Board/Social Care Areas (HB) was estimated based on the postcode of the registered address for patients on renal replacement therapy (RRT). Data on ethnic origin, supplied as Patient Administration System (PAS) codes, were retrieved from fields within renal centre IT systems. For the purpose of this analysis, patients were grouped into Whites, South Asians, Blacks, Others and Unknown. The details of ethnicity regrouping into the above categories are provided in appendix H: Coding https://www.renalreg.org/publications-reports/.

Results and Conclusions

Prevalent transplant numbers across the UK are described in table 3.3.

The prevalence of renal transplant recipients in each CCG/HB in England, Northern Ireland (Health and Social Care Trust Areas), Scotland (Health Boards) and Wales (Local Health Boards) and the proportion of prevalent patients according to modality in the renal centres across the UK is described in tables 3.4 and 3.5 respectively. After standardisation for age and gender, unexplained variability was evident in the prevalence of renal transplant recipients, with some areas having higher than the predicted number of prevalent transplant patients per million population and others lower. There are a number of potential explanations for these inconsistencies, including

Table 3.3. The prevalence per million population (pmp) of renal transplants in adults in the UK on 31/12/2014, by country

	England	N Ireland	Scotland	Wales	UK
Number of prevalent transplant patients	26,108	912	2,610	1,534	31,164
Total population, mid-2014 estimates from ONS* (millions)	54.3	1.8	5.3	3.1	64.6
Prevalence pmp transplant	481	496	488	496	482

*Office of National Statistics, UK

Table 3.4 Prevalence per million population of patients with a renal transplant and age/gender standardised rate ratio in the UK, as on 31st December 2010–2014, by CCG/HB

CCG/HB – CCG in England, Health and Social Care Areas in Northern Ireland, Local Health Boards in Wales and Health Boards in Scotland
O/E – age and gender standardised transplant prevalence rate ratio
LCL – lower 95% confidence limit
UCL – upper 95% confidence limit
pmp – per million population
CCG/HBs with significantly high average rate ratios are bold in greyed areas
CCG/HBs with significantly low average rate ratios are italicised in greyed areas
Mid-2013 population data from the Office for National Statistics, National Records of Scotland and the Northern Ireland Statistics and Research Agency – based on the 2011 census
% non-White – percentage of the CCG/HB population that is non-White, from 2011 Census

UK area	CCG/HB	Total population	Crude rate pmp					Age and gender standardised rate ratio 2014			% non-White
			2010	2011	2012	2013	2014	O/E	95% LCL	95% UCL	
Cheshire, Warrington and Wirral	NHS Eastern Cheshire	195,500	358	389	414	445	465	0.88	0.72	1.08	3.7
	NHS South Cheshire	177,200	389	389	401	446	502	0.98	0.80	1.21	2.9
	NHS Vale Royal	*102,000*	*274*	*284*	*314*	*363*	*372*	*0.72*	*0.53*	*0.99*	*2.1*
	NHS Warrington	205,100	361	380	405	463	483	0.96	0.79	1.17	4.1
	NHS West Cheshire	229,000	384	406	428	463	493	0.97	0.80	1.16	2.8
	NHS Wirral	*320,300*	*343*	*350*	*347*	*362*	*368*	*0.73*	*0.61*	*0.88*	*3.0*
Durham, Darlington and Tees	NHS Darlington	105,400	332	389	398	446	493	0.99	0.76	1.30	3.8
	NHS Durham Dales, Easington and Sedgefield	272,900	410	451	462	506	550	1.06	0.90	1.25	1.2
	NHS Hartlepool and Stockton-on-Tees	285,900	430	413	437	469	497	1.01	0.86	1.19	4.4
	NHS North Durham	243,100	399	395	411	424	432	0.86	0.71	1.04	2.5
	NHS South Tees	**273,900**	**526**	**566**	**577**	**577**	**595**	**1.23**	**1.05**	**1.43**	**6.7**
Greater Manchester	**NHS Bolton**	**280,100**	**453**	**500**	**532**	**546**	**575**	**1.21**	**1.03**	**1.41**	**18.1**
	NHS Bury	186,500	391	407	440	445	493	1.01	0.82	1.23	10.8
	NHS Central Manchester	**182,200**	**329**	**351**	**368**	**428**	**466**	**1.26**	**1.02**	**1.56**	**48.0**
	NHS Heywood, Middleton & Rochdale	212,100	401	438	462	490	467	0.98	0.81	1.20	18.3
	NHS North Manchester	170,700	270	305	340	375	404	0.98	0.78	1.25	30.8
	NHS Oldham	227,300	383	400	409	466	462	1.00	0.83	1.21	22.5
	NHS Salford	239,000	339	360	410	414	443	0.97	0.80	1.17	9.9
	NHS South Manchester	161,500	235	279	316	340	378	0.89	0.69	1.14	19.6
	NHS Stockport	285,000	403	414	432	460	467	0.93	0.78	1.10	7.9
	NHS Tameside and Glossop	253,700	410	449	457	477	512	1.03	0.87	1.22	8.2
	NHS Trafford	230,200	326	348	378	404	456	0.94	0.78	1.14	14.5
	NHS Wigan Borough	319,700	394	460	491	544	557	1.10	0.95	1.27	2.7
Lancashire	NHS Blackburn with Darwen	147,400	332	380	407	455	495	1.09	0.87	1.37	30.8
	NHS Blackpool	141,400	347	347	403	481	523	1.04	0.83	1.30	3.3
	NHS Chorley and South Ribble	169,500	354	407	407	448	472	0.93	0.74	1.15	2.9
	NHS East Lancashire	372,300	408	440	446	475	491	0.99	0.86	1.15	11.9
	NHS Fylde & Wyre	165,800	332	344	386	416	422	0.79	0.63	1.00	2.1
	NHS Greater Preston	201,700	317	327	372	392	421	0.88	0.72	1.09	14.7
	NHS Lancashire North	*159,500*	*326*	*332*	*332*	*345*	*364*	*0.75*	*0.58*	*0.97*	*4.0*
	NHS West Lancashire	111,300	341	359	386	386	395	0.78	0.58	1.05	1.9
Merseyside	NHS Halton	126,000	389	413	452	460	500	1.01	0.79	1.29	2.2
	NHS Knowsley	146,100	383	376	397	418	424	0.88	0.68	1.12	2.8
	NHS Liverpool	470,800	346	374	391	416	444	0.96	0.84	1.10	11.1
	NHS South Sefton	158,900	359	378	422	453	459	0.90	0.72	1.14	2.2
	NHS Southport and Formby	*114,300*	*306*	*315*	*289*	*350*	*359*	*0.69*	*0.51*	*0.94*	*3.1*
	NHS St Helens	176,200	335	358	363	409	465	0.91	0.74	1.14	2.0

Table 3.4 Continued

UK area	CCG/HB	Total population	Crude rate pmp					Age and gender standardised rate ratio 2014			% non-White
			2010	2011	2012	2013	2014	O/E	95% LCL	95% UCL	
Cumbria, Northumberland, Tyne and Wear	NHS Cumbria	504,100	391	399	423	450	472	0.89	0.78	1.01	1.5
	NHS Gateshead	200,000	385	420	440	435	440	0.88	0.71	1.08	3.7
	NHS Newcastle North and East	143,900	424	466	438	452	486	1.14	0.90	1.44	10.7
	NHS Newcastle West	142,900	308	322	336	357	364	0.81	0.62	1.06	18.3
	NHS North Tyneside	202,200	564	579	579	579	549	1.08	0.90	1.30	3.4
	NHS Northumberland	315,800	383	427	437	475	494	0.92	0.79	1.08	1.6
	NHS South Tyneside	148,500	471	505	512	559	518	1.02	0.82	1.28	4.1
	NHS Sunderland	276,100	431	467	493	514	522	1.04	0.88	1.22	4.1
North Yorkshire and Humber	NHS East Riding of Yorkshire	314,600	388	404	426	490	493	0.92	0.78	1.07	1.9
	NHS Hambleton, Richmondshire and Whitby	153,600	286	319	332	371	449	0.85	0.67	1.08	2.7
	NHS Harrogate and Rural District	158,200	461	468	524	531	562	1.09	0.88	1.34	3.7
	NHS Hull	257,600	373	392	419	458	478	1.03	0.87	1.23	5.9
	NHS North East Lincolnshire	159,800	369	419	444	463	457	0.93	0.74	1.17	2.6
	NHS North Lincolnshire	*168,800*	*273*	*290*	*290*	*314*	*356*	*0.70*	*0.54*	*0.90*	*4.0*
	NHS Scarborough and Ryedale	110,100	436	463	445	427	463	0.88	0.67	1.16	2.5
	NHS Vale of York	349,100	401	427	481	516	544	1.10	0.95	1.26	4.0
South Yorkshire and Bassetlaw	NHS Barnsley	235,800	399	403	411	433	475	0.94	0.78	1.13	2.1
	NHS Bassetlaw	*113,700*	*308*	*308*	*317*	*326*	*387*	*0.74*	*0.55*	*0.99*	*2.6*
	NHS Doncaster	303,600	343	379	402	405	448	0.90	0.76	1.07	4.7
	NHS Rotherham	258,700	394	429	452	487	541	1.08	0.91	1.27	6.4
	NHS Sheffield	560,100	355	380	393	416	429	0.95	0.83	1.07	16.3
West Yorkshire	NHS Airedale, Wharfedale and Craven	158,500	454	435	448	473	492	0.97	0.78	1.22	11.1
	NHS Bradford City	**82,700**	**387**	**399**	**483**	**544**	**556**	**1.58**	**1.18**	**2.11**	**72.2**
	NHS Bradford Districts	**334,600**	**457**	**469**	**520**	**562**	**583**	**1.29**	**1.12**	**1.49**	**28.7**
	NHS Calderdale	206,400	470	504	538	533	514	1.03	0.85	1.24	10.3
	NHS Greater Huddersfield	240,400	399	433	462	474	507	1.04	0.87	1.24	17.4
	NHS Leeds North	199,900	380	420	435	445	490	1.00	0.82	1.22	17.4
	NHS Leeds South and East	241,000	382	402	419	465	469	1.05	0.87	1.26	18.3
	NHS Leeds West	320,500	318	340	390	427	468	1.07	0.91	1.25	10.8
	NHS North Kirklees	**187,900**	**474**	**495**	**500**	**580**	**649**	**1.39**	**1.17**	**1.66**	**25.3**
	NHS Wakefield	*329,700*	*334*	*349*	*370*	*388*	*403*	*0.80*	*0.67*	*0.94*	*4.6*
Arden, Herefordshire and Worcestershire	NHS Coventry and Rugby	431,200	387	410	431	448	499	1.11	0.97	1.26	22.2
	NHS Herefordshire	*186,100*	*285*	*301*	*333*	*339*	*365*	*0.70*	*0.55*	*0.88*	*1.8*
	NHS Redditch and Bromsgrove	179,300	351	357	390	402	435	0.86	0.69	1.07	6.0
	NHS South Warwickshire	259,200	405	409	463	482	494	0.97	0.81	1.15	7.0
	NHS South Worcestershire	*294,500*	*323*	*336*	*346*	*374*	*391*	*0.76*	*0.63*	*0.91*	*3.7*
	NHS Warwickshire North	188,100	409	452	447	457	457	0.90	0.73	1.11	6.5
	NHS Wyre Forest	98,400	356	356	376	406	386	0.73	0.53	1.01	2.8
Birmingham and the Black Country	NHS Birmingham CrossCity	725,400	358	378	403	425	458	1.07	0.96	1.19	35.2
	NHS Birmingham South and Central	201,200	368	358	353	418	482	1.17	0.96	1.43	40.4
	NHS Dudley	*314,400*	*299*	*302*	*283*	*318*	*337*	*0.68*	*0.56*	*0.82*	*10.0*
	NHS Sandwell and West Birmingham	480,100	354	362	385	444	452	1.05	0.92	1.20	45.3
	NHS Solihull	*208,900*	*297*	*316*	*335*	*345*	*373*	*0.75*	*0.60*	*0.93*	*10.9*
	NHS Walsall	272,200	378	408	430	474	511	1.09	0.92	1.28	21.1
	NHS Wolverhampton	251,600	302	294	314	382	409	0.88	0.73	1.07	32.0

Table 3.4 Continued

UK area	CCG/HB	Total population	Crude rate pmp					Age and gender standardised rate ratio 2014			% non-White
			2010	2011	2012	2013	2014	O/E	95% LCL	95% UCL	
Derbyshire and Nottingham-shire	NHS Erewash	94,900	284	284	295	400	432	0.86	0.64	1.17	3.2
	NHS Hardwick	*109,300*	*284*	*275*	*275*	*265*	*320*	*0.62*	*0.44*	*0.86*	*1.8*
	NHS Mansfield & Ashfield	193,900	356	402	454	474	505	1.00	0.82	1.22	2.5
	NHS Newark & Sherwood	117,000	453	462	513	564	607	1.17	0.93	1.48	2.4
	NHS North Derbyshire	*272,200*	*331*	*356*	*401*	*401*	*408*	*0.77*	*0.64*	*0.92*	*2.5*
	NHS Nottingham City	310,800	306	322	344	380	396	0.96	0.80	1.15	28.5
	NHS Nottingham North & East	147,600	345	386	413	440	400	0.79	0.61	1.01	6.2
	NHS Nottingham West	111,200	458	476	485	548	584	1.14	0.90	1.46	7.3
	NHS Rushcliffe	112,800	328	372	390	443	417	0.82	0.61	1.08	6.9
	NHS Southern Derbyshire	518,200	355	390	413	442	463	0.95	0.83	1.07	11.0
East Anglia	NHS Cambridgeshire and Peterborough	855,000	371	396	408	433	457	0.95	0.86	1.04	9.5
	NHS Great Yarmouth & Waveney	213,800	299	313	337	430	477	0.93	0.77	1.13	2.7
	NHS Ipswich and East Suffolk	396,100	336	369	371	429	444	0.88	0.76	1.01	5.6
	NHS North Norfolk	168,500	368	404	374	499	481	0.88	0.71	1.09	1.5
	NHS Norwich	195,000	277	303	297	390	410	0.88	0.71	1.10	7.3
	NHS South Norfolk	237,400	383	362	383	476	489	0.95	0.79	1.14	2.6
	NHS West Norfolk	171,500	332	338	379	397	432	0.83	0.66	1.04	2.6
	NHS West Suffolk	223,800	362	371	407	411	416	0.84	0.68	1.02	4.6
Essex	NHS Basildon and Brentwood	252,800	364	384	388	475	475	0.98	0.82	1.17	7.1
	NHS Castle Point, Rayleigh and Rochford	172,500	359	359	371	417	493	0.94	0.76	1.16	3.0
	NHS Mid Essex	381,500	388	427	417	472	480	0.94	0.82	1.09	4.4
	NHS North East Essex	316,300	345	379	395	433	490	0.99	0.84	1.15	5.5
	NHS Southend	175,800	341	358	404	461	495	1.02	0.82	1.25	8.4
	NHS Thurrock	160,800	323	361	373	379	404	0.87	0.68	1.11	14.1
	NHS West Essex	293,200	361	368	406	419	454	0.92	0.77	1.09	8.2
Hertfordshire and the South Midlands	NHS Bedfordshire	425,900	404	413	470	488	528	1.07	0.94	1.21	11.2
	NHS Corby	64,200	327	358	327	327	343	0.72	0.48	1.10	4.5
	NHS East and North Hertfordshire	546,300	357	372	403	428	458	0.95	0.84	1.08	10.4
	NHS Herts Valleys	575,800	384	406	419	448	485	1.01	0.90	1.13	14.6
	NHS Luton	**208,000**	**380**	**433**	**471**	**524**	**596**	**1.40**	**1.17**	**1.67**	**45.3**
	NHS Milton Keynes	261,400	375	413	444	448	509	1.09	0.92	1.29	19.6
	NHS Nene	626,600	393	409	402	429	474	0.96	0.86	1.07	9.1
Leicestershire and Lincolnshire	NHS East Leicestershire and Rutland	321,900	373	391	410	432	481	0.94	0.80	1.10	9.8
	NHS Leicester City	**333,800**	**503**	**536**	**560**	**617**	**677**	**1.60**	**1.41**	**1.83**	**49.5**
	NHS Lincolnshire East	229,400	366	370	392	423	445	0.83	0.68	1.00	2.0
	NHS Lincolnshire West	229,600	327	344	357	396	422	0.85	0.70	1.04	3.0
	NHS South Lincolnshire	*142,600*	*281*	*281*	*309*	*309*	*365*	*0.70*	*0.53*	*0.92*	*2.3*
	NHS South West Lincolnshire	*122,800*	*252*	*309*	*334*	*358*	*374*	*0.72*	*0.54*	*0.96*	*2.3*
	NHS West Leicestershire	377,300	419	445	461	482	501	1.00	0.86	1.15	6.9
Shropshire and Staffordshire	*NHS Cannock Chase*	*133,600*	*337*	*329*	*329*	*359*	*367*	*0.72*	*0.54*	*0.95*	*2.4*
	NHS East Staffordshire	*124,600*	*233*	*257*	*249*	*329*	*329*	*0.66*	*0.48*	*0.89*	*9.0*
	NHS North Staffordshire	214,400	354	382	410	443	443	0.86	0.70	1.05	3.5
	NHS Shropshire	*308,600*	*347*	*360*	*344*	*356*	*369*	*0.70*	*0.59*	*0.84*	*2.0*
	NHS South East Staffs and Seisdon and Peninsular	224,500	401	392	379	423	450	0.86	0.71	1.05	3.6
	NHS Stafford and Surrounds	151,700	316	343	363	402	435	0.83	0.65	1.05	4.7
	NHS Stoke on Trent	258,400	410	406	433	433	460	0.96	0.81	1.15	11.0
	NHS Telford & Wrekin	*168,500*	*285*	*291*	*285*	*332*	*332*	*0.69*	*0.53*	*0.89*	*7.3*

Table 3.4 Continued

UK area	CCG/HB	Total population	Crude rate pmp					Age and gender standardised rate ratio 2014			% non-White
			2010	2011	2012	2013	2014	O/E	95% LCL	95% UCL	
London	NHS Barking & Dagenham	194,400	329	391	386	453	484	1.20	0.98	1.47	41.7
	NHS Barnet	**369,100**	**463**	**515**	**580**	**607**	**615**	**1.37**	**1.20**	**1.56**	**35.9**
	NHS Camden	229,700	392	440	466	470	474	1.07	0.89	1.30	33.7
	NHS City and Hackney	265,000	328	328	343	392	441	1.07	0.89	1.28	44.6
	NHS Enfield	**320,500**	**484**	**543**	**596**	**618**	**671**	**1.51**	**1.33**	**1.73**	**39.0**
	NHS Haringey	**263,400**	**421**	**459**	**501**	**528**	**581**	**1.32**	**1.13**	**1.55**	**39.5**
	NHS Havering	*242,100*	*310*	*326*	*339*	*392*	*384*	*0.80*	*0.65*	*0.98*	*12.3*
	NHS Islington	**215,700**	**459**	**496**	**538**	**566**	**603**	**1.39**	**1.17**	**1.65**	**31.8**
	NHS Newham	**318,200**	**305**	**317**	**368**	**431**	**497**	**1.26**	**1.08**	**1.47**	**71.0**
	NHS Redbridge	**288,300**	**413**	**437**	**496**	**524**	**590**	**1.35**	**1.16**	**1.57**	**57.5**
	NHS Tower Hamlets	272,900	264	268	304	326	381	1.00	0.82	1.21	54.8
	NHS Waltham Forest	**265,800**	**406**	**433**	**433**	**470**	**542**	**1.25**	**1.06**	**1.47**	**47.8**
	NHS Brent	**317,300**	**574**	**589**	**640**	**712**	**744**	**1.67**	**1.47**	**1.90**	**63.7**
	NHS Central London (Westminster)	162,700	449	455	473	498	559	1.17	0.95	1.43	36.2
	NHS Ealing	**342,500**	**569**	**593**	**625**	**642**	**707**	**1.57**	**1.39**	**1.78**	**51.0**
	NHS Hammersmith and Fulham	178,700	431	420	437	470	492	1.11	0.90	1.37	31.9
	NHS Harrow	**243,400**	**703**	**703**	**723**	**731**	**801**	**1.73**	**1.50**	**1.99**	**57.8**
	NHS Hillingdon	**286,800**	**502**	**554**	**586**	**593**	**655**	**1.47**	**1.27**	**1.69**	**39.4**
	NHS Hounslow	**262,400**	**492**	**507**	**522**	**591**	**644**	**1.44**	**1.24**	**1.67**	**48.6**
	NHS West London (Kensington and Chelsea, Queen's Park and Paddington)	219,800	469	464	460	482	519	1.09	0.90	1.31	33.4
	NHS Bexley	**236,700**	**499**	**511**	**524**	**566**	**579**	**1.23**	**1.04**	**1.46**	**18.1**
	NHS Bromley	317,900	475	475	503	525	547	1.13	0.97	1.31	15.7
	NHS Croydon	372,800	338	365	378	416	443	0.97	0.83	1.13	44.9
	NHS Greenwich	**264,000**	**348**	**383**	**420**	**458**	**542**	**1.25**	**1.06**	**1.47**	**37.5**
	NHS Kingston	166,800	390	402	438	456	492	1.08	0.87	1.34	25.5
	NHS Lambeth	314,200	309	350	395	442	484	1.12	0.96	1.32	42.9
	NHS Lewisham	286,200	370	381	391	468	510	1.16	0.99	1.37	46.5
	NHS Merton	**203,200**	**403**	**433**	**472**	**536**	**566**	**1.24**	**1.03**	**1.49**	**35.1**
	NHS Richmond	191,400	308	334	361	392	418	0.86	0.69	1.07	14.0
	NHS Southwark	**298,500**	**469**	**499**	**546**	**593**	**637**	**1.47**	**1.28**	**1.70**	**45.8**
	NHS Sutton	195,900	434	449	485	495	500	1.05	0.86	1.28	21.4
	NHS Wandsworth	310,500	328	364	386	415	454	1.05	0.89	1.24	28.6
Bath, Gloucestershire, Swindon and Wiltshire	NHS Bath and North East Somerset	180,100	283	283	289	361	400	0.84	0.67	1.06	5.4
	NHS Gloucestershire	*605,700*	*352*	*383*	*378*	*421*	*424*	*0.83*	*0.74*	*0.94*	*4.6*
	NHS Swindon	219,300	410	438	447	483	520	1.07	0.89	1.29	10.0
	NHS Wiltshire	*479,600*	*352*	*379*	*398*	*402*	*434*	*0.86*	*0.75*	*0.98*	*3.4*
Bristol, North Somerset, Somerset and South Gloucestershire	**NHS Bristol**	**437,500**	**464**	**471**	**494**	**530**	**549**	**1.26**	**1.11**	**1.42**	**16.0**
	NHS North Somerset	206,100	461	471	505	534	534	1.04	0.86	1.25	2.7
	NHS Somerset	*538,100*	*379*	*411*	*414*	*435*	*452*	*0.87*	*0.77*	*0.99*	*2.0*
	NHS South Gloucestershire	269,100	453	468	476	502	502	1.01	0.86	1.20	5.0

Table 3.4 Continued

UK area	CCG/HB	Total population	Crude rate pmp					Age and gender standardised rate ratio 2014			% non-White
			2010	2011	2012	2013	2014	O/E	95% LCL	95% UCL	
Devon, Cornwall and Isles of Scilly	NHS Kernow	543,600	456	482	521	548	570	1.09	0.97	1.22	1.8
	NHS North, East, West Devon	874,300	424	431	455	491	503	1.00	0.91	1.10	3.0
	NHS South Devon and Torbay	275,000	469	487	495	553	596	1.12	0.97	1.31	2.1
Kent and Medway	NHS Ashford	121,700	460	485	534	534	575	1.18	0.93	1.49	6.3
	NHS Canterbury and Coastal	202,400	400	425	494	504	553	1.16	0.97	1.40	5.9
	NHS Dartford, Gravesham and Swanley	251,900	476	465	484	512	548	1.14	0.96	1.34	13.0
	NHS Medway	271,100	406	409	432	468	480	1.01	0.85	1.20	10.4
	NHS South Kent Coast	203,600	344	368	388	417	467	0.91	0.74	1.11	4.5
	NHS Swale	109,600	420	520	547	611	620	1.26	1.00	1.60	3.8
	NHS Thanet	**136,800**	**409**	**461**	**541**	**592**	**629**	**1.27**	**1.03**	**1.57**	**4.5**
	NHS West Kent	*467,500*	*347*	*361*	*385*	*409*	*430*	*0.87*	*0.75*	*0.99*	*4.9*
Surrey and Sussex	NHS Brighton & Hove	278,100	349	356	363	370	388	0.84	0.70	1.02	10.9
	NHS Coastal West Sussex	480,200	394	423	421	456	479	0.93	0.82	1.06	3.8
	NHS Crawley	*109,000*	*257*	*284*	*294*	*294*	*321*	*0.70*	*0.50*	*0.98*	*20.1*
	NHS East Surrey	*177,900*	*326*	*337*	*343*	*377*	*365*	*0.74*	*0.58*	*0.94*	*8.3*
	NHS Eastbourne, Hailsham and Seaford	*183,500*	*316*	*327*	*338*	*360*	*371*	*0.73*	*0.58*	*0.93*	*4.4*
	NHS Guildford and Waverley	*207,800*	*284*	*270*	*308*	*322*	*337*	*0.70*	*0.55*	*0.88*	*7.2*
	NHS Hastings & Rother	*181,800*	*325*	*352*	*347*	*369*	*396*	*0.77*	*0.61*	*0.97*	*4.6*
	NHS High Weald Lewes Havens	169,100	331	337	396	402	426	0.81	0.64	1.02	3.1
	NHS Horsham and Mid Sussex	*225,300*	*324*	*324*	*328*	*355*	*408*	*0.81*	*0.66*	*0.99*	*4.9*
	NHS North West Surrey	340,200	420	429	453	476	494	1.00	0.86	1.17	12.5
	NHS Surrey Downs	284,700	393	397	400	432	453	0.90	0.75	1.07	9.1
	NHS Surrey Heath	94,400	477	508	540	508	466	0.92	0.68	1.24	9.3
Thames Valley	NHS Aylesbury Vale	199,500	491	521	541	562	577	1.15	0.96	1.38	9.7
	NHS Bracknell and Ascot	134,400	417	454	476	499	499	1.03	0.81	1.31	9.5
	NHS Chiltern	319,400	426	423	470	498	498	1.01	0.86	1.18	15.8
	NHS Newbury and District	105,700	501	568	568	577	568	1.13	0.88	1.46	4.4
	NHS North & West Reading	99,900	410	410	440	500	490	0.98	0.74	1.30	10.4
	NHS Oxfordshire	652,300	423	437	469	483	520	1.09	0.98	1.21	9.3
	NHS Slough	**143,000**	**601**	**608**	**636**	**762**	**811**	**1.91**	**1.60**	**2.30**	**54.3**
	NHS South Reading	**109,000**	**495**	**504**	**495**	**532**	**587**	**1.42**	**1.11**	**1.82**	**30.5**
	NHS Windsor, Ascot and Maidenhead	139,900	408	436	508	558	593	1.23	0.99	1.53	14.7
	NHS Wokingham	157,900	405	418	443	450	481	0.96	0.77	1.21	11.6
Wessex	*NHS Dorset*	*754,500*	*404*	*412*	*410*	*419*	*441*	*0.87*	*0.78*	*0.96*	*4.0*
	NHS Fareham and Gosport	197,100	396	411	406	467	487	0.96	0.79	1.17	3.4
	NHS Isle of Wight	*138,400*	*354*	*361*	*376*	*354*	*354*	*0.67*	*0.50*	*0.88*	*2.7*
	NHS North East Hampshire and Farnham	207,500	366	366	385	414	453	0.93	0.76	1.14	9.7
	NHS North Hampshire	*217,800*	*331*	*358*	*372*	*386*	*404*	*0.81*	*0.66*	*0.99*	*6.4*
	NHS Portsmouth	207,500	371	371	386	410	410	0.92	0.75	1.14	11.6
	NHS South Eastern Hampshire	209,900	414	405	434	448	510	1.00	0.82	1.20	3.1
	NHS Southampton	242,100	326	372	405	446	483	1.12	0.93	1.34	14.1
	NHS West Hampshire	*548,000*	*398*	*411*	*422*	*438*	*445*	*0.87*	*0.77*	*0.98*	*3.9*
Wales	*Betsi Cadwaladr University*	*692,000*	*361*	*361*	*355*	*341*	*358*	*0.70*	*0.62*	*0.80*	*2.5*
	Powys Teaching	*132,700*	*414*	*407*	*354*	*377*	*384*	*0.72*	*0.54*	*0.94*	*1.6*
	Hywel Dda	383,900	401	430	425	487	492	0.96	0.83	1.11	2.2
	Abertawe Bro Morgannwg University	**520,700**	**490**	**545**	**574**	**601**	**613**	**1.23**	**1.11**	**1.38**	**3.9**
	Cwm Taf	**295,100**	**630**	**664**	**688**	**742**	**732**	**1.49**	**1.30**	**1.70**	**2.6**
	Aneurin Bevan	**579,100**	**499**	**521**	**582**	**597**	**604**	**1.21**	**1.09**	**1.35**	**3.9**
	Cardiff and Vale University	478,900	441	466	497	510	505	1.11	0.98	1.26	12.2

Table 3.4 Continued

UK area	CCG/HB	Total population	Crude rate pmp 2010	2011	2012	2013	2014	Age and gender standardised rate ratio 2014 O/E	95% LCL	95% UCL	% non-White
Scotland	Ayrshire and Arran	372,200	395	387	414	435	465	0.89	0.76	1.03	1.2
	Borders	113,900	465	465	527	544	553	1.02	0.79	1.30	1.3
	Dumfries and Galloway	150,300	366	399	393	393	439	0.81	0.64	1.03	1.2
	Fife	*366,900*	*333*	*360*	*376*	*409*	*422*	*0.83*	*0.71*	*0.97*	*2.4*
	Forth Valley	299,700	317	344	370	397	444	0.87	0.73	1.03	2.2
	Grampian	579,200	373	387	406	439	447	0.89	0.79	1.01	4.0
	Greater Glasgow and Clyde	**1,137,900**	**424**	**439**	**485**	**522**	**549**	**1.12**	**1.04**	**1.21**	**7.3**
	Highland	321,000	483	480	483	505	530	0.99	0.85	1.15	1.3
	Lanarkshire	652,600	408	428	461	481	527	1.04	0.93	1.15	2.0
	Lothian	*849,700*	*347*	*364*	*374*	*385*	*410*	*0.84*	*0.76*	*0.94*	*5.6*
	Orkney	21,600	371	371	371	371	278	0.51	0.23	1.14	0.7
	Shetland	23,200	259	216	259	259	259	0.50	0.22	1.11	1.5
	Tayside	412,200	405	417	425	446	459	0.91	0.79	1.05	3.2
	Western Isles	27,400	255	292	292	292	292	0.54	0.27	1.07	0.9
Northern Ireland	Belfast	349,600	383	395	429	458	509	1.12	0.97	1.29	3.2
	Northern	466,700	358	373	384	414	456	0.95	0.83	1.09	1.2
	Southern	365,700	306	345	388	418	468	1.02	0.88	1.19	1.2
	South Eastern	350,800	359	388	393	419	465	0.95	0.82	1.11	1.3
	Western	296,900	347	354	360	438	522	1.12	0.95	1.31	1.0

Table 3.5. Distribution of prevalent patients on RRT by centre and modality on 31/12/2014

Centre	*N*	% HD	% PD	% transplant
Transplant centres				
B QEH	2,137	45	7	49
Belfast	750	27	2	71
Bristol	1,460	36	5	59
Camb	1,243	30	2	68
Cardff	1,593	31	5	64
Covnt	962	41	9	50
Edinb	758	37	3	60
Glasgw	1,641	36	3	61
L Barts	2,236	43	10	47
L Guys	1,924	34	2	64
L Rfree	2,010	35	7	57
L St.G	797	37	6	55
L West	3,244	44	2	54
Leeds	1,500	35	4	61
Leic	2,151	42	6	52
Liv Roy	1,312	28	5	67
M RI	1,815	29	4	67
Newc	983	29	5	66
Nottm	1,066	34	8	58
Oxford	1,658	28	5	67
Plymth	510	27	7	66
Ports	1,595	39	5	56
Sheff	1,360	43	5	53

Table 3.5. Continued

Centre	*N*	% HD	% PD	% transplant
Dialysis centres				
Abrdn	515	41	5	53
Airdrie	399	46	2	51
Antrim	229	54	6	41
B Heart	638	65	5	30
Bangor*	99	84	16	
Basldn	280	62	10	28
Bradfd	549	41	4	56
Brightn	916	47	7	46
Carlis	250	30	11	59
Carsh	1,565	51	9	41
Chelms	263	51	10	38
Clwyd	165	55	7	38
Colchr	119	100		
D & Gall	133	37	13	50
Derby	519	46	17	37
Donc	285	64	9	26
Dorset	665	42	8	51
Dudley	305	58	18	25
Dundee	414	43	6	51
Exeter	950	44	10	46
Glouc	429	49	10	41
Hull	804	41	10	49
Inverns	227	31	7	62
Ipswi	369	34	8	57
Kent	1,019	40	6	53
Klmarnk	306	46	12	42
Krkcldy	283	52	6	42
L Kings	1,025	53	9	38
Liv Ain	218	74	19	7
Middlbr	858	39	2	59
Newry	208	44	8	48
Norwch	691	47	5	48
Prestn	1,171	48	5	47
Redng	763	39	10	52
Salford	969	42	9	49
Shrew	349	55	9	36
Stevng	782	62	3	34
Sthend	238	49	8	43
Stoke	776	43	11	46
Sund	452	47	4	49
Swanse	704	47	8	45
Truro	380	39	6	55
Ulster	149	66	3	31
West NI	272	43	5	52
Wirral	246	83	9	7
Wolve	575	55	14	32
Wrexm	281	40	11	49
York	461	31	6	63
England	**49,842**	**41**	**6**	**52**
N Ireland	**1,608**	**39**	**4**	**57**
Scotland	**4,676**	**40**	**5**	**56**
Wales	**2,842**	**39**	**7**	**54**
UK	**58,968**	**41**	**6**	**53**

*Bangor was only able to report on a few transplant patients with the rest reported by Liverpool Royal. These have thus been reallocated to Liverpool Royal to maintain consistency with previous annual reports, for analyses shown in tables 3.3 and 3.5 only
Blank cells: no patients on that modality

Table 3.6. Median age and gender ratio of incident and prevalent transplant patients 2009–2014

	Incident transplants			Prevalent transplants*		
Year	*N*	Median age	M:F ratio	*N*	Median age	M:F ratio
2009	2,488	48.3	1.6	23,500	50.8	1.5
2010	2,584	49.6	1.7	24,889	51.2	1.6
2011	2,627	49.1	1.7	26,180	51.7	1.6
2012	2,781	50.4	1.6	27,541	52.3	1.6
2013	3,123	50.3	1.6	29,467	52.8	1.6
2014	3,020	50.6	1.5	31,164	53.3	1.5

*As on 31st December for given year

geographical differences in access to renal transplantation in the UK. This has previously been analysed in detail by the UKRR [2] and is currently the focus of a large national study (access to Transplant and Transplant Outcome Measures (ATTOM)).

The proportion of prevalent RRT patients with a transplant relative to the number on dialysis has gradually risen over the last decade.

Age and gender

The gender ratio amongst incident and prevalent transplant patients has remained stable for at least the last ten years (table 3.6, figure 3.1). Note, absolute patient numbers differ from those published in previous reports as a result of additional data validation and reallocation of patients. The average age of incident transplant patients has steadily increased during the same time period. There has also been a gradual increase in the average age of prevalent transplant patients, which could reflect the increasing age at which patients are transplanted and/or improved survival after renal transplantation over the last few years. The prevalent transplant patient workload across the UK increased to 31,164 patients at the end of 2014. The continued expansion of this patient group means there is a need for careful planning by renal centres for future service provision and resource allocation.

Primary renal diagnosis

The primary renal diagnosis of patients receiving kidney transplants in the UK has remained relatively stable over the last five years (table 3.7).

Ethnicity

It was difficult to compare the proportion of patients within each ethnic group receiving a transplant to those commencing dialysis from the same group because data on ethnicity were missing in a considerable number of patients who were classified as ethnicity 'unknown' (table 3.8). The percentages of patients with unknown ethnicity between 2009 and 2013 provided in this year's chapter are different from those in last year's chapter [3]; this reflects retrospective input of ethnicity data, improving data completeness.

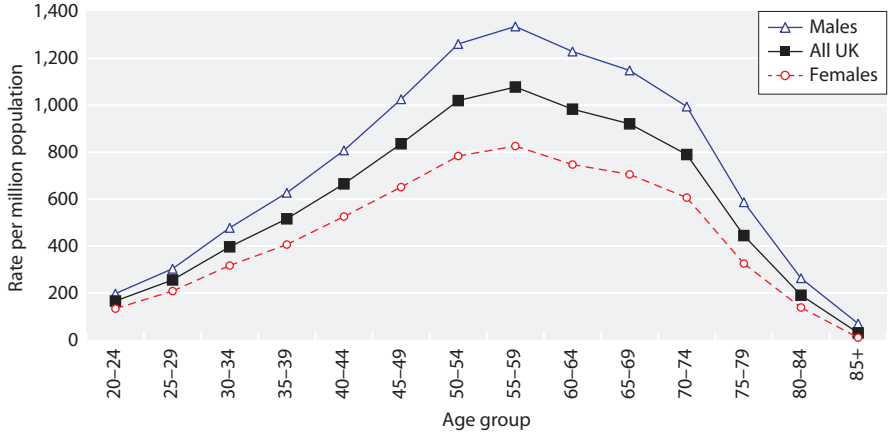

Fig. 3.1. Transplant prevalence rate per million population by age and gender on 31/12/2014

Table 3.7. Primary renal diagnosis in renal transplant recipients 2009–2014

	New transplants by year							Established transplants on 01/01/2014	
Primary renal diagnosis	2009 %	2010 %	2011 %	2012 %	2013 %	2014 %	2014 *N*	%	*N*
Aetiology uncertain	14.0	14.1	14.6	12.2	13.0	11.8	347	14.9	4,396
Diabetes	13.1	11.3	13.0	15.2	13.8	15.0	439	10.0	2,943
Glomerulonephritis	23.3	19.8	22.9	23.1	22.8	21.4	628	23.1	6,817
Polycystic kidney disease	13.2	13.5	12.3	13.5	13.8	13.7	402	13.1	3,860
Pyelonephritis	11.2	9.5	10.0	10.4	10.1	8.5	248	13.3	3,906
Reno-vascular disease	6.2	7.0	7.0	7.0	8.3	7.5	219	5.9	1,752
Other	15.9	16.0	17.0	17.0	15.1	17.1	502	17.5	5,145
Not available	3.1	8.8	3.2	1.7	3.2	4.9	145	2.2	648

Clinical and laboratory outcomes

Introduction

There continued to be marked variation in the completeness of data (tables 3.9a, 3.9b) reported by each renal centre, particularly for blood pressure. Better data records (or possibly better extraction of data held within renal IT systems) would facilitate more meaningful comparisons between centres and help to determine the causes of inter-centre differences in outcomes. For this reason, along with differences in repatriation policies of prevalent transplant patients between centres as highlighted previously, caution needs to be exercised when comparing centre performance.

The 71 renal centres in the UK comprise 52 centres in England, five in Wales, five in Northern Ireland and nine in Scotland. Colchester was reported as having no transplanted patients and was therefore excluded. After exclusion of this centre, prevalent patient data from 70 renal centres across the UK were analysed.

For the one year post-transplant analyses, in which patients were assigned to the centre that performed their transplant, all 23 transplant centres across the UK were included in the analysis.

Methods

Data for key laboratory variables are reported for all prevalent patients with valid data returns for a given renal centre (both transplanting and non-transplanting centres) and for one year post-transplant results for patients transplanted 2007–2013, with patients attributed to the transplant centre that performed the procedure.

Time since transplantation may have a significant effect on key biochemical and clinical variables and this is likely to be independent of a centre's clinical practices. Therefore, inter-centre comparison of data on prevalent transplant patients is open to bias. To minimise bias relating to fluctuations in biochemical and clinical parameters occurring in the initial post-transplant period, one year post-transplantation outcomes are also reported. It is presumed that patient selection policies and local clinical practices are more likely to be relevant in influencing outcomes 12 months post-transplant and therefore comparison of outcomes between centres is more robust. However, even the 12 months post-transplant comparisons could be biased by the fact that in some centres, repatriation of patients only occurs if the graft is failing whereas in others it only occurs if the graft function is stable.

Centres with <20 patients or $<50\%$ data completeness have been excluded from the figures. Scottish centres were also excluded from blood pressure analyses as data were not provided.

Prevalent patient data

Biochemical and clinical data for patients with a functioning transplant followed in either a transplanting or non-transplanting

Table 3.8. Ethnicity of patients who received a transplant in the years 2009–2014

Year	% White	% S Asian	% Black	% Other	% Unknown
2009	76.2	10.5	6.9	2.1	4.3
2010	76.8	10.6	6.0	2.1	4.4
2011	76.1	9.9	6.5	2.4	5.1
2012	73.3	9.9	7.4	2.9	6.5
2013	71.5	12.0	7.4	2.2	6.9
2014	68.6	12.7	7.3	2.9	8.4

Table 3.9a. Percentage completeness of ethnicity, eGFR and blood pressure by centre for prevalent transplant patients on 31/12/2014

Centre	*N*	Ethnicity[a]	eGFR	Blood pressure[b]
England				
B Heart	189	100	93	1
B QEH	1,008	100	94	93
Basldn	78	100	99	82
Bradfd	295	100	94	67
Brightn	407	99	96	0
Bristol	835	100	100	71
Camb	819	98	90	80
Carlis	144	100	95	0
Carsh	627	100	89	0
Chelms	98	99	96	92
Covnt	487	100	96	82
Derby	184	100	96	90
Donc	67	100	97	97
Dorset	320	100	88	74
Dudley	73	100	99	47
Exeter	430	100	98	92
Glouc	173	100	98	92
Hull	389	99	95	1
Ipswi	211	100	97	0
Kent	528	100	98	91
L Barts	995	100	98	0
L Guys	1,200	99	97	0
L Kings	385	100	98	99
L RFree	1,109	99	97	78
L St.G	417	95	97	91
L West	1,699	100	95	0
Leeds	884	100	98	97
Leic	1,077	98	97	39
Liv Ain	12	92	100	0
Liv Roy	861	99	89	1
M RI	1,163	99	96	0
Middlbr	492	100	92	40
Newc	627	100	99	0
Norwch	328	100	98	4
Nottm	598	100	98	84
Oxford	1,057	95	99	17
Plymth	317	100	96	89
Ports	876	99	95	11
Prestn	522	100	99	0
Redng	361	99	99	0
Salford	436	100	96	0
Sheff	695	100	99	97
Shrew	123	100	89	0
Stevng	263	100	98	25
Sthend	101	100	98	49
Stoke	349	100	99	1
Sund	217	100	98	1
Truro	207	100	100	1
Wirral	14	100	86	0
Wolve	182	100	96	73
York	278	99	95	37
N Ireland				
Antrim	93	100	99	97
Belfast	511	100	99	51
Newry	97	100	100	87
Ulster	44	100	100	95
West NI	123	100	100	95
Scotland				
Abrdn	268	59	96	n/a
Airdrie	200	62	73	n/a
D & Gall	66	29	94	n/a
Dundee	210	65	99	n/a
Edinb	445	26	97	n/a
Glasgw	989	24	71	n/a
Inverns	139	86	87	n/a
Klmarnk	125	73	61	n/a
Krkcldy	118	38	94	n/a
Wales				
Bangor	3	100	100	0
Cardff	995	100	99	98
Clwyd	60	100	88	62
Swanse	308	100	98	98
Wrexm	135	100	99	16
England	**25,228**	**99**	**96**	**38**
N Ireland	**868**	**100**	**99**	**68**
Scotland	**2,560**	**41**	**83**	**n/a**
Wales	**1,501**	**100**	**99**	**89**
UK	**30,157**	**94**	**95**	**42[c]**

[a]Patients with missing ethnicity were classed as White for eGFR calculation
[b]Scottish centres excluded from blood pressure analysis as data not provided by the Scottish Renal Registry
[c]Excluding Scotland

centre were included in the analyses. The cohort consisted of prevalent patients as on 31st December 2014. Patients were considered as having a functioning transplant if 'transplant' was listed as the last mode of RRT in the last quarter of 2014. Patients were assigned to the renal centre that sent the data to the UKRR but some patients will have received care in more than one centre. If data for the same transplant patient were received from both the transplant centre and non-transplant centre, care was usually allocated to the non-transplant centre (see appendix B2). Patients with a functioning transplant of less than three months duration were excluded from analyses. For haemoglobin, estimated glomerular filtration rate (eGFR), corrected calcium, phosphate and blood pressure (BP), the latest value in quarter 3 or quarter 4 of 2014 was used.

Estimated glomerular filtration rate (eGFR)

For the purpose of eGFR calculation, the original 4-variable MDRD formula was used (with a constant of 186) to calculate

Table 3.9b. Percentage completeness of haemoglobin, serum cholesterol, serum calcium, serum phosphate and serum PTH by centre for prevalent transplant patients on 31/12/2014

Centre	*N*	Haemoglobin	Total serum cholesterol	Adjusted serum calcium[b]	Serum phosphate	Serum PTH
England						
B Heart	189	92	67	91	90	22
B QEH	1,008	94	92	94	93	77
Basldn	78	99	46	97	87	38
Bradfd	295	93	71	82	57	28
Brightn	407	96	68	93	93	44
Bristol	835	100	95	99	99	99
Camb	819	89	85	90	89	84
Carlis	144	95	63	92	88	14
Carsh	627	89	58	89	89	41
Chelms	98	95	85	96	78	12
Covnt	487	95	1	94	71	46
Derby	184	95	93	95	94	89
Donc	67	97	54	97	97	52
Dorset	320	86	73	86	68	40
Dudley	73	99	92	99	99	75
Exeter	430	98	86	97	97	33
Glouc	173	98	58	97	97	26
Hull	389	95	26	92	92	25
Ipswi	211	95	49	97	97	48
Kent	528	97	80	96	96	19
L Barts	995	98	98	98	98	97
L Guys	1,200	0	61	95	95	43
L Kings	385	98	79	98	98	65
L RFree	1,109	96	76	96	96	83
L St.G	417	97	90	97	97	80
L West	1,699	95	39	95	95	35
Leeds	884	98	98	97	97	36
Leic	1,077	97	95	96	96	48
Liv Ain	12	100	83	100	100	67
Liv Roy	861	89	71	86	86	62
M RI	1,163	96	72	96	96	52
Middlbr	492	91	39	90	90	10
Newc	627	99	92	99	99	65
Norwch	328	97	98	95	95	21
Nottm	598	98	82	96	93	92
Oxford	1,057	98	71	98	98	39
Plymth	317	96	62	93	93	38
Ports	876	95	59	92	90	22
Prestn	522	99	66	98	97	62
Redng	382	99	81	99	87	51
Salford	436	96	89	96	95	56
Sheff	695	99	63	99	99	26
Shrew	123	89	75	82	82	2
Stevng	263	98	60	94	83	47
Sthend	101	98	54	97	94	16
Stoke	349	99	99	99	98	59
Sund	217	97	95	97	97	92
Truro	207	100	99	99	99	92
Wirral	14	86	93	86	86	71
Wolve	182	96	82	95	85	66
York	278	94	59	93	90	13

Table 3.9b. Continued

Centre	*N*	Haemoglobin	Total serum cholesterol	Adjusted serum calcium[b]	Serum phosphate	Serum PTH
N Ireland						
Antrim	93	99	99	94	98	98
Belfast	511	98	99	98	98	29
Newry	97	100	100	99	100	98
Ulster	44	100	100	93	100	48
West NI	123	94	99	96	98	97
Scotland						
Abrdn	268	96	n/a	95	94	n/a
Airdrie	200	99	n/a	99	96	n/a
D & Gall	66	98	n/a	95	91	n/a
Dundee	210	99	n/a	98	96	n/a
Edinb	445	97	n/a	95	91	n/a
Glasgw	989	98	n/a	98	97	n/a
Inverns	139	82	n/a	74	68	n/a
Klmarnk	125	98	n/a	99	98	n/a
Krkcldy	118	92	n/a	94	94	n/a
Wales						
Bangor	3	100	100	100	100	67
Cardff	995	99	96	99	99	20
Clwyd	60	98	100	95	95	87
Swanse	308	99	90	97	97	70
Wrexm	135	99	99	99	99	98
England	**25,228**	**91**	**73**	**95**	**93**	**52**
N Ireland	**868**	**98**	**99**	**97**	**98**	**55**
Scotland[a]	**2,560**	**97**	**n/a**	**95**	**94**	**n/a**
Wales	**1,501**	**99**	**95**	**98**	**98**	**40**
UK	**30,157**	**92**	**75[c]**	**95**	**94**	**52[c]**

[a]Dataset provided by the Scottish Renal Registry for Scottish centres shown did not include data on serum cholesterol or serum PTH
[b]Serum calcium corrected for serum albumin
[c]Excluding Scotland

eGFR from the serum creatinine concentration as reported by the centre (unless otherwise stated). A wide variety of creatinine assays are in use in clinical biochemistry laboratories in the UK, and it is not possible to ensure that all measurements of creatinine concentration collected by the UKRR are harmonised. Although many laboratories are now reporting assay results that have been aligned to the isotope dilution-mass spectrometry standard (which would necessitate use of the modified MDRD formula), this was not the case at the end of 2014. Patients with valid serum creatinine results but no ethnicity data were classed as White for the purpose of the eGFR calculation.

One year post-transplant data

Patients who received a renal transplant between 1st January 2007 and 31st December 2013 were assigned according to the renal centre in which they were transplanted. In a small number of instances, the first documented evidence of transplantation in a patient's record is from a timeline entry in data returned from a non-transplant centre, in these instances the patient was re-assigned to the nearest transplant centre.

Patients who had died or experienced graft failure within 12 months of transplantation were excluded from the analyses. Patients with more than one transplant during 2007–2013 were included as separate episodes provided each of the transplants functioned for a year.

For each patient, the most recent laboratory or blood pressure result for the relevant 4th/5th quarter after renal transplantation was taken to be representative of the one year post-transplant outcome. Again, for the purpose of the eGFR calculation patients with valid serum creatinine results but missing ethnicity data were classed as White.

Results and conclusions

Post-transplant eGFR in prevalent transplant patients

When interpreting eGFR post-transplantation, it is important to remember that estimated GFR formulae only have a modest predictive performance in the transplant population [4]. Median eGFR in each centre and percentage of patients with eGFR <30 ml/min/1.73 m^2 are shown in figures 3.2 and 3.3. The median eGFR was 52.5 ml/min/1.73 m^2, with 13% of prevalent transplant recipients having an eGFR <30 ml/min/1.73 m^2.

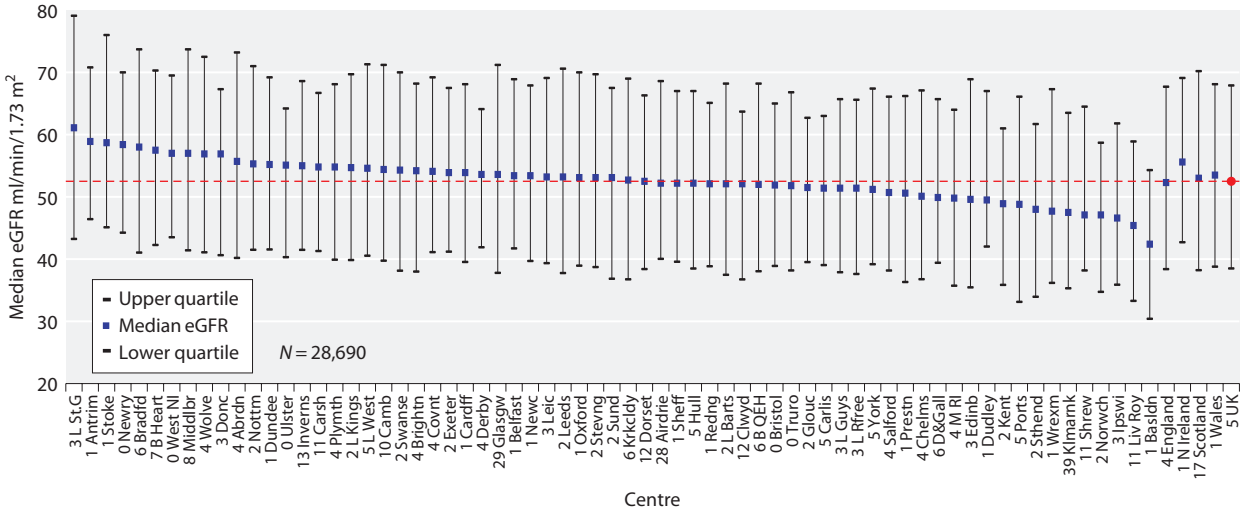

Fig. 3.2. Median eGFR in prevalent transplant patients by centre on 31/12/2014

Table 3.10 summarises the proportion of transplant patients with an eGFR <30 ml/min/1.73 m^2 by centre. Whilst local repatriation policies on timing of transfer of care for patients with failing transplants from transplant centres to referring centres might explain some of the differences, it is notable that both transplanting and non-transplanting centres feature at both ends of the scale. The accuracy of the 4–variable MDRD equation in estimating GFR $\geqslant$ 60 ml/min/1.73 m^2 is questionable [5], therefore a figure describing this is not included in this chapter.

Figure 3.4 shows the percentage of prevalent patients by centre with eGFR <30 ml/min/1.73 m^2 as a funnel plot, enabling a more reliable comparison of outcomes between centres across the UK. The solid lines show the 2 standard deviation limits (95%) and the dotted lines the limits for 3 standard deviations (99.9%). With 67 centres included and a normal distribution, 3–4 centres would be expected to fall between the 95–99.9% CI (1 in 20) and no centres should fall outside the 99.9% limits.

There continued to be variation between centres; these data show over-dispersion with 14 centres falling outside the 95% CI of which five centres were outside the 99.9% CI. Three centres (Nottingham, London St Georges, London West) fell outside the lower 99.9% CI suggesting a lower than expected proportion of patients with eGFR <30 ml/min/1.73 m^2. Liverpool Royal and Portsmouth both fell outside the upper 99.9% CI suggesting a higher

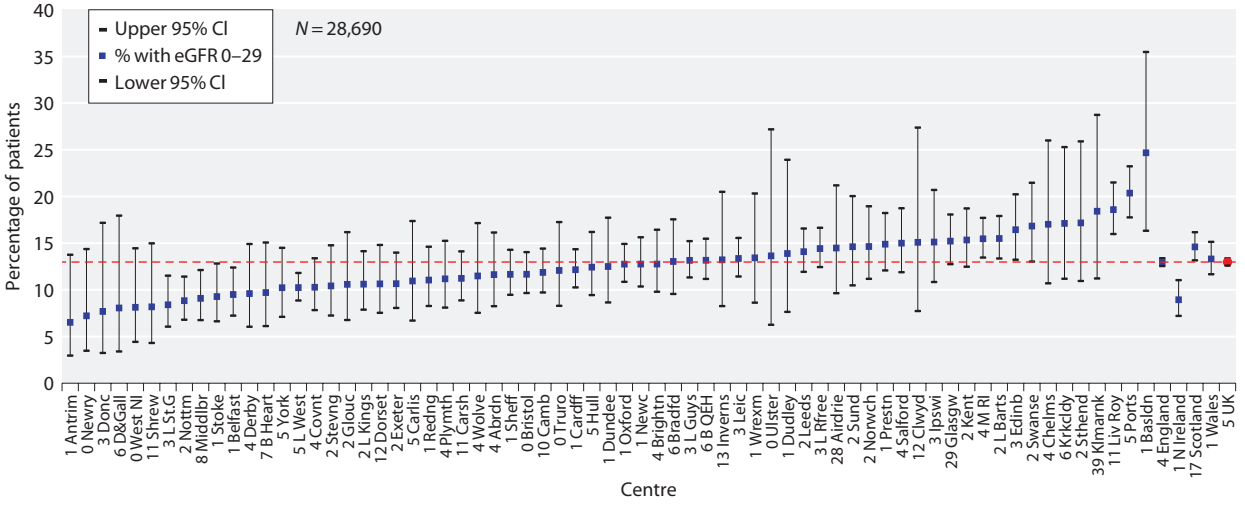

Fig. 3.3. Percentage of prevalent transplant patients by centre on 31/12/2014 with eGFR <30 ml/min/1.73 m^2

Table 3.10. Percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 on 31/12/2014

Centre	Patients with eGFR data (*N*)	Percentage with eGFR <30
Ulster	44	13.6
Clwyd	53	15.1
D & Gall	62	8.1
Donc	65	7.7
Dudley	72	13.9
Klmarnk	76	18.4
Basldn	77	24.7
Antrim	92	6.5
Chelms	94	17.0
Newry	97	7.2
Sthend	99	17.2
Shrew	110	8.2
Krkcldy	111	17.1
Inverns	121	13.2
West NI	123	8.1
Wrexm	134	13.4
Carlis	137	10.9
Airdrie	145	14.5
Glouc	170	10.6
Wolve	174	11.5
B Heart	175	9.7
Derby	177	9.6
Ipswi	205	15.1
Truro	207	12.1
Dundee	208	12.5
Sund	212	14.6
Abrdn	258	11.6
Stevng	259	10.4
York	264	10.2
Bradfd	276	13.0
Dorset	282	10.6
Swanse	303	16.8
Plymth	304	11.2
Norwch	321	14.6
Stoke	345	9.3
Hull	370	12.4
L Kings	377	10.6
Redng	380	11.1
Brightn	392	12.8
L St.G	405	8.4
Salford	420	15.0
Exeter	422	10.7
Edinb	432	16.4
Middlbr	451	9.1
Covnt	467	10.3
Belfast	505	9.5
Kent	515	15.3
Prestn	517	14.9
Carsh	561	11.2
Nottm	588	8.8
Newc	619	12.8
Sheff	686	11.7
Glasgw	703	15.2
Camb	733	11.9
Liv Roy	764	18.6
Bristol	831	11.7
Ports	835	20.4
Leeds	866	14.1
B QEH	949	13.2
L Barts	974	15.5
Cardff	987	12.2
Oxford	1,043	12.8
Leic	1,048	13.4
L Rfree	1,075	14.4
M RI	1,112	15.5
L Guys	1,163	13.2
L West	1,621	10.2

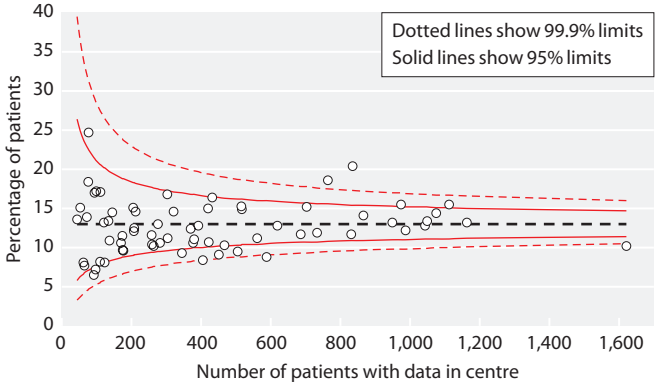

Fig. 3.4. Funnel plot of percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 by centre size on 31/12/2014

than expected proportion of patients with eGFR <30 ml/min/1.73 m^2.

eGFR in patients one year after transplantation

Graft function at one year post-transplantation may predict subsequent long term graft outcome [6]. Figures 3.5a, 3.5b, and 3.5c show the median one year post-transplant eGFR for patients transplanted between 2007–2013, by transplant type. Living kidney donation had the highest median eGFR at one year (57.4 ml/min/1.73 m^2), followed by donation after brainstem death (53.6 ml/min/1.73 m^2) and donation after circulatory death (50.1 ml/min/1.73 m^2).

Figures 3.6a, 3.6b and 3.6c show one year post-transplant eGFR by donor type and year of transplantation. An upward trend in eGFR ($p = 0.0007$) over the time

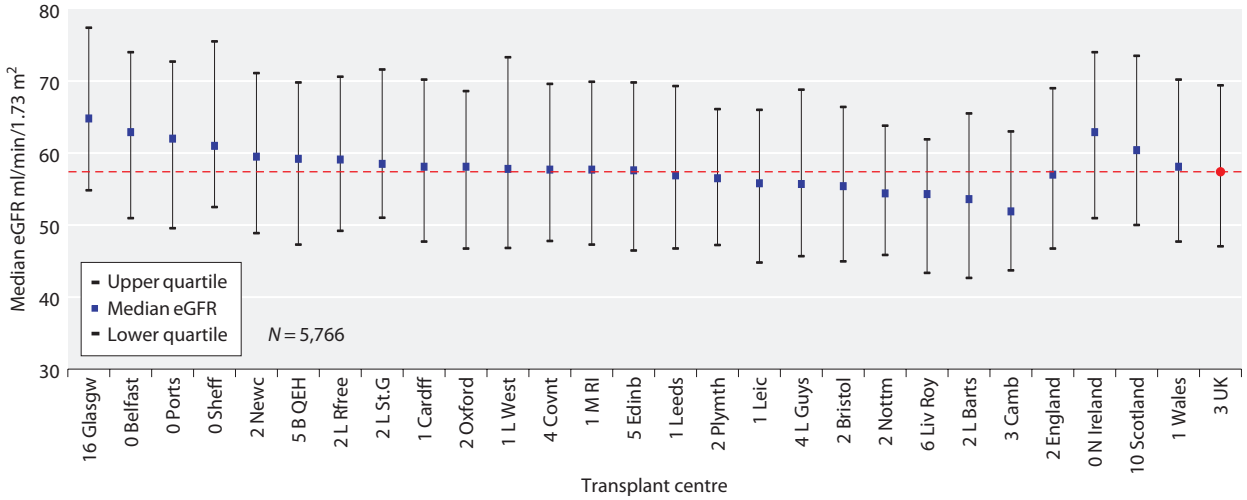

Fig. 3.5a. Median eGFR one year post-live donor transplant by transplant centre 2007–2013

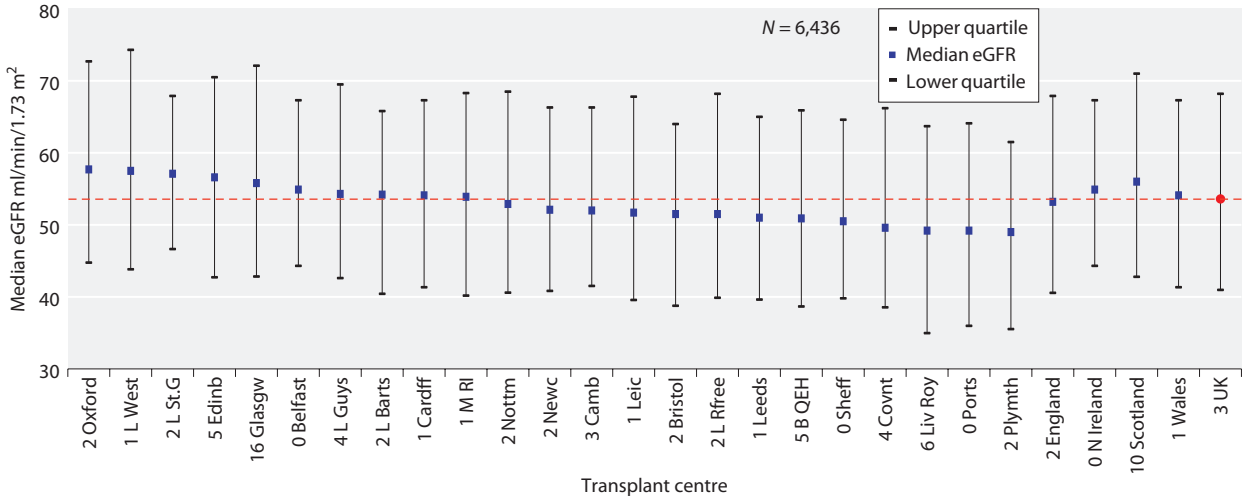

Fig. 3.5b. Median eGFR one year post-brainstem death donor transplant by transplant centre 2007–2013

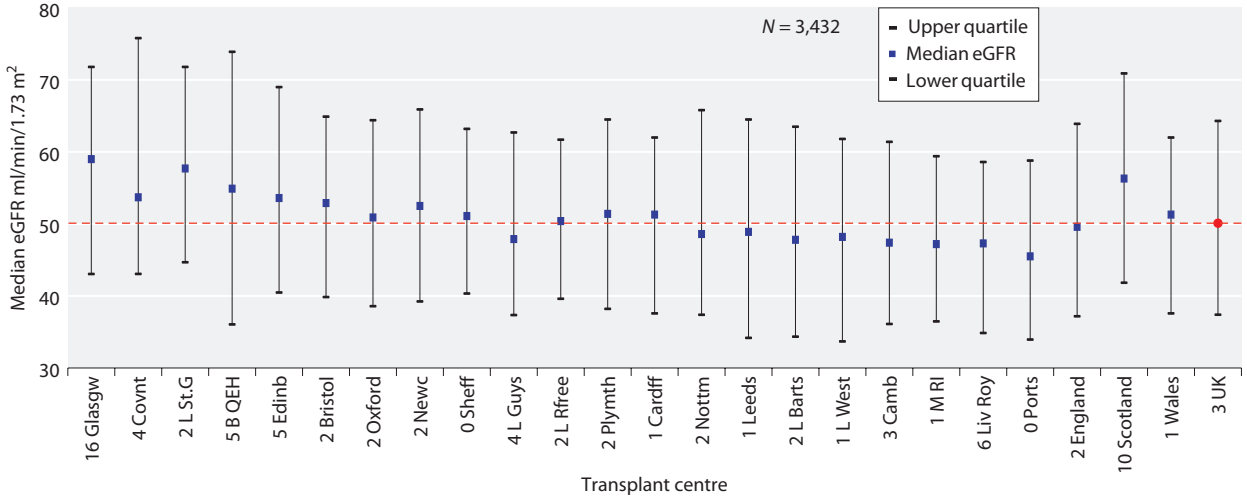

Fig. 3.5c. Median eGFR one year post-circulatory death donor transplant by transplant centre 2007–2013

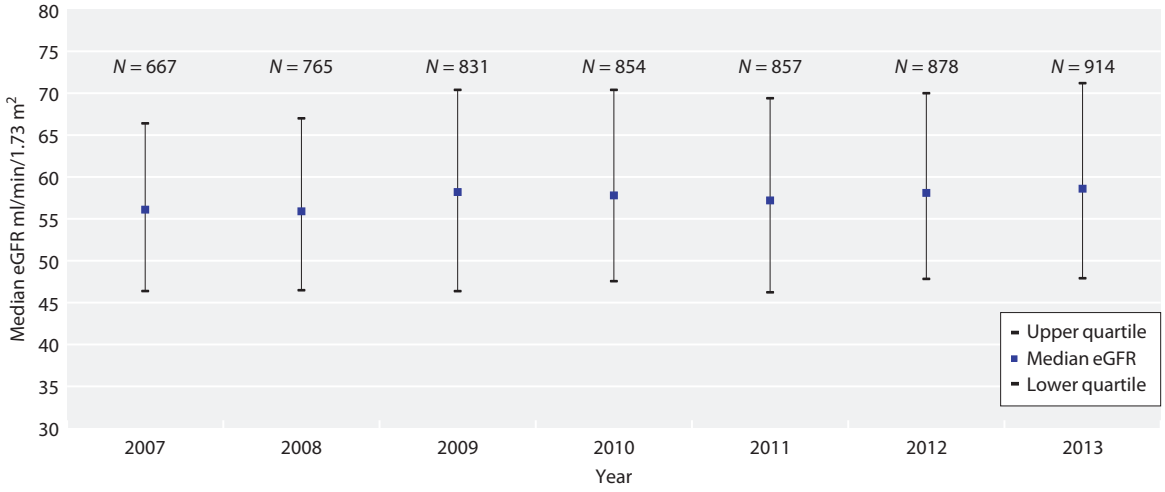

Fig. 3.6a. Median eGFR one year post-live donor transplant by year of transplantation 2007–2013

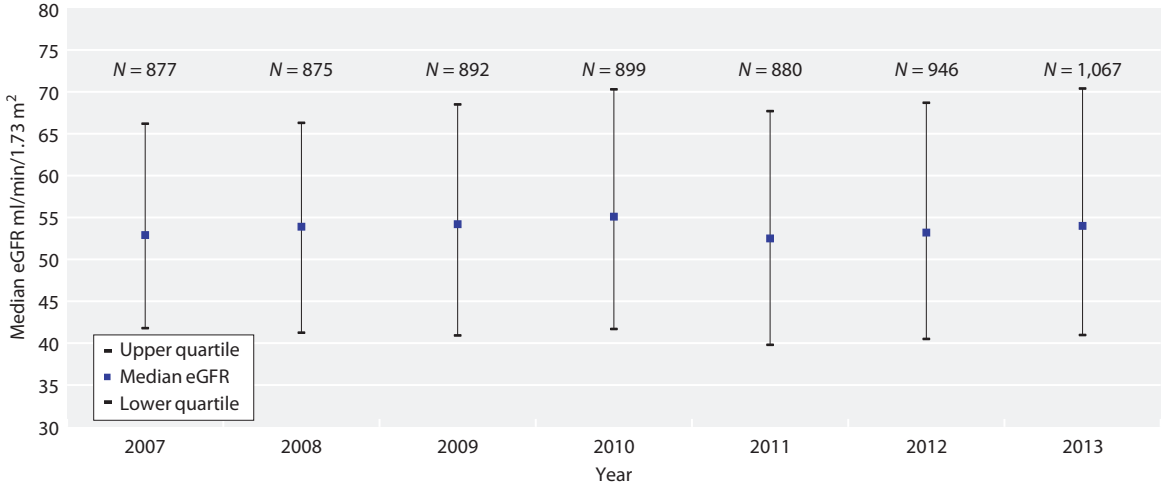

Fig. 3.6b. Median eGFR one year post-brainstem death donor transplant by year of transplantation 2007–2013

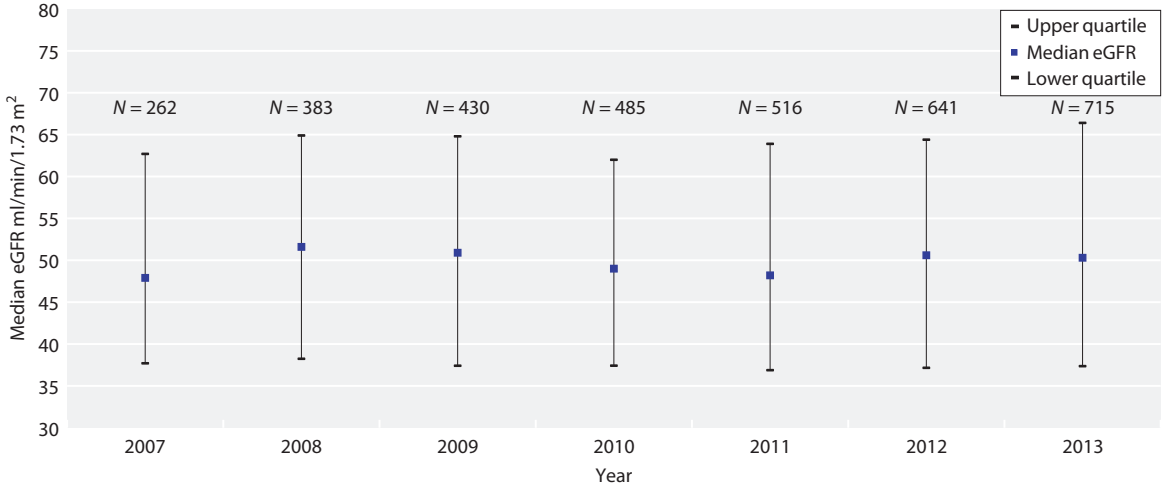

Fig. 3.6c. Median eGFR one year post-circulatory death donor transplant by year of transplantation 2007–2013

period was noticed with live kidney donation transplantation, but not with donation after brainstem death ($p = 0.14$) or donation after circulatory death ($p = 0.4$).

Haemoglobin in prevalent transplant patients

Transplant patients have previously fallen under the remit of the UK Renal Association Complications of Chronic Kidney Disease (CKD) guidelines. Updated guidelines regarding the management of anaemia in CKD were published by the association in November 2010 [7] which have now been adopted for this report. These guidelines recommend '***achieving a population distribution centred on a mean of 11 g/dl with a range of 10–12 g/dl***' *[8]* (equivalent to 110 g/L, range 100–120 g/L). However, many transplant patients with good transplant function will have haemoglobin concentrations >120 g/L without the use of erythopoiesis stimulating agents, and so it is inappropriate to audit performance using the higher limit.

A number of factors including comorbidity, immunosuppressive medication, graft function, ACE inhibitor use, erythropoietin (EPO) use, intravenous or oral iron use, as well as centre practices and protocols for management of anaemia, affect haemoglobin concentrations in transplant patients. Most of these data are not collected by the UKRR and therefore caution must be used when interpreting analyses of haemoglobin attainment. Figures 3.7a and 3.7b report centre results stratified according to graft function as estimated by eGFR. The

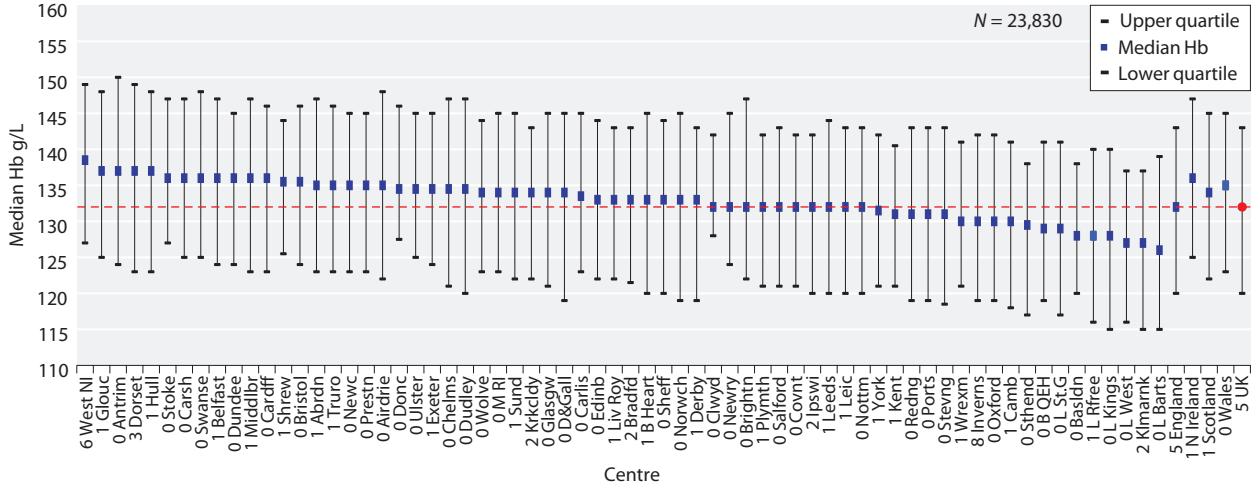

Fig. 3.7a. Median haemoglobin for prevalent transplant patients with eGFR ⩾30 ml/min/1.73 m^2 by centre on 31/12/2014

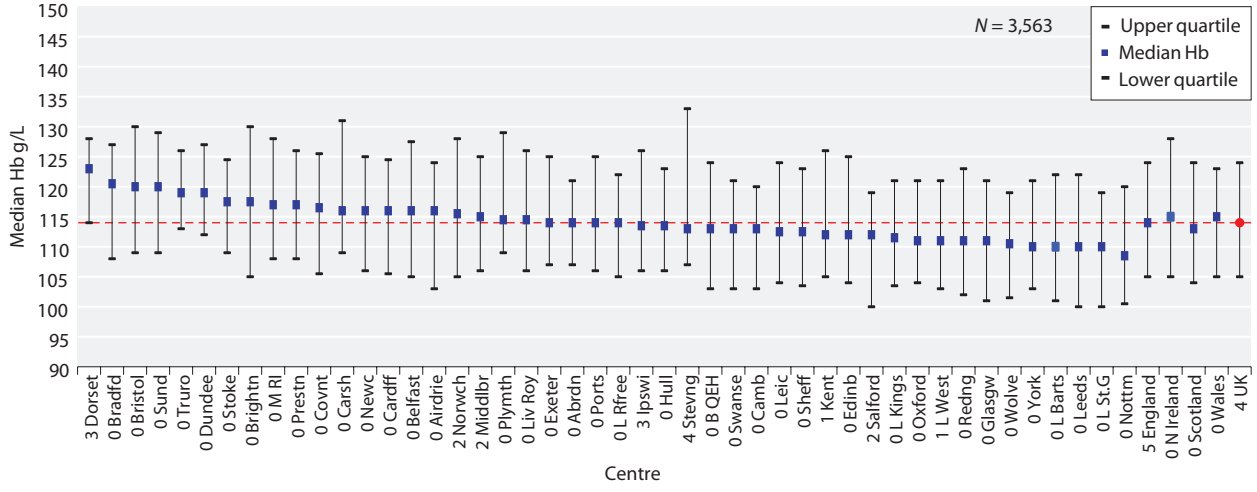

Fig. 3.7b. Median haemoglobin for prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 by centre on 31/12/2014

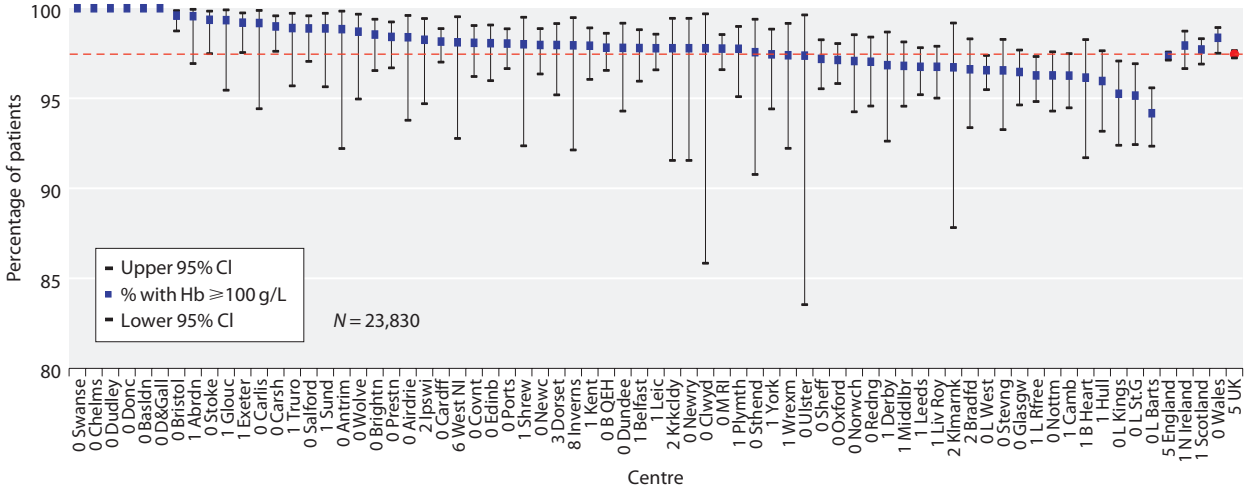

Fig. 3.8a. Percentage of prevalent transplant patients with eGFR ⩾30 ml/min/1.73 m^2 achieving haemoglobin ⩾100 g/L by centre on 31/12/2014

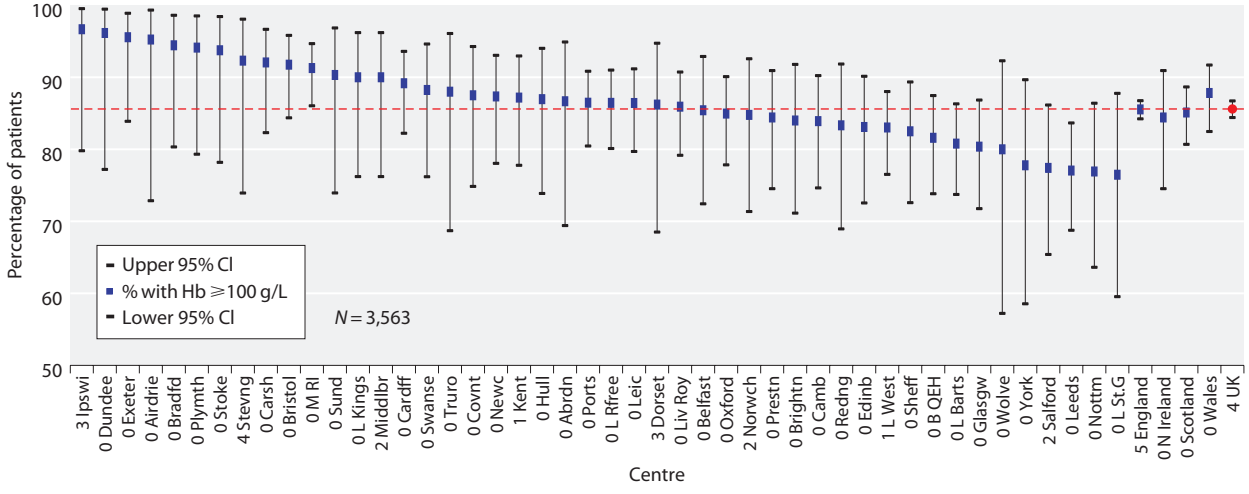

Fig. 3.8b. Percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 achieving haemoglobin ⩾100 g/L by centre on 31/12/2014

percentage of prevalent transplant patients achieving Hb ⩾100 g/L in each centre, stratified by eGFR, is displayed in figures 3.8a and 3.8b.

Figure 3.9 describes the percentage of prevalent patients by centre with haemoglobin <100 g/L as a funnel plot enabling more reliable comparison of outcomes between centres across the UK. With 66 centres included and a normal distribution, 3–4 centres would be expected to fall between the 95%–99.9% CI (1 in 20) and no centres should fall outside the 99.9% CI purely as a chance event.

One centre (London St Bartholomew's) fell outside the upper 99.9% CI and two further centres (Leeds, Glasgow) fell outside the upper 95% CI indicating a higher than

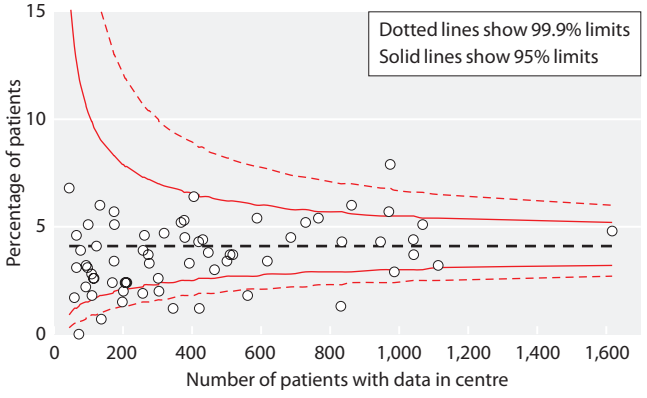

Fig. 3.9. Funnel plot of percentage of prevalent transplant patients with haemoglobin <100 g/L by centre size on 31/12/2014

predicted proportion of transplant patients not achieving the haemoglobin target. Six centres fell outside the lower 99.9% CI, indicating they performed better than expected with fewer than predicted patients having a haemoglobin <100 g/L.

Blood pressure in prevalent transplant patients

In the absence of controlled trial data, the opinion based recommendation of the UK Renal Association (RA) published in the 2010 guideline for the care of kidney transplant recipients is that '***Blood pressure should be <130/80 mmHg (or <125/75 mmHg if proteinuria)***' [9]. This blood pressure target is the same as that used in previous annual reports [10].

As indicated in table 3.9a, completeness for blood pressure data returns was variable and only centres with >50% data returns were included for consideration. Despite this restriction, caution needs to be exercised in interpretation of these results because of the volume of missing data and potential bias, (e.g. a centre may be more likely to record and report blood pressure data electronically in patients with poor BP control). Figures 3.10a and 3.10b show the percentage of patients with a blood pressure of <130/80 mmHg, by eGFR. The percentage of patients with BP <130/80 (systolic BP <130 **and** diastolic BP <80 mmHg) was higher (26.5% vs. 20.3%) in those with better renal function (eGFR ⩾30 ml/min/1.73 m^2).

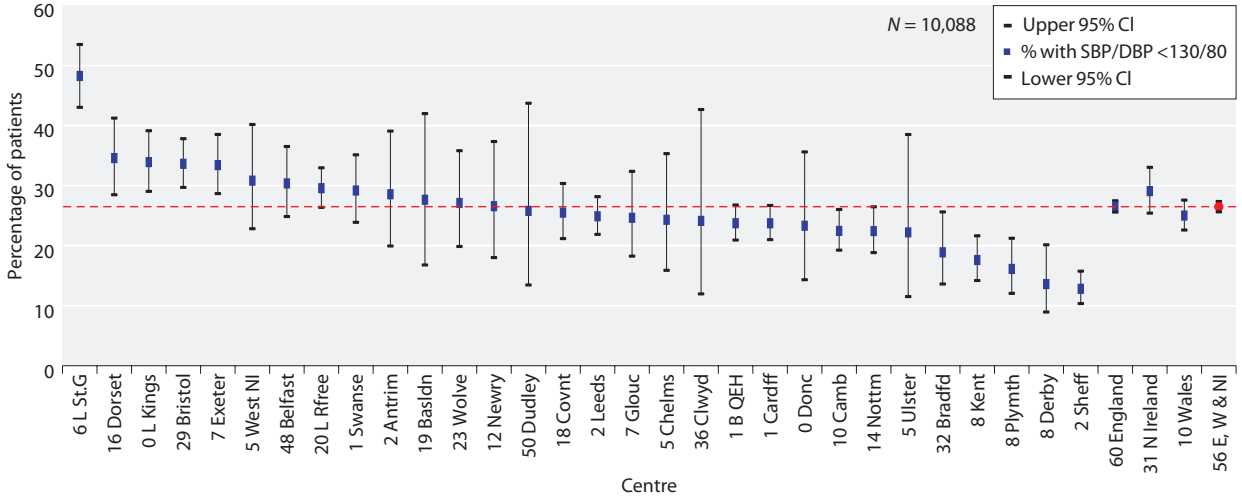

Fig. 3.10a. Percentage of prevalent transplant patients with eGFR ⩾30 ml/min/1.73 m^2 achieving blood pressure of <130/80 mmHg by centre on 31/12/2014

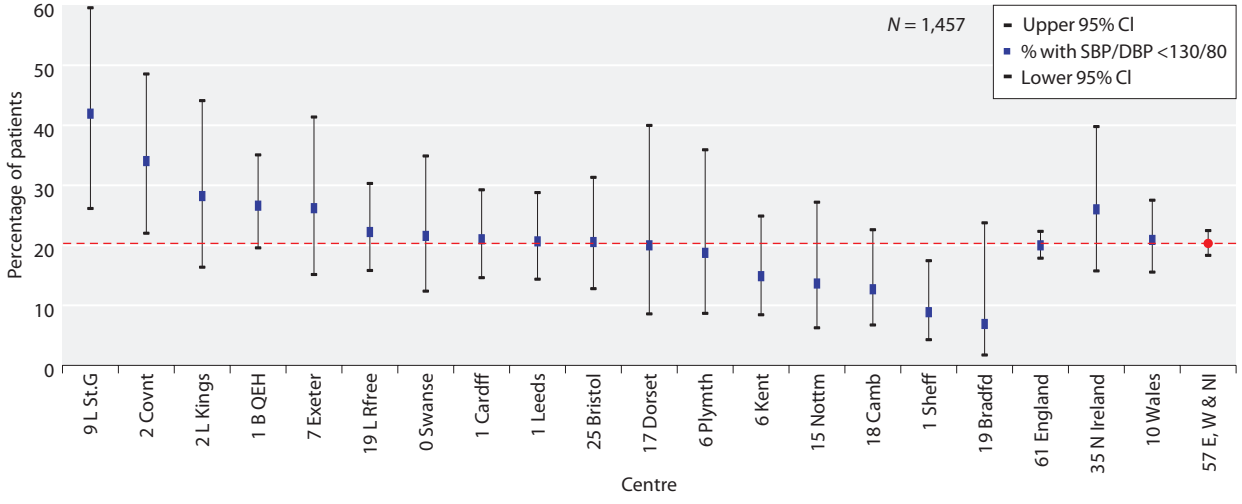

Fig. 3.10b. Percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 achieving blood pressure of <130/80 mmHg by centre on 31/12/2014

Analysis of prevalent patients by CKD stage

Introduction

Approximately 2.4% of prevalent transplant patients returned to dialysis in 2014, a similar percentage to that seen over the last few years. Amongst patients with native chronic kidney disease, late presentation is associated with poor outcomes, largely attributable to lack of specialist management of anaemia, acidosis, hyperphosphataemia and to inadequate advance preparation for dialysis. Transplant recipients on the other hand, are almost always followed up regularly in specialist transplant or renal clinics and it would be reasonable to expect patients with failing grafts to receive appropriate care and therefore have many of their modifiable risk factors addressed before complete graft failure and return to dialysis.

Methods

The transplant cohort consisted of prevalent transplant recipients as on 31st December 2014 ($N = 28,707$) and were classified according to the KDIGO staging criteria with the suffix of 'T' to represent their transplant status. Patients with missing ethnicity information were classified as White for the purpose of calculating eGFR. Prevalent dialysis patients, except those who commenced dialysis in 2014, comprised the comparison dialysis cohort ($N = 21,408$) including 2,222 peritoneal dialysis patients. Only patients on peritoneal dialysis were considered when examining differences in serum phosphate between transplant recipients and dialysis patients. For both the transplant and dialysis cohorts, the analysis used the most recent available value from the last two quarters of the 2014 laboratory data. Scottish centres were excluded from blood pressure, cholesterol and PTH analyses as corresponding data were not provided.

Results and conclusions

Table 3.11 shows that 13% of the prevalent transplant population (3,732 patients), had moderate to advanced

Table 3.11. Analysis by CKD stage for prevalent transplant patients compared with prevalent dialysis patients on 31/12/2014

	Stage 1–2T (⩾60)	Stage 3T (30–59)	Stage 4T (15–29)	Stage 5T (<15)	Stage 5D
Number of patients	10,548	14,427	3,293	439	21,408
% of patients	36.7	50.3	11.5	1.5	
eGFR ml/min/1.73 m^2 [a]					
mean ± SD	77.6 ± 15.6	45.8 ± 8.4	23.8 ± 4.1	11.9 ± 2.4	
median	73.5	46.1	24.4	12.3	
Systolic BP mmHg					
mean ± SD	133.7 ± 16.6	136.3 ± 17.6	140.2 ± 19.4	144.1 ± 23.0	133.1 ± 25.4
% ⩾130	58.9	64.1	71.9	76.0	53.1
Diastolic BP mmHg					
mean ± SD	78.7 ± 9.9	78.8 ± 10.2	78.7 ± 11.4	79.7 ± 12.8	68.7 ± 14.9
% ⩾80	49.4	48.6	49.2	49.2	22.0
Cholesterol mmol/L					
mean ± SD	4.4 ± 1.0	4.6 ± 1.1	4.6 ± 1.2	4.6 ± 1.3	3.9 ± 1.1
% ⩾4	66.8	70.6	71.9	65.6	43.4
Haemoglobin g/L					
mean ± SD	137.0 ± 16.1	128.3 ± 16.6	115.7 ± 15.3	106.2 ± 15.5	111.4 ± 13.8
% <100.0	1.5	3.3	12.1	32.6	17.5
Phosphate mmol/L [b]					
mean ± SD	0.9 ± 0.2	1.0 ± 0.2	1.1 ± 0.3	1.5 ± 0.4	1.6 ± 0.4
% >1.7	0.1	0.3	2.6	29.2	35.3
Corrected calcium mmol/L					
mean ± SD	2.4 ± 0.1	2.4 ± 0.1	2.4 ± 0.2	2.3 ± 0.2	2.4 ± 0.2
% >2.5	24.7	24.3	19.6	15.0	16.2
% <2.2	3.7	4.7	9.3	18.3	16.4
PTH pmol/L					
median	8.2	9.5	15.7	31.4	31.5
% >72	0.5	0.6	3.2	15.4	17.2

[a]Prevalent transplant patients with no ethnicity data were classed as White
[b]Only PD patients included in stage 5D, $N = 2,222$

renal impairment of eGFR <30 ml/min/1.73 m^2. The table also demonstrates that patients with failing grafts achieved UK Renal Association standards for some key biochemical and clinical outcome variables less often than dialysis patients. This substantial group of patients represents a considerable challenge, as resources need to be channelled to improve key outcome variables and achieve a safe and timely modality switch to another form of renal replacement therapy.

eGFR slope analysis

Introduction

The gradient of deterioration in eGFR (slope) may predict patients likely to have early graft failure. The eGFR slope and its relationship to specific patient characteristics are presented here.

Methods

All UK patients aged ⩾ 18 years receiving their first renal transplant between 1st January 2003 and 31st December 2012, were considered for inclusion. A minimum duration of 18 months graft function was required and three or more creatinine measurements from the second year of graft function onwards were used to plot eGFR slope. If a transplant failed but there were at least three creatinine measurements between one year post-transplant and graft failure, the patient was included but no creatinine measurements after the quarter preceding the recorded date of transplant failure were analysed.

Slopes were calculated using linear regression, assuming linearity, and the effect of age, ethnicity, gender, diabetes, donor type, year of transplant and current transplant status were analysed. *P* values were calculated using the Kruskal-Wallis test. eGFR was calculated using the CKD-EPI equation and results expressed as ml/min/1.73 m^2/year. The CKD-EPI equation was used in preference to the MDRD formula as it is thought to have a greater degree of accuracy at higher levels of eGFR [11].

Results and conclusions

The study cohort consisted of 15,970 patients. The median GFR slope was −0.48 ml/min/1.73 m^2/year (table 3.12). The gradient was steeper for Black recipients (−0.94 ml/min/1.73 m^2/year), in keeping with previously published data suggesting poorer outcomes for this group [12, 13]. There was no statistically significant difference in eGFR slope in recipients of deceased donor kidneys (−0.51 ml/min/1.73 m^2/year) compared to patients who received organs from live donors (−0.44 ml/min/1.73 m^2/year). Female patients had a steeper slope (−0.8 ml/min/1.73 m^2/year) than males (−0.27 ml/min/1.73 m^2/year), as did diabetic patients (−1.12 ml/min/1.73 m^2/year) compared to non-diabetic patients (−0.38 ml/min/1.73 m^2/year). The slope was steeper in younger recipients, possibly reflecting increased risk of immunological damage. As might be expected, the steepest slope was in patients where the transplant subsequently failed. This analysis has assumed linearity of progression of fall in GFR and further work is ongoing to characterise the patterns of progression more precisely.

The findings in this study differ slightly from previous UKRR work exploring eGFR changes in transplant recipients [14]. This identified that male donor to female recipient transplantation, younger recipients, diabetes, white ethnicity, and human leukocyte antigen (HLA) mismatch were associated with faster decline in eGFR. These differences may be explained by patients with eGFR >60 ml/min/1.73 m^2 at one year post-transplantation being excluded and the more complex multivariable model used in the previous work. Udayaraj and colleagues [14] also adjusted for factors such as HLA mismatch and donor age, which were not available for the patients studied in this chapter.

Cause of death in transplant recipients

Introduction

Differences in causes of death between dialysis and transplant patients may be expected due to selection for transplantation and use of immunosuppression. Chapter 5 includes a more detailed discussion on cause of death in dialysis patients.

Methods

The cause of death is sent by renal centres as an ERA-EDTA registry code. These have been grouped into the following categories: cardiac disease, cerebrovascular disease, infection, malignancy, treatment withdrawal, other and uncertain.

Some centres have high data returns to the UKRR regarding cause of death, whilst others return no information. Provision of this information is not mandatory. Analysis of prevalent patients included all those aged over 18 years and receiving RRT on 1st January 2014.

Results and conclusions

Table 3.13 and figure 3.11 show the differences in the cause of death between prevalent dialysis and transplant patients. Table 3.14 shows the cause of death for prevalent transplant patients by age. Death due to cardiovascular disease was less common in transplanted patients than in dialysis patients, perhaps reflecting the

Table 3.12. Differences in median eGFR slope between subgroups of prevalent transplant patients

Patients characteristics		*N*	Median Slope	Lower Quartile	Upper Quartile	p-value
Age at transplant	<40	4,718	−0.95	−3.90	1.09	<0.0001
	40–55	6,117	−0.28	−2.54	1.60	
	>55	5,135	−0.32	−2.61	1.70	
Ethnicity	Asian	1,484	−0.82	−3.81	1.57	<0.0001
	Black	1,000	−0.94	−4.06	1.35	
	Other	347	−0.64	−3.86	1.80	
	White	12,385	−0.41	−2.76	1.47	
Gender	Male	9,776	−0.27	−2.59	1.62	<0.0001
	Female	6,194	−0.80	−3.59	1.21	
Diabetes	Non-diabetic	13,315	−0.38	−2.74	1.54	<0.0001
	Diabetic	2,225	−1.12	−3.96	1.09	
Donor	Cadaveric	10,340	−0.51	−3.00	1.47	0.2
	Live	5,630	−0.44	−2.90	1.51	
Year of transplant	2003	973	−0.63	−2.26	0.72	<0.0001
	2004	1,141	−0.37	−2.03	0.85	
	2005	1,134	−0.31	−2.01	1.06	
	2006	1,442	−0.61	−2.57	0.95	
	2007	1,579	−0.64	−2.51	1.00	
	2008	1,810	−0.50	−2.61	1.14	
	2009	1,891	−0.72	−3.18	1.13	
	2010	1,978	−0.44	−3.25	1.83	
	2011	1,926	−0.08	−3.82	2.86	
	2012	2,096	−0.04	−5.29	5.05	
Status of transplant at end of follow-up	Died	1,115	−0.69	−3.90	1.93	<0.0001
	Failed	1,164	−6.24	−12.02	−2.95	
	Re-transplanted	56	−4.31	−7.47	−1.94	
	Functioning	13,635	−0.22	−2.28	1.64	
All		**15,970**	**−0.48**	**−2.97**	**1.49**	

cardiovascular screening undertaken during transplant work-up; transplant recipients are a pre-selected lower risk group of patients. The leading causes of death amongst transplant patients were malignancy (26%) and infection (24%). There has been a reduction over time in the proportion of deaths in transplant patients attributed to cardiovascular or stroke disease (43% in 2003 compared to 23% in 2014) with an increase in the

Table 3.13. Cause of death by modality in prevalent RRT patients on 1/1/2014, who died in 2014

	All modalities		Dialysis		Transplant	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	722	23	628	24	94	18
Cerebrovascular disease	136	4	112	4	24	5
Infection	622	20	498	19	124	24
Malignancy	350	11	214	8	136	26
Treatment withdrawal	504	16	490	19	14	3
Other	607	19	517	20	90	17
Uncertain	189	6	154	6	35	7
Total	**3,130**		**2,613**		**517**	
No cause of death data	1,564	33	1,313	33	251	33

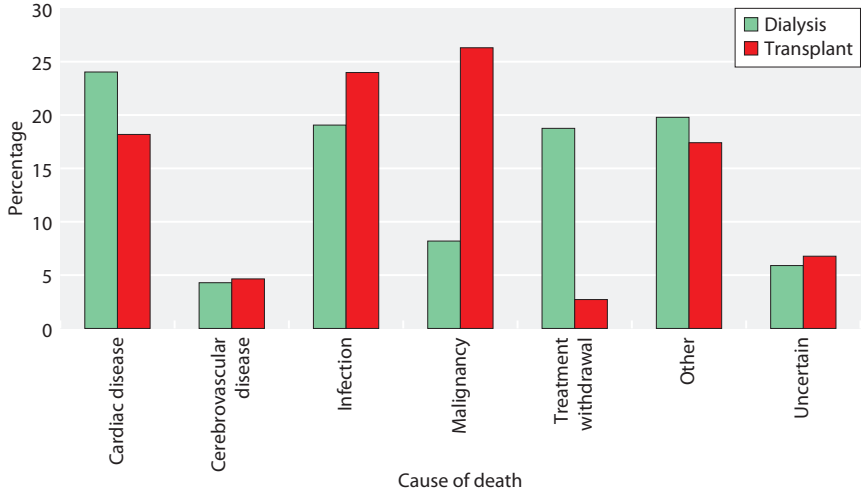

Fig. 3.11. Cause of death by modality for prevalent patients on 1/1/2014, who died in 2014

Table 3.14. Cause of death in prevalent transplant patients on 1/1/2014 by age, who died in 2014

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	94	18	42	18	52	19
Cerebrovascular disease	24	5	12	5	12	4
Infection	124	24	48	20	76	27
Malignancy	136	26	65	27	71	25
Treatment withdrawal	14	3	7	3	7	3
Other	90	17	47	20	43	15
Uncertain	35	7	17	7	18	6
Total	**517**		**238**		**279**	
No cause of death data	251	33	107	31	144	34

proportion ascribed to infection or malignancy (30% in 2003 compared to 50% in 2014). This change has also been reported in other registries, e.g. ANZDATA (http://www.anzdata.org.au) and may reflect better management of cardiovascular risk (although table 3.11 shows blood pressure management remained sub-optimal). Explanations for the rising death rate secondary to malignancy may include the increasing age of transplant recipients and the increased intensity of immunosuppressive regimens leading to complications of over-immunosuppression.

Conflicts of interest: Dr I MacPhee has received research funding and speaker honoraria from Astellas and speaker honoraria from Chiesi.

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Appendix 1: Reporting status of audit measures

Table 3.15. The reporting status of the recommended Renal Association Audit Measures for the Post-operative Care of Kidney Transplant Recipients in the 18th Annual Report

RA audit measure	Included in UKRR annual report?	Reason for non-inclusion
1. Proportion of blood results available for review, and reviewed, within 24 hours	No	UKRR does not currently collect these data
2. Proportion of units with a written follow-up schedule available to all staff and patients	No	UKRR does not currently collect these data
3. Percentage of patients accessing their results through Renal Patient View	No	Requires linkage with RPV
4. Percentage of total patients assessed in an annual review clinic.	No	UKRR does not currently collect these data
5. Percentage of total patients receiving induction with ILRAs and TDAs	No	Poor data completeness
6. Percentage of de novo KTRs receiving tacrolimus	No	Poor data completeness
7. Percentage of de novo KTRs receiving MPA based immunosuppression	No	Poor data completeness
8. Percentage of de novo KTRs receiving corticosteroid maintenance therapy	No	Poor data completeness
9. Use of generic agents	No	UKRR does not currently collect these data
10 Severity of biopsy proven acute rejection (BPAR) recorded by BANFF criteria.	No	UKRR does not currently collect these data
11. Percentage of KTRs with BPAR in first 3 months and first 12 months.	No	UKRR does not currently collect these data
12. Percentage of KTRs requiring TDAs to treat rejection in first year	No	UKRR does not currently collect these data
13. Complication rates after renal transplant biopsy	No	UKRR does not currently collect these data
14. Proportion of patients receiving a target blood pressure of 130/80 mmHg or 125/75 mmHg in the presence of proteinuria (PCR>100 or ACR<70)	No	Poor data completeness
15. Proportion of patients receiving an ACE inhibitor or angiotensin receptor blocker	No	Poor data completeness
16. Proportion of patients with proteinuria assessed by dipstick and, if present, quantified at each clinic visit.	No	UKRR does not currently collect these data
17. Proportion of renal transplant recipients with an annual fasting lipid profile	No	UKRR does not currently collect these data
18. Proportion of KTR taking statins (including the type of statin) for primary and secondary prevention of premature cardiovascular disease	No	UKRR does not currently collect these data
19. Proportion of patients on other lipid lowering agents	No	Poor data completeness
20. Proportion of patients achieving dyslipidaemia targets	Yes	
21. Incidence of new onset diabetes after transplantation (NODAT) at three months and at annual intervals thereafter	No	UKRR does not currently collect these data
22. Proportion of patients who require insulin, and in whom remedial action is undertaken – minimisation of steroids and switching of CNIs	No	UKRR does not currently collect these data
23. Proportion of patients with ischaemic heart disease	No	Poor data completeness
24. Proportion of patients suffering myocardial infarction	No	Poor data completeness
25. Proportion of patients undergoing primary revascularisation	No	Poor data completeness
26. Proportion of patients receiving secondary prevention with a statin, anti-platelet agents and RAS blockers	No	UKRR does not currently collect these data

Table 3.15. Continued

RA audit measure	Included in UKRR annual report?	Reason for non-inclusion
27. Proportion of patients who are obese	No	Poor data completeness
28. Proportion of patients having screening procedures for neoplasia at the annual review clinic	No	UKRR does not currently collect these data
29. Incidence of CMV disease	No	Poor data completeness
30. Rate of EBV infection and PTLD	No	UKRR does not currently collect these data
31. Completeness of records for EBV donor and recipient serology	No	UKRR does not currently collect these data
32. Rates of primary VZV and shingles infection	No	UKRR does not currently collect these data
33. Completeness of records for VZV recipient serology	No	UKRR does not currently collect these data
34. Rates and outcomes of HSV infection.	No	UKRR does not currently collect these data
35. Rates of BK viral infection in screening tests.	No	UKRR does not currently collect these data
36. Rates and outcomes of BK nephropathy	No	UKRR does not currently collect these data
37. Frequency of bisphosponate use	No	UKRR does not currently collect these data
38. Incidence of fractures	No	UKRR does not currently collect these data
39. Incidence of hyperparathyroidism	No	Poor data completeness
40. Incidence of parathyroidectomy	No	UKRR does not currently collect these data
41. Use of cinacalcet	No	Poor data completeness
42. Frequency of hyperuricaemia and gout	No	UKRR does not currently collect these data
43. Prevalence of anaemia	Yes	
44. Prevalence of polycythaemia	No	Poor data completeness
45. Pregnancy rates and outcomes	No	UKRR does not currently collect these data
46. Prevalence of sexual dysfunction	No	UKRR does not currently collect these data

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UK Renal Registry 18th Annual Report: Chapter 4 Demography of Patients Receiving Renal Replacement Therapy in Paediatric Centres in the UK in 2014

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Key words
Adolescents · Aetiology · Children · Demography · Established renal failure · Incidence · Prevalence · Pre-emptive transplantation · Renal replacement therapy · Survival · Young adults

Summary

- A total of 917 children and young people under 18 years with established renal failure (ERF) were receiving treatment at paediatric nephrology centres in 2014.
- At the census date (31st December 2014), 79.3% of prevalent paediatric patients aged <18 years had a functioning kidney transplant, 11.2% were receiving haemodialysis (HD) and 9.5% were receiving peritoneal dialysis (PD).
- In patients aged <16 years, prevalence of ERF was 60.4 per million age related population (pmarp) and the incidence 9.4 pmarp.
- The most common primary renal diagnosis was renal dysplasia ± reflux, present in 32.6% of prevalent paediatric patients aged <16 years.
- About a third of patients had one or more reported comorbidity at onset of renal replacement therapy (RRT).
- The improvement in rates of pre-emptive transplantation for those referred early has been maintained over the last 10 years at 37.5%, compared to 27.4% in 2000–2004.
- At transfer to adult services, 90.3% of patients had a functioning kidney transplant.
- Survival during childhood amongst children commencing RRT was the lowest in those aged less than two years compared to those aged 12 to less than 16 years with a hazard ratio of 4.1 (confidence interval 2.2–8.0), and in those receiving dialysis compared to having a functioning transplant with a hazard ratio of 6.3 (confidence interval 3.9–10.2).

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Introduction

The UK Renal Registry (UKRR) publishes an annual report detailing demographics, clinical, haematological and biochemical parameters for patients managed in UK paediatric nephrology centres. In the UK, care for children, adolescents and young adults with established renal failure (ERF) requiring renal replacement therapy (RRT) is a tertiary service provided in 13 paediatric nephrology centres. All centres are equipped to provide peritoneal dialysis (PD) and haemodialysis (HD), with 10 centres also undertaking kidney transplantation.

Young adults aged 16–18 may be managed in either paediatric or adult services, depending on local practices, educational and social factors. In this report, data for all patients aged under 18 years in UK paediatric nephrology centres reported to the UKRR with a particular focus on the demographics of those aged 16 and under are described.

In the UK in 2013, the prevalence rate of treated ERF in children aged under 16 years was 58.2 and the incidence rate was 9.3 per million age related population (pmarp) [1].

The objectives of this report are:

(i) To describe the UK prevalence, incidence, causes of ERF and modality of treatment of children, adolescents and young adults on RRT on 31st December 2014
(ii) To describe trends in (i) over the past 15 years, and
(iii) To describe pre-emptive transplantation rates and survival of children, adolescents and young adults on RRT aged <16 years old in the UK.

All 13 paediatric nephrology centres in the UK contributed data to the UKRR, mandated in England by the NHS service specification which requires '*paediatric renal units to submit data comprising the national renal data set to the UK Renal Registry on all patients on renal replacement therapy*' [2]. In most cases this is via an annual extract of a centre's clinical computer system which is checked, validated and loaded onto the UKRR paediatric database. Where this is not possible, data returns are completed using a data collection form and manually loaded. At each return, missing data items are sought. Centres pay a capitation fee in order to support the process. Currently, the UKRR paediatric and adult databases are maintained separately and a future merger is planned.

Methods

Centres arranged for their own data to be extracted and sent to the UKRR for processing by clinical informaticians. For this report, end of year numbers were required by the 31st January 2015 and the full data by the 31st March 2015, however, the last submission was received on the 3rd August 2015. Overall responsibility for the process is held by the Chair of the British Association for Paediatric Nephrology (BAPN) Audit & Registry Committee.

The content and analyses contained in the paediatric chapters are discussed and agreed by the BAPN Audit & Registry Committee members.

In this report, patient groups are described as:

(i) 'prevalent' group: patients who were receiving RRT on the 31st December 2014
(ii) 'incident' group: patients who started RRT between 1st January and 31st December 2014
(iii) '5 year' groups: patients who started RRT in the periods of 2000–2004, 2005–2009 and 2010–2014.

The populations used to calculate the incidence and prevalence were obtained from the Office for National Statistics (ONS) [3]. The mid-2014 population estimate produced by the ONS, based on the 2011 Census, was used to calculate the 2014 incidence and prevalence; the 2002 Census data used for the 2000–2004 group, the 2007 data for the 2005–2009 group and the 2012 data for the 2010–2014 group. Incidence and prevalence for 16–18 year olds are not reported. This is because data would not be representative of the UK as a whole as they may also be managed in adult services.

Statistical analyses were performed using SAS 9.3, with group analyses using the Chi-square test and median analyses using the Kruskal-Wallis test. Infants under the age of three months and 'late presenters' (defined as those commencing dialysis within three months following first review by a paediatric nephrologist) were excluded from analyses when calculating pre-emptive transplantation rates. For survival analysis, only patients starting RRT between 1st January 2000 and 31st December 2013 were included to ensure a minimum of one year follow up at the census date, and were followed up to a maximum age of 16 years. As the maximum age of follow up was restricted to 16 years it was not possible to calculate 10 year survival probabilities for patients starting RRT aged >8 years, or 5 year survival probability for children starting RRT aged >12 years. A Cox regression model was used in calculating hazard ratios for patient survival, adjusting for gender, age at start of RRT, and RRT modality as a time dependent variable. Survival probabilities were calculated using univariate Kaplan Meier curves.

Results

Data returns

Centres used a variety of clinical data systems to facilitate returns. In 2014, the majority of paediatric

Table 4.1. Data completeness for the paediatric prevalent ERF population in 2014

Centre	*N*	Percentage completeness				
		First seen date	Height at RRT start	Weight at RRT start	Creatinine at RRT start	Primary renal diagnosis
Blfst_P*	30	90.0	76.7	83.3	90.0	96.7
Bham_P*	103	98.1	93.2	97.1	97.1	100.0
Brstl_P*	57	94.7	89.5	94.7	96.5	100.0
Cardf_P	28	100.0	100.0	100.0	100.0	100.0
Glasg_P*	56	100.0	96.4	100.0	100.0	100.0
L Eve_P*	99	98.0	69.7	75.8	77.8	100.0
L GOSH_P*	185	96.8	87.0	94.1	95.1	93.0
Leeds_P*	86	100.0	90.7	100.0	100.0	100.0
Livpl_P	41	87.8	70.7	75.6	85.4	87.8
Manch_P*	85	95.3	89.4	96.5	96.5	100.0
Newc_P*	37	100.0	100.0	100.0	100.0	100.0
Nottm_P*	85	100.0	60.0	71.8	90.6	98.8
Soton_P	25	100.0	72.0	72.0	84.0	100.0
UK	**917**	**97.3**	**84.1**	**90.2**	**93.5**	**97.8**

*Denotes centres undertaking paediatric kidney transplantation

renal centres were using Vitaldata (Birmingham, Cardiff, Glasgow, Leeds, London Great Ormond Street) with others using Proton (Bristol, Nottingham), Clinicalvision (Manchester, Newcastle), Mediqal (Belfast), CyberREN (Liverpool) or bespoke systems (London Evelina, Southampton).

In 2014, most centres submitted data electronically ($n = 12$) to the UKRR via extracts. The remaining centre used paper forms which were manually entered into the database.

Overall data completeness was excellent for the following: age and gender (100%), ethnicity (98.0%), start and 90 day treatment modality (99.7%) and start date (99.5%). Completeness of other data items ranged from 84.1% to 97.8% and is shown by centre in table 4.1. Centre size and type (if undertaking paediatric kidney transplantation) is also displayed.

The UK paediatric prevalent ERF population in 2014

A total of 917 children and young people under 18 years with ERF were receiving treatment at paediatric nephrology centres in 2014 (table 4.1). Of these, 734 were under 16 years of age. Table 4.2 shows the number of patients receiving RRT and rate of RRT by age group and gender. There were more than ten times the number of teenagers than infants receiving RRT. The prevalence of RRT increased with age and was higher in males across all age groups with an overall male to female ratio of 1.7 : 1. The reported prevalence in under 16 year olds was 60.4 pmarp.

Table 4.3 shows the prevalence of childhood ERF by ethnicity. Children from ethnic minorities displayed higher RRT prevalence rates when compared with White children, with South Asian children displaying the highest rates.

Table 4.2. The UK paediatric prevalent ERF population <16 years old in 2014, by age group

Age group (years)	All patients		Males		Female		M : F rate ratio
	N	pmarp	*N*	pmarp	*N*	pmarp	
0–<2	23	14.6	15	18.5	8	10.4	1.8
2–<4	49	29.8	35	41.5	14	17.4	2.4
4–<8	163	51.3	107	65.9	56	36.1	1.8
8–<12	214	73.8	140	94.4	74	52.3	1.8
12–<16	285	99.8	169	115.6	116	83.2	1.4
Under 16	**734**	**60.4**	**466**	**74.9**	**268**	**45.2**	**1.7**

pmarp – per million age related population

Table 4.3. The UK paediatric prevalent ERF population <16 years old by age and ethnic group[a] in 2014

	White		South Asian		Black		Other[b]
Age group (years)	*N*	pmarp	*N*	pmarp	*N*	pmarp	*N*
0–<4	51	19.7	8	37.9	2	23.7	8
4–<8	110	46.0	31	158.9	4	51.3	16
8–<12	148	57.9	38	182.3	11	131.9	12
12–<16	206	76.5	45	204.9	14	159.4	17
Under 16	**515**	**50.3**	**122**	**146.3**	**31**	**92.9**	**53**

pmarp – per million age related population
[a]ethnicity data missing for 13 children, not included in this table
[b]pmarp not expressed for group 'Other', as heterogeneous group

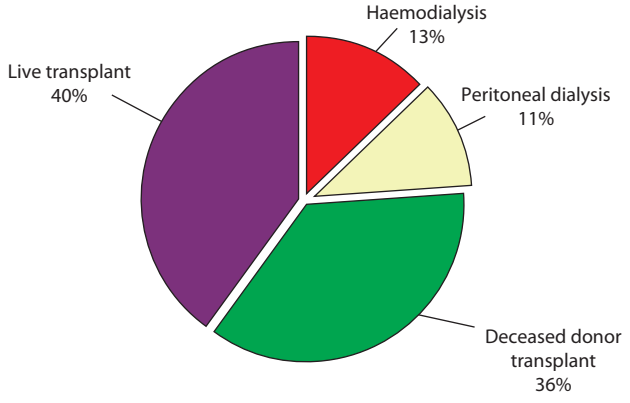

Fig. 4.1. RRT treatment used by prevalent paediatric patients <16 years old in 2014

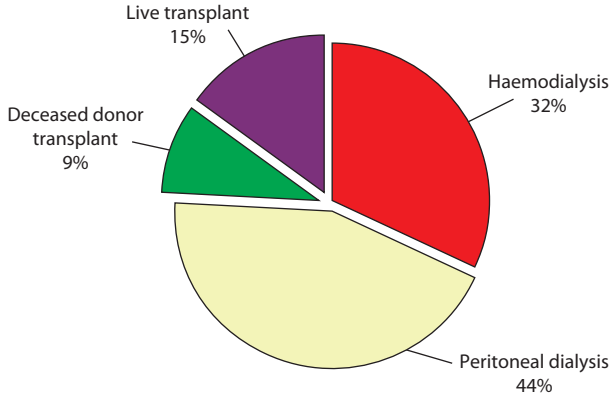

Fig. 4.2. Treatment modality at start of RRT in prevalent paediatric patients <16 years old in 2014

Modality of treatment

The majority of prevalent paediatric patients under 16 years old in 2014 had a functioning transplant, as shown in figure 4.1. The ratio of living to deceased donor transplants was 1 : 1.

Almost half of patients started RRT on PD, similar proportions started with a pre-emptive transplant or on HD, as displayed in figure 4.2.

Analysis by age shows the proportion of those receiving dialysis as current treatment is lower in older children with increasing use of transplantation (particularly from deceased donors) in older patients, as seen in table 4.4.

Table 4.4. Current treatment modality by age in the prevalent paediatric ERF population in 2014

		Current treatment							
		HD		PD		Live transplant		Deceased donor transplant	
Age group (years)	Total	*N*	%	*N*	%	*N*	%	*N*	%
0–<2	23	8	34.8	13	56.5	2	8.7	0	0.0
2–<4	49	19	38.8	13	26.5	13	26.5	4	8.2
4–<8	163	21	12.9	16	9.8	90	55.2	36	22.1
8–<12	214	22	10.3	15	7.0	93	43.5	84	39.3
12–<16	285	23	8.1	25	8.8	99	34.7	138	48.4
16–<18	183	10	5.5	5	2.7	76	41.5	92	50.3
Under 16	**734**	**93**	**12.7**	**82**	**11.2**	**297**	**40.5**	**262**	**35.7**
Under 18	**917**	**103**	**11.2**	**87**	**9.5**	**373**	**40.7**	**354**	**38.6**

HD – haemodialysis; PD – peritoneal dialysis

Table 4.5. Number, percentage and gender by primary renal disease in the prevalent paediatric ERF population under 16 years in 2014

Diagnostic group	Total	%	Male	Female	M : F ratio
Renal dysplasia ± reflux	239	32.6	153	86	1.8
Obstructive uropathy	135	18.4	131	4	32.8
Glomerular disease	79	10.8	37	42	0.9
Congenital nephrotic syndrome	69	9.4	37	32	1.2
Tubulo-interstitial disease	51	6.9	22	29	0.8
Uncertain aetiology	38	5.2	20	18	1.1
Renovascular disease	32	4.4	22	10	2.2
Polycystic kidney disease	31	4.2	13	18	0.7
Metabolic	29	4.0	17	12	1.4
Malignancy & associated disease	16	2.2	4	12	0.3
Missing	15	2.0	10	5	2.0
Total	**734**		**466**	**268**	**1.7**

Treatment in the youngest age groups is subject to variation as there were few patients. There was no difference in modality by gender. There was significantly higher transplantation in Whites versus non-Whites ($p = 0.001$).

Cause of ERF

Renal dysplasia with or without reflux nephropathy was the commonest primary renal diagnosis (PRD) in prevalent patients under 16 years in 2014, shown in table 4.5. The high male to female ratio in those with obstructive uropathy was a result of posterior urethral valves. Figure 4.3 displays the percentage of patients in each diagnostic category for incident and prevalent cohorts, and shows a disproportionately high amount of uncertain diagnoses in incident compared to prevalent patients, although the absolute numbers are small here. Missing PRD data has increased from 0.4% in 2011 [4] to 2.0% in 2014, some of which may be due to a PRD not being assigned until the results of genetic tests have been received.

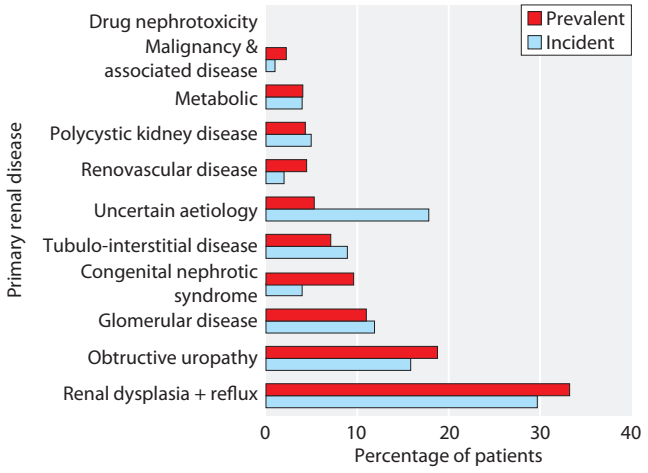

Fig. 4.3. Primary renal disease percentage in incident and prevalent paediatric patients in 2014 for whom a causative diagnosis was reported

The commonest comorbidities at the onset of RRT in 2014 were congenital abnormalities, developmental delay and syndromic diagnoses, reported in 7.5% of patients respectively, shown in table 4.6. Although the majority of children are reported to have no comorbidities, there was considerable variation between centres (e.g. no

Table 4.6. Frequency of registered comorbidities at onset of RRT in prevalent paediatric patients aged <16 years with ERF in 2014

Comorbidity	*N*	Percentage of all RRT patients
Congenital abnormality	55	7.5
Developmental delay	55	7.5
Syndromic diagnosis	55	7.5
Prematurity	42	5.7
Consanguinity	30	4.1
Chromosomal abnormality	12	1.6
Liver disease	12	1.6
Congenital heart disease	9	1.2
Family member with ERF	9	1.2
Cerebral palsy	8	1.1
Malignancy	6	0.8
Neural tube defect	4	0.5
Psychological disorder	4	0.5
Diabetes	1	0.1
No reported comorbidity	**528**	**71.9**
One reported comorbidity	**136**	**18.5**
Two or more comorbidities	**70**	**9.5**

RRT – renal replacement therapy; ERF – established renal failure

Table 4.7. The incident paediatric ERF population <16 years old in the UK in 2014, by age group and gender

	All patients		Males		Females		
Age group (years)	*N*	pmarp	*N*	pmarp	*N*	pmarp	M : F ratio
0–<2	14	8.9	10	12.4	4	5.2	2.4
2–<4	17	10.3	10	11.9	7	8.7	1.4
4–<8	25	7.9	18	11.1	7	4.5	2.5
8–<12	25	8.6	21	14.2	4	2.8	5.0
12–<16	33	11.6	18	12.3	15	10.8	1.1
Under 16	**114**	**9.4**	**77**	**12.4**	**37**	**6.2**	**2.1**

pmarp – per million age related population

comorbidity reported in 92% of patients from Cardiff, and 40% of patients from Manchester). This may be due to small numbers in some centres or reporting practice and is subject to a current data quality exercise in order to evaluate whether there are genuine differences between centres in willingness to accept patients with comorbidity onto the RRT programme.

The UK incident paediatric ERF population in 2014

There were 120 patients under 18 years of age who commenced RRT at paediatric renal centres in 2014. As previously, the following analyses are restricted to the 114 patients who were under 16 years of age.

The incidence of RRT was 9.4 pmarp in 2014. Patients commencing RRT in 2014 are displayed by age and gender in table 4.7, although any apparent differences may be a result of small group sizes.

Table 4.8 shows that the reported incidence of RRT has remained steady since 2000, with the highest incidence seen in both the youngest and oldest age groups.

Trends in ERF demographics

There were 1,697 children and adolescents under 16 years of age who had received RRT in the UK over the 15 year period between 2000 and 2014. Table 4.9 demonstrates slight fluctuations over time in the ages of patients starting RRT. Table 4.10 shows overall ethnicity proportions are similar, with slightly more in the 'Other' ethnic group and slightly fewer in the White group more recently. Table 4.11 demonstrates that the overall proportions between paediatric renal centres have remained largely unchanged since 2000–2004.

Table 4.12 shows the number and percentage of children receiving RRT with each of the major reported comorbidities over the last 15 years. As before, any apparent differences may be as a result of small numbers

Table 4.8. Reported average incidence by age group in 5-year time periods of children under 16 years of age commencing RRT

Age group (years)	Per million age related population		
	2000–2004	2005–2009	2010–2014
0–<2	10.9	14.6	11.8
2–<4	6.4	6.7	9.0
4–<8	5.5	7.5	6.1
8–<12	8.8	8.8	9.0
12–<16	12.7	14.8	11.7
Under 16	**9.0**	**10.6**	**9.3**

Table 4.9. Number and percentage of children <16 years old who commenced RRT by age group and 5-year period at start of RRT

	2000–2004		2005–2009		2010–2014	
Age group (years)	*N*	%	*N*	%	*N*	%
0–<2	72	13.6	109	17.9	96	17.2
2–<4	44	8.3	48	7.9	71	12.7
4–<8	80	15.1	101	16.6	92	16.5
8–<12	136	25.7	127	20.9	125	22.4
12–<16	198	37.4	224	36.8	174	31.2
16	**530**		**609**		**558**	

Table 4.10. Number* and percentage of children under 16 years who commenced RRT, by ethnicity and 5-year period of starting RRT

	2000–2004		2005–2009		2010–2014	
Ethnic group	*N*	%	*N*	%	*N*	%
White	407	77.2	451	75.2	378	69.4
South Asian	87	16.5	98	16.3	97	17.8
Black	13	2.5	25	4.2	20	3.7
Other	20	3.8	26	4.3	50	9.2
Under 16 years	**527**		**600**		**545**	

*Three children in 2000–2004, nine in 2005–2009 and 13 in 2010–2014 with no ethnicity recorded are excluded from this table

Table 4.11. Number and percentage of children under 16 years by renal centre and 5-year period of starting RRT

	2000–2004		2005–2009		2010–2014	
Centre	*N*	%	*N*	%	*N*	%
Blfst_P	15	2.8	19	3.1	20	3.6
Bham_P	51	9.6	66	10.8	63	11.3
Brstl_P	38	7.2	33	5.4	36	6.5
Cardf_P	15	2.8	20	3.3	22	3.9
Glasg_P	34	6.4	50	8.2	36	6.5
L Eve_P	53	10.0	65	10.7	56	10.0
L GOSH_P	91	17.2	124	20.4	103	18.5
Leeds_P	47	8.9	56	9.2	51	9.1
Livpl_P	29	5.5	26	4.3	19	3.4
Manch_P	60	11.3	48	7.9	62	11.1
Newc_P	28	5.3	26	4.3	22	3.9
Nottm_P	48	9.1	63	10.3	49	8.8
Soton_P	21	4.0	13	2.1	19	3.4
Total <16	**530**		**609**		**558**	

Table 4.12. Trends in reported comorbidity frequency at the start of RRT in the paediatric population under 16 years by 5-year period

	2000–2004		2005–2009		2010–2014	
Comorbidity	*N*	%	*N*	%	*N*	%
Syndromic diagnosis	41	7.7	53	8.7	39	7.0
Developmental delay	44	8.3	44	7.2	36	6.5
Congenital abnormality	44	8.3	57	9.4	30	5.4
Prematurity	27	5.1	31	5.1	28	5.0
Consanguinity	25	4.7	18	3.0	23	4.1
Family member with ERF	19	3.6	15	2.5	11	2.0
Liver disease	7	1.3	12	2.0	8	1.4
Neural tube defect	0		6	1.0	6	1.1
Psychological disorder	11	2.1	7	1.1	6	1.1
Cerebral palsy	10	1.9	11	1.8	5	0.9
Congenital heart disease	10	1.9	23	3.8	4	0.7
Malignancy	8	1.5	4	0.7	3	0.5
Chromosomal abnormality	17	3.2	19	3.1	2	0.4
Diabetes	6	1.1	3	0.5	0	
No reported comorbidity	**338**	**63.8**	**415**	**68.1**	**417**	**74.7**
One reported comorbidity	**137**	**25.8**	**123**	**20.2**	**96**	**17.2**
Two or more comorbidities	**55**	**10.4**	**71**	**11.7**	**45**	**8.1**

ERF – established renal failure

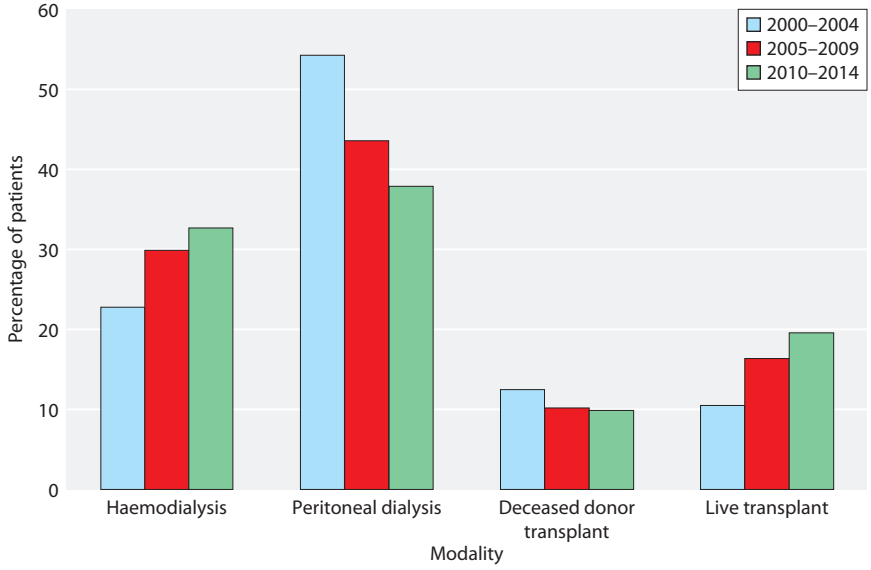

Fig. 4.4. Treatment modality at start of RRT by 5-year time period

between groups. Overall there is a trend towards the reporting of less comorbidity in children receiving RRT over the last 15 years and as previously mentioned, it is not clear whether this is due to reporting or differences in case selection.

The continued fall in the use of deceased donor transplants at the start of RRT demonstrated in previous reports [1] appears to have stabilised as seen in figure 4.4, with little change between the most recent five year periods. Use of PD as a start modality has fallen from 54% in 2000–2004 to 38% in 2010–2014, being replaced with increasing use of HD and living kidney donation.

Glomerular disease as a cause of ERF has fallen compared to other PRDs in the prevalent paediatric population over the last fifteen years, as shown in table 4.13.

Pre-emptive transplantation

Of a total of 1,697 patients aged 0–16 years who started RRT between 2000 and 2014, 465 patients were excluded from this analysis (95 patients due to being aged <3 months, 369 due to being late presenters, and one additional patient with unclear dates). Of 1,232 patients identified as being aged three months to <16 years and having started RRT between 2000–2014, table 4.14 shows that a third of patients had a pre-emptive transplant.

There was a significant difference in pre-emptive transplantation rates by time period (higher rates more recently, $p = 0.005$), with similar rates between the two most recent five year periods.

There remained a significant difference in pre-emptive transplantation rates with higher rates in boys ($p = 0.01$),

Table 4.13. Number* and percentage of primary renal diseases in prevalent paediatric patients under 16 years by 5-year time period

	2000–2004		2005–2009		2010–2014	
Primary renal diagnosis	*N*	%	*N*	%	*N*	%
Renal dysplasia ± reflux	159	30.4	194	32.4	182	33.6
Obstructive uropathy	77	14.7	83	13.9	98	18.1
Glomerular disease	119	22.8	122	20.4	68	12.6
Congenital nephrotic syndrome	24	4.6	36	6.0	36	6.7
Tubulo-interstitial disease	43	8.2	49	8.2	43	7.9
Uncertain aetiology	14	2.7	35	5.8	39	7.2
Renovascular disease	25	4.8	20	3.3	16	3.0
Polycystic kidney disease	14	2.7	18	3.0	24	4.4
Metabolic	28	5.4	29	4.8	30	5.5
Malignancy & associated disease	10	1.9	9	1.5	5	0.9
Drug nephrotoxicity	10	1.9	4	0.7	0	0.0

*Seven children in 2000–2004, 10 in 2005–2009 and 17 in 2010–2014 with no primary renal diagnosis recorded are excluded from this table

Table 4.14. Demographic characteristics of pre-emptive transplantation in children aged three months to 16 years in the UK between 2000–2014, analysed by 5-year time period, gender, ethnicity, age at start of RRT and primary renal diagnosis

	N	*N* (%) pre-emptively transplanted
Total cohort analysed (2000–2014)	1,232	417 (33.8)
Time period		
2000–2004	390	107 (27.4)
2005–2009	426	154 (36.2)
2010–2014	416	156 (37.5)
Gender		
Male	773	282 (36.5)
Female	459	135 (29.4)
Ethnicity		
White	899	330 (36.7)
South Asian	209	47 (22.5)
Black	39	6 (15.4)
Other	62	23 (37.1)
Age at start of RRT (years)		
3 months–<2	123	7 (5.7)
2–<4	137	38 (27.7)
4–<8	220	88 (40)
8–<12	304	110 (36.2)
12–<16	448	174 (38.8)
Primary renal diagnosis		
Renal dysplasia ± reflux	410	173 (42.2)
Obstructive uropathy	217	101 (46.5)
Glomerular disease	205	25 (12.2)
Congenital nephrotic syndrome	81	4 (4.9)
Tubulo-interstitial disease	76	17 (22.4)
Metabolic	74	31 (41.9)
Polycystic kidney disease	46	23 (50)
Uncertain aetiology	39	11 (28.2)
Renovascular disease	37	15 (40.5)
Malignancy & associated disease	15	1 (6.7)
Drug nephrotoxicity	6	1 (16.7)

although this difference was not significant when adjusted for other factors in a logistic regression. Pre-emptive transplantation rates were higher in White versus non-White ethnicity ($p < 0.0001$). Rates also differed with PRD (lower in glomerular diseases versus renal dysplasia ± reflux nephropathy and obstructive uropathies, $p < 0.0001$). Children with polycystic kidney disease, obstructive uropathy, renal dysplasia ± reflux, metabolic causes and renovascular diseases had the highest rates of pre-emptive transplantation, whilst those with congenital nephrotic syndrome had the lowest rate.

Analysis by age at start of RRT showed that as expected, the lowest rate of pre-emptive transplantation was in the three months to two year group, whilst children aged four to sixteen years all had similar rates of pre-emptive transplantation. Following exclusion of the youngest age group, there was no difference in pre-emptive transplantation rates by age.

Transfer of patients to adult renal services in 2014

Ninety three patients were reported by paediatric nephrology centres to have transferred to adult renal services in 2014, fairly consistent with the 101 who transferred during 2013 [1]. The median age of patients transferred out was 18.1 years with an inter-quartile range of 17.8 to 18.5 years. Table 4.15 shows that the demographics of those transferring out were very similar to that of the overall prevalent paediatric RRT population, but with over 90% having a functioning transplant.

Survival of children on RRT during childhood

Of patients under 16 years of age, 1,583 were identified as starting RRT between 2000 and 2013 at paediatric centres in the UK and were included in the survival

Table 4.15. Modality, gender, ethnicity and primary renal diagnosis of patients transferred out from paediatric nephrology centres to adult renal services in 2014

	N	%
Modality		
Transplant	84	90.3
HD	6	6.5
PD	3	3.2
Gender		
Male	53	57.0
Female	40	43.0
Ethnicity		
White	63	67.7
South Asian	15	16.1
Other	9	9.7
Black	6	6.5
Primary renal diagnosis		
Renal dysplasia ± reflux	28	30.1
Glomerular disease	27	29.0
Obstructive uropathy	13	14.0
Tubulo-interstitial disease	10	10.8
Congenital nephrotic syndrome	4	4.3
Polycystic kidney disease	4	4.3
Metabolic	3	3.2
Uncertain aetiology	2	2.2
Malignancy & associated disease	1	1.1
Renovascular disease	1	1.1
Drug nephrotoxicity	0	

HD – haemodialysis; PD – peritoneal dialysis

Table 4.16. Survival hazard ratio during childhood for paediatric RRT patients aged <16 years in the UK adjusted for age at start of RRT, gender and RRT modality

	Hazard ratio	Confidence interval	*p*-value
Age (years)			
0–<2	4.1	2.2–8.0	<0.0001
2–<4	2.1	1.0–4.3	0.06
4–<8	2.0	0.9–4.1	0.08
8–<12	1.4	0.6–3.1	0.5
12–<16	1.0	–	
Gender			
Female	1.2	0.7–1.8	0.5
Male	1.0	–	
RRT modality			
Dialysis	6.3	3.9–10.2	<0.0001
Transplant	1.0	–	

analyses. At the census date (31st December 2014) there were a total of 99 deaths reported in children on RRT under 16 years of age at paediatric centres. The median follow up time was 3.5 years (range of 1 day to 14.5 years). Table 4.16 shows the survival hazard ratios (following adjustment for age at start of RRT, gender and RRT modality) and highlights that children starting RRT under two years of age had the worst survival outcomes with a hazard ratio of 4.1 (confidence interval (CI) 2.2–8.0, $p < 0.0001$) when compared to 12–16 year olds. Being on dialysis was seen to lower survival significantly compared to having a functioning transplant with a hazard ratio of 6.3 (CI 3.9–10.3, $p < 0.0001$). There was insufficient power to add PRD to the model; drug induced nephrotoxicity and metabolic PRDs had the worst survival but confidence intervals were wide and included no effect. Figure 4.5 shows unadjusted Kaplan Meier (KM) survival probabilities and highlights worse outcomes for those aged less than two years, particularly during the first year.

Mortality data in 2014

Six deaths occurred in paediatric renal centres in 2014; four were in patients aged under two years and two were in 15 year olds. The median age at death was 1.5 years with a range of 0.4 years to 15.9 years. In children aged <16 years with treated ERF, the total reported mortality in 2014 in UK paediatric centres was 0.8% (6/734), and 2.9% (5/175) for those on dialysis.

Transplant deaths

At the time of death, one adolescent had received a kidney transplant. The cause of death was intractable seizures in the context of a previously undiagnosed mitochondrial disorder.

Dialysis deaths

At the time of death, three children were on dialysis (two HD and one PD). One HD patient died as a result of substance abuse on a background of poor compliance, and the second had a sudden unexplained death. Infection was the cause of death in the PD patient. Two further children died whilst receiving active palliative care, both having withdrawn from PD.

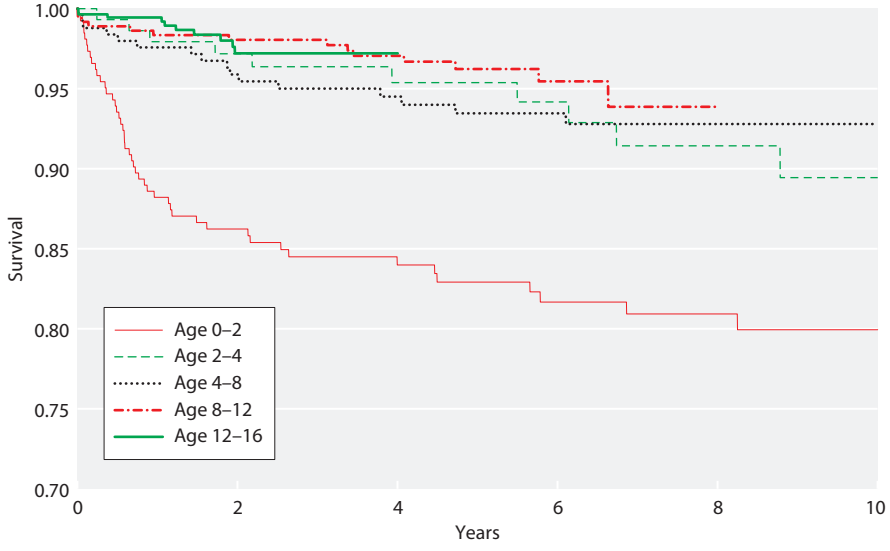

Fig. 4.5. Unadjusted KM survival in paediatric patients <16 years old starting RRT between 2000 and 2013, by age at start

Discussion

This report provides the paediatric nephrology community with a unique resource of data on the demographics of the UK paediatric RRT population from the previous year, as well as allowing comparison of trends over the last fifteen years. This information is vital for commissioning of such a tertiary service, and data is also contributed to European registry reports to allow for international comparisons.

Data returns

Paediatric nephrology in the UK faces the challenge of being mandated to submit electronic data on small numbers of patients to the UKRR, sometimes in the context of being 'shoehorned' into using renal computer systems designed to collect registry data for adult patients. This often results in the need for additional data collection for the paediatric-specific dataset. Unsurprisingly, submission of data to the UKRR remained variable. Improved infrastructure, funding and familiarity with extraction procedures are required, and when staff or computer systems change fresh investment by centres is needed to successfully manage the process. Issues are faced when centres lack financial resources for a renal computer system that supports UKRR specific data collection, or there is not widespread use of such systems by clinical staff. This year, the majority of 2014 data returns breached the target submission date which affects the UKRR's ability to produce the Annual Report on time. In spite of this all centres are included. Despite a standardised dataset, the extracts received by the UKRR usually required extensive manipulation to allow them to be uploaded into the database. Once submitted data has been checked and validated they are returned to submitting renal centres with the onus on clinicians to provide any missing data items. A system is being devised to mark unobtainable missing data and to 'write off' such, to minimise requests to clinicians. Feedback on improving the process is always welcomed.

Highlights from the 2014 data

Incident and prevalent rates showed no major changes over time. Overall the prevalent population remained largely White, male and predominantly aged >8 years, with a functioning transplant.

Again the data shows most paediatric patients starting RRT do so on PD, with stable pre-emptive transplant rates. Current treatment modality is subject to variation over time in the youngest children as they are few. Previous reports have shown decreasing use of pre-emptive deceased donor transplants over time [1]. In the 2014 data, this showed a plateau in the most recent five year periods at 10%. Pre-emptive transplantation was observed to be influenced by ethnicity and PRD.

Structural renal disorders remained the main cause of ERF. The proportion of glomerular disease in the paediatric RRT population has fallen by 10% since 2000–2004. It would be interesting to know if this is due to better treatment preserving renal function for longer and therefore a corresponding increase in those with earlier stages of chronic kidney disease due to glomerular pathologies.

On the whole it would appear that most paediatric patients start RRT without comorbidity but reporting varied by centre. It will be useful to compare the data before and after our data quality exercise which is further discussed below.

A higher proportion of transplanted patients (90%) transferred to adult services in 2014 than the previous year (85%) which is reassuring, but these figures are prone to fluctuation due to small absolute numbers. A project to examine the long term survival of paediatric renal transplants in adulthood in the UK is planned to further explore this.

Survival analysis continues to show the negative influence of young age and dialysis modality. As in previous years, there were few deaths in 2014; however the death of a teenager from substance abuse highlights the likely benefit of additional psychosocial aspects to the reported paediatric data. The forthcoming Surveying Patients Experiencing young Adult Kidney failure (SPEAK) study will be collecting such data on 16–30 year olds receiving RRT in the UK. Information about the study can be found at https://www.renalreg.org/projects/speak/.

Current and future work

In 2016, the BAPN Audit & Registry Committee will be hosting an event for all those involved in paediatric UKRR data, including administrative staff, managers, information technology staff and clinicians. The aim will be to share best practice and identify improvement areas. The UKRR is also reviewing the support that can be given to centres and may be able to offer a paid extraction service for paediatric centres in the future. In 2014, only one centre was unable to provide an extract, instead using a data collection form, and it is hoped such an event can achieve the aim of extracts in all centres.

Centres will be contacted with the aim of completing comorbidity and disability data for prevalent patients

where this may have been submitted unclearly making it impossible to differentiate between a condition being not present in the patient or this information not being available at the time of submission. Once complete it will be possible to comment with more confidence if there are inter-centre differences in the rates of offering RRT to patients with additional comorbidities.

The grouping system for PRD codes is also being reviewed and is unique to the UKRR. These are grouped differently to the adult Report, with many paediatric conditions being lost into the broad 'other' adult category, should that be used. A change now would make past comparisons more difficult but moving forwards to the use of the most recent 2012 ERA-EDTA PRD groupings needs to be considered. This framework uses five groups which would lose some of the detail presented in this report.

A UKRR project presenting data for young adults from both adult and paediatric databases has been completed and should achieve publication in the near future.

A significant step towards merging new data in the adult and paediatric databases has been made this year, in that quarterly laboratory data has been submitted by ten centres. This data is reported in chapter 10. Uniform extracts and quarterly reporting will enable the loading of new data into the adult dataset (although the historic paediatric data will be held separately), allowing analysis of all 16–18 year olds rather than just those reported by paediatric centres.

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Conflicts of interest: the authors declare no conflicts of interest

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UK Renal Registry 18th Annual Report (December 2015) Chapter 5: Survival and Causes of Death in UK Adult Patients on Renal Replacement Therapy in 2014: National and Centre-specific Analyses

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Key Words

Causes of death · Comorbidity · Dialysis · End stage renal disease · Established renal failure · Haemodialysis · Outcome · Peritoneal dialysis · Renal replacement therapy (RRT) · Survival · Transplant · Vintage

Summary

- Survival of incident patients on RRT continued to improve over the last 14 years for both short and long term survival up to 10 years post RRT start.
- One year after 90 day age adjusted survival for incident RRT patients in the 2013 cohort increased to 91.4% from the previous year (91.0%); survival increased in incident patients aged <65 years and in older patients (⩾65 years).
- There was a difference in one year after 90 day incident survival by age group and diabetic status: diabetic patients aged <65 years have slightly worse survival than non-diabetic patients, but survival for older diabetic patients (⩾65 years) was significantly better than for non-diabetic patients.
- One year age adjusted survival for prevalent dialysis patients was 88.6% in the 2013 cohort, a slight decrease from the 2012 cohort (89.3%). Age adjusted one year survival for prevalent dialysis patients with diabetic primary renal disease has been declining slightly since 2012.
- Centre and UK country variability was evident in incident and prevalent patient survival after adjusting to age 60 and this finding would benefit from further investigation.
- The relative one year risk of death on RRT decreased with age from about 19 times that of the general population at age 35–39 years to 2.6 times at age 85 and over.
- In the prevalent RRT population, cardiovascular disease was the most common cause of death, accounting for 23% of deaths. Infection accounted for 20% of deaths and treatment withdrawal for 16% of deaths.

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Introduction

The analyses presented in this chapter examine: a) survival from the start of renal replacement therapy (RRT) of adult patients; b) survival amongst prevalent adult dialysis patients alive on 31st December 2013; c) the death rate in the UK compared to the general population; d) the causes of death for incident and prevalent adult patients. They encompass the outcomes of the total incident adult UK RRT population (2013) reported to the UK Renal Registry (UKRR), including the 19.7% who started on peritoneal dialysis and the 8.3% who received a pre-emptive renal transplant. These results are therefore a true reflection of the outcomes in the whole UK adult incident RRT population. Analyses of survival within the first year of starting RRT include patients who were recorded as having started RRT for established renal failure (as opposed to acute kidney injury) but who had died within the first 90 days of starting RRT, a group excluded from most other countries' registry data. As is common in other countries, survival analyses are also presented for the first year after 90 days.

The term established renal failure (ERF) used throughout this chapter is synonymous with the terms end stage renal failure (ESRF) and end stage renal disease (ESRD) which are in more widespread international usage. Within the UK, patients have disliked the term 'end stage'; the term ERF was endorsed by the English National Service Framework for Renal Services, published in 2004.

Since 2006, the UKRR has openly reported and published centre attributable RRT survival data. It is again stressed that these are raw data which continue to require very cautious interpretation. The UKRR can adjust for the effects of the different age distributions of patients in different centres, but lacks sufficient data from many participating centres to enable adjustment for primary renal diagnosis, other comorbidities at start of RRT (age and comorbidity, especially diabetes, are major factors associated with survival [1–3]) and ethnic origin, which have been shown to have an impact on outcome (for instance, better survival is expected in centres with a higher proportion of Black and South Asian patients) [4]. This lack of information on case-mix makes interpretation of any apparent difference in survival between centres and UK countries difficult. Despite the uncertainty about any apparent differences in outcome, for centres which appear to be outliers the UKRR will follow the clinical governance procedures as set out in chapter 2 of the 2009 UKRR Report [5].

Methods

The unadjusted survival probabilities (with 95% confidence intervals) were calculated using the Kaplan–Meier method, in which the probability of surviving more than a given time can be estimated for all members of a cohort of patients overall or by subgroup such as age group, but without any adjustment for confounding factors such as age that affect the chances of survival. Where centres are small, or the survival probabilities are greater than 90%, the confidence intervals are only approximate.

In order to estimate the difference in survival of different subgroups of patients within the cohort, a stratified proportional hazards model (Cox) was used where appropriate. The results from the Cox model were interpreted using a hazard ratio. When comparing two groups, the hazard ratio is the ratio of the estimated hazard for group A relative to group B, where the hazard is the risk of dying at time t given that the individual has survived until this time. The underlying assumption of a proportional hazards model is that the hazard ratio remains constant throughout the period under consideration. Whenever used, the assumptions of the proportional hazards model were tested by plotting the log(−log(survival)) versus the log of survival time or by testing time dependent covariates in the model.

To allow for comparisons between centres with differing age distributions, survival analyses were statistically adjusted for age and reported as survival adjusted to age 60. This gives an estimate of what the survival would have been if all patients in that centre had been aged 60 at the start of RRT. This age was chosen because it was approximately the average age of patients starting RRT 15 years ago at the start of the UKRR's data collection. The average age of patients commencing RRT in the UK has recently stabilised around an age of 62 years, but the UKRR has maintained age adjustment to 60 years for comparability with all previous years' analyses. Diabetic patients were included in all analyses unless stated otherwise and for some analyses, diabetic and non-diabetic patients were analysed separately and compared. Non-diabetic patients were defined as all patients excluding those patients with diabetes as the primary renal disease. All analyses were undertaken using SAS 9.3.

Centre variability for incident and prevalent patient survival was analysed using a funnel plot. For any number of patients in the incident or prevalent cohort (x-axis), one can identify whether any given survival probability (y-axis) falls within, plus or minus two standard deviations (SDs) from the national mean (solid lines, 95% limits) or 3SDs (dotted lines, 99.9% limits).

Definition of RRT start date

The incident survival figures quoted in this chapter are from the first day of RRT whether with dialysis or a pre-emptive transplant. In the UKRR all patients starting RRT for ERF are included from the date of the first RRT treatment wherever it took place (a date currently defined by the clinician) if the clinician considered the renal failure irreversible. Should a patient recover renal function within 90 days they were then excluded. These UK data therefore may include some patients who died within 90 days who had developed acute potentially reversible renal failure but were recorded by the clinician as being in irreversible established renal failure.

Previously, the UKRR asked clinicians to re-enter a code for established renal failure in patients initially coded as having

acute renal failure once it had become clear that there was no recovery of kidney function. However, adherence to this requirement was very variable, with some clinicians entering a code for established renal failure only once a decision had been made to plan for long-term RRT [6]. All UK nephrologists have now been asked to record the date of the first haemodialysis session and to record whether the patient was considered to have acute kidney injury (acute renal failure) or to be in ERF at the time. For patients initially categorised as 'acute', but who were subsequently categorised as ERF, the UKRR assigns the date of this first 'acute' session as the date of start of RRT.

UKRR analyses of electronic data extracted for the immediate month prior to the start date of RRT provided by clinicians highlighted additional inconsistencies in the definition of this first date when patients started on peritoneal dialysis, with the date of start reported to the UKRR being later than the actual date of start. These findings are described in detail in chapter 13 of the 2009 Report [6]. This concern is unlikely to be unique to the UK, but will be common to analyses from all renal centres and registries.

In addition to these problems of defining day 0 within one country, there is international variability when patient data are collected by national registries with some countries (often for financial re-imbursement or administrative reasons) defining the 90th day after starting RRT as day 0, whilst others collect data only on those who have survived 90 days and report as zero the number of patients dying within the first 90 days.

Thus, as many other national registries do not include reports on patients who do not survive the first 90 days, survival from 90 days onwards is also reported to allow international comparisons. This distinction is important, as there is a much higher death rate in the first 90 days, which would distort comparisons.

Methodology for incident patient survival

The incident population is defined as all patients over 18 who started RRT at UK renal centres. Patients were considered 'incident' at the time of their first RRT, thus patients re-starting dialysis after a failed transplant were not included in the incident cohort (see appendix B:1 for a detailed definition of the incident (take-on) population).

For incident survival analyses, patients newly transferred into a centre who were already on RRT were excluded from the incident population for that centre and were counted at the centre at which they started RRT. Some patients recovered renal function after more than 90 days but subsequently returned to RRT and for these patients the most recent start of RRT was used.

The incident survival cohort was **NOT** censored at the time of transplantation and therefore included the survival of the 8.3% who received a pre-emptive transplant. An additional reason for not censoring was to facilitate comparison between centres. Centres with a high proportion of patients of South Asian and Black origin are likely to have a healthier dialysis population, because South Asian and Black patients are less likely to undergo early transplantation [7], and centres with a high pre-emptive transplant rate are likely to have a less healthy dialysis population as transplantation selectively removes fitter patients. However, censoring at transplantation was performed in the 1997–2013 cohort to establish the effect on long term survival by age group and also in the 2010–2013 cohort to investigate the effect on the outlying status of centres.

The one year incident survival is for patients who started RRT from 1st October 2012 until the 30th September 2013 and followed up for one full year (e.g. patients starting RRT on 1st December 2012 were followed through to 30th November 2013). The 2014 incident patients could not be analysed as they had not yet been followed for a sufficient length of time. For analysis of one year after 90 day survival, patients who started RRT from 1st October 2012 until 30th September 2013 were included in the cohort and they were followed up for a full one year after the first 90 days of RRT.

Two years' incident data (2012–2013) were combined to increase the size of the patient cohort, so that any differences between the four UK countries can be more reliably identified. To help identify any centre differences in survival from the small centres (where confidence intervals are large), an analysis of one year after 90 day survival using a rolling four year combined incident cohort from 2010 to 2013 was also undertaken. A 10 year rolling cohort was used when analysing trends over time and for long term survival, a cohort from 1997 to 2013 was analysed.

The death rate per 1,000 patient years was calculated by dividing the number of deaths by the person years exposed. Person years exposed are the total years at risk for each patient (until death, recovery or lost to follow up). The death rate is presented by age group and UK nation.

Adjustment of one year after 90 day survival for the effect of comorbidity was undertaken using a rolling four year combined incident cohort from 2010 to 2013. Twenty-five centres returned $\geqslant$85% of comorbidity data for patients in the combined cohort. Adjustment was first performed to a mean age of 60 years, then to the average distribution of primary diagnoses for the 25 centres. The individual centre data were then further adjusted for average distribution of comorbidity present at these centres.

Methodology for prevalent dialysis patient survival

The prevalent dialysis patient group was defined as all patients over 18 years old, alive and receiving dialysis on 31st December 2013 who had been on dialysis for at least 90 days at one of the UK adult renal centres. Prevalent dialysis patients on 31st December 2013 were followed-up in 2014 and were censored at transplantation. When a patient is censored at transplantation, this means that the patient is considered as alive up to the point of transplantation, but the patient's status post-transplant is not considered.

As discussed in previous reports, comparison of survival of prevalent dialysis patients between centres is complex. Survival of prevalent dialysis patients can be studied with or without censoring at transplantation and it is common practice in some registries to censor at transplantation. Censoring could cause apparent differences in survival between those renal centres with a high transplant rate and those with a low transplant rate, especially in younger patients where the transplant rate is highest. Censoring at transplantation systematically removes younger fitter patients from the survival data. The differences are likely to be small due to the relatively small proportion of patients being transplanted in a given year compared to the whole dialysis population (about 13% of the dialysis population aged under 65 and about 2% of the population aged 65 years and over). To allow comparisons with other registries the survival results for prevalent dialysis patients **CENSORED** for transplantation have been quoted. To understand survival of patients, including survival following

transplantation, the incident patient analyses should be viewed. The effect of not censoring at transplantation was performed in the 2013 cohort to investigate the effect on the outlying status of centres.

Methodology for comparing mortality in prevalent RRT patients with the mortality in the general population

Data on the UK population in mid-2014 and the number of deaths in each age group in 2014 were obtained from the Office of National Statistics. The age specific UK death rate was calculated as the number of deaths in the UK per thousand people in the population. The age specific expected number of deaths in the RRT population was calculated by applying the UK age specific death rate to the total of years exposed for RRT patients in that age group. This is expressed as deaths per 1,000 patient years. The age specific number of RRT deaths is the actual number of deaths observed in 2014 in RRT patients. The RRT observed death rate was calculated as number of deaths observed in 2014 per 1,000 patient years exposed. Relative risk of death was calculated as the ratio of the observed and expected death rates for RRT patients. The death rate was calculated for the UK general population by age group and compared with the same age group for prevalent patients on RRT on 31st December 2013.

Methodology of causes of death

The EDTA-ERA Registry codes for causes of death were used. These have been grouped into the following categories:

- Cardiac disease
- Cerebrovascular disease
- Infection
- Malignancy
- Treatment withdrawal
- Other
- Uncertain

Completeness of cause of death data was calculated for all prevalent patients on RRT that died in a specific year with cause of death data completed for that year. Patients that were lost to follow up or that recovered were not included in the cause of death completeness calculation.

Adult patients aged 18 years and over from England, Wales, Scotland and Northern Ireland were included in the analyses of cause of death. The incident patient analysis included all patients starting RRT in the years 2000–2013. Analysis of prevalent patients included all those aged over 18 years and receiving RRT on 31st December 2013 and followed-up for one year in 2014.

Results

Incident (new RRT) patient survival

Overall survival

The 2013 incident cohort included 7,030 patients who started RRT. Age adjusted (adjusted to age 60) one year after 90 days survival for incident patients starting RRT in 2013 (table 5.1), increased compared to last year: 91.4% compared to 91.0% in the 2012 cohort. Survival at 90 days (adjusted to age 60) was also higher in the 2013 cohort at 96.9% (table 5.1) compared to 96.2% in the 2012 cohort.

Survival by UK country

There was no evidence of a significant difference in survival at 90 days between the UK countries (table 5.2), but there was evidence that one year after 90 day survival in Wales was lower compared to the other UK countries (table 5.2). It has to be stressed that the data has not been adjusted for differences in primary renal diagnosis, ethnicity, socio-economic status or comorbidity, nor for differences in life expectancy in the general populations of the four UK countries. There are known regional differences in the life expectancy of the general population within the UK and these are likely to be one of the reasons contributing to the variation in survival between renal centres and UK countries. Table 5.3 shows differences in life expectancy of the

Table 5.1. Survival of incident patients, 2013 cohort

Interval	Unadjusted survival (%)	Adjusted survival (%)	*95% CI*	*N*
Survival at 90 day	94.9	96.9	*96.4–97.4*	7,030
Survival one year after 90 days	88.4	91.4	*90.6–92.2*	6,657

Table 5.2. Incident survival across the UK countries, combined two year cohort (2012–2013), adjusted to age 60

	England	N Ireland	Scotland	Wales	UK
Survival at 90 day (%)	96.5	95.2	97.1	96.1	96.5
95% CI	*96.1–96.9*	*93.5–97.0*	*96.2–98.0*	*95.0–97.2*	*96.1–96.9*
Survival 1 year after 90 days (%)	91.5	91.9	90.6	86.5	91.2
95% CI	*90.9–92.1*	*89.5–94.4*	*88.9–92.3*	*84.4–88.8*	*90.6–91.7*

Table 5.3. Life expectancy in years in the UK countries, 2012–2014 (source ONS [8])

	At birth		At age 65	
Country	Male	Female	Male	Female
England	79.4	83.1	18.6	21.1
Northern Ireland	78.3	82.3	18.1	20.5
Scotland	77.1	81.1	17.3	19.6
Wales	78.4	82.3	18.0	20.5
UK	**79.1**	**82.8**	**18.4**	**20.9**

general population between the UK countries for the period 2012–2014.

Survival by modality

It is impossible to obtain truly valid comparisons of survival of patients starting RRT on different treatment modalities, as modality selection is not random. In the UK, patients starting peritoneal dialysis as a group were younger and fitter and were transplanted more quickly than those starting haemodialysis. The age adjusted one year survival estimates for incident patients starting RRT on haemodialysis (HD) and peritoneal dialysis (PD) were 89.8% and 93.4% respectively, with HD patient survival increasing by 0.6% from the previous year (figure 5.1). Over the last 10 years the one year after 90 days survival has progressively improved in HD patients, but in PD patients survival has remained static over the last five years (figure 5.1).

Survival by age

Tables 5.4 and 5.5 show survival for all incident patients, those aged ⩾65 years and those aged <65 years. Both short term (survival at 90 days) and one year after 90 days survival increased marginally: survival at 90 days increased to 94.9% compared to 94.5% in the previous year (2012 cohort) and one year after 90 days survival increased to 88.4% compared to 88.0% in the 2012 cohort. There was a steep decline in survival with advancing age (figures 5.2 and 5.3). There was evidence that one year after 90 days survival in the 85+ age group increased significantly from 66.2% in the 2012 cohort to 73.2% in the 2013 cohort.

There was a curvilinear increase in the death rate per 1,000 patient years with age for the period one year after 90 days (figure 5.3). There was evidence that the overall death rate in Wales was higher than in the other UK countries, mostly due to a higher death rate in Wales for older patients (⩾65 years old) (figure 5.3). A similar finding is reported in table 5.12, where there was evidence that the one year death rate in prevalent dialysis patients (2013 cohort) was higher in Wales compared to England. Results in table 5.2 also confirm a

Table 5.4. Unadjusted 90 day survival of incident patients, 2013 cohort, by age

Age group	Survival (%)	*95% CI*	*N*
18–64	98.1	*97.6–98.5*	3,585
⩾65	91.6	*90.7–92.5*	3,445
All ages	94.9	*94.4–95.4*	7,030

Table 5.5. Unadjusted one year after day 90 survival of incident patients, 2013 cohort, by age

Age group	Survival (%)	*95% CI*	*N*
18–64	94.2	*93.3–94.9*	3,506
⩾65	81.9	*80.5–83.2*	3,151
All ages	88.4	*87.6–89.1*	6,657

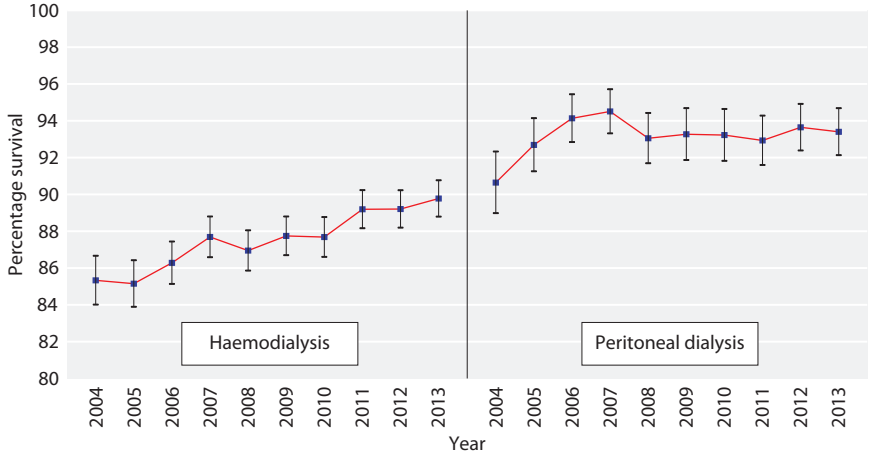

Fig. 5.1. Trend in one year after 90 day incident patient survival by first modality, 2004–2013 cohorts (adjusted to age 60, excluding patients whose first modality was transplantation)

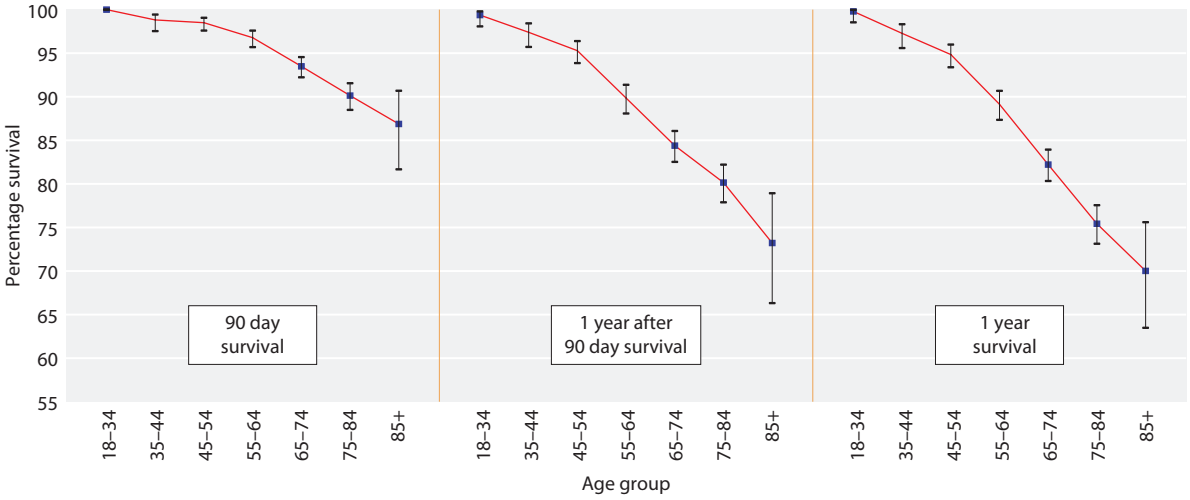

Fig. 5.2. Unadjusted survival of incident patients by age group, 2013 cohort

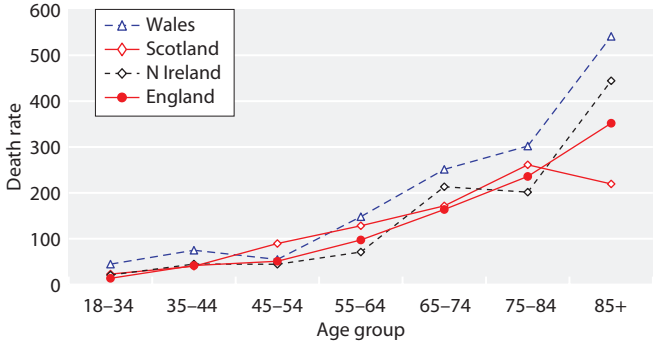

Fig. 5.3. One year after 90 days death rate per 1,000 patient years by UK country and age group for incident patients, 2010–2013 cohort

significantly higher death rate at one year after 90 days in Wales compared to the other UK countries (table 5.2).

From figure 5.4 it can be seen that 50% of patients starting RRT aged between 45–54 survived for over 10 years, 50% of patients starting RRT aged between 55–64 survived for about 5.9 years and 50% of patients starting RRT aged between 65–74 survived for about 3.4 years.

Figure 5.5 illustrates the survival of incident patients, excluding those who died within the first 90 days and shows that 50% of patients aged between 55–64 years survived for six years and 50% of patients aged between 65–74 years survived for about 3.7 years. These survival results are similar to those that included the first 90 days (figure 5.4).

Censoring at transplantation would make the longer term outcomes of younger patients (who were more likely to have undergone transplantation) appear worse than they actually were. Without censoring, the 10 year survival for patients aged 18–34 years was 83.7% (figure 5.4), which contrasts sharply with a 58.3% survival when censoring at the time of transplantation (data not shown). The 10 year survival without and with censoring at transplantation were 70.7% and 44.8% for age group 35–44 and 54.7% and 31.1% for age group 45–54 respectively. This difference in survival is less pronounced in older

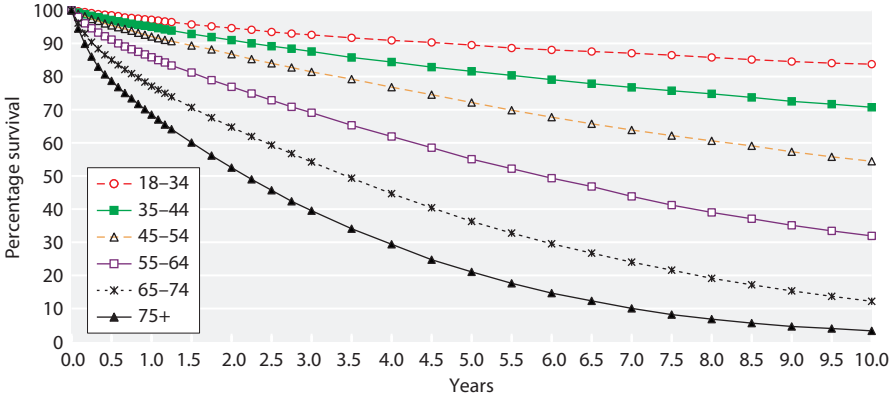

Fig. 5.4. Survival of incident patients (unadjusted), 1997–2013 cohort (from day 0), without censoring at transplantation

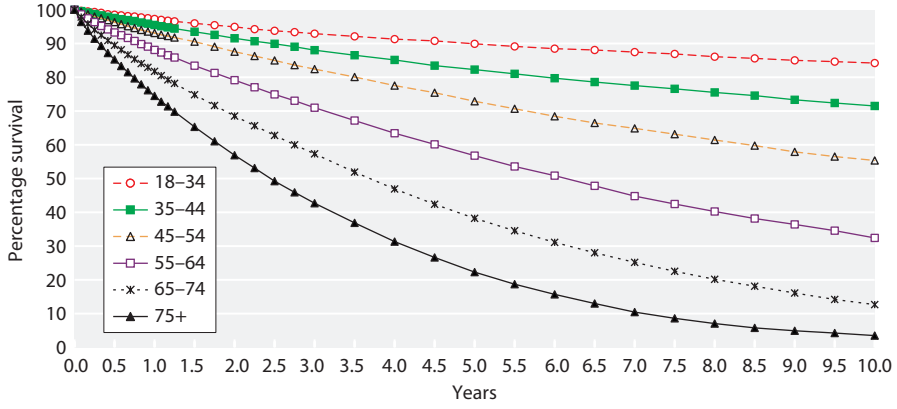

Fig. 5.5. Survival of incident patients (unadjusted), 1997–2013 cohort (from day 90), without censoring at transplantation

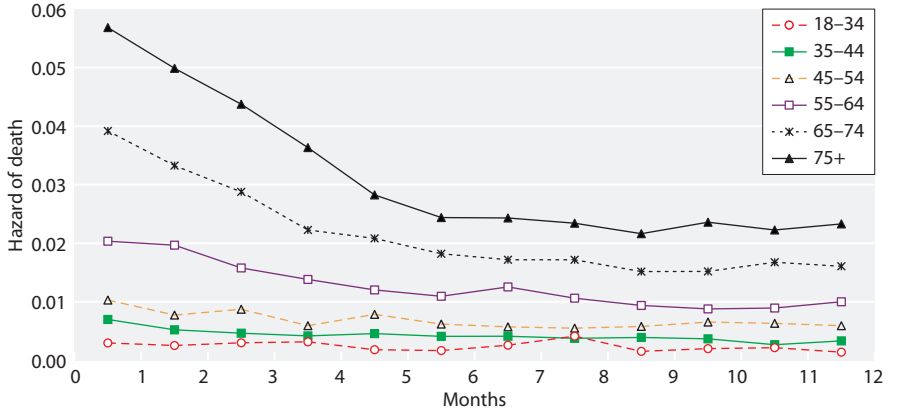

Fig. 5.6. First year monthly hazard of death, by age group, 1997–2013 combined incident cohort

age groups, especially for patients aged 65+. For more detailed information on this effect, refer to the 2008 Report [9].

Age and the hazard of death

Figure 5.6 shows the monthly hazard of death from the first day of starting RRT by age group, which falls sharply during the first 4–5 months, particularly for older patients (⩾65 years), after which time the hazard remains relatively stable up to one year.

The 10 year hazard of death at 90 days increased to 1.85 in the 2013 cohort from 1.68 (2012 cohort) whereas the hazard in the 1st year after 90 days was similar. A 10 year increase in patient age was associated with a 1.85 times increased risk of death within 90 days and a 1.65 times increased risk of death within one year after 90 days (table 5.6).

Survival by gender

There were no survival differences between genders in an incident cohort of patients starting RRT from 2002 to 2011 and followed up for a minimum of three years until 2014 (figure 5.7). There was also no evidence of a survival difference between genders in the first 90 days and one year after the first 90 days (data not shown).

Survival in the 2004–2013 cohort

The death rate per 1,000 patient years in the first year of starting RRT from 2004 to 2013 is shown in figure 5.8. There was a declining trend in the overall death rate with a steeper rate of decline in the older age group (⩾65 years). It is important to note that these death rates are not directly comparable with those produced by the USRDS Registry, as the UK data include the first 90 day period when death rates are higher than subsequent time periods.

The time trend changes in one year after 90 days incident survival over the period 2004–2013 are shown

Table 5.6. Increase in proportional hazard of death for each 10 year increase in age, 2013 incident cohort

Interval	Hazard of death for 10 year age increase	*95% CI*
First 90 days	1.85	*1.68–2.03*
1 year after first 90 days	1.65	*1.56–1.75*

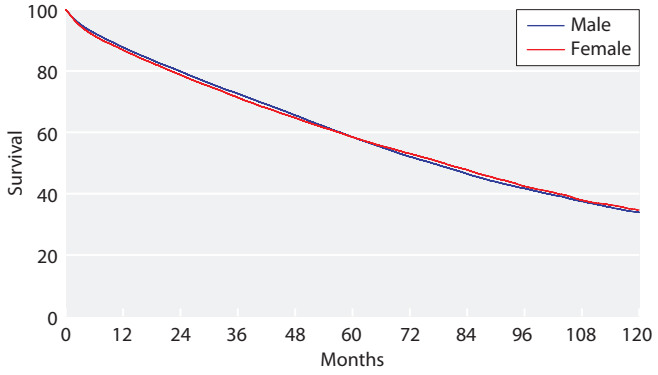

Fig. 5.7. Long term survival of incident patients by gender, 2002–2011 combined cohort, adjusted to age 60, followed-up for a minimum of three years

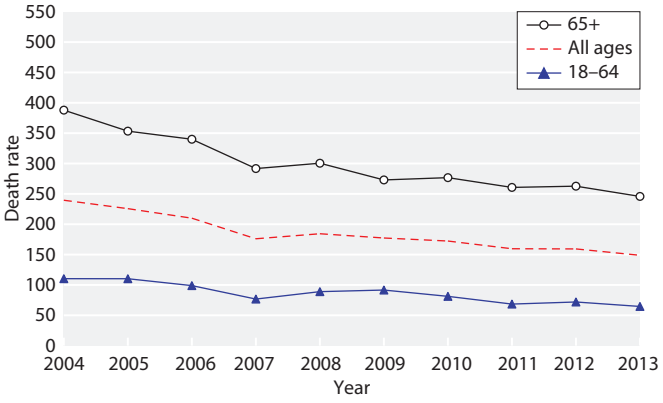

Fig. 5.8. One year incident death rate per 1,000 patient years by age group, 2004–2013 cohort

in figure 5.9. The left hand plot, which includes only those centres that have been sending data continuously since 2000, shows a similar improvement in survival to the plot in which data from all renal centres were analysed.

One year after 90 days incident patient survival in the 2004–2013 cohort by centre, UK country and overall, can be found in appendix 1, table 5.22.

Long term survival: trends up to 10 years post RRT start

Longer term survival from start of RRT continued to improve for incident patients (tables 5.7 and 5.8). There was a steep decline in survival with advancing age. The unadjusted survival analyses (tables 5.7, 5.8 and figures 5.10, 5.11) show a large improvement in one to 10 year survival across the years for both those aged under and those 65 years and over. One year survival amongst patients aged <65 years at start of RRT has improved from 87.5% in the 1998 cohort to 93.7% in the 2013 cohort.

Although survival has improved both in patients aged under 65 and those aged ⩾65 years, the improvement was more pronounced in patients aged ⩾65: there has been a 15.8% absolute improvement in one year survival from the 1998 to 2013 cohorts (table 5.8). As these are observational data it remains difficult to attribute this reduction in risk of death to any specific improvements in care.

Change in survival on RRT by vintage

Figure 5.12 shows the six monthly hazard of death by age group for incident patients. There is little evidence of a worsening prognosis with time on RRT (vintage) for the majority of incident RRT patients in the UK (not censored for transplantation), although an increased hazard over time is evident for incident patients aged 65 years and older. When censoring for transplantation an apparent vintage effect is evident (data not shown) and this effect is at least in part because younger and healthier patients are only included in the survival calculation up to the date of transplantation. In the older age groups there were decreasing numbers remaining alive beyond seven years accounting for the increased variability seen. Figures 5.13 and 5.14 show these data for the non-diabetic

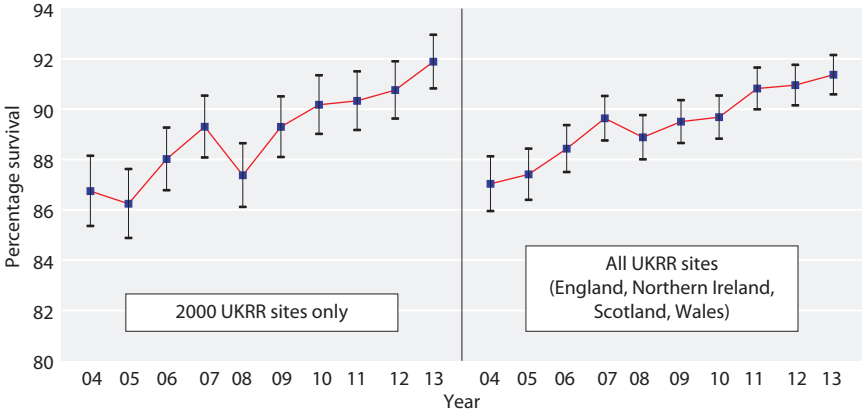

Fig. 5.9. Change in one year after 90 day survival, 2004–2013 incident cohort (adjusted to age 60)
Showing 95% confidence intervals

Table 5.7. Unadjusted survival of incident patients, 1998–2013 cohort for patients aged 18–64 years

Cohort	1 year	2 year	3 year	4 year	5 year	6 year	7 year	8 year	9 year	10 year	*95% CI for latest year*	*N*
2013	**93.7**										***92.9–94.5***	**3,585**
2012	93.1	87.3									*86.2–88.4*	3,542
2011	93.4	88.7	83.7								*82.4–84.9*	3,356
2010	92.2	86.6	81.7	77.3							*75.8–78.7*	3,365
2009	91.3	85.0	80.4	76.3	71.1						*69.5–72.6*	3,389
2008	91.5	86.0	81.1	76.9	73.2	69.5					*67.9–71.0*	3,445
2007	92.6	87.1	81.8	76.9	73.1	69.5	66.1				*64.4–67.7*	3,328
2006	90.6	85.0	80.1	75.7	72.0	68.1	64.1	61.3			*59.5–63.0*	3,160
2005	89.6	83.6	78.6	73.9	69.3	65.7	62.5	59.5	56.5		*54.7–58.3*	2,830
2004	89.6	83.4	78.0	72.6	67.9	64.2	61.0	57.2	54.6	53.0	*51.1–55.0*	2,563
2003	89.4	82.7	77.3	72.3	67.3	63.2	59.5	56.7	54.1	51.6	*49.5–53.6*	2,265
2002	88.5	80.7	74.7	69.1	65.0	61.1	57.7	54.8	51.6	49.5	*47.3–51.7*	2,023
2001	88.0	81.0	75.4	70.3	65.3	60.6	56.6	53.1	50.2	48.0	*45.7–50.4*	1,739
2000	89.1	81.3	74.5	69.1	63.6	59.0	55.5	52.3	49.9	47.2	*44.6–49.7*	1,528
1999	87.0	81.1	73.3	67.5	62.1	58.1	53.9	51.0	48.5	46.9	*44.2–49.6*	1,346
1998	87.5	80.2	74.4	69.5	64.1	59.1	55.1	53.1	49.9	47.7	*44.7–50.5*	1,166

Table 5.8. Unadjusted survival of incident patients, 1998–2013 cohort for patients aged ⩾65 years

Cohort	1 year	2 year	3 year	4 year	5 year	6 year	7 year	8 year	9 year	10 year	*95% CI for latest year*	*N*
2013	**78.5**										***77.1–79.9***	**3,445**
2012	77.3	65.3									*63.6–66.9*	3,334
2011	77.4	62.8	51.4								*49.7–53.1*	3,365
2010	76.3	63.4	51.2	41.9							*40.2–43.6*	3,277
2009	76.6	63.3	52.5	41.6	32.9						*31.3–34.5*	3,371
2008	74.6	61.2	49.9	40.5	32.3	25.8					*24.2–27.3*	3,175
2007	75.1	61.2	49.8	40.5	32.0	25.5	20.2				*18.8–21.6*	3,209
2006	72.0	58.2	46.9	37.2	29.0	23.2	17.7	13.5			*12.3–14.7*	3,120
2005	71.0	57.2	45.2	36.1	27.8	21.1	16.6	12.5	9.9		*8.9–11.0*	2,936
2004	68.9	53.9	42.4	33.9	26.8	20.9	16.3	12.9	9.9	7.6	*6.7–8.7*	2,628
2003	68.4	53.6	41.7	31.8	24.3	18.1	14.2	11.1	8.5	6.8	*5.8–7.9*	2,315
2002	66.0	50.7	40.3	31.8	23.9	18.3	13.7	10.9	8.2	6.5	*5.5–7.6*	2,086
2001	66.5	51.8	38.4	28.8	21.8	16.0	12.0	9.1	7.2	5.5	*4.5–6.7*	1,709
2000	66.0	52.3	39.5	28.5	22.2	17.2	13.1	9.7	7.5	5.7	*4.6–6.9*	1,496
1999	68.4	51.6	39.1	29.8	22.2	16.2	11.5	8.4	6.2	4.9	*3.8–6.2*	1,213
1998	62.7	45.5	36.2	26.5	20.1	14.0	10.6	7.6	5.7	4.6	*3.5–6.1*	1,016

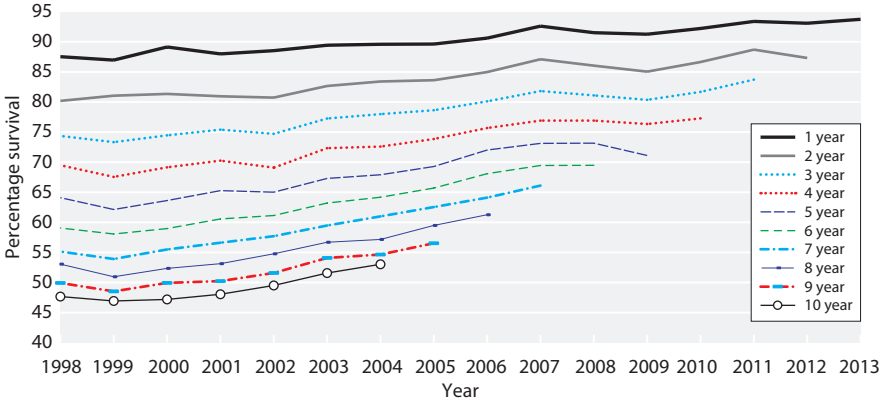

Fig. 5.10. Change in long term survival by year of starting RRT, for incident patients aged 18–64 years

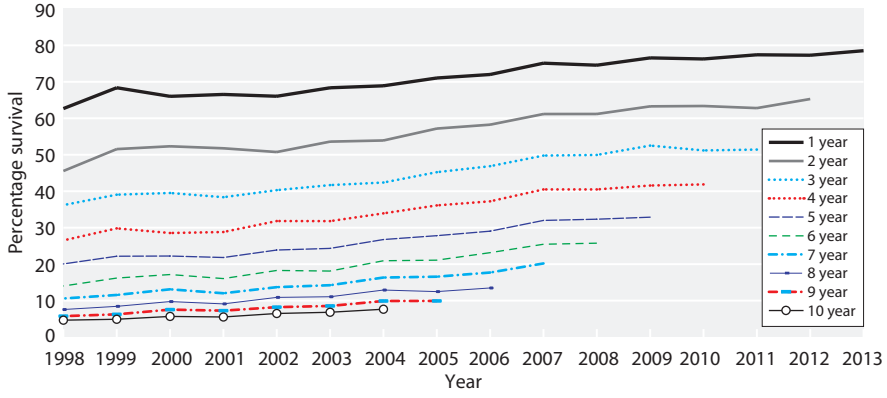

Fig. 5.11. Change in long term survival by year of starting RRT, for incident patients aged >65 years

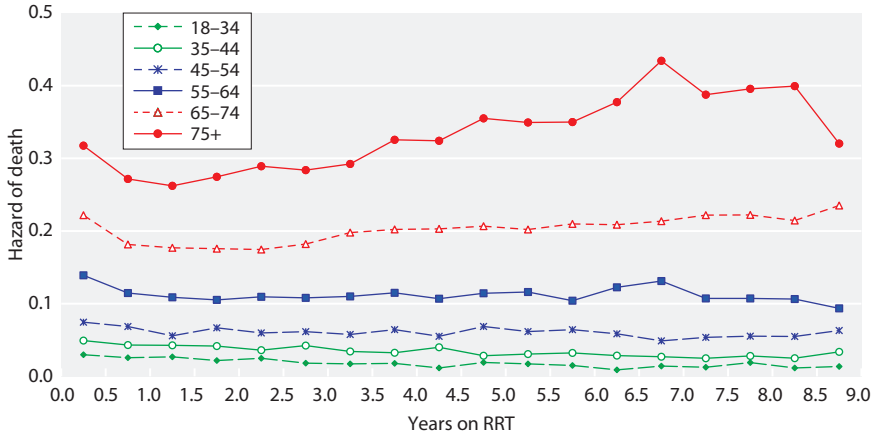

Fig. 5.12. Six monthly hazard of death, by vintage and age group, 1997–2013 incident cohort after day 90 (not censored at transplantation)

and diabetic patients respectively. An increased hazard of death over time is evident for diabetic patients predominantly over >65 years of age.

Centre variability in one year after 90 days survival

Centre variability was assessed in a larger cohort across several years due to small numbers of patients and wide confidence intervals (appendix 1, table 5.22) in the 2013 incident cohort. Similar to previous years, sustained performance was assessed in a rolling four year cohort from 2010 to 2013. These data are presented as a funnel plot in figure 5.15. Table 5.9 allows centres to be identified on this graph by finding the number of patients treated by the centre and then looking up this number on the x-axis. One centre (Swansea) had survival below the 95% lower limit whilst five centres (London St. George's, London Guy's, Western Trust Northern Ireland, Reading, Exeter) had survival above the 95% upper limit and this is an increase from the previous cohort where four centres were survival outliers above the 95% upper limit.

With 71 centres it would be expected that only three centres would be outside these limits by chance. It is

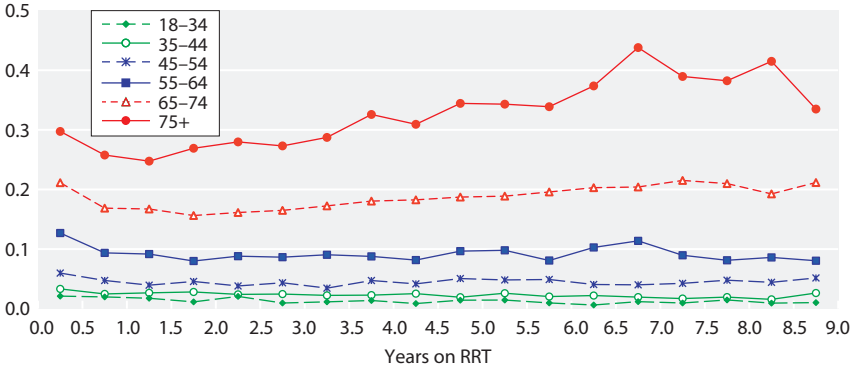

Fig. 5.13. Six monthly hazard of death, by vintage and age group, 1997–2013 non-diabetic incident cohort after day 90 (not censored at transplantation)

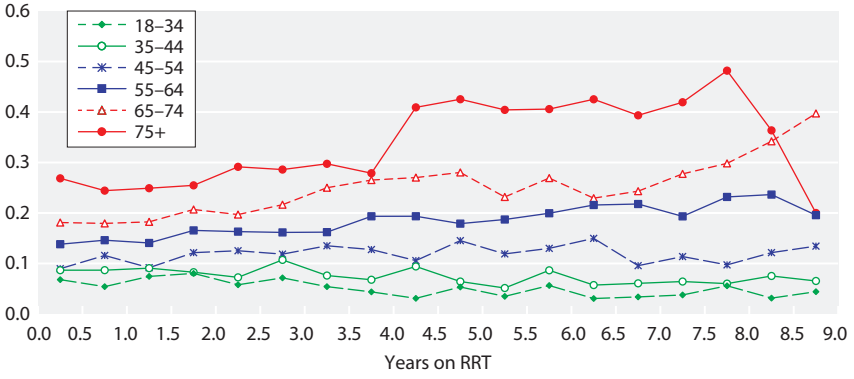

Fig. 5.14. Six monthly hazard of death, by vintage and age group, 1997–2013 diabetic incident cohort after day 90 (not censored at transplantation)

important to acknowledge that these data have not been adjusted for any patient related factor except age (i.e. not comorbidity, primary renal disease or ethnicity) and have not been censored at transplantation, so the effect of differing centre rates of transplantation was not taken into account. Figure 5.16 illustrates the effect of adjusting for comorbidity on survival in centres with good comorbidity returns (⩾85%), with the biggest improvement in survival seen in Swansea. Adjustment for comorbidity could have an important effect in some renal centres like Swansea that seem to have a higher comorbid burden in their RRT population and this could affect the outlier status of centres as illustrated in figure 5.15, but due to poor comorbidity returns for many renal centres, comorbidity adjustment for the entire incident RRT population is not yet possible. Case mix adjustment performed in a cohort of incident patients starting RRT in England from 2002 to 2006 and linked to the Hospital Episodes Statistics (HES) data, found that three of the four survival outliers were no longer outliers after adjustment for HES-derived case mix. Swansea could not be evaluated in this analysis as the linkage was only done for England's RRT patients, but the study results highlight that variability in survival between centres is affected by case mix [10].

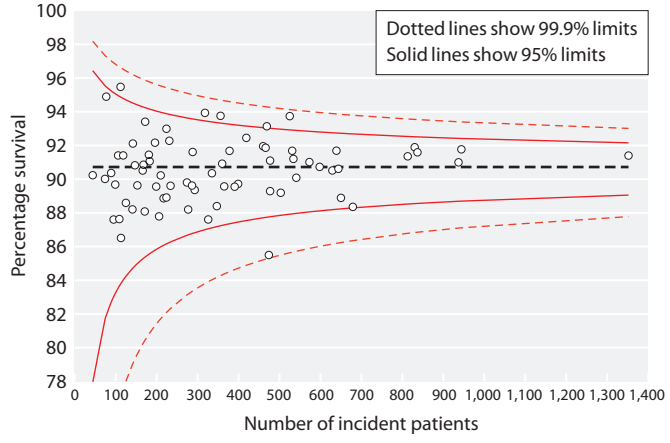

Fig. 5.15. Funnel plot for age adjusted one year after 90 days survival, 2010–2013 incident cohort

Also see appendix 1, table 5.22 and 5.23 for unadjusted and adjusted survival together with 95% confidence intervals for incident patient survival one year after 90 days and at 90 days. Table 5.24 in appendix 1 shows the one year after 90 day incident survival by centre for incident cohort years 2004–2013, adjusted to age 60. One to five year survival after the first 90 days of RRT adjusted to age 60 is included in appendix 1, table 5.25 for incident cohorts 2009–2013 and is a new table in the survival chapter.

Centre variability in one year after 90 day survival: impact of adjustment for comorbidity

Although comorbidity returns to the UKRR have remained poor, there was an increase in the number of centres (26 to 31 centres) returning ⩾85% of comorbidity data to the UKRR for patients starting RRT in 2013. These analyses use a different cohort, a combined incident cohort from 2010–2013 where 25 centres returned comorbidity data over the period for ⩾85% of patients and these centres were included in this analysis. Adjustment was first performed to age 60, then to the average distribution of primary renal diagnoses for the 25 centres. Further adjustment was then made to the average distribution of comorbidities present at those centres (table 5.10).

It can be seen that adjustment for age has the largest effect, most notably in those centres with the lower unadjusted survival figures. Survival improved for all centres after adjustment for age, as the average age for incident patients was higher than the adjustment to the average age of 60 years. There were only minor differences for most centres after adjustment for primary renal diagnosis, but survival increased by ⩾1% for two centres (Swansea, Newry). In five centres (Swansea, Newry, Basildon, Bradford, Leeds) adjustment for comorbidity had a noticeable effect (⩾1% increase) on

Table 5.9. Age adjusted (to age 60) one year after 90 day survival, 2010–2013 incident cohort

	1 year after 90 days					1 year after 90 days			
			Limits for funnel plot					Limits for funnel plot	
Centre	*N*	Adjusted survival %	Lower 95% limit	Upper 95% limit	Centre	*N*	Adjusted survival %	Lower 95% limit	Upper 95% limit
D & Gall	44	90.2	77.9	96.4	L St.G	318	93.9	87.0	93.5
Clwyd	74	90.0	81.7	95.5	Wolve	326	87.6	87.1	93.4
Inverns	77	94.9	81.9	95.5	Stoke	335	90.3	87.1	93.4
Bangor	89	90.4	82.7	95.2	Newc	347	88.4	87.2	93.4
Newry	95	87.6	83.0	95.1	Redng	356	93.8	87.2	93.3
Ulster	99	89.7	83.2	95.1	Hull	360	90.9	87.3	93.3
Carlis	106	91.4	83.5	95.0	Liv Roy	365	89.6	87.3	93.3
Antrim	109	87.6	83.7	94.9	B Heart	378	91.7	87.4	93.3
West NI	112	95.5	83.8	94.9	Covnt	391	89.5	87.4	93.2
Wrexm	113	86.5	83.8	94.9	Middlbr	399	89.7	87.5	93.2
Sthend	117	91.4	84.0	94.8	Nottm	419	92.4	87.5	93.1
Colchr	125	88.6	84.2	94.7	Camb	460	92.0	87.7	93.1
Klmarnk	141	88.2	84.7	94.5	Stevng	465	91.9	87.7	93.0
Ipswi	142	92.1	84.7	94.5	Swanse	465	85.3	87.7	93.0
Krkcldy	147	90.8	84.8	94.5	Exeter	469	93.1	87.7	93.0
Basldn	153	89.6	85.0	94.4	Brightn	477	89.3	87.8	93.0
York	166	90.5	85.3	94.3	Kent	477	91.1	87.8	93.0
Donc	168	90.9	85.3	94.3	Salford	503	89.2	87.9	93.0
Chelms	171	88.1	85.4	94.2	L Guys	525	93.7	87.9	92.9
Truro	172	93.4	85.4	94.2	Prestn	531	91.7	87.9	92.9
Dudley	181	91.4	85.5	94.2	Sheff	534	91.2	87.9	92.9
Dundee	183	91.1	85.6	94.2	L Kings	541	90.1	88.0	92.9
Abrdn	196	92.2	85.8	94.1	Leeds	573	91.0	88.1	92.8
Liv Ain	199	89.6	85.8	94.0	Bristol	598	90.7	88.1	92.8
Shrew	206	87.8	85.9	94.0	Ports	629	90.5	88.2	92.8
Wirral	210	90.2	86.0	94.0	Oxford	639	91.7	88.2	92.7
Airdrie	217	88.9	86.1	93.9	M RI	640	90.6	88.2	92.7
Plymth	224	93.0	86.2	93.9	Glasgw	650	88.9	88.2	92.7
Sund	224	88.9	86.2	93.9	Cardff	684	88.4	88.3	92.7
Glouc	231	92.3	86.2	93.8	B QEH	813	91.4	88.5	92.5
Bradfd	234	89.6	86.3	93.8	Carsh	830	91.9	88.5	92.5
Dorset	274	89.8	86.7	93.6	L Rfree	837	91.6	88.6	92.5
Edinb	277	88.2	86.7	93.6	Leic	937	91.0	88.7	92.4
Derby	286	89.6	86.8	93.6	L Barts	944	91.8	88.7	92.4
Belfast	288	91.6	86.8	93.6	L West	1352	91.4	89.1	92.2
Norwch	293	89.4	86.8	93.5					

adjusted survival (table 5.10, figure 5.16) helping to explain the lower survival noted in figure 5.15. After adjustment for age, primary renal diagnosis and comorbidity, Swansea, Ulster and Wrexham had a noticeable improvement in survival of 9.4%, 7.7% and 7.0% respectively.

Survival in patients with diabetes

Although it has previously been shown that diabetic patients have worse long term survival compared to non-diabetic patients [3], non-diabetic patient survival in the older age group ($\geqslant$65 years) was worse compared to diabetic patients in the same age group during the first 90 days of starting RRT (2013 cohort) (figure 5.17) and in the subsequent year (figure 5.18); this might be due to patient selection. Survival in patients $<$65 years was almost similar between diabetic and non-diabetic patients during the first 90 days of starting RRT and in the subsequent year.

Long term survival for diabetic and non-diabetic patients was evaluated in a cohort of patients starting RRT from 2002 to 2011 with a minimum of three years

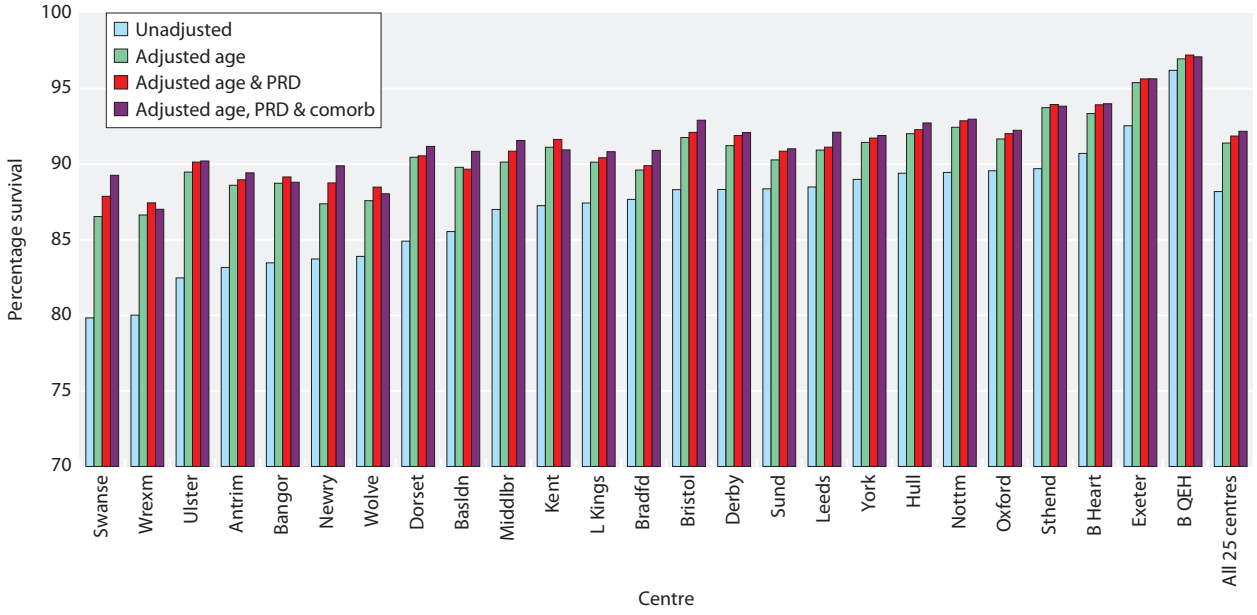

Fig. 5.16. The effect on survival after sequential adjustment for age, primary renal diagnosis and comorbidity, 2010–2013 incident cohort

Table 5.10. The effect of adjustment for age, primary renal diagnosis and comorbidity on survival, 2010–2013 incident cohort, % survival one year after 90 days

Centre*	Unadjusted	Age adjusted	Age, PRD adjusted	Age, PRD and comorbidity adjusted
Swanse	79.8	86.5	87.9	89.3
Wrexm	80.0	86.6	87.4	87.0
Ulster	82.5	89.5	90.1	90.2
Antrim	83.2	88.6	89.0	89.4
Bangor	83.5	88.7	89.2	88.8
Newry	83.7	87.4	88.8	89.9
Wolve	83.9	87.6	88.5	88.0
Dorset	84.9	90.5	90.6	91.2
Basldn	85.5	89.8	89.7	90.8
Middlbr	87.0	90.1	90.9	91.6
Kent	87.3	91.1	91.6	90.9
L Kings	87.4	90.1	90.4	90.8
Bradfd	87.7	89.6	89.9	90.9
Bristol	88.3	91.8	92.1	92.9
Derby	88.3	91.2	91.9	92.1
Sund	88.4	90.3	90.9	91.0
Leeds	88.5	90.9	91.1	92.1
York	89.0	91.4	91.7	91.9
Hull	89.4	92.0	92.3	92.7
Nottm	89.5	92.4	92.9	93.0
Oxford	89.6	91.7	92.0	92.2
Sthend	89.7	93.7	93.9	93.8
B Heart	90.7	93.3	93.9	94.0
Exeter	92.5	95.4	95.6	95.6
B QEH	96.2	97.0	97.2	97.1
All 25 centres	88.2	91.4	91.9	92.2

PRD primary renal diagnosis
*Centre included if ⩾85% comorbidity data available

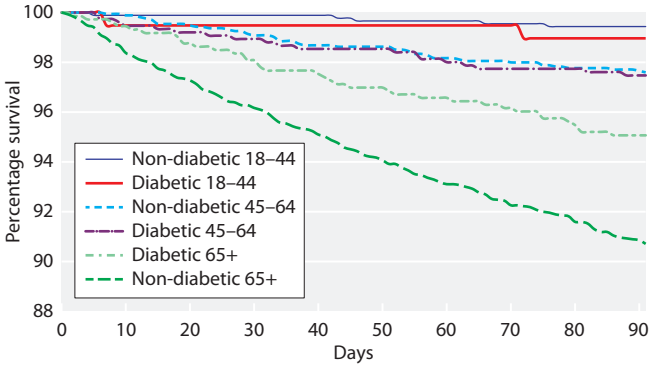

Fig. 5.17. Survival at 90 days for incident diabetic and non-diabetic patients by age group for patients starting RRT, 2013 cohort

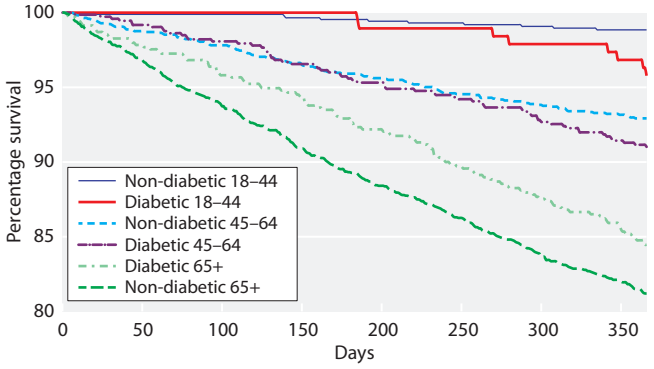

Fig. 5.18. Survival at one year after 90 days for incident diabetic and non-diabetic patients by age group for patients starting RRT, 2013 cohort

follow up until 2014. These data show large differences between diabetic and non-diabetic patient survival in the age groups 18–44 and 45–64 years. In age group 18–44, 89% of non-diabetic patients were alive five years after start of RRT compared to 71% for diabetic patients. In the age group 45–64, 68% of non-diabetic patients were alive five years after start of RRT compared to 51% for diabetic patients (figure 5.19). The initial survival difference where non-diabetic incident patients in the older age group (⩾65 years) have worse survival than incident diabetic patients in the same age group,

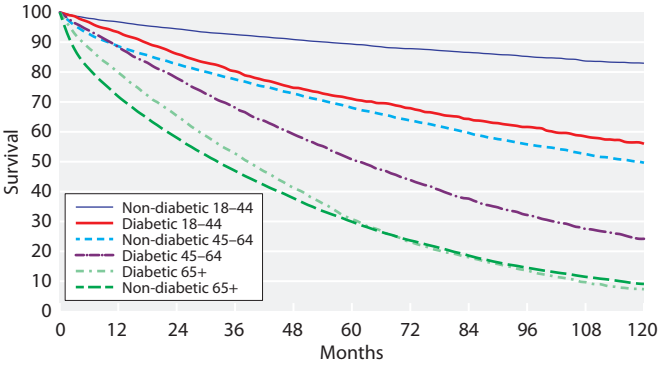

Fig. 5.19. Long term survival for incident diabetic and non-diabetic patients by age group, 2002–2011 cohort, followed up for a minimum of three years

diminished over the years until there was very little difference in five year survival between these patients.

Survival in prevalent dialysis patients

Overall survival

Table 5.11 shows the one year survival for prevalent patients on dialysis. One year age adjusted survival for prevalent dialysis patients decreased to 88.6% in the 2013 cohort compared to 89.3% in the 2012 cohort.

Survival by UK country

The one year death rate for prevalent dialysis patients in each UK country is shown in table 5.12 for the 2013 cohort and survival increased across all four UK nations compared to the previous year (2012 cohort). There was evidence that the one year death rate in Wales was significantly higher than in England: the higher median age in Wales compared to England and socio-economic factors such as life expectancy of the population and area deprivation, would affect the death rate in Wales. These results are unadjusted for age, primary renal diagnosis or comorbidity.

Table 5.11. One year survival of prevalent dialysis patients in the UK (unadjusted unless indicated otherwise)

Patient group	Patients	Deaths	Survival	*95% CI*
Dialysis patients 2013 cohort				
All	26,184	3,770	85.0	*84.5–85.4*
All – adjusted to age 60	26,184	3,770	88.6	*88.2–89.1*
2 year survival – dialysis patients				
All patients alive on 31/12/2012	26,060	6,667	72.1	*71.5–72.6*

Cohorts of patients alive on 31/12/2013 unless indicated otherwise

Table 5.12. One year death rate per 1,000 prevalent dialysis patient years in the 2013 cohort and median age of prevalent dialysis patients by country

	England	N Ireland	Scotland	Wales
Death rate	159	180	177	200
95% CI	*154–165*	*149–216*	*158–199*	*174–229*
Median age	66.6	68.9	65.9	68.6

One year survival of prevalent dialysis patients by centre

The age adjusted (adjusted to age 60) one year survival of dialysis patients by centre is illustrated in a funnel plot (figure 5.20). With 71 centres included in the analyses, it would be expected by chance that three centres would fall outside the 95% (1 in 20) confidence limits. The survival for one centre (Portsmouth) was below the 95% confidence limit, and for three centres (London St George's, Dorset, Stevenage) above the 95% confidence limits.

Case mix adjustment performed in a cohort of incident patients starting RRT in England from 2002 to 2006 and linked to the Hospital Episodes Statistics (HES) data, showed that the lower than expected survival in Portsmouth may be explained by case mix [10]. This study found that three of the four survival outliers were no longer outliers after adjustment for HES-derived case mix. It is not yet possible to routinely perform this adjustment using HES-linked data, but looking back at the 2002–2006 HES-linked data, there was a large improvement in survival at Portsmouth after case mix adjustment and the current outlier status at this centre may reflect a higher comorbid burden in prevalent dialysis patients at this centre.

The funnel plot analysis shows a decrease in the number of centres that were outliers below the 95% lower limits compared to last year (2012 cohort) when there were four outlying centres. The number of centres that were outliers above the 95% upper limit was the same as in the previous year (2012 cohort). Not censoring at transplantation did not change the results of the outlying centres.

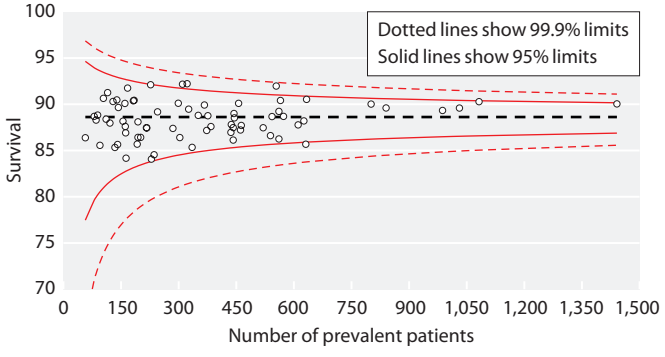

Fig. 5.20. One year survival funnel plot of prevalent dialysis patients by centre adjusted to age 60, 2013 cohort

Table 5.13 allows centres in figure 5.20 to be identified by finding the number of patients treated by the centre and the corresponding survival and then looking this up on the axes of the funnel plot.

One year survival of dialysis patients by centre is illustrated in figures 5.21 and 5.22 for patients aged <65 years and those aged ⩾65 years.

Survival by age group

Figure 5.23 shows the one year survival of prevalent dialysis patients who were alive and receiving dialysis on 31st December 2013, stratified by age group. There was a curvilinear decrease in survival with increasing age (figure 5.23).

One year death rate in prevalent dialysis patients in the 2013 cohort by age group

The death rates for prevalent patients on dialysis by age group are shown in figure 5.24. The younger patients included in this analysis are a selected higher risk group, as the similar aged transplanted patients have been excluded. The increase in the death rate was not linear with age; in younger patients (<55 years of age) a 10 year increase in age increased the death rate by about 25 deaths per 1,000 patient years compared with an increase of 88 deaths per 1,000 patient years in older patients (75+). There was evidence that the death rate in Wales was significantly higher compared to England, but there was no evidence that the apparent difference in the death rates between other UK countries were significant.

Time trends in survival, 2004 to 2013

Figure 5.25 illustrates that one year survival for prevalent dialysis patients in England gradually improved from 2004 to 2011 with a gradual decrease thereafter. In Northern Ireland and Wales the numbers of patients were much smaller than in England and survival was therefore more variable with very wide confidence intervals, making it difficult to draw conclusions on trends. The change in prevalent survival by centre over the cohort years 2004 to 2013 is included in appendix 1, table 5.26.

Survival in patients with diabetes

There was a large difference (8.3%) in one year survival in younger (aged <65 years) prevalent dialysis patients without diabetes compared to patients with diabetes,

Table 5.13. One year survival of prevalent dialysis patients in each centre (adjusted to age 60), 2013 cohort

Centre	*N*	Adjusted survival %	Limits for funnel plot	
			Lower 95% limit	Upper 95% limit
D & Gall	57	86.4	77.5	94.6
Inverns	80	88.7	79.6	94.0
Carlis	85	88.3	80.0	93.8
Clwyd	89	88.8	80.2	93.7
Bangor	95	85.6	80.5	93.6
Newry	104	90.6	81.0	93.5
Colchr	111	88.4	81.3	93.3
Ulster	115	91.3	81.4	93.3
Wrexm	121	88.0	81.6	93.2
Sthend	129	90.3	81.9	93.1
Antrim	134	85.3	82.1	93.0
Chelms	139	90.5	82.2	92.9
West NI	141	85.7	82.2	92.9
Ipswi	143	89.7	82.3	92.9
York	155	88.2	82.6	92.8
Truro	160	90.1	82.7	92.7
Liv Ain	161	87.6	82.7	92.7
Plymth	162	86.9	82.8	92.7
Krkcldy	163	84.2	82.8	92.7
Klmarnk	167	91.8	82.9	92.6
Dundee	182	90.4	83.1	92.5
Donc	184	90.4	83.2	92.5
Airdrie	192	85.7	83.3	92.4
Basldn	194	86.4	83.3	92.4
Sund	194	88.1	83.3	92.4
Shrew	201	86.4	83.4	92.3
Bradfd	216	87.5	83.7	92.2
Dudley	217	87.4	83.7	92.2
Glouc	227	92.1	83.8	92.2
Abrdn	229	84.1	83.8	92.1
Wirral	236	84.5	83.9	92.1
Belfast	245	89.2	84.0	92.0
Edinb	285	87.4	84.4	91.8
Derby	299	90.1	84.5	91.8
Newc	303	86.4	84.5	91.7
Dorset	310	92.2	84.6	91.7
L St.G	322	92.2	84.7	91.7
Redng	326	89.5	84.7	91.6
Middlbr	335	85.3	84.8	91.6
Norwch	351	88.8	84.9	91.6
Wolve	367	89.9	85.0	91.5
Swanse	373	87.2	85.0	91.5
Stoke	376	88.8	85.0	91.5
Hull	384	87.6	85.0	91.4
Liv Roy	436	87.0	85.3	91.3
Kent	437	87.8	85.3	91.3
Covnt	442	86.1	85.3	91.3
B Heart	442	87.5	85.3	91.3
Salford	444	89.0	85.3	91.3
Nottm	445	88.5	85.3	91.3
Exeter	456	90.1	85.4	91.2
Brightn	461	87.2	85.4	91.2
Camb	463	87.7	85.4	91.2
Oxford	520	87.5	85.6	91.1
Cardff	539	86.6	85.7	91.0
Leeds	543	88.7	85.7	91.0
Stevng	554	92.0	85.7	91.0
Bristol	561	89.2	85.7	91.0
M RI	561	86.3	85.7	91.0
L Kings	565	90.4	85.7	91.0
Prestn	573	88.7	85.8	91.0
Glasgw	611	87.8	85.9	90.9
Sheff	626	88.2	85.9	90.9
Ports	631	85.7	85.9	90.9
L Guys	633	90.5	85.9	90.9
L Rfree	801	90.0	86.2	90.6
Carsh	840	89.6	86.3	90.6
Leic	987	89.3	86.5	90.5
B QEH	1,031	89.6	86.5	90.4
L Barts	1,082	90.3	86.6	90.4
L West	1,441	90.0	86.9	90.2

whereas survival was very similar for non-diabetic compared with diabetic older (aged 65+ years) prevalent dialysis patients (2.4% difference, table 5.14). Similar findings were reported for incident RRT patients (see figures 5.17 to 5.19 and discussion).

Time trends in patients with a primary diagnosis of diabetes

The age adjusted one year survival for prevalent dialysis patients with diabetic primary renal disease in the UK are shown in table 5.15. The proportion of prevalent dialysis patients with diabetes surviving one year has been variable over the last ten years and has decreased slightly since 2012.

Death rate on RRT compared with the UK general population

The death rate of patients on RRT compared to the general population is shown in table 5.16. The relative risk of death on RRT decreased with age from a peak of more than 30 times that of the general population at

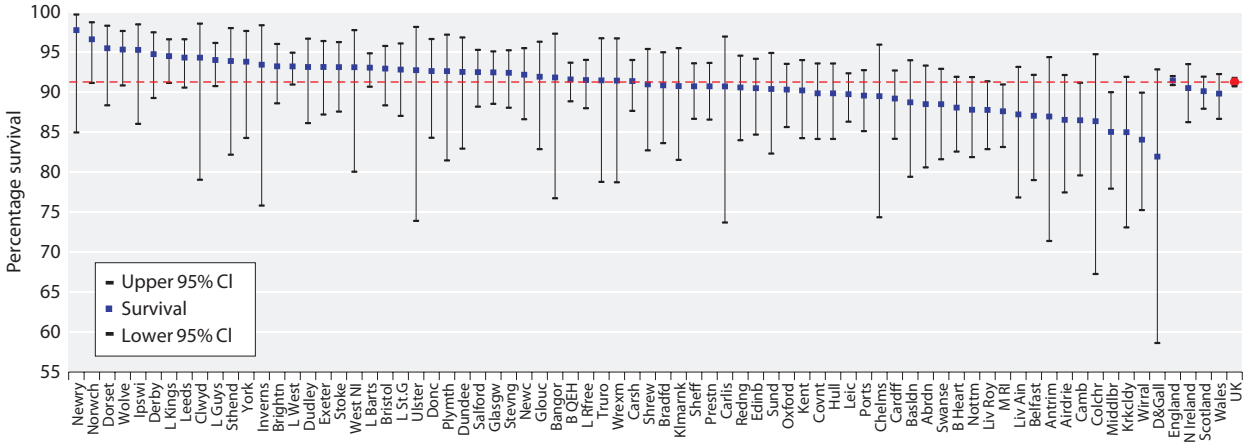

Fig. 5.21. One year survival of prevalent dialysis patients aged under 65 by centre, 2013 cohort

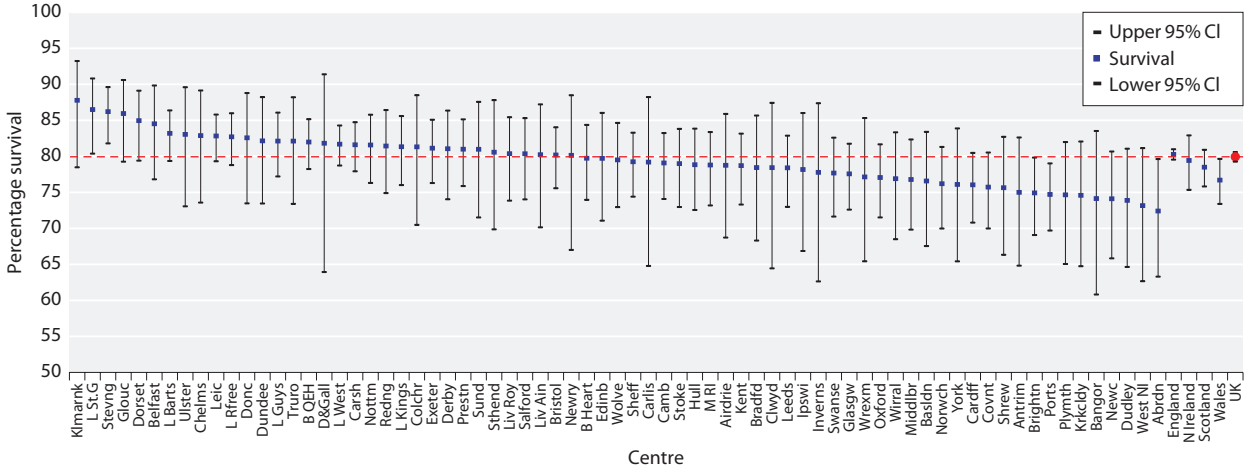

Fig. 5.22. One year survival of prevalent dialysis patients aged 65 years and over by centre, 2013 cohort

age 25–29 years to 2.6 times the general population at age 85 and over. Figure 5.26 shows that the relative risk of death has decreased substantially for the younger age groups (<50 years) whereas the relative risk of death in patients aged over 55 has not changed greatly compared to the relative risk of death in the 1998–2001 cohort. The overall relative risk of death at 6.2 in the 2013 cohort was similar to the death rate in the last three years (2012, 2011 and 2010 cohorts).

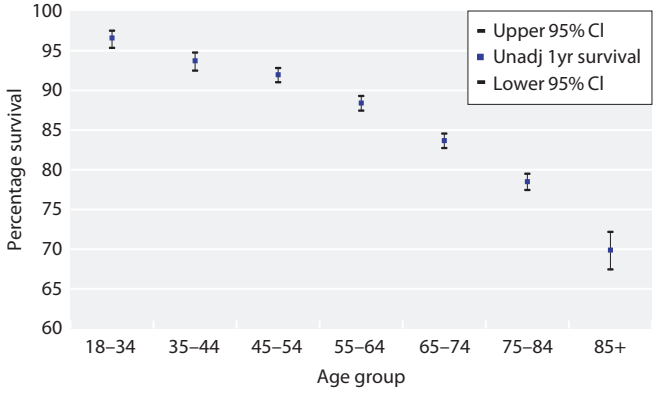

Fig. 5.23. One year survival of prevalent dialysis patients by age group, 2013 cohort

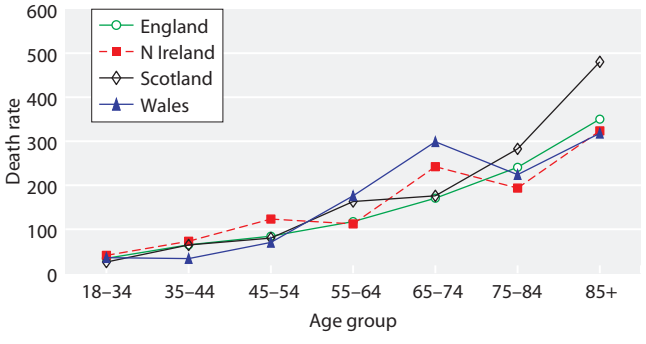

Fig. 5.24. One year death rate per 1,000 patient years by UK country and age group for prevalent dialysis patients, 2013 cohort

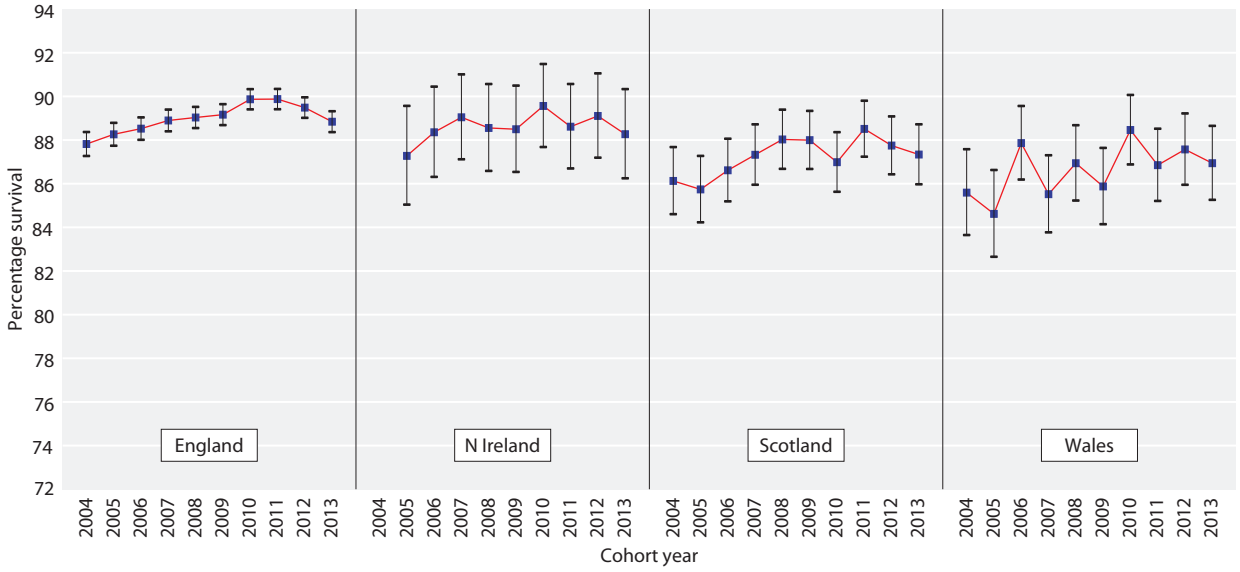

Fig. 5.25. Serial one year survival for prevalent dialysis patients by UK country, 2004 to 2013 cohort years, adjusted to age 60

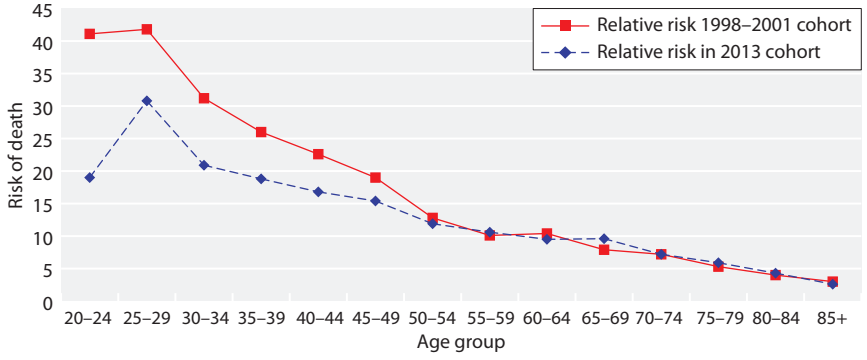

Fig. 5.26. Relative risk of death in prevalent RRT patients in the 2013 cohort compared to the 1998–2001 cohort

Table 5.14. One year survival of prevalent RRT patients in the UK by age group and diabetic status, 2013 cohort

Patient group	Patients	Deaths	Survival	*95% CI*
Dialysis patients 2013 cohort				
All, age <65	12,019	975	91.2	*90.7–91.8*
All, age 65+	14,165	2,795	79.9	*79.3–80.6*
Non-diabetic <65	9,369	592	93.1	*92.6–93.6*
Non-diabetic 65+	11,020	2,117	80.5	*79.7–81.2*
Diabetic <65	2,650	383	84.8	*83.3–86.1*
Diabetic 65+	3,145	678	78.1	*76.6–79.5*

Cohorts of patients alive on 31/12/2013

Causes of death

Data completeness

Completeness of cause of death data in the UK decreased to 64.8% in 2014 from 70.0% in 2013, although cause of death completeness improved in Northern Ireland and Wales (see appendix, table 5.27). Some centres consistently achieve a very high rate of data return for cause of death because a process is in place to ensure that cause of death data was entered. Several centres have shown substantial improvement in data returns

Table 5.15. Serial one year survival of prevalent dialysis patients with a primary diagnosis of diabetes, 2004–2013 cohort years

Survival	Year									
	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
1 year survival %	82.9	82.6	84.9	83.5	83.7	83.2	84.9	85.1	84.6	83.2

Table 5.16. Death rate by age group for prevalent RRT patients, 2013 cohort, compared with the general population and with previous analyses in the 1998–2001 cohort

Age group	UK population mid 2014 (thousands)	UK deaths in 2014	Death rate per 1,000 population	Expected number of deaths in UKRR population	UKRR deaths in 2014	UKRR death rate per 1,000 prevalent RRT patients	Relative risk of death in 2014	Relative risk of death 1998–2001 cohort
20–24	4,313	1,605	0.4	0	7	7	19.0	41.1
25–29	4,391	2,037	0.5	1	22	14	30.8	41.8
30–34	4,356	2,762	0.6	1	30	13	20.9	31.2
35–39	3,994	3,756	0.9	3	49	18	18.8	26.0
40–44	4,391	6,327	1.4	6	102	24	16.8	22.6
45–49	4,673	9,758	2.1	12	177	32	15.4	19.0
50–54	4,458	13,876	3.1	19	230	37	11.9	12.8
55–59	3,843	18,897	4.9	30	311	52	10.6	10.1
60–64	3,512	27,708	7.9	45	432	75	9.5	10.4
65–69	3,562	42,444	11.9	72	688	114	9.6	7.9
70–74	2,634	52,572	20.0	97	692	143	7.2	7.2
75–79	2,140	72,014	33.7	139	824	200	5.9	5.3
80–84	1,568	94,419	60.2	157	671	258	4.3	4.0
85+	1,503	217,023	144.4	178	458	371	2.6	3.0
Total	**49,338**	**565,198**	**11.5**	**759**	**4,693**	**87**	**6.2**	**7.7**

(appendix 1, table 5.27), but there is still much variability between the centres regarding the completeness of cause of death with some centres returning no data and other centres having 100% completeness.

Causes of death in incident RRT patients

The number and proportion of patients with missing cause of death data in the cohort analysed is shown in the last row of each table for cause of death (tables 5.17 to 5.21).

Causes of death within the first 90 days

See table 5.17.

Causes of death within one year after 90 days

In both the first 90 days after start of RRT and the subsequent year, treatment withdrawal as a cause of death was more common in older patients (aged 65+) whereas malignancy and cardiac disease were more common in younger patients (<65 years old) (tables 5.17, 5.18). Infection as cause of death within the first 90 days was more common in older patients. Cardiac disease remained the leading cause of death both in the first 90 days and one year after the first 90 days in both the older (aged 65+) and younger age groups (aged <65 years). There has been an increasing trend of treatment withdrawal as cause of death at 90 days in older patients

Table 5.17. Causes of death in the first 90 days for incident patients by age group, 2000–2013 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	785	26	185	29	600	26
Cerebrovascular disease	139	5	31	5	108	5
Infection	527	18	93	14	434	18
Malignancy	274	9	81	12	193	8
Treatment withdrawal	472	16	65	10	407	17
Other	673	22	167	26	506	22
Uncertain	126	4	25	4	101	4
Total	**2,996**		**647**		**2,349**	
No cause of death data	2,680	47	589	48	2,091	47

Table 5.18. Cause of death in one year after 90 days for incident patients by age group, 2000–2013 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	1,234	22	393	25	841	21
Cerebrovascular disease	273	5	82	5	191	5
Infection	1,010	18	280	18	730	18
Malignancy	618	11	202	13	416	10
Treatment withdrawal	929	17	141	9	788	20
Other	1,168	21	359	23	809	20
Uncertain	310	6	88	6	222	6
Total	**5,542**		**1,545**		**3,997**	
No cause of death data	4,814	46.5	1,347	46.6	3,467	46.5

Table 5.19. Cause of death in prevalent RRT patients by modality, 2013 cohort

	All modalities		Dialysis		Transplant	
Causes of death	*N*	%	*N*	%	*N*	%
Cardiac disease	722	23	628	24	94	18
Cerebrovascular disease	136	4	112	4	24	5
Infection	622	20	498	19	124	24
Malignancy	350	11	214	8	136	26
Treatment withdrawal	504	16	490	19	14	3
Other	607	19	517	20	90	17
Uncertain	189	6	154	6	35	7
Total	**3,130**		**2,613**		**517**	
No cause of death data	1,564	33	1,313	33	251	33

(aged 65+) over the last four years. Cardiac disease as cause of death at one year after the first 90 days has decreased over time.

Cause of death in prevalent RRT patients in the 2013 cohort

Table 5.19 shows the cause of death for both prevalent dialysis and transplant patients in the 2013 cohort. Cardiac disease as a cause of death was less common in transplanted patients who were a pre-selected low-risk group of patients. Malignancy and infection were both responsible for a greater percentage of deaths in prevalent transplanted patients, with treatment withdrawal a more common cause of death in the prevalent dialysis population.

Table 5.20 shows the cause of death for prevalent dialysis patients in the 2013 cohort.

Table 5.20. Cause of death in prevalent dialysis patients by age group, 2013 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	628	24	204	31	424	22
Cerebrovascular disease	112	4	42	6	70	4
Infection	498	19	123	19	375	19
Malignancy	214	8	52	8	162	8
Treatment withdrawal	490	19	77	12	413	21
Other	517	20	132	20	385	20
Uncertain	154	6	33	5	121	6
Total	**2,613**		**663**		**1,950**	
No cause of death data	1,313	33	353	33	960	0

Table 5.21. Cause of death in prevalent transplanted patients by age group, 2013 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	94	18	42	18	52	19
Cerebrovascular disease	24	5	12	5	12	4
Infection	124	24	48	20	76	27
Malignancy	136	26	65	27	71	25
Treatment withdrawal	14	3	7	3	7	3
Other	90	17	47	20	43	15
Uncertain	35	7	17	7	18	6
Total	**517**		**238**		**279**	
No cause of death data	251	0	107	0	144	31

Prevalent dialysis patients aged ⩾65 years were substantially more likely to withdraw from treatment than younger patients (21% and 12% respectively) and cardiac disease represented a much higher proportion of all deaths (amongst those where cause of death was known) in younger (<65 years) dialysis patients, although the absolute number of cardiac deaths were higher amongst those aged ⩾65 years. Figure 5.27 shows cause of death for prevalent patients in the 2003 to 2013 cohort. Over time, cardiovascular disease as cause of death has decreased, treatment withdrawal has increased whilst infection as cause of death remained at a similar level over this period (figure 5.27).

Table 5.21 shows that malignancy was a slightly more common cause of death in younger (<65 years) prevalent transplanted patients, whereas infection was a more common cause in older transplanted patients.

Conclusion

Survival of incident patients on RRT at 90 days and one year after 90 days (adjusted to age 60) increased slightly in the 2013 cohort compared to the previous year (2012 cohort). Long term survival of incident patients on RRT continued to improve over time for one year up to 10 years post RRT start. Survival increased in both younger (aged <65 years) and older patients (aged ⩾65 years) for one year after 90 days survival. This year's survival chapter includes a new table (appendix 1, table 5.25) showing one to five year survival after the first 90 days of RRT for incident patients by centre, adjusted for age 60.

There was a difference in short term incident survival (90 days and one year after 90 days) by age group and diabetic status: diabetic patients aged <65 years have

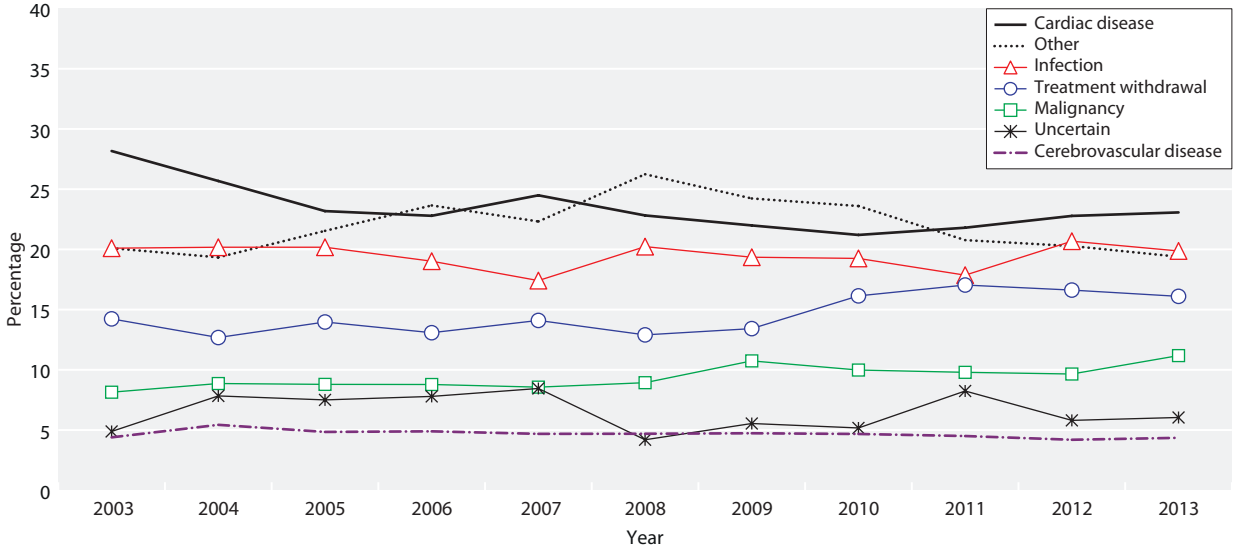

Fig. 5.27. Cause of death in prevalent RRT patients by cohort year

slightly worse survival than non-diabetic patients, but survival for older diabetic patients (⩾65 years) was significantly better than for non-diabetic patients. This initial survival difference in older incident patients diminished over time until there was very little difference in five year survival between diabetic and non-diabetic patients in the older age group (⩾65 years).

One year age adjusted survival for prevalent dialysis patients declined from 89.3% in the 2012 cohort to 88.6% in the 2013 cohort and prevalent dialysis patient survival in the UK seems to have peaked in 2010 and remains relatively stable or slightly lower in more recent years. The age adjusted one year survival for prevalent dialysis patients with diabetic primary renal disease in the UK has been decreasing slightly from 2012 onwards. The relative one year risk of death on RRT decreased with age from nearly 19 times that of the general population at age 35–39 years to 2.6 times at age 85 and over.

In the prevalent RRT dialysis population, cardiovascular disease was the most common cause of death accounting for 24% of deaths, infection accounted for 19% of deaths and treatment withdrawal for 19% of deaths. Trends in causes of death over time (2003–2013) show a decrease in cardiovascular disease, an increase in treatment withdrawal and a plateauing of infection.

Variability in survival between centres was still evident, with some centres appearing as outliers in the data (below the lower 95% and above the upper 95% confidence limits) in incident RRT and prevalent dialysis patient survival. The survival analyses in this chapter have not been adjusted for any case-mix factors except for age, and differences in primary renal diagnosis, ethnicity and comorbidity have not been considered due to low data completeness in some renal centres. Although research has suggested that adjustment for comorbidity only explains a modest part of the variance in ERF patient outcomes [11], at centre level, the prevalence of comorbidities could vary substantially between renal centres and it would be expected that adjustment for comorbidity may explain an increased amount of the variance in survival outcome. The UK Renal Registry regularly evaluates the effect of adjusting for primary renal diagnosis and comorbidity in addition to age in those centres returning ⩾85% of comorbidities and repeatedly shows that at centre level, there is clear benefit for some centres in adjusting for primary renal diagnosis and comorbidities. Research using comorbid conditions identified from hospital episode statistics (HES) data for England RRT patients showed that adjusting for HES-derived case-mix, including comorbid conditions, affected the position and outlying status of some renal centres on the funnel plot for incident patients and reduced outlying centres from four to one [10].

Routine linkage of the UK Renal Registry data with hospital admissions information in the UK will allow the UKRR to report on survival adjusted for case-mix (age, ethnicity, primary renal diagnosis and comorbidity) in future UKRR reports. This will provide a fairer comparison between centres and more accurate identification and location of outlying centres on funnel plots.

There is also much variability at centre level in the hazard of death in the first six months from start of RRT. The proportion of deaths in the first 90 days of starting RRT varies at centre level and in some centres the proportion is very low or even zero. This may be due to unreported deaths in patients that die within the first 90 days of starting RRT but may more likely be due to the exclusion of these patients as acute kidney injury (AKI) patients. The UKRR will in future be able to more accurately identify patients with AKI as opposed to people with chronic kidney disease (CKD) requiring RRT when data on patients with CKD stage four and AKI becomes available. This will result in an improvement in the accuracy of survival estimates for patients starting RRT in the UK.

Conflicts of interest: the authors declare no conflicts of interest

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Appendix 1: Survival tables

Table 5.22. One year after 90 day incident survival percentage by centre, 2013 cohort, unadjusted and adjusted to age 60

Centre	Unadjusted one year after 90 days survival	Adjusted one year after 90 days survival	*Adjusted one year after 90 days 95% CI*
England			
B Heart	90.3	93.4	*89.2–97.9*
B QEH	88.9	91.6	*88.3–95.1*
Basldn	85.9	90.4	*82.9–98.7*
Bradfd	94.9	95.4	*90.4–100.0*
Brightn	82.5	87.1	*82.4–92.0*
Bristol	87.3	91.2	*87.7–94.9*
Camb	90.7	93.5	*90.0–97.1*
Carlis	94.6	95.6	*89.9–100.0*
Carsh	91.1	94.0	*91.3–96.7*
Chelms	84.6	92.1	*86.2–98.3*
Colchr	96.2	97.9	*93.9–100.0*
Covnt	86.1	90.8	*86.1–95.7*
Derby	89.0	91.1	*85.4–97.1*
Donc	88.7	92.2	*86.3–98.4*
Dorset	89.1	93.2	*88.5–98.2*
Dudley	90.0	93.7	*88.6–99.2*
Exeter	91.8	94.9	*91.7–98.2*
Glouc	94.7	96.7	*93.1–100.0*
Hull	89.5	91.9	*86.9–97.1*
Ipswi	82.6	86.7	*77.5–97.1*
Kent	86.8	90.9	*86.9–95.0*
L Barts	90.8	91.4	*88.1–94.7*
L Guys	93.4	94.3	*90.5–98.2*
L Kings	86.6	90.0	*85.9–94.4*
L Rfree	89.4	91.6	*88.3–95.0*
L St.G	89.7	92.2	*87.3–97.5*
L West	92.4	93.9	*91.5–96.4*
Leeds	89.0	91.3	*87.5–95.2*
Leic	87.6	90.7	*87.6–93.9*
Liv Ain	79.4	85.9	*78.2–94.3*
Liv Roy	92.9	91.4	*85.0–98.1*
M RI	88.2	90.2	*86.3–94.3*
Middlbr	89.2	92.1	*87.7–96.7*
Newc	90.6	92.8	*88.1–97.7*
Norwch	82.4	87.7	*81.7–94.2*
Nottm	90.7	93.2	*89.3–97.4*
Oxford	91.6	93.6	*90.4–96.9*
Plymth	90.0	94.4	*90.1–98.8*
Ports	87.6	91.4	*87.8–95.1*
Prestn	91.9	93.9	*90.5–97.3*
Redng	90.1	93.1	*89.1–97.3*
Salford	86.7	89.1	*84.1–94.3*
Sheff	88.7	91.9	*88.0–96.1*
Shrew	81.1	86.2	*78.3–94.9*
Stevng	88.1	90.6	*86.6–94.9*
Sthend	85.7	89.6	*82.2–97.7*
Stoke	82.3	88.4	*83.1–94.2*
Sund	84.0	88.6	*81.6–96.3*
Truro	92.9	95.4	*90.4–100.0*
Wirral	89.5	93.4	*88.4–98.6*
Wolve	85.9	88.8	*82.7–95.2*
York	83.3	87.5	*79.3–96.5*
N Ireland			
Antrim	88.5	92.4	*84.7–100.0*
Belfast	89.6	92.1	*87.0–97.5*
Newry	81.8	84.7	*72.3–99.2*
Ulster	76.9	88.3	*80.1–97.4*
West NI	92.4	93.8	*86.0–100.0*
Scotland			
Abrdn	96.1	97.1	*93.3–100.0*
Airdrie	92.7	95.0	*90.4–99.9*
Dundee	86.5	90.7	*83.5–98.7*
Edinb	83.9	81.5	*71.9–92.4*
Glasgw	87.5	89.8	*85.8–93.9*
Inverns	95.0	95.0	*86.2–100.0*
Klmarnk	77.8	83.3	*73.4–94.4*
Krkcldy	71.4	81.4	*71.7–92.4*
Wales			
Bangor	79.2	89.0	*80.5–98.4*
Cardff	85.0	89.0	*84.9–93.3*
Swanse	77.5	84.9	*79.4–90.7*
Wrexm	80.6	88.2	*80.4–96.7*
England	**89.0**	**91.8**	***91.0–92.6***
N Ireland	**87.0**	**90.8**	***87.2–94.5***
Scotland	**86.8**	**89.5**	***87.0–92.0***
Wales	**81.7**	**87.6**	***84.7–90.6***
UK	**88.4**	**91.4**	***90.6–92.2***

Excluded: centres with less than 20 patients (Clwyd, D & Gall)

Table 5.23. Ninety day incident survival percentage by centre, 2013 cohort, unadjusted and adjusted to age 60

Centre	Unadjusted 90 day survival	Adjusted 90 day survival	*Adjusted 90 day 95% CI*
England			
B Heart	87.5	93.0	*89.2–97.0*
B QEH	99.0	99.4	*98.5–100.0*
Basldn	97.4	98.5	*95.8–100.0*
Bradfd	96.8	97.3	*93.8–100.0*
Brightn	94.8	96.9	*94.8–99.1*
Bristol	97.1	98.3	*96.9–99.8*
Camb	97.0	98.2	*96.5–100.0*
Carsh	94.3	96.8	*95.0–98.6*
Chelms	95.1	98.0	*95.3–100.0*
Colchr	87.1	93.8	*88.1–99.8*
Covnt	94.0	96.7	*94.2–99.4*
Derby	97.3	98.2	*95.7–100.0*
Donc	86.9	92.6	*87.9–97.7*
Dorset	95.5	97.7	*95.1–100.0*
Dudley	98.0	99.0	*97.0–100.0*
Exeter	94.9	97.4	*95.3–99.5*
Glouc	96.6	98.2	*95.8–100.0*
Hull	98.9	99.3	*97.8–100.0*
Kent	95.9	97.5	*95.6–99.5*
L Barts	95.3	96.1	*94.0–98.2*
L Guys	96.9	97.7	*95.4–99.9*
L Rfree	96.9	97.9	*96.4–99.5*
L St.G	95.2	96.9	*94.0–99.9*
L West	98.4	98.9	*97.9–99.9*
Leeds	93.9	95.9	*93.5–98.3*
Leic	94.4	96.5	*94.7–98.3*
Liv Ain	79.4	88.2	*82.3–94.6*
Liv Roy	89.5	88.8	*82.5–95.5*
M RI	96.8	97.8	*96.0–99.6*
Middlbr	92.0	95.0	*91.8–98.3*
Newc	91.5	94.2	*90.4–98.2*
Norwch	94.9	97.2	*94.5–99.9*
Nottm	93.1	95.7	*92.9–98.7*
Oxford	96.6	97.8	*96.1–99.6*
Plymth	96.8	98.5	*96.5–100.0*
Ports	93.1	96.0	*93.8–98.3*
Prestn	94.3	96.2	*93.8–98.7*
Redng	92.9	95.8	*93.0–98.7*
Salford	97.6	98.3	*96.4–100.0*
Sheff	94.0	96.5	*94.2–99.0*
Shrew	88.9	93.5	*88.7–98.7*
Stevng	95.6	97.1	*95.0–99.2*
Sthend	97.7	98.7	*96.2–100.0*
Stoke	87.9	93.3	*89.6–97.1*
Sund	94.4	96.8	*93.2–100.0*
Truro	93.6	96.3	*92.3–100.0*
Wirral	87.9	93.5	*89.2–98.0*
Wolve	92.9	95.3	*91.6–99.0*
York	95.6	97.2	*93.5–100.0*
N Ireland			
Antrim	86.7	92.3	*85.6–99.6*
Belfast	97.5	98.4	*96.3–100.0*
Newry	95.7	96.8	*91.1–100.0*
Ulster	83.9	93.3	*87.9–99.2*
West NI	96.4	97.5	*93.0–100.0*
Scotland			
Abrdn	91.1	94.2	*89.4–99.2*
Edinb	95.4	95.1	*89.9–100.0*
Glasgw	97.8	98.5	*97.0–100.0*
Klmarnk	94.7	96.7	*92.4–100.0*
Krkcldy	89.7	94.7	*89.7–99.9*
Wales			
Bangor	88.9	95.2	*90.2–100.0*
Cardff	94.7	96.8	*94.7–98.9*
Swanse	91.5	95.5	*92.7–98.3*
Wrexm	95.0	97.4	*94.0–100.0*
England	**95.0**	**96.9**	***96.4–97.4***
N Ireland	**93.2**	**96.0**	***93.9–98.2***
Scotland	**96.4**	**97.5**	***96.4–98.7***
Wales	**93.5**	**96.5**	***95.0–97.9***
UK	**94.9**	**96.9**	***96.4–97.4***

Excluded: centres with less than 20 patients (Clwyd, D & Gall) and centres with no deaths recorded in the first 90 days of RRT (Ipswich, L Kings, Carlisle, Airdrie, Dundee, Inverness)

Table 5.24. One year after 90 day incident survival percentage by centre for incident cohort years 2004–2013, adjusted to age 60

Centre	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
England										
B Heart	86.5	83.6	88.5	93.5	93.6	83.7	92.0	94.4	86.9	93.4
B QEH	88.0	90.4	86.8	92.8	89.6	92.3	88.3	93.3	92.3	91.6
Basldn	92.4	92.9	90.8	89.9	89.3	86.9	85.7	91.6	89.6	90.4
Bradfd	80.7	86.2	81.3	83.8	84.2	91.6	87.8	88.9	86.7	95.4
Brightn	90.7	84.3	87.0	94.2	89.1	85.6	88.4	91.0	91.1	87.1
Bristol	88.1	82.9	92.4	91.4	84.0	89.2	88.9	94.5	88.1	91.2
Camb	87.0	89.8	90.7	93.4	91.1	87.3	89.5	91.8	92.5	93.5
Carlis	87.0	79.6	89.9	96.5	87.8	71.8	86.3	91.5		95.6
Carsh	85.9	90.6	88.2	87.1	86.6	88.0	89.9	94.3	89.5	94.0
Chelms	82.3	82.9	94.2	86.6	90.8	94.1	85.6	82.1	91.1	92.1
Colchr					85.0	86.3	93.9	84.1	82.6	97.9
Covnt	87.7	82.6	88.5	90.5	86.9	94.2	89.1	90.6	87.9	90.8
Derby	83.1	87.9	93.0	96.4	90.4	88.0	87.4	90.9	89.3	91.1
Donc					89.8	87.8	91.5	90.3	88.9	92.2
Dorset	91.4	82.6	86.2	90.4	93.5	92.4	87.5	88.2	90.2	93.2
Dudley	81.4	97.3	92.6	85.6	71.1	84.1	87.8	93.7	90.0	93.7
Exeter	88.7	86.2	88.7	86.3	87.0	89.1	95.3	88.5	92.9	94.9
Glouc	83.6	95.1	89.6	86.3	94.4	89.2	92.4	89.6	91.3	96.7
Hull	88.9	85.6	93.5	89.6	85.4	89.2	87.9	93.1	90.3	91.9
Ipswi	97.4	84.7	93.8	96.0	95.8	92.2	93.2	95.5	93.1	86.7
Kent				91.8	89.9	89.7	90.5	88.3	94.8	90.9
L Barts	87.1	91.1	93.9	86.4	92.5	90.8	91.7	93.7	90.8	91.4
L Guys	91.6	90.4	92.9	92.0	90.5	94.1	91.5	94.7	94.7	94.3
L Kings	86.9	91.7	84.5	87.5	89.6	85.5	89.7	90.8	89.8	90.0
L Rfree		93.3	89.7	94.4	95.2	89.1	90.3	90.9	93.5	91.6
L St.G				92.1	94.0	92.7	93.7	96.6	93.5	92.2
L West	92.5	94.1	92.8	92.8	94.2	93.1	88.8	90.7	92.5	93.9
Leeds	90.3	89.7	85.0	87.1	88.7	90.4	92.7	88.2	92.5	91.3
Leic	87.5	84.7	87.8	89.8	90.5	90.4	92.0	91.3	90.3	90.7
Liv Ain			86.9	82.8	78.5	82.7	89.0	86.3	95.1	85.9
Liv Roy	80.8	90.0	86.4	86.2	94.1	93.9	88.5	88.9	89.9	91.4
M RI				90.1	87.7	87.5	89.6	93.2	89.9	90.2
Middlbr	85.4	82.8	91.5	87.9	82.3	86.8	88.0	88.9	89.6	92.1
Newc	85.4	82.1	86.2	85.8	91.3	85.7	88.8	86.0	85.7	92.8
Norwch	84.7	90.7	86.4	91.0	89.0	89.7	92.2	89.5	88.2	87.7
Nottm	85.7	87.0	91.9	90.0	91.1	88.8	93.5	92.7	90.0	93.2
Oxford	87.9	87.9	89.9	89.2	87.1	91.6	90.6	88.8	93.9	93.6
Plymth	77.9	84.6	81.0	90.1	87.8	89.0	93.8	91.3	92.0	94.4
Ports	88.4	83.2	87.5	88.7	88.8	90.1	88.1	91.2	91.0	91.4
Prestn	87.4	88.5	83.6	91.4	82.1	87.5	87.6	91.8	92.8	93.9
Redng	91.0	89.7	91.3	90.1	95.3	89.0	93.0	93.0	96.0	93.1
Salford	84.8	88.3	90.5	89.2	86.0	89.1	86.4	91.9	89.0	89.1
Sheff	91.5	90.6	88.6	90.9	92.5	94.1	92.2	87.5	93.4	91.9
Shrew	87.5	86.2	87.7	91.8	92.9	84.7	86.9	91.7	85.0	86.2
Stevng	93.3	76.7	85.3	90.7	90.2	96.7	94.0	91.1	93.1	90.6
Sthend	90.5	91.1	94.8	91.8	86.2	91.5	82.0	94.3		89.6
Stoke				87.1	89.7	85.8	87.1	93.0	94.0	88.4
Sund	86.8	80.6	83.5	88.7	85.3	83.0	84.1	88.7	93.0	88.6
Truro	92.8	90.6	89.4	90.2	89.2	94.2	90.9	93.3	94.6	95.4
Wirral	85.4	87.0	85.9	88.9	90.4	84.8	93.0	86.7	86.1	93.4
Wolve	88.1	84.2	89.2	89.5	89.3	88.5	87.5	89.4	84.1	88.8
York	91.4	83.9	82.6	95.1	86.2	94.1	86.3	93.4	93.9	87.5

Table 5.24. Continued

Centre	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
N Ireland										
Antrim		85.0	93.9	85.2	88.6	97.4	85.9	85.9	86.6	92.4
Belfast		85.1	92.4	90.8	88.0	91.4	88.3	92.5	93.0	92.1
Newry		90.2					92.0	85.4	89.8	84.7
Ulster							90.9	86.3		88.3
West NI			90.1	97.3	93.1	97.6	91.4	95.8		93.8
Scotland										
Abrdn	88.8	84.2	84.6	86.0	86.9	88.8	85.4	92.8	91.5	97.1
Airdrie	86.2	75.1	80.7	76.7	88.3	94.2	82.1	84.0	92.0	95.0
D & Gall						84.0				
Dundee	80.5	84.4	89.2	82.4	85.2	87.7	90.2	90.5	93.4	90.7
Edinb	75.9	83.3	88.6	90.2	84.1	84.7	86.4	89.7	92.9	81.5
Glasgw	80.5	86.1	83.6	87.8	83.2	88.4	86.8	88.6	90.1	89.8
Inverns	89.3	84.3	83.8	90.6	87.1		96.7			95.0
Klmarnk	87.4	96.3	82.7	86.7	90.1	84.0	88.4	91.0	90.9	83.3
Krkcldy	80.5	78.3	80.1	87.4	86.6	90.7	93.6	92.4	97.3	81.4
Wales										
Bangor	81.0	82.3	81.4	92.2	87.8	87.3	89.1	94.3		89.0
Cardff	85.5	87.2	87.0	84.2	83.2	89.3	90.0	88.1	86.8	89.0
Clwyd		75.5	96.9			92.3				
Swanse	77.8	82.7	84.1	89.0	85.1	81.7	86.8	85.0	83.8	84.9
Wrexm	77.3	97.7	85.5	89.9			82.1	88.8	86.0	88.2
England	**87.9**	**87.9**	**88.9**	**90.2**	**89.5**	**89.8**	**89.9**	**91.1**	**91.2**	**91.8**
N Ireland		**87.7**	**91.1**	**90.2**	**87.8**	**92.1**	**89.2**	**89.9**	**93.0**	**90.8**
Scotland	**83.0**	**84.5**	**84.7**	**86.5**	**85.5**	**87.2**	**87.8**	**90.1**	**91.6**	**89.5**
Wales	**82.6**	**86.0**	**86.1**	**86.7**	**84.4**	**87.3**	**88.8**	**87.6**	**85.4**	**87.6**
UK	**87.0**	**87.4**	**88.4**	**89.6**	**88.9**	**89.5**	**89.7**	**90.8**	**91.0**	**91.4**

Blank cells: centres with either less than 20 patients, no deaths or no data contribution to the UKRR for that year

Table 5.25. Incident survival percentage after 90 days from start of RRT by centre for incident cohort years 2009–2013, adjusted to age 60

Centre	5 year survival 2009 cohort	4 year survival 2010 cohort	3 year survival 2011 cohort	2 year survival 2012 cohort	1 year survival 2013 cohort
England					
B Heart	49.3	63.1	79.1	82.4	93.4
B QEH	68.3	70.1	80.5	86.1	91.6
Basldn	57.5	69.1	82.8	81.0	90.4
Bradfd	60.0	67.4	70.8	82.1	95.4
Brightn	59.9	67.9	76.8	85.3	87.1
Bristol	58.6	69.0	82.7	81.8	91.2
Camb	66.4	69.7	77.9	84.3	93.5
Carlis	47.4	71.7	73.4		95.6
Carsh	64.9	69.1	82.5	82.4	94.0
Chelms	68.4	72.8	71.0	87.6	92.1
Colchr	65.3	71.7	68.9	70.4	97.9
Covnt	71.3	68.5	77.6	81.1	90.8
Derby	63.1	60.4	73.6	79.0	91.1
Donc	53.1	61.2	77.8	84.6	92.2
Dorset	63.6	61.1	76.2	83.7	93.2
Dudley	43.3	65.0	83.5	78.7	93.7
Exeter	56.2	72.8	72.0	87.7	94.9
Glouc	65.0	72.4	77.2	82.8	96.7
Hull	61.3	62.7	78.7	83.0	91.9
Ipswi	61.3	74.0	80.7	85.8	86.7
Kent	61.8	68.8	75.2	87.6	90.9
L Barts	65.4	73.4	79.4	83.2	91.4
L Guys	63.0	72.8	84.3	85.4	94.3
L Kings	56.4	72.7	80.3	80.6	90.0
L Rfree	62.5	69.8	78.3	88.5	91.6
L St.G	61.1	76.9	84.5	87.3	92.2
L West	64.4	72.3	78.4	83.9	93.9
Leeds	55.0	65.4	72.3	86.2	91.3
Leic	62.8	75.7	75.9	83.9	90.7
Liv Ain	57.7	47.1	66.5	85.3	85.9
Liv Roy	58.1	70.5	63.7	80.8	91.4
M RI	56.2	61.3	73.5	79.9	90.2
Middlbr	60.4	74.3	73.7	82.2	92.1
Newc	50.4	60.6	77.4	80.4	92.8
Norwch	64.8	69.7	76.1	83.3	87.7
Nottm	57.5	70.2	82.4	85.0	93.2
Oxford	66.3	66.7	74.2	87.7	93.6
Plymth	62.8	61.1	78.5	84.4	94.4
Ports	61.2	66.9	72.8	81.3	91.4
Prestn	57.1	60.3	78.5	85.7	93.9
Redng	62.2	73.2	79.3	88.9	93.1
Salford	49.1	59.5	77.6	79.9	89.1
Sheff	61.2	75.0	73.4	87.1	91.9
Shrew	53.5	56.8	72.7	77.2	86.2
Stevng	66.1	71.8	79.0	88.2	90.6
Sthend	74.7	71.7	82.0	86.3	89.6
Stoke	59.7	64.7	71.6	89.0	88.4
Sund	50.5	64.2	65.4	86.7	88.6
Truro	59.0	65.5	81.3	90.6	95.4
Wirral	54.0	73.9	75.9	78.4	93.4
Wolve	45.5	64.0	70.9	78.1	88.8
York	69.2	63.9	81.3	87.4	87.5

Table 5.25. Continued

Centre	5 year survival 2009 cohort	4 year survival 2010 cohort	3 year survival 2011 cohort	2 year survival 2012 cohort	1 year survival 2013 cohort
N Ireland					
Antrim	46.7	51.6	76.0	86.4	92.4
Belfast	55.1	57.8	72.8	78.8	92.1
Newry			63.5	81.8	84.7
Ulster			80.0		88.3
West NI	68.4	64.0	84.1	94.7	93.8
Scotland					
Abrdn	57.0	63.4	74.7	87.8	97.1
Airdrie	66.0	53.2	71.7	76.7	95.0
D & Gall	57.5				
Dundee	56.1	69.2	76.6	87.9	90.7
Edinb	50.7	64.6	75.3	87.9	81.5
Glasgw	49.2	61.9	66.3	83.2	89.8
Inverns		77.9			95.0
Klmarnk	47.8	59.4	60.2	80.5	83.3
Krkcldy	62.5	66.1	59.9	80.0	81.4
Wales		64.5			
Bangor	65.0	59.4	64.7		89.0
Cardff	53.6	69.7	70.8	79.9	89.0
Clwyd	69.3	48.7			
Swanse	54.2	60.6	70.5	76.0	84.9
Wrexm		65.0	72.4	69.0	88.2
England	**60.8**	**68.8**	**77.0**	**84.0**	**91.8**
N Ireland	**56.8**	**63.8**	**75.2**	**85.0**	**90.8**
Scotland	**52.8**	**62.9**	**70.4**	**83.7**	**89.5**
Wales	**55.3**	**64.5**	**69.9**	**77.1**	**87.6**
UK	**59.9**	**67.9**	**76.0**	**83.6**	**91.4**

Blank cells: centres with less than 20 patients for that year

Table 5.26. One year prevalent patient survival percentage by centre for prevalent cohort years 2004–2013, adjusted to age 60

Centre	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
England										
B Heart	87.9	86.6	87.8	90.4	90.9	87.4	89.5	88.4	89.1	87.5
B QEH	89.0	88.2	88.0	88.3	89.9	89.3	91.0	91.5	91.8	89.6
Basldn	90.1	89.9	90.3	92.6	91.6	88.5	90.8	88.4	92.7	86.4
Bradfd	86.4	82.9	84.3	87.7	84.5	89.2	88.0	87.7	85.1	87.5
Brightn	84.4	87.6	87.2	88.7	87.4	89.9	88.2	89.4	88.3	87.2
Bristol	87.4	87.7	89.2	87.4	85.0	85.8	89.7	90.8	90.0	89.2
Camb	87.2	89.3	88.0	92.6	90.0	91.4	93.1	89.1	92.8	87.7
Carlis	83.7	83.9	85.8	87.0	80.3	80.5	93.2	88.9	82.9	88.3
Carsh	85.7	89.2	88.4	89.8	88.7	89.2	89.6	91.0	90.5	89.6
Chelms	82.9	85.6	87.5	85.1	86.1	89.6	84.1	91.6	90.7	90.5
Colchr					91.1	86.6	89.0	89.2	85.9	88.4
Covnt	89.3	84.8	87.2	87.3	90.9	90.2	91.0	91.9	90.6	86.1
Derby	87.4	88.5	86.9	90.3	90.4	90.0	89.8	89.8	88.2	90.1
Donc				88.8	83.9	88.9	91.8	91.5	82.8	90.4
Dorset	89.4	87.0	87.5	89.9	90.1	93.0	90.0	90.5	91.9	92.2
Dudley	85.9	87.3	87.2	88.8	88.8	90.8	87.7	91.5	86.8	87.4
Exeter	84.0	91.1	87.4	85.6	85.5	86.7	88.4	88.3	91.7	90.1
Glouc	88.2	91.1	88.2	86.3	91.7	92.1	89.5	90.7	89.7	92.1
Hull	84.3	85.8	89.9	86.7	87.7	87.5	89.8	90.9	88.5	87.6
Ipswi	85.6	84.2	86.1	93.1	84.4	87.5	91.8	90.3	88.0	89.6
Kent				86.3	87.9	90.4	89.7	89.1	87.8	87.8
L Barts	85.6	88.3	89.3	88.7	90.8	92.9	91.7	89.8	91.2	90.3
L Guys	89.3	87.3	90.5	90.3	91.4	91.0	93.9	91.2	90.9	90.5
L Kings	86.4	88.6	84.3	87.4	87.6	88.8	89.7	89.4	88.9	90.4
L Rfree		90.0	90.3	91.2	89.7	90.3	91.6	90.2	90.9	90.0
L St.G				94.3	89.2	90.8	91.9	88.4	91.7	92.2
L West	91.2	91.2	91.5	90.3	92.0	90.6	90.6	91.7	90.2	90.0
Leeds	88.9	88.4	88.2	87.3	88.8	90.8	88.9	86.6	88.3	88.7
Leic	86.6	84.4	89.7	89.5	88.6	90.4	89.8	90.3	89.0	89.3
Liv Ain	97.0	86.8	90.5	88.3	91.9	89.7	89.7	83.8	84.2	87.6
Liv Roy	83.6	87.6	84.4	86.4	89.1	88.9	90.5	88.5	87.8	87.0
M RI				86.3	87.6	86.9	88.5	90.7	86.1	86.3
Middlbr	86.0	85.0	87.1	86.8	86.4	83.3	93.0	88.5	88.7	85.3
Newc	85.9	83.7	86.0	86.3	87.0	86.1	85.0	89.2	84.4	86.4
Norwch	88.4	90.3	87.6	91.1	89.6	89.9	91.3	91.4	88.6	88.8
Nottm	84.8	83.2	89.5	88.3	88.0	89.6	89.9	88.9	90.5	88.5
Oxford	87.2	86.7	86.7	87.7	88.3	87.1	87.8	88.0	89.4	87.5
Plymth	87.8	83.8	82.8	88.1	85.9	85.3	89.9	84.8	89.9	86.9
Ports	86.0	85.2	89.8	88.5	89.2	88.4	88.3	90.0	90.3	85.7
Prestn	85.8	86.3	90.8	90.2	89.7	90.1	88.2	90.6	89.1	88.7
Redng	86.3	89.0	90.3	88.9	92.4	88.9	89.4	90.9	90.9	89.5
Salford	82.6	85.3	87.6	86.0	87.5	84.6	87.0	88.4	87.5	89.0
Sheff	86.9	89.2	88.8	88.8	89.7	89.6	88.7	89.0	91.4	88.2
Shrew	86.3	86.6	89.1	89.0	87.9	85.6	87.4	89.9	83.9	86.4
Stevng	88.8	89.4	89.8	92.5	90.5	90.0	92.8	92.1	89.1	92.0
Sthend	87.0	83.4	86.3	90.2	91.0	92.4	90.3	87.8	91.8	90.3
Stoke				87.4	88.4	86.9	90.6	90.5	91.6	88.8
Sund	86.4	79.4	83.7	87.5	85.3	84.8	83.8	86.6	84.9	88.1
Truro	84.9	91.8	89.3	89.5	89.0	90.7	89.1	89.7	88.9	90.1
Wirral	89.4	88.4	88.1	89.3	90.3	88.6	90.7	90.2	90.8	84.5
Wolve	86.5	89.3	87.9	92.6	89.5	87.4	89.3	88.8	89.0	89.9
York	89.4	84.0	88.5	87.8	88.9	90.0	84.2	88.7	91.5	88.2

Table 5.26. Continued

Centre	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
N Ireland										
Antrim		85.2	85.2	87.8	89.5	88.1	91.6	90.0	90.5	85.3
Belfast		89.5	89.5	87.8	87.0	87.4	87.3	87.7	85.2	89.2
Newry		87.3	87.3	89.1	91.5	86.6	91.1	81.5	90.0	90.6
Ulster		89.5	89.5	89.6	87.4	89.8	89.0	90.9	91.2	91.3
West NI		90.2	90.2	92.7	89.3	91.0	90.7	91.4	91.7	85.6
Scotland										
Abrdn	87.2	86.1	87.1	89.4	89.3	89.6	89.0	91.2	88.5	84.1
Airdrie	82.8	79.7	79.4	86.0	85.5	89.4	88.4	86.4	85.8	85.7
D & Gall	91.7	81.3	90.2	83.9	86.5	86.4	90.6	86.5	89.8	86.4
Dundee	86.4	86.6	82.6	82.6	93.0	86.9	86.9	91.1	88.5	90.4
Edinb	84.5	85.7	87.0	87.5	85.7	88.4	81.2	89.2	88.9	87.4
Glasgw	86.7	85.7	87.5	87.7	87.8	87.9	87.3	87.5	87.1	87.8
Inverns	85.5	85.6	93.4	88.6	91.7	88.3	85.9	87.1	86.3	88.7
Klmarnk	84.1	91.9	87.0	89.0	88.1	88.1	88.8	89.5	86.9	91.7
Krkcldy	89.0	87.4	87.6	89.9	85.0	86.2	89.0	86.9	90.5	84.2
Wales										
Bangor	86.6	88.5	81.5	88.7	85.1	85.5	86.9	89.9	84.5	85.6
Cardff	84.4	84.1	88.8	82.5	86.5	85.8	88.3	86.3	87.6	86.6
Clwyd	82.0	77.3	90.5	87.1	88.8	78.2	93.1	90.0	86.3	88.8
Swanse	89.0	85.4	88.0	89.4	87.3	87.4	89.0	86.2	88.4	87.2
Wrexm	82.1	85.1	87.6	85.1	89.0	86.7	85.8	87.3	89.3	88.0
England	**87.8**	**88.3**	**88.5**	**88.9**	**89.0**	**89.2**	**89.9**	**89.9**	**89.5**	**88.8**
N Ireland		**87.3**	**88.4**	**89.0**	**88.6**	**88.5**	**89.6**	**88.6**	**89.1**	**88.3**
Scotland	**86.1**	**85.7**	**86.6**	**87.3**	**88.0**	**88.0**	**87.0**	**88.5**	**87.7**	**87.3**
Wales	**85.6**	**84.6**	**87.9**	**85.5**	**86.9**	**85.9**	**88.5**	**86.8**	**87.6**	**86.9**
UK	**87.5**	**87.8**	**88.3**	**88.6**	**88.8**	**88.9**	**89.6**	**89.6**	**89.3**	**88.6**

Blank cells: data not reported to the UKRR for that year or less than 20 patients in the year

Table 5.27. Percentage completeness of EDTA cause of death for prevalent patients by centre and year of death, 2005 to 2014

Centre	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
England										
B Heart	68.1	85.7	84.5	93.9	100.0	96.6	96.1	96.6	95.0	65.6
B QEH	60.0	4.7	7.0	5.8	0.7	1.7	2.0	2.1	61.9	90.4
Basldn	45.0	21.7	45.5	47.6	76.2	66.7	84.6	88.9	90.9	90.0
Bradfd	87.8	92.2	86.5	92.5	81.8	97.0	97.5	97.7	97.9	98.0
Brightn	0.0	0.0	11.9	0.0	1.1	2.4	1.1	1.1	0.0	0.9
Bristol	76.9	61.0	60.3	66.4	70.7	89.4	96.1	82.2	82.0	90.0
Camb	1.5	1.3	1.1	1.6	5.1	10.4	62.0	94.1	80.5	42.3
Carlis	91.3	91.3	73.9	47.6	80.6	100.0	92.9	94.7	92.3	92.0
Carsh	0.0	0.0	0.8	1.5	0.8	6.7	25.0	40.8	17.4	16.3
Chelms	68.6	64.0	76.5	71.4	86.7	86.7	87.0	96.3	92.3	85.7
Colchr				33.3	66.7	85.2	82.6	100.0	91.7	77.3
Covnt	0.0	0.0	0.0	1.2	1.8	0.0	1.4	33.3	70.5	6.7
Derby	77.6	75.6	83.3	97.8	73.5	91.2	88.5	86.9	88.7	73.7
Donc				100.0	94.3	90.9	91.7	92.6	100.0	96.8
Dorset	61.5	65.1	87.2	88.9	85.2	95.7	95.0	89.1	98.3	90.6
Dudley	14.3	5.9	6.1	5.3	0.0	94.4	88.1	91.2	94.0	95.5
Exeter	36.7	19.0	4.7	3.1	3.0	89.5	84.6	95.1	98.6	96.5
Glouc	64.5	61.1	77.8	70.8	68.4	97.2	93.6	91.5	100.0	88.1
Hull	81.5	76.0	76.5	52.7	18.7	92.0	93.5	96.9	86.8	91.7
Ipswi	10.3	21.9	35.5	13.6	18.8	73.3	77.8	77.4	78.8	83.3
Kent				61.7	92.8	89.0	96.2	94.9	81.4	86.6
L Barts	83.3	87.4	74.6	77.0	69.5	73.9	82.6	79.9	82.9	82.7
L Guys	0.0	0.0	3.5	0.0	0.0	67.6	84.2	58.2	1.1	0.0
L Kings	85.7	87.9	75.8	86.2	67.1	94.8	97.6	100.0	98.9	98.7
L Rfree		0.0	0.0	0.0	0.9	1.7	0.0	7.1	5.7	15.9
L St.G			16.7	17.9	21.4	77.6	47.9	42.4	62.5	57.1
L West	79.8	31.3	18.9	6.3	2.2	2.2	95.0	97.3	96.4	93.8
Leeds	69.3	66.7	29.6	30.1	34.5	100.0	99.1	97.7	98.3	99.2
Leic	72.5	76.9	65.5	69.5	69.8	74.5	61.7	94.1	80.0	55.2
Liv Ain	50.0	81.3	73.3	66.7	100.0	85.0	95.7	0.0	0.0	0.0
Liv Roy	41.5	66.3	76.8	75.8	82.1	71.6	76.4	2.8	33.7	19.0
M RI			4.0	0.9	1.0	4.7	3.1	10.0	0.8	1.4
Middlbr	79.4	63.5	57.5	26.0	52.0	89.2	97.5	94.9	81.3	95.1
Newc	20.8	29.8	48.7	35.7	40.8	14.0	45.0	16.9	23.6	51.8
Norwch	21.0	21.4	18.2	21.2	44.4	75.8	70.3	76.5	91.0	74.0
Nottm	97.0	87.5	87.0	98.8	97.1	98.8	100.0	100.0	97.6	98.9
Oxford	2.8	0.0	0.0	1.0	0.0	84.6	97.4	92.7	96.5	98.3
Plymth	51.4	45.8	56.7	70.7	47.5	80.9	43.6	41.2	100.0	24.5
Ports	21.5	12.8	21.4	6.9	44.5	68.7	23.3	19.8	40.7	38.8
Prestn	50.0	55.4	47.8	38.1	17.9	95.7	98.9	96.4	99.0	95.2
Redng	81.5	77.1	97.8	89.6	83.0	100.0	96.7	91.2	91.9	79.7
Salford	0.0	0.0	1.3	0.0	1.3	0.0	0.0	0.0	0.0	0.0
Sheff	4.6	9.2	12.9	0.9	1.9	3.0	0.8	0.8	1.9	0.9
Shrew	66.7	53.1	89.3	62.5	20.5	46.0	0.0	7.9	17.7	0.0
Stevng	86.3	60.8	55.1	67.2	74.3	86.3	86.8	67.7	69.8	9.3
Sthend	39.4	9.4	3.2	57.7	75.0	92.3	90.0	100.0	100.0	95.7
Stoke			16.1	21.0	28.6	54.7	57.9	89.6	55.0	53.5
Sund	56.3	60.0	60.5	50.0	78.9	93.5	95.1	97.4	82.6	97.4
Truro	2.3	6.9	0.0	18.4	28.9	93.3	94.9	78.8	100.0	97.1
Wirral	31.3	94.1	84.6	96.9	84.8	86.5	0.0	2.6	25.8	68.5
Wolve	92.3	47.8	51.5	65.8	76.4	98.4	94.1	92.2	83.8	85.2
York	41.4	83.3	38.5	62.1	67.9	96.7	97.3	100.0	100.0	97.4

Table 5.27. Continued

Centre	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
N Ireland										
Antrim	4.0	10.0	8.6	3.4	26.9	96.8	95.2	100.0	93.1	100.0
Belfast	17.2	33.8	36.0	20.0	25.4	81.7	75.9	77.0	41.7	51.1
Newry	0.0	42.9	15.0	11.8	68.4	95.2	94.4	96.7	100.0	93.3
Ulster	100.0	85.7	92.9	69.2	75.0	95.0	90.9	100.0	95.7	90.0
West NI	40.0	57.7	35.0	22.2	45.8	92.3	80.0	96.6	96.2	93.9
Scotland										
Abrdn	2.8	0.0	2.1	100.0	100.0	100.0	100.0	97.1	90.7	67.7
Airdrie	40.0	26.3	100.0	100.0	100.0	100.0	97.0	93.9	100.0	97.6
D & Gall	80.0	76.9	100.0	93.3	94.4	100.0	100.0	87.5	100.0	100.0
Dundee	88.9	2.8	9.3	100.0	96.9	100.0	100.0	100.0	100.0	52.8
Edinb	52.5	29.3	48.3	100.0	97.5	100.0	98.8	100.0	96.4	96.2
Glasgw	45.9	55.1	59.1	100.0	97.8	97.1	99.3	99.2	98.7	100.0
Inverns	0.0	0.0	0.0	100.0	94.7	100.0	100.0	100.0	100.0	100.0
Klmarnk	0.0	11.1	15.6	100.0	96.7	97.0	100.0	100.0	100.0	100.0
Krkcldy	88.2	65.0	61.5	100.0	96.4	96.6	100.0	96.9	100.0	92.3
Wales										
Bangor	66.7	35.0	86.2	52.4	76.9	73.9	90.0	100.0	95.8	95.0
Cardff	4.3	2.9	4.9	0.0	2.4	6.7	7.9	0.6	73.5	96.7
Clwyd	5.9	11.1	45.5	84.2	83.3	100.0	85.7	89.5	83.3	90.0
Swanse	85.7	92.4	97.3	94.8	89.8	98.0	87.5	98.1	95.7	82.6
Wrexm	3.6	3.4	22.7	69.2	100.0	95.7	92.6	100.0	95.7	87.0
England	**47.7**	**41.5**	**37.9**	**36.9**	**39.0**	**58.8**	**63.5**	**64.4**	**64.7**	**60.1**
N Ireland	**19.5**	**38.7**	**31.7**	**20.4**	**40.8**	**89.9**	**84.0**	**90.7**	**75.2**	**81.5**
Scotland	**43.2**	**33.7**	**44.9**	**99.8**	**97.6**	**98.6**	**99.3**	**98.2**	**98.2**	**89.7**
Wales	**29.3**	**30.7**	**43.8**	**36.3**	**47.6**	**53.3**	**48.6**	**50.5**	**84.8**	**91.2**
UK	**45.2**	**39.9**	**38.7**	**42.2**	**44.9**	**62.9**	**66.6**	**67.1**	**69.0**	**64.8**

Blank cells: data not available for that year

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UK Renal Registry 18th Annual Report: Chapter 6 Comorbidities and Current Smoking Status amongst Patients starting Renal Replacement Therapy in England, Wales and Northern Ireland from 2013 to 2014

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Key Words
Comorbidity · Completeness · Diabetes · Dialysis · Ethnicity · Prevalence · Renal replacement therapy · Smoking

Summary

- Data on comorbidity at the time of start of renal replacement therapy (RRT) were submitted to the UK Renal Registry (UKRR) for 7,786 (58.1%) incident patients between 2013 and 2014. In 2014, 11 centres provided data on 100% of new patients and eight provided data for less than 5% of new patients, highlighting the continued wide variation in the completeness of data returns.
- In 2014, comorbidity data completeness in Wales and Northern Ireland was around 90% compared with 53% in England.
- In patients with comorbidity data, about half (49.8%) had one or more comorbidities and in the subgroup of patients aged ⩾65 years, this increased to 63.1%.
- Diabetes mellitus (listed as primary renal disease or comorbidity) and ischaemic heart disease were the most common comorbid conditions, observed in 36% and 20% of patients respectively. Most comorbid conditions were more prevalent in patients aged ⩾65 years, but the prevalence rates for ischaemic heart disease and malignancy were substantially higher than the rest.
- In 2013–2014, 12.5% of incident RRT patients were recorded as being smokers at initiation of dialysis; this is a decrease from 14% in the previous two years (2011–2012).
- Amongst incident RRT patients of White origin, the prevalence of having at least one comorbid condition was approximately 14% and 7% higher than in incident patients of Black and South Asian origin, respectively.
- There was a higher prevalence of ischaemic heart disease and peripheral vascular disease in patients referred early to a nephrologist than amongst patients referred late. Malignancy was much more common in patients who were referred late.

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Introduction

There is a high prevalence of comorbid disease in patients on RRT and the number and extent of comorbid illnesses in patients initiating dialysis is increasing [1–3]. Demand for RRT is still growing and the proportion of older patients (75+ years) on RRT is on the increase. With the rising median age of RRT patients, there is also a corresponding increase in comorbid conditions in these patients. The mortality risk in RRT patients is higher than in the general population and this risk is affected by pre-existing comorbid conditions at initiation of RRT.

The importance of comorbid conditions as predictors of mortality and other adverse outcomes in patients on RRT is well established in the literature [4–9]. This also applies when comparing survival in different treatment groups at centre [10–12] and international level [13]. The aim of this work is to describe the completeness of comorbidity data submitted to the UKRR and the prevalence of comorbid conditions and current smoking status in patients starting RRT.

Methods

Study population

Incident adult (⩾18 years) RRT patients from 2009 to 2014 in the centres submitting data to the UKRR were considered. Of these, patients who had data recorded on comorbid conditions were included in statistical analyses. Data on completeness of comorbidity returns from each centre and overall may differ from those in previous UKRR reports due to some centres retrospectively entering previously missing comorbidity data.

Centre exclusions

The Scottish Renal Registry (SRR) does not report on comorbidities and the nine centres in Scotland are not included in these analyses. There was concern that data extraction in four centres was inaccurate and these centres were excluded from this year's comorbidity analyses.

Definition of comorbidity and method of data collection

Clinical staff in each centre are responsible for recording in yes/no format on their renal information technology (IT) system the presence or absence of 13 comorbid conditions and information on current smoking (table 6.1) for each patient at the time of starting RRT. Definitions of each of these conditions are given in appendix B (www.renalreg.org/publications-reports/).

Patients were classified as having complete comorbidity data if there was at least one entry (yes/no) for any one or more of the comorbid conditions, excluding smoking. Comorbidities were grouped into broader categories for some analyses:

Table 6.1. Comorbid conditions listed in the UKRR dataset

Comorbid condition
• Angina
• Previous myocardial infarction (MI) within 3 months prior to start of RRT
• Previous MI more than 3 months prior to start of RRT
• Previous coronary artery bypass grafting (CABG) or coronary angioplasty (in some analyses the above four variables are combined under the term 'ischaemic heart disease')
• Cerebrovascular disease
• Diabetes (when not listed as the primary renal disease)
• Chronic obstructive pulmonary disease (COPD)
• Liver disease
• Claudication
• Ischaemic or neuropathic ulcers
• Non-coronary angioplasty, vascular graft, or aneurysm
• Amputation for peripheral vascular disease (in some analyses these four variables are combined under the term 'peripheral vascular disease')
• Smoking
• Malignancy

- 'Ischaemic heart disease' was defined as the presence of one or more of the following conditions: angina, MI in the three months prior to starting RRT, MI more than three months prior to starting RRT or CABG/angioplasty.
- 'Peripheral vascular disease' was defined as the presence of one or more of the following conditions: claudication, ischaemic or neuropathic ulcers, non-coronary angioplasty, vascular graft, aneurysm or amputation for peripheral vascular disease.
- 'Non-coronary vascular disease' was defined as the presence of cerebrovascular disease or any of the data items that comprise 'peripheral vascular disease'.

Specific consideration needs to be made regarding diabetes coding. The UKRR also collect data on primary renal disease (PRD), and have used these data alongside the comorbidity data to determine which patients had diabetes mellitus. The comorbidity screen is intended to capture those patients who have diabetes only when it is not the PRD, however some clinicians do enter 'yes' in the comorbidity field in such cases. Prior to statistical analyses, these fields were examined together to identify these cases and ensure diabetes was only counted as either the PRD or a comorbid condition for a certain individual.

Ethnicity data reporting

Some centres electronically upload ethnicity coding to their renal IT system from the hospital Patient Administration System (PAS) [14]. Ethnicity coding in PAS is based on self-reported ethnicity and uses a different system [14] to the remaining centres where coding of ethnicity is performed by clinical staff and recorded directly into the renal IT system (using a variety of coding systems). For all these analyses, data on ethnic origin were grouped into Whites, South Asians, Blacks and Others.

Appendix H (www.renalreg.org/publications-reports/) details the regrouping of the PAS codes into the above ethnic categories.

Statistical methods

The statistical methods for the two individual sections of this chapter are described separately.

1) Patient demographics

The proportion of patients starting RRT with various comorbidities was examined by age group (18–34, 35–44, 45–54, 55–64, 65–74 and ⩾75 years), primary renal disease, ethnic origin and first modality of RRT. Chi-squared, Fischer's exact and Kruskal-Wallis tests were used as appropriate to test for statistically significant differences between groups.

2) Late presentation (referral) and start of RRT

Referral time was defined as the number of days between the date first seen by a nephrologist and the date of starting RRT. Referral times of 90 or more days and less than 90 days define early and late presentation respectively. Data on referral time were incomplete and therefore only patients with data on comorbidity and referral time from centres with >75% data completeness for referral time were included in this analysis. Many UKRR analyses, including those presented here, rely on the accuracy of the date of start of RRT. A discussion of the issues around the definition of the start date is included in chapter 13 of the 2009 Annual Report [15].

Patient survival

Due to the high proportion of missing comorbidity data, survival analyses have been excluded from this year's annual report. Previous analyses by the UKRR have shown that the subgroup of patients with comorbidity data returned to the UKRR was a select group of patients that had outcomes different to those patients with missing comorbidity data and any subsequent models developed using this subgroup of patients could result in the introduction of bias into model results and possibly invalidate results [16, 17].

All statistical analyses were performed using SAS version 9.3.

Results

Completeness of comorbidity returns from each participating centre

Of the 38,339 patients starting RRT in 2009–2014, only 22,762 (59.4%) had comorbidity reported to the UKRR. Of the 13,390 incident RRT patients in 2013 and 2014, 7,786 individuals (58.1%) had comorbidity data reported (tables 6.2, 6.3). Table 6.2 highlights the continued wide variation in the completeness of data returns with 11 centres providing comorbidity data on 100% of patients and eight centres providing data for less than 5% of new patients in 2014. In 2014, comorbidity completeness in Wales and Northern Ireland was substantially higher (approximately 90%) compared with England (53%) (table 6.2).

When centres with 0% completeness for comorbidity were excluded, the median percentage of comorbidity returns in 2014 was 81.3%; for centres returning comorbidity data there has been an improvement in completeness from 2009 of 8.5% (table 6.3), albeit with a decline in 2012 and in the most recent year (2014).

Table 6.2. Percentage completeness of comorbidity data returns on incident patients from individual renal centres 2009–2014

	Percentage completeness of comorbidity data					
Centre	2009	2010	2011	2012	2013	2014
England						
B Heart	63.6	78.7	94.7	92.1	93.9	99.0
B QEH	66.4	67.9	85.9	93.0	97.5	96.7
Basldn	89.3	91.4	95.5	90.6	100.0	89.1
Bradfd	96.4	92.4	100.0	98.6	98.4	100.0
Brightn	13.8	8.6	12.6	17.3	13.7	11.6
Bristol	86.5	96.4	95.0	89.2	97.7	84.5
Camb	3.0	0.0	0.8	2.4	3.7	4.7
Carlis	85.7	68.2	74.1	57.9	57.1	55.3
Carsh	79.7	73.6	80.7	59.0	30.1	11.4
Chelms	33.3	28.9	22.9	17.4	50.0	92.3
Colchr	4.4	0.0	0.0	0.0	0.0	100.0
Covnt	2.6	3.5	2.7	12.3	39.6	15.2
Derby	96.2	87.3	92.0	96.3	91.9	94.7
Donc	42.5	60.0	64.3	82.9	86.7	70.4
Dorset	90.4	95.8	100.0	94.5	100.0	100.0

Table 6.2. Continued

Centre	Percentage completeness of comorbidity data					
	2009	2010	2011	2012	2013	2014
Dudley	6.0	11.6	4.7	5.4	70.6	87.8
Exeter	47.9	70.5	88.4	100.0	90.0	93.5
Glouc	68.4	47.5	51.7	43.4	52.8	15.7
Hull	84.7	87.2	97.3	99.0	93.4	100.0
Ipswi	2.6	9.1	0.0	4.6	0.0	0.0
Kent	92.1	100.0	100.0	100.0	100.0	100.0
L Barts	86.9	78.5	77.6	77.6	71.0	55.2
L Guys	7.0	3.5	5.0	1.6	2.3	1.9
L Kings	100.0	100.0	98.6	100.0	100.0	100.0
L Rfree	18.3	25.6	35.9	46.0	35.8	22.3
L St.G	60.9	61.2	55.6	45.7	40.5	42.9
L West	3.9	1.9	3.9	2.0	1.0	0.3
Leeds	90.4	91.2	98.1	99.4	99.5	100.0
Leic	69.9	65.4	49.6	64.7	58.8	42.9
Liv Ain	71.1	77.1	63.8	65.1	56.9	56.7
Liv Roy	55.1	42.9	42.3	58.7	64.2	48.2
M RI	65.5	41.5	39.0	33.5	29.0	34.2
Middlbr	93.8	96.0	98.0	97.5	98.2	97.1
Newc	36.1	69.2	85.7	79.6	94.6	97.2
Norwch	23.9	45.9	51.2	41.3	18.2	43.0
Nottm	97.7	96.6	99.1	99.0	99.1	95.5
Oxford	93.7	97.0	98.9	99.4	99.4	95.2
Plymth	84.2	76.8	71.7	67.3	65.6	41.5
Ports	72.8	64.0	65.8	66.7	71.8	26.7
Prestn	50.3	44.3	21.6	11.0	9.3	4.6
Redng	67.0	70.8	84.5	91.8	86.3	92.5
Salford	0.0	0.7	0.0	0.0	0.0	0.0
Sheff	54.7	77.3	77.8	83.3	91.2	78.8
Shrew	89.6	10.5	9.8	13.8	11.9	18.5
Stevng	95.9	0.0	1.8	1.8	0.0	0.7
Sthend	95.7	77.8	86.2	100.0	88.1	76.7
Stoke	100.0	73.7	42.9	58.1	69.5	81.3
Sund	98.4	92.6	100.0	98.6	98.0	95.2
Truro	87.9	84.8	92.3	4.1	0.0	0.0
Wirral	1.6	1.7	5.0	2.3	0.0	30.4
Wolve	100.0	100.0	98.7	98.9	71.4	16.5
York	74.4	97.4	98.0	96.2	97.2	95.3
N Ireland						
Antrim	31.8	94.7	72.4	100.0	93.1	100.0
Belfast	50.9	55.7	50.0	67.7	83.3	77.8
Newry	100.0	95.2	100.0	94.1	100.0	94.7
Ulster	100.0	95.0	97.2	100.0	96.7	100.0
West NI	83.8	81.5	88.6	72.7	80.0	97.1
Wales						
Bangor	83.3	96.2	100.0	81.0	87.5	59.1
Cardff	44.6	57.7	66.7	62.9	83.0	89.9
Clwyd	72.0	71.4	82.4	95.5	100.0	55.2
Swanse	98.2	88.8	96.6	97.4	94.6	100.0
Wrexm	94.7	100.0	100.0	100.0	100.0	100.0
England	**59.2**	**57.1**	**58.8**	**58.8**	**58.2**	**52.8**
N Ireland	**66.7**	**77.3**	**77.0**	**80.0**	**88.6**	**90.7**
Wales	**69.1**	**74.5**	**81.2**	**80.5**	**89.4**	**89.4**
E, W & NI	**59.9**	**58.8**	**60.7**	**60.6**	**60.8**	**55.7**

Table 6.3. Summary of completeness of incident patient comorbidity returns (2009–2014)

	Year						Combined years
	2009	2010	2011	2012	2013	2014	
Renal centres included *N*	62	62	62	62	62	62	
New patients *N*	6,202	6,105	6,303	6,339	6,527	6,863	38,339
Patients with comorbid data entries *N*	3,716	3,591	3,826	3,843	3,965	3,821	22,762
Percentage of patients with comorbid data entries	59.9	58.8	60.7	60.6	60.8	55.7	59.4
Median percentage amongst only centres returning >0% comorbidity	72.8	73.7	79.2	77.6	86.5	81.3	77.8

Table 6.4. Number of reported comorbidities in patients starting RRT, as a percentage of those for whom comorbidity data were available 2013–2014

	Number of comorbidities					
	0	1	2	3	4	5+
Percentage	50.2	26.3	12.6	6.1	3.0	1.8

Prevalence of multiple comorbidity

Including all incident patients from the years 2013–2014 ($N = 13{,}390$), comorbidity data were available for 7,786 (58.1%). About half of these patients had one or more comorbidities (49.8%) (table 6.4), but in the subgroup of patients aged ⩾65 years, this increased to 63.1% (table 6.5).

Frequency of each comorbid condition

Table 6.5 lists the prevalence of specific comorbidities and the percentage of the total number of incident patients for whom data were available for the comorbid condition. Diabetes mellitus (either listed as the cause of PRD or as a comorbidity) and ischaemic heart disease were present in approximately 36% and 20% of patients respectively.

Prevalence of comorbidity by age group

The majority of comorbid conditions were more prevalent in patients 65 years and over and a substantially higher prevalence was evident for ischaemic heart disease and malignancy. The proportion of patients with myocardial infarction within three months prior to start of RRT, ischaemic/neuropathic ulcers and prior amputation were very similar in both younger and older patients, but actual percentages were quite small (table 6.5). Smoking, liver disease and diabetes listed as cause of primary renal disease were more common amongst patients under 65 years of age.

With age categorised in 10–year age groups, the prevalence of most comorbidities has increased markedly in patients across the age groups up to age group 55–64

Table 6.5. Frequency with which each comorbid condition was reported in incident RRT patients 2013–2014

	Age <65 years		Age ⩾65 years		% overall prevalence
Comorbidity	*N*	(%)	*N*	(%)	
Any comorbidity present	1,400	(36.2)	2,477	(63.1)	49.8
Angina	238	(6.3)	568	(14.9)	10.6
MI in past 3 months	60	(1.6)	119	(3.1)	2.4
MI >3 months ago	237	(6.3)	557	(14.7)	10.5
CABG/angioplasty	225	(5.9)	476	(12.4)	9.2
Cerebrovascular disease	318	(8.4)	536	(14.0)	11.2
Diabetes (not listed as PRD)	261	(6.9)	519	(13.5)	10.2
Diabetes listed as PRD	1,079	(28.5)	905	(23.8)	26.1
COPD	167	(4.4)	414	(10.8)	7.6
Liver disease	171	(4.5)	78	(2.0)	3.3
Claudication	126	(3.3)	305	(8.0)	5.7
Ischaemic/neuropathic ulcers	157	(4.1)	134	(3.5)	3.8
Angioplasty/vascular graft	83	(2.2)	215	(5.6)	3.9
Amputation	118	(3.1)	81	(2.1)	2.6
Smoking	546	(14.8)	383	(10.3)	12.5
Malignancy	262	(6.9)	767	(19.9)	13.4

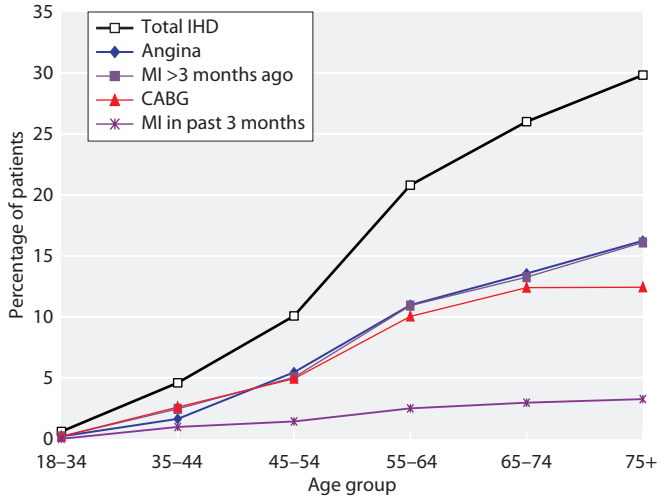

Fig. 6.1. Prevalence of ischaemic heart disease amongst incident patients 2013–2014 by age at start of RRT

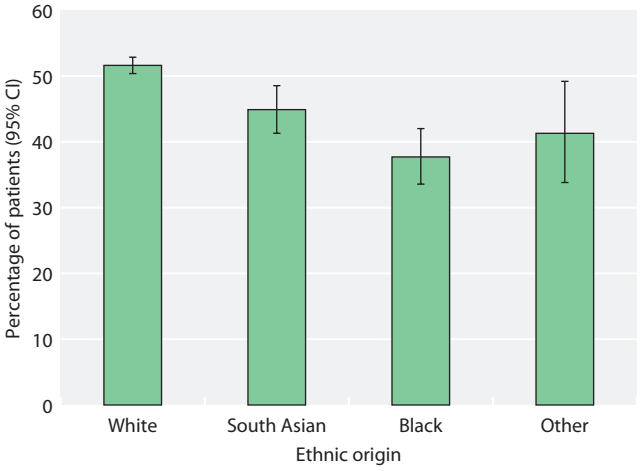

Fig. 6.3. Presence of comorbid conditions at the start of RRT by ethnic origin amongst patients starting RRT 2013–2014

(figures 6.1, 6.2). Ischaemic heart disease (IHD) increased sharply in patients aged 55 years and older and the presence of PVD decreased in patients aged 75 years and older. The prevalence of smoking status and the comorbidities claudication, ischaemic/neuropathic ulcers and amputation have reduced slightly in older patients.

Prevalence of comorbidity by ethnic origin

Figures 6.3 and 6.4 illustrate the presence of comorbidity by ethnic origin and age group. There was evidence that the prevalence of comorbid conditions in patients of White origin was significantly higher than the other ethnic groups. The prevalence of having at least one comorbid condition recorded amongst incident RRT patients of White origin was about 14% and 7% higher respectively than in incident patients from Black and South Asian origin (figure 6.3). Figure 6.4 shows the higher prevalence of comorbid conditions in patients of White origin in the younger and older age groups, with fairly similar prevalence across the ethnic groups for those aged 45–54 and 55–64 (figure 6.4).

Diabetes mellitus as PRD was much more frequently reported in South Asian (44.8%) patients than in White (23.0%) or Black (33.7%) patients. Diabetes as a comorbid condition was more frequently reported in White patients (table 6.6). The reported prevalence of PVD, COPD, malignancy and smoking was highest in individuals of White ethnicity, whereas IHD and cerebrovascular disease were most prevalent in South Asian patients (table 6.6).

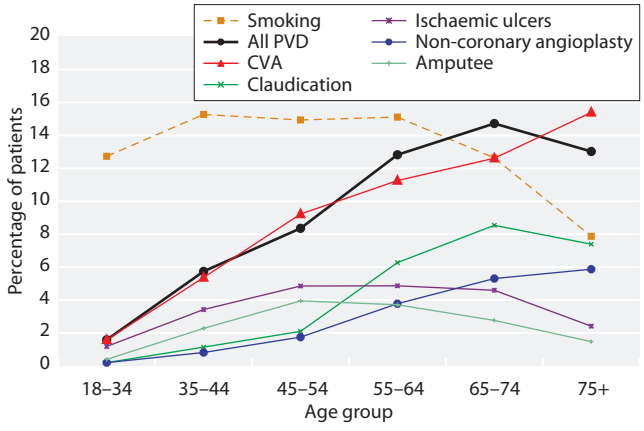

Fig. 6.2. Prevalence of non-coronary vascular disease amongst incident patients 2013–2014 by age at start of RRT

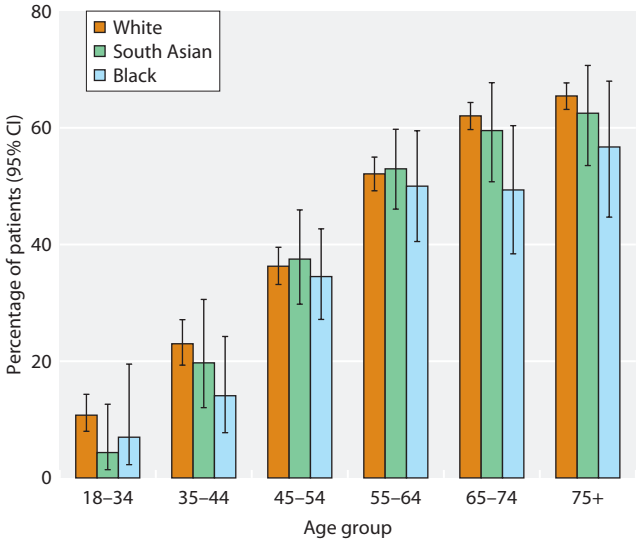

Fig. 6.4. Percentage of patients with comorbidity by ethnic origin in each age group at the start of RRT 2013–2014

Table 6.6. Prevalence of comorbidities amongst incident patients starting RRT 2013–2014 by ethnic group, as percentages of the total number of patients in that ethnic group for whom comorbidity data were available

	White		South Asian		Black		Other	
Comorbidity	*N*	%	*N*	%	*N*	%	*N*	%
Ischaemic heart disease	1,218	(20.2)	189	(26.4)	53	(10.6)	18	(11.8)
Cerebrovascular disease	658	(10.9)	100	(14.0)	56	(11.3)	16	(10.5)
Diabetes (not listed as PRD)	650	(10.7)	69	(9.6)	27	(5.4)	18	(11.8)
Diabetes (listed as PRD)	1,389	(23.0)	320	(44.8)	168	(33.7)	45	(30.2)
COPD	515	(8.5)	36	(5.0)	13	(2.6)	3	(2.0)
Liver disease	187	(3.1)	24	(3.3)	22	(4.4)	12	(7.8)
Peripheral vascular disease	751	(12.5)	36	(5.1)	39	(7.9)	10	(6.7)
Smoking	816	(13.7)	42	(6.1)	40	(8.6)	15	(10.2)
Malignancy	907	(14.9)	35	(4.9)	42	(8.4)	16	(10.5)

Prevalence of comorbidity amongst patients with diabetes mellitus

Table 6.7 describes comorbidity amongst patients with and without diabetes (as either primary renal disease or comorbidity). As would be expected, patients with diabetes mellitus had a higher prevalence of peripheral vascular disease (19.4% compared to 6.2% in non-diabetic patients). Similarly, there was a substantially higher prevalence of ischaemic heart disease (28.3% and 14.8% respectively) and cerebrovascular disease (15.6% and 8.5% respectively) in diabetic patients. Similar proportions of diabetic and non-diabetic patients were smokers and had liver disease at the time of initiation of RRT (table 6.7). Malignancy was much more common in non-diabetic patients and may reflect 'competing risks', with diabetic patients tending to die at a younger age with cardiovascular disease, rather than developing malignancy in older age.

Late presentation and comorbidity

Table 6.8 shows the presentation time for patients with specific comorbidities. In total in 2013–2014, 5,600 patients contributed data to this analysis. Patients referred to a nephrologist early had a higher prevalence of peripheral vascular disease and ischaemic heart disease. There was a much higher proportion of patients with malignancy in the late referral group and more patients with liver disease were also referred late.

Age and comorbidity in patients by treatment modality at start of RRT

Although all comorbidities were more prevalent in patients receiving haemodialysis as their initial modality of treatment than in those starting on peritoneal dialysis (table 6.9), substantial differences were noted for the comorbid conditions angina, cerebrovascular disease, diabetes (not listed as PRD), COPD and malignancy. The median age for incident patients initiating treatment on haemodialysis was substantially higher than those patients starting treatment on peritoneal dialysis (67.5 years and 60.5 years respectively). For patients with a pre-emptive transplant, the median age of patients with comorbidity data was 51.8 years, which was substantially lower than the corresponding age for dialysis patients (66.1 years). For most of the comorbid conditions, the median age of patients on haemodialysis (HD) was

Table 6.7. Number and percentage of patients with and without diabetes (either as primary disease or comorbidity) who have other comorbid conditions, incident patients starting RRT during 2013–2014

	Non-diabetic patients		Diabetic patients	
Comorbidity	*N*	(%)	*N*	(%)
Ischaemic heart disease	667	(14.8)	725	(28.3)
Cerebrovascular disease	382	(8.5)	399	(15.6)
COPD	299	(6.6)	220	(8.6)
Liver disease	145	(3.2)	85	(3.3)
Peripheral vascular disease	280	(6.2)	492	(19.4)
Smoking	548	(12.5)	332	(13.4)
Malignancy	696	(15.4)	245	(9.6)

Table 6.8. Percentage prevalence of specific comorbidities amongst patients presenting late (<90 days) compared with those presenting early (⩾90 days) (2013–2014 incident patients)

	Late referral		Early referral	
Comorbidity	*N*	(%)	*N*	(%)
Ischaemic heart disease	144	14.3	1,104	21.4
Cerebrovascular disease	89	8.8	598	11.5
Peripheral vascular disease	86	8.5	634	12.3
Diabetes (not listed as PRD)	112	11.1	520	10.0
Liver disease	50	5.0	151	2.9
Malignancy	223	21.9	640	12.3
COPD	87	8.6	394	7.6
Smoking	141	13.3	627	11.8

higher than for patients on peritoneal dialysis (PD) (table 6.9). A much lower percentage of the transplanted patients had comorbid conditions present compared to non-transplanted patients (19.6% and 52.0% respectively) (table 6.10). The prevalence of comorbidities was higher in non-transplanted incident patients, especially IHD and cerebrovascular disease. The only exception was liver disease where the prevalence

Table 6.9. Number (and percentage) of incident patients with comorbid conditions starting PD and HD in 2013–2014

	HD			PD		
Comorbidity	*N*	(%)	Median age	*N*	(%)	Median age
Angina	676	(12.3)	72.4	119	(7.6)	68.1
MI in past 3 months	148	(2.7)	70.8	28	(1.8)	70.0
MI >3 months ago	648	(11.8)	72.6	132	(8.4)	68.4
CABG/angioplasty	552	(10.0)	71.0	133	(8.4)	68.9
Cerebrovascular disease	716	(13.0)	70.5	120	(7.6)	66.6
Diabetes (not listed as PRD)	643	(11.6)	70.2	113	(7.1)	68.7
COPD	500	(9.1)	72.1	70	(4.4)	68.4
Liver disease	205	(3.7)	61.2	30	(1.9)	58.2
Claudication	338	(6.1)	72.2	91	(5.7)	68.3
Ischaemic/neuropathic ulcers	237	(4.3)	64.1	50	(3.2)	60.4
Angioplasty/vascular graft	245	(4.4)	73.4	49	(3.1)	67.3
Amputation	159	(2.9)	61.8	37	(2.3)	64.7
Smoking	711	(13.3)	63.2	182	(11.7)	56.8
Malignancy	871	(15.7)	73.8	140	(8.8)	70.0

Table 6.10. Comorbidity amongst incident patients (2013–2014) who underwent transplantation (by the end of 2014) compared to those who remained on dialysis or died

	Not transplanted (HD or PD)			Transplanted		
Comorbidity	*N*	%	Median age	*N*	%	Median age
Patients with comorbidity data	7,255	59.3	66.1	531	46.3	51.8
No comorbidity present	3,482	48.0	59.6	427	80.4	49.9
Ischaemic heart disease	1,495	21.1	71.5	27	5.2	60.7
Cerebrovascular disease	836	11.8	70.0	18	3.4	51.6
Diabetes (not listed as PRD)	756	10.6	70.0	24	4.6	59.8
COPD	570	8.0	71.3	11	2.1	61.3
Liver disease	235	3.3	61.1	14	2.7	60.8
Peripheral vascular disease	847	12.0	69.4	11	2.1	47.1
Smoking	893	12.9	61.6	36	6.9	50.2
Malignancy	1,011	14.2	73.0	18	3.4	57.9

between transplanted and non-transplanted patients was similar.

Discussion

Data completeness in the UKRR and the pattern of missing comorbidity data

Comorbidity data completeness continues to be a cause for concern with overall completeness of comorbidity reporting to the UKRR falling by about 5% in 2014 to 56%. Missing comorbidity data led to difficulties in performing comparisons between renal centres. Research by the UKRR has shown that patients with missing comorbidity data generally have worse survival than those patients without the comorbid condition, indicating that there is a high unmeasured prevalence of comorbid conditions for patients with missing comorbidity data. Some renal IT systems have at times defaulted missing comorbidity data to mean that the comorbid condition was absent. Comorbidity data from these centres were excluded from the annual report and any subsequent statistical analyses. Treating missing comorbidity entries as an indication of the absence of the comorbidity (i.e. a tick only if yes policy) should be discouraged as it is not only impossible to distinguish between missing comorbidity data and the absence of comorbid conditions [16, 17], but also leads to an attenuation of the effect of comorbidity on survival [17]. If the subset of patients with complete comorbidity data is not representative of all incident RRT patients in the UK, then analyses will be biased as comorbidity data are not representing the actual situation in the country accurately and comorbidities will not be comparable at international level [18]. Missing data also hamper case-mix adjustment and can introduce selection bias in model estimates with a resulting lack of generalisability of results. Case-mix adjustment is integral to quality reporting [19, 20], risk adjustment in clinical research [21, 22], resource allocation and management of patients with comorbid conditions in day to day practice [23].

Improving comorbidity data completeness

The first choice for improving comorbidity data completeness would be improving the collection of data by identifying good practice and incentivising it in all renal centres. In addition to this, a separate regular linkage with administrative hospital episodes data in each of the UK countries may be possible in the future, enabling additional information on many prognostic risk factors like comorbid conditions to be obtained. Comorbid conditions identified from administrative hospital episodes data will be used to augment the UKRR comorbidity data where there are missing data in the UKRR database. Currently only comorbidities at start of RRT are collected by the UKRR. A regular data linkage with administrative hospital episodes data would allow the identification of accrued comorbidities after start of RRT. This would be an important area of research as studies have shown that not only comorbidities at start of RRT but also the change in comorbid conditions were associated with outcome [24]. In addition to this, multiple imputation, a statistical approach of handling missing data, may also be implemented. Research by the UKRR has shown that multiple imputation is a viable option for imputing missing data in the UKRR database.

Expansion of comorbidity data collected

From January 2016, renal centres will be expected to expand the collection of comorbidity data by recording comorbidity data continuously from the pre-dialysis stage, not just when the patient starts RRT, which is currently the case. The expansion of comorbidity data collected will greatly improve the understanding of the comorbidity burden in patients before starting RRT and those on treatment for many years and will enhance survival analysis.

It is very important to improve comorbidity data completeness. Robust comorbidity data are central to health care systems, to audit renal centre outcomes adjusted for comorbid conditions and for patient driven decision making based on accurate risks and benefits of health care treatments adjusted for comorbid conditions.

Conflicts of interest: the authors declare no conflicts of interest

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UK Renal Registry 18th Annual Report: Chapter 7 Adequacy of Haemodialysis in UK Adult Patients in 2014: National and Centre-specific Analyses

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Key Words
Adequacy · Haemodialysis · Urea reduction ratio

Summary

- Data suitable for urea reduction ratio (URR) analyses were available for 14,761 (71.9%) of the 20,539 patients receiving haemodialysis (HD) in the UK on the 30/9/2014.
- In 2014, 88.6% of prevalent HD patients achieved a URR >65%. The between centre range of prevalent patients achieving this target was wide (74.9–97.0%).
- The median URR in 2014 was 75%.
- URR was greater in those with longer dialysis vintage, with 91.2% of patients who had survived on renal replacement therapy (RRT) for more than two years achieving a URR >65% compared with only 73.4% of those on RRT for less than six months.
- Large variation between centres in the percentage of patients achieving the UK Renal Association's (RA) URR guideline persists.

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Introduction

The UK Renal Registry (UKRR) started collecting data from dialysis centres in England, Wales and Northern Ireland approximately 20 years ago. At that time haemodialysis facilities were limited, and one of the objectives of the UKRR, in collaboration with the UK Renal Association was to provide data on haemodialysis provision, and quality metrics compared to clinical standards set by the Renal Association [1], designed to establish parity between centres and improve provision and delivery of treatments.

The traditional paradigm for determining haemodialysis adequacy is based on sessional urea clearance, and both prospective and observational studies have reported an association between urea clearance and patient outcomes [2, 3]. The delivered dose of HD depends on both treatment factors (duration and frequency of dialysis sessions, dialyser size and characteristics, dialysate and blood flow rate) and patient characteristics (including size, protein intake, physical activity, haematocrit and vascular access) [4]. The most widely accepted measures of urea clearance are Kt/V, the ratio between the product of urea clearance (K, in ml/min) and dialysis session duration (t, in minutes) divided by the volume of distribution of urea in the body (V, in ml) and urea reduction ratio, which is derived solely from the percentage fall in serum urea during a dialysis treatment. Whilst Kt/V is a more accurate descriptor of urea clearance, its calculation is more complex and requires additional data items not commonly reported by most UK renal centres [5–7]. The UKRR has historically presented analyses based on URR rather than Kt/V for comparative audit of haemodialysis adequacy as these data are more widely available. On one hand, URR does not take into account the rebound in serum urea concentration at the end of dialysis, and so may over estimate delivered dialysis dose, particularly when higher blood pump speeds are used, whereas on the other hand URR does not include any estimate of residual renal function (RRF).

Clinical practice guidelines have been developed by various national and regional organisations [1, 8, 9], with considerable uniformity to the minimum dose of dialysis recommended, although there are differences in the methodology advised. Table 7.1 outlines the recommended UK RA audit measures for haemodialysis patients and whether the audit measure is currently reported in the annual UKRR report [1].

The objective of this chapter is to determine haemodialysis practice patterns in the UK, and the extent to which patients undergoing HD treatment received the dose of HD, as measured by URR, recommended by the current UK RA clinical practice guidelines [1].

Methods

Seventy-one renal centres in the UK submitted data electronically to the UKRR on a quarterly basis. The majority of these centres have satellite units but for the purposes of this study the data from the renal centres and their associated satellite units were amalgamated. Data from two groups of patients were

Table 7.1 Summary of recommended Renal Association audit measures relevant to haemodialysis adequacy [1]

RA audit measure	Included in UKRR annual report?	Reason for non-inclusion
Haemodialysis adequacy audit measures		
Audit measure: The proportion of patients in the main renal centre and its satellite units who are on twice weekly haemodialysis	No	Varying levels of reporting between centres
Audit measure: Cumulative frequency curves of urea reduction ratio measured using a standard method of post-dialysis sampling	Yes, but data not presented in the cumulative frequency format	
Audit measure: The proportion of patient non-attendances for haemodialysis sessions and the proportion of dialysis sessions shortened at the patient's request	No	Data not available
Audit measure: The proportion of thrice weekly haemodialysis sessions which have prescribed treatment times less than 4 hours	No	Varying levels of reporting between centres
Audit measure: The proportion of hospital (main and satellite unit) and home haemodialysis patients who are prescribed more frequent than thrice weekly haemodialysis	Yes	Not for home haemodialysis patients

analysed. Firstly, analysis was undertaken using data from the prevalent adult HD patient population as of the 30th September 2014. For this analysis, data for URR were taken from the 3rd quarter of 2014 unless that data point was missing in which case data from the 2nd quarter were taken. The prevalent population only included patients receiving HD who were alive on September 30th 2014. Data from those patients who had died before that date have not been included in the analysis. The second analysis involved adult incident patients who had commenced treatment with HD during 2013. For these patients, analysis was undertaken using the last recorded URR in the quarter in which the patient had started dialysis. The incident HD patient cohort was followed up for one year and the last recorded URR in the quarter after one year follow-up was used for this analysis.

Data from patients known to be receiving more or less than thrice weekly HD were omitted from the analysis for both the incident and prevalent population. Patients for whom data recording the number of dialysis sessions per week were missing, were assumed to be dialysing thrice weekly. However, because not all centres report frequency of HD, it is possible that data from a small number of patients receiving HD at a different frequency were included in the analyses. Home HD patients were excluded from the analysis.

Analyses of the data from both groups of patients included the calculation of the median URR and of the proportion of patients who had achieved the RA guideline (as outlined below) in each of the renal centres as well as for the country as a whole. The median URR and proportion of patients who achieved the RA guideline were also calculated separately for males and females. The number of dialysis sessions per week and the time per dialysis session is shown by renal centre.

All patients with data were included in the statistical analyses at a national level, although centres with fewer than 20 patients, or providing less than 50% data completeness were excluded from the comparison between centres. The number preceding the centre name in each figure indicates the percentage of missing data for that centre.

The UK RA clinical practice guidelines in operation at the time these data were collected were as follows:

HD should take place at least three times per week in nearly all patients. Reduction of dialysis frequency to twice per week because of insufficient dialysis facilities is unacceptable.

Every patient receiving thrice weekly HD should have consistently:

- ***either URR >65%***
- ***or equilibrated Kt/V (eKt/V) of >1.2 (or single pool Kt/V of >1.3) calculated from pre- and post-dialysis urea values, duration of dialysis and weight loss during dialysis).***

To achieve a URR above 65% or eKt/V above 1.2 consistently in the vast majority of the HD population clinicians should aim for a minimum target URR of 70% or minimum eKt/V of 1.4 in individual patients.

The duration of thrice weekly HD in adult patients with minimal residual renal function should not be reduced below 4 hours without careful consideration.

Patients receiving HD twice weekly for reasons of geography should receive a higher sessional dose of HD. If this cannot be achieved, then it should be recognised that there is a compromise between the practicalities of HD and the patient's long-term health.

Measurement of the 'dose' or 'adequacy' of HD should be performed monthly in all hospital HD patients and may be performed less frequently in home HD patients. All dialysis units should collect and report this data to their regional network and the UKRR.

Post-dialysis blood samples should be collected either by the slow-flow method, the simplified stop-flow method, or the stop dialysate flow method. The method used should remain consistent within renal units and should be reported to the Registry.

The RA clinical practice guidelines for HD dose apply specifically to patients undergoing thrice weekly HD. In these patients it is recommended that blood for biochemical measurement (including pre-dialysis urea for URR) should be taken before the mid-week dialysis session [1].

Results

Data completeness

Sixty four of the 71 renal centres submitted HD dose (URR) data to the UKRR (table 7.2). Data were available for 71.9% ($N = 14{,}761$) of the total prevalent population ($N = 20{,}539$) treated with HD who met the inclusion criteria for these analyses.

Fifty centres reported URR data on more than 90% of patients. Thirteen centres reported URR data on less than 50% of prevalent patients (Carshalton, Manchester RI, Newcastle, Reading, Brighton, Sunderland), with no URR data received from seven centres (London Barts, London King's, London Royal Free, London St Georges, Liverpool Aintree, Liverpool Royal Infirmary, Wirral).

Several centres had a reduction in the completeness of URR data submitted to the UKRR in 2014 compared with 2013 (data not shown). These changes may represent changes in data extraction, or a move by centres to utilising Kt/V rather than URR as the preferred measure of dialysis dose.

Of the total incident patient population ($N = 4{,}404$) who started HD during 2013 and meeting the inclusion criteria for URR analyses, 48.5% ($N = 2{,}137$) had URR data available during the first quarter of treatment (data not shown).

Data completeness on the number of HD sessions per week varied between centres (table 7.3). Seven centres in England and four centres in Wales returned no data. All centres in Northern Ireland returned data for 100% of their HD population. All centres in Scotland returned data in over 95% of their HD population.

Table 7.2. Percentage completeness of URR data returns for prevalent patients on HD by centre, on 30/9/2014

Centre	*N*	% completeness	Centre	*N*	% completeness
England					
B Heart	347	100.0	Sheff	487	96.7
B QEH	841	96.1	Shrew	142	97.9
Basldn	146	95.9	Stevng	389	99.7
Bradfd	179	100.0	Sthend	98	99.0
Brightn	347	4.3	Stoke	256	75.0
Bristol	443	100.0	Sund	173	0.6
Camb	265	96.2	Truro	118	82.2
Carlis	62	98.4	Wirral	169	0.0
Carsh	688	0.7	Wolve	276	90.9
Chelms	102	94.1	York	103	100.0
Colchr	109	91.7			
Covnt	323	99.1	**N Ireland**		
Derby	191	92.7	Antrim	113	97.4
Donc	159	99.4	Belfast	161	98.8
Dorset	248	100.0	Newry	82	84.2
Dudley	145	97.9	Ulster	88	98.9
Exeter	352	99.7	West NI	87	95.4
Glouc	206	100.0			
Hull	298	99.3	**Scotland**		
Ipswi	104	100.0	Abrdn	185	99.5
Kent	360	98.3	Airdrie	171	98.8
L Barts	889	0.0	D & Gall	29	96.6
L Guys	556	63.9	Dundee	150	100.0
L Kings	480	0.0	Edinb	250	100.0
L Rfree	650	0.0	Glasgw	529	99.6
L St.G	270	0.0	Inverns	53	100.0
L West	1,309	88.2	Klmarnk	123	100.0
Leeds	423	99.8	Krkcldy	135	99.3
Leic	790	99.5			
Liv Ain	131	0.0	**Wales**		
Liv Roy	257	0.0	Bangor	65	100.0
M RI	418	3.8	Cardff	416	99.0
Middlbr	302	99.3	Clwyd	73	97.3
Newc	233	13.7	Swanse	283	71.4
Norwch	275	98.2	Wrexm	101	100.0
Nottm	306	92.8			
Oxford	387	98.2	**England**	**17,445**	**67.6**
Plymth	128	93.8	**N Ireland**	**531**	**95.7**
Ports	499	95.6	**Scotland**	**1,625**	**99.6**
Prestn	475	77.9	**Wales**	**938**	**90.7**
Redng	256	9.8	**UK**	**20,539**	**71.9**
Salford	285	87.0			

For those centres returning data, three dialysis sessions a week was most prevalent, although a few centres reported >10% of HD patients receiving more or less than thrice weekly treatments (table 7.3). For example, Salford reported 20.1% of patients receiving more than three sessions a week, whereas Southend reported 14.0% of patients having less than three sessions per week.

Again there was a wide variation between centres in completeness of data on dialysis session time (table 7.4). The great majority of prevalent patients dialysed between 3.5–5.0 hours, although there was variation. Taking centres with 99% or greater data completion for time per dialysis session, then London King's reported 16.3% of patients dialysing <3.5 hours per session, and Newcastle reported dialysing 1.3% of patients for more than five hours per session.

Achieved URR

The UK median URR reported for prevalent HD patients was 75.0% (centre range 71.0–82.5%) (figure 7.1a), with a

Table 7.3. Number of dialysis sessions for prevalent patients on HD by centre, on 30/9/2014

Centre	*N*	Percentage completeness	Percentage		
			<3 sessions	3 sessions	>3 sessions
England					
B Heart	381	83.7	8.8	89.3	1.9
B QEH	841	0.0			
Basldn	152	98.7	0.0	96.0	4.0
Bradfd	192	100.0	5.7	93.2	1.0
Brightn	348	99.7	0.0	99.7	0.3
Bristol	471	100.0	4.0	94.1	1.9
Camb	298	98.7	9.2	88.8	2.0
Carlis	65	96.9	4.8	95.2	0.0
Carsh	693	99.3	0.4	99.3	0.3
Chelms	115	99.1	9.6	88.6	1.8
Colchr	109	100.0	0.0	100.0	0.0
Covnt	323	2.5			
Derby	191	61.8	0.0	100.0	0.0
Donc	160	95.6	0.7	99.3	0.0
Dorset	252	99.2	1.2	98.4	0.4
Dudley	148	99.3	1.4	98.0	0.7
Exeter	375	99.7	4.5	93.9	1.6
Glouc	206	0.0			
Hull	298	1.0			
Ipswi	110	76.4	6.0	92.9	1.2
Kent	378	99.2	3.2	95.2	1.6
L Barts	889	0.0			
L Guys	556	0.0			
L Kings	480	100.0	0.0	100.0	0.0
L Rfree	650	0.0			
L St.G	272	90.1	0.8	99.2	0.0
L West	1,320	41.4			
Leeds	449	98.9	5.9	94.1	0.0
Leic	797	98.5	0.9	99.1	0.0
Liv Ain	141	99.3	2.1	92.9	5.0
Liv Roy	295	98.3	0.7	86.9	12.4
M RI	421	23.5			
Middlbr	304	19.1			
Newc	237	100.0	0.4	98.3	1.3
Norwch	281	99.6	1.4	97.9	0.7
Nottm	310	99.0	1.3	98.7	0.0
Oxford	387	100.0	0.0	100.0	0.0
Plymth	128	0.0			
Ports	541	98.5	6.0	92.1	1.9
Prestn	475	0.0			
Redng	259	98.8	0.4	98.8	0.8
Salford	360	99.7	0.8	79.1	20.1
Sheff	510	99.8	4.5	95.5	0.0
Shrew	153	100.0	5.2	92.8	2.0
Stevng	421	99.3	5.5	92.3	2.2
Sthend	114	100.0	14.0	86.0	0.0
Stoke	267	99.6	0.8	95.9	3.4
Sund	190	96.8	0.0	90.8	9.2
Truro	130	90.0	7.7	89.7	2.6
Wirral	187	98.9	1.1	90.3	8.6
Wolve	276	7.6			
York	112	97.3	0.9	91.7	7.3

Table 7.3. Continued

Centre	*N*	Percentage completeness	Percentage		
			<3 sessions	3 sessions	>3 sessions
N Ireland					
Antrim	114	100.0	0.0	99.1	0.9
Belfast	168	100.0	0.6	95.8	3.6
Newry	86	100.0	4.7	95.3	0.0
Ulster	91	100.0	1.1	96.7	2.2
West NI	99	100.0	2.0	87.9	10.1
Scotland					
Abrdn	196	100.0	1.5	94.4	4.1
Airdrie	171	97.1	0.0	100.0	0.0
D & Gall	41	100.0	4.9	70.7	24.4
Dundee	153	99.4	0.0	98.0	2.0
Edinb	251	99.6	0.4	99.6	0.0
Glasgw	533	95.5	0.6	99.2	0.2
Inverns	56	100.0	0.0	94.6	5.4
Klmarnk	123	98.4	0.0	100.0	0.0
Krkcldy	136	97.8	0.8	99.2	0.0
Wales					
Bangor	65	0.0			
Cardff	416	0.0			
Clwyd	79	94.9	1.3	92.0	6.7
Swanse	283	0.0			
Wrexm	101	0.0			
England	**18,018**	**65.4**	**2.7**	**95.1**	**2.1**
N Ireland	**558**	**100.0**	**1.4**	**95.2**	**3.4**
Scotland	**1,660**	**97.8**	**0.6**	**97.8**	**1.5**
Wales	**944**	**7.9**			
UK	**21,180**	**66.3**	**2.4**	**95.4**	**2.2**

Blank cells denote no data returned by that centre or data not shown due to <50% data completeness

median URR for women of 78.0% (centre range 71.0–87.0%) compared with a median for men of 74.0% (centre range 69.0–81.0%) (figures 7.1b, 7.1c). The percentage of patients achieving the UK RA guideline of a URR >65% was 88.6% for the UK, with a centre range of 74.9–97.0% (figure 7.2). There continued to be variation between renal centres in the percentage of prevalent patients with a URR of >65%, with 23 centres attaining the UK RA clinical practice guideline for >90% of patients and 34 centres reporting a URR of >65% in 75–90% of patients (figure 7.2). The percentage of prevalent male HD patients achieving the URR target was 86.5% for the UK, with a centre range of 64.7–96.2%, compared to 92.0% for prevalent female HD patients, with a centre range of 73.6–100%.

Changes in URR over time

The proportion of patients attaining the UK RA guideline (sessional URR >65%) increased from 70.7% to 88.6% from 2001–2014, whilst the median URR has risen from 70.0% to 75.0% during the same time period (figure 7.3). However, between 2011 and 2014, there has been no substantial increase in median URR reported by centres in the UK, or in the percentage of patients achieving the UK RA target.

Variation of achieved URR with time on dialysis

The proportion of prevalent HD patients who attained the UK RA clinical guideline for sessional URR was greatest for those who had been on dialysis for the longest time (figure 7.4). In 2014, 73.4% of those dialysed for less than six months had a URR >65%, whilst 91.2% of patients who had survived and continued on RRT for more than two years had a URR within the guideline target. In all strata of time on dialysis, there has been an improvement in the proportion of patients receiving the target dose between 2000–2011, thereafter there has been no substantial increase.

Table 7.4. Time per dialysis session for prevalent patients on HD by centre, on 30/9/2014

Centre	*N*	Percentage completeness	Percentage per dialysis session		
			<3.5 hours	3.5–5 hours	5+ hours
England					
B Heart	347	76.7	4.5	95.1	0.4
B QEH	841	0.0			
Basldn	146	98.6	11.8	88.2	0.0
Bradfd	179	99.4	8.4	91.6	0.0
Brightn	347	99.7	2.0	98.0	0.0
Bristol	443	100.0	5.6	94.4	0.0
Camb	265	0.0			
Carlis	62	96.8	5.0	95.0	0.0
Carsh	688	97.7	1.8	98.2	0.0
Chelms	102	99.0	5.9	94.1	0.0
Colchr	109	100.0	0.0	100.0	0.0
Covnt	323	4.6			
Derby	191	61.8	0.8	99.2	0.0
Donc	159	95.6	11.2	88.8	0.0
Dorset	248	99.2	2.8	97.2	0.0
Dudley	145	99.3	8.3	91.7	0.0
Exeter	352	100.0	19.0	81.0	0.0
Glouc	206	0.0			
Hull	298	2.3			
Ipswi	104	75.0	2.6	97.4	0.0
Kent	360	99.7	17.0	83.0	0.0
L Barts	889	0.0			
L Guys	556	14.2			
L Kings	480	100.0	16.3	83.8	0.0
L Rfree	650	0.0			
L St.G	270	80.0	1.4	98.6	0.0
L West	1,309	41.3			
Leeds	423	99.5	6.9	93.1	0.0
Leic	790	81.9	3.1	95.5	1.4
Liv Ain	131	100.0	14.5	85.5	0.0
Liv Roy	257	100.0	8.2	90.7	1.2
M RI	418	23.2			
Middlbr	302	100.0	19.2	79.8	1.0
Newc	233	99.6	6.0	92.7	1.3
Norwch	275	99.6	16.1	83.9	0.0
Nottm	306	99.0	6.6	93.1	0.3
Oxford	387	100.0	8.3	91.5	0.3
Plymth	128	0.0			
Ports	499	0.0			
Prestn	475	0.4			
Redng	256	94.1	0.8	99.2	0.0
Salford	285	94.4	6.3	93.3	0.4
Sheff	487	86.2	50.2	49.3	0.5
Shrew	142	100.0	12.7	87.3	0.0
Stevng	389	99.7	33.5	66.5	0.0
Sthend	98	100.0	26.5	73.5	0.0
Stoke	256	100.0	5.5	94.5	0.0
Sund	173	85.0	7.5	92.5	0.0
Truro	118	94.1	18.9	80.2	0.9
Wirral	169	100.0	17.8	81.7	0.6
Wolve	276	7.6			
York	103	99.0	2.0	98.0	0.0

Table 7.4. Continued

Centre	*N*	Percentage completeness	Percentage per dialysis session		
			<3.5 hours	3.5–5 hours	5+ hours
N Ireland					
Antrim	113	100.0	1.8	98.2	0.0
Belfast	161	100.0	9.3	90.7	0.0
Newry	82	100.0	9.8	90.2	0.0
Ulster	88	100.0	3.4	96.6	0.0
West NI	87	100.0	17.2	82.8	0.0
Scotland					
Abrdn	185	98.9	1.1	97.3	1.6
Airdrie	171	95.3	5.5	93.9	0.6
D & Gall	29	82.8	0.0	95.8	4.2
Dundee	150	99.3	3.4	96.6	0.0
Edinb	250	99.2	9.3	89.9	0.8
Glasgw	529	94.9	1.6	93.8	4.6
Inverns	53	100.0	1.9	98.1	0.0
Klmarnk	123	90.2	0.0	100.0	0.0
Krkcldy	135	97.8	14.4	84.8	0.8
Wales					
Bangor	65	0.0			
Cardff	416	0.0			
Clwyd	73	97.3	33.8	66.2	0.0
Swanse	283	0.0			
Wrexm	101	0.0			
England	**17,445**	**60.3**	**10.6**	**89.1**	**0.3**
N Ireland	**531**	**100.0**	**8.1**	**91.9**	**0.0**
Scotland	**1,625**	**96.3**	**4.3**	**93.7**	**2.0**
Wales	**938**	**7.6**			
UK	**20,539**	**61.8**	**9.9**	**89.6**	**0.5**

Blank cells denote no data returned by that centre or data not shown due to <50% data completeness

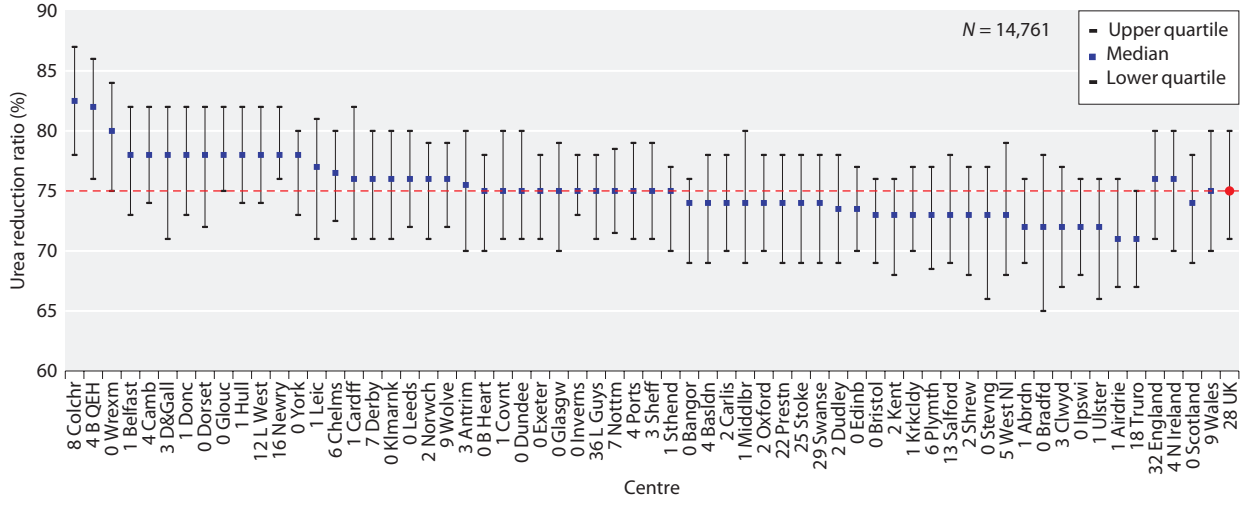

Fig. 7.1a. Median URR achieved in prevalent patients on HD by centre, 30/9/2014

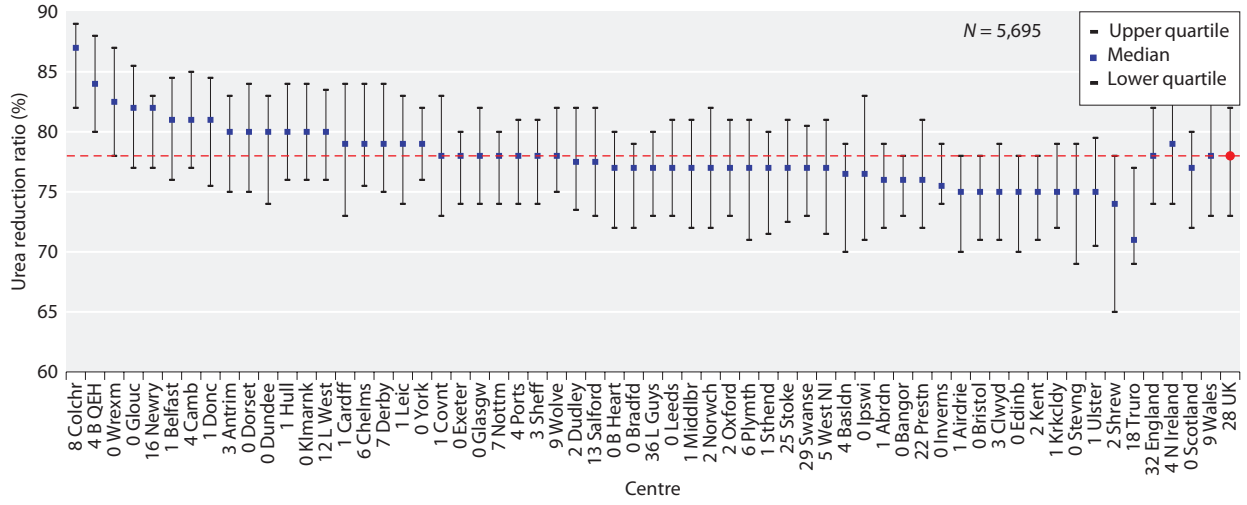

Fig. 7.1b. Median URR achieved in female prevalent patients on HD by centre, 30/9/2014

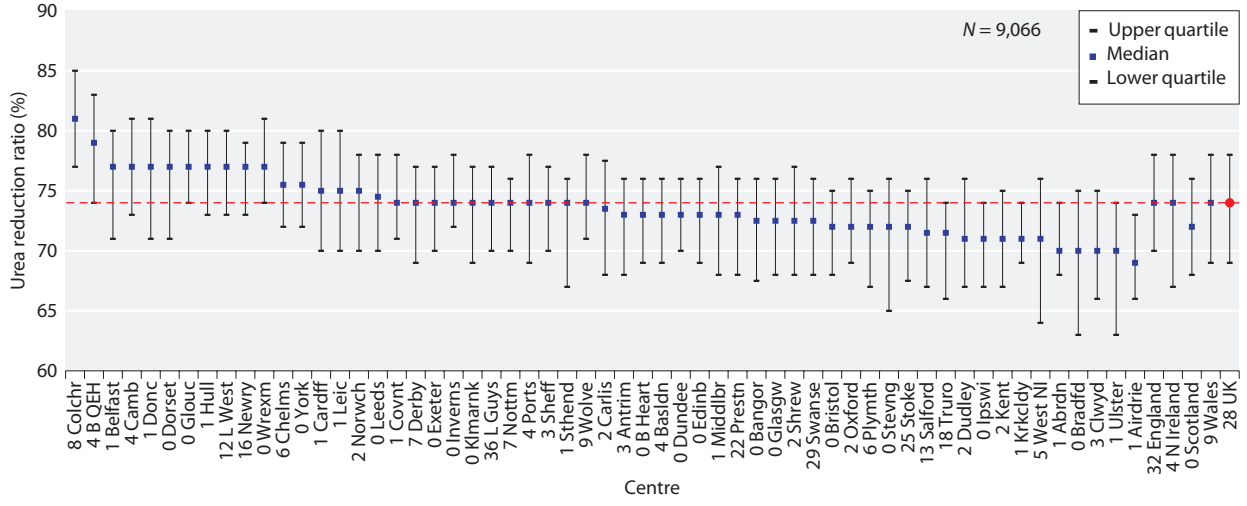

Fig. 7.1c. Median URR achieved in male prevalent patients on HD by centre, 30/9/2014

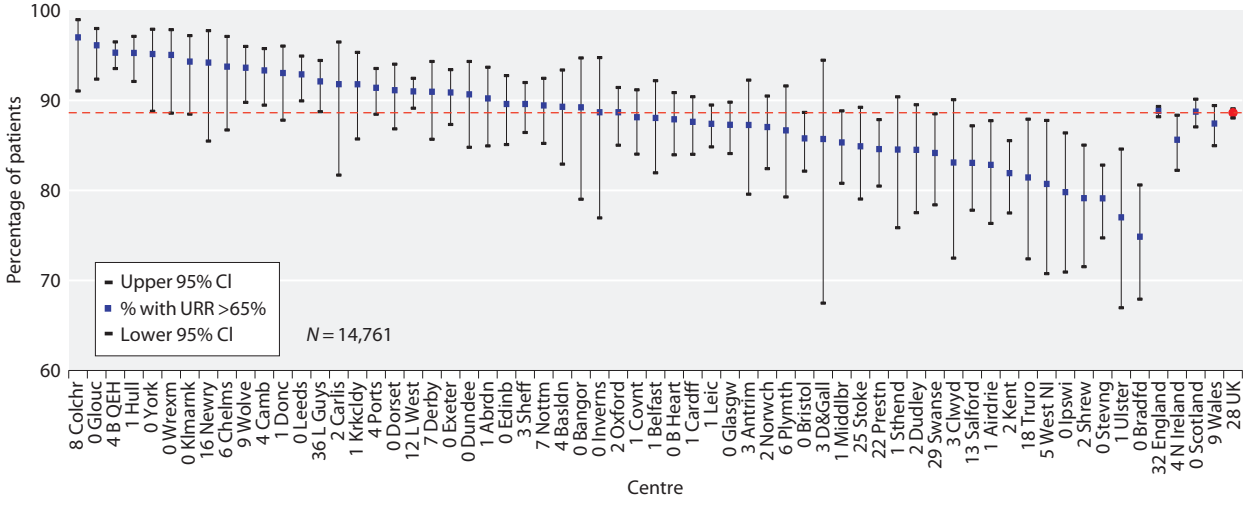

Fig. 7.2. Percentage of prevalent patients on HD with URR >65% by centre, 30/9/2014

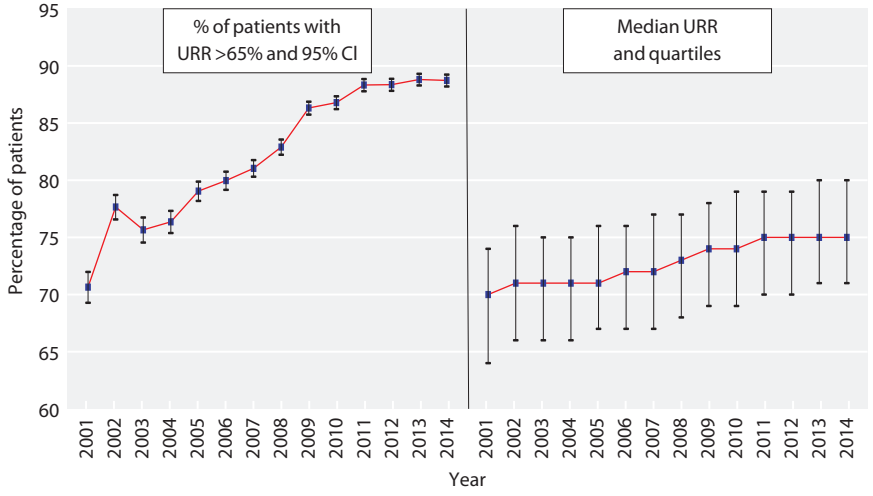

Fig. 7.3. Change in the percentage of prevalent patients on HD with URR >65% and the median URR between 2001 and 2014

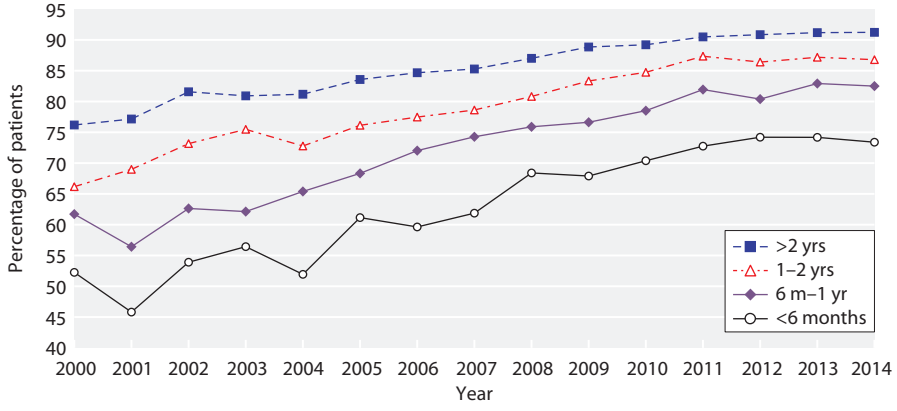

Fig. 7.4. Percentage of prevalent patients on HD achieving URR >65% by time on RRT between 2000 and 2014

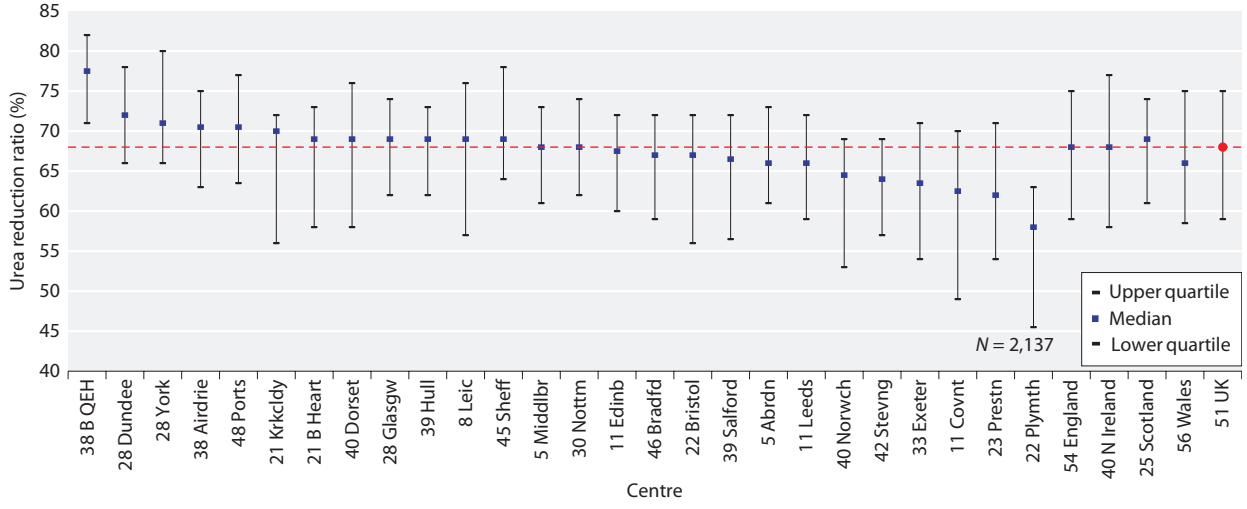

Fig. 7.5a. Median URR in the first quarter of starting RRT in incident patients who started HD in 2013

The median URR during the first quarter after initiating HD treatment of the incident HD population in the UK in 2013 was 68% (centre range 58.0–77.5%) (figure 7.5a). At the end of twelve months, the median URR for this incident cohort was higher (median URR 74%, centre range 70–81%) (figure 7.5b).

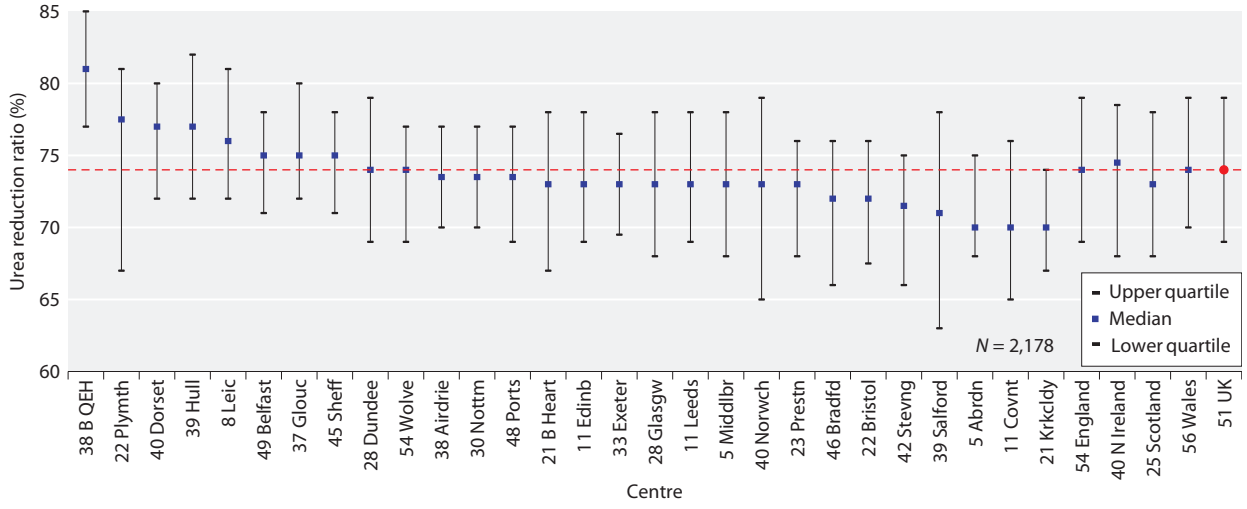

Fig. 7.5b. Median URR one year after starting RRT for incident patients who started HD in 2013

Conclusions

Although the dose of delivered HD is recognised as having an important influence on outcome in HD patients treated with low flux HD, it remains unclear as to whether higher urea clearance targets add benefit [2, 10]. More recently, higher convective volume clearance achieved with haemodiafiltration has been reported to be associated with improved patient survival [11]. The UKRR does not currently systematically collect data on haemodialysis modality or dialyser flux.

Since 2000, the proportion of UK patients achieving the RA guideline for URR has steadily increased, with more than 88% of the prevalent 2014 HD population achieving the target, with a median URR of 75%. This increase in delivered URR not only reflects improvements in clinical practice and delivery of dialysis, but also enhanced coverage and quality of the data collected by the UKRR and renal centres over the years. However, it must be acknowledged that not all centres contributed data. This may be due to the difficulties in providing pre and post treatment results, as with many centres now dialysing in outlying satellites utilising evening and overnight shifts, leading to difficulties in establishing pre and post samples by registering different laboratory dates. In addition pre and post urea data has to be cleaned by excluding samples from HD patients admitted as inpatients. Secondly, with the introduction of dialysis machines with on-line clearance, some centres have opted to record Kt/V data, which is not currently collected by the UKRR.

Although the URR delivered has increased over time there remained a wide range (74.9–97.0%) between dialysis centres in the percentage of prevalent HD patients achieving a URR of >65%. This is likely to reflect genuine differences in the HD dose delivered consequent to both individual patient and centre level factors, although standardised methods for urea sampling are advised [1], inconsistency in sampling methodology for the post-dialysis urea sample may also play a part in the variations reported. Understanding individual renal centre practice would be informative, for example some centres may determine residual renal function and adjust dialysis sessions accordingly. Observational evidence supports that preservation of residual renal function is associated with improved survival [12], and reduced extracellular water expansion [13], although there appears to be no benefit maintaining overhydration in patients to try and preserve residual renal function [14]. Some centres may be adopting an incremental approach to the imitation of HD [15], starting patients on twice weekly dialysis schedules or prescribing shorter dialysis sessions, as the median URR for patients initiating dialysis was lower in the first quarter of starting dialysis, and then increased over the course of the first year of haemodialysis, but remained lower than that of prevalent patients established on dialysis, suggesting that dialysis treatments were being adjusted according to residual renal function. Although this may account for some of the differences in dialysis frequency and session times, other centres are known to favour higher blood flows and shorter, but more efficient dialysis sessions. In the future the UKRR

will collect data from individual patient dialysis sessions, which will allow closer inspection of centre practices.

The median URR was higher for women and more women achieved the URR target in the UK than men. This does not necessarily reflect a greater dose of HD for women, and may simply reflect differences in dietary intake and lower pre-dialysis serum urea values in women [10, 16]. Paradoxically, although URR may be higher for women, clearance of larger solutes may be lower, as typically women have shorter session times than men [10, 16].

The UK government changed reimbursement policy to encourage the provision of more frequent dialysis sessions, by switching to payment for each individual in-centre treatment session [17]. However only four centres reported providing $\geqslant$10% of patients receiving more frequent dialysis than thrice weekly, and five other centres $\geqslant$5%. This may reflect logistical problems in terms of provision, although the option of more frequent dialysis may also not have universal support from patients.

Although urea clearance is the paradigm for dialysis adequacy, debate continues as to whether urea clearance is representative of the clearance of azotaemic toxin [18, 19]. In addition to clearance of azotaemic toxins, the dialysis prescription also encompasses volume control, sodium and divalent cation balance and correction of metabolic acidosis. As such, basing and evaluating HD dose simply on urea clearance has been criticised, with patient outcomes reported to be improved by longer sessional times independent of urea removal [20] and that clearance of 'middle molecules' may also have an important effect [11, 21]. However, no consensus has yet emerged on alternative markers of HD adequacy [18]. The UKRR has historically reported URR, predominantly for logistical reasons with the URR being the simplest measure of dialysis adequacy to calculate, and the measure of dialysis adequacy that is most complete when returned to the UKRR. However, limitations of the URR must be recognised [22]. The revised UKRR data set, due to be embedded in the 2016 dialysis centre returns, should help contribute to further improvements in both UK URR data capture, as well as Kt/V reporting in addition to dialysis centre prescription practices.

Conflicts of interest: the authors declare no conflicts of interest

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UK Renal Registry 18th Annual Report: Chapter 8 Haemoglobin, Ferritin and Erythropoietin amongst UK Adult Dialysis Patients in 2014: National and Centre-specific Analyses

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Key Words

Anaemia · Chronic kidney disease · Dialysis · End stage renal disease · Epidemiology · Erythropoietin · Erythropoietin stimulating agent · European Best Practice Guidelines · Ferritin · Haemodialysis · Haemoglobin · NICE · Peritoneal dialysis · Renal Association

Summary

In the UK in 2014:

- The median haemoglobin (Hb) of patients at the time of starting dialysis was 100 g/L with 50% of patients having a Hb ⩾100 g/L.
- The median Hb in patients starting haemodialysis (HD) was 97 g/L (IQR 87–106) and in patients starting peritoneal dialysis (PD) was 108 g/L (IQR 100–117).
- At start of dialysis, 54% of patients presenting early had Hb ⩾100 g/L whilst only 33% of patients presenting late had Hb ⩾100 g/L.
- The median Hb of prevalent patients on HD was 111 g/L with an IQR of 103–120 g/L.
- The median Hb of prevalent patients on PD was 112 g/L with an IQR of 103–121 g/L.
- 81% of HD patients and 83% of PD patients had Hb ⩾100 g/L.
- 58% of HD patients and 56% of PD patients had Hb ⩾100 and ⩽120 g/L.
- The median ferritin in HD patients was 432 μg/L (IQR 274–631) and 95% of HD patients had a ferritin ⩾100 μg/L.
- The median ferritin in PD patients was 292 μg/L (IQR 168–479) with 88% of PD patients having a ferritin ⩾100 μg/L.

In England, Wales and Northern Ireland in 2014:

- The median erythropoietin stimulating agent (ESA) dose was higher for HD than PD patients (7,333 vs. 4,148 IU/week).

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Introduction

Anaemia is a common feature of Chronic Kidney Disease (CKD) and when untreated is strongly associated with poor outcomes, resulting in increased hospitalisations and mortality. This chapter describes analyses of the UK Renal Registry (UKRR) data relating to the management of anaemia in dialysis patients during 2014.

The diagnosis and management of anaemia in chronic kidney disease and the standards to be achieved have been detailed in the Kidney Disease Improving Global Outcomes (KDIGO), Kidney Disease Outcomes Quality Initiative (KDOQI), European Best Practice Guidelines (EBPG) and UK Renal Association guidelines [1–4]. The health economics of anaemia therapy using ESAs has also been subject to a National Institute of Clinical Excellence (NICE) systematic review which concluded that treating to a target haemoglobin (Hb) 110–120 g/L is cost effective in HD patients [5]. The NICE guidance was updated in June 2015 [6] but this will not have influenced the data reported in this chapter from 2014.

This chapter reports on the analyses of data items collected by the UKRR largely in the context of the 5th edition of the UK Renal Association's Anaemia in CKD guidelines and recommendations which was published at the end of 2010 [4]. Table 8.1 lists the audit measures from these guidelines along with reasons for the exclusion of some of the measures.

The Proactive IV irOn Therapy in haemodiALysis patients (PIVOTAL) trial is a randomised control trial that has been recruiting in the UK since November 2013 in 40 renal centres (target 2,000 participants) to test the efficacy and safety of high-dose IV iron supplementation in incident haemodialysis patients. This is unlikely to have had a large impact on the centre level data presented in this chapter [7].

Methods

Most of the analyses in this chapter use the incident or prevalent renal replacement therapy (RRT) cohorts for 2014.

Table 8.1. Summary of recommended Renal Association audit measures relevant to anaemia management

RA audit measure	Included in UKRR annual report?	Reason for exclusion
1. Proportion of CKD patients with eGFR <30 ml/min by 4 variable MDRD method with an annual Hb level	No	Data not available for the period covered by this report
2. Proportion of patients starting an ESA without prior measurement of serum ferritin and/or TSAT	No	UKRR does not know when all patients start ESA treatment. UKRR does not collect TSAT data
3. Proportion of patients on renal replacement therapy with Hb level <10 who are not prescribed an ESA	Yes	
4. Each renal unit should audit the type, route and frequency of administration and weekly dose of ESA prescribed	UKRR reports the completeness of these data items	
5. The proportion of CKD stage 4–5 patients with Hb 10–12 g/dl	No	Data not available for the period covered by this report
6. The proportion of patients treated with an ESA with Hb >12 g/dl	Yes	
7. Each renal unit should monitor ESA dose adjustments	No	UKRR does not collect this data
8. Proportion of patients with serum ferritin levels <100 ng/ml at start of treatment with ESA	No	UKRR does not know when all patients start ESA treatment
9. Proportion of pre-dialysis and PD patients receiving iron therapy; type: oral vs. parenteral	No	Data not available for the period covered by this report/poor data completeness
10. Proportion of HD patients receiving IV iron	No	Poor data completeness
11. Prevalence of resistance to ESA among renal replacement therapy patients	Yes	
12. Proportion of HD patients who received a blood transfusion within the past year	No	Data held at NHS Blood and Transplant

Some analyses use data from earlier years. Haemoglobin levels are given in g/L as the majority of UK laboratories have now switched to reporting using these units rather than g/dl.

The UKRR extracted quarterly data electronically from renal centres in England, Wales and Northern Ireland (E,W&NI) taking the latest available result from each quarter.

Data from Scotland were provided by the Scottish Renal Registry (SRR). For Q2 and Q4 the data provided were from May and November respectively due to the SRR's bi-annual census. For Q1 and Q3 the earliest available results in the quarter were provided. Data was provided for patients on treatment on 1st February, 1st May, 1st August and 1st November respectively for the four quarters. Therefore, for people who started treatment in the later part of each quarter, data was not available for the quarter of start. So, in order to improve completeness for the analysis of incident patients (see below), the cohort used for Scotland was patients starting treatment between 2nd November 2013 and 1st November 2014 inclusive and the definition of quarters was adjusted (e.g. for patients starting treatment from 2nd August 2014 up to 1st November 2014 the Hb data from Q4 was used).

For the analyses of Hb for incident patients, those patients commencing RRT on PD or HD were included whilst those receiving a pre-emptive transplant were excluded. Hb measurements from after starting dialysis but still within the same quarter of the year were used. Therefore, depending on when in the quarter a patient started RRT the Hb data could be from zero to 90 days later. Patients who died within the first 90 days on treatment were excluded. Results are also shown with the cohort subdivided into early and late presenters (date first seen by a nephrologist, 90 or more days and less than 90 days before starting dialysis respectively). For these analyses only centres with at least 75% completeness of presentation time data were included.

For the analyses of prevalent dialysis patients those patients receiving dialysis on 31st December 2014 were included if they had been on the same modality of dialysis in the same centre for at least three months. In order to improve completeness, the last available measurement for each patient from the last two quarters was used for Hb and from the last three quarters for ferritin.

The completeness of data items were analysed at both centre and country level. As in previous years, all patients were included in analyses but centres with less than 50% completeness were excluded from the caterpillar and funnel plots showing centre level results. Centres providing relevant data from less than 10 patients were also excluded from the plots. The number preceding the centre name in the caterpillar plots is the percentage of patients who have data missing.

Summary statistics including minimum, maximum, interquartile ranges (IQR), averages (mean and median) and standard deviations were calculated. The median values and the IQRs are shown using caterpillar plots. The percentages achieving standards were also calculated and these are displayed using caterpillar plots with the percentages meeting the targets and 95% confidence intervals (CIs) shown. Funnel plots show the distribution of the percentages meeting the targets and also whether any of the centres were significantly different from the average. Longitudinal analyses were performed to show overall changes in achievement of standards over time.

Erythropoietin data from the last quarter of 2014 were used to define which patients were receiving ESAs. Scotland was excluded from this analysis as data about ESAs was not included in its return. Each individual was defined as being on ESA if a drug type and/or a dose was present in the data. Centres reporting fewer than 60% of HD patients or fewer than 45% of PD patients being treated with ESAs were considered to have incomplete data and were excluded from further analysis. It is recognised that these exclusion criteria are relatively arbitrary but they are in part based upon the frequency distribution graph of centres' ESA use as it appears in the data. The percentage of patients on ESAs was calculated from these data and incomplete data returns risk seriously impacting on any conclusions drawn.

For analyses of ESA dose, values are presented as weekly erythropoietin dose. Doses of less than 150 IU/week (likely to be darbepoietin) were harmonised with erythropoietin data by multiplying by 200. No adjustments were made with respect to route of administration. Patients who were not receiving ESAs were not included in analyses of dose (rather than being included with dose = 0).

Until three years ago, UKRR annual reports only used the dose from the final quarter of the year. Now, starting with the cohort of patients receiving ESAs in the final quarter and having a dose value present for that quarter, any further dose values available from the earlier three quarters of the year were used (provided the patient was on the same treatment and receiving the same drug in those quarters). The average (mean) of the available values was then used in analyses rather than the dose in the final quarter.

The ESA data were collected electronically from renal IT systems but in contrast to laboratory linked variables the ESA data required manual data entry. The reliability depended upon the data source, whether the entry was linked to the prescription or whether the prescriptions were provided by the primary care physician. In the latter case, doses may not be as reliably updated as the link between data entry and prescription is indirect.

Results

Anaemia management in incident dialysis patients

Haemoglobin in incident dialysis patients

The Hb at the time of starting RRT gives the only indication of concordance with current anaemia management recommendations in the pre-dialysis (CKD 5 not yet on dialysis) group. The percentage of data returned and outcome Hb are listed in table 8.2. Results are not shown for London Guys as no Hb data was available. The median Hb of patients at the time of starting dialysis in the UK was 100 g/L. The median Hb when starting dialysis is shown in figure 8.1. The percentage of patients having a Hb $\geqslant$100 g/L was again 50% after falling over the previous years from the 55% seen for the 2009 cohort. The percentage starting with a Hb $\geqslant$100 g/L by centre is given in figure 8.2.

The variation between centres in the proportion of patients starting dialysis with Hb $\geqslant$100 g/L remained high (27–89%). Using the centres that had provided the date of first presentation with good completeness, the

Table 8.2. Haemoglobin data for incident patients starting RRT on haemodialysis or peritoneal dialysis during 2014, both overall and by presentation time

	All incident dialysis patients				Early presenters (⩾90 days)		Late presenters (<90 days)	
Centre	% data return	*N* with data	Median Hb g/L	% Hb ⩾100 g/L	Median Hb g/L	% Hb ⩾100 g/L	Median Hb g/L	% Hb ⩾100 g/L
England								
B Heart	100	87	95	34	94	31		
B QEH	97	194	100	51	101	55	93	35
Basldn	98	41	91	37	93	40		
Bradfd	99	70	95	39	95	38	96	
Brightn	98	129	102	57	104	63	96	40
Bristol	100	119	103	74	103	73	102	70
Camb	84	76	101	53				
Carlis	100	34	109	68	111	79		
Carsh	100	225	100	50				
Chelms	98	44	109	84	109	86		
Colchr	52	17	97	29				
Covnt	98	102	99	46	99	48	90	17
Derby	100	69	103	59	104	63	95	43
Donc	98	50	98	46	101	52		
Dorset	99	72	100	53	101	57		
Dudley	97	38	100	53	102	59		
Exeter	98	126	106	89	106	90		
Glouc	100	49	105	61				
Hull	71	61	101	57				
Ipswi	79	26	95	42	101	53		
Kent	100	138	100	50	101	53	88	32
L Barts	99	274	98	47				
L Guys	0	0						
L Kings	100	139	96	38	97	42	92	21
L Rfree	100	185	100	54	104	59	92	34
L St.G	99	81	97	42				
L West	59	179	103	61	103	61		
Leeds	96	114	93	32	95	36	88	18
Leic	100	206	95	41	97	45	91	24
Liv Ain	100	55	100	51	103	55		
Liv Roy	100	97	100	54	101	59	91	31
M RI	100	140	98	46				
Middlbr	100	80	95	44	99	50	93	24
Newc	98	90	101	52	101	55	96	36
Norwch	99	71	94	44				
Nottm	99	82	98	45	101	51		
Oxford	100	157	95	39	98	44	90	21
Plymth	100	42	101	55				
Ports	100	195	101	53				
Prestn	99	136	96	41	96	42	96	36
Redng	100	92	102	55	108	63	92	35
Salford	98	128	98	48				
Sheff	100	128	96	43	97	46	85	9
Shrew	98	60	104	60	105	65	101	50
Stevng	99	135	98	45	97	44	100	50
Sthend	100	27	98	41	101	59	93	10
Stoke	95	88	102	57	102	61	97	41
Sund	95	54	97	46	96	44	100	54
Truro	100	33	102	61	101	60		
Wirral	85	34	101	53	102	61		
Wolve	90	63	97	44	98	46		
York	82	40	100	50				

Table 8.2. Continued

Centre	All incident dialysis patients				Early presenters (⩾90 days)		Late presenters (<90 days)	
	% data return	*N* with data	Median Hb g/L	% Hb ⩾100 g/L	Median Hb g/L	% Hb ⩾100 g/L	Median Hb g/L	% Hb ⩾100 g/L
N Ireland								
Antrim	97	30	91	27	91	30		
Belfast	95	40	98	48	100	53		
Newry	100	17	108	65	109	69		
Ulster	95	18	102	61	103	69		
West NI	100	34	98	50	102	57		
Scotland								
Abrdn	94	51	98	43				
Airdrie	94	49	98	37				
D & Gall	100	17	108	71				
Dundee	98	44	102	61				
Edinb	99	68	103	51				
Glasgw	99	133	100	51				
Inverns	95	21	102	62				
Klmarnk	94	31	95	42				
Krkcldy	97	30	103	57				
Wales								
Bangor	91	20	107	65	107	65		
Cardff	100	143	102	59	102	60	96	46
Clwyd	80	20	97	35				
Swanse	100	96	99	45	101	51	92	27
Wrexm	98	39	99	49	100	52		
England	**93**	**4,972**	**100**	**50**	**101**	**54**	**94**	**34**
N Ireland	**97**	**139**	**97**	**47**	**100**	**54**	**87**	**8**
Scotland	**97**	**444**	**100**	**51**				
Wales	**98**	**318**	**100**	**52**	**102**	**57**	**95**	**34**
UK	**94**	**5,873**	**100**	**50**	**101**	**54**	**94**	**33**

Blank cells: centres excluded from analyses due to poor data completeness or low patient numbers
Presentation time data has not been collected from the Scottish Renal Registry
For Scottish centres the cohort is patients starting RRT on dialysis between 2/11/2013 and 1/11/2014 inclusive

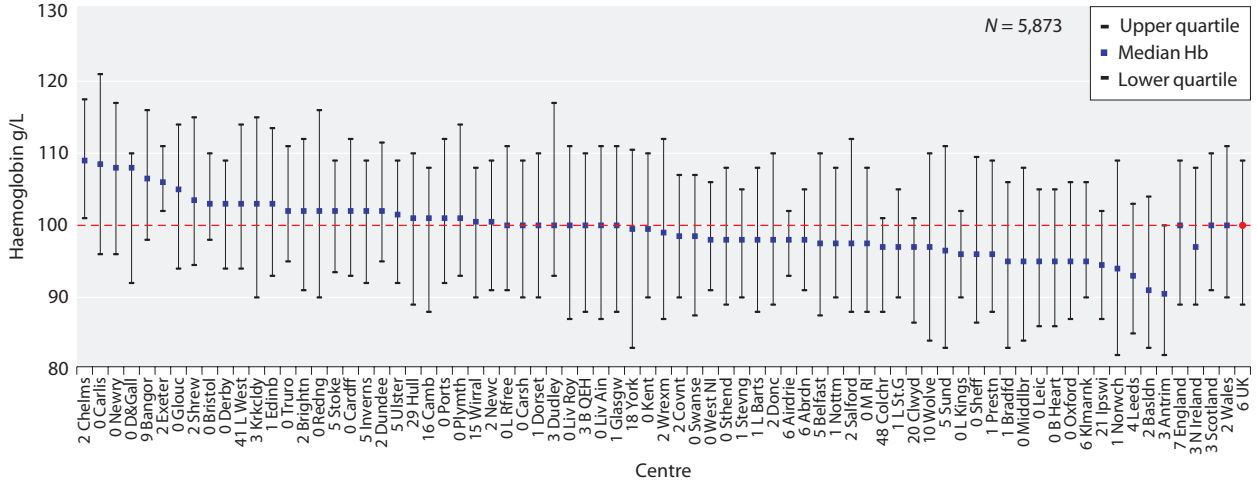

Fig. 8.1. Median haemoglobin for incident dialysis patients at start of dialysis treatment in 2014

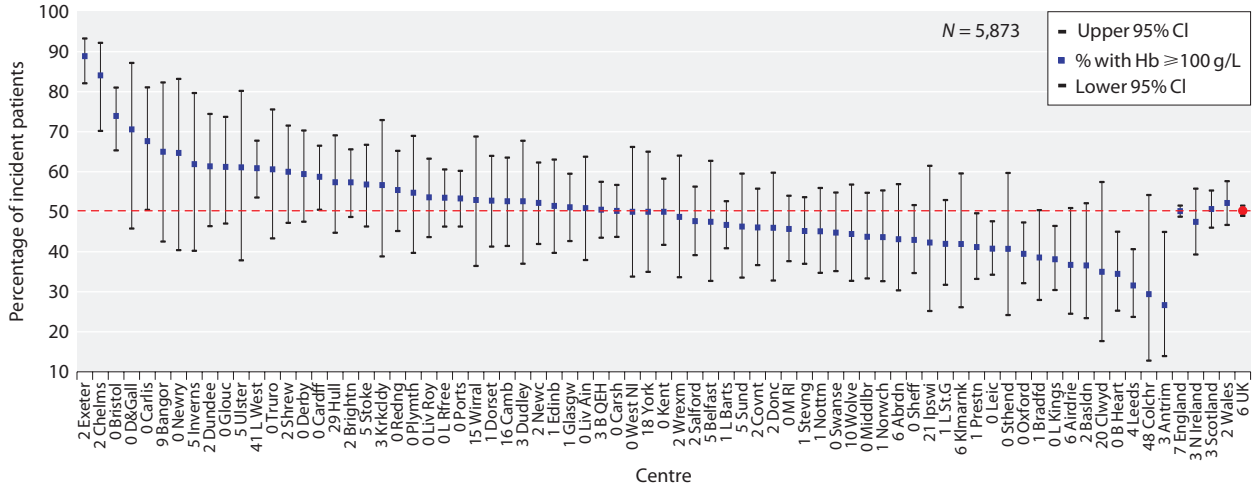

Fig. 8.2. Percentage of incident dialysis patients with Hb ⩾100 g/L at start of dialysis treatment in 2014

median Hb in the late presenters was 94 g/L with only 33% of patients having a Hb ⩾100 g/L compared with a median Hb of 101 g/L and 54% of patients having a Hb ⩾100 g/L in the early presenters. In both groups there was large variation between centres in the percentage of patients having a Hb ⩾100 g/L (9–70% in the late presenters and 30–90% in the early presenters).

Median Hb of patients at the time of starting HD was 97 g/L (IQR 87–106 g/L) and in those starting PD it was 108 g/L (IQR 100–117 g/L). When starting dialysis, 43% of HD patients had a Hb ⩾100 g/L, compared with 75% of PD patients.

Incident dialysis patients from 2013 were followed for one year and the median haemoglobin (and percentage with a Hb ⩾100 g/L) of survivors on the same treatment at the same centre after a year was calculated for each quarter. Only patients who had Hb data for each of the four time points were included in this analysis. This was sub-analysed by modality and length of pre-RRT care (figures 8.3, 8.4). Hb was higher in the second quarter on dialysis than during the quarter at start of dialysis reflecting the benefits of treatment administered. Over 75% of incident patients surviving to a year had Hb ⩾100 g/L regardless of the modality or the length of pre-RRT care.

The annual distribution of Hb in incident dialysis patients is shown in figure 8.5. Since 2005, the proportion of incident dialysis patients with Hb ⩾120 g/L has fallen from 16% to 9%. The proportion of patients with Hb <100 g/L at the time of starting dialysis has increased from 43% in 2005 to 50% in 2014. In the 2014 cohort whose date of presentation was available, 67% of patients in the late presentation group had Hb <100 g/L compared with 46% in the early presentation group.

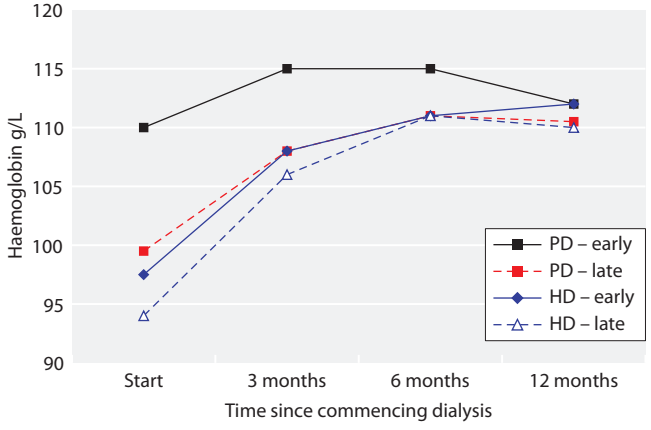

Fig. 8.3. Median haemoglobin, by time on dialysis and length of pre-RRT care, for incident dialysis patients in 2013

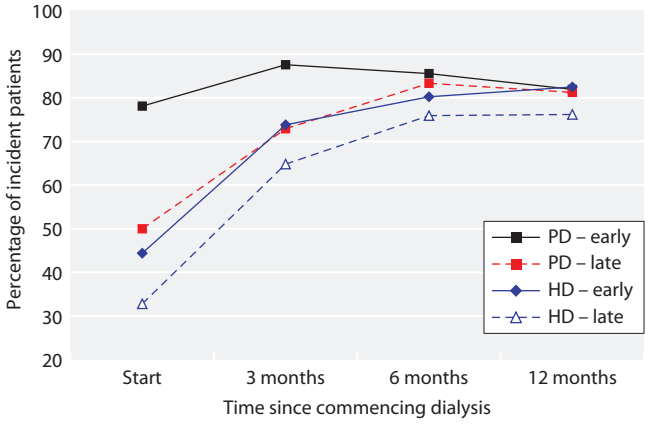

Fig. 8.4. Percentage of incident dialysis patients in 2013 with Hb ⩾100 g/L, by time on dialysis and by length of pre-RRT care

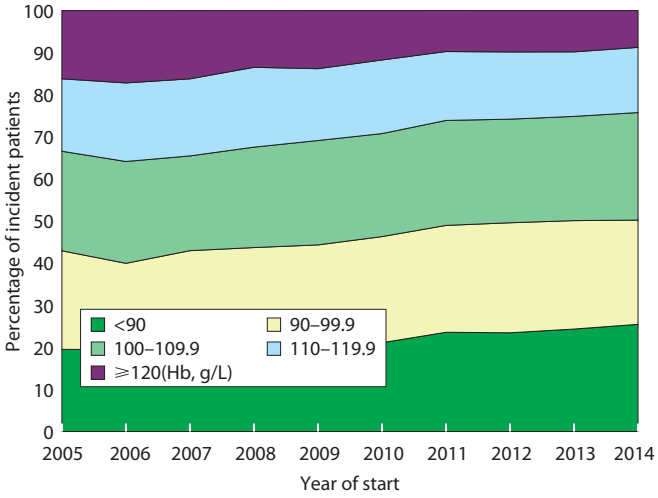

Fig. 8.5. Distribution of haemoglobin in incident dialysis patients by year of start

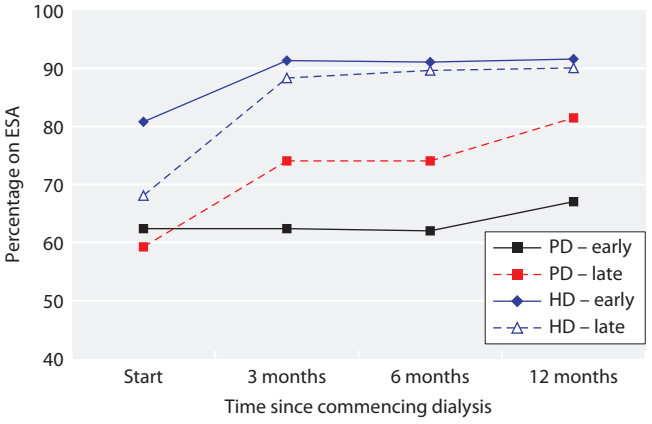

Fig. 8.6. Percentage of incident dialysis patients in 2013 on ESA, by time on dialysis and by length of pre-RRT care

ESA by time on dialysis in early vs. late presenters

Incident dialysis patients from 2013 were followed for one year and the percentages receiving an ESA were calculated for each quarter for survivors on the same treatment at the same centre after a year. This was sub-analysed by modality and length of pre-RRT care (figure 8.6). For HD patients at the start of treatment there was a difference between early and late presenters in the percentage of patients receiving an ESA. This difference was greatly reduced by three months after starting. For PD patients there was little difference between the early and late groups at start but there was a difference at the later time points. However, caution is advised when interpreting this as the number (27) of patients in the PD late presenter group was small.

Anaemia management in prevalent dialysis patients

Compliance with data returns for Hb and serum ferritin are shown for the 71 renal centres in the UK in table 8.3 for HD and PD patients. Completeness of data

Table 8.3. Percentage completeness of data returns for haemoglobin and serum ferritin and percentages on ESA for prevalent HD and PD patients in 2014

	HD				PD			
Centre	*N*	Hb	Ferritin	% on ESA	*N*	Hb	Ferritin	% on ESA
England								
B Heart	398	100	99	76	32	100	97	47
B QEH	893	99	99	85	117	100	100	60
Basldn	157	99	100	90	26	96	100	69
Bradfd	196	100	100	95	16	100	94	81
Brightn	398	99	99	0	55	100	93	0
Bristol	495	100	99	90	55	100	100	67
Camb	360	88	80	0	31	90	84	0
Carlis	60	100	3	67	24	100	54	88
Carsh	727	95	94	0	120	93	92	0
Chelms	127	99	100	94	19	95	95	47
Colchr	111	95	92	12				
Covnt	330	100	99	87	85	95	92	68
Derby	220	100	100	0	71	100	99	0
Donc	166	100	98	86	24	100	100	71
Dorset	264	100	98	95	46	100	98	83
Dudley	160	99	98	3	50	98	88	2
Exeter	383	100	100	93	83	100	99	77
Glouc	204	100	98	91	39	97	87	72
Hull	302	100	100	74	67	97	97	49
Ipswi	115	99	98	56	30	100	97	33
Kent	374	100	100	93	58	100	100	50
L Barts	905	100	100	0	199	99	91	0

Table 8.3. Continued

	HD				PD			
Centre	*N*	Hb	Ferritin	% on ESA	*N*	Hb	Ferritin	% on ESA
L Guys	615	0	67	14	26	0	65	0
L Kings	504	100	100	92	79	100	100	66
L Rfree	664	100	100	0	125	98	99	0
L St.G	284	100	99	0	45	100	98	0
L West	1,312	95	97	0	57	86	89	0
Leeds	471	100	100	91	49	100	100	82
Leic	837	100	100	98	108	100	98	83
Liv Ain	150	100	100	0	35	100	100	0
Liv Roy	343	100	100	0	49	98	100	0
M RI	473	93	84	0	61	100	98	0
Middlbr	305	100	98	75	13	100	100	69
Newc	266	100	100	67	44	93	91	0
Norwch	309	100	100	89	30	100	100	70
Nottm	341	100	100	87	72	100	100	71
Oxford	415	100	100	94	76	100	97	80
Plymth	129	100	99	0	33	100	79	0
Ports	560	100	99	8	66	98	100	3
Prestn	521	100	96	83	46	100	100	76
Redng	265	100	99	87	62	100	97	2
Salford	382	100	1	67	72	94	0	13
Sheff	555	100	100	88	52	100	100	48
Shrew	174	100	99	90	26	100	96	62
Stevng	447	100	99	0	26	100	96	0
Sthend	110	100	100	93	16	100	100	69
Stoke	308	86	98	1	72	100	100	0
Sund	200	100	100	90	14	100	100	57
Truro	136	100	99	0	18	100	100	0
Wirral	189	99	98	0	20	80	80	0
Wolve	287	100	100	82	72	99	99	65
York	124	100	100	90	21	100	100	57
N Ireland								
Antrim	111	99	100	92	13	100	100	85
Belfast	189	100	99	94	15	100	100	73
Newry	86	97	37	90	14	100	100	86
Ulster	94	100	100	97	4	100	100	100
West NI	99	100	100	95	11	100	100	91
Scotland								
Abrdn	194	100	100		26	100	96	
Airdrie	177	100	100		7	100	100	
D & Gall	46	98	98		14	100	93	
Dundee	165	99	98		21	100	100	
Edinb	259	100	99		19	100	84	
Glasgw	540	100	99		36	100	100	
Inverns	67	100	85		11	100	100	
Klmarnk	132	100	100		35	100	100	
Krkcldy	140	100	98		14	100	0	
Wales								
Bangor	78	100	100	69	15	100	100	40
Cardff	458	100	100	40	72	100	69	14
Clwyd	83	100	100	7	11	91	91	18
Swanse	322	100	100	84	50	98	98	56
Wrexm	102	100	100	30	23	100	100	9
England	**19,021**	**95**	**95**		**2,732**	**97**	**93**	
N Ireland	**579**	**99**	**91**		**57**	**100**	**100**	
Scotland	**1,720**	**100**	**99**		**183**	**100**	**90**	
Wales	**1,043**	**100**	**100**		**171**	**99**	**86**	
UK	**22,363**	**96**	**95**		**3,143**	**98**	**93**	

Blank cells: centres with no PD patients or because data was not available
All percentages on ESA are shown but it is believed that there were data problems for those centres with apparently less than 60% of HD patients or 45% of PD patients on ESA. Therefore, country averages are not shown – these can be found in tables 8.4 and 8.5

returns was generally good for Hb and ferritin. For Hb, data were not available from London Guys. For ferritin, results are not given in later tables and figures for Carlisle (HD), Kirkcaldy (PD), Newry (HD) and Salford (HD & PD) because completeness was below 50%. Percentages on ESA are also shown in table 8.3. These are as they appear in the data received by the UKRR. For some centres, there were no data and for others the proportion of patients reported to be on ESA was very low. For the latter centres it is presumed that there were either problems with data entry and/or data transfer. Centres have been excluded from analyses of ESA use if fewer than 60% of HD patients or 45% of PD patients were reported to be receiving ESA.

Summary statistics for haemoglobin, serum ferritin and ESA are shown for the 71 renal centres in the UK in table 8.4 for HD and table 8.5 for PD patients.

Haemoglobin in prevalent haemodialysis patients

The median Hb of patients on HD in the UK was 111 g/L (IQR 103–120 g/L) and 81% of HD patients had a Hb $\geqslant$100 g/L (table 8.4). The median Hb by centre is shown in figure 8.7. Figure 8.8 shows compliance with the target range of Hb $\geqslant$100 and $\leqslant$120 g/L. The UK average (58%) was similar to that for 2013 (59%) after rising for several years (53% in 2010, 56% in 2011, 57% in 2012). The percentages of HD patients with Hb below 100 g/L and above 120 g/L, as well as the percentages meeting the target, are shown by centre in figure 8.9.

Funnel plots are shown for the minimum (Hb $\geqslant$100 g/L) and target range (Hb $\geqslant$100 and $\leqslant$120 g/L) in figures 8.10 and 8.11 respectively. Many centres complied well with respect to both the minimum and target range Hb standards. Some centres complied well

Table 8.4. Summary statistics for haemoglobin, serum ferritin and ESA for prevalent HD patients in 2014

Centre	*N* with Hb data	Median Hb g/L	% Hb $\geqslant$100 g/L	% Hb 100–120 g/L	Median ferritin µg/L	% ferritin $\geqslant$100 µg/L	% ferritin $>$200 and $\leqslant$500 µg/L	% on ESA	Median ESA dose (IU/week)	% with Hb $\geqslant$100 g/L and not on ESA
England										
B Heart	398	110	83	66	374	97	59	76	6,667	22
B QEH	887	109	77	61	425	96	55	85	6,250	13
Basldn	156	108	71	51	334	94	73	90	6,500	8
Bradfd	196	113	86	58	454	97	54	95	7,000	4
Brightn	395	109	78	60	581	98	30			
Bristol	495	111	95	71	577	97	31	90	7,250	9
Camb	318	113	79	55	309	93	56			
Carlis	60	117	88	52				67	4,833	33
Carsh	691	110	82	66	347	95	67			
Chelms	126	118	90	47	607	98	16	94	10,000	6
Colchr	105	112	87	60	575	99	32			
Covnt	329	107	72	63	384	97	62	87	8,750	10
Derby	220	115	87	56	455	95	45			
Donc	166	110	75	55	435	99	55	86	6,875	13
Dorset	264	115	90	60	462	99	52	95	8,000	4
Dudley	159	110	80	65	334	92	66			
Exeter	383	112	97	77	286	92	55	93	7,333	7
Glouc	204	114	90	58	387	93	50	91		9
Hull	301	111	77	56	387	97	64	74	5,000	20
Ipswi	114	109	78	59	575	96	32			
Kent	374	109	79	56	474	93	36	93	7,750	6
L Barts	904	109	79	63	497	95	38			
L Guys	0				560	95	31			
L Kings	504	108	74	63	488	93	40	92	7,500	8
L Rfree	664	112	82	60	567	95	29			
L St.G	284	111	80	55	407	95	55			
L West	1,247	114	89	63	336	95	65			
Leeds	471	109	78	56	495	93	37	91	4,500	8
Leic	836	113	80	53	336	93	62	98	6,000	2

Table 8.4. Continued

Centre	*N* with Hb data	Median Hb g/L	% Hb ⩾100 g/L	% Hb 100–120 g/L	Median ferritin µg/L	% ferritin ⩾100 µg/L	% ferritin >200 and ⩽500 µg/L	% on ESA	Median ESA dose (IU/week)	% with Hb ⩾100 g/L and not on ESA
Liv Ain	150	110	78	57	618	94	23			
Liv Roy	343	112	78	51	382	88	39			
M RI	438	113	82	52	360	93	53			
Middlbr	304	111	79	54	935	98	16	75	4,000	20
Newc	266	114	85	58	436	91	38	67	11,866	29
Norwch	309	113	84	55	496	97	38	89	9,000	10
Nottm	341	110	80	69	497	96	45	87	7,000	13
Oxford	415	110	75	49	266	91	46	94	10,000	5
Plymth	129	113	83	55	808	97	15			
Ports	559	115	84	50	493	95	40			
Prestn	521	111	82	58	619	94	27	83		14
Redng	265	116	82	44	520	99	44	87	12,653	9
Salford	381	110	73	49				67	7,500	24
Sheff	555	111	77	51	490	97	44	88	7,875	9
Shrew	174	113	88	56	380	96	61	90	8,000	9
Stevng	447	111	79	59	673	98	22			
Sthend	110	107	76	68	331	99	83	93	10,000	7
Stoke	265	114	83	55	314	94	54			
Sund	200	115	80	50	437	93	35	90	9,039	10
Truro	136	111	83	66	462	96	51			
Wirral	187	110	83	63	440	96	53			
Wolve	286	116	84	48	485	92	38	82	7,333	17
York	124	108	76	57	431	98	62	90	4,000	10
N Ireland										
Antrim	110	114	83	53	518	98	40	92	6,250	7
Belfast	189	114	86	57	416	93	38	94	8,000	6
Newry	83	105	75	64				90	4,750	10
Ulster	94	111	82	57	691	100	16	97	5,000	3
West NI	99	112	82	69	542	96	36	95	7,500	5
Scotland										
Abrdn	194	108	75	59	593	97	33			
Airdrie	177	112	85	59	644	98	29			
D & Gall	45	115	91	73	772	98	20			
Dundee	164	112	85	62	326	90	50			
Edinb	258	116	87	48	447	89	30			
Glasgw	540	111	78	53	427	93	40			
Inverns	67	112	82	60	345	88	58			
Klmarnk	132	108	74	55	307	83	39			
Krkcldy	140	113	82	58	291	85	34			
Wales										
Bangor	78	114	90	62	320	97	54	69		28
Cardff	458	111	77	54	275	92	58			
Clwyd	83	112	83	57	361	100	70			
Swanse	322	110	80	65	333	88	47	84	8,125	16
Wrexm	102	114	89	65	513	99	39			
England	**18,156**	**111**	**82**	**58**	**436**	**95**	**46**	**87**	**7,400**	**11**
N Ireland	**575**	**112**	**82**	**59**	**543**	**96**	**33**	**93**	**6,000**	**6**
Scotland	**1,717**	**112**	**81**	**56**	**435**	**92**	**37**			
Wales	**1,043**	**111**	**81**	**59**	**308**	**92**	**53**	**81**	**8,125**	**18**
UK	**21,491**	**111**	**81**	**58**	**432**	**95**	**45**	**87***	**7,333***	**11***

Blank cells: centres excluded from analyses due to poor data completeness or low patient numbers or because the data item was not available

ESA data only shown for those centres for which the % on ESA was 60% or more

*For ESA, these overall averages are for E,W & NI (not UK)

Table 8.5. Summary statistics for haemoglobin, serum ferritin and ESA for prevalent PD patients in 2014

Centre	*N* with Hb data	Median Hb g/L	% Hb ⩾100 g/L	% Hb 100–120 g/L	Median ferritin μg/L	% ferritin ⩾100 μg/L	% ferritin >100 and ⩽500 μg/L	% on ESA	Median ESA dose (IU/week)	% with Hb ⩾100 g/L and not on ESA
England										
B Heart	32	116	97	66	272	84	74	47	6,000	53
B QEH	117	111	82	58	352	91	68	60	4,000	39
Basldn	25	107	68	52	156	73	58	69	4,125	24
Bradfd	16	114	88	56	289	80	67	81	6,747	19
Brightn	55	111	80	55	381	94	51			
Bristol	55	112	91	64	315	95	67	67	6,000	31
Camb	28	115	86	61	239	88	65			
Carlis	24	114	96	71	238	92	92	88	4,000	13
Carsh	111	108	74	56	184	84	78			
Chelms	18	117	94	78	176	78	78	47		50
Colchr	n/a									
Covnt	81	112	78	54	283	85	60	68	8,000	28
Derby	71	111	82	56	410	97	63			
Donc	24	117	83	46	427	100	75	71	5,000	29
Dorset	46	111	85	61	322	98	82	83	4,000	17
Dudley	49	112	90	61	109	57	50			
Exeter	83	113	99	70	218	88	76	77	4,000	23
Glouc	38	108	76	53	160	76	74	72		24
Hull	65	111	83	60	376	97	74	49	4,000	45
Ipswi	30	112	77	43	346	90	55			
Kent	58	111	90	72	280	88	71	50	4,000	47
L Barts	197	113	82	51	264	88	60			
L Guys	0				198	82	65			
L Kings	79	110	77	56	217	94	84	66	4,583	32
L Rfree	123	107	72	48	607	94	32			
L St.G	45	113	87	62	291	95	86			
L West	49	115	92	67	234	94	84			
Leeds	49	109	78	59	324	96	69	82	5,200	18
Leic	108	110	77	56	301	92	73	83	3,675	17
Liv Ain	35	115	77	46	361	89	51			
Liv Roy	48	117	88	46	313	88	69			
M RI	61	114	84	51	219	83	73			
Middlbr	13	112	92	85	329	100	69	69		31
Newc	41	114	76	61	440	93	53			
Norwch	30	116	87	57	244	83	53	70	5,000	27
Nottm	72	109	69	54	433	97	65	71		26
Oxford	76	113	83	62	275	93	84	80	8,000	20
Plymth	33	119	91	52	412	96	54			
Ports	65	116	88	46	433	100	65			
Prestn	46	112	89	65	334	91	54	76		22
Redng	62	117	89	48	388	93	50			
Salford	68	117	91	57						
Sheff	52	117	88	52	378	90	52	48	6,000	52
Shrew	26	113	85	46	225	64	48	62	5,500	38
Stevng	26	113	88	62	309	84	72			
Sthend	16	113	88	69	177	69	63	69		31
Stoke	72	113	83	57	337	89	63			
Sund	14	116	86	50	415	100	57	57		43
Truro	18	119	89	44	184	78	78			
Wirral	16	114	88	69	350	94	63			
Wolve	71	112	79	49	164	72	66	65	5,000	27
York	21	108	86	52	259	81	71	57	3,000	38

Table 8.5. Continued

Centre	*N* with Hb data	Median Hb g/L	% Hb ⩾100 g/L	% Hb 100–120 g/L	Median ferritin µg/L	% ferritin ⩾100 µg/L	% ferritin >100 and ⩽500 µg/L	% on ESA	Median ESA dose (IU/week)	% with Hb ⩾100 g/L and not on ESA
N Ireland										
Antrim	13	115	100	62	629	100	46	85	4,250	15
Belfast	15	111	100	80	359	87	73	73	3,000	27
Newry	14	113	93	71	309	100	86	86	2,500	14
Ulster	4									
West NI	11	113	100	73	270	82	73	91	2,500	9
Scotland										
Abrdn	26	118	85	54	224	92	72			
Airdrie	7									
D & Gall	14	110	86	71	373	92	54			
Dundee	21	114	76	52	430	90	57			
Edinb	19	116	100	68	292	75	50			
Glasgw	36	110	72	53	258	92	75			
Inverns	11	111	100	82	166	73	73			
Klmarnk	35	106	74	51	347	86	57			
Krkcldy	14	115	93	79						
Wales										
Bangor	15	115	93	60	219	73	60			
Cardff	72	116	82	46	122	54	50			
Clwyd	10	117	100	70	328	70	50			
Swanse	49	113	82	49	335	96	71	56	3,125	41
Wrexm	23	115	87	57	235	87	74			
England	**2,658**	**112**	**83**	**56**	**294**	**89**	**66**	**68**	**4,500**	**30**
N Ireland	**57**	**113**	**95**	**70**	**385**	**93**	**67**	**84**	**3,000**	**16**
Scotland	**183**	**112**	**83**	**60**	**283**	**87**	**64**			
Wales	**169**	**114**	**85**	**51**	**208**	**76**	**62**	**56**	**3,125**	**41**
UK	**3,067**	**112**	**83**	**56**	**292**	**88**	**65**	**68***	**4,148***	**30***

Blank cells: centres excluded from analyses due to poor data completeness or low patient numbers or because the data item was not available
n/a – no PD patients
ESA data only shown for those centres for which the % on ESA was 45% or more
*For ESA these overall averages are for E,W & NI (not UK)

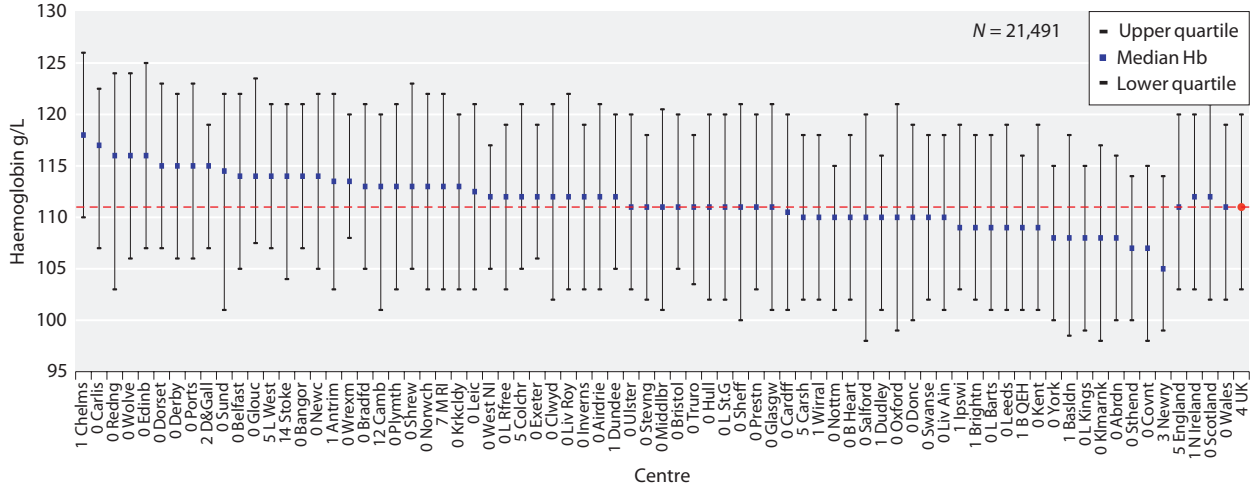

Fig. 8.7. Median haemoglobin in patients treated with HD by centre in 2014

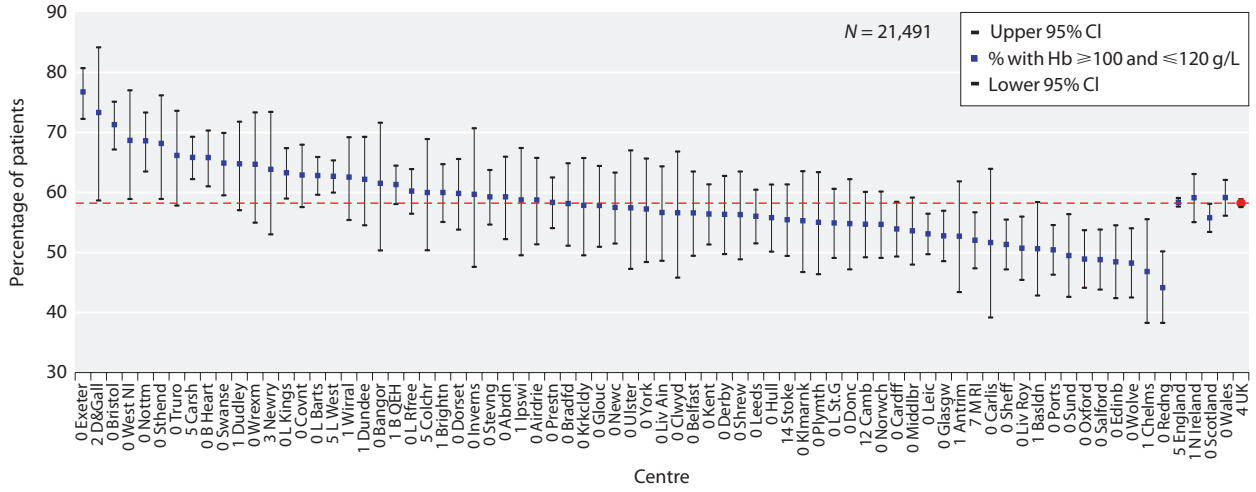

Fig. 8.8. Percentage of HD patients with Hb ⩾100 and ⩽120 g/L by centre in 2014

with the percentage with Hb ⩾100 g/L (figure 8.10) but had a poor compliance with percentage of patients with Hb ⩾100 and ⩽120 g/L (figure 8.11). Table 8.4 can be used in conjunction with figures 8.10 and 8.11 to identify centres.

Haemoglobin in prevalent peritoneal dialysis patients

Overall, 83% of patients on PD had a Hb ⩾100 g/L (table 8.5). The median Hb of patients on PD in the UK in 2014 was 112 g/L (IQR 103–121 g/L). The median Hb by centre is shown in figure 8.12. The compliance with Hb ⩾100 and ⩽120 g/L is shown in figure 8.13. In 2014, 56% of prevalent PD patients had a Hb within the target range. The distribution of Hb in PD patients by centre is shown in figure 8.14. Funnel plots for percentage with Hb ⩾100 g/L and for the percentage of patients with Hb ⩾100 and ⩽120 g/L are shown in figures 8.15 and 8.16 respectively. Table 8.5 can be used in conjunction with figures 8.15 and 8.16 to identify centres in the funnel plots.

Relationship between Hb in incident and prevalent dialysis patients in 2014

The relationship between the percentage of incident and prevalent dialysis (HD and PD) patients with a Hb ⩾100 g/L is shown in figure 8.17. As expected, all centres had a higher percentage of prevalent patients achieving a Hb ⩾100 g/L than that for incident patients. Overall in

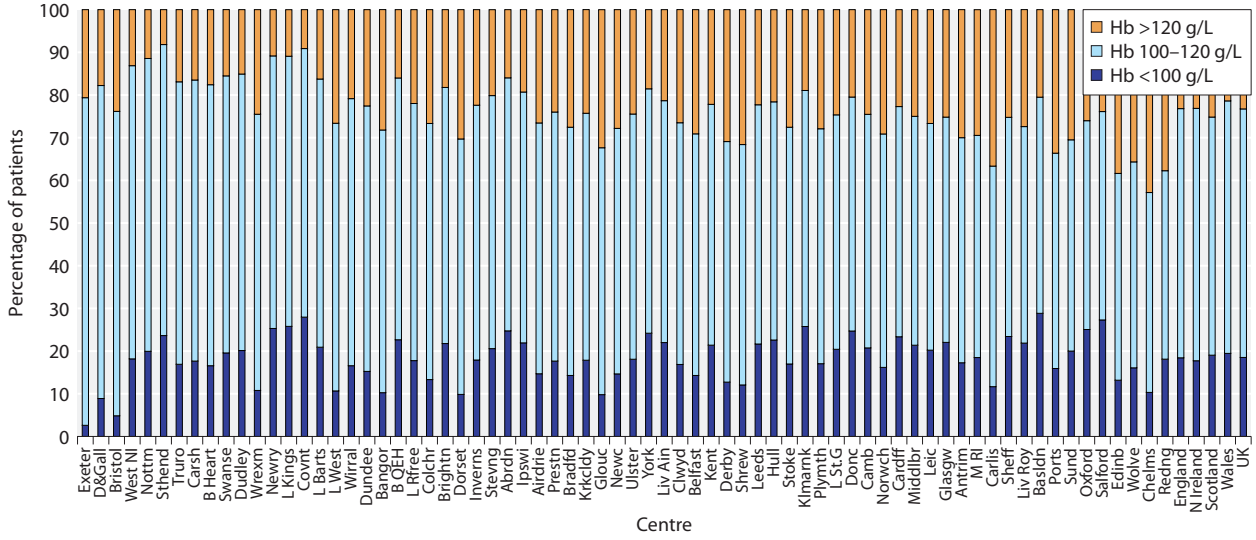

Fig. 8.9. Distribution of haemoglobin in patients treated with HD by centre in 2014

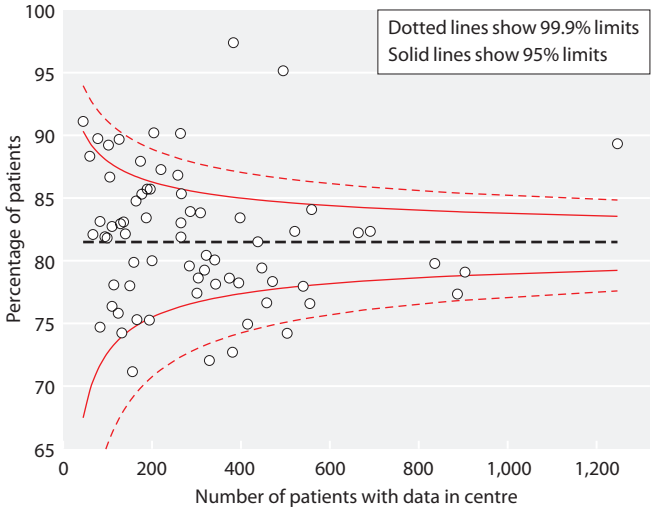

Fig. 8.10. Funnel plot of percentage of HD patients with Hb ⩾100 g/L by centre in 2014

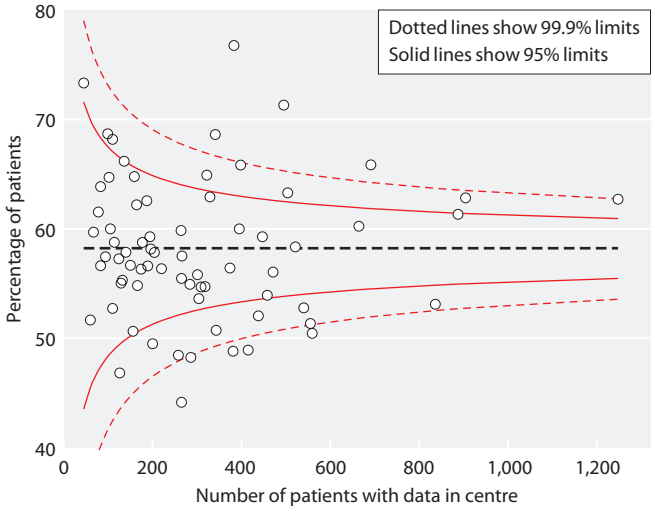

Fig. 8.11. Funnel plot of percentage of HD patients with Hb ⩾100 and ⩽120 g/L by centre in 2014

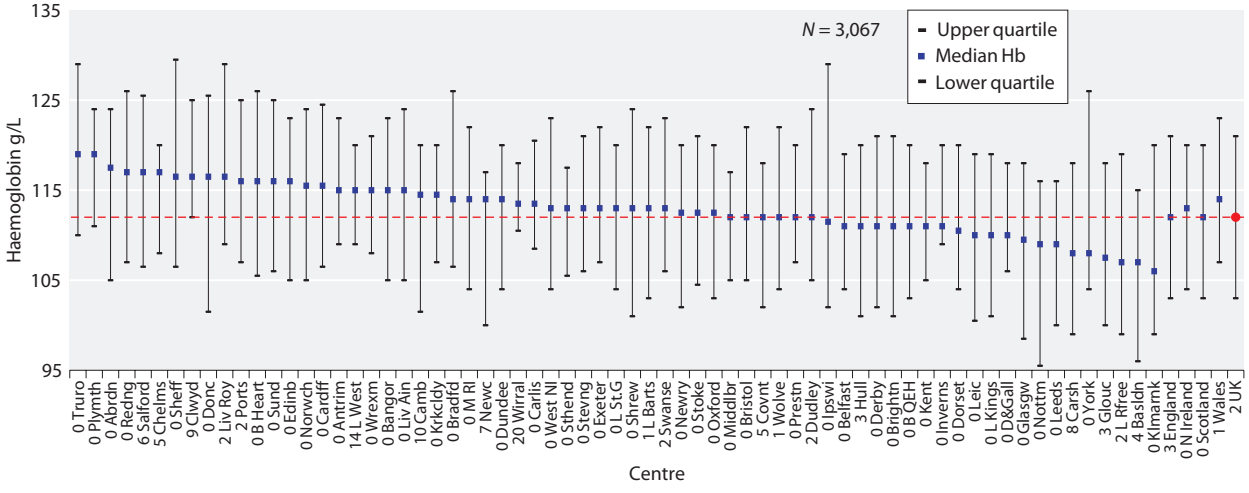

Fig. 8.12. Median haemoglobin in patients treated with PD by centre in 2014

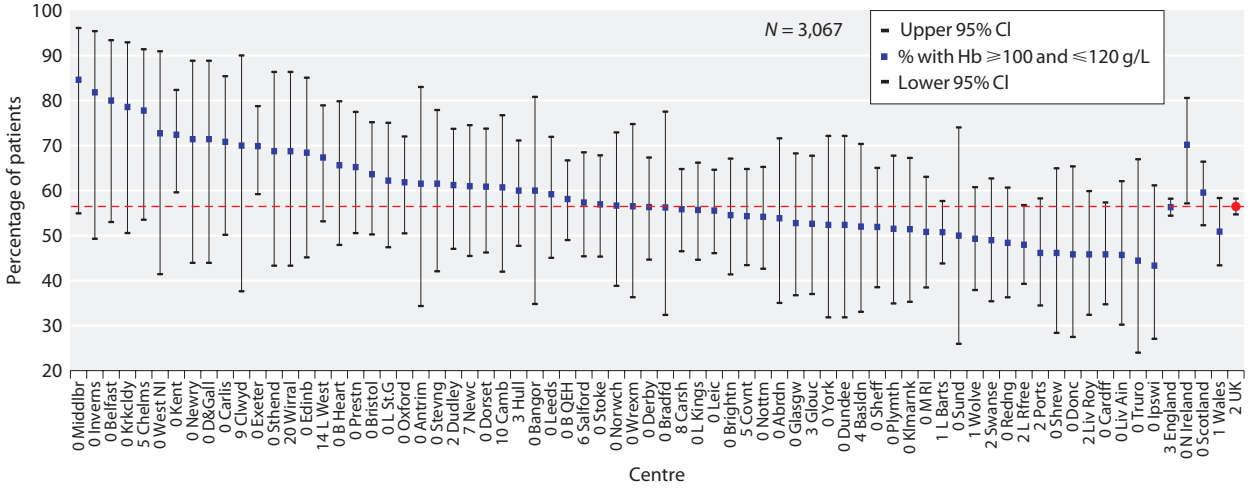

Fig. 8.13. Percentage of PD patients with Hb ⩾100 and ⩽120 g/L by centre in 2014

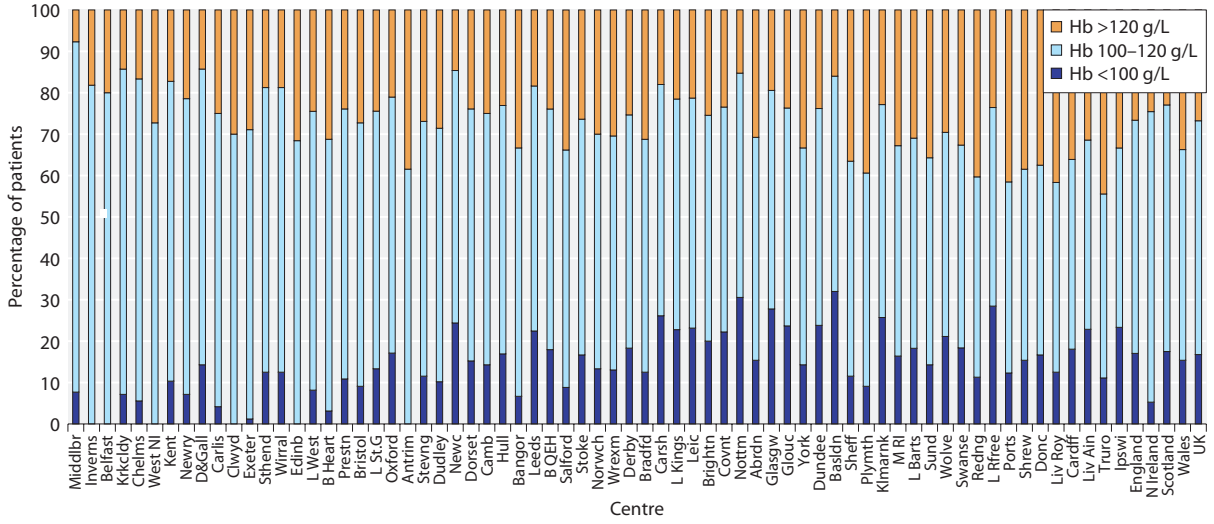

Fig. 8.14. Distribution of haemoglobin in patients treated with PD by centre in 2014

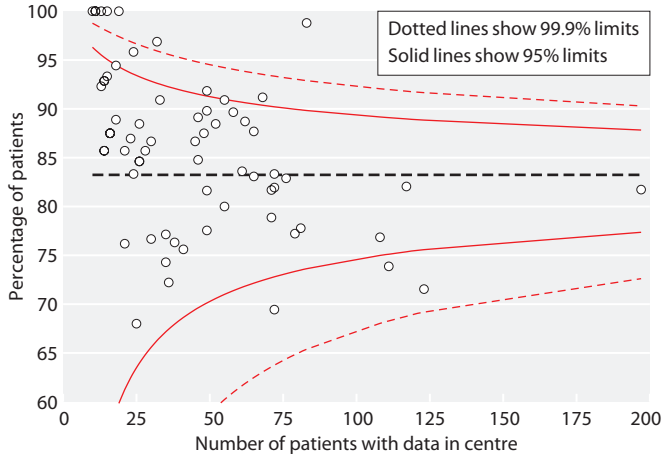

Fig. 8.15. Funnel plot of percentage of PD patients with Hb ⩾100 g/L by centre in 2014

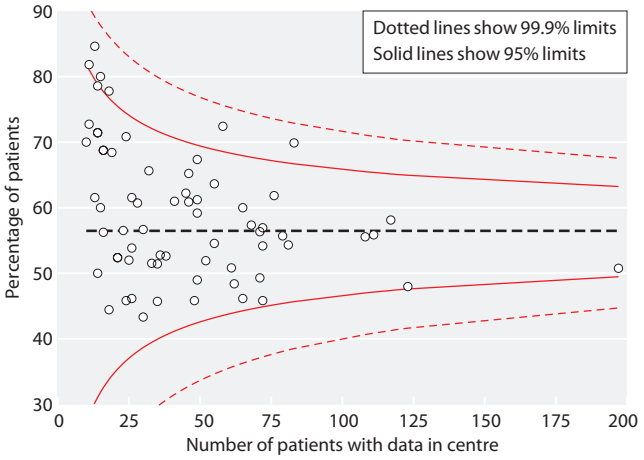

Fig. 8.16. Funnel plot of percentage of PD patients with Hb ⩾100 g/L and ⩽120 g/L by centre in 2014

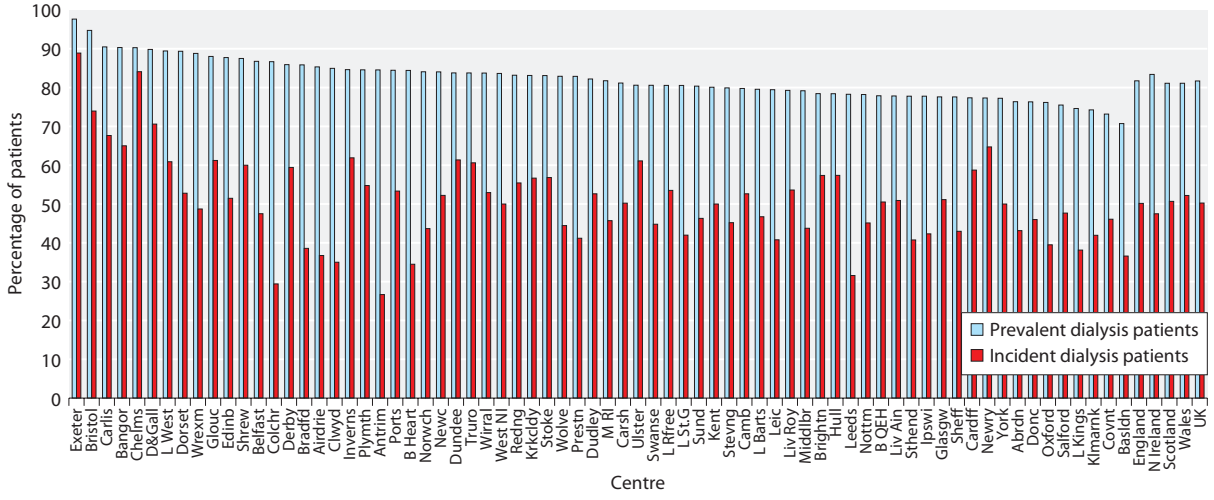

Fig. 8.17. Percentage of incident and prevalent dialysis patients with Hb ⩾100 g/L by centre in 2014

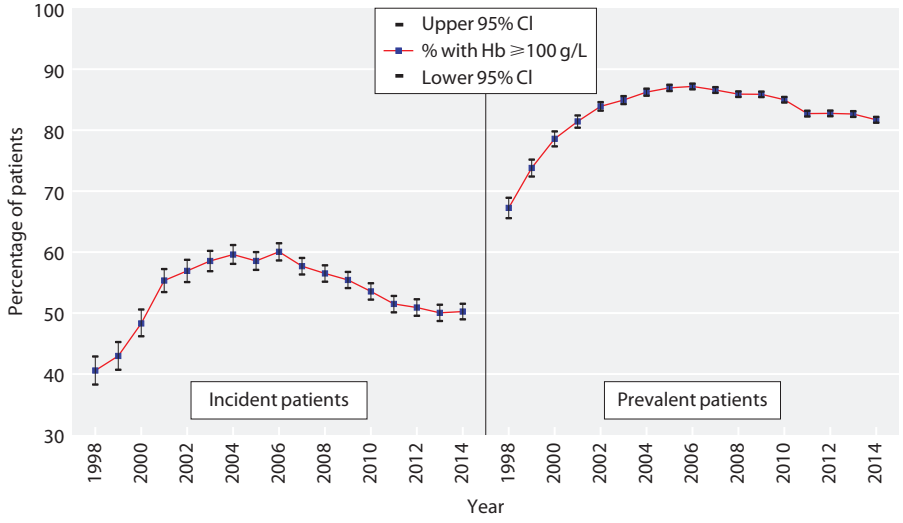

Fig. 8.18. Percentage of incident and prevalent dialysis patients (1998–2014) with Hb ⩾100 g/L

the UK, 82% of prevalent patients, compared with 50% of incident patients, had a Hb ⩾100 g/L in 2014. Compliance with the current minimum standard (Hb ⩾100 g/L) is shown by year (1998–2014) for incident and prevalent dialysis patients in figure 8.18. The decline in achieving this standard appears to be levelling off.

Ferritin in prevalent haemodialysis patients

The median and IQR for serum ferritin for patients treated with HD are shown in figure 8.19. The percentages with serum ferritin ⩾100 μg/L, >200 μg/L to ⩽500 μg/L, and ⩾800 μg/L are shown in figures 8.20, 8.21 and 8.22 respectively. Most centres achieved greater than 90% compliance with a serum ferritin ⩾100 μg/L for HD patients. The HD population had a median ferritin value of 432 μg/L (IQR 274–631 μg/L). Seventeen centres had greater than 20% of their patients having ferritin ⩾800 μg/L (figure 8.22) but serum ferritin correlated poorly with median Hb achieved and ESA dose (table 8.4).

Ferritin in prevalent peritoneal dialysis patients

The median and IQR for serum ferritin for patients treated with PD are shown in figure 8.23. The percentages with serum ferritin ⩾100 μg/L, >100 μg/L and ⩽500 μg/L, and ⩾800 μg/L are shown in figures 8.24, 8.25 and 8.26 respectively. The PD population had a lower median ferritin value (292 μg/L, IQR 168–479)

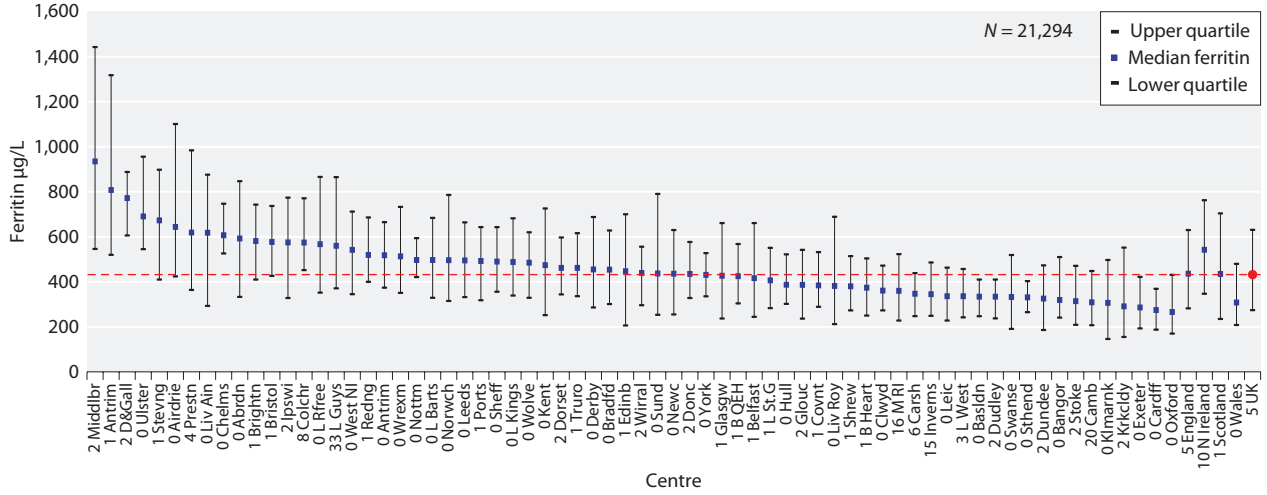

Fig. 8.19. Median ferritin in patients treated with HD by centre in 2014

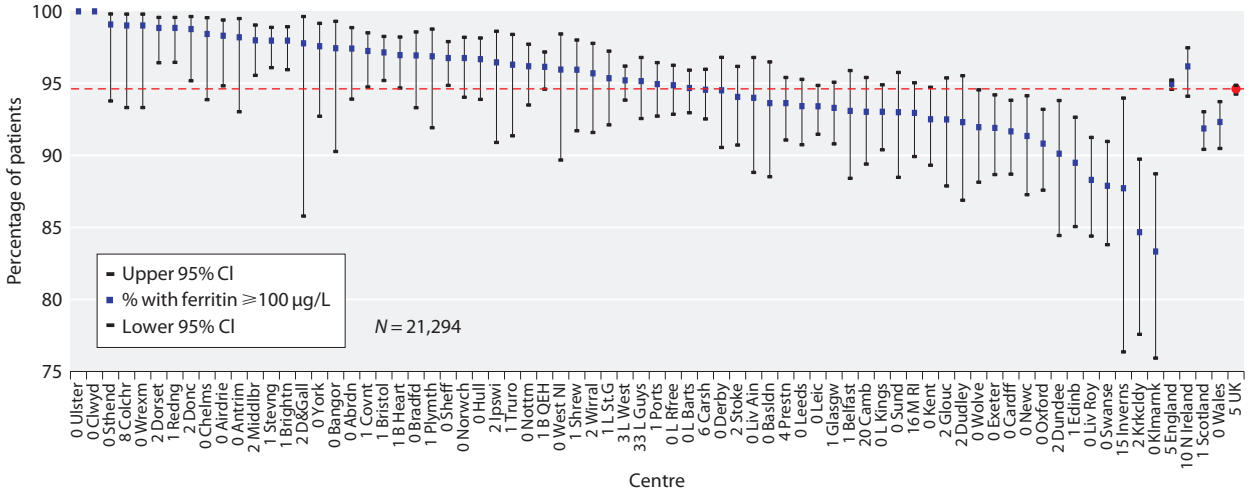

Fig. 8.20. Percentage of HD patients with ferritin ⩾100 µg/L by centre in 2014

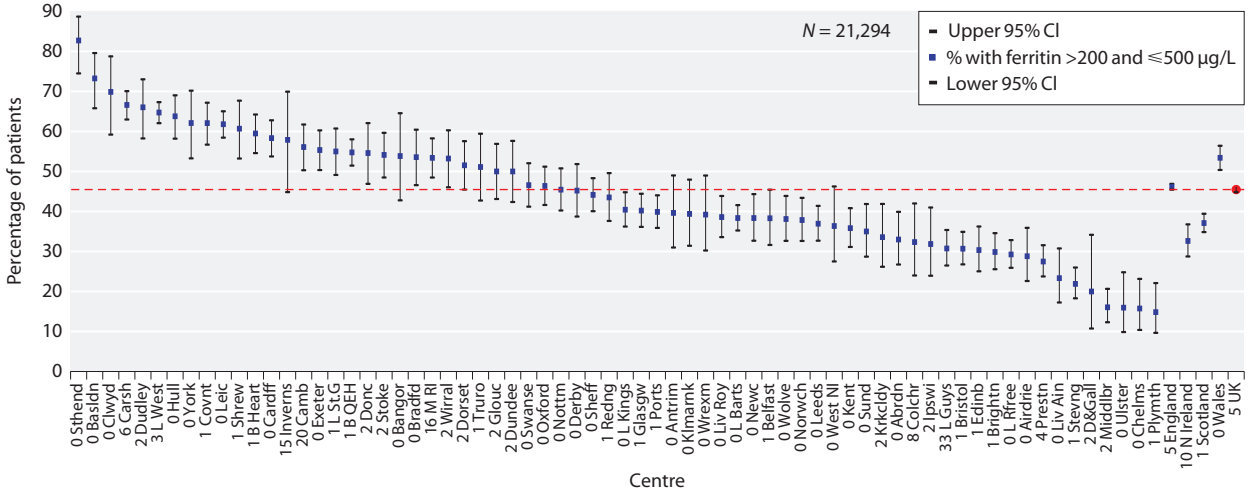

Fig. 8.21. Percentage of HD patients with ferritin >200 µg/L and ⩽500 µg/L by centre in 2014

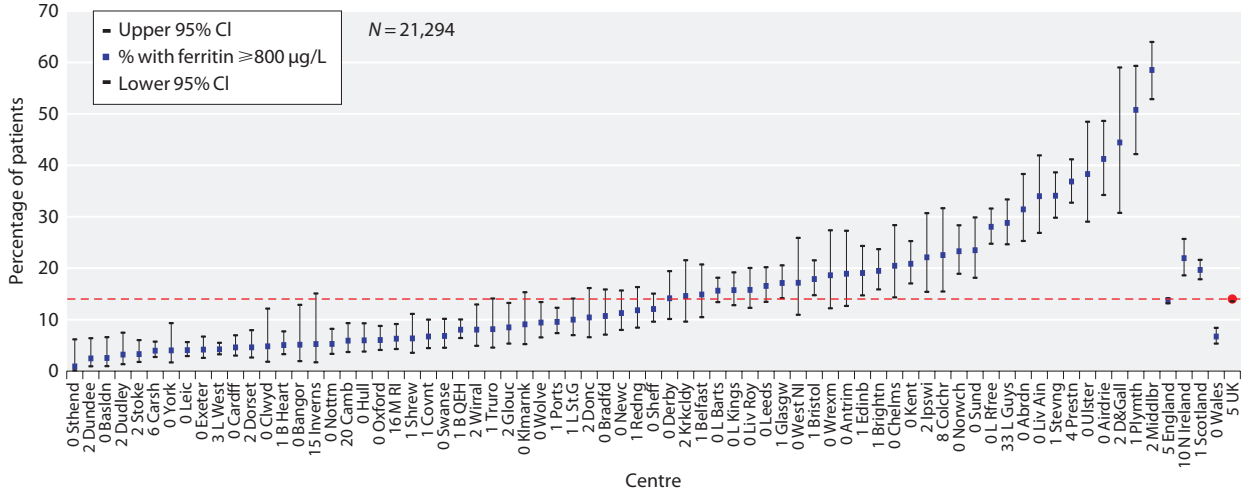

Fig. 8.22. Percentage of HD patients with ferritin ⩾800 µg/L by centre in 2014

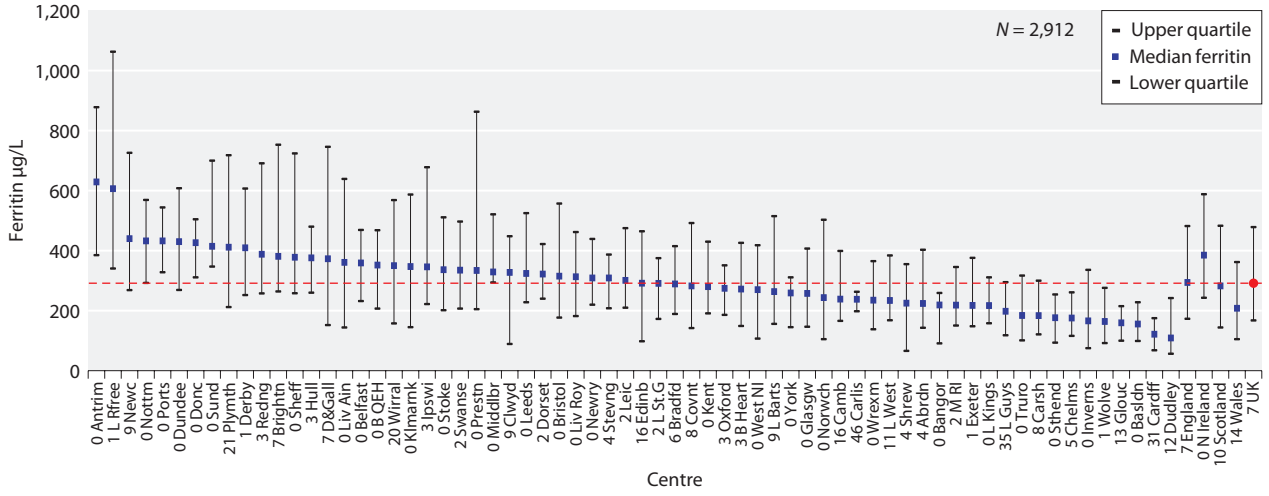

Fig. 8.23. Median ferritin in patients treated with PD by centre in 2014

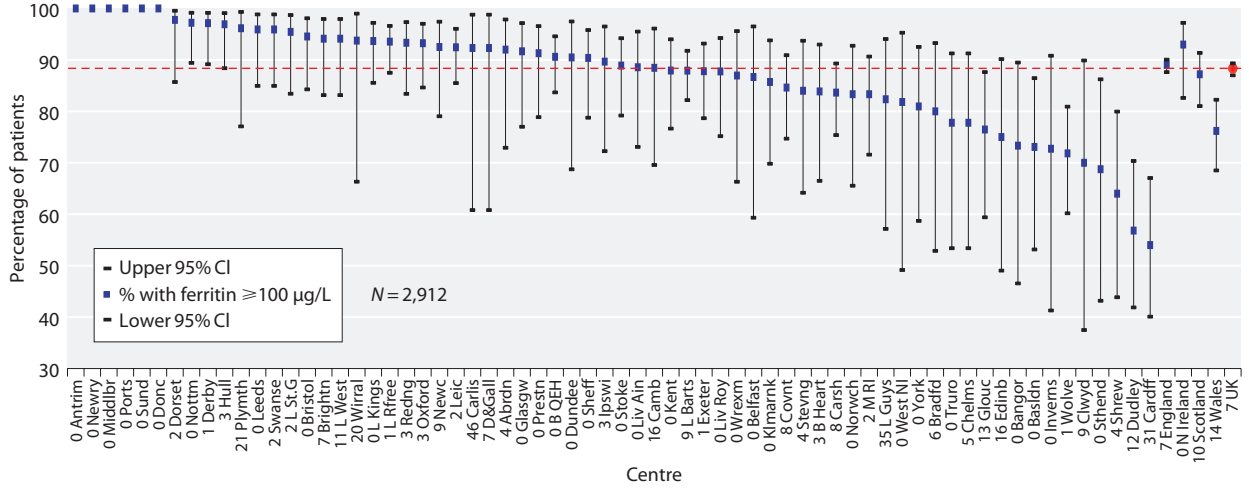

Fig. 8.24. Percentage of PD patients with ferritin ⩾100 µg/L by centre in 2014

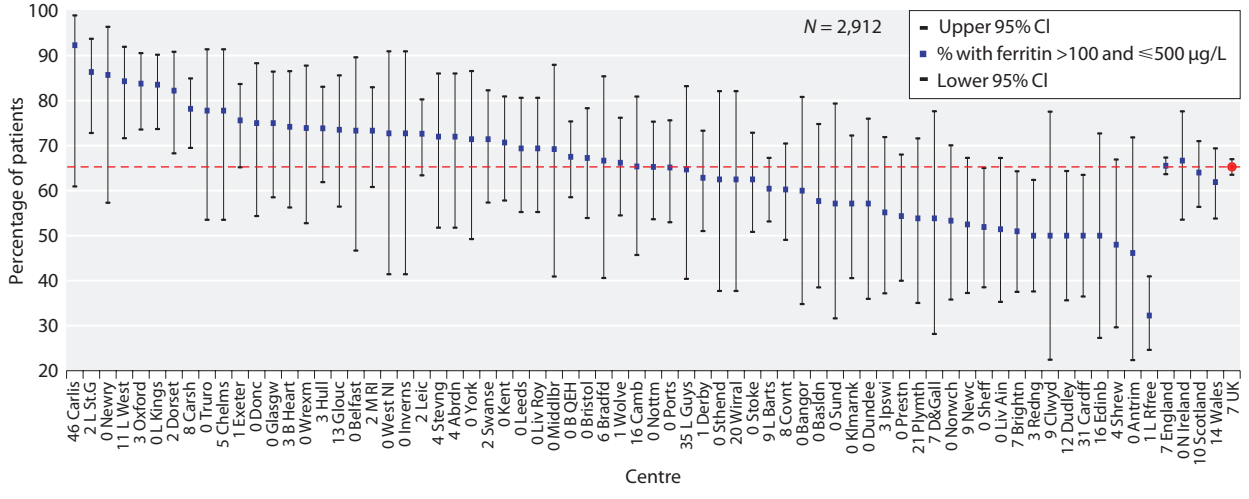

Fig. 8.25. Percentage of PD patients with ferritin >100 µg/L and ⩽500 µg/L by centre in 2014

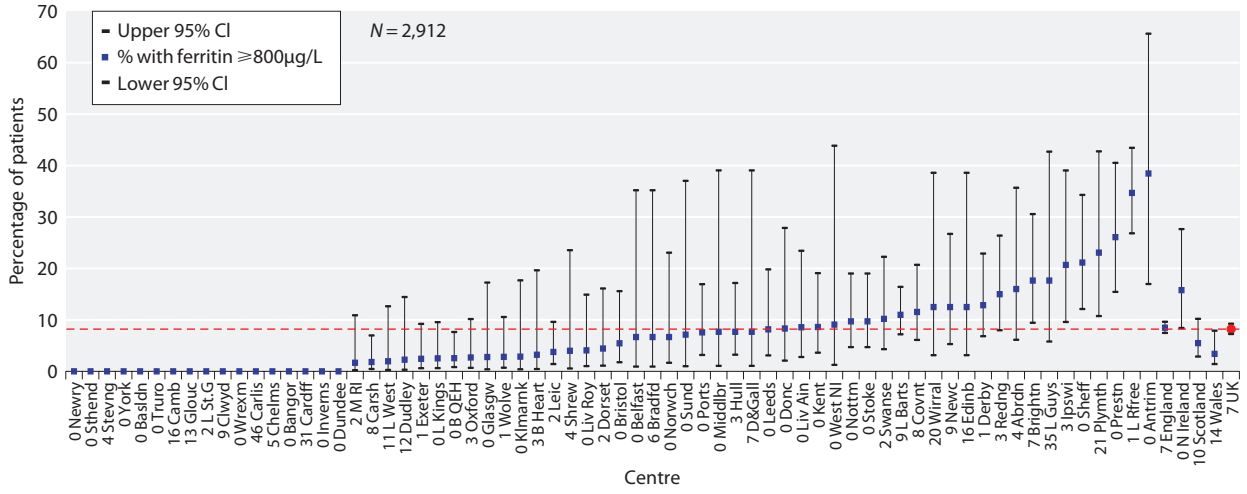

Fig. 8.26. Percentage of PD patients with ferritin ⩾800 µg/L by centre in 2014

than the HD population. Thirty-four centres reported fewer than 90% of PD patients being compliant with serum ferritin ⩾100 µg/L although this appeared to have little bearing on their achieved median Hb or median ESA dose when compared with other centres (table 8.5).

Erythropoietin stimulating agents in prevalent haemodialysis patients

As shown in previous reports there was substantial variation in the average dose of ESA prescription used. The median dose for prevalent HD patients in England, Wales and Northern Ireland was 7,333 IU/week. The median dose varied from 4,000 IU/week (Middlesbrough, York) to 12,700 IU/week (Reading) with median Hb for these centres of 111 g/L (Middlesbrough), 108 g/L (York) and 116 g/L (Reading) (table 8.4). The 2014 median dose was the same as that for 2013.

Erythropoietin stimulating agents in prevalent peritoneal dialysis patients

For prevalent PD patients the median dose was lower than for HD patients. The median dose was 4,148 IU/week with a range of 2,500 to 8,000 (table 8.5). The 2014 median dose was similar to that for 2013 (4,000 IU/week).

ESA prescription and association with achieved haemoglobin

For HD patients, centre level median Hb is plotted against median ESA dose in figure 8.27 and compliance with the RA standards for Hb ⩾100 g/L and ⩽120 g/L is plotted against median ESA dose in figure 8.28. For these figures, Hb data was only used for those patients

Fig. 8.27. Median Hb versus median ESA dose in HD patients on ESA, by centre in 2014

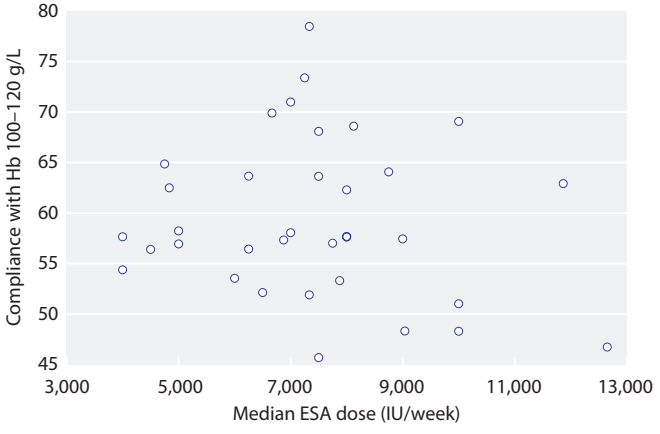

Fig. 8.28. Compliance with Hb 100–120 g/L versus median ESA dose in HD patients on ESA, by centre in 2014

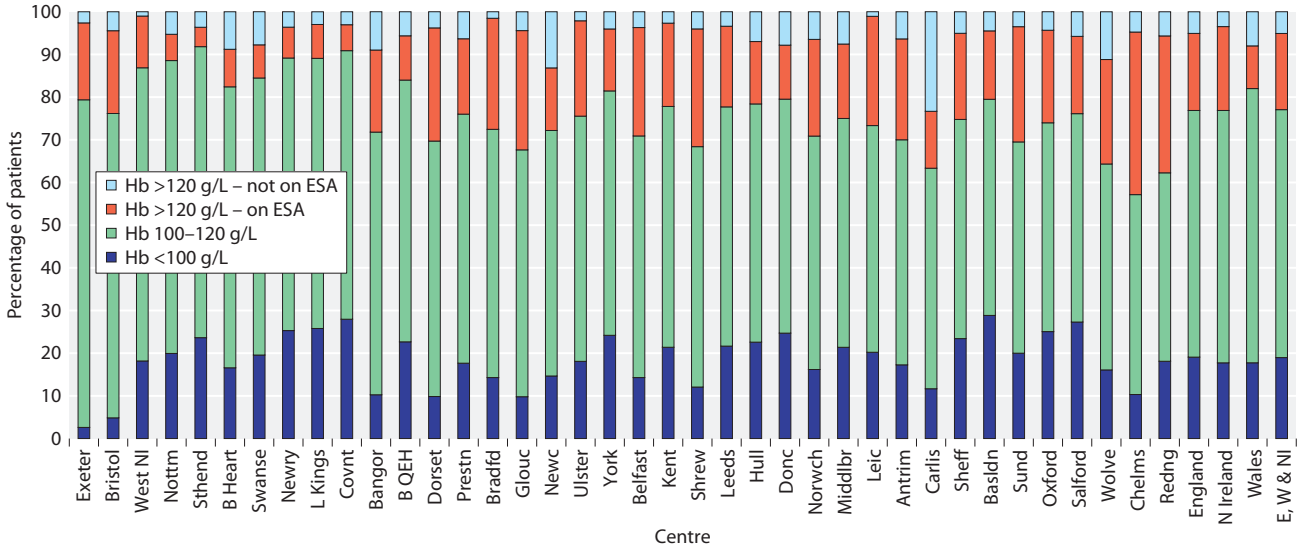

Fig. 8.29. Distribution of haemoglobin in patients treated with HD and the proportion of patients with Hb >120 g/L receiving ESA by centre in 2014

who were receiving an ESA and had dose data available. There was no meaningful relationship in either figure.

It is known that not all patients treated with dialysis who have a Hb above 120 g/L are receiving ESA. It has been suggested that it may be inappropriate to include those patients not receiving ESA within the group not meeting this RA target. There are two reasons: firstly, the high Hb remains outside the control of the clinician, and secondly, the recent trials suggesting that it may be detrimental to achieve a high Hb in renal patients were based only upon patients treated with ESAs [8, 9].

Figures 8.29 and 8.30 show the percentages of HD and PD patients in each centre whose Hb lies above, within or below the RA guidelines of 100–120 g/L. These charts also show the proportion of patients with a Hb above the upper limit who were receiving, or were not receiving an ESA. These figures show that, in those centres for which useable ESA data was available, 23% of HD

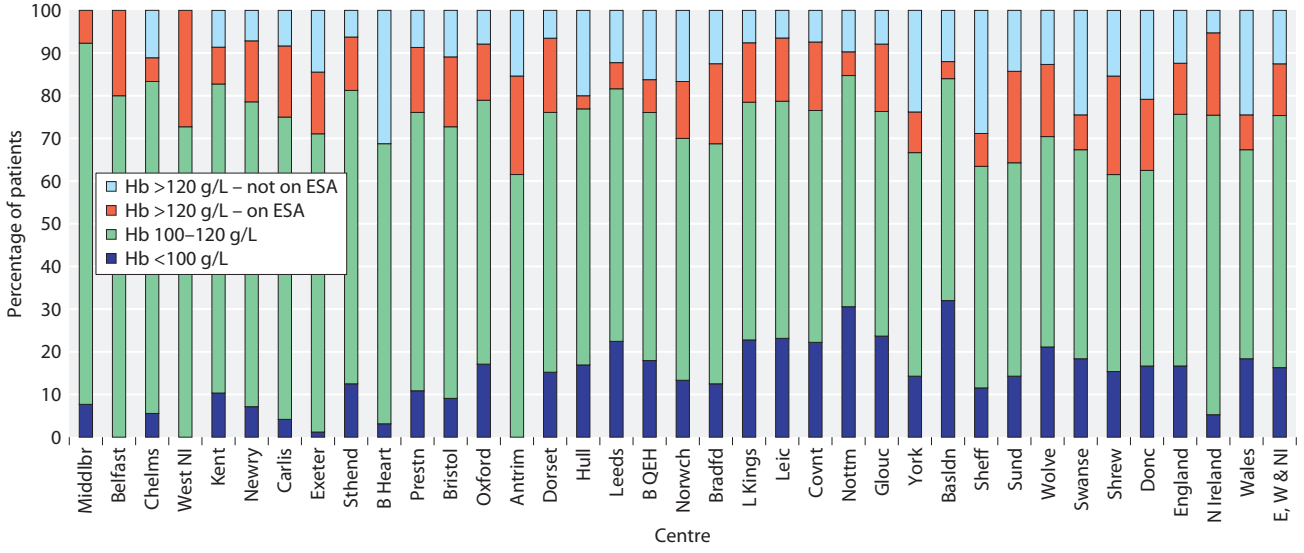

Fig. 8.30. Distribution of haemoglobin in patients treated with PD and the proportion of patients with Hb >120 g/L receiving ESA by centre in 2014

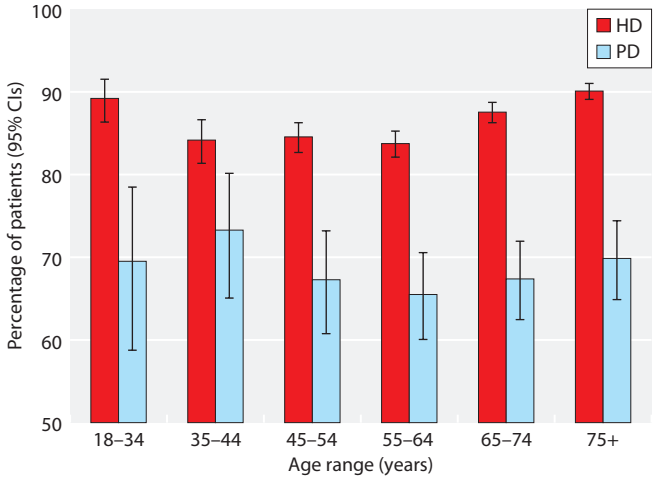

Fig. 8.31. Percentage of dialysis patients on ESA, by age group and treatment modality (2014)

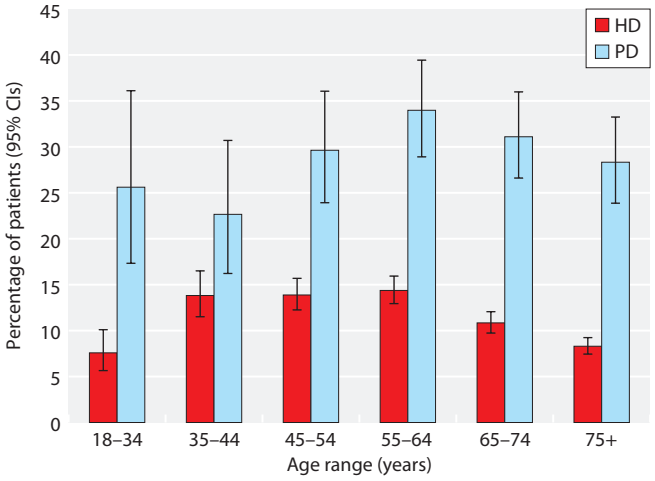

Fig. 8.32. Percentage of whole cohort (2014) who are not on ESA and have Hb ⩾100 g/L, by age group and treatment modality

patients had a Hb >120 g/L and that most of these patients (78%) were on ESAs. For PD, 25% of patients had a Hb >120 g/L but only about half (49%) of these were on ESAs.

ESA prescription: age and modality associations

The proportion of patients on an ESA was higher for HD (87%) than PD (68%) and this difference was present and similar across all age groups (figure 8.31). The proportion of patients who had a Hb ⩾100 g/L without requiring ESA is shown (by age group and modality) in figure 8.32.

ESAs and time on renal replacement therapy

The percentage of patients on ESA by time on RRT and dialysis modality is shown in figure 8.33. This is a cross-sectional analysis at the final quarter of 2014. Patients who had previously changed RRT modality were included in this analysis. The proportion of PD patients on ESA rises with duration of RRT from 65% after 3–12 months to 83% after 10 or more years. For at least the first 10 years on RRT, a greater percentage of HD patients were receiving ESA treatment than patients on PD.

Resistance to ESA therapy

Figure 8.34 shows the frequency distribution of weekly ESA dose adjusted for weight by treatment modality. RA guidelines define resistance to ESA therapy as '***failure to reach the target Hb level despite SC epoetin dose >300 IU/kg/week (450 IU/kg/week IV epoetin) or darbepoetin dose >1.5 mcg/kg/week***'. For the purposes of this analysis the centres were restricted to those with good completeness for weight (over 75%) and ESA dose data (33 centres for HD and 20 centres for PD). As per the above definition and assuming that HD patients largely receive ESA intravenously and PD patients receive ESA subcutaneously, the prevalence of high doses of ESA was 1.0% ($N = 76$) and 1.9% ($N = 9$) for HD and PD patients respectively. For these patients the dose range for HD was 450–862 IU/kg/week and for PD 305–509 IU/kg/week. For patients on HD with high ESA doses, 47% ($N = 36$) had Hb <100 g/L and 49% were within 100–120 g/L. For patients on PD with high ESA doses, 44% ($N = 4$) had a Hb <100 g/L and the remaining 56% were within 100–120 g/L. The percentage of

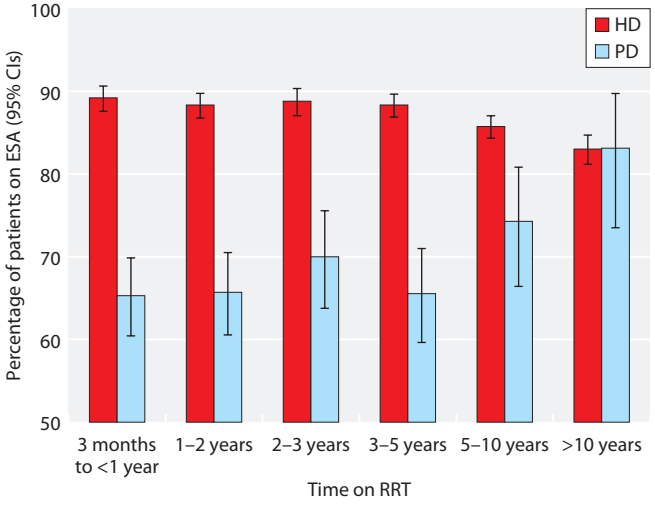

Fig. 8.33. Percentage of patients on ESA by time on RRT (2014)

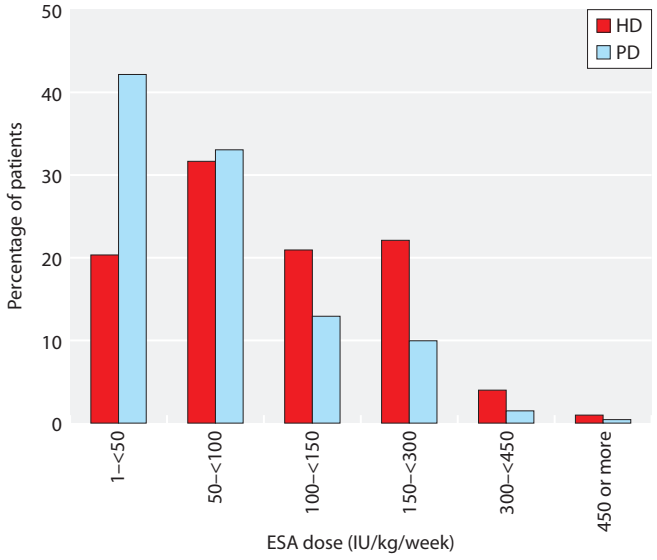

Fig. 8.34. Frequency distribution of mean weekly ESA dose corrected for weight in 2014

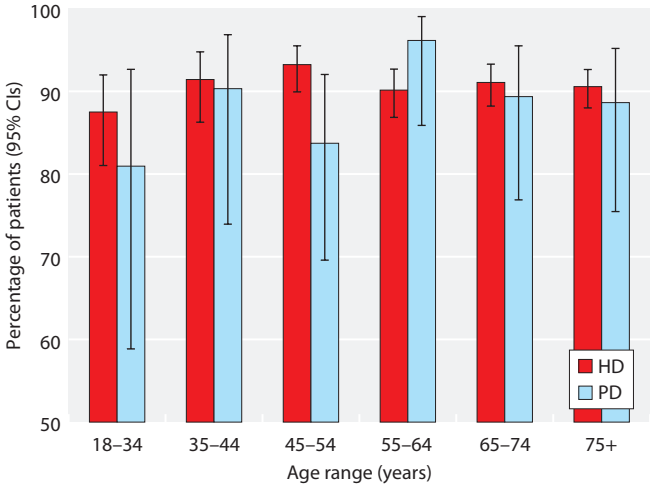

Fig. 8.36. Percentage of patients with Hb <100 g/L who were on ESA, by age group and treatment modality (2014)

patients with ESA resistance, defined as those failing to reach Hb ⩾100 g/L despite a high dose of ESA, were 0.5% for HD and 0.9% for PD.

Success with guideline compliance

Compliance with current minimum standards by year (1998 to 2014) is shown in figure 8.35 for prevalent patients (by treatment modality).

Figure 8.36 shows the percentage of anaemic patients (Hb <100 g/L) receiving an ESA. A minority of patients with Hb <100 g/L were not receiving ESA therapy. Across the age groups this was between 7–13% for HD patients and 4–19% for PD patients.

Table 8.6 shows that the percentage of all patients treated with an ESA and having Hb >120 g/L ranged between 5–38% for HD and between 0–27% for PD. For HD, there was a small percentage of patients having ferritin levels <100 μg/L and being on an ESA (0–8%). The percentages were somewhat higher for PD (0–20%).

Table 8.7 shows the percentage completeness for drug type, dose, route and frequency of administration for centres reporting ESA data. The completeness was generally good for drug type and dose but patchy for frequency and route of administration.

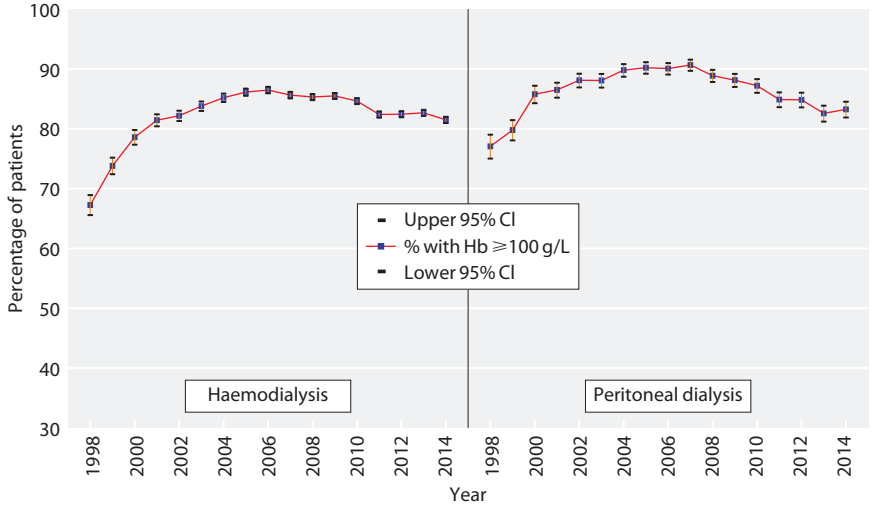

Fig. 8.35. Percentage of prevalent HD and PD patients (1998–2014) with Hb ⩾100 g/L

Table 8.6. Percentage of patients with Hb >120 g/L and on ESA and percentage of patients with serum ferritin levels <100 μg/L and on ESA, by modality.

	HD		PD	
Centre	% with Hb >120 g/L and on ESA	% with ferr <100 μg/L and on ESA	% with Hb >120 g/L and on ESA	% with ferr <100 μg/L and on ESA
England				
B Heart	9	1	0	0
B QEH	10	1	8	2
Basldn	16	4	4	15
Bradfd	26	3	19	8
Bristol	19	1	16	2
Carlis	13		17	0
Chelms	38	2	6	13
Covnt	6	1	16	5
Donc	13	0	17	0
Dorset	27	1	17	0
Exeter	18	6	14	4
Glouc	28	4	16	20
Hull	15	1	3	2
Kent	20	7	9	0
L Kings	8	5	14	4
Leeds	19	4	6	0
Leic	26	6	15	4
Middlbr	17	1	8	0
Newc	15	4		
Norwch	23	2	13	10
Nottm	6	0	6	0
Oxford	22	8	13	5
Prestn	18	3	15	5
Redng	32	1		
Salford	18			
Sheff	20	1	8	0
Shrew	28	2	23	0
Sthend	5	1	13	13
Sund	27	4	21	0
Wolve	24	4	17	17
York	15	1	10	0
N Ireland				
Antrim	24	0	23	0
Belfast	25	5	20	13
Newry	7		14	0
Ulster	22	0		
West NI	12	3	27	18
Wales				
Bangor	19	0		
Swanse	8	8	8	0
England	**18**	**3**	**12**	**4**
N Ireland	**20**	**3**	**19**	**7**
Wales	**10**	**6**	**8**	**0**
E, W & NI	**18**	**3**	**12**	**4**

Blank cells: centres excluded from analyses due to poor completeness, small numbers with data or incomplete ESA data

Table 8.7. Percentage completeness for type, dose, route and frequency of administration of ESA

	HD					PD				
Centre	*N* on ESA	% with drug type	% with dose	% with frequency	% with administration route	*N* on ESA	% with drug type	% with dose	% with frequency	% with administration route
England										
B Heart	301	100	99	0	0	15	100	100	0	0
B QEH	759	100	100	100	0	70	100	100	100	0
Basldn	141	100	100	99	100	18	100	100	100	100
Bradfd	187	100	99	99	96	13	100	92	92	100
Bristol	447	100	100	0	0	37	100	100	0	0
Carlis	40	100	100	0	0	21	100	100	0	0
Chelms	119	100	100	99	100	9	100	100	100	100
Covnt	286	100	99	0	0	58	100	100	0	0
Donc	143	100	100	100	100	17	100	100	100	100
Dorset	252	100	100	96	100	38	100	100	76	100
Exeter	357	100	99	0	0	64	100	100	0	0
Glouc	185	100	0	0	0	28	100	0	0	0
Hull	224	100	100	100	100	33	100	94	94	100
Kent	349	100	100	99	100	29	100	100	100	100
L Kings	462	100	100	0	0	52	100	100	0	0
Leeds	429	100	100	100	99	40	100	100	100	100
Leic	817	100	100	0	0	90	100	100	0	0
Middlbr	229	100	100	0	0	9	100	100	0	0
Newc	178	100	100	0	0					
Norwch	275	100	100	99	100	21	100	100	90	100
Nottm	295	100	99	0	0	51	100	49	0	0
Oxford	392	100	99	0	0	61	100	93	0	0
Prestn	435	100	19	0	0	35	100	0	0	0
Redng	231	100	100	0	0					
Salford	256	100	100	98	0					
Sheff	490	100	92	0	0	25	100	100	0	0
Shrew	156	100	100	98	97	16	100	100	100	100
Sthend	102	100	95	0	0	11	100	82	0	0
Sund	180	100	100	0	0	8	100	100	0	0
Wolve	235	100	100	99	100	47	100	100	100	100
York	111	100	100	100	98	12	100	92	100	100
N Ireland										
Antrim	102	100	100	100	100	11	100	100	100	100
Belfast	177	100	100	100	100	11	100	100	100	100
Newry	77	100	100	97	100	12	100	100	100	100
Ulster	91	100	100	100	100	4	100	100	100	100
West NI	94	100	100	100	100	10	100	100	100	100
Wales										
Bangor	54	100	0	0	0					
Swanse	269	100	96	96	99	28	100	96	96	100
England	**9,063**	**100**	**93**	**40**	**29**	**928**	**100**	**89**	**38**	**32**
N Ireland	**541**	**100**	**100**	**100**	**100**	**48**	**100**	**100**	**100**	**100**
Wales	**323**	**100**	**80**	**80**	**82**	**28**	**100**	**96**	**96**	**100**
E, W & NI	**9,927**	**100**	**93**	**44**	**34**	**1,004**	**100**	**90**	**42**	**37**

Blank cells: centres with usable ESA data for HD patients but not for PD patients

Conclusions

Anaemia is one of the major problems that contributes to high comorbidity and poor outcomes in dialysis patients. Renal centres continue to strive towards achieving the Renal Association standards in order to prevent adverse outcomes associated with low Hb such as impaired quality of life, increased hospitalisation, increased cardiovascular events and increased cardiovascular and all-cause mortality. This chapter provides important information regarding the management of anaemia in the UK.

Haemoglobin outcomes for patients on HD and PD were largely compliant with the RA minimum standard of Hb $\geqslant$100 g/L (81% and 83% respectively). The median Hb of patients on HD was 111 g/L with an IQR of 103–120 g/L, and the median Hb of patients on PD was 112 g/L with an IQR of 103–121 g/L. As would be anticipated, a greater proportion of prevalent patients (82%) than incident patients (50%) had a Hb $\geqslant$100 g/L in 2014. In the late presenters only 33% of patients had a Hb $\geqslant$100 g/L compared with 54% in the early presenters. The lower median Hb in late presenters may reflect inadequate pre-dialysis care as late presentation limits therapeutic options. The lower Hb in late presenters could also be due to multisystem disease or inter-current illness. This chapter and previous reports show that since the early 2000s, the proportion of both incident and prevalent dialysis patients with Hb $\geqslant$120 g/L has fallen. This is probably an effect of guideline changes that resulted from evidence from several studies in the early 2000s which in their post hoc analyses demonstrated increased risk of fatal and nonfatal strokes in the group with higher haemoglobin values [10–12].

Compliance with regards to serum ferritin was good overall with 95% of HD patients and 88% of PD patients achieving a serum ferritin of 100 μg/L or greater. Seventeen centres had greater than 20% of their HD patients having ferritin $\geqslant$800 μg/L and six centres had greater than 20% of their PD patients having ferritin $\geqslant$800 μg/L. Across the UK, the average percentage with ferritin $\geqslant$800 μg/L was 14% in HD patients and 8% in PD patients. There is currently a lot of uncertainty regarding the safety of achieving high ferritin levels in dialysis patients. Due to this, a large multicentre study – The Proactive IV irOn Therapy in haemodiALysis patients (PIVOTAL) trial is currently recruiting in over 40 renal centres, to receive either a high dose of intravenous iron or standard low dose of intravenous iron.

The analysis of ESA usage was limited by incomplete data returns. From the available data, 87% of HD patients and 68% of PD patients were on ESA treatment. The attainment of Hb targets correlated poorly with median ferritin and ESA usage. The percentage of patients treated with an ESA and having Hb >120 g/L ranged between centres from 5–38% for HD and from 0–27% for PD. At the other end of the spectrum, the percentage of patients with Hb <10 g/L and not on ESA varied between 7–13% for HD patients and between 4–19% for PD patients. There may be several clinical reasons why some patients with low Hb were not on ESA including cessation of treatment in those who were unresponsive and avoidance of ESA in those with malignancy. Others may have been on ESA but not had it recorded. A small proportion of patients had ferritin levels <100 μg/L and were receiving an ESA. There was substantial variation between centres in the average dose of ESA prescribed for which there is no obvious explanation. For the first 10 years on RRT, a greater percentage of HD patients were receiving ESA treatment than patients on PD. This could be due to several reasons; the prevalence and severity of anaemia is lower in patients on peritoneal dialysis (PD) than in patients on HD [13–14]; this could also be a consequence of earlier loss of residual renal function in HD patients when compared to those on PD [15]. Decline of residual renal function contributes significantly to anaemia and inflammation which results in increasing ESA requirements. The prevalence of ESA resistance was 0.5% and 0.9% for HD and PD patients respectively.

In summary there continues to be variation in anaemia management between centres.

Conflicts of interest: the authors declare no conflicts of interest

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UK Renal Registry 18th Annual Report: Chapter 9 Biochemical Variables amongst UK Adult Dialysis Patients in 2014: National and Centre-specific Analyses

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Key Words

Bicarbonate · Biochemical variables · Calcium · Dialysis · Haemodialysis · Parathyroid hormone · Peritoneal dialysis · Phosphate · Quality improvement

Summary

In 2014

- 57.5% of HD patients and 62.7% of PD patients achieved the audit measure for phosphate.
- 29.0% of HD and 30.3% of PD patients had a serum phosphate above the audit standard range.
- 79.1% of HD and 79.7% of PD patients had adjusted calcium between 2.2–2.5 mmol/L.
- 57.4% of HD and 65.0% of PD patients had a serum PTH between 16–72 pmol/L.
- 16.4% of HD and 12.0% of PD patients had a serum PTH >72 pmol/L.
- Simultaneous control of all three parameters within current audit standards was achieved by 50.3% of HD and 52.5% of PD patients.
- 60.4% of HD and 81.8% of PD patients achieved the audit measure for bicarbonate.

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Introduction

The UK Renal Registry (UKRR) collects routine biochemical data from clinical information systems in renal centres in England, Wales and Northern Ireland and receives data from Scotland via the Scottish Renal Registry. Annual cross sectional analyses are undertaken on some of these variables to determine centre level performance against national (Renal Association (RA)) clinical performance measures [1]. This enables UK renal centres to compare their own performance against each other and to the UK average performance. Currently the 5th edition of the UK Renal Association clinical practice guidelines is in practice [1]. This edition commenced in a graded manner in 2009 and includes an expanded number of guideline modules compared to previous editions.

Audit measures for kidney disease increasingly include tighter specification limits in conjunction with a growing evidence base. Out of range observations (e.g. hyperphosphataemia and hypophosphataemia) need to be interpreted cautiously as they may relate to different clinical problems or population characteristics. These will therefore require different strategies to improve centre performance of clinical audit measures. Summary statistical data have been provided to enhance understanding of the population characteristics of each centre and longitudinal analyses to demonstrate changes over time.

Data are also available on the UKRR data portal at www.renalreg.org.

Table 9.1 lists the recommended biochemical based audit measures from the RA which are relevant to the dialysis population. Several of the audit measures are not currently reported by the UKRR in its annual report; the reasons behind this are varied, but predominantly relate to a high proportion of incomplete data or that the relevant variable is not currently within the specified UKRR dataset. Over time it is hoped to work with the renal community to improve reporting across the range of recommended standards.

Methods

The analyses presented in this chapter relate to biochemical variables in the prevalent dialysis cohort in the UK. The cohort studied were patients prevalent on dialysis treatment on 31st December 2014. Patients receiving dialysis for less than 90 days and those who had changed modality or renal centre in the last 90 days were excluded. Haemodialysis (HD) and peritoneal dialysis (PD) cohorts were analysed separately. A full definition of the cohort including inclusion and exclusion criteria is available in appendix B (www.renalreg.org).

The biochemical variables analysed in this chapter were serum phosphate, calcium (adjusted for albumin), parathyroid hormone and bicarbonate. The method of data collection and validation by the UKRR has been previously described [2]. In brief, for each quarter of 2014 the UKRR extracted biochemical data electronically from clinical information systems in renal centres in England, Wales and Northern Ireland (E,W&NI). Scottish centres have only been included in analyses relating to corrected calcium and phosphate control, with data for their prevalent dialysis cohort being supplied directly by the Scottish Renal Registry. The UKRR does not currently collect data regarding different assay methods mainly because a single dialysis centre may process samples in several different laboratories. The audit measure used for serum phosphate was 1.1–1.7 mmol/L in both the HD and PD cohorts [1, 3]. For centres providing adjusted calcium values, these data were analysed directly as it is these values on which clinical decisions within centres are based. For centres providing unadjusted calcium values, a formula in widespread use was used to calculate adjusted calcium [4]. The audit measure for adjusted calcium depends on the local reference range [3]. For the purposes of these analyses, the UKRR has used the RA guideline standard of adjusted calcium between 2.2–2.5 mmol/L as the audit measure [3]. There are also a variety of methods and reference ranges in use to measure parathyroid hormone (PTH). To enable some form of comparative audit the UKRR has used 2–9 times the median upper limit of the reference range (8 pmol/L) as the audit measure in line with the 5th edition of the RA clinical practice guidelines and KDIGO 2009 guidance [3, 5]. This equates to a PTH range of 16–72 pmol/L. The audit measure used for serum bicarbonate in the HD cohort was 18–24 mmol/L as per the updated haemodialysis guidelines and in the PD cohort was 22–30 mmol/L. A summary of the current RA audit measures for these variables and conversion factors to SI units are given in table 9.2.

Quarterly values were extracted from the database for the last two quarters for calcium, phosphate and bicarbonate and the last three quarters for PTH. Patients who did not have these data were excluded from the analyses. Data completeness was analysed at centre and country level. All patients were included in analyses but centres with less than 50% completeness were excluded from plots and tables showing centre level performance. Data were also excluded from plots and tables when there were less than 10 patients with data, both at centre or country level. These data were analysed to calculate summary descriptive statistics (maximum, minimum, means with the corresponding standard deviation, medians and interquartile ranges). Where applicable, the percentage achieving the Renal Association standard or other surrogate clinical performance measure was also calculated.

The simultaneous control of all three components of bone and mineral disorder (BMD) parameters were analysed in combination. The proportion of patients with control of none, one, two or three parameters are presented. For the purpose of these analyses a corrected calcium between 2.2–2.5 mmol/L, a phosphate level being maintained at or below 1.7 mmol/L and a PTH level being at or below 72 pmol/L, were evaluated in combination.

Centres report several biochemical variables with different levels of accuracy, leading to problems in comparative evaluation.

Table 9.1. Summary of Renal Association audit measures for biochemical variables [1]

RA audit measure	Included in UKRR annual report	Reason
CKD-MBD in CKD stage 5D guidance		
Serum calcium, adjusted for albumin, in dialysis patients (pre-dialysis for haemodialysis patients)	Yes	
Serum phosphate in dialysis patients (pre-dialysis for haemodialysis patients)	Yes	
Proportion of PTH values within range 0/4, 1/4, 2/4, 3/4, and 4/4 of the 4 annual measurements of PTH in CKD stage 5D patients	Yes	Summary measures using data from the last three quarters for PTH-based analyses are presented, rather than stratified by quarter
Percentage of patients with all parameters (calcium/phosphate/PTH) within target range	Yes	
Peritoneal dialysis guidelines		
Cumulative frequency curves of plasma bicarbonate	Yes	Summary measures at centre and country level are presented in various formats but not as cumulative frequency curves
Haemodialysis guidelines		
Cumulative frequency curves of pre-dialysis potassium concentration	No	It is hoped for the next report that data completeness will enable analysis. There are also concerns that potential delays in blood sample processing may result in over estimates of potassium concentrations
Cumulative frequency curves of pre-dialysis serum calcium (adjusted for albumin) and phosphate concentrations	Yes	Summary measures at centre and country level are presented in various formats but not as cumulative frequency curves
Cardiovascular disease in CKD guidance		
Record of HbA1c concentrations in IFCC (mmol/mol) and/or DCCT (%) units	No	Poor data completeness
Cholesterol concentrations in patients prescribed HMG CoA reductase inhibitors	Partially	The UKRR report summary statistics for total cholesterol. These summary data were presented on 2013 data and will be presented again on 2015 data. Reliable information is not currently available within the UKRR data on statin prescription

Table 9.2. Summary of clinical audit measures and conversion factors from SI units

Biochemical variable	Clinical audit measure	Conversion factor from SI units
Phosphate	HD patients: 1.1–1.7 mmol/L PD patients: 1.1–1.7 mmol/L	mg/dl = mmol/L × 3.1
Calcium (adjusted)	Normal range (ideally <2.5 mmol/L)	mg/dl = mmol/L × 4
Parathyroid hormone	2–9 times upper limit of normal	ng/L = pmol/L × 9.5
Bicarbonate	HD patients: 18–24 mmol/L PD patients: 22–30 mmol/L	mg/dl = mmol/L × 6.1

For example, in the case of serum bicarbonate, data can be submitted as integer values but some centres submit data to one decimal place. All data has been rounded in an attempt to make all centres more comparable.

The number preceding the centre name in each figure indicates the percentage of missing data for that centre. Funnel plot analyses were used to identify outlying centres [6]. The percentage within range for each standard was plotted against centre size along with the upper and lower 95% and 99.9% limits. Centres can be identified on these plots by looking up the number of patients treated in each centre in the relevant table and finding this value on the x-axis. Longitudinal analyses were performed for some data to calculate overall changes in achievement of a performance measure annually from 2004 to 2014 and were recalculated for each previous year using the rounding procedure.

All data are presented unadjusted for case-mix.

Results

Mineral and bone variables

Phosphate

In 2014 the following Renal Association clinical practice guideline regarding phosphate management was applicable:

Guideline 3.2 CKD-MBD: Serum phosphate in dialysis patients

'We suggest that serum phosphate in dialysis patients, measured before a "short-gap" dialysis session in haemodialysis patients, should be maintained between 1.1 and 1.7 mmol/L (2C)' [3]

Overall, 21,732 HD and 3,068 PD patient details from the UK were used to perform serum phosphate analyses in 2014. The data completeness for serum phosphate across the UK was 97.2% for HD and 97.6% for PD patients, although there was considerable variation between centres (tables 9.3, 9.5).

Data completeness for serum phosphate has improved over the last decade in HD patients from 73.2% to 97.2% and in PD patients from 90.0% to 97.6%.

HD centre returns were only low (<90%) for three centres, with the most notable being Sunderland at 0%. With PD patients, five centres had data returns less than 90%. Sunderland PD patients' phosphate returns were 100% complete.

Table 9.3 Summary statistics for phosphate in haemodialysis patients in 2014

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	100.0	398	1.6	0.5	1.5	1.3	1.9
B QEH	96.9	865	1.5	0.4	1.4	1.2	1.7
Basldn	98.7	155	1.4	0.5	1.4	1.1	1.7
Bradfd	100.0	196	1.5	0.5	1.4	1.1	1.7
Brightn	99.3	395	1.6	0.5	1.5	1.3	1.9
Bristol	100.0	495	1.6	0.5	1.6	1.3	1.8
Camb	86.9	313	1.5	0.4	1.5	1.2	1.7
Carlis	100.0	60	1.6	0.5	1.5	1.3	1.9
Carsh	94.0	683	1.5	0.5	1.5	1.2	1.8
Chelms	100.0	127	1.4	0.4	1.5	1.2	1.7
Colchr	94.6	105	1.5	0.4	1.5	1.2	1.8
Covnt	99.7	329	1.6	0.5	1.6	1.3	1.9
Derby	99.6	219	1.6	0.5	1.5	1.3	1.8
Donc	100.0	166	1.6	0.5	1.5	1.2	1.8
Dorset	99.6	263	1.5	0.5	1.4	1.2	1.7
Dudley	100.0	160	1.6	0.5	1.6	1.3	1.8
Exeter	100.0	383	1.5	0.5	1.5	1.2	1.8
Glouc	100.0	204	1.5	0.5	1.5	1.2	1.7
Hull	99.7	301	1.6	0.5	1.5	1.3	1.7
Ipswi	99.1	114	1.4	0.6	1.3	1.1	1.7
Kent	100.0	374	1.7	0.5	1.6	1.3	1.9
L Barts	99.9	904	1.6	0.6	1.5	1.2	1.9
L Guys	73.7	453	1.5	0.5	1.4	1.2	1.8
L Kings	100.0	504	1.4	0.4	1.4	1.1	1.7
L Rfree	100.0	664	1.5	0.5	1.5	1.2	1.8
L St.G	100.0	284	1.5	0.5	1.4	1.2	1.7

Table 9.3 Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
L West	95.8	1,257	1.5	0.5	1.4	1.2	1.8
Leeds	100.0	471	1.6	0.5	1.5	1.2	1.9
Leic	99.9	836	1.6	0.5	1.6	1.3	1.9
Liv Ain	100.0	150	1.4	0.5	1.3	1.0	1.7
Liv Roy	99.7	342	1.5	0.5	1.4	1.2	1.8
M RI	93.9	444	1.5	0.5	1.5	1.2	1.8
Middlbr	100.0	305	1.6	0.5	1.5	1.3	1.9
Newc	100.0	266	1.5	0.5	1.5	1.2	1.8
Norwch	99.7	308	1.5	0.4	1.5	1.2	1.8
Nottm	100.0	341	1.5	0.5	1.5	1.2	1.8
Oxford	100.0	415	1.6	0.6	1.5	1.2	1.9
Plymth	100.0	129	1.6	0.5	1.5	1.2	1.9
Ports	100.0	560	1.6	0.5	1.6	1.3	1.9
Prestn	100.0	521	1.6	0.5	1.6	1.3	1.9
Redng	100.0	265	1.5	0.4	1.5	1.3	1.7
Salford	99.5	380	1.5	0.5	1.4	1.1	1.8
Sheff	100.0	555	1.6	0.5	1.5	1.2	1.8
Shrew	100.0	174	1.6	0.5	1.5	1.3	1.9
Stevng	100.0	447	1.6	0.5	1.5	1.2	1.8
Sthend	100.0	110	1.6	0.4	1.6	1.3	1.8
Stoke	97.7	301	1.5	0.4	1.4	1.2	1.8
Sund	0.0	0					
Truro	100.0	136	1.5	0.5	1.5	1.2	1.7
Wirral	98.4	186	1.6	0.5	1.5	1.2	1.9
Wolve	99.3	285	1.5	0.5	1.4	1.2	1.8
York	100.0	124	1.3	0.4	1.3	1.1	1.6
N Ireland							
Antrim	100.0	111	1.4	0.4	1.4	1.1	1.7
Belfast	100.0	189	1.5	0.6	1.4	1.1	1.8
Newry	100.0	86	1.6	0.4	1.6	1.4	1.8
Ulster	100.0	94	1.6	0.6	1.5	1.2	1.8
West NI	100.0	99	1.6	0.6	1.5	1.2	1.9
Scotland							
Abrdn	98.5	191	1.6	0.5	1.5	1.2	1.9
Airdrie	100.0	177	1.4	0.5	1.4	1.1	1.7
D & Gall	97.8	45	1.6	0.5	1.6	1.2	1.8
Dundee	98.8	163	1.7	0.5	1.6	1.3	2.0
Edinb	99.6	258	1.7	0.5	1.6	1.4	2.0
Glasgw	95.7	517	1.7	0.5	1.6	1.3	1.9
Inverns	100.0	67	1.7	0.4	1.7	1.4	1.9
Klmarnk	100.0	132	1.6	0.5	1.6	1.3	1.9
Krkcldy	99.3	139	1.5	0.4	1.5	1.3	1.8
Wales							
Bangor	100.0	78	1.5	0.5	1.4	1.3	1.7
Cardff	99.8	457	1.6	0.5	1.5	1.2	1.8
Clwyd	100.0	83	1.6	0.5	1.6	1.3	1.9
Swanse	100.0	322	1.5	0.4	1.5	1.2	1.7
Wrexm	100.0	102	1.4	0.5	1.4	1.1	1.8
England	**96.9**	**18,422**	**1.5**	**0.5**	**1.5**	**1.2**	**1.8**
N Ireland	**100.0**	**579**	**1.5**	**0.5**	**1.5**	**1.1**	**1.8**
Scotland	**98.2**	**1,689**	**1.6**	**0.5**	**1.6**	**1.3**	**1.9**
Wales	**99.9**	**1,042**	**1.5**	**0.5**	**1.5**	**1.2**	**1.8**
UK	**97.2**	**21,732**	**1.6**	**0.5**	**1.5**	**1.2**	**1.8**

Blank cells: centres excluded from analyses due to low patient numbers or poor data completeness

The individual centre means and standard deviations are shown in tables 9.3 and 9.5 for HD and PD patients respectively.

For HD 57.5% and for PD 62.7% of patients achieved a phosphate level within the target range specified by the RA clinical audit measure (tables 9.4, 9.6).

The proportion of HD patients with hyperphosphataemia was 29.0% and with hypophosphataemia was 13.5% (table 9.4).

The proportion of PD patients with hyperphosphataemia was 30.3% and with hypophosphataemia was 7.1% (table 9.6, figures 9.3, 9.4).

There was inter-centre and inter-modality variation in the proportion of patients below, within and above the phosphate range specified by the clinical performance measure (figures 9.1–9.4, tables 9.4, 9.6).

Longitudinal analysis demonstrated a small but continued improvement overall against the clinical performance measure in all the countries and modalities (figure 9.5).

Adjusted calcium

In 2014, the following Renal Association clinical practice guideline regarding calcium management was applicable:

Guideline 2.2 CKD-MBD: Serum calcium in dialysis patients (stage 5D)

'We suggest that serum calcium, adjusted for albumin concentration, should be maintained within the normal reference range for the laboratory used, measured before a "short-gap" dialysis session in haemodialysis patients. Ideally, adjusted serum calcium should be maintained between 2.2 and 2.5 mmol/L, with avoidance of hypercalcaemic episodes (2D)' [3].

Table 9.4. Percentage of haemodialysis patients within, below and above the range specified in the RA audit measure for phosphate (1.1–1.7 mmol/L) in 2014

Centre	*N*	% phos 1.1–1.7 mmol/L	Lower 95% CI	Upper 95% CI	% phos <1.1 mmol/L	% phos >1.7 mmol/L	Change in % within range from 2013	95% LCL change	95% UCL change
England									
B Heart	398	55.5	50.6	60.3	10.6	33.9	0.6	−6.3	7.4
B QEH	865	63.6	60.3	66.7	14.3	22.1	0.7	−3.9	5.2
Basldn	155	56.1	48.2	63.7	21.9	21.9	1.2	−10.0	12.3
Bradfd	196	55.1	48.1	61.9	20.4	24.5	1.6	−8.4	11.6
Brightn	395	58.5	53.6	63.2	10.6	30.9	−0.1	−7.1	7.0
Bristol	495	56.4	52.0	60.7	10.9	32.7	−2.2	−8.4	4.0
Camb	313	65.2	59.7	70.3	12.5	22.4	3.9	−3.5	11.3
Carlis	60	55.0	42.4	67.0	11.7	33.3	1.6	−16.4	19.5
Carsh	683	62.5	58.8	66.1	10.7	26.8	6.0	0.7	11.2
Chelms	127	64.6	55.9	72.4	18.1	17.3	−2.7	−14.8	9.4
Colchr	105	58.1	48.5	67.1	12.4	29.5	−12.2	−25.2	0.8
Covnt	329	59.9	54.5	65.0	7.6	32.5	0.0	−7.4	7.3
Derby	219	58.5	51.8	64.8	10.5	31.1	−3.2	−12.6	6.1
Donc	166	65.1	57.5	71.9	9.0	25.9	0.0	−10.6	10.6
Dorset	263	64.6	58.7	70.2	14.1	21.3	4.8	−3.6	13.2
Dudley	160	61.9	54.1	69.1	6.9	31.3	8.0	−2.8	18.9
Exeter	383	60.6	55.6	65.4	13.3	26.1	−0.1	−7.0	6.9
Glouc	204	65.2	58.4	71.4	11.8	23.0	5.2	−4.4	14.8
Hull	301	63.5	57.9	68.7	11.6	24.9	−0.7	−8.4	6.9
Ipswi	114	55.3	46.1	64.1	24.6	20.2	9.2	−3.7	22.2
Kent	374	57.5	52.4	62.4	8.6	34.0	4.5	−2.6	11.7
L Barts	904	48.2	45.0	51.5	17.2	34.6	−4.4	−9.0	0.3
L Guys	453	54.3	49.7	58.8	18.3	27.4	−0.3	−6.8	6.2
L Kings	504	66.9	62.6	70.8	16.5	16.7	1.4	−4.5	7.4
L Rfree	664	56.3	52.5	60.1	15.5	28.2	−3.1	−8.4	2.2
L St.G	284	59.5	53.7	65.1	16.6	23.9	1.4	−6.9	9.7
L West	1,257	55.1	52.3	57.8	17.0	27.9	−1.4	−5.3	2.4
Leeds	471	52.4	47.9	56.9	14.0	33.6	0.6	−5.7	7.0

Table 9.4. Continued

Centre	*N*	% phos 1.1–1.7 mmol/L	Lower 95% CI	Upper 95% CI	% phos <1.1 mmol/L	% phos >1.7 mmol/L	Change in % within range from 2013	95% LCL change	95% UCL change
Leic	836	56.2	52.8	59.6	8.9	34.9	2.3	−2.5	7.1
Liv Ain	150	52.0	44.0	59.9	27.3	20.7	−1.7	−13.1	9.6
Liv Roy	342	54.7	49.4	59.9	16.4	29.0	−4.7	−12.1	2.8
M RI*	444	54.3	49.6	58.9	16.4	29.3	2.4	−4.1	8.9
Middlbr	305	57.1	51.4	62.5	12.1	30.8	−0.2	−8.0	7.6
Newc	266	59.0	53.0	64.8	14.7	26.3	1.8	−6.6	10.3
Norwch	308	62.7	57.1	67.9	11.4	26.0	3.7	−4.0	11.5
Nottm	341	56.6	51.3	61.8	15.0	28.5	−0.5	−7.8	6.9
Oxford	415	49.9	45.1	54.7	15.2	34.9	−0.6	−7.5	6.2
Plymth	129	58.9	50.2	67.1	10.9	30.2	1.1	−11.2	13.3
Ports	560	50.7	46.6	54.8	13.8	35.5	0.2	−5.7	6.1
Prestn	521	53.6	49.3	57.8	10.8	35.7	−3.3	−9.4	2.7
Redng	265	67.2	61.3	72.6	11.3	21.5	4.9	−3.3	13.0
Salford*	380	50.3	45.3	55.3	20.3	29.5	−3.4	−10.8	4.1
Sheff	555	60.2	56.1	64.2	11.0	28.8	−0.5	−6.3	5.2
Shrew	174	60.3	52.9	67.3	7.5	32.2	3.2	−7.1	13.5
Stevng	447	61.1	56.5	65.5	9.8	29.1	6.6	0.0	13.1
Sthend	110	58.2	48.8	67.0	7.3	34.6	−2.7	−15.7	10.2
Stoke	301	61.8	56.2	67.1	12.6	25.6	−0.2	−8.5	8.0
Truro	136	66.9	58.6	74.3	11.8	21.3	9.4	−2.0	20.8
Wirral	186	52.2	45.0	59.2	16.7	31.2	−2.5	−12.6	7.5
Wolve	285	53.0	47.2	58.7	18.6	28.4	0.6	−7.6	8.9
York	124	62.9	54.1	70.9	23.4	13.7	0.1	−11.8	12.0
N Ireland									
Antrim	111	59.5	50.1	68.2	20.7	19.8	−1.4	−14.0	11.3
Belfast	189	48.2	41.1	55.3	24.3	27.5	−3.4	−13.4	6.6
Newry	86	57.0	46.4	67.0	11.6	31.4	−1.4	−16.2	13.5
Ulster	94	58.5	48.3	68.0	11.7	29.8	4.1	−9.7	18.0
West NI	99	55.6	45.7	65.0	8.1	36.4	−4.3	−17.7	9.2
Scotland									
Abrdn	191	58.6	51.5	65.4	10.5	30.9	3.1	−6.8	12.9
Airdrie	177	59.3	51.9	66.3	19.8	20.9	−1.6	−11.8	8.6
D & Gall	45	53.3	38.9	67.2	13.3	33.3	−3.5	−24.1	17.2
Dundee	163	52.8	45.1	60.3	6.1	41.1	2.4	−8.5	13.4
Edinb	258	53.1	47.0	59.1	6.6	40.3	1.0	−7.8	9.8
Glasgw	517	54.9	50.6	59.2	8.7	36.4	1.4	−4.6	7.4
Inverns	67	56.7	44.7	68.0	4.5	38.8	1.2	−16.6	18.9
Klmarnk	132	56.1	47.5	64.3	12.1	31.8	8.9	−3.3	21.1
Krkcldy	139	64.0	55.7	71.6	9.4	26.6	4.0	−7.5	15.5
Wales									
Bangor	78	65.4	54.2	75.1	12.8	21.8	1.1	−13.6	15.8
Cardff	457	58.0	53.4	62.4	11.6	30.4	2.5	−3.9	8.9
Clwyd	83	51.8	41.1	62.3	9.6	38.6	−3.8	−19.5	12.0
Swanse	322	65.5	60.2	70.5	11.5	23.0	2.8	−4.6	10.3
Wrexm	102	55.9	46.2	65.2	18.6	25.5	0.7	−13.2	14.5
England	**18,422**	**57.6**	**56.9**	**58.3**	**13.8**	**28.6**	**0.4**	**−0.6**	**1.4**
N Ireland	**579**	**54.6**	**50.5**	**58.6**	**16.9**	**28.5**	**−1.7**	**−7.3**	**4.0**
Scotland	**1,689**	**56.2**	**53.8**	**58.5**	**9.8**	**34.0**	**2.0**	**−1.4**	**5.3**
Wales	**1,042**	**60.2**	**57.2**	**63.1**	**12.2**	**27.6**	**1.8**	**−2.5**	**6.0**
UK	**21,732**	**57.5**	**56.9**	**58.2**	**13.5**	**29.0**	**0.6**	**−0.4**	**1.5**

*Salford and Manchester RI have been involved in the SPIRiT study —an RCT comparing low phosphate control (0.8 to 1.4 mmol/L) with high phosphate group control (1.8 to 2.4 mmol/L); HD patients only were recruited

Table 9.5. Summary statistics for phosphate in peritoneal dialysis patients in 2014

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	100.0	32	1.7	0.6	1.6	1.3	2.2
B QEH	99.2	116	1.6	0.5	1.5	1.2	1.9
Basldn	96.2	25	1.6	0.5	1.6	1.3	1.8
Bradfd	100.0	16	1.8	0.4	1.9	1.6	2.0
Brightn	100.0	55	1.6	0.4	1.6	1.4	1.8
Bristol	100.0	55	1.7	0.3	1.7	1.4	1.9
Camb	90.3	28	1.4	0.4	1.5	1.2	1.7
Carlis	100.0	24	1.6	0.3	1.6	1.4	1.7
Carsh	92.5	111	1.6	0.4	1.5	1.3	1.8
Chelms	94.7	18	1.7	0.5	1.7	1.4	1.9
Colchr	n/a						
Covnt	90.6	77	1.5	0.4	1.4	1.3	1.7
Derby	98.6	70	1.6	0.5	1.5	1.2	1.8
Donc	100.0	24	1.6	0.4	1.5	1.3	2.0
Dorset	100.0	46	1.5	0.5	1.4	1.2	1.8
Dudley	98.0	49	1.8	0.4	1.8	1.5	2.1
Exeter	100.0	83	1.5	0.4	1.5	1.3	1.7
Glouc	94.9	37	1.7	0.4	1.7	1.3	1.9
Hull	98.5	66	1.6	0.4	1.6	1.4	1.8
Ipswi	100.0	30	1.6	0.5	1.5	1.2	1.8
Kent	100.0	58	1.5	0.5	1.5	1.2	1.8
L Barts	98.0	195	1.5	0.4	1.5	1.2	1.8
L Guys	76.9	20	1.6	0.4	1.6	1.3	1.8
L Kings	100.0	79	1.5	0.4	1.5	1.2	1.7
L Rfree	98.4	123	1.6	0.5	1.6	1.3	1.9
L St.G	100.0	45	1.6	0.4	1.5	1.4	1.8
L West	84.2	48	1.5	0.4	1.4	1.2	1.8
Leeds	100.0	49	1.6	0.4	1.7	1.3	1.9
Leic	100.0	108	1.7	0.4	1.6	1.4	2.0
Liv Ain	100.0	35	1.7	0.5	1.6	1.4	1.9
Liv Roy	100.0	49	1.5	0.4	1.4	1.3	1.6
M RI	100.0	61	1.6	0.4	1.5	1.3	1.8
Middlbr	100.0	13	1.8	0.4	1.6	1.5	1.9
Newc	95.5	42	1.8	0.7	1.6	1.3	2.1
Norwch	100.0	30	1.5	0.4	1.5	1.2	1.9
Nottm	100.0	72	1.5	0.4	1.5	1.2	1.7
Oxford	100.0	76	1.6	0.4	1.5	1.4	1.8
Plymth	100.0	33	1.5	0.3	1.4	1.3	1.6
Ports	93.9	62	1.6	0.5	1.6	1.2	1.8
Prestn	100.0	46	1.6	0.4	1.5	1.4	1.7
Redng	100.0	62	1.5	0.4	1.4	1.3	1.7
Salford	94.4	68	1.8	0.5	1.6	1.5	1.9
Sheff	100.0	52	1.5	0.3	1.5	1.3	1.7
Shrew	96.2	25	1.7	0.3	1.7	1.5	1.9
Stevng	100.0	26	1.5	0.2	1.5	1.3	1.6
Sthend	100.0	16	1.7	0.4	1.7	1.4	2.0
Stoke	98.6	71	1.5	0.4	1.5	1.3	1.7
Sund	100.0	14	1.8	0.6	1.6	1.4	2.0
Truro	100.0	18	1.6	0.3	1.5	1.3	1.7
Wirral	80.0	16	1.7	0.7	1.5	1.1	2.4
Wolve	98.6	71	1.7	0.5	1.6	1.3	1.9
York	100.0	21	1.6	0.3	1.6	1.3	1.9

Table 9.5. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
N Ireland							
Antrim	100.0	13	1.6	0.4	1.5	1.3	1.8
Belfast	100.0	15	1.7	0.3	1.7	1.4	1.9
Newry	100.0	14	1.5	0.3	1.5	1.3	1.7
Ulster	100.0	4					
West NI	100.0	11	1.5	0.2	1.4	1.3	1.7
Scotland							
Abrdn	100.0	26	1.7	0.4	1.7	1.5	1.9
Airdrie	100.0	7					
D & Gall	85.7	12	1.5	0.5	1.6	1.2	1.8
Dundee	100.0	21	1.6	0.4	1.5	1.3	1.7
Edinb	89.5	17	1.6	0.4	1.6	1.4	1.7
Glasgw	97.2	35	1.7	0.4	1.5	1.4	1.9
Inverns	100.0	11	1.7	0.6	1.5	1.3	1.8
Klmarnk	100.0	35	1.7	0.4	1.6	1.4	1.9
Krkcldy	92.9	13	1.5	0.5	1.4	1.2	1.8
Wales							
Bangor	100.0	15	1.6	0.5	1.4	1.2	2.0
Cardff	98.6	71	1.5	0.4	1.4	1.3	1.8
Clwyd	90.9	10	1.6	0.4	1.5	1.3	2.1
Swanse	98.0	49	1.6	0.5	1.6	1.3	1.8
Wrexm	100.0	23	1.7	0.4	1.6	1.4	1.9
England	**97.6**	**2,666**	**1.6**	**0.4**	**1.5**	**1.3**	**1.8**
N Ireland	**100.0**	**57**	**1.6**	**0.3**	**1.5**	**1.3**	**1.8**
Scotland	**96.7**	**177**	**1.6**	**0.4**	**1.5**	**1.4**	**1.8**
Wales	**98.3**	**168**	**1.6**	**0.4**	**1.5**	**1.3**	**1.9**
UK	**97.6**	**3,068**	**1.6**	**0.4**	**1.5**	**1.3**	**1.8**

Blank cells: centres excluded from analyses due to low patient numbers or poor data completeness
n/a – no PD patients

In 2014, 21,685 HD and 3,078 PD patients' data from the UK were available for serum adjusted calcium analysis. The data were 97.0% complete for HD patients and 97.9% complete for PD patients overall, although there was between centre variation (tables 9.7, 9.9). From 2004 to 2014 across UK centres, data completeness for serum adjusted calcium increased from 57.2% to 97.0% in HD patients and from 56.8% to 97.9% in PD patients.

Coventry, Dorset, London West, Sunderland and Belfast failed to return locally adjusted calcium results and hence their data are shown using a generic formula that may not be applicable to the calcium and albumin methods used locally and may have over- or underestimated the adjusted calcium. These centres are served by laboratories that report adjusted calcium results and these should be reported to the UKRR.

Of HD patients, 79.1% (95% CI 78.6–79.7%) and of PD patients 79.7% (95% CI 78.2–81.1%) had an adjusted calcium between 2.2–2.5 mmol/L (tables 9.8, 9.10).

The proportion of hypocalcaemic patients in the UK was 10.4% for HD and 7.7% for PD (tables 9.8, 9.10). The proportion of hypercalcaemic patients in the UK was 10.5% for HD and 12.6% for PD (Tables 9.8, 9.10).

Figures 9.6 and 9.8 present the individual centre level data of achieving serum adjusted calcium levels between 2.2 and 2.5 mmol/L in HD and PD patients respectively. Figure 9.7 presents the funnel plot of HD patients attaining adjusted calcium levels between 2.2 and 2.5 mmol/L in 2014. Six centres achieved significantly lower results: Edinburgh, Middlesbrough, Birmingham Heartlands, Birmingham QEH, London Barts and London West. However, the London West data may be misleading since the centre failed to return locally adjusted calcium results. Colchester, Reading, Exeter, Stevenage and Glasgow all achieved a significantly higher percentage than the national average.

Figure 9.9 presents the funnel plots of PD patients attaining the adjusted calcium levels between 2.2 and 2.5 mmol/L in 2014. Once corrected for centre size, no centre was significantly lower than the national average. There were two centres achieving a significantly higher percentage compared with the UK average: Dorset and

Table 9.6. Percentage of peritoneal dialysis patients within, below and above the range specified in the RA audit measure for phosphate (1.1–1.7 mmol/L) in 2014

Centre	*N*	% phos 1.1–1.7 mmol/L	Lower 95% CI	Upper 95% CI	% phos <1.1 mmol/L	% phos >1.7 mmol/L	Change in % within range from 2013	95% LCL change	95% UCL change
England									
B Heart	32	53.1	36.1	69.4	6.3	40.6	3.1	−21.0	27.2
B QEH	116	62.9	53.8	71.2	8.6	28.5	4.8	−7.4	17.0
Basldn	25	56.0	36.6	73.7	8.0	36.0	−20.7	−45.3	4.0
Bradfd	16	37.5	17.9	62.3	6.3	56.3	−10.5	−41.3	20.3
Brightn	55	72.7	59.6	82.8	1.8	25.5	21.2	4.4	38.1
Bristol	55	54.6	41.4	67.1	0.0	45.5	0.2	−18.3	18.6
Camb	28	64.3	45.4	79.6	21.4	14.3	−2.4	−30.5	25.7
Carlis	24	75.0	54.4	88.3	4.2	20.8	9.8	−16.3	35.8
Carsh	111	61.3	51.9	69.9	10.8	27.9	−8.7	−21.5	4.0
Chelms	18	50.0	28.4	71.6	11.1	38.9	−29.0	−58.4	0.5
Covnt	77	72.7	61.8	81.5	9.1	18.2	12.1	−3.3	27.5
Derby	70	64.3	52.5	74.6	8.6	27.1	2.1	−13.6	17.9
Donc	24	62.5	42.2	79.2	8.3	29.2	−0.8	−26.8	25.1
Dorset	46	67.4	52.7	79.3	6.5	26.1	4.5	−16.4	25.5
Dudley	49	38.8	26.3	52.9	4.1	57.1	−8.0	−27.8	11.7
Exeter	83	69.9	59.2	78.8	7.2	22.9	4.8	−10.6	20.2
Glouc	37	62.2	45.8	76.2	0.0	37.8	−2.4	−25.3	20.6
Hull	66	66.7	54.5	76.9	6.1	27.3	−1.4	−17.1	14.3
Ipswi	30	66.7	48.4	81.0	6.7	26.7	−8.3	−32.5	15.9
Kent	58	56.9	44.0	68.9	12.1	31.0	−5.6	−23.6	12.4
L Barts	195	61.0	54.0	67.6	10.8	28.2	−0.1	−10.1	9.8
L Guys	20	65.0	42.6	82.3	10.0	25.0	2.5	−26.0	31.0
L Kings	79	70.9	60.0	79.8	5.1	24.1	−0.9	−15.0	13.2
L Rfree	123	56.9	48.0	65.4	8.1	35.0	−7.3	−19.9	5.2
L St.G	45	57.8	43.1	71.2	11.1	31.1	−12.7	−32.4	7.1
L West	48	62.5	48.2	74.9	10.4	27.1	−8.7	−27.1	9.8
Leeds	49	61.2	47.1	73.7	4.1	34.7	14.5	−4.0	32.9
Leic	108	53.7	44.3	62.9	4.6	41.7	−11.5	−23.9	1.0
Liv Ain	35	57.1	40.6	72.3	5.7	37.1	−12.1	−36.2	12.1
Liv Roy	49	67.4	53.2	78.9	10.2	22.5	−3.2	−21.4	14.9
M RI	61	67.2	54.6	77.8	4.9	27.9	8.1	−8.6	24.8
Middlbr	13	69.2	40.9	88.0	0.0	30.8	5.6	−32.3	43.5
Newc	42	50.0	35.3	64.7	4.8	45.2	−9.4	−32.1	13.4
Norwch	30	56.7	38.8	72.9	13.3	30.0	−16.9	−40.0	6.3
Nottm	72	68.1	56.5	77.8	9.7	22.2	−4.0	−19.2	11.2
Oxford	76	67.1	55.8	76.7	6.6	26.3	11.7	−3.3	26.7
Plymth	33	84.9	68.4	93.6	3.0	12.1	33.1	11.2	55.0
Ports	62	56.5	44.0	68.2	9.7	33.9	−2.2	−18.8	14.4
Prestn	46	73.9	59.5	84.6	2.2	23.9	14.3	−4.1	32.7
Redng	62	71.0	58.6	80.9	9.7	19.4	−1.3	−17.0	14.3
Salford	68	54.4	42.6	65.8	2.9	42.7	−1.8	−18.2	14.7
Sheff	52	80.8	67.8	89.3	3.9	15.4	18.5	2.3	34.7
Shrew	25	56.0	36.6	73.7	0.0	44.0	−13.2	−39.6	13.1
Stevng	26	84.6	65.5	94.1	7.7	7.7	26.3	5.0	47.5
Sthend	16	50.0	27.3	72.7	6.3	43.8	−10.0	−44.9	24.9
Stoke	71	67.6	55.9	77.4	9.9	22.5	10.1	−5.2	25.5
Sund	14	50.0	26.0	74.0	7.1	42.9			
Truro	18	77.8	53.5	91.4	0.0	22.2	38.9	9.3	68.5
Wirral	16	31.3	13.6	56.7	25.0	43.8	−13.8	−45.2	17.7
Wolve	71	57.8	46.1	68.6	4.2	38.0	1.3	−14.6	17.2
York	21	57.1	36.0	76.0	4.8	38.1	−14.9	−42.4	12.7

Table 9.6. Continued

Centre	*N*	% phos 1.1–1.7 mmol/L	Lower 95% CI	Upper 95% CI	% phos <1.1 mmol/L	% phos >1.7 mmol/L	Change in % within range from 2013	95% LCL change	95% UCL change
N Ireland									
Antrim	13	61.5	34.4	83.0	7.7	30.8	11.5	−25.7	48.8
Belfast	15	53.3	29.3	75.9	0.0	46.7	−0.5	−32.2	31.2
Newry	14	78.6	50.6	92.9	7.1	14.3	13.9	−17.4	45.1
West NI	11	90.9	56.1	98.7	0.0	9.1	26.6	−3.7	56.9
Scotland									
Abrdn	26	57.7	38.5	74.8	3.9	38.5	7.7	−21.3	36.7
D & Gall	12	50.0	24.4	75.6	8.3	41.7	−13.6	−53.7	26.5
Dundee	21	76.2	54.0	89.7	0.0	23.8	29.1	−0.8	59.0
Edinb	17	76.5	51.5	90.9	5.9	17.7	20.5	−7.6	48.5
Glasgw	35	62.9	46.0	77.1	2.9	34.3	3.9	−18.3	26.1
Inverns	11	63.6	33.9	85.7	9.1	27.3	−9.1	−47.8	29.6
Klmarnk	35	54.3	37.9	69.8	2.9	42.9	−8.9	−31.4	13.7
Krkcldy	13	38.5	17.0	65.6	23.1	38.5	−2.7	−38.0	32.6
Wales									
Bangor	15	46.7	24.1	70.7	13.3	40.0	−20.0	−56.7	16.7
Cardff	71	69.0	57.4	78.7	5.6	25.4	1.3	−14.3	17.0
Clwyd	10	60.0	29.7	84.2	10.0	30.0	−9.2	−48.6	30.2
Swanse	49	59.2	45.1	71.9	8.2	32.7	−8.7	−27.4	9.9
Wrexm	23	56.5	36.3	74.8	0.0	43.5	12.1	−18.5	42.7
England	**2,666**	**62.7**	**60.8**	**64.5**	**7.3**	**30.0**	**0.7**	**−1.9**	**3.3**
N Ireland	**57**	**68.4**	**55.4**	**79.1**	**3.5**	**28.1**	**8.4**	**−8.0**	**24.8**
Scotland	**177**	**61.6**	**54.2**	**68.5**	**5.1**	**33.3**	**4.7**	**−5.3**	**14.8**
Wales	**168**	**61.9**	**54.3**	**68.9**	**6.6**	**31.6**	**−3.3**	**−13.7**	**7.1**
UK	**3,068**	**62.7**	**61.0**	**64.4**	**7.1**	**30.3**	**0.9**	**−1.5**	**3.3**

Blank cells: no data available for 2013

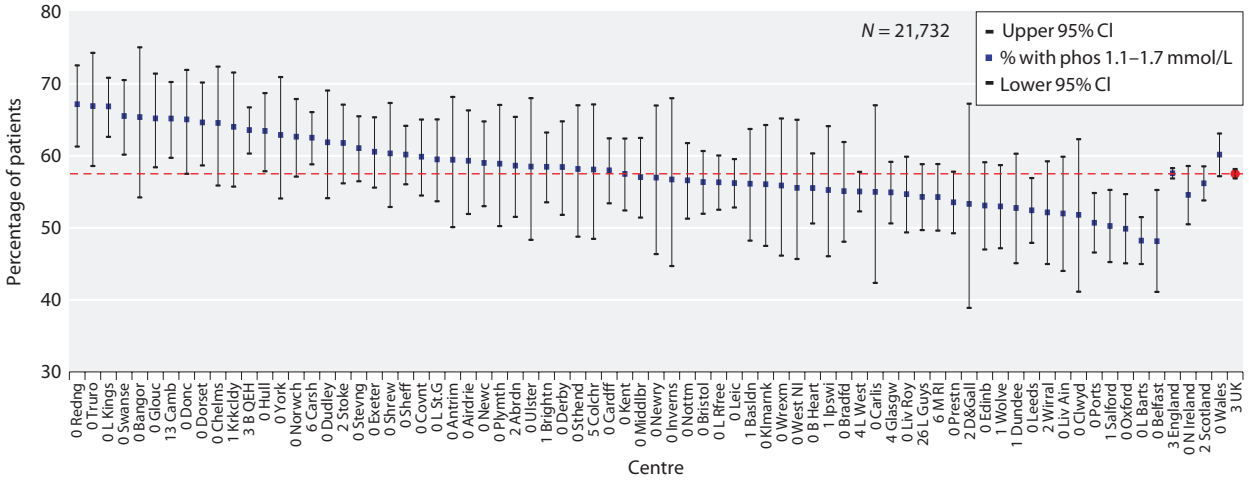

Fig. 9.1. Percentage of haemodialysis patients with phosphate within the range specified by the RA clinical audit measure (1.1–1.7 mmol/L) by centre in 2014

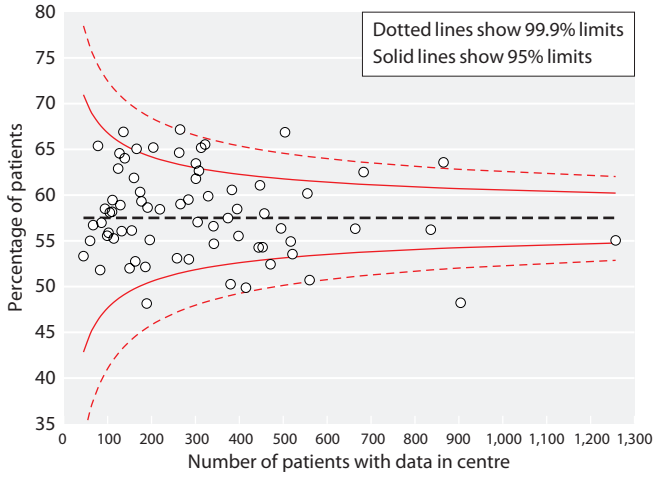

Fig. 9.2. Funnel plot of percentage of haemodialysis patients with phosphate within the range specified by the RA clinical audit measure (1.1–1.7 mmol/L) by centre in 2014

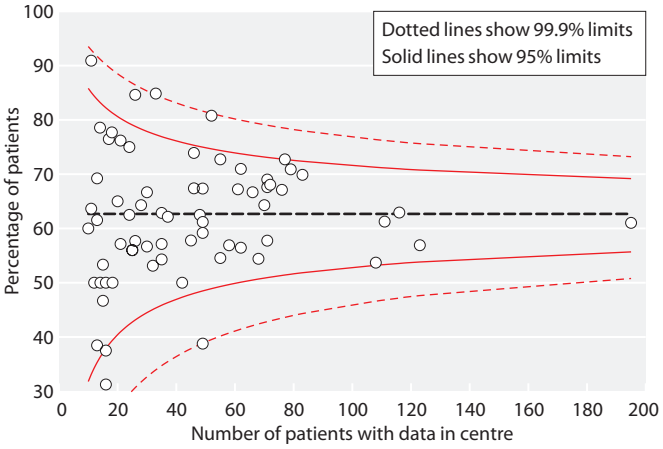

Fig. 9.4. Funnel plot of percentage of peritoneal dialysis patients with phosphate within the range specified by the RA clinical audit measure (1.1–1.7 mmol/L) by centre in 2014

London Guys. However, the Dorset data may be misleading since the centre failed to return locally adjusted calcium results.

Longitudinal changes in the control measures of serum adjusted calcium show improvements in the attained national standards. Hypocalcaemia in HD patients has declined since 2010, with no significant changes being observed in PD patients. In the same time period there has been little change in hypercalcaemia in either modality (figure 9.10).

Parathyroid hormone

At the beginning of 2014 the following RA guideline for PTH applied:

Guideline 4.2.1 CKD-MBD: Target range of serum PTH in patients on dialysis

'We suggest that the target range for parathyroid hormone measured using an intact PTH assay should be between 2 and 9 times the upper limit of normal for the assay used (2C)' [3].

PTH results from 19,354 HD patients and 2,714 PD patients from England, Northern Ireland and Wales were available for analysis from 2014. The data were 93.8% complete for HD patients and 91.7% for PD patients overall, although there was between centre variation (tables 9.11, 9.13).

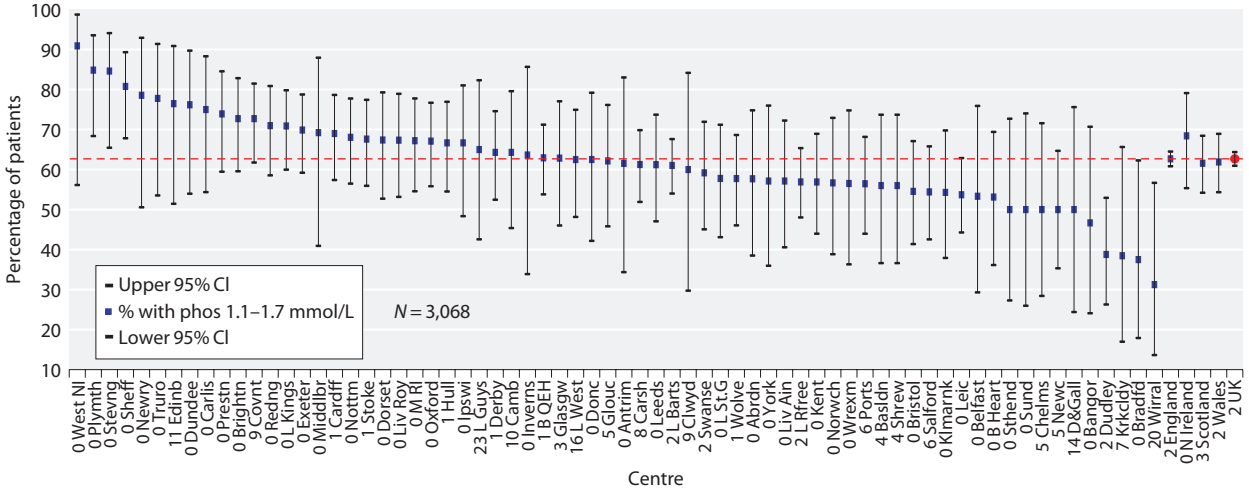

Fig. 9.3. Percentage of peritoneal dialysis patients with phosphate within the range specified by the RA clinical audit measure (1.1–1.7 mmol/L) by centre in 2014

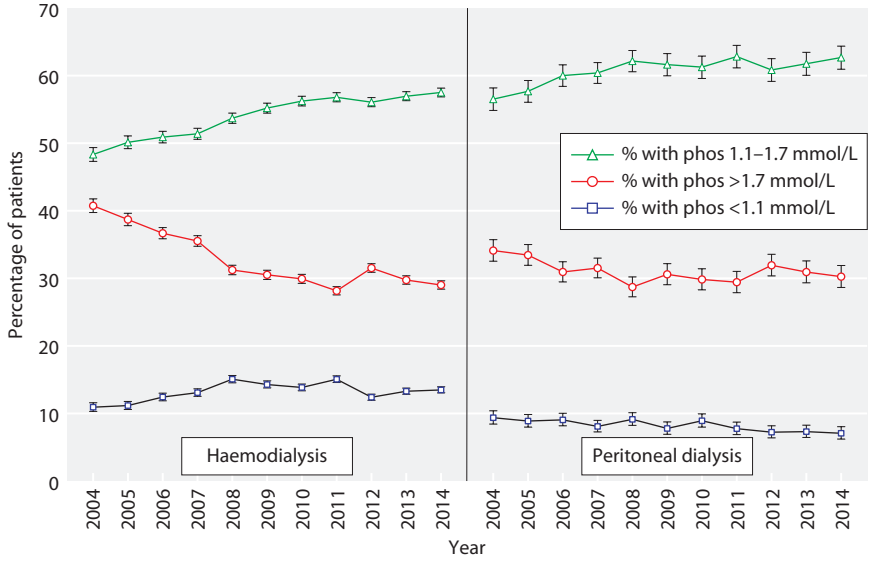

Fig. 9.5. Longitudinal change in percentage of patients with phosphate below, within and above the 2010 RA standard by dialysis modality 2004–2014

Table 9.7. Summary statistics for adjusted calcium in haemodialysis patients in 2014

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart[a]	100.0	398	2.5	0.2	2.5	2.4	2.6
B QEH	99.4	888	2.3	0.2	2.3	2.2	2.4
Basldn	99.4	156	2.4	0.1	2.4	2.3	2.5
Bradfd	100.0	196	2.4	0.2	2.4	2.3	2.5
Brightn	99.3	395	2.3	0.2	2.3	2.2	2.4
Bristol	100.0	495	2.4	0.1	2.4	2.3	2.5
Camb	86.9	313	2.3	0.2	2.3	2.2	2.5
Carlis	100.0	60	2.3	0.2	2.3	2.2	2.4
Carsh	94.2	685	2.3	0.2	2.3	2.2	2.4
Chelms	100.0	127	2.3	0.1	2.3	2.2	2.4
Colchr	94.6	105	2.4	0.1	2.4	2.3	2.5
Covnt[b]	99.7	329	2.3	0.2	2.3	2.2	2.4
Derby	99.6	219	2.5	0.2	2.5	2.4	2.6
Donc	100.0	166	2.4	0.1	2.4	2.3	2.5
Dorset[b]	99.6	263	2.3	0.2	2.3	2.2	2.4
Dudley	100.0	160	2.4	0.2	2.3	2.2	2.5
Exeter	100.0	383	2.3	0.1	2.3	2.2	2.4
Glouc	100.0	204	2.4	0.2	2.4	2.3	2.5
Hull	99.7	301	2.4	0.2	2.4	2.3	2.4
Ipswi	99.1	114	2.4	0.2	2.4	2.3	2.5
Kent	100.0	374	2.4	0.2	2.4	2.3	2.5
L Barts	99.8	903	2.3	0.2	2.3	2.2	2.4
L Guys	73.5	452	2.4	0.2	2.4	2.3	2.5
L Kings	100.0	504	2.3	0.1	2.3	2.2	2.4
L Rfree[c]	100.0	664	2.3	0.2	2.3	2.2	2.4
L St.G	100.0	284	2.3	0.2	2.3	2.2	2.4
L West[b]	76.6	1,005	2.3	0.2	2.3	2.2	2.5
Leeds	99.8	470	2.4	0.2	2.3	2.2	2.4
Leic	99.9	836	2.4	0.2	2.4	2.3	2.5

Table 9.7. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
Liv Ain	100.0	150	2.4	0.2	2.3	2.3	2.5
Liv Roy	99.7	342	2.4	0.2	2.4	2.3	2.5
M RI	93.9	444	2.4	0.2	2.4	2.3	2.5
Middlbr	100.0	305	2.3	0.2	2.3	2.1	2.4
Newc[d]	100.0	266	2.3	0.2	2.3	2.2	2.4
Norwch	99.7	308	2.4	0.2	2.4	2.3	2.5
Nottm	100.0	341	2.4	0.1	2.4	2.3	2.5
Oxford	100.0	415	2.4	0.2	2.3	2.3	2.5
Plymth	98.5	127	2.3	0.2	2.3	2.2	2.4
Ports	98.8	553	2.4	0.2	2.4	2.3	2.5
Prestn	94.2	491	2.3	0.2	2.3	2.2	2.4
Redng	100.0	265	2.3	0.2	2.4	2.3	2.4
Salford	99.5	380	2.3	0.2	2.3	2.3	2.5
Sheff	100.0	555	2.3	0.2	2.3	2.2	2.4
Shrew	100.0	174	2.3	0.2	2.3	2.2	2.4
Stevng	100.0	447	2.3	0.2	2.3	2.2	2.4
Sthend	100.0	110	2.4	0.2	2.4	2.3	2.5
Stoke	97.4	300	2.4	0.2	2.4	2.3	2.5
Sund[b]	100.0	200	2.3	0.2	2.3	2.2	2.4
Truro	100.0	136	2.4	0.2	2.4	2.3	2.5
Wirral	97.9	185	2.3	0.2	2.3	2.2	2.4
Wolve	99.3	285	2.4	0.2	2.4	2.3	2.5
York	100.0	124	2.4	0.1	2.4	2.3	2.5
N Ireland							
Antrim	100.0	111	2.4	0.2	2.4	2.2	2.5
Belfast[b]	100.0	189	2.4	0.2	2.4	2.3	2.5
Newry	100.0	86	2.3	0.2	2.3	2.2	2.4
Ulster	97.9	92	2.4	0.2	2.4	2.3	2.5
West NI	100.0	99	2.3	0.2	2.3	2.2	2.4
Scotland							
Abrdn	98.5	191	2.3	0.2	2.3	2.2	2.4
Airdrie	100.0	177	2.4	0.2	2.3	2.3	2.4
D & Gall	97.8	45	2.3	0.2	2.3	2.2	2.4
Dundee	99.4	164	2.4	0.2	2.4	2.3	2.5
Edinb	99.6	258	2.4	0.2	2.4	2.3	2.5
Glasgw	100.0	540	2.4	0.1	2.4	2.3	2.4
Inverns	100.0	67	2.4	0.2	2.4	2.3	2.5
Klmarnk	100.0	132	2.4	0.2	2.3	2.2	2.5
Krkcldy	100.0	140	2.3	0.2	2.3	2.3	2.4
Wales							
Bangor	100.0	78	2.3	0.2	2.3	2.3	2.4
Cardff	99.8	457	2.4	0.2	2.3	2.2	2.5
Clwyd	100.0	83	2.3	0.2	2.3	2.2	2.5
Swanse	100.0	322	2.3	0.2	2.3	2.2	2.4
Wrexm	100.0	102	2.4	0.2	2.4	2.3	2.5
England	**96.5**	**18,352**	**2.4**	**0.2**	**2.3**	**2.2**	**2.5**
N Ireland	**99.7**	**577**	**2.4**	**0.2**	**2.3**	**2.2**	**2.5**
Scotland	**99.7**	**1,714**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
Wales	**99.9**	**1,042**	**2.3**	**0.2**	**2.3**	**2.2**	**2.4**
UK	**97.0**	**21,685**	**2.4**	**0.2**	**2.3**	**2.2**	**2.5**

[a]Birmingham Heartlands had a change in calcium assay in 2012
[b]These centres supplied unadjusted calcium and were corrected using the formula: adjusted calcium = unadjusted calcium + [(40-albumin) × 0.02]
[c]London Royal Free were using an incorrect equation to adjust for calcium until October 2013 when this was rectified
[d]Newcastle were using an incorrect equation to adjust for calcium until April 2013 when this was rectified

Table 9.8. Percentage of haemodialysis patients within, below and above the range for adjusted calcium (2.2–2.5 mmol/L) in 2014

Centre	*N*	% adjusted Ca 2.2–2.5 mmol/L	Lower 95% CI	Upper 95% CI	% adjusted Ca <2.2 mmol/L	% adjusted Ca >2.5 mmol/L	Change in % within range from 2013	95% LCL change	95% UCL change
England									
B Heart[a]	398	68.3	63.6	72.7	2.8	28.9	3.2	−3.4	9.7
B QEH	888	74.2	71.2	77.0	23.2	2.6	−2.9	−6.9	1.1
Basldn	156	80.8	73.8	86.2	2.6	16.7	−3.3	−11.8	5.2
Bradfd	196	81.1	75.0	86.0	4.6	14.3	0.0	−7.8	7.9
Brightn	395	83.3	79.3	86.7	9.4	7.3	12.5	6.1	18.9
Bristol	495	84.4	81.0	87.4	1.6	13.9	−2.0	−6.4	2.5
Camb	313	73.2	68.0	77.8	16.0	10.9	−9.0	−15.4	−2.7
Carlis	60	80.0	68.0	88.3	15.0	5.0	14.5	−1.4	30.4
Carsh	685	77.2	73.9	80.2	15.6	7.2	−3.8	−8.1	0.5
Chelms	127	85.0	77.7	90.3	11.8	3.2	−3.1	−11.8	5.5
Colchr	105	93.3	86.7	96.8	0.0	6.7	0.3	−6.6	7.1
Covnt[b]	329	78.7	74.0	82.8	11.6	9.7	3.0	−3.3	9.3
Derby	219	72.2	65.8	77.7	1.8	26.0	−2.1	−10.6	6.4
Donc	166	86.8	80.7	91.1	6.0	7.2	−4.3	−11.3	2.6
Dorset[b]	263	81.8	76.6	86.0	13.7	4.6	−0.6	−7.3	6.1
Dudley	160	79.4	72.4	85.0	11.9	8.8	−1.4	−10.2	7.4
Exeter	383	88.8	85.2	91.6	2.6	8.6	0.5	−4.1	5.0
Glouc	204	83.8	78.1	88.3	7.4	8.8	1.7	−5.7	9.1
Hull	301	84.7	80.2	88.4	4.7	10.6	5.1	−1.0	11.2
Ipswi	114	82.5	74.4	88.4	2.6	14.9	6.3	−4.2	16.9
Kent	374	77.0	72.5	81.0	6.7	16.3	6.4	0.1	12.8
L Barts	903	73.1	70.1	75.9	16.7	10.2	2.2	−2.0	6.3
L Guys	452	81.6	77.8	84.9	5.8	12.6	5.2	−0.1	10.5
L Kings	504	82.5	79.0	85.6	14.9	2.6	−5.9	−10.3	−1.5
L Rfree[c]	664	79.1	75.8	82.0	13.3	7.7	−6.8	−10.9	−2.7
L St.G	284	82.4	77.5	86.4	9.5	8.1	3.2	−3.5	9.8
L West[b]	1,005	71.5	68.7	74.3	15.6	12.8	3.7	−0.1	7.5
Leeds	470	79.4	75.5	82.8	8.1	12.6	−1.7	−6.8	3.3
Leic	836	79.7	76.8	82.3	7.3	13.0	1.4	−2.5	5.3
Liv Ain	150	80.0	72.8	85.7	6.0	14.0	−2.3	−11.2	6.6
Liv Roy	342	80.7	76.2	84.5	7.0	12.3	3.0	−3.1	9.1
M RI	444	76.6	72.4	80.3	10.6	12.8	−1.4	−6.9	4.0
Middlbr	305	67.5	62.1	72.6	28.5	3.9	−0.8	−8.2	6.5
Newc[d]	266	79.7	74.4	84.1	14.3	6.0	−8.2	−14.5	−2.0
Norwch	308	79.2	74.3	83.4	2.9	17.9	6.6	−0.2	13.3
Nottm	341	85.3	81.2	88.7	5.0	9.7	7.4	1.6	13.1
Oxford	415	79.8	75.6	83.4	10.1	10.1	−0.7	−6.2	4.8
Plymth	127	80.3	72.5	86.3	11.0	8.7	2.8	−7.4	13.0
Ports	553	80.1	76.6	83.2	8.1	11.8	1.6	−3.2	6.4
Prestn	491	79.2	75.4	82.6	16.3	4.5	0.4	−4.7	5.5
Redng	265	88.3	83.8	91.7	7.9	3.8	4.1	−1.8	10.0
Salford	380	80.5	76.2	84.2	10.3	9.2	0.4	−5.5	6.3
Sheff	555	80.5	77.0	83.6	11.4	8.1	0.7	−4.0	5.4
Shrew	174	81.0	74.5	86.2	10.3	8.6	−1.3	−9.4	6.9
Stevng	447	85.9	82.4	88.8	7.4	6.7	4.2	−0.7	9.1
Sthend	110	77.3	68.5	84.2	8.2	14.6	5.5	−6.0	16.9
Stoke	300	81.0	76.2	85.1	8.3	10.7	−2.6	−9.2	3.9
Sund[b]	200	74.5	68.0	80.1	16.5	9.0	−0.2	−9.0	8.6
Truro	136	78.7	71.0	84.8	7.4	14.0	−2.6	−12.1	6.8
Wirral	185	78.4	71.9	83.7	12.4	9.2	−5.0	−12.9	3.0
Wolve	285	74.0	68.6	78.8	3.5	22.5	−3.2	−10.3	3.9
York	124	82.3	74.5	88.0	1.6	16.1	−10.0	−18.1	−1.8

Table 9.8. Continued

Centre	*N*	% adjusted Ca 2.2–2.5 mmol/L	Lower 95% CI	Upper 95% CI	% adjusted Ca <2.2 mmol/L	% adjusted Ca >2.5 mmol/L	Change in % within range from 2013	95% LCL change	95% UCL change
N Ireland									
Antrim	111	78.4	69.8	85.1	9.0	12.6	9.2	−2.1	20.5
Belfast[b]	189	80.4	74.2	85.5	6.4	13.2	3.8	−4.4	11.9
Newry	86	75.6	65.4	83.5	17.4	7.0	−8.6	−20.6	3.5
Ulster	92	73.9	64.0	81.9	3.3	22.8	−8.6	−20.2	3.0
West NI	99	79.8	70.8	86.6	12.1	8.1	−1.5	−12.3	9.3
Scotland									
Abrdn	191	81.7	75.6	86.5	11.0	7.3			
Airdrie	177	85.9	79.9	90.3	6.2	7.9			
D & Gall	45	82.2	68.3	90.9	11.1	6.7			
Dundee	164	82.9	76.4	87.9	6.7	10.4			
Edinb	258	68.6	62.7	74.0	6.6	24.8			
Glasgw	540	88.7	85.8	91.1	4.4	6.9			
Inverns	67	74.6	62.9	83.6	7.5	17.9			
Klmarnk	132	77.3	69.4	83.6	10.6	12.1			
Krkcldy	140	81.4	74.1	87.0	9.3	9.3			
Wales									
Bangor	78	85.9	76.3	92.0	9.0	5.1	0.2	−10.6	10.9
Cardff	457	78.1	74.1	81.7	11.4	10.5	7.2	1.6	12.8
Clwyd	83	73.5	63.0	81.9	13.3	13.3	−9.8	−22.7	3.0
Swanse	322	77.0	72.1	81.3	15.2	7.8	4.7	−2.1	11.4
Wrexm	102	77.5	68.3	84.5	4.9	17.7	2.5	−9.4	14.3
England	**18,352**	**79.0**	**78.4**	**79.6**	**10.6**	**10.4**	**0.5**	**−0.3**	**1.3**
N Ireland	**577**	**78.2**	**74.6**	**81.4**	**9.0**	**12.8**	**0.2**	**−4.6**	**4.9**
Scotland	**1,714**	**81.9**	**80.0**	**83.6**	**7.1**	**11.1**			
Wales	**1,042**	**77.9**	**75.3**	**80.3**	**11.9**	**10.2**	**4.1**	**0.4**	**7.8**
UK	**21,685**	**79.1**	**78.6**	**79.7**	**10.4**	**10.5**	**0.9**	**0.1**	**1.7**

Blank cells: no data available for 2013
[a]Birmingham Heartlands had a change in calcium assay in 2012
[b]These centres supplied unadjusted calcium and were corrected using the formula: adjusted calcium = unadjusted calcium + [(40-albumin) × 0.02]
[c]London Royal Free were using an incorrect equation to adjust for calcium until October 2013 when this was rectified
[d]Newcastle were using an incorrect equation to adjust for calcium until April 2013 when this was rectified

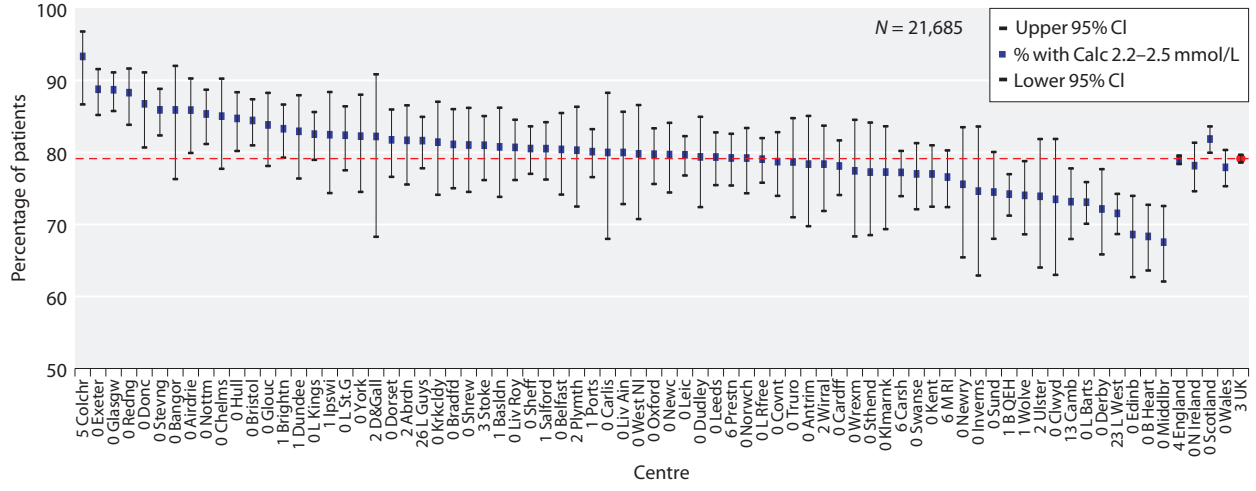

Fig. 9.6. Percentage of haemodialysis patients with adjusted calcium within range (2.2–2.5 mmol/L) by centre in 2014

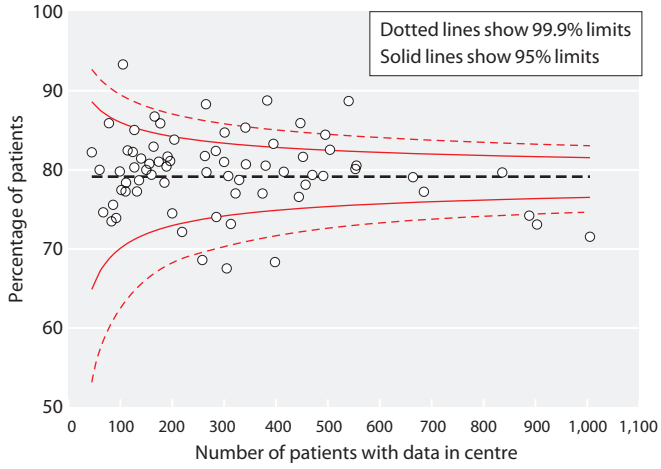

Fig. 9.7. Funnel plot of percentage of haemodialysis patients with adjusted calcium within range (2.2–2.5 mmol/L) by centre in 2014

From 2004 to 2014 across the three countries, data completeness for PTH increased from 76.6% to 93.8% in HD patients and from 80.1% to 91.7% in PD patients.

Median PTH among HD patients was 30 pmol/L (IQR 15–55 pmol/l) and among PD patients was 30 pmol/L (IQR 17–51 pmol/L) for the three countries.

Of HD patients, 57.4% (95% CI 56.7–58.1%) and of PD patients, 65.0% (95% CI 63.1–66.7%) achieved a PTH between 16–72 pmol/L (tables 9.12, 9.14, figures 9.11–9.14).

In 2014, the proportion of HD patients with a PTH above the upper limit of the range (>72 pmol/L) was 16.4% and the proportion below the lower limit of the range (<16 pmol/L) was 26.2%.

The proportion of PD patients with PTH above the upper limit (>72 pmol/L) of the range was 12.0% and

Table 9.9. Summary statistics for adjusted calcium in peritoneal dialysis patients in 2014

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart[a]	100.0	32	2.5	0.1	2.5	2.4	2.5
B QEH	100.0	117	2.4	0.2	2.3	2.2	2.4
Basldn	96.2	25	2.5	0.2	2.5	2.4	2.5
Bradfd	93.8	15	2.4	0.2	2.4	2.3	2.5
Brightn	100.0	55	2.4	0.1	2.4	2.3	2.5
Bristol	100.0	55	2.5	0.2	2.5	2.4	2.5
Camb	90.3	28	2.3	0.2	2.4	2.2	2.4
Carlis	100.0	24	2.2	0.2	2.3	2.2	2.3
Carsh	92.5	111	2.3	0.2	2.3	2.2	2.4
Chelms	100.0	19	2.5	0.1	2.5	2.3	2.5
Colchr[b]							
Covnt[c]	95.3	81	2.3	0.2	2.3	2.2	2.4
Derby	100.0	71	2.5	0.2	2.5	2.4	2.6
Donc	100.0	24	2.4	0.2	2.4	2.3	2.5
Dorset[c]	100.0	46	2.3	0.1	2.3	2.2	2.4
Dudley	98.0	49	2.5	0.2	2.4	2.4	2.5
Exeter	100.0	83	2.4	0.1	2.4	2.3	2.5
Glouc	94.9	37	2.4	0.2	2.4	2.3	2.4
Hull	98.5	66	2.4	0.2	2.4	2.3	2.5
Ipswi	100.0	30	2.3	0.2	2.4	2.2	2.4
Kent	100.0	58	2.4	0.2	2.5	2.3	2.6
L Barts	98.0	195	2.3	0.2	2.3	2.2	2.4
L Guys	76.9	20	2.4	0.1	2.3	2.3	2.4
L Kings	100.0	79	2.3	0.1	2.2	2.2	2.3
L Rfree[d]	98.4	123	2.3	0.2	2.3	2.3	2.4
L St.G	100.0	45	2.4	0.1	2.4	2.3	2.5
L West[c]	84.2	48	2.5	0.2	2.5	2.4	2.7
Leeds	100.0	49	2.4	0.1	2.3	2.3	2.5
Leic	100.0	108	2.4	0.2	2.4	2.3	2.5
Liv Ain	100.0	35	2.3	0.2	2.3	2.2	2.4
Liv Roy	100.0	49	2.4	0.2	2.4	2.3	2.4

Table 9.9. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
M RI	100.0	61	2.4	0.2	2.4	2.3	2.5
Middlbr	100.0	13	2.3	0.2	2.3	2.2	2.4
Newc[e]	95.5	42	2.3	0.2	2.3	2.2	2.4
Norwch	100.0	30	2.5	0.2	2.5	2.4	2.6
Nottm	98.6	71	2.4	0.2	2.4	2.3	2.5
Oxford	100.0	76	2.4	0.2	2.4	2.3	2.5
Plymth	100.0	33	2.4	0.1	2.3	2.3	2.5
Ports	93.9	62	2.4	0.2	2.4	2.3	2.4
Prestn	100.0	46	2.3	0.2	2.3	2.2	2.4
Redng	100.0	62	2.4	0.1	2.4	2.3	2.5
Salford	94.4	68	2.4	0.2	2.4	2.3	2.5
Sheff	100.0	52	2.4	0.2	2.3	2.3	2.5
Shrew	96.2	25	2.4	0.1	2.4	2.3	2.4
Stevng	100.0	26	2.3	0.1	2.3	2.3	2.4
Sthend	100.0	16	2.4	0.2	2.4	2.3	2.5
Stoke	98.6	71	2.4	0.2	2.4	2.3	2.5
Sund[c]	100.0	14	2.3	0.2	2.4	2.2	2.4
Truro	100.0	18	2.4	0.2	2.4	2.3	2.5
Wirral	80.0	16	2.3	0.1	2.3	2.2	2.4
Wolve	98.6	71	2.4	0.2	2.4	2.3	2.5
York	100.0	21	2.4	0.1	2.4	2.3	2.4
N Ireland							
Antrim	100.0	13	2.4	0.1	2.4	2.4	2.5
Belfast[c]	100.0	15	2.3	0.2	2.3	2.3	2.5
Newry	100.0	14	2.4	0.2	2.4	2.3	2.5
Ulster	100.0	4					
West NI	100.0	11	2.3	0.1	2.3	2.2	2.4
Scotland							
Abrdn	100.0	26	2.3	0.2	2.3	2.2	2.3
Airdrie	100.0	7					
D & Gall	100.0	14	2.4	0.2	2.3	2.3	2.5
Dundee	100.0	21	2.4	0.2	2.3	2.3	2.5
Edinb	100.0	19	2.5	0.2	2.5	2.4	2.6
Glasgw	100.0	36	2.3	0.2	2.3	2.2	2.5
Inverns	100.0	11	2.4	0.1	2.4	2.2	2.5
Klmarnk	100.0	35	2.4	0.2	2.4	2.2	2.5
Krkcldy	92.9	13	2.4	0.2	2.4	2.3	2.4
Wales							
Bangor	100.0	15	2.4	0.2	2.4	2.2	2.5
Cardff	98.6	71	2.4	0.2	2.4	2.3	2.5
Clwyd	90.9	10	2.4	0.2	2.5	2.4	2.5
Swanse	98.0	49	2.3	0.1	2.3	2.3	2.4
Wrexm	100.0	23	2.4	0.1	2.4	2.3	2.5
England	**97.8**	**2,671**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
N Ireland	**100.0**	**57**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
Scotland	**99.5**	**182**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
Wales	**98.3**	**168**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**
UK	**97.9**	**3,078**	**2.4**	**0.2**	**2.4**	**2.3**	**2.5**

Blank cells: centres excluded from the analysis due to low patient numbers
[a]Birmingham Heartlands had a change in calcium assay in 2012
[b]No PD patients
[c]These centres supplied unadjusted calcium and were corrected using the formula: adjusted calcium = unadjusted calcium + [(40-albumin) × 0.02]
[d]London Royal Free were using an incorrect equation to adjust for calcium until October 2013 when this was rectified
[e]Newcastle were using an incorrect equation to adjust for calcium until April 2013 when this was rectified

Table 9.10. Percentage of peritoneal dialysis patients within, below and above the range for adjusted calcium (2.2–2.5 mmol/L) in 2014

Centre	*N*	% adjusted Ca 2.2–2.5 mmol/L	Lower 95% CI	Upper 95% CI	% adjusted Ca <2.2 mmol/L	% adjusted Ca >2.5 mmol/L	Change in % within range from 2013	95% LCL change	95% UCL change
England									
B Heart[a]	32	84.4	67.5	93.3	0.0	15.6	−3.9	−20.5	12.7
B QEH	117	82.9	75.0	88.7	7.7	9.4	5.4	−4.5	15.3
Basldn	25	80.0	60.0	91.4	0.0	20.0	3.3	−18.5	25.1
Bradfd	15	86.7	59.5	96.6	6.7	6.7	10.7	−13.3	34.7
Brightn	55	83.6	71.4	91.3	1.8	14.6	−2.7	−15.5	10.1
Bristol	55	74.6	61.5	84.3	1.8	23.6	−9.7	−24.6	5.2
Camb	28	82.1	63.6	92.4	14.3	3.6	9.9	−15.2	35.0
Carlis	24	75.0	54.4	88.3	25.0	0.0	−7.6	−30.8	15.6
Carsh	111	80.2	71.7	86.6	17.1	2.7	1.2	−9.7	12.1
Chelms	19	89.5	66.3	97.4	0.0	10.5	−10.5	−24.3	3.3
Covnt[b]	81	77.8	67.5	85.5	17.3	4.9	−9.5	−21.5	2.4
Derby	71	67.6	55.9	77.4	2.8	29.6	−1.7	−16.8	13.4
Donc	24	83.3	63.1	93.6	4.2	12.5	−3.3	−22.6	15.9
Dorset[b]	46	93.5	81.6	97.9	2.2	4.4	1.8	−9.7	13.3
Dudley	49	75.5	61.7	85.5	2.0	22.5	−7.5	−23.6	8.7
Exeter	83	90.4	81.9	95.1	0.0	9.6	1.5	−8.6	11.5
Glouc	37	83.8	68.3	92.5	8.1	8.1	−3.3	−20.1	13.4
Hull	66	77.3	65.7	85.8	9.1	13.6	−0.5	−14.5	13.4
Ipswi	30	73.3	55.0	86.1	10.0	16.7	6.7	−18.0	31.3
Kent	58	67.2	54.3	78.0	5.2	27.6	8.3	−9.4	26.0
L Barts	195	75.9	69.4	81.4	14.9	9.2	5.6	−3.4	14.7
L Guys	20	100.0	0.0	100.0	0.0	0.0	20.8	4.6	37.1
L Kings	79	77.2	66.7	85.2	21.5	1.3	−8.7	−20.7	3.4
L Rfree[c]	123	81.3	73.4	87.3	13.8	4.9	−3.1	−12.8	6.6
L St.G	45	86.7	73.4	93.9	2.2	11.1	11.1	−4.9	27.1
L West[b]	48	56.3	42.1	69.5	2.1	41.7	10.1	−9.4	29.6
Leeds	49	91.8	80.2	96.9	2.0	6.1	16.0	2.9	29.2
Leic	108	82.4	74.1	88.5	4.6	13.0	1.3	−8.5	11.2
Liv Ain	35	71.4	54.6	83.9	14.3	14.3	−9.3	−30.6	12.0
Liv Roy	49	81.6	68.3	90.2	4.1	14.3	−4.6	−19.0	9.7
M RI	61	77.1	64.9	85.9	6.6	16.4	2.8	−12.1	17.7
Middlbr	13	69.2	40.9	88.0	23.1	7.7	−21.7	−52.0	8.6
Newc[d]	42	78.6	63.7	88.5	14.3	7.1	6.7	−13.2	26.6
Norwch	30	60.0	42.0	75.7	6.7	33.3	−1.8	−25.7	22.2
Nottm	71	73.2	61.8	82.2	7.0	19.7	−7.6	−21.5	6.3
Oxford	76	84.2	74.2	90.8	2.6	13.2	9.5	−2.9	21.9
Plymth	33	90.9	75.3	97.0	6.1	3.0	18.5	−0.5	37.5
Ports	62	85.5	74.4	92.3	4.8	9.7	0.2	−11.7	12.0
Prestn	46	76.1	61.8	86.2	15.2	8.7	1.1	−16.0	18.1
Redng	62	87.1	76.3	93.4	1.6	11.3	−0.6	−12.1	11.0
Salford	68	80.9	69.8	88.6	4.4	14.7	4.2	−9.3	17.6
Sheff	52	88.5	76.6	94.7	3.9	7.7	6.5	−6.5	19.5
Shrew	25	92.0	73.1	98.0	4.0	4.0	22.8	2.1	43.5
Stevng	26	88.5	69.7	96.2	11.5	0.0	2.0	−14.5	18.5
Sthend	16	75.0	49.2	90.3	0.0	25.0	−5.0	−34.3	24.3
Stoke	71	77.5	66.3	85.7	4.2	18.3	8.4	−6.0	22.9
Sund[b]	14	64.3	37.6	84.3	21.4	14.3			
Truro	18	77.8	53.5	91.4	0.0	22.2	0.0	−27.2	27.2
Wirral	16	87.5	61.4	96.9	6.3	6.3	7.5	−16.4	31.4
Wolve	71	74.7	63.3	83.4	7.0	18.3	−10.0	−22.9	2.9
York	21	90.5	68.9	97.6	0.0	9.5	6.5	−12.6	25.6

Table 9.10. Continued

Centre	*N*	% adjusted Ca 2.2–2.5 mmol/L	Lower 95% CI	Upper 95% CI	% adjusted Ca <2.2 mmol/L	% adjusted Ca >2.5 mmol/L	Change in % within range from 2013	95% LCL change	95% UCL change
N Ireland									
Antrim	13	76.9	47.9	92.4	0.0	23.1	15.4	−19.6	50.4
Belfast[b]	15	73.3	46.7	89.6	13.3	13.3	−11.3	−37.6	15.0
Newry	14	71.4	44.0	88.9	7.1	21.4	−22.7	−48.9	3.5
West NI	11	90.9	56.1	98.7	0.0	9.1	12.3	−15.1	39.7
Scotland									
Abrdn	26	69.2	49.5	83.8	23.1	7.7			
D & Gall	14	78.6	50.6	92.9	7.1	14.3			
Dundee	21	76.2	54.0	89.7	4.8	19.1			
Edinb	19	73.7	50.2	88.6	0.0	26.3			
Glasgw	36	83.3	67.5	92.3	5.6	11.1			
Inverns	11	90.9	56.1	98.7	0.0	9.1			
Klmarnk	35	68.6	51.7	81.7	14.3	17.1			
Krkcldy	13	92.3	60.9	98.9	0.0	7.7			
Wales									
Bangor	15	73.3	46.7	89.6	13.3	13.3	−10.0	−40.8	20.8
Cardff	71	78.9	67.9	86.8	5.6	15.5	23.5	8.1	38.9
Clwyd	10	80.0	45.9	95.0	0.0	20.0	3.1	−30.7	36.8
Swanse	49	85.7	72.9	93.0	6.1	8.2	0.8	−12.9	14.5
Wrexm	23	91.3	71.1	97.8	0.0	8.7	19.1	−4.6	42.8
England	**2,671**	**79.8**	**78.3**	**81.3**	**7.8**	**12.4**	**1.3**	**−0.9**	**3.5**
N Ireland	**57**	**75.4**	**62.7**	**84.9**	**7.0**	**17.5**	**−4.3**	**−18.7**	**10.2**
Scotland	**182**	**76.9**	**70.3**	**82.5**	**8.2**	**14.8**			
Wales	**168**	**82.1**	**75.6**	**87.2**	**5.4**	**12.5**	**11.3**	**2.2**	**20.4**
UK	**3,078**	**79.7**	**78.2**	**81.1**	**7.7**	**12.6**	**1.6**	**−0.5**	**3.6**

[a]Birmingham Heartlands had a change in calcium assay in 2012
[b]These centres supplied unadjusted calcium and were corrected using the formula: adjusted calcium = unadjusted calcium + [(40-albumin) × 0.02]
[c]London Royal Free were using an incorrect equation to adjust for calcium until October 2013 when this was rectified
[d]Newcastle were using an incorrect equation to adjust for calcium until April 2013 when this was rectified

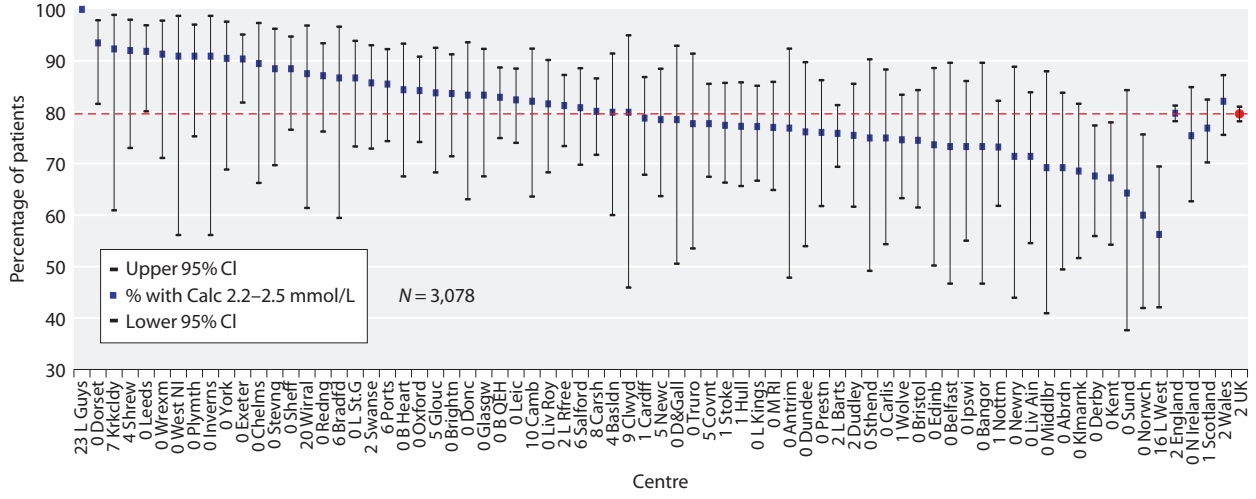

Fig. 9.8. Percentage of peritoneal dialysis patients with adjusted calcium within range (2.2–2.5 mmol/L) by centre in 2014

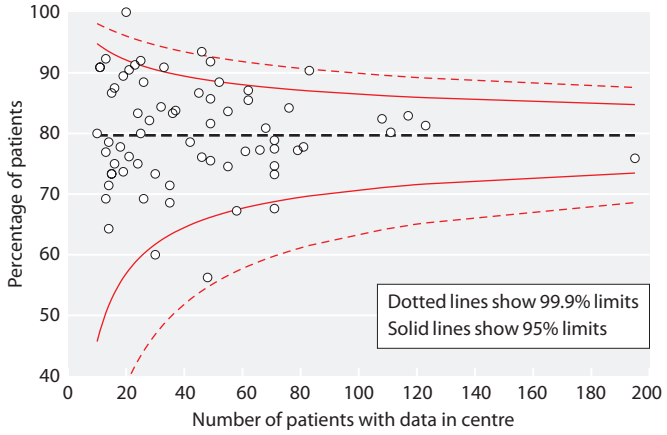

Fig. 9.9. Funnel plot of percentage of peritoneal dialysis patients with adjusted calcium within range (2.2–2.5 mmol/L) by centre in 2014

the proportion below the lower limit of the range (<16 pmol/L) was 23.1% (tables 9.12, 9.14).

There was significant variation by centre following unadjusted analyses for the proportion of patients below, within and above the range specified by the clinical performance measures. The funnel plot (figure 9.12) for HD patients showed above average achievement of the target range in Antrim, Doncaster, Derby, Kent, Stevenage and London Barts and below average achievement for Liverpool Aintree, Exeter, Leicester and London West. For PD patients (figure 9.14) there were no outliers.

Longitudinal analysis of PTH control measures at the level of the three countries noted sustained reduction in the proportion of patients with low PTH levels (<16 pmol/L) in HD and PD patients. Similarly, there has been a corresponding increase in the fraction of HD and PD patients with PTH levels being maintained within the 16–72 pmol/L range. The fraction of patients with PTH above range (>72 pmol/L) increased from 13.9% in 2004 to 16.4%in 2014 in HD and decreased from 13.3% to 12.0% in PD (figure 9.15).

Simultaneous control of adjusted calcium, phosphate and PTH in preventing severe hyperparathyroidism

Biochemical results to perform the bone mineral disease (BMD) combination analyses were available from 61 HD and 58 PD centres, covering 18,896 HD and 2,676 PD patients, from England, Wales and Northern Ireland in 2014.

Tables 9.15 and 9.16 identify each centre and detail the numbers of patients who had received HD and PD and the results of the BMD combination analyses.

Figures 9.16 and 9.17 demonstrate the caterpillar plots of all centres and the percentage achievement of simultaneous control of all three BMD parameters for HD and PD patients respectively.

Control of none of the parameters of BMD was found in 1.8% of HD and 1.8% of PD patients across England, Wales and Northern Ireland. Control of one parameter was reported in 12.7% of HD and 10.8% of PD patients; of two parameters in 35.2% of HD and 35.0% of PD

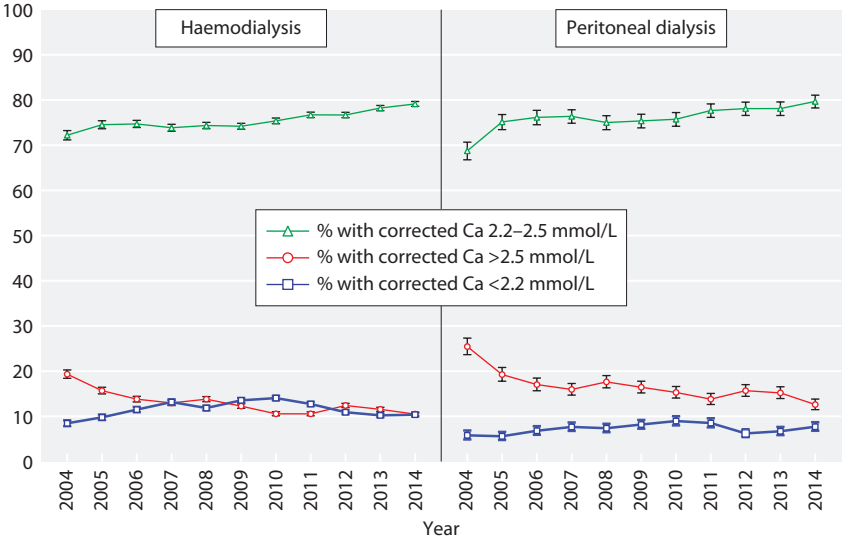

Fig. 9.10. Longitudinal change in percentage of patients with adjusted calcium <2.2 mmol/L, 2.2–2.5 mmol/L and >2.5 mmol/L by dialysis modality 2004–2014

Table 9.11. Summary statistics for PTH in haemodialysis patients in 2014

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	99.8	397	41.9	44.2	28	15	57
B QEH	96.8	864	41.3	40.4	31	15	55
Basldn	100.0	157	38.4	38.0	27	12	47
Bradfd	97.5	191	38.7	40.9	26	14	48
Brightn	97.5	388	46.6	50.3	30	15	61
Bristol	98.4	487	36.7	38.2	26	13	47
Camb	65.0	234	26.6	26.7	21	7	37
Carlis	98.3	59	25.5	25.6	18	9	33
Carsh	90.8	660	59.7	56.0	44	23	74
Chelms	98.4	125	44.5	34.0	37	22	57
Colchr	91.9	102	27.8	27.5	23	12	33
Covnt	98.2	324	37.4	41.2	25	12	45
Derby	99.6	219	34.3	25.5	29	18	44
Donc	100.0	166	49.1	42.8	36	24	62
Dorset	98.1	259	28.0	35.0	18	10	33
Dudley	95.6	153	31.1	34.1	21	10	36
Exeter	99.5	381	22.7	32.0	14	7	28
Glouc	100.0	204	39.7	43.5	27	15	48
Hull	96.4	291	44.8	48.8	31	13	58
Ipswi	99.1	114	34.5	44.9	22	11	38
Kent	98.9	370	54.2	50.0	38	19	67
L Barts	99.0	896	45.0	44.1	36	19	56
L Guys	64.4	396	51.4	53.0	36	17	69
L Kings	97.6	492	43.5	44.5	29	13	55
L Rfree	99.6	661	43.4	38.9	32	17	59
L St.G	95.4	271	59.3	51.1	45	21	81
L West	74.5	977	65.5	65.6	45	22	87
Leeds	99.4	468	38.5	38.3	25	13	51
Leic	96.9	811	42.1	43.5	29	12	60
Liv Ain	98.0	147	21.6	23.4	14	6	27
Liv Roy	96.2	330	36.8	36.2	25	13	48
M RI	88.0	416	46.6	46.4	33	17	63
Middlbr	94.1	287	51.8	46.0	38	21	70
Newc	100.0	266	47.6	41.4	35	20	61
Norwch	95.8	296	35.2	33.5	26	14	48
Nottm	99.7	340	40.3	43.3	29	15	50
Oxford	98.1	407	47.6	41.6	36	18	63
Plymth	96.9	125	37.5	39.4	28	12	42
Ports	95.7	536	47.5	45.4	35	17	60
Prestn	99.8	520	43.1	41.6	31	15	54
Redng	100.0	265	44.6	43.4	37	19	58
Salford	98.7	377	45.1	43.6	31	17	58
Sheff	99.3	551	40.1	39.0	31	17	51
Shrew	98.9	172	39.7	42.7	29	10	57
Stevng	98.2	439	42.1	32.9	38	19	57
Sthend	96.4	106	55.0	55.9	37	20	63
Stoke	78.6	242	45.1	37.8	34	19	62
Sund	96.0	192	41.3	42.5	27	12	57
Truro	99.3	135	22.7	24.8	16	7	28
Wirral	97.9	185	36.8	28.4	29	16	51
Wolve	97.6	280	44.3	53.8	26	13	53
York	94.4	117	25.5	29.6	16	7	36

Table 9.11. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
N Ireland							
Antrim	100.0	111	35.6	41.0	25	16	42
Belfast	97.9	185	28.7	42.9	17	8	35
Newry	98.8	85	29.9	34.2	22	13	39
Ulster	100.0	94	24.7	22.0	20	8	30
West NI	100.0	99	34.2	33.4	27	11	46
Wales							
Bangor	100.0	78	29.1	25.7	21	12	40
Cardff	98.3	450	46.3	44.9	35	17	59
Clwyd	96.4	80	37.3	34.7	26	12	53
Swanse	70.8	228	39.7	39.0	32	17	49
Wrexm	94.1	96	26.3	25.5	20	9	35
England	**93.8**	**17,848**	**43.6**	**44.8**	**30**	**15**	**57**
N Ireland	**99.1**	**574**	**30.5**	**37.0**	**21**	**10**	**38**
Wales	**89.4**	**932**	**40.4**	**40.2**	**30**	**15**	**51**
E, W & NI	**93.8**	**19,354**	**43.1**	**44.4**	**30**	**15**	**55**

Table 9.12. Percentage of haemodialysis patients within, below and above the range for PTH (16–72 pmol/L) in 2014

Centre	*N*	% PTH 16–72 pmol/L	Lower 95% CI	Upper 95% CI	% PTH <16 pmol/L	% PTH >72 pmol/L	Change in % within range from 2013	95% LCL change	95% UCL change
England									
B Heart	397	55.4	50.5	60.2	27.5	17.1	−0.8	−7.7	6.1
B QEH	864	60.2	56.9	63.4	25.5	14.4	0.7	−4.0	5.4
Basldn	157	58.6	50.8	66.0	28.7	12.7	−9.2	−19.9	1.6
Bradfd	191	56.0	48.9	62.9	30.9	13.1	4.1	−6.0	14.2
Brightn	388	55.7	50.7	60.5	25.8	18.6	−1.1	−8.6	6.3
Bristol	487	59.1	54.7	63.4	28.5	12.3	1.8	−4.4	8.0
Camb	234	54.7	48.3	61.0	39.7	5.6	−4.8	−13.6	3.9
Carlis	59	50.9	38.3	63.3	42.4	6.8	−8.8	−26.8	9.2
Carsh	660	57.1	53.3	60.9	16.4	26.5	−0.6	−6.3	5.1
Chelms	125	69.6	61.0	77.0	14.4	16.0	2.3	−9.6	14.2
Colchr	102	58.8	49.1	67.9	34.3	6.9	9.8	−3.9	23.5
Covnt	324	51.5	46.1	57.0	34.6	13.9	−4.1	−11.6	3.5
Derby	219	75.8	69.7	81.0	18.7	5.5	3.2	−5.2	11.5
Donc	166	74.7	67.5	80.7	9.6	15.7	2.8	−7.1	12.6
Dorset	259	50.2	44.1	56.3	42.5	7.3	0.0	−8.8	8.8
Dudley	153	52.3	44.4	60.1	39.2	8.5	−6.5	−17.7	4.7
Exeter	381	42.3	37.4	47.3	53.0	4.7	−0.1	−7.2	7.0
Glouc	204	59.8	52.9	66.3	27.0	13.2	−5.3	−14.8	4.3
Hull	291	53.6	47.9	59.3	28.5	17.9	0.4	−7.8	8.5

Table 9.12. Continued

Centre	*N*	% PTH 16–72 pmol/L	Lower 95% CI	Upper 95% CI	% PTH <16 pmol/L	% PTH >72 pmol/L	Change in % within range from 2013	95% LCL change	95% UCL change
Ipswi	114	58.8	49.5	67.4	31.6	9.7	9.2	−3.7	22.1
Kent	370	66.2	61.2	70.9	12.2	21.6	−0.3	−7.1	6.5
L Barts	896	65.5	62.3	68.6	19.3	15.2	8.2	3.7	12.8
L Guys	396	53.0	48.1	57.9	23.5	23.5	3.7	−3.1	10.5
L Kings	492	51.6	47.2	56.0	29.5	18.9	2.0	−4.4	8.3
L Rfree	661	62.0	58.3	65.7	21.5	16.5	1.1	−4.1	6.4
L St.G	271	50.6	44.6	56.5	17.7	31.7	−3.9	−12.4	4.7
L West	977	49.7	46.6	52.9	18.6	31.6	−1.2	−5.6	3.1
Leeds	468	54.9	50.4	59.4	29.5	15.6	0.4	−6.0	6.8
Leic	811	51.1	47.6	54.5	31.1	17.9	3.4	−1.4	8.3
Liv Ain	147	38.1	30.6	46.2	55.8	6.1	−5.4	−16.6	5.9
Liv Roy	330	55.5	50.1	60.7	31.5	13.0	1.8	−5.7	9.4
M RI	416	56.5	51.7	61.2	24.0	19.5	−1.9	−8.7	4.8
Middlbr	287	57.5	51.7	63.1	19.9	22.7	−4.1	−12.0	3.8
Newc	266	60.5	54.5	66.2	19.9	19.6	0.8	−7.6	9.2
Norwch	296	63.5	57.9	68.8	28.7	7.8	0.8	−7.0	8.5
Nottm	340	58.8	53.5	63.9	26.8	14.4	−1.6	−8.9	5.7
Oxford	407	58.7	53.9	63.4	20.2	21.1	2.7	−4.1	9.5
Plymth	125	56.0	47.2	64.4	32.0	12.0	−1.3	−13.8	11.2
Ports	536	58.6	54.4	62.7	21.8	19.6	2.1	−4.0	8.3
Prestn	520	58.3	54.0	62.4	26.0	15.8	1.6	−4.5	7.6
Redng	265	65.7	59.7	71.1	20.0	14.3	−2.0	−10.1	6.0
Salford	377	58.9	53.8	63.8	22.8	18.3	−0.7	−8.1	6.7
Sheff	551	63.3	59.2	67.3	23.4	13.3	2.4	−3.4	8.1
Shrew	172	57.0	49.5	64.2	30.8	12.2	7.6	−2.9	18.0
Stevng	439	66.5	62.0	70.8	19.8	13.7	−2.6	−8.8	3.7
Sthend	106	57.6	48.0	66.6	20.8	21.7	−6.1	−19.4	7.3
Stoke	242	59.9	53.6	65.9	19.4	20.7	−7.3	−16.1	1.4
Sund	192	49.5	42.5	56.5	33.9	16.7	−1.9	−12.1	8.3
Truro	135	47.4	39.1	55.8	48.2	4.4	6.1	−5.7	17.9
Wirral	185	62.7	55.5	69.4	24.9	12.4	−3.5	−13.1	6.2
Wolve	280	50.4	44.5	56.2	32.1	17.5	−6.6	−15.0	1.8
York	117	46.2	37.3	55.2	47.9	6.0	−3.4	−16.1	9.2
N Ireland									
Antrim	111	73.9	64.9	81.2	21.6	4.5	11.4	−0.5	23.3
Belfast	185	46.0	38.9	53.2	46.0	8.1	−6.9	−16.9	3.2
Newry	85	57.7	47.0	67.7	36.5	5.9	−1.9	−16.7	13.0
Ulster	94	52.1	42.1	62.0	41.5	6.4	6.1	−7.9	20.0
West NI	99	58.6	48.7	67.9	31.3	10.1	−12.4	−25.4	0.5
Wales									
Bangor	78	61.5	50.4	71.6	33.3	5.1	−5.9	−20.7	8.8
Cardff	450	59.8	55.2	64.2	21.1	19.1	−5.8	−12.1	0.5
Clwyd	80	52.5	41.6	63.2	31.3	16.3	−1.7	−17.6	14.2
Swanse	228	66.2	59.9	72.1	22.8	11.0	4.5	−4.3	13.3
Wrexm	96	55.2	45.2	64.8	39.6	5.2	1.5	−12.8	15.7
England	**17,848**	**57.3**	**56.6**	**58.0**	**25.9**	**16.8**	**0.4**	**−0.6**	**1.5**
N Ireland	**574**	**56.3**	**52.2**	**60.3**	**36.6**	**7.1**	**−1.5**	**−7.1**	**4.2**
Wales	**932**	**60.4**	**57.2**	**63.5**	**25.3**	**14.3**	**−2.3**	**−6.7**	**2.1**
E, W & NI	**19,354**	**57.4**	**56.7**	**58.1**	**26.2**	**16.4**	**0.3**	**−0.7**	**1.2**

Table 9.13. Summary statistics for PTH in peritoneal dialysis patients in 2014

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	93.8	30	39.8	21.1	42	21	53
B QEH	100.0	117	38.0	57.3	24	16	41
Basldn	96.2	25	44.7	27.2	46	24	55
Bradfd	93.8	15	42.3	31.7	37	21	53
Brightn	90.9	50	34.9	30.4	25	11	55
Bristol	96.4	53	33.1	29.2	27	15	36
Camb	87.1	27	39.6	36.3	27	15	61
Carlis	91.7	22	26.6	18.5	24.5	12	32
Carsh	84.2	101	59.2	42.7	46	26	79
Chelms	89.5	17	50.6	36.1	41	22	74
Colchr*							
Covnt	91.8	78	25.3	25.8	18	10	31
Derby	98.6	70	34.3	27.6	26.5	18	44
Donc	95.8	23	38.7	21.0	33	21	59
Dorset	76.1	35	20.7	16.2	17	9	31
Dudley	94.0	47	27.2	21.3	20	12	39
Exeter	97.6	81	25.6	25.2	18	11	30
Glouc	59.0	23	42.4	31.5	36	21	60
Hull	86.6	58	31.1	27.0	22	14	42
Ipswi	96.7	29	42.7	37.7	32	17	58
Kent	98.3	57	42.8	34.1	29	19	57
L Barts	94.5	188	37.0	30.0	30	15.5	48
L Guys	65.4	17	39.5	22.5	34	23	43
L Kings	96.2	76	54.9	44.5	44.5	22.5	73
L Rfree	87.2	109	39.6	33.3	32	16	57
L St.G	100.0	45	46.7	42.6	35	19	62
L West	86.0	49	47.7	35.2	41	25	59
Leeds	100.0	49	36.9	21.1	35	24	49
Leic	93.5	101	40.3	36.0	31	16	47
Liv Ain	94.3	33	24.4	18.9	20	13	31
Liv Roy	95.9	47	29.8	21.4	24	16	37
M RI	85.3	52	38.2	26.0	39	20.5	50
Middlbr	61.5	8					
Newc	90.9	40	47.4	36.4	42	23	59.5
Norwch	76.7	23	43.2	30.4	36	26	52
Nottm	98.6	71	46.3	36.5	37	22	64
Oxford	97.4	74	35.8	30.3	29.5	15	46
Plymth	90.9	30	17.9	14.3	15.5	9	22
Ports	81.8	54	44.7	44.4	32.5	16	54
Prestn	100.0	46	38.5	28.5	32.5	20	51
Redng	96.8	60	35.2	26.5	28	19	43.5
Salford	91.7	66	44.0	33.7	34	19	62
Sheff	84.6	44	37.1	28.1	28.5	17	51.5
Shrew	84.6	22	78.3	114.9	48	29	67
Stevng	96.2	25	30.0	19.8	29	10	48
Sthend	81.3	13	32.4	19.6	33	17	45
Stoke	100.0	72	51.4	32.2	47.5	26.5	75
Sund	100.0	14	22.1	17.0	20	7	29
Truro	100.0	18	26.4	15.0	20	17	35
Wirral	80.0	16	25.3	18.6	17	11	44
Wolve	93.1	67	39.3	29.5	33	20	51
York	100.0	21	35.1	33.0	26	14	42

Table 9.13. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
N Ireland							
Antrim	100.0	13	30.3	27.7	22	11	44
Belfast	100.0	15	33.4	23.9	27	13	45
Newry	100.0	14	27.4	16.5	30.5	12	41
Ulster	100.0	4					
West NI	100.0	11	20.7	12.2	21	7	30
Wales							
Bangor	93.3	14	33.2	24.9	24	18	44
Cardff	76.4	55	38.8	29.0	30	18	53
Clwyd	72.7	8					
Swanse	98.0	49	41.1	32.7	36	19	54
Wrexm	100.0	23	42.0	20.6	41	23	56
England	**91.8**	**2,508**	**38.9**	**35.4**	**30**	**16**	**51**
N Ireland	**100.0**	**57**	**29.6**	**22.6**	**24**	**12**	**41**
Wales	**87.1**	**149**	**39.5**	**28.8**	**31**	**20**	**54**
E, W & NI	**91.7**	**2,714**	**38.7**	**34.9**	**30**	**17**	**51**

Blank cells: centres excluded from analyses due to small numbers or poor data completeness
*No PD patients

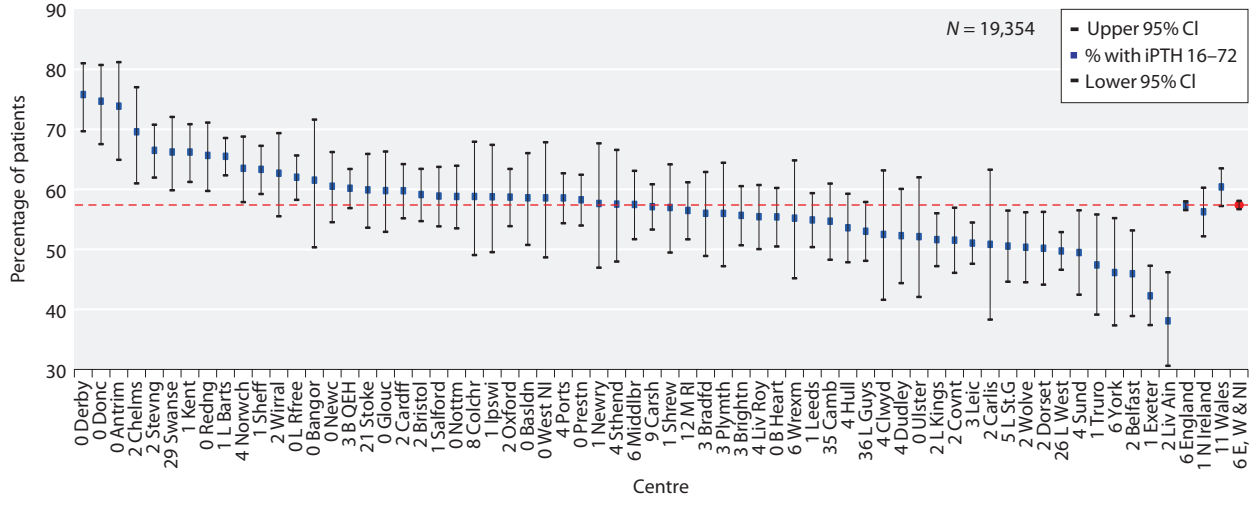

Fig. 9.11. Percentage of haemodialysis patients with PTH within range (16–72 pmol/L) by centre in 2014

Table 9.14. Percentage of peritoneal dialysis patients within, below and above the range for PTH (16–72 pmol/L) in 2014

Centre	*N*	% PTH 16–72 pmol/L	Lower 95% CI	Upper 95% CI	% PTH <16 pmol/L	% PTH >72 pmol/L	Change in % within range from 2013	95% LCL change	95% UCL change
England									
B Heart	30	70.0	51.7	83.6	20.0	10.0	10.0	−14.0	34.0
B QEH	117	66.7	57.7	74.6	23.9	9.4	4.8	−7.3	16.8
Basldn	25	64.0	44.0	80.1	16.0	20.0	−2.7	−27.9	22.6
Bradfd	15	73.3	46.7	89.6	13.3	13.3	25.5	−4.8	55.8
Brightn	50	50.0	36.5	63.5	32.0	18.0	−9.4	−27.7	9.0
Bristol	53	66.0	52.4	77.4	28.3	5.7	−1.2	−19.0	16.6
Camb	27	59.3	40.3	75.8	25.9	14.8	−9.2	−37.1	18.8
Carlis	22	59.1	38.2	77.2	36.4	4.6	−20.9	−47.9	6.1

Table 9.14. Continued

Centre	*N*	% PTH 16–72 pmol/L	Lower 95% CI	Upper 95% CI	% PTH <16 pmol/L	% PTH >72 pmol/L	Change in % within range from 2013	95% LCL change	95% UCL change
Carsh	101	64.4	54.6	73.1	7.9	27.7			
Chelms	17	58.8	35.2	79.0	11.8	29.4	−4.3	−36.2	27.6
Covnt	78	53.9	42.8	64.6	41.0	5.1	−5.2	−21.5	11.0
Derby	70	72.9	61.3	82.0	21.4	5.7	−0.1	−14.6	14.4
Donc	23	82.6	61.8	93.3	13.0	4.4	10.2	−12.3	32.7
Dorset	35	48.6	32.7	64.7	48.6	2.9	−22.9	−45.2	−0.5
Dudley	47	68.1	53.6	79.8	27.7	4.3	19.3	−1.0	39.6
Exeter	81	55.6	44.6	66.0	40.7	3.7	−1.6	−17.9	14.7
Glouc	23	60.9	40.2	78.2	21.7	17.4	−16.1	−41.7	9.6
Hull	58	67.2	54.3	78.0	25.9	6.9	9.7	−9.8	29.2
Ipswi	29	72.4	53.8	85.6	17.2	10.3	17.9	−8.6	44.3
Kent	57	64.9	51.8	76.1	17.5	17.5	1.3	−16.5	19.0
L Barts	188	63.3	56.2	69.9	25.0	11.7	6.5	−3.7	16.7
L Guys	17	82.4	57.3	94.2	5.9	11.8	13.6	−15.5	42.7
L Kings	76	56.6	45.3	67.2	18.4	25.0	0.0	−15.8	15.8
L Rfree	109	61.5	52.0	70.1	24.8	13.8	−0.5	−14.0	13.0
L St.G	45	64.4	49.6	76.9	17.8	17.8	−1.4	−21.6	18.7
L West	49	63.3	49.1	75.5	18.4	18.4	1.7	−17.2	20.6
Leeds	49	73.5	59.5	83.9	20.4	6.1	9.0	−8.2	26.1
Leic	101	62.4	52.6	71.3	22.8	14.9	1.2	−11.6	14.1
Liv Ain	33	57.6	40.5	73.0	39.4	3.0	28.4	3.6	53.2
Liv Roy	47	70.2	55.8	81.5	23.4	6.4	7.7	−11.2	26.6
M RI	52	67.3	53.6	78.6	23.1	9.6	−8.9	−25.4	7.6
Newc	40	62.5	46.8	76.0	20.0	17.5	9.2	−14.1	32.5
Norwch	23	69.6	48.5	84.8	17.4	13.0	−1.0	−25.3	23.2
Nottm	71	69.0	57.4	78.7	14.1	16.9	2.3	−13.3	18.0
Oxford	74	67.6	56.2	77.2	25.7	6.8	8.1	−7.1	23.3
Plymth	30	50.0	32.8	67.2	50.0	0.0	0.0	−27.5	27.5
Ports	54	57.4	44.0	69.8	24.1	18.5	8.2	−9.7	26.0
Prestn	46	76.1	61.8	86.2	15.2	8.7	6.9	−10.7	24.4
Redng	60	80.0	68.0	88.3	11.7	8.3	5.8	−9.1	20.7
Salford	66	69.7	57.6	79.5	16.7	13.6	14.8	−1.3	30.8
Sheff	44	65.9	50.9	78.3	22.7	11.4	−2.0	−20.8	16.8
Shrew	22	72.7	51.1	87.2	9.1	18.2	3.5	−22.2	29.2
Stevng	25	64.0	44.0	80.1	32.0	4.0	−11.0	−35.1	13.1
Sthend	13	76.9	47.9	92.4	23.1	0.0			
Stoke	72	61.1	49.5	71.6	12.5	26.4	−9.3	−24.8	6.2
Sund	14	57.1	31.6	79.4	42.9	0.0			
Truro	18	77.8	53.5	91.4	22.2	0.0	2.8	−25.8	31.4
Wirral	16	50.0	27.3	72.7	50.0	0.0	−22.2	−54.3	9.8
Wolve	67	68.7	56.7	78.6	17.9	13.4	−0.2	−15.3	15.0
York	21	47.6	27.9	68.2	38.1	14.3	−16.4	−44.8	12.1
N Ireland									
Antrim	13	46.2	22.4	71.8	46.2	7.7	−18.1	−55.1	18.8
Belfast	15	66.7	40.6	85.4	26.7	6.7	9.0	−21.5	39.5
Newry	14	71.4	44.0	88.9	28.6	0.0	0.8	−31.2	32.9
West NI	11	63.6	33.9	85.7	36.4	0.0	6.5	−32.0	45.0
Wales									
Bangor	14	71.4	44.0	88.9	21.4	7.1	−19.5	−48.6	9.7
Cardff	55	72.7	59.6	82.8	16.4	10.9	11.1	−6.0	28.1
Swanse	49	71.4	57.4	82.3	18.4	10.2	3.3	−15.0	21.7
Wrexm	23	87.0	66.5	95.7	4.4	8.7	2.8	−18.7	24.2
England	**2,508**	**64.5**	**62.6**	**66.4**	**23.3**	**12.2**	**1.6**	**−1.0**	**4.3**
N Ireland	**57**	**61.4**	**48.3**	**73.1**	**33.3**	**5.3**	**1.4**	**−15.4**	**18.2**
Wales	**149**	**73.8**	**66.2**	**80.3**	**15.4**	**10.7**	**4.7**	**−5.5**	**14.9**
E, W & NI	**2,714**	**65.0**	**63.1**	**66.7**	**23.1**	**12.0**	**1.8**	**−0.7**	**4.4**

Blank cells: no data available for 2013

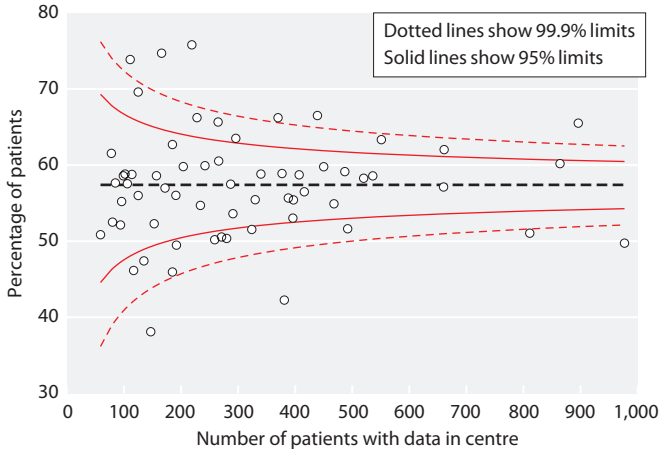

Fig. 9.12. Funnel plot of percentage of haemodialysis patients with PTH within range (16–72 pmol/L) by centre in 2014

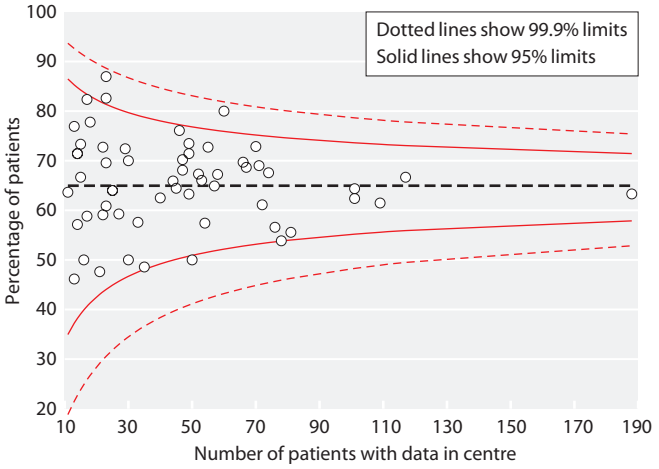

Fig. 9.14. Funnel plot of percentage of peritoneal dialysis patients with PTH within range (16–72 pmol/L) by centre in 2014

patients; and of all three parameters in 50.3% of HD and 52.5% of PD patients (tables 9.15, 9.16).

Figures 9.18 and 9.19 are funnel plots of all centres who contributed data to these analyses based on the size of the centre and the percentage of patients achieving the control of all three BMD parameters. In HD patients, there was a negative trend observed between centre size and the simultaneous control of all three BMD parameters as identified in this analysis.

No such trend was observed in PD patients.

Bicarbonate

In 2014 the following Renal Association clinical practice guidelines regarding bicarbonate management were applicable:

Haemodialysis Guideline 6.3: Pre-dialysis serum bicarbonate concentrations

'We suggest that pre-dialysis serum bicarbonate concentrations, measured with minimum delay after venepuncture, should be between 18 and 24 mmol/L' [7].

Peritoneal Dialysis Guideline 6.2 – PD: Metabolic factors

'We recommend that plasma bicarbonate should be maintained within the normal range' [8].

A total of 18,671 HD and 2,603 PD patients' data were available for serum bicarbonate analysis from England, Wales and Northern Ireland in 2014. Data were 90.5%

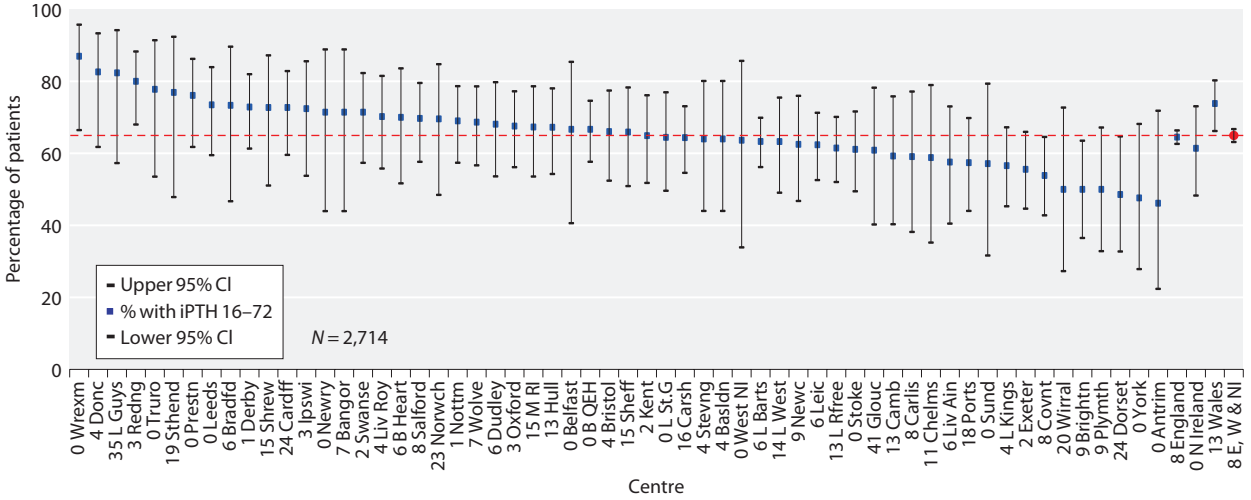

Fig. 9.13. Percentage of peritoneal dialysis patients with PTH within range (16–72 pmol/L) by centre in 2014

Table 9.15. Percentage of haemodialysis patients within the ranges specified for the simultaneous combinations of control of bone and mineral disorder parameters in preventing severe hyperparathyroidism in 2014

		Number of parameters			
Centre	*N*	None	One	Two	Three
England					
B Heart	397	5.3	14.9	37.3	42.6
B QEH	842	1.5	12.2	32.4	53.8
Basldn	155	0.6	7.7	36.8	54.8
Bradfd	191	2.6	9.4	29.8	58.1
Brightn	388	1.0	15.7	31.7	51.5
Bristol	487	0.8	11.7	34.3	53.2
Camb	226	0.0	8.4	37.2	54.4
Carlis	59	0.0	8.5	42.4	49.2
Carsh	655	2.6	15.7	37.3	44.4
Chelms	125	0.0	6.4	36.0	57.6
Colchr	102	0.0	7.8	27.5	64.7
Covnt	324	1.9	14.2	33.3	50.6
Derby	219	0.9	8.2	45.2	45.7
Donc	166	1.2	10.2	30.7	57.8
Dorset	258	0.0	9.3	28.7	62.0
Dudley	153	2.0	7.8	39.9	50.3
Exeter	381	0.0	6.6	29.1	64.3
Glouc	204	0.5	8.8	33.3	57.4
Hull	291	1.7	10.0	32.3	56.0
Ipswi	114	1.8	6.1	29.8	62.3
Kent	370	2.7	14.3	41.9	41.1
L Barts	894	1.8	15.9	39.8	42.5
L Guys	391	1.5	15.1	36.1	47.3
L Kings	492	0.8	10.6	29.9	58.7
L Rfree	661	1.5	14.2	32.7	51.6
L St.G	271	1.8	14.4	39.9	43.9
L West	810	3.2	19.9	40.7	36.2
Leeds	468	2.1	13.5	36.3	48.1
Leic	811	1.2	14.3	40.4	44.0
Liv Ain	147	1.4	8.2	25.9	64.6
Liv Roy	329	0.6	12.2	35.6	51.7
M RI	413	3.1	13.3	36.1	47.5
Middlbr	287	2.8	21.6	33.1	42.5
Newc	266	4.5	11.3	30.1	54.1
Norwch	295	1.7	8.8	31.5	58.0
Nottm	340	1.2	10.0	33.8	55.0
Oxford	407	2.0	16.0	38.6	43.5
Plymth	123	2.4	11.4	29.3	56.9
Ports	529	1.9	14.6	40.8	42.7
Prestn	490	2.9	12.9	37.3	46.9
Redng	265	0.8	8.7	27.9	62.6
Salford	377	1.9	13.5	35.0	49.6
Sheff	551	0.7	11.4	36.5	51.4
Shrew	172	2.9	11.0	33.1	52.9
Stevng	439	1.8	8.7	34.6	54.9
Sthend	106	1.9	18.9	34.9	44.3
Stoke	236	1.7	13.1	38.6	46.6
Truro	135	2.2	5.2	30.4	62.2
Wirral	184	1.1	16.3	29.9	52.7
Wolve	279	3.9	12.5	35.1	48.4
York	117	0.9	6.8	21.4	70.9

Table 9.15. Continued

Centre	*N*	Number of parameters			
		None	One	Two	Three
N Ireland					
Antrim	111	0.9	7.2	28.8	63.1
Belfast	185	1.1	10.8	30.3	57.8
Newry	85	4.7	5.9	36.5	52.9
Ulster	92	2.2	10.9	33.7	53.3
West NI	99	2.0	11.1	38.4	48.5
Wales					
Bangor	78	0.0	10.3	20.5	69.2
Cardff	450	2.0	13.6	38.0	46.4
Clwyd	80	1.3	18.8	37.5	42.5
Swanse	228	3.1	7.9	32.9	56.1
Wrexm	96	1.0	12.5	26.0	60.4
England	**17,392**	**1.8**	**12.8**	**35.3**	**50.0**
N Ireland	**572**	**1.9**	**9.4**	**32.9**	**55.8**
Wales	**932**	**1.9**	**12.2**	**34.0**	**51.8**
E, W & NI	**18,896**	**1.8**	**12.7**	**35.2**	**50.3**

Table 9.16. Percentage of peritoneal dialysis patients within the ranges specified for the simultaneous combinations of control of bone and mineral disorder parameters in preventing severe hyperparathyroidism in 2014

Centre	*N*	Number of parameters			
		None	One	Two	Three
England					
B Heart	30	3.3	10.0	33.3	53.3
B QEH	116	1.7	8.6	31.9	57.8
Basldn	25	8.0	12.0	28.0	52.0
Bradfd	14	0.0	21.4	50.0	28.6
Brightn	50	2.0	10.0	34.0	54.0
Bristol	53	1.9	11.3	47.2	39.6
Camb	25	0.0	12.0	20.0	68.0
Carlis	22	0.0	13.6	22.7	63.6
Carsh	100	3.0	17.0	30.0	50.0
Chelms	17	0.0	11.8	52.9	35.3
Covnt	74	0.0	6.8	29.7	63.5
Derby	70	0.0	12.9	38.6	48.6
Donc	23	0.0	4.3	39.1	56.5
Dorset	35	0.0	2.9	22.9	74.3
Dudley	47	0.0	21.3	42.6	36.2
Exeter	81	0.0	4.9	27.2	67.9
Glouc	23	0.0	26.1	30.4	43.5
Hull	58	0.0	13.8	31.0	55.2
Ipswi	29	3.4	6.9	34.5	55.2
Kent	57	5.3	10.5	42.1	42.1
L Barts	186	3.2	9.7	33.3	53.8
L Guys	17	0.0	11.8	17.6	70.6
L Kings	76	1.3	10.5	48.7	39.5
L Rfree	109	2.8	11.9	33.9	51.4
L St.G	45	0.0	17.8	26.7	55.6
L West	47	4.3	8.5	61.7	25.5
Leeds	49	2.0	4.1	34.7	59.2
Leic	101	2.0	16.8	34.7	46.5
Liv Ain	33	0.0	6.1	57.6	36.4

Table 9.16. Continued

Centre	*N*	Number of parameters			
		None	One	Two	Three
Liv Roy	47	2.1	2.1	36.2	59.6
M RI	52	0.0	9.6	40.4	50.0
Newc	40	2.5	20.0	32.5	45.0
Norwch	23	0.0	21.7	39.1	39.1
Nottm	70	2.9	11.4	34.3	51.4
Oxford	74	1.4	4.1	36.5	58.1
Plymth	30	0.0	3.3	13.3	83.3
Ports	52	7.7	5.8	34.6	51.9
Prestn	46	0.0	15.2	26.1	58.7
Redng	60	1.7	8.3	20.0	70.0
Salford	66	1.5	9.1	54.5	34.8
Sheff	44	0.0	4.5	29.5	65.9
Shrew	22	0.0	13.6	50.0	36.4
Stevng	25	0.0	8.0	8.0	84.0
Sthend	13	0.0	7.7	53.8	38.5
Stoke	70	4.3	12.9	32.9	50.0
Sund	14	0.0	28.6	21.4	50.0
Truro	18	0.0	5.6	33.3	61.1
Wirral	16	0.0	6.3	43.8	50.0
Wolve	67	3.0	14.9	41.8	40.3
York	21	0.0	9.5	42.9	47.6
N Ireland					
Antrim	13	7.7	7.7	23.1	61.5
Belfast	15	0.0	13.3	53.3	33.3
Newry	14	0.0	7.1	28.6	64.3
West NI	11	0.0	0.0	18.2	81.8
Wales					
Bangor	14	0.0	14.3	50.0	35.7
Cardff	55	0.0	12.7	27.3	60.0
Swanse	49	2.0	10.2	30.6	57.1
Wrexm	23	0.0	8.7	43.5	47.8
England	**2,482**	**1.8**	**10.8**	**35.1**	**52.3**
N Ireland	**53**	**1.9**	**7.5**	**32.1**	**58.5**
Wales	**141**	**0.7**	**11.3**	**33.3**	**54.6**
E, W & NI	**2,676**	**1.8**	**10.8**	**35.0**	**52.5**

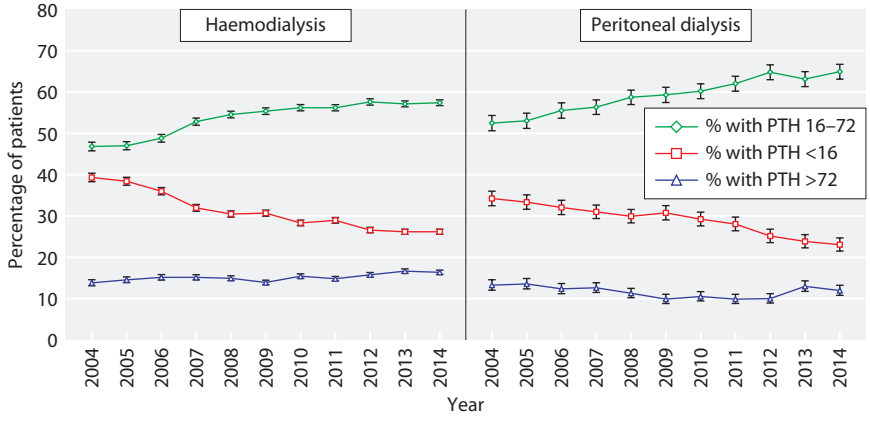

Fig. 9.15. Longitudinal change in percentage of patients with PTH within range (16–72 pmol/L), below and above range, by dialysis modality 2004–2014

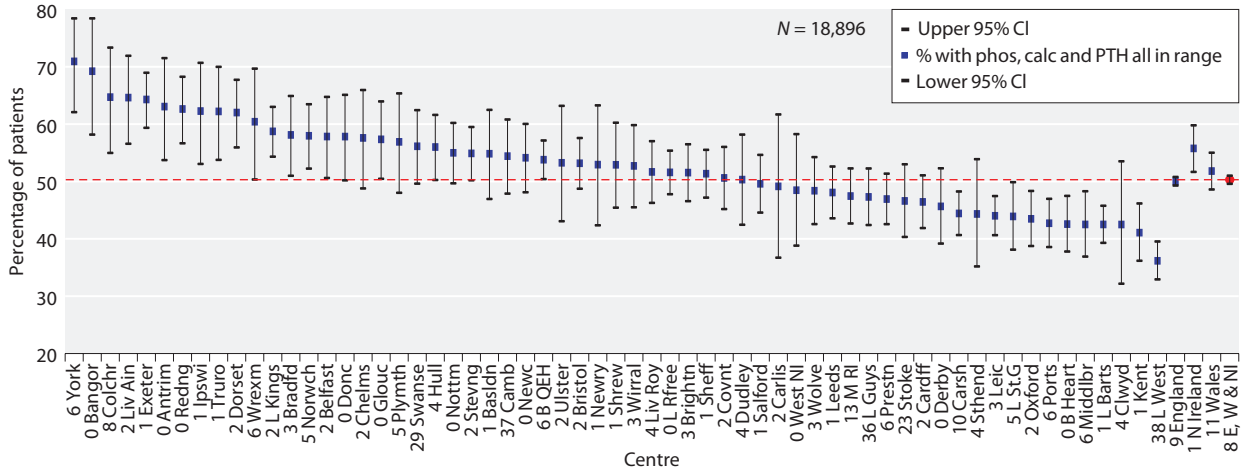

Fig. 9.16. Percentage of HD patients achieving simultaneous control of all three BMD parameters in preventing severe hyperparathyroidism by centre in 2014

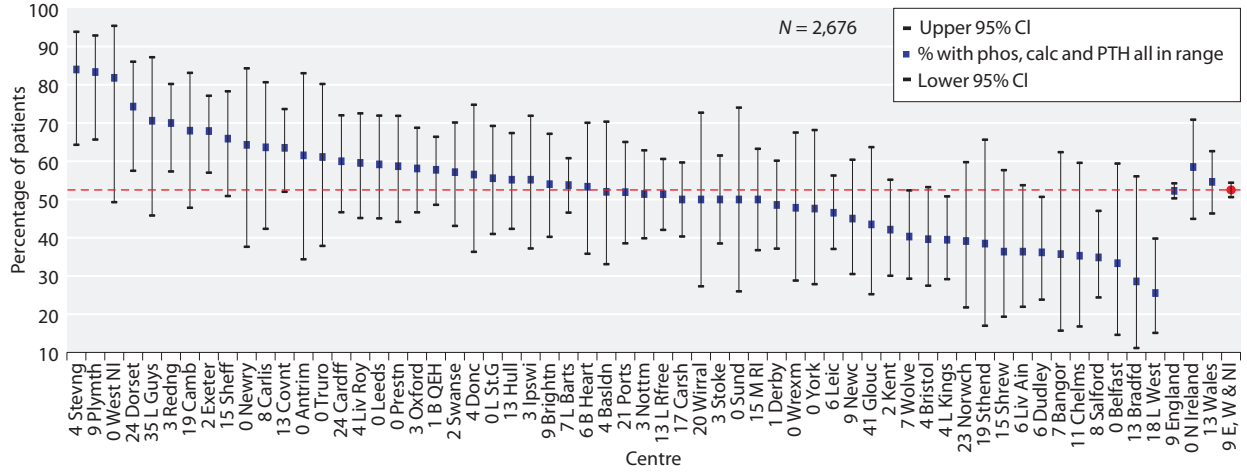

Fig. 9.17. Percentage of PD patients achieving simultaneous control of all three BMD parameters in preventing severe hyperparathyroidism by centre in 2014

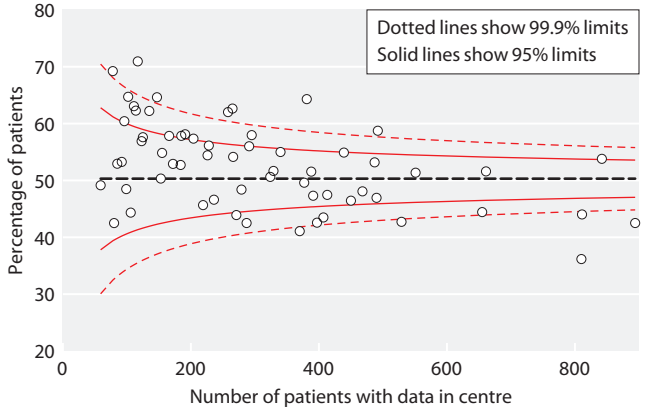

Fig. 9.18. Funnel plot for percentage of HD patients achieving simultaneous control of all three BMD parameters in preventing severe hyperparathyroidism by centre in 2014

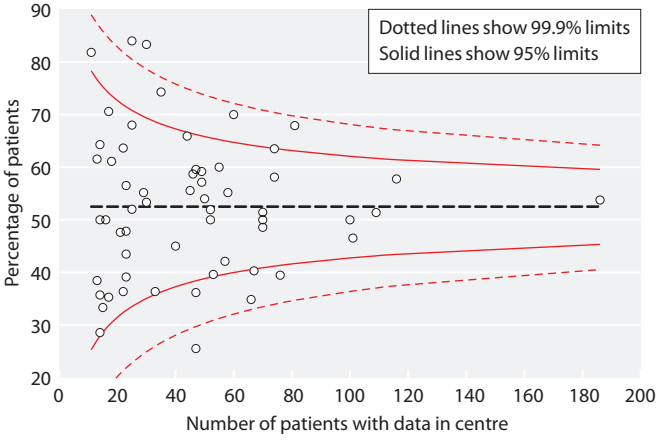

Fig. 9.19. Funnel plot for percentage of PD patients achieving simultaneous control of all three BMD parameters in preventing severe hyperparathyroidism by centre in 2014

complete for HD patients and 87.9% complete for PD patients (tables 9.17, 9.19). Data completeness for serum bicarbonate levels in HD and PD patients has not changed significantly over a decade. The proportion of HD patients with a serum bicarbonate within the audit measure range was 60.4% in 2014 (95% CI 59.7–61.1%) (table 9.18); the mean bicarbonate in HD patients was 23.5 mmol/L (table 9.17). The proportion with a serum bicarbonate within the audit standard in PD patients was 81.8% (CI 80.3–83.2%) (table 9.20). The mean bicarbonate level in PD patients was 25.4 mmol/L (table 9.19).

As in previous reports, inter-centre variation was observed in attainment of the audit standard for both HD and PD groups (tables 9.18, 9.20, figures 9.20–9.23). The funnel plot of serum bicarbonate values in 2014 for HD patients (figure 9.21) showed a large dispersal of attainment, 19 centres being above average and 20 below average. In contrast the funnel plot for PD patients (figure 9.23) showed few outliers. Sample processing, case-mix, differences in dialysis, residual renal function and oral bicarbonate prescriptions may all contribute to the variation observed.

Serial trends in serum bicarbonate measures between 2004 and 2014 by dialysis modality are presented in figure 9.24. Achievement of bicarbonate audit measures has not changed over the past decade for either modality.

Table 9.17. Summary statistics for serum bicarbonate in haemodialysis patients by centre in 2014

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	98.0	390	22.7	2.8	23	21	24
B QEH	99.0	884	23.7	2.5	24	22	25
Basldn	99.4	156	22.6	2.6	23	21	24
Bradfd	100.0	196	24.0	2.7	24	23	26
Brightn	98.7	393	22.9	2.7	23	21	24
Bristol	100.0	495	22.2	2.5	22	21	24
Camb	85.6	308	25.2	3.2	25	23	27
Carlis	100.0	60	21.2	2.4	22	20	23
Carsh	56.3	409	25.0	2.0	25	24	26
Chelms	100.0	127	21.6	2.3	22	21	23
Colchr	94.6	105	23.4	2.0	24	22	25
Covnt	87.6	289	23.9	3.2	24	22	26
Derby	99.6	219	22.8	2.4	23	21	24
Donc	100.0	166	23.0	2.8	23	21	25
Dorset	98.9	261	22.0	2.6	22	21	24
Dudley	98.1	157	23.6	2.9	24	22	25
Exeter	100.0	383	23.6	2.6	24	22	25
Glouc	100.0	204	24.2	2.9	24	22	26
Hull	99.7	301	23.8	2.7	24	22	25
Ipswi	100.0	115	24.1	3.1	24	22	26
Kent	99.7	373	22.5	2.7	22	21	24
L Barts	99.8	903	22.4	3.0	22	20	24
L Guys	62.4	384	24.8	2.9	25	23	27
L Kings	100.0	504	22.4	2.0	22	21	24
L Rfree	100.0	664	21.0	2.9	21	19	23
L St.G	97.5	277	27.6	3.4	27	25	30
L West	45.2	593					
Leeds	100.0	471	22.2	3.2	22	20	24
Leic	98.9	828	24.7	3.1	25	23	27
Liv Ain	100.0	150	25.5	3.5	25	23	27
Liv Roy	99.7	342	25.5	3.4	25	23	28
M RI	93.5	442	22.5	2.7	23	21	24
Middlbr	100.0	305	26.3	3.1	26	24	28
Newc	99.3	264	22.7	3.2	23	20	25
Norwch	99.4	307	21.9	2.7	22	20	23
Nottm	93.6	319	25.2	2.8	25	24	27
Oxford	100.0	415	24.2	3.4	24	22	26
Plymth	97.7	126	24.9	2.3	25	23	26
Ports	92.9	520	23.7	2.9	24	22	26

Table 9.17. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
Prestn	99.2	517	24.5	2.7	25	23	26
Redng	100.0	265	24.6	2.9	25	23	27
Salford	11.3	43					
Sheff	100.0	555	23.7	3.2	24	22	26
Shrew	99.4	173	23.9	3.2	24	22	25
Stevng	100.0	447	24.0	3.2	24	22	26
Sthend	100.0	110	24.9	3.3	25	23	27
Stoke	79.9	246	25.5	3.1	25	24	27
Sund	100.0	200	27.5	3.0	28	26	30
Truro	100.0	136	24.0	2.9	24	22	26
Wirral	94.7	179	24.8	2.9	25	23	27
Wolve	99.7	286	20.2	2.7	20	19	22
York	100.0	124	25.3	3.0	25	23	27
N Ireland							
Antrim	100.0	111	26.0	2.5	26	24	28
Belfast	100.0	189	22.3	2.7	22	21	24
Newry	100.0	86	23.0	2.9	23	22	25
Ulster	100.0	94	24.1	2.6	24	23	26
West NI	100.0	99	22.6	2.4	23	21	24
Wales							
Bangor	100.0	78	25.4	4.1	25	23	28
Cardff	99.1	454	23.4	3.1	24	21	25
Clwyd	100.0	83	24.6	2.5	25	23	26
Swanse	100.0	322	24.5	3.5	24	22	26
Wrexm	67.7	69	22.9	2.5	23	21	25
England	**89.8**	**17,086**	**23.5**	**3.3**	**23**	**21**	**25**
N Ireland	**100.0**	**579**	**23.5**	**2.9**	**23**	**22**	**25**
Wales	**96.5**	**1,006**	**24.0**	**3.3**	**24**	**22**	**26**
E, W & NI	**90.5**	**18,671**	**23.5**	**3.3**	**23**	**21**	**26**

Blank cells: centres excluded from analyses due to poor data completeness

Table 9.18. Percentage of haemodialysis patients within, below and above the range for bicarbonate (18–24 mmol/L) by centre in 2014

Centre	*N*	% bicarb 18–24 mmol/L	Lower 95% CI	Upper 95% CI	% bicarb <18 mmol/L	% bicarb >24 mmol/L	Change in % within range from 2013	95% LCL change	95% UCL change
England									
B Heart	390	75.4	70.9	79.4	2.6	22.1	−6.1	−12.3	0.2
B QEH	884	62.7	59.4	65.8	0.8	36.5	4.6	0.0	9.1
Basldn	156	77.6	70.4	83.4	1.9	20.5	1.4	−8.0	10.8
Bradfd	196	54.1	47.1	60.9	2.0	43.9	−2.7	−12.7	7.3
Brightn	393	76.8	72.4	80.8	1.8	21.4	11.0	4.6	17.5
Bristol	495	78.8	75.0	82.2	3.4	17.8	14.9	9.3	20.5
Camb	308	47.1	41.6	52.7	0.0	52.9	−11.0	−18.6	−3.3
Carlis	60	93.3	83.5	97.5	5.0	1.7	15.7	3.3	28.2
Carsh	409	37.9	33.3	42.7	0.2	61.9	−4.6	−10.6	1.5
Chelms	127	88.2	81.3	92.8	3.2	8.7	4.6	−4.4	13.5
Colchr	105	70.5	61.1	78.4	1.0	28.6	36.8	24.1	49.5
Covnt	289	55.0	49.2	60.7	2.4	42.6	−9.5	−17.3	−1.7
Derby	219	74.4	68.2	79.8	1.8	23.7	1.3	−7.1	9.7
Donc	166	72.3	65.0	78.6	1.2	26.5	33.9	23.5	44.3

Table 9.18. Continued

Centre	*N*	% bicarb 18–24 mmol/L	Lower 95% CI	Upper 95% CI	% bicarb <18 mmol/L	% bicarb >24 mmol/L	Change in % within range from 2013	95% LCL change	95% UCL change
Dorset	261	81.2	76.0	85.5	4.2	14.6	3.6	−3.4	10.7
Dudley	157	57.3	49.5	64.8	3.2	39.5	−12.4	−23.0	−1.8
Exeter	383	59.0	54.0	63.8	2.4	38.6	−18.9	−25.4	−12.5
Glouc	204	52.9	46.1	59.7	1.0	46.1	−11.3	−20.9	−1.6
Hull	301	60.8	55.2	66.2	0.7	38.5	−4.1	−11.8	3.6
Ipswi	115	57.4	48.2	66.1	0.0	42.6	−16.5	−28.7	−4.3
Kent	373	76.1	71.6	80.2	3.0	20.9	−6.6	−12.4	−0.8
L Barts	903	74.0	71.0	76.7	4.2	21.8	−9.7	−13.5	−6.0
L Guys	384	47.4	42.4	52.4	0.5	52.1	−24.0	−30.7	−17.3
L Kings	504	85.3	82.0	88.2	1.0	13.7	60.9	55.9	65.8
L Rfree	664	80.0	76.8	82.8	9.9	10.1	11.6	7.0	16.3
L St.G	277	15.9	12.0	20.7	0.4	83.8	−1.8	−8.1	4.5
Leeds	471	70.9	66.7	74.8	6.6	22.5	−4.9	−10.6	0.7
Leic	828	46.6	43.2	50.0	1.8	51.6	−4.6	−9.4	0.2
Liv Ain	150	37.3	30.0	45.3	0.7	62.0	−7.6	−18.7	3.6
Liv Roy	342	40.6	35.6	45.9	0.3	59.1	−7.9	−15.3	−0.4
M RI	442	75.6	71.3	79.4	3.2	21.3	21.0	15.0	27.1
Middlbr	305	25.3	20.7	30.4	1.0	73.8	3.4	−3.3	10.1
Newc	264	66.3	60.4	71.7	4.6	29.2	45.3	37.7	52.9
Norwch	307	81.8	77.0	85.7	4.2	14.0	34.6	27.5	41.7
Nottm	319	37.3	32.2	42.7	0.9	61.8	1.4	−6.0	8.8
Oxford	415	49.6	44.9	54.4	2.9	47.5	2.4	−4.5	9.2
Plymth	126	41.3	33.0	50.1	0.8	57.9	−2.4	−14.8	10.0
Ports	520	58.7	54.4	62.8	1.9	39.4	0.3	−5.7	6.2
Prestn	517	46.4	42.2	50.7	1.6	52.0	−12.9	−18.9	−6.8
Redng	265	47.2	41.2	53.2	0.8	52.1	3.7	−4.8	12.2
Sheff	555	56.2	52.1	60.3	2.3	41.4	−2.0	−7.8	3.8
Shrew	173	56.1	48.6	63.3	2.3	41.6	−0.4	−10.8	10.0
Stevng	447	54.4	49.7	58.9	1.8	43.9	−15.4	−21.7	−9.0
Sthend	110	43.6	34.7	53.0	0.9	55.5	0.0	−13.1	13.1
Stoke	246	36.2	30.4	42.4	0.0	63.8	−12.4	−21.4	−3.5
Sund	200	18.0	13.3	24.0	0.5	81.5	6.8	−0.3	13.8
Truro	136	52.2	43.8	60.5	0.7	47.1	−24.1	−35.0	−13.1
Wirral	179	48.0	40.8	55.4	1.1	50.8	−12.4	−22.6	−2.2
Wolve	286	80.8	75.8	84.9	14.0	5.2	6.1	−0.7	13.0
York	124	41.1	32.8	50.0	0.0	58.9	−11.6	−23.8	0.6
N Ireland									
Antrim	111	27.0	19.6	36.0	0.0	73.0	−32.3	−44.4	−20.2
Belfast	189	80.4	74.2	85.5	3.7	15.9	4.8	−3.5	13.0
Newry	86	70.9	60.5	79.5	2.3	26.7	−13.6	−25.9	−1.3
Ulster	94	59.6	49.4	69.0	2.1	38.3	0.4	−13.4	14.1
West NI	99	78.8	69.6	85.7	0.0	21.2	9.6	−2.3	21.5
Wales									
Bangor	78	35.9	26.1	47.1	2.6	61.5	3.8	−10.8	18.4
Cardff	454	60.1	55.6	64.5	3.1	36.8	2.4	−4.0	8.7
Clwyd	83	44.6	34.3	55.4	1.2	54.2	−29.0	−43.8	−14.3
Swanse	322	50.6	45.2	56.1	1.2	48.1	−13.3	−20.9	−5.6
Wrexm	69	68.1	56.3	78.0	1.5	30.4	−12.1	−25.7	1.5
England	**17,086**	**60.6**	**59.8**	**61.3**	**2.9**	**36.5**	**1.8**	**0.7**	**2.8**
N Ireland	**579**	**65.1**	**61.1**	**68.9**	**1.9**	**33.0**	**−4.7**	**−10.0**	**0.6**
Wales	**1,006**	**54.5**	**51.4**	**57.5**	**2.2**	**43.3**	**−6.3**	**−10.6**	**−2.0**
E, W & NI	**18,671**	**60.4**	**59.7**	**61.1**	**2.8**	**36.8**	**1.1**	**0.1**	**2.1**

Table 9.19. Summary statistics for serum bicarbonate in peritoneal dialysis patients by centre in 2014

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
England							
B Heart	96.9	31	22.9	2.2	23	22	24
B QEH	88.9	104	24.9	2.6	25	23	27
Basldn	84.6	22	26.7	2.9	26	25	29
Bradfd	100.0	16	26.2	2.7	26	26	28
Brightn	100.0	55	24.4	2.8	25	23	26
Bristol	100.0	55	22.1	2.2	22	21	23
Camb	77.4	24	30.5	3.6	31	29	33
Carlis	100.0	24	25.0	2.8	25	23	27
Carsh	0.0	0					
Chelms	94.7	18	25.2	3.2	26	23	27
Colchr*							
Covnt	88.2	75	26.2	2.9	26	25	28
Derby	98.6	70	24.2	2.7	25	22	26
Donc	100.0	24	25.0	3.0	25	24	26
Dorset	100.0	46	24.0	4.2	24	20	27
Dudley	96.0	48	25.6	3.8	26	24	27
Exeter	100.0	83	25.6	3.1	26	24	28
Glouc	94.9	37	25.9	2.9	26	25	27
Hull	97.0	65	26.3	3.0	27	24	28
Ipswi	100.0	30	28.2	2.8	28	27	30
Kent	100.0	58	24.9	3.1	25	23	27
L Barts	98.0	195	23.9	3.2	24	22	26
L Guys	76.9	20	24.9	3.7	25	22	28
L Kings	100.0	79	25.3	2.2	25	24	27
L Rfree	79.2	99	24.4	3.5	25	23	26
L St.G	100.0	45	27.7	2.6	28	26	30
L West	77.2	44	23.1	2.4	23	21	25
Leeds	100.0	49	27.9	3.1	28	26	30
Leic	92.6	100	25.6	3.3	25	23	28
Liv Ain	100.0	35	26.0	3.6	26	25	29
Liv Roy	100.0	49	25.2	2.5	26	24	27
M RI	100.0	61	24.1	3.3	24	22	26
Middlbr	100.0	13	25.4	4.1	26	25	28
Newc	95.5	42	24.7	2.9	24	23	27
Norwch	100.0	30	21.1	2.3	21	19	23
Nottm	63.9	46	27.7	2.8	28	26	30
Oxford	88.2	67	25.4	3.3	25	23	27
Plymth	93.9	31	24.3	2.7	24	23	26
Ports	89.4	59	26.5	3.2	26	24	29
Prestn	100.0	46	26.5	3.4	27	24	28
Redng	100.0	62	27.5	2.8	27	26	29
Salford	5.6	4					
Sheff	100.0	52	24.1	3.0	24	22	26
Shrew	96.2	25	25.9	2.5	26	25	28
Stevng	92.3	24	26.6	3.3	27	25	29
Sthend	100.0	16	25.6	2.7	26	24	28
Stoke	100.0	72	26.8	3.5	27	24	29
Sund	100.0	14	24.6	2.7	25	22	27
Truro	88.9	16	26.9	2.7	27	25	29
Wirral	75.0	15	27.3	4.0	26	24	31
Wolve	98.6	71	23.4	2.8	23	22	25
York	100.0	21	27.3	2.5	27	26	29

Table 9.19. Continued

Centre	% completeness	Patients with data *N*	Mean	SD	Median	Lower quartile	Upper quartile
N Ireland							
Antrim	46.2	6					
Belfast	100.0	15	24.7	3.0	25	23	27
Newry	100.0	14	26.6	4.2	27	26	29
Ulster	100.0	4					
West NI	90.9	10	25.9	3.3	26	26	27
Wales							
Bangor	100.0	15	27.3	2.9	27	25	29
Cardff	98.6	71	26.4	3.7	27	24	29
Clwyd	81.8	9					
Swanse	98.0	49	28.7	2.6	28	27	30
Wrexm	100.0	23	26.0	3.1	27	23	28
England	**87.4**	**2,387**	**25.3**	**3.4**	**25**	**23**	**28**
N Ireland	**86.0**	**49**	**25.4**	**3.4**	**26**	**23**	**27**
Wales	**97.7**	**167**	**27.0**	**3.4**	**27**	**25**	**29**
E, W & NI	**87.9**	**2,603**	**25.4**	**3.4**	**25**	**23**	**28**

Blank cells: low patient numbers or poor data completeness
*No PD patients

Table 9.20. Percentage of peritoneal dialysis patients within, below and above the range for bicarbonate (22–30 mmol/L) by centre in 2014

Centre	*N*	% bicarb 22–30 mmol/L	Lower 95% CI	Upper 95% CI	% bicarb <22 mmol/L	% bicarb >30 mmol/L	Change in % within range from 2013	95% LCL change	95% UCL change
England									
B Heart	31	77.4	59.6	88.8	22.6	0.0	18.6	−3.5	40.7
B QEH	104	87.5	79.7	92.6	11.5	1.0	12.1	2.2	22.0
Basldn	22	81.8	60.4	93.0	0.0	18.2	−9.9	−29.4	9.7
Bradfd	16	93.8	66.5	99.1	6.3	0.0	−2.3	−16.4	11.9
Brightn	55	83.6	71.4	91.3	16.4	0.0	7.9	−6.3	22.1
Bristol	55	65.5	52.1	76.8	34.6	0.0	−7.8	−24.9	9.3
Camb	24	45.8	27.5	65.4	4.2	50.0	−36.5	−63.5	−9.6
Carlis	24	87.5	67.6	95.9	8.3	4.2	9.2	−12.2	30.7
Chelms	18	88.9	64.8	97.2	11.1	0.0	−0.6	−20.6	19.5
Covnt	75	90.7	81.7	95.5	5.3	4.0	−1.3	−10.7	8.2
Derby	70	82.9	72.2	90.0	17.1	0.0	−6.3	−17.6	5.0
Donc	24	83.3	63.1	93.6	12.5	4.2	0.0	−20.0	20.0
Dorset	46	63.0	48.4	75.6	32.6	4.4	−5.5	−26.3	15.2
Dudley	48	79.2	65.4	88.4	10.4	10.4	11.8	−6.0	29.5
Exeter	83	88.0	79.0	93.4	7.2	4.8	2.2	−8.9	13.4
Glouc	37	94.6	80.8	98.6	2.7	2.7	7.5	−6.4	21.4
Hull	65	86.2	75.5	92.6	7.7	6.2	2.8	−9.2	14.8
Ipswi	30	76.7	58.5	88.5	3.3	20.0	−15.0	−33.7	3.7
Kent	58	84.5	72.8	91.7	12.1	3.5	17.8	2.4	33.2
L Barts	195	77.4	71.0	82.8	21.5	1.0	16.3	7.0	25.6
L Guys	20	65.0	42.6	82.3	25.0	10.0	2.5	−26.0	31.0
L Kings	79	97.5	90.4	99.4	2.5	0.0	6.4	−0.8	13.7
L Rfree	99	83.8	75.2	89.9	13.1	3.0	3.6	−7.7	14.9
L St.G	45	86.7	73.4	93.9	0.0	13.3	8.9	−6.8	24.6
L West	44	72.7	57.9	83.8	27.3	0.0	−0.3	−18.2	17.5
Leeds	49	81.6	68.3	90.2	2.0	16.3	−8.7	−21.8	4.4
Leic	100	84.0	75.5	90.0	10.0	6.0	6.2	−4.0	16.4
Liv Ain	35	88.6	73.2	95.6	8.6	2.9	−7.6	−20.5	5.3
Liv Roy	49	91.8	80.2	96.9	8.2	0.0	−2.3	−12.3	7.7
M RI	61	83.6	72.1	91.0	16.4	0.0	−1.2	−13.9	11.5

Table 9.20. Continued

Centre	*N*	% bicarb 22–30 mmol/L	Lower 95% CI	Upper 95% CI	% bicarb <22 mmol/L	% bicarb >30 mmol/L	Change in % within range from 2013	95% LCL change	95% UCL change
Middlbr	13	84.6	54.9	96.1	15.4	0.0	2.8	−27.3	32.9
Newc	42	81.0	66.3	90.2	19.1	0.0	−0.3	−18.3	17.7
Norwch	30	40.0	24.3	58.1	60.0	0.0	−50.9	−71.0	−30.8
Nottm	46	78.3	64.1	87.9	2.2	19.6	−1.1	−19.2	16.9
Oxford	67	77.6	66.1	86.0	13.4	9.0	−10.5	−23.1	2.2
Plymth	31	87.1	70.3	95.1	12.9	0.0	20.4	−0.9	41.8
Ports	59	83.1	71.3	90.6	5.1	11.9	2.0	−11.1	15.1
Prestn	46	76.1	61.8	86.2	8.7	15.2	−6.6	−22.7	9.5
Redng	62	80.7	68.9	88.7	3.2	16.1	2.2	−11.8	16.2
Sheff	52	76.9	63.6	86.4	21.2	1.9	1.5	−14.2	17.3
Shrew	25	92.0	73.1	98.0	4.0	4.0	7.4	−10.1	24.9
Stevng	24	91.7	72.1	97.9	4.2	4.2	9.9	−7.3	27.0
Sthend	16	93.8	66.5	99.1	6.3	0.0	20.4	−4.9	45.7
Stoke	72	83.3	72.9	90.3	5.6	11.1	−4.2	−15.4	7.1
Sund	14	85.7	57.3	96.4	14.3	0.0			
Truro	16	87.5	61.4	96.9	0.0	12.5	16.9	−10.1	44.0
Wirral	15	73.3	46.7	89.6	0.0	26.7	−1.7	−31.0	27.7
Wolve	71	76.1	64.8	84.6	23.9	0.0	26.7	11.8	41.7
York	21	90.5	68.9	97.6	0.0	9.5	−1.5	−18.0	14.9
N Ireland									
Belfast	15	86.7	59.5	96.6	13.3	0.0	13.6	−10.6	37.8
Newry	14	85.7	57.3	96.4	7.1	7.1	3.4	−22.4	29.1
West NI	10	80.0	45.9	95.0	20.0	0.0	−4.6	−36.2	27.0
Wales									
Bangor	15	80.0	53.0	93.4	0.0	20.0	−3.3	−32.6	25.9
Cardff	71	80.3	69.4	88.0	8.5	11.3	−2.8	−15.8	10.2
Swanse	49	79.6	66.1	88.7	0.0	20.4	−11.0	−24.7	2.8
Wrexm	23	82.6	61.8	93.3	13.0	4.4	3.7	−20.3	27.7
England	**2,387**	**81.8**	**80.2**	**83.3**	**12.7**	**5.5**	**3.3**	**1.0**	**5.5**
N Ireland	**49**	**85.7**	**72.9**	**93.0**	**12.2**	**2.0**	**7.1**	**−6.6**	**20.9**
Wales	**167**	**80.8**	**74.2**	**86.1**	**6.0**	**13.2**	**−4.3**	**−12.4**	**3.7**
E, W & NI	**2,603**	**81.8**	**80.3**	**83.2**	**12.3**	**6.0**	**2.9**	**0.8**	**5.0**

Blank cells: no data available for 2013

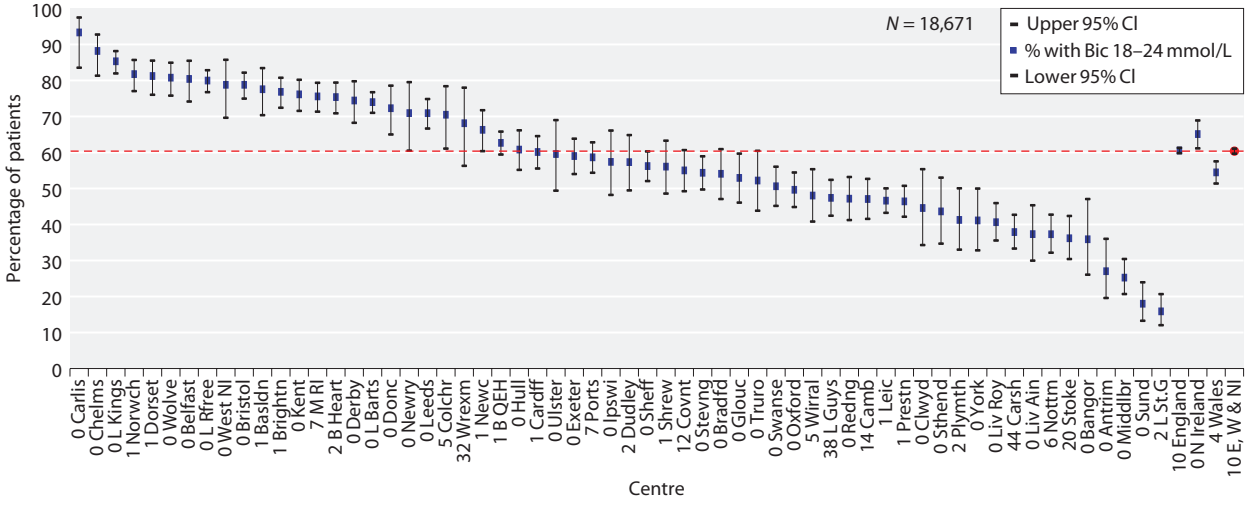

Fig. 9.20. Percentage of haemodialysis patients with serum bicarbonate within range (18–24 mmol/L) by centre in 2014

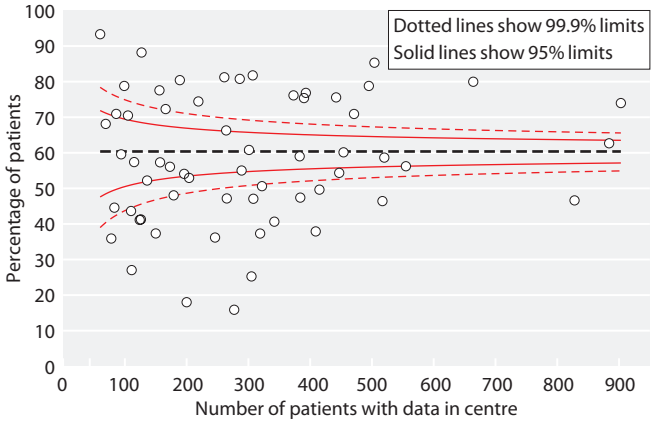

Fig. 9.21. Funnel plot for percentage of haemodialysis patients within the range for bicarbonate (18–24 mmol/L) by centre in 2014

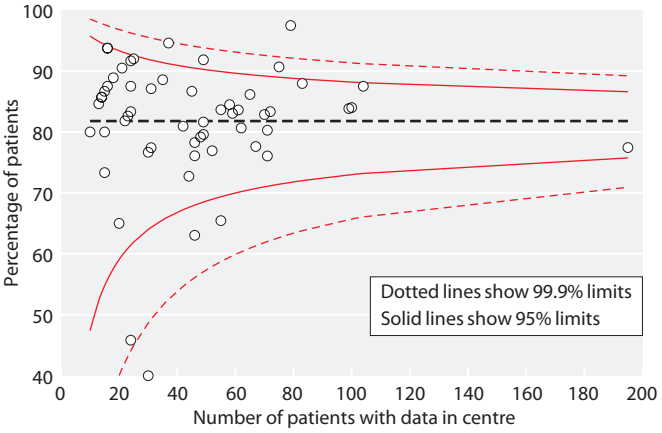

Fig. 9.23. Funnel plot for percentage of peritoneal dialysis patients within the range for bicarbonate (22–30 mmol/L) by centre in 2014

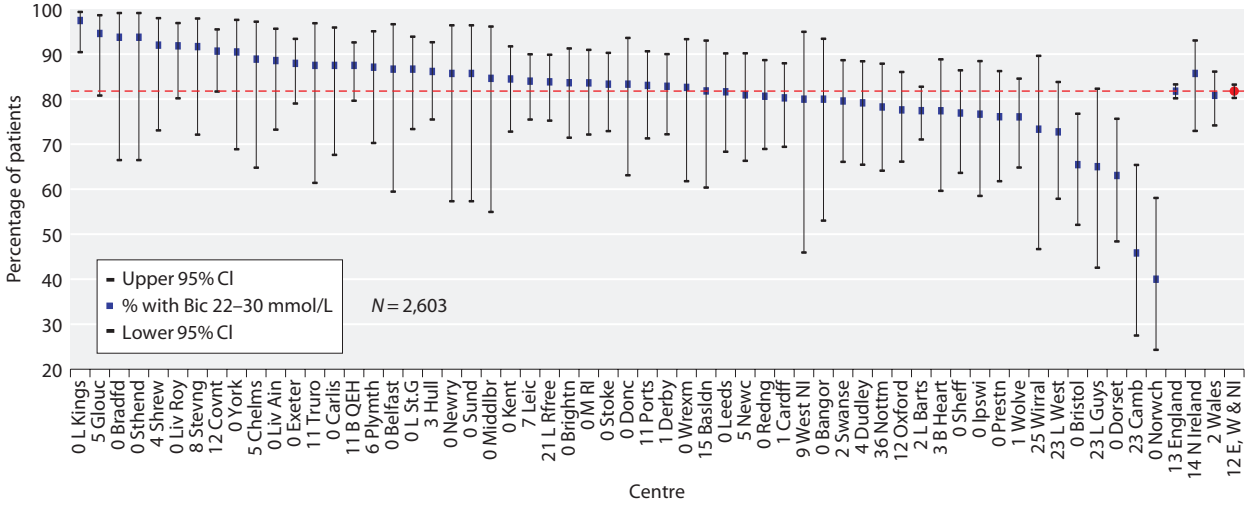

Fig. 9.22. Percentage of peritoneal dialysis patients with serum bicarbonate within range (22–30 mmol/L) by centre in 2014

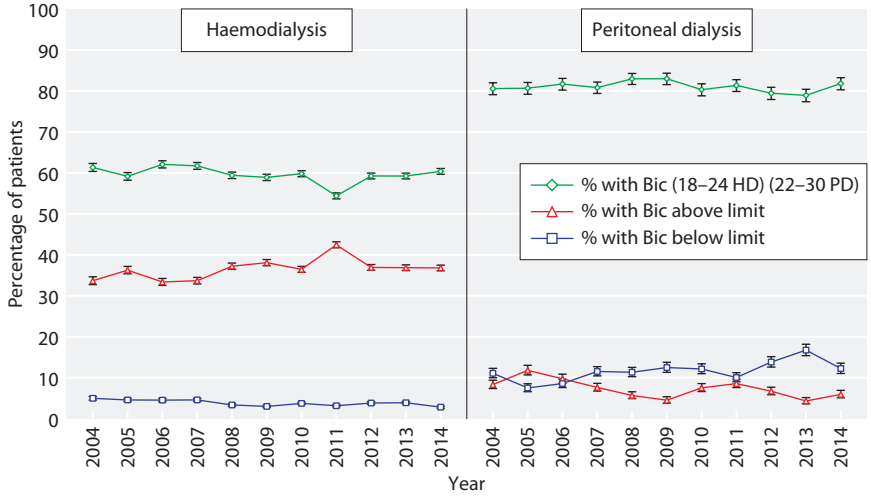

Fig. 9.24. Longitudinal change in percentage of patients within, below and above range for bicarbonate by dialysis modality 2004–2014

There has been a consistent difference between the modalities in the percentage with raised bicarbonate measures.

Conclusions

In summary, serum bicarbonate levels have not changed significantly, but it was observed that a persistent fraction of HD patients remained with raised bicarbonate levels. The UKRR has previously conducted a limited survey [9] into the possible underlying causes of serum bicarbonate variation. The study examined measures of sample processing and of dialysis treatment. It did not adjust for case-mix and was unable to detect any significant differences between centres. Studies have identified an increased risk of death stratified by a reduced pre dialysis serum bicarbonate level (<17 mmol/L) or with raised levels (>27 mmol/L) [10–13], as well as with raised dialysate bicarbonate concentrates [13]. Future analysis of management of acidosis will have to re-explore the factors associated with an increased trend in developing alkalosis in HD patients.

Analyses within this chapter present the ongoing improvement in achieving measures of bone and mineral disease management (BMD) in ESRF patients in the UK. In order to optimise BMD control further, it is necessary to explore confounding factors and applying adjustments to a number of case mix factors. These considerations can only be applied once the UKRR has access to an enhanced dataset from each centre. Many centres are updating their own IT systems, with an ambition that all new developments will comply with the National Renal Dataset. Thus, in future analyses, it may be possible to integrate details of assays used for the biochemical parameters, the local reference ranges adhered to, the dialysis dose and dialysate concentrations prescribed, as well as accessing all details of phosphate binder, calcium mimetic and vitamin D analogue use.

A number of studies have demonstrated reduced patient survival with disordered calcium and phosphate levels in dialysis patients [14–15] as well as with inadequate simultaneous control of three BMD parameters [13, 16, 17].

The UKRR 17th Annual Report chapter 8 [18] discussed the problems related to variations in calcium and PTH measurements. The inter and intra centre variation in the control of BMD parameters remains a challenge. So far, it has not been possible to perform analyses to examine these variations as the UKRR is faced with confounding factors, such as the completeness of data returns, as well as the differing assays used for PTH and albumin estimation.

Conflicts of interest: the authors declare no conflict of interest

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UK Renal Registry 18th Annual Report: Chapter 10 Clinical, Haematological and Biochemical Parameters in Patients Receiving Renal Replacement Therapy in Paediatric Centres in the UK in 2014: National and Centre-specific Analyses

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Key words

Adolescents · Biochemical variables · Blood pressure · BMI · Children · Dialysis · Established renal failure · Growth · Haemoglobin · Height · Hypertension · Paediatric · Quality improvement · Renal replacement therapy · Transplant · Weight · Young adults

Summary

- The median height z-score for paediatric patients on dialysis was −2.1 and for those with a functioning transplant −1.3. Children transplanted before the age of 12 years improved their height z-score over the subsequent five years, whereas those older than 12 maintained their height z-score, with all transplanted patients having a similar median height z-score after five years of starting renal replacement therapy (RRT).
- The median weight z-score for children on dialysis was −1.4 whereas children with a functioning transplant had a near normal weight for age and sex with a median z-score of −0.3.
- Of those with data, 75% of the prevalent paediatric RRT population had one or more 'traditional' risk factors for cardiovascular disease, with 1 in 10 having all three risk factors present.
- For the 10 centres reporting quarterly laboratory data, the average creatinine in transplant patients was 79 μmol/L; dialysis patients had normal average anaemia and acidosis markers and evidence of secondary hyperparathyroidism with an average PTH of 17.3 pmol/L.
- For transplant patients, 80% achieved the systolic blood pressure (SBP) standard and 93% achieved the haemoglobin standard.
- For haemodialysis patients, 57% achieved the SBP standard, 62% achieved the haemoglobin standard, 82% achieved the calcium standard, 51% achieved the phosphate standard and 39% achieved the parathyroid hormone (PTH) standard.
- For peritoneal dialysis patients, 70% achieved the SBP standard, 77% achieved the haemoglobin standard, 72% achieved the calcium standard, 54% achieved the phosphate standard and 33% achieved the PTH standard.

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Introduction

This Report focuses on the following variables for the prevalent paediatric dialysis and transplantation cohort on the 31st December 2014:

1. The completeness of data returns to the UK Renal Registry (UKRR)
2. Anthropometric characteristics and growth
3. Cardiovascular risk factors (CVRFs)
4. Laboratory and clinical indices including anaemia control and biochemical findings

Analyses of prevalent paediatric patients aged <18 years receiving renal replacement therapy (RRT) for the year 2014 and for the period 2003 to 2014 inclusive are reported. A single dataset was collected for each patient per year during this time period. Where possible, analysis of incident cohorts has been undertaken with centre specific data for each paediatric nephrology centre in the UK also being provided.

In previous years the analyses have been restricted to those aged under 16 years, this year those aged 16–18 years are also included.

Methods

Processes for data collection for the paediatric UKRR are described in chapter 4. The data presented in this Report relate to the annual census date of 31st December 2014.

Standards and standardisation

Standards are in bold text and are from the 'Treatment of adults and children with renal failure', Renal Association standards third edition (2002) [1] unless otherwise stated.

Where the value of clinical parameters in childhood varies with age, sex and size, data are presented as z-scores.

Anthropometry

'Measures of supine length or standing height and weight should be monitored at each clinic visit. All measurements should be plotted on European reference growth charts for healthy children.'

The reference range for height (Ht), weight (Wt) and body mass index (BMI) in childhood varies with gender and age. BMI was calculated using the formula BMI = Wt (kg)/Ht^2 (m). Height and weight were adjusted for age. To account for discrepancies in linear growth secondary to renal disease, BMI was expressed according to height-age, rather than chronological age. The International Obesity Taskforce definition [2]was used to define overweight and obesity; z-scores were calculated based on the British 1990 reference data for height and weight [3].

Blood pressure

'Blood pressure varies throughout childhood and should be maintained within two standard deviations of the mean for normal children of the same height and sex. The systolic blood pressure during peritoneal dialysis or after haemodialysis should be maintained at <90th centile for age, gender and height.'

'In paediatric renal transplant patients, the systolic blood pressure should be maintained at <90th percentile for age, gender and height.'

The analyses of systolic blood pressure (SBP) in this Report present the achievement of SBPs at or below the 90th percentile. Guidance for blood pressure in paediatric renal transplant patients was based on 2011 British Association for Paediatric Nephrology recommendations [4].

The reference range for SBP varies with gender, age and height. The data is therefore presented as z-scores based on data from the fourth report of the National High Blood Pressure Education Programme working group in the United States [5].

Cholesterol

The National Heart Lung and Blood Institute recommends screening for dyslipidaemias in children with chronic kidney disease/established renal failure/post renal transplant (deemed high risk) between the ages of 2 and 17, and defines high total cholesterol as ⩾5.2 mmol/L [6]. This cut-off has been adopted for this Report.

Haemoglobin (Hb) and Ferritin

Guidance on the management of anaemia in adults and children with chronic kidney disease was updated and published by the National Institute for Health and Care Excellence in February 2011 (Clinical Guideline 114) [7].

'Typically maintain the aspirational Hb range between 100 and 120 g/L for young people and children aged 2 years and older, and between 95 and 115 g/L for children younger than 2 years of age, reflecting the lower normal range in that age group.'

Haemoglobin and ferritin were analysed using age related laboratory reference ranges as in table 10.1.

Calcium, phosphate and parathyroid hormone (PTH)

'Serum phosphate and calcium should be kept within the normal range. PTH levels should be maintained within twice the upper limit of the normal range but, contrary to adult standards, may be kept within the normal range if growth is normal.'

Calcium, phosphate and PTH were analysed using age related laboratory reference ranges as in table 10.1. Individual variable data analysis has been performed per centre and nationally. It should be noted that 'normal' growth is difficult to determine in the setting of paediatric RRT.

Bicarbonate

'Serum bicarbonate concentrations should be between 20 and 26 mmol/L.'

Bicarbonate reference ranges vary by centre, and are reported as within or outside the reference range as given in table 10.1.

Table 10.1. Summary of relevant biochemical clinical audit measures

	Age			
Parameter	<1 year	1–5 years	6–12 years	>12 years
Haemoglobin (g/L), NICE guideline CG 114	Maintain 95–115 if aged <2 years	Maintain 100–120 if aged >2 years	100–120	100–120
Ferritin (μg/L)	200–500	200–500	200–500	200–500
Corrected calcium (mmol/L)	2.24–2.74	2.19–2.69	2.19–2.69	2.15–2.55
Phosphate (mmol/L)	1.10–1.95	1.05–1.75	1.05–1.75	1.05–1.75
Parathyroid hormone (individual centre)	Within twice the normal range Levels may be maintained within normal range if growing appropriately			
Bicarbonate (mmol/L)	Reported as either within or outside centre reference range			

NICE – National Institute for Health and Care Excellence

Cardiovascular risk factors

Last year we presented a new cross-sectional evaluation of the prevalence of traditional risk factors for cardiovascular disease, including hypertension, overweight/obesity and hypercholesterolaemia in children with established renal failure (ERF). In this initial analysis, we showed the prevalence of one or more CVRFs in children with ERF in the UK. Evidence for the use of total cholesterol and the relationship of childhood CVRFs with adult CVRFs is available from The National Heart Lung and Blood Institute [6].

Statistical analyses

Annual and quarterly clinical and laboratory data have been analysed separately, with annual data being used unless stated otherwise. Data were analysed to calculate summary statistics (maximum, minimum, mean and median values in addition to standard deviation and quartile ranges). Where applicable, the percentage achieving the audit standard was also calculated. If a patient had missing data, they were excluded from the relevant analyses.

Longitudinal analyses of attainment of standards were also performed. These were based on a single data point per ERF patient per year collected as described previously. Caution should be exercised in the interpretation of analyses based on data items from a single annual measurement per patient. This is due to changing audit standards over time and variable data returns for previous years. Furthermore, for biochemical variables there are not only differences between assays used at different centres, but also differences in the timing of the result between modalities to take into account. All analyses were performed using SAS 9.3.

Results

Data completeness

Annual data

Tables 10.2 and 10.3 show the completeness of annual data returns for transplant and dialysis patients for 2014.

Overall, completeness was excellent for key variables in both groups, with the larger group of transplant patients having slightly better completeness for height, BMI, SBP and cholesterol and the smaller group of dialysis patients having somewhat better completeness for PTH, calcium and phosphate. Ferritin completeness is relatively low in transplant patients which may reflect satisfactory graft function and anaemia control, or use of alternative methods of assessing iron stores. Reporting of therapy for anaemia remains patchy and only half the patients have a cholesterol value reported to the paediatric UKRR.

Quarterly data

Ten centres supplied quarterly 2014 data to the UKRR. Completeness of this data is shown for transplant patients in table 10.4 and dialysis patients in table 10.5. For transplant patients, ferritin and PTH were included in quarterly returns but not widely used; the overall quarterly completeness for ferritin in transplant patients was 40%, and for PTH was 46%.

Growth

Height

Figures 10.1 and 10.2 show that children receiving RRT were short for their age and sex; those on dialysis were significantly shorter than those with renal transplants. The overall median z-score was −1.3 in the transplanted group and −2.1 in the dialysis group, $p < 0.0001$. When taking into account data completeness, some centres with apparently less desirable transplant height z-scores had only 54% completeness. Belfast was excluded from figure 10.2 as no height data for dialysis patients was reported. Figure 10.3 demonstrates that by

Table 10.2. Percentage data completeness for transplant patients <18 years old old by centre for each variable and total number of patients per centre in 2014

Centre	Transplant patients *N*	Height	Weight	BMI	SBP	Hb	Creat	Ferr	ESA	IV Iron	Chol	Bicarb	PTH	Ca	Phos
Bham_P	79	91.1	91.1	91.1	91.1	91.1	91.1	41.8	0.0	0.0	0.0	91.1	82.3	91.1	91.1
Blfst_P*	24	54.2	87.5	54.2	50.0	100.0	100.0	75.0	91.7	8.3	58.3	100.0	41.7	100.0	100.0
Brstl_P*	43	97.7	95.4	93.0	95.4	100.0	100.0	62.8	97.7	2.3	53.5	100.0	72.1	100.0	100.0
Cardf_P	22	95.5	100.0	95.5	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Glasg_P*	44	100.0	100.0	100.0	100.0	90.9	100.0	61.4	100.0	100.0	47.7	88.6	86.4	88.6	93.2
L Eve_P*	79	98.7	98.7	98.7	98.7	98.7	98.7	98.7	94.9	98.7	93.7	98.7	98.7	98.7	98.7
L GOSH_P*	157	94.9	96.2	94.3	94.3	96.8	96.8	96.2	22.9	20.4	33.1	96.8	96.8	96.8	96.8
Leeds_P*	69	78.3	95.7	78.3	91.3	95.7	95.7	73.9	98.6	98.6	89.9	95.7	72.5	95.7	92.8
Livpl_P	36	88.9	88.9	88.9	88.9	88.9	86.1	83.3	88.9	86.1	69.4	86.1	2.8	88.9	86.1
Manch_P*	52	100.0	100.0	100.0	100.0	100.0	100.0	69.2	100.0	100.0	13.5	100.0	100.0	100.0	100.0
Newc_P*	30	100.0	100.0	100.0	100.0	100.0	100.0	86.7	100.0	100.0	70.0	96.7	76.7	96.7	96.7
Nottm_P*	68	76.5	77.9	76.5	73.5	92.7	94.1	88.2	0.0	0.0	85.3	92.7	89.7	94.1	94.1
Soton_P	23	87.0	95.7	87.0	95.7	100.0	100.0	95.7	95.7	95.7	56.5	100.0	95.7	95.7	100.0
UK	**726**	**90.8**	**94.2**	**90.4**	**91.7**	**96.0**	**96.6**	**80.0**	**61.3**	**52.6**	**54.0**	**95.6**	**83.3**	**95.7**	**95.7**

BMI – body mass index; SBP – systolic blood pressure; Hb – haemoglobin; Creat – creatinine; Ferr – ferritin; ESA – erythropoietin stimulating agent; IV – intravenous; Chol – cholesterol; Bicarb – bicarbonate; PTH – parathyroid hormone; Ca – calcium; Phos – phosphate
*Denotes centre undertaking paediatric kidney transplantation

the time of RRT start, children were already short for their age and sex with an overall median height z-score of −1.4 (shown by the dotted line) with younger children aged 2–8 most affected. Figure 10.4 shows that although transplanted paediatric patients aged up to 12 years improved their height z-score in the first 5 years of starting RRT, those older than 12 started with a better height z-score which was maintained. In contrast, all dialysis patients had a worsening height z-score over time. This was more pronounced in older children, who were better grown at RRT start. It should be noted that due to changes in modality, groups are not strictly sequential in this analysis, and as most patients received a transplant, there are small numbers of dialysis patients at

Table 10.3. Percentage data completeness for dialysis patients <18 years old old by centre for each variable and total number of patients per centre in 2014

Centre	Dialysis patients *N*	Height	Weight	BMI	SBP	Hb	Ferr	ESA	IV Iron	Chol	Bicarb	PTH	Ca	Phos
Bham_P	24	95.8	95.8	95.8	100.0	95.8	95.8	0.0	0.0	0.0	95.8	95.8	95.8	95.8
Blfst_P	6	0.0	50.0	0.0	16.7	100.0	83.3	66.7	16.7	66.7	100.0	100.0	100.0	100.0
Brstl_P	14	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	78.6	100.0	92.9	100.0	100.0
Cardf_P	6	83.3	100.0	83.3	100.0	100.0	100.0	100.0	100.0	66.7	100.0	100.0	100.0	100.0
Glasg_P	12	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	58.3	91.7	100.0	100.0	100.0
L Eve_P	20	90.0	100.0	90.0	100.0	100.0	100.0	90.0	100.0	60.0	100.0	100.0	100.0	100.0
L GOSH_P	28	96.4	100.0	96.4	96.4	100.0	82.1	100.0	100.0	64.3	100.0	100.0	100.0	100.0
Leeds_P	17	76.5	100.0	76.5	88.2	100.0	100.0	100.0	100.0	76.5	100.0	100.0	100.0	100.0
Livpl_P	5	60.0	80.0	60.0	80.0	80.0	80.0	80.0	60.0	60.0	60.0	80.0	80.0	80.0
Manch_P	33	90.9	97.0	90.9	93.9	97.0	97.0	100.0	97.0	15.2	100.0	97.0	100.0	100.0
Newc_P	7	100.0	100.0	100.0	100.0	85.7	85.7	100.0	100.0	57.1	85.7	85.7	85.7	85.7
Nottm_P	17	52.9	58.8	52.9	29.4	100.0	94.1	0.0	0.0	52.9	100.0	94.1	100.0	100.0
Soton_P	2	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	50.0	100.0	50.0	100.0	100.0
UK	**191**	**85.3**	**93.2**	**85.3**	**88.0**	**97.9**	**94.2**	**75.9**	**74.4**	**47.6**	**97.4**	**96.3**	**98.4**	**98.4**

BMI – body mass index; SBP – systolic blood pressure; Hb – haemoglobin; Ferr – ferritin; ESA – erythropoietin stimulating agent; IV – intravenous; Chol – cholesterol; Bicarb – bicarbonate; PTH – parathyroid hormone; Ca – calcium; Phos – phosphate

Table 10.4. Percentage data completeness for transplant patients <18 years old old by centre reporting quarterly laboratory data

	Transplant patients					
Centre	*N*	Creatinine	Hb	Calcium	Phosphate	Bicarbonate
Bham_P	79	85.7	100.0	85.7	85.7	85.7
Blfst_P	24	100.0	95.7	100.0	100.0	100.0
Brstl_P	43	95.2	92.0	92.7	92.1	89.7
Cardf_P	22	74.1	72.7	74.1	74.1	74.1
Glasg_P	44	71.5	84.3	71.5	71.5	88.6
L Eve_P	79	98.0	98.7	98.0	98.0	98.0
L GOSH_P	157	98.0	99.1	97.8	97.4	97.3
Leeds_P	69	90.7	100.0	90.3	88.3	89.1
Newc_P	30	85.1	93.8	85.1	85.1	71.1
Nottm_P	68	87.9	92.9	87.9	87.9	87.4
Overall	**615**	**88.6**	**92.9**	**88.3**	**88.0**	**88.1**

Table 10.5. Percentage data completeness for dialysis patients <18 years old old by centre reporting quarterly laboratory data

	Dialysis patients						
Centre	*N*	Hb	Ferritin	Calcium	Phosphate	PTH	Bicarbonate
Bham_P	24	100.0	75.8	100.0	100.0	100.0	100.0
Blfst_P	6	95.7	91.3	95.7	95.7	95.7	95.7
Brstl_P	14	92.0	84.0	92.0	92.0	92.0	92.0
Cardf_P	6	72.7	72.7	72.7	72.7	63.6	72.7
Glasg_P	12	84.3	78.4	84.3	84.3	80.4	91.7
L Eve_P	20	98.7	94.7	98.7	98.7	96.1	98.7
L GOSH_P	28	99.1	40.5	99.1	99.1	98.3	99.1
Leeds_P	17	100.0	92.4	100.0	100.0	89.4	100.0
Newc_P	7	93.8	93.8	87.5	93.8	87.5	93.8
Nottm_P	17	92.9	92.9	94.3	94.3	92.9	94.3
Overall	**151**	**92.9**	**81.7**	**92.4**	**93.1**	**89.6**	**93.8**

Hb – haemoglobin; PTH – parathyroid hormone

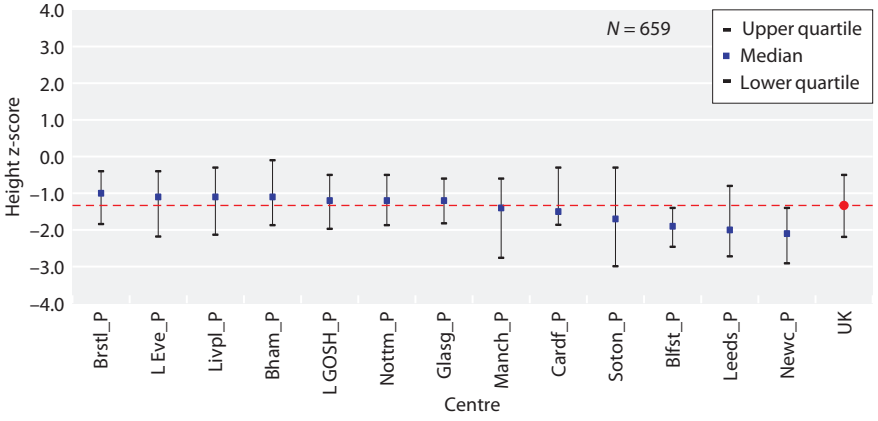

Fig. 10.1. Median height z-scores for transplant patients <18 years old in 2014, centre specific and national averages

five years after starting RRT. Data for 16–18 year olds was omitted owing to small group numbers.

The proportion of patients aged 2–18 years with a height less than two standard deviations in 2014 was much higher for those on dialysis (55.9% for haemodialysis (HD) and 43.6% for peritoneal dialysis (PD)) compared to those with a functioning transplant (26.0%), excluding situations where growth might be compromised, for example patients with syndromes and those born prematurely. For transplanted patients, the proportion increased with age, with

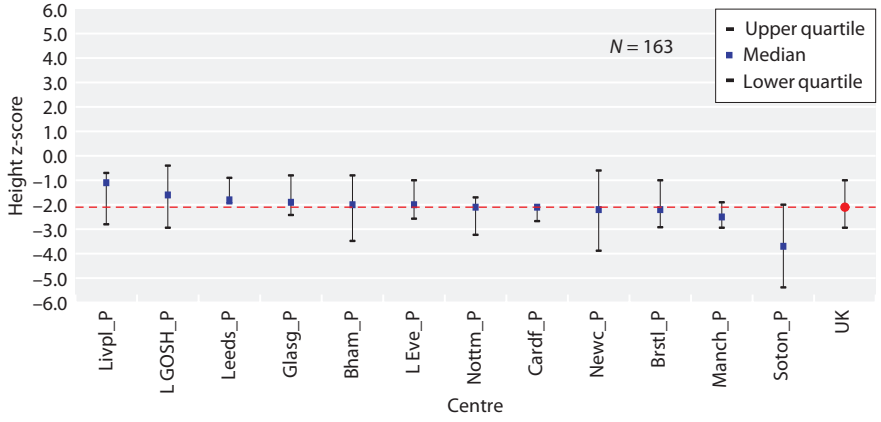

Fig. 10.2. Median height z-scores for dialysis patients <18 years old in 2014, centre specific and national averages

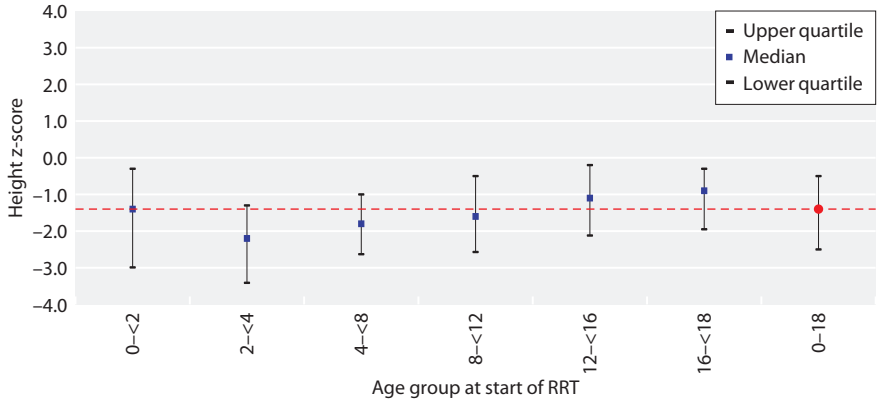

Fig. 10.3. Median height z-scores at start of RRT for patients <18 years old between 2003 and 2014, by age at start

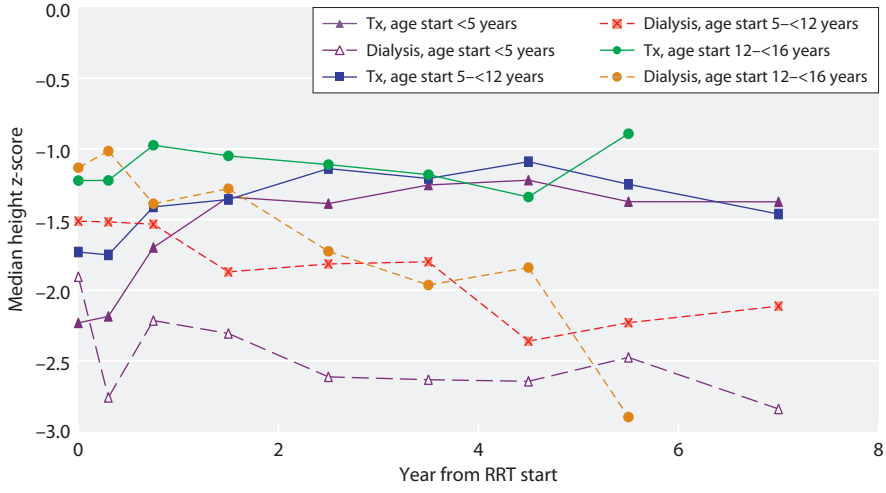

Fig. 10.4. Median height z-scores for patients <16 years old by time on RRT and treatment modality

20.5% of those aged 5–<12 having a height z-score less than two standard deviations, 26.3% of those aged 12–<16 and 32.2% of those aged 16–<18. No comments can be made at centre level or for dialysis patients due to small patient numbers. Figure 10.5 shows large variation in the use of growth hormone in those with a height less than two standard deviations. The proportion of patients with a height less than two standard deviations whose growth hormone status was not known is high (ranging from approximately 10% in 2010 to 50% in 2011), and this limits meaningful interpretation. Average use of growth hormone for patients aged under 18 with a height less than two standard deviations since 2003 is 26.1% for dialysis patients and 10.2% for transplant patients.

Weight

Figures 10.6 and 10.7 show that paediatric patients receiving dialysis were significantly more underweight

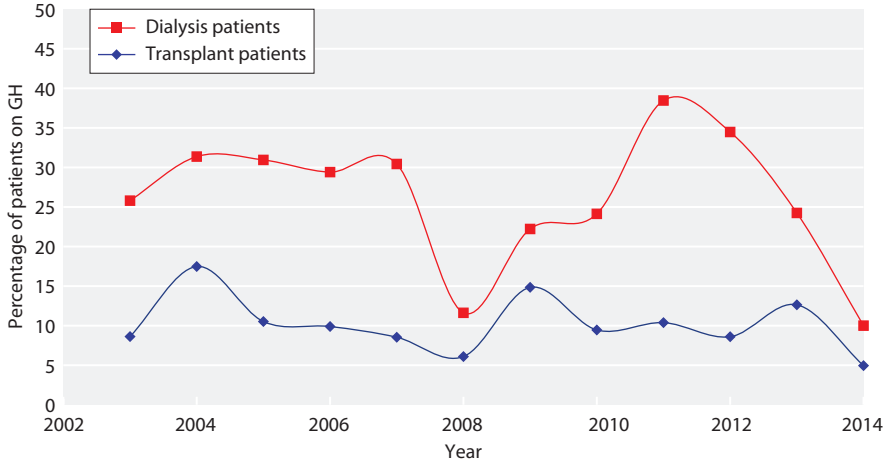

Fig. 10.5. Use of growth hormone in children <18 years old with a height under 2SD between 2003 and 2014

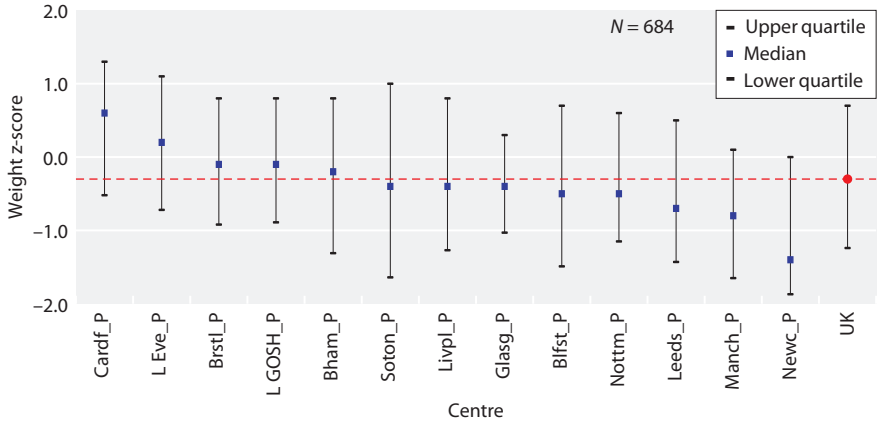

Fig. 10.6. Median weight z-scores for transplant patients <18 years old in 2014, centre specific and national averages

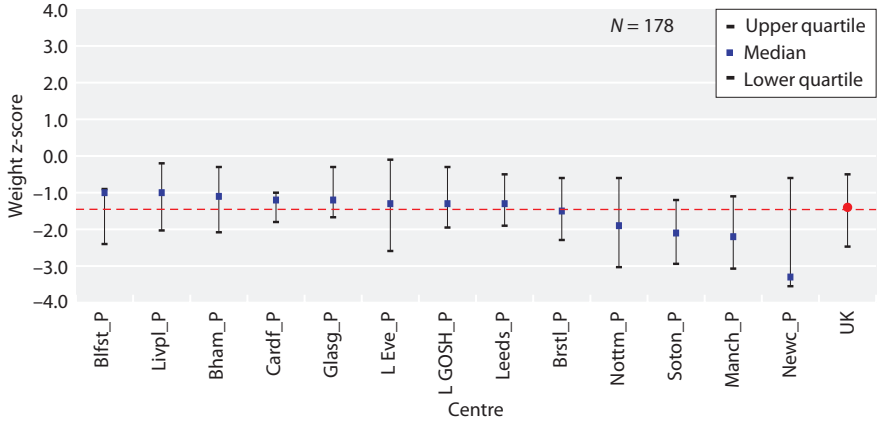

Fig. 10.7. Median weight z-scores for dialysis patients <18 years old in 2014, centre specific and national averages

for age and sex than those with renal transplants. The overall median z-score was −0.3 in the transplanted group and −1.4 in the dialysis group, $p < 0.0001$. Centre level comparison for dialysis patients in particular should be avoided due to low numbers per centre.

When taking height into account and examining BMI rather than weight alone, figures 10.8 and 10.9 show that BMI z-scores are mostly within the upper half of the normal range for transplant patients, and spread throughout the normal range in dialysis patients. The majority of paediatric RRT patients have a BMI within the normal range, as shown in figure 10.10.

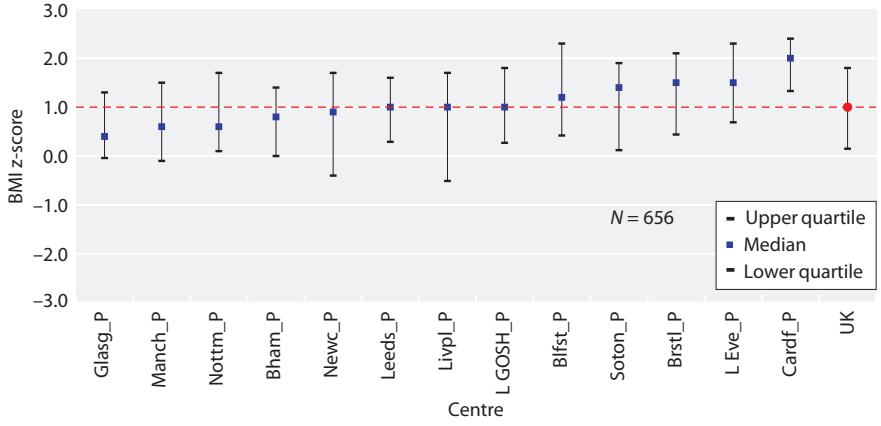

Fig. 10.8. Median BMI z-scores for transplant patients <18 years old in 2014, centre specific and national averages

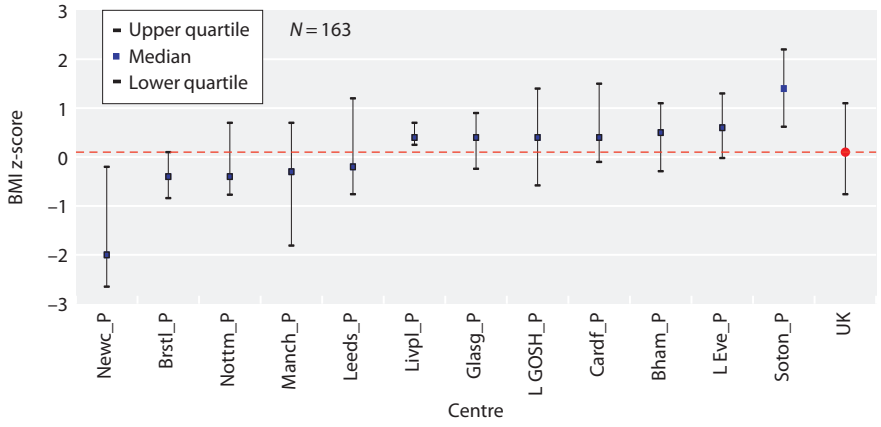

Fig. 10.9. Median BMI z-scores for dialysis patients <18 years old in 2014, centre specific and national averages

Cardiovascular risk factor evaluation

Obesity

Figures 10.8 and 10.9 show that children with renal transplants had a significantly higher body mass index for age and sex than those receiving dialysis. The overall median z-score was 1.0 in the transplanted group and 0.1 in the dialysis group, $p < 0.0001$.

Figure 10.10 demonstrates higher proportions of overweight and obese children in those with renal transplants

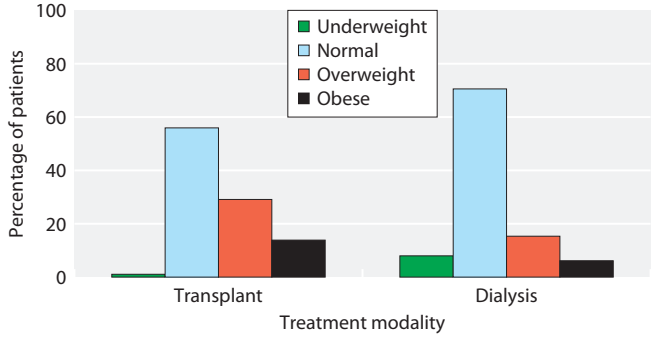

Fig. 10.10. BMI categorisation in children <18 years old by modality in 2014

(43.0%) compared to those receiving dialysis (21.5%). There was a higher proportion of underweight children in the dialysis group (8.0%) compared to those with renal transplants (1.1%).

Of those aged 16 to <18 years, 44.4% were overweight or obese compared to 23.7% of those aged 0 to <5 years, but there was no significant difference by age in the transplant patient group. There were no statistically significant differences between proportions of those underweight, normal, overweight or obese in terms of sex, ethnicity or donor source (deceased or living).

Hypertension

Figures 10.11 and 10.12 show paediatric patients receiving RRT were hypertensive compared to the healthy population, and those receiving dialysis had a significantly higher median SBP than those with renal transplants. There was wide inter-centre variability in median SBP z-score, with many centres having wide confidence intervals that included zero. The median SBP z-score was maintained at or below the 90th percentile by all but one centre for those with transplants whereas four centres

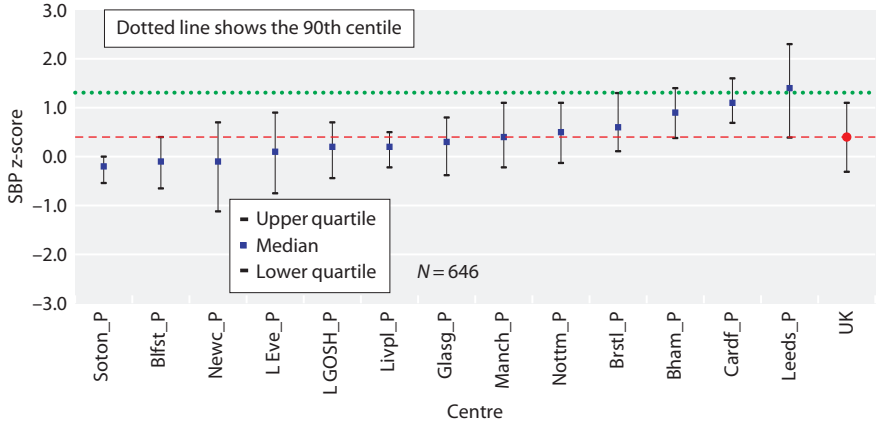

Fig. 10.11. Median systolic blood pressure z-scores for transplant patients <18 years old in 2014, centre specific and national averages

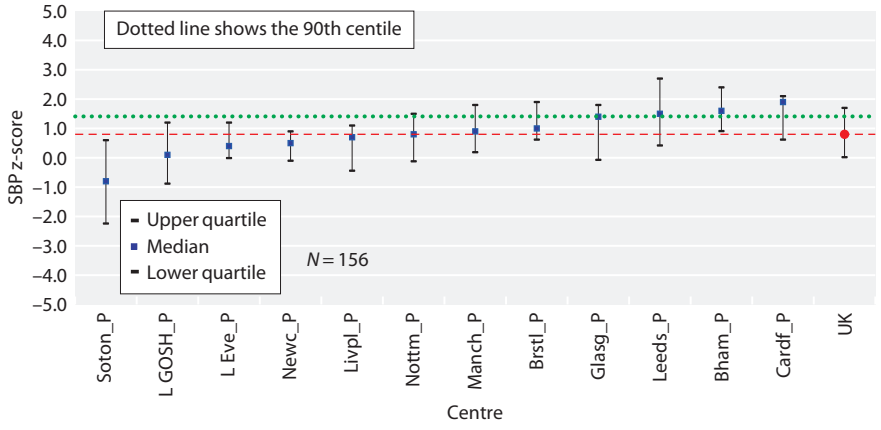

Fig. 10.12. Median systolic blood pressure z-scores for dialysis patients <18 years old in 2014, centre specific and national averages

were above the 90th percentile for median SBP z-score for those receiving dialysis. The overall median z-score was 0.4 in the transplanted group and 0.8 in the dialysis group, $p < 0.0001$. Of those aged <18, 80.2% of children with a functioning kidney transplant, 57.3% of those receiving HD, and 70.3% of those receiving PD had a SBP <90th percentile in 2014. No comments can be made at centre level or for dialysis patients due to small patient numbers. Table 10.6 shows that there were significant differences in the percentage below the 90th percentile for SBP between RRT modalities, gender, and ethnicity. There was no statistically significant difference in SBP between age groups, HD and PD or between living and deceased donor transplants.

Cardiovascular risk factor prevalence

Table 10.7 shows that the percentage of patients with no CVRFs was 22.7%, one CVRF was 39.3%, two CVRFs was 27.8% and the percentage of those with all evaluated CVRFs was 10.3%. This analysis is restricted to the 428 of 917 (46.7%) patients with complete data for all three items. Thus of the included prevalent

Table 10.6. Percentage of patients <18 years old achieving the standard for systolic blood pressure in 2014

	N	% below 90th percentile	*p* value
Total	802	76.9	
Age group (years)			0.07
0–<5	91	71.4	
5–<12	310	73.6	
12–<16	257	81.3	
16–<18	144	79.9	
Gender			0.0002
Male	501	81.2	
Female	301	69.8	
Ethnicity			0.007
Black	32	78.1	
Other	54	75.9	
South Asian	137	65.7	
White	571	79.7	
RRT modality			<0.0001
Dialysis	156	63.5	
Transplant	646	80.2	

Table 10.7. Frequency of number of cardiovascular risk factors in prevalent RRT patients <18 years old in 2014

Number of CV risk factors	Hypertensive	OW/Obese	Hypercholesterolaemic	*N*	%	Total %
0	No	No	No	97	22.7	22.7
1	Yes	No	No	48	11.2	
	No	Yes	No	60	14.0	39.3
	No	No	Yes	60	14.0	
2	Yes	Yes	No	37	8.6	
	Yes	No	Yes	34	7.9	27.8
	No	Yes	Yes	48	11.2	
3	Yes	Yes	Yes	44	10.3	10.3
N	163	189	186			
Total %	**38.1**	**44.2**	**43.5**			

CV – cardiovascular; OW – overweight

paediatric RRT population three quarters had one or more risk factors for cardiovascular disease, with 1 in 10 having all three risk factors evaluated. Of those included in this analysis, 163 (38.1%) had hypertension, 189 (44.2%) were overweight/obese and 186 (43.5%) had hypercholesterolaemia. There were no statistically significant differences in number of CVRFs according to age, gender, ethnicity or modality.

Laboratory and clinical indices – quarterly data

Tables 10.8 and 10.10 display the median values and interquartile ranges (IQR) for quarterly laboratory parameters for paediatric transplant and dialysis patients in 2014 by centre, with table 10.9 showing age specific creatinine results. The total number of data points for each parameter varied depending on completeness, ranging from 2,059 data points for creatinine in transplant patients to 430 data points for ferritin in dialysis patients.

For transplant patients, these results demonstrate excellent average graft function in the paediatric population, with associated good anaemia control and normal bone metabolism markers. The overall median ferritin in transplant patients was 61 (IQR 32–139) μg/L based on 40% completeness. Similarly the overall median PTH in transplant patients was 5.9 (IQR 3.9–8.9) pmol/L based on 46% completeness, again likely to be unused in the absence of transplant related chronic kidney disease.

For dialysis patients, the average haemoglobin and ferritin were in target. For bone biochemistry, although average calcium and phosphate were in range, there was evidence of hyperparathyroidism with average PTH

Table 10.8. Median quarterly laboratory data by centre in prevalent transplant patients <18 years old in 2014

	Transplant patients				
Centre	Creatinine μmol/L	Haemoglobin g/L	Calcium mmol/L	Phosphate mmol/L	Bicarbonate mmol/L
Bham_P	71	120	2.45	1.32	25
Blfst_P	82	125	2.36	1.22	22
Brstl_P	71	125	2.45	1.28	25
Cardf_P	66	125	2.52	1.21	23
Glasg_P	81	118	2.44	1.27	21
L Eve_P	81	118	2.46	1.20	23
L GOSH_P	80	122	2.37	1.34	23
Leeds_P	91	116	2.38	1.32	25
Newc_P	83	127	2.41	1.23	23
Nottm_P	71	124	2.44	1.27	25
Overall median	**79**	**121**	**2.41**	**1.29**	**24**
Interquartile range	**(59–105)**	**(111–131)**	**(2.35–2.48)**	**(1.13–1.43)**	**(22–26)**

Table 10.9. Median quarterly creatinine by age group and centre in prevalent transplant patients <18 years old in 2014

	Age group							
	0–<5		5–<12		12–<16		16–<18	
Centre	*N*	Creatinine umol/L	*N*	Creatinine umol/L	*N*	Creatinine umol/L	*N*	Creatinine umol/L
Bham_P	14	41	92	63	95	83	26	94
Blfst_P	6	55	52	77	8	64	27	109
Brstl_P	7	45	90	60	27	83	33	102
Cardf_P	0		35	64	16	66	9	85
Glasg_P	4	51	39	59	57	94	13	119
L Eve_P	22	41	110	74	95	99	61	96
L GOSH_P	56	37	228	65	178	97	112	120
Leeds_P	10	42	76	80	96	97	51	99
Newc_P	4	34	13	41	40	83	40	100
Nottm_P	11	32	98	67	77	74	31	99
Total *N* and overall UK median	**134**	**40**	**833**	**66**	**689**	**89**	**403**	**104**
Interquartile range		**(33–49)**		**(52–85)**		**(71–114)**		**(85–131)**

Blank cell denotes missing data

over target at more than twice the upper limit of normal, with variation between centres. Control of acidosis was also within the desired range.

Laboratory and clinical indices – annual data

Haemoglobin and ferritin

The percentage of patients aged <18 on dialysis achieving the haemoglobin standard in 2014 was 61.8% for those on HD and 76.5% for those on PD, compared to 92.5% for those with a renal transplant. There was no pattern by age, and no comments could be made at centre level or for dialysis patients due to small patient numbers. During 2012–2014, 74.6% of dialysis patients and 92.2% of transplant patients achieved the standard for haemoglobin, which has remained consistent since the 2003–2005 period. The proportion of patients with a ferritin in range during 2012–2014 was 35.5% for dialysis patients and 14.5% for transplant patients. It is not possible to draw conclusions on ferritin data trends, as the completeness for transplant patients was only 40.6% in the 2003–2005 period, but had improved to 77.5% in the 2012–2014 period. A similar improvement

Table 10.10. Median quarterly laboratory data by centre in prevalent dialysis patients <18 years old in 2014

	Dialysis patients					
Centre	Haemoglobin g/L	Ferritin µg/L	Calcium mmol/L	Phosphate mmol/L	PTH pmol/L	Bicarbonate mmol/L
Bham_P	112	245	2.57	1.65	14.5	26
Blfst_P	117	1,117	2.46	1.03	21.8	27
Brstl_P	111	453	2.60	1.36	5.1	24
Cardf_P	114	316	2.61	1.36	44.2	22
Glasg_P	106	146	2.46	1.18	17.6	20
L Eve_P	108	334	2.48	1.50	31.1	24
L GOSH_P	117	203	2.47	1.39	9.0	25
Leeds_P	101	330	2.46	2.07	42.5	26
Newc_P	102	319	2.54	1.23	9.2	24
Nottm_P	103	229	2.50	1.21	21.8	30
Overall median	**109**	**280**	**2.50**	**1.48**	**17.3**	**26**
Interquartile range	**(98–121)**	**(137–492)**	**(2.41–2.61)**	**(1.10–1.88)**	**(6.9–46.0)**	**(23–29)**

PTH – parathyroid hormone

Table 10.11. Proportion of paediatric RRT patients on ESA, by haemoglobin attainment, across time

Time period	Hb below standard % on ESA	Hb above standard % on ESA
Transplant patients		
2003–2005	20.2	3.8
2006–2008	22.9	4.6
2009–2011	22.2	6.9
2012–2014	26.0	4.3
Dialysis patients		
2003–2005	96.6	92.3
2006–2008	94.9	95.7
2009–2011	88.1	80.7
2012–2014	85.5	90.2

Hb – haemoglobin; ESA – erythropoietin stimulating agent

was also seen for dialysis ferritin data, increasing from 72.9% to 94.8% over the same time periods.

At first inspection, table 10.11 appears to show increasing use of erythropoietin stimulating agents (ESAs) over time in transplant patients and a decrease in use of ESAs in dialysis patients over time. However the amount of missing data increased from 2.5% in the 2003–2005 period to 22.5% in the most recent period for dialysis patients, and by a similar margin for the transplant patients.

Overall, figure 10.13 shows high usage of ESAs in dialysis patients without a clear difference by haemoglobin standard, noting erratic results from 2010 when there was a reduction in data completeness. Usage of ESAs in transplant patients remained low and reasonably stable with a more discernible separation by haemoglobin standard. Figure 10.14 is similar to figure 10.13 but demonstrates wider variation for usage of intravenous (IV) iron for dialysis patients by haemoglobin standard, in keeping with low completeness for past years, and low usage of IV iron in transplant patients.

Calcium

The percentage of patients aged <18 on HD ($n = 102$) achieving the calcium standard in 2014 was 82.4%, with 5.9% of patients being hypocalcaemic, and 11.8% being hypercalcaemic. The percentage of patients aged <18 on PD ($n = 86$) achieving the calcium standard in 2014 was 72.1%, with no patients being hypocalcaemic, and 27.9% being hypercalcaemic. Small cohort numbers prevent commentary at centre level or by age group.

Phosphate

The percentage of patients aged <18 on HD ($n = 102$) achieving the phosphate standard in 2014 was 51.0%, with 12.8% of patients being hypophosphataemic, and 36.3% being hyperphosphataemic. The percentage of patients aged <18 on PD ($n = 86$) achieving the phosphate standard in 2014 was 53.5%, with 11.6% of patients being hypophosphataemic, and 34.9% being hyperphosphataemic.

Small cohort numbers prevent commentary at centre level or by age group.

Parathyroid hormone

The percentage of patients aged <18 with a renal transplant ($n = 605$) achieving the PTH standard in 2014 was 83.5%, with 16.5% having hyperparathyroidism. The percentage of patients aged <18 on HD ($n = 98$) achieving the PTH standard in 2014 was 38.8%, with 61.2% having hyperparathyroidism. The percentage of patients aged <18 on PD ($n = 86$) achieving the PTH standard in 2014 was 32.6%, with 67.4% having hyperparathyroidism. Small cohort numbers and low

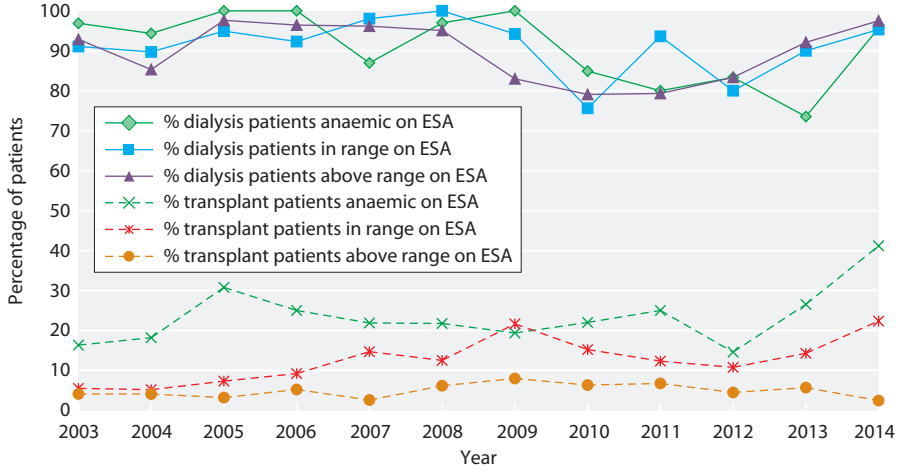

Fig. 10.13. The use of ESA by haemoglobin standard and treatment modality between 2003 and 2014 in prevalent RRT patients <18 years old

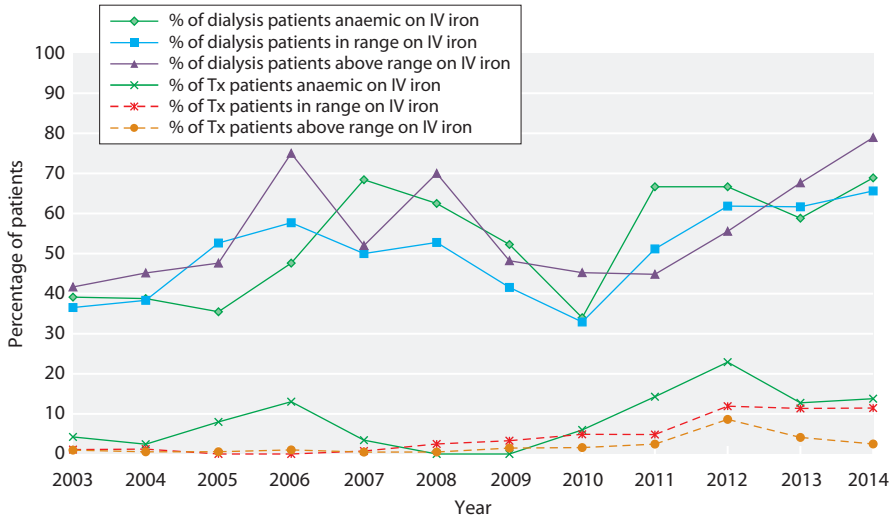

Fig. 10.14. The use of intravenous iron by haemoglobin standard and treatment modality between 2003 and 2014 in prevalent RRT patients <18 years old

completeness from some centres for transplant patients prevent commentary at centre level or by age group.

Bicarbonate

The percentage of patients aged <18 with a renal transplant ($n = 694$) achieving the bicarbonate standard in 2014 was 85.7%, with 10.4% being below the standard and 3.9% being above the standard. The percentage of patients aged <18 on HD ($n = 100$) achieving the bicarbonate standard in 2014 was 75.0%, with 18.0% being below the standard and 7.0% being above the standard. The percentage of patients aged <18 on PD ($n = 86$) achieving the bicarbonate standard in 2014 was 68.6%, with 5.8% being below the standard and 25.6% being above the standard.

Small cohort numbers prevent commentary at centre level or by age group.

Discussion

This chapter provides information describing clinical and laboratory parameters of paediatric RRT patients in the UK. This enables comparison against national standards and guidelines, assessment of quality of care and benchmarking the performance of UK tertiary paediatric nephrology centres. Data from 2014 and trends over the last 12 years have been analysed. The results and conclusions are a valuable resource for the paediatric renal community and this data accounts for nearly 20% of European Paediatric Renal Registry data.

Major additions this year are (i) a section including quarterly data from 10 of 13 centres; and (ii) data on all patients, including 16–18 year olds reported to the paediatric UKRR. The efforts of the past few years have continued to improve data quality to enable conclusions to be drawn with greater confidence against a background of small patient numbers from a relatively rare condition. An example of this is seeking to receive quarterly rather than annual data to ensure better representation from centres.

Quarterly data

Ten centres provided quarterly biochemistry data for analysis. This has enabled the reporting of actual average values for the parameters collected which is a major change providing reassuring evidence of excellent graft function for those with a transplant, and good control of anaemia and acidosis in those on dialysis, perhaps with some room for improvement for metabolic bone disease management. The data presented has good coverage of the UK with only one larger centre and two smaller centres being omitted to date (Southampton did provide quarterly data for height, weight and BP but not biochemistry).

This progress moves the paediatric and adult renal registry databases a big step closer to unification which would allow more comprehensive reporting, especially of adolescents and young adults who may be managed in paediatric or adult services.

The ongoing challenge is to continue to work with the three remaining centres to achieve quarterly biochemistry returns, and to improve extracts to allow new data to be loaded into a single UKRR database.

Highlights from the 2014 data

For core items there was very good completeness. Anaemia and growth hormone therapy data continues to be patchy but more complete for dialysis patients.

Growth

As previously reported, dialysis patients had lower median height z-scores than transplanted patients, but also only constitute approximately a fifth of the population. Median height z-scores were very comparable between centres for both transplant and dialysis patients, especially when completeness and confidence intervals are taken into account. The inclusion of 16–18 year olds has not altered the median height z-scores suggesting that the older patients are faring no worse in growth.

Over the last 15 years, the overall median height z-score at RRT start is −1.4, demonstrating the impact of a chronic disease in childhood and opportunities to improve growth at earlier stages of chronic renal failure. It is interesting to note that the median height z-score for most transplant patients at five years was nearly the same as that at start, so despite the need for RRT, patients maintain their height, with the youngest transplant patients improving their height z-score from a lower value at RRT start.

The information on use of growth hormone remained difficult to interpret due to a high proportion of missing data, and also there are many interventions to improve growth (other than growth hormone therapy) which the UKRR does not collect. Further, in situations where use of growth hormone is not recommended (such as in newly transplanted patients and in those demonstrating catch up growth) adjustment is not made in the analyses.

While the median weight z-score for transplant patients is quite close to that of the healthy population, the data for dialysis patients show that they were more underweight. As dialysis patients and transplant patients were both shorter on average than their healthy peers, this meant that transplant patients had a higher BMI than their healthy peers with dialysis patients having a relatively normal BMI. It would be interesting to relate BMI to the use or not of steroids post transplantation.

Adding height and weight to the quarterly data (which some centres are already providing) would allow calculation of growth rates.

Cardiovascular risk factor evaluation

The analysis of SBP across different centres in 2014 continued to show some differences between centres although overall there has been some improvement in SBP levels. An investigation to understand and identify specific factors in transplant patients that have helped some centres achieve improved BP control is recommended.

In terms of the SBP standard, statistically fewer girls, South Asians and dialysis patients achieved the target. Further analysis also suggests primary renal diagnosis is important with metabolic and tubulo-interstitial primary renal diagnoses being associated with higher SBP. Further analysis regarding this is planned for the next Annual Report.

The prevalence of CVRFs was unchanged with 2014 data and the inclusion of 16–18 year olds, and although only data on half the patients is included it is consistent with previous evidence, including pre-dialysis CKD cohorts [8–9]. Current data highlights concern regarding this cohort. Last year the analysis showed hypertension to be the most prevalent CVRF at 48% [10]. The data including the older patients now shows being both overweight and having hypercholesterolaemia were the most common at 44%, secondary to higher BMIs in the 16–18 year olds. This suggests that weight should be a specific target for intervention in the older patients.

Laboratory and clinical indices

Annual data regarding attainment of standards for laboratory measures was similar to previous years for haemoglobin, ferritin, calcium, phosphate, PTH and bicarbonate. The proportion of dialysis patients achieving the standards was rather low; however over-interpretation of single measurements of variable completeness from a small proportion of the cohort should be avoided.

The aim is to be able to report quarterly data for all laboratory indices for all centres which will indicate whether the standard achievements based on annual data are indeed accurate.

Future work

The goals of the paediatric UKRR remain the reporting of quarterly data for all paediatric renal centres, improving data extracts and then combining the adult and paediatric UKRR databases.

Acknowledgement

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Conflicts of interest: the authors declare no conflicts of interest

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UK Renal Registry 18th Annual Report: Chapter 11 2014 Multisite Dialysis Access Audit in England, Northern Ireland and Wales and 2013 PD One Year Follow-up: National and Centre-specific Analyses

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Key Words

Chronic kidney disease · Diabetes · Dialysis · End stage renal disease · Established renal failure · Haemodialysis · Peritoneal dialysis · Prevalence · Renal replacement therapy · Transplantation · Treatment modality · Vascular access

Summary

- Data are presented from the third combined vascular and peritoneal dialysis access audit.
- In 2014, 53 centres in England, Wales and Northern Ireland (out of 62) returned data on first access from 4,339 incident haemodialysis (HD) patients and 1,090 incident peritoneal dialysis (PD) patients.
- Of the 5,429 incident patients, 20.1% started dialysis on PD, 27.8% started with an arteriovenous fistula (AVF), 1.0% with an arteriovenous graft (AVG), 27.1% on a tunnelled line (TL) and 24.0% on a non-tunnelled line (NTL).
- Older patients ($\geqslant$65 years) were more likely to start haemodialysis using AVF compared to their younger counterparts (36.2% vs. 32.8%).
- Thirteen of the nineteen centres (68%) using the physician led percutaneous insertion technique had over 20% of their incident patients starting on PD when compared to only seven out of fourteen centres (50%) which used single technique (open surgical or laparoscopic) for their PD catheter insertion.
- Wide variations were apparent between centres for use of AVF as the first haemodialysis access ranging from 10–54%.
- Eight of the 49 centres were achieving close to the 65% target for AV fistula in their incident patients.
- Length of time known to nephrology services and likelihood of commencing dialysis using either an AVF or a PD catheter are strongly associated. Patients who were known to a nephrologist for over one year were more likely to start dialysis with AVF, as compared to those who were referred between 90–365 days (39.2% vs. 24.6%). Similarly, patients who were known to a nephrologist between 90 days and one year were more likely to start on PD when compared to patients who were referred $<$90 days prior to dialysis start (26.9% vs. 9.1%). By comparison, amongst the late presenters, only 3.5% had first access documented as an AVF and 87.3% started dialysis on either a tunnelled line or a non-tunnelled line.
- Initial surgical assessment was a key determinant of the likelihood of AVF formation. Of the incident patients known to renal services for longer than three months and in those assessed by a surgeon at least three months prior to starting dialysis, 71.4% started dialysis with an AVF whereas of those who were not seen by a surgeon only 10.8% did.
- Thirty one of the 38 centres were 2 or 3 standard deviations below the 85% target for prevalent haemodialysis patients with an AV fistula.
- For centres returning data on one-year peritoneal dialysis outcomes, the majority of centres (28/32) maintained $\geqslant$50% of patients on PD at one year, having censored for transplantation.
- This report demonstrates wide variations in practice between centres across several domains in the provision of dialysis access and further work will be required to understand the underlying reasons.

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Introduction

High quality vascular access is a key modifiable risk factor for patients on dialysis and is an important measure of good clinical care. The third combined vascular and peritoneal dialysis access audit in England, Wales and Northern Ireland represents the findings from the 2014 data collection period for patients starting dialysis between 1st January 2014 and 31st December 2014. The combined access audit provides information on timely and appropriate access interventions in order to achieve permanent access based on the recommendations and quality requirements stated in Renal Association clinical practice guidelines and vascular access guidelines for haemodialysis and peritoneal access [1, 2]. The core principal of these audits has been to highlight the performance variation of renal centres across England, Wales and Northern Ireland and explore factors that may contribute to the provision of excellent quality vascular and peritoneal access.

The term established renal failure used within this chapter is synonymous with the terms end stage renal failure and end stage kidney disease, which are in more widespread international usage. Patients have disliked the term 'end stage', which reflects the inevitable outcome of this disease.

Methods

All adult renal centres in England, Wales and Northern Ireland were contacted regarding vascular and peritoneal access for all incident and prevalent dialysis patients (centre level only) in 2014. Data were collected using Microsoft Excel spreadsheets circulated by the UK Renal Registry (UKRR).

The records were also validated against the UKRR database to confirm that the population collected at each centre for the audit was the same as, or representative of, the incident population at that centre as collected via the usual UKRR quarterly return. Data checks were made by cross-referencing with the UKRR database. Any patients identified from the UKRR as not incident to dialysis between 1st January 2014 and 31st December 2014 were excluded. Patients were categorised as having AKI for the purposes of this audit and therefore excluded if they did not match to UKRR data and their access at three months was recorded as recovered renal function or not recorded. Similarly, where the reported prevalent numbers from the audit were more than 10% different to those in the UKRR database, those centres were excluded. The cross-referencing also enabled ascertainment of information on mortality within three months of commencing dialysis.

Centres who reported data on peritoneal dialysis (PD) patients in the 2013 vascular and peritoneal access audit were asked to complete a one year follow up of their PD patients. Additional information was requested on the date of PD catheter failure, the reason for catheter failure, the number of catheters used during the year, and the modality in use at one year after starting PD.

Table 11.1 lists the summary of audit measures as stated in the Renal Association clinical practice guidelines, with explanation for why some of the audit measures were not reported.

Patients starting haemodialysis (HD) were grouped by type of first vascular access: arteriovenous fistula (AVF), arteriovenous graft (AVG), tunnelled dialysis line (TL), non-tunnelled dialysis line (NTL). Patients starting PD were categorised by the insertion technique: laparoscopic, peritoneoscopic, open surgery, percutaneous. Access at three months was defined as the type of access in use at three months after starting dialysis. If a patient was no longer receiving dialysis at three months then the reason was recorded instead, for example died or transplanted. Referral time was defined as the number of days between the date of first being seen by a renal physician and the date of commencing dialysis. A patient was classified as presenting late if they had a referral time of less than 90 days. In the analyses involving whether or not a patient had received surgical assessment at least three months before starting dialysis, patients were excluded if they were categorised as a late presenter.

Access failure was defined as the access no longer being usable for dialysis. Data about the date and cause of access failure was collected. For the purposes of analysis, access failures were grouped into five groups (maturation, mechanical, infection, other and unknown) for HD failures and six groups (infection, catheter related, solute/water clearance, leaks/hernia, other and unknown) for PD failures. Those grouped into 'other' included conservative management, dialysis withdrawn and line replaced. Access failure was censored for death, transplantation, withdrawal from renal replacement therapy (RRT) and elective switching of access type. It was the intention to only capture access failures relating to the first type of access. If the reason recorded for access failure was not related to the first type of access recorded, then the data was not included in this analysis.

Separate and combined analyses have been performed for incident HD patients and incident PD patients as appropriate. Due to the exploratory nature of the audit the analyses have been limited to descriptive statistics of frequencies, percentages and unadjusted associations between variables. If a centre had more than 50% missing returns for a particular data field, then all patients from that centre were excluded from analyses involving that data field. The data were analysed using SAS 9.3.

Results

Inclusion and exclusion criteria

Figure 11.1 is a flow diagram of exclusions. Of the 62 centres contacted, data were received from 54 centres. In the three years of the running of the combined audit, three centres have not contributed data (Carshalton, Coventry, Kent) with three centres having contributed only once (Bristol, Dudley, London Guys). Only one

Table 11.1. Summary of audit measures stated in Renal Association clinical practice guidelines for dialysis access

RA audit measure/guideline		Reported	Reason for non-inclusion
HD access			
1	Proportion of patients whose first haemodialysis treatment is with an arteriovenous fistula:	Yes	
1a	Stratified by new patients with established renal failure and known to the nephrology team for >90 days	Yes	
1b	Stratified by new patients with established renal failure and known to the nephrology team for ⩽90 days	Yes	
1c	Patients with a failed renal transplant	No	Not captured by the audit
1d	Patients transferred permanently from PD to haemodialysis	No	Not captured by the audit
2	65% of all patients commencing haemodialysis should commence with an AV fistula	Yes	
3	A centre should measure the proportion of prevalent long term haemodialysis patients receiving dialysis via a fistula, an arteriovenous graft and a tunnelled or a non-tunnelled line	Yes	
4	85% of all prevalent patients on haemodialysis should receive dialysis via a functioning arteriovenous fistula	Yes	
5	Complications related to vascular access	Yes	
5a	Rupture of vascular access (fistula and graft)	Partly	Incident patients only
PD access			
1	Catheter patency – more than 80% of catheters should be patent at 1 year (censoring for death and elective modality change)	Yes	
2	Complications following PD catheter insertion:	Partly	
2a	Bowel perforation <1%	No	Not captured by the audit
2b	Significant haemorrhage <1%	No	Not captured by the audit
2c	Exit site infection within 2 weeks of catheter insertion <5%	No	Not captured by the audit
2d	Peritonitis within 2 weeks of catheter insertion <5%	Yes	
2e	Functional catheter problem requiring manipulation or replacement or leading to technique failure <20%	No	Not captured by the audit

centre was excluded due to poor data quality (Ipswich). Patients ($n = 558$) who did not match when cross-referencing with the UKRR database and whose access at three months was 'recovered renal function' were categorised as having AKI for the purposes of this audit and excluded. Fifteen patients were excluded from all analyses due to missing RRT start date or first access type.

Data completeness

Fifty-three centres returned data on first dialysis access for 4,339 incident HD patients and 1,090 incident PD patients. The UKRR incident patient data for the same year were 4,895 HD and 1,396 PD, thus there were access returns on 88.6% of HD and 78.1% of PD patients. The patient demographic returns via the access audit correlated well with the data returns made via the usual UKRR quarterly returns. The completeness of all variables in the audit was over 80% apart from body mass index (BMI) which was 54.3% (data not shown).

Variations in first dialysis access

Patient demographics

The median patient age when starting RRT was 68 years in the HD cohort and 61 years for patients commencing PD. Overall, 63.7% of the patients were male, 36.3% female; the proportional distribution of the sexes was similar for both the HD and PD subgroups.

A significant proportion of patients starting dialysis had diabetes (53.6%), however diabetes associated nephropathy was the primary renal disease (PRD) in only 26.2% (table 11.2).

Table 11.3 presents HD and PD patient subgroups stratified by age, dichotomised body mass index (BMI) (⩽30 or >30), PRD, referral time (<90 or ⩾90 days) and surgical assessment status.

There was an association between the access modality (HD vs. PD), referral time (<90 days vs. ⩾90 days) and surgical assessment status in excess of three months prior to dialysis start. The following observations can be made:

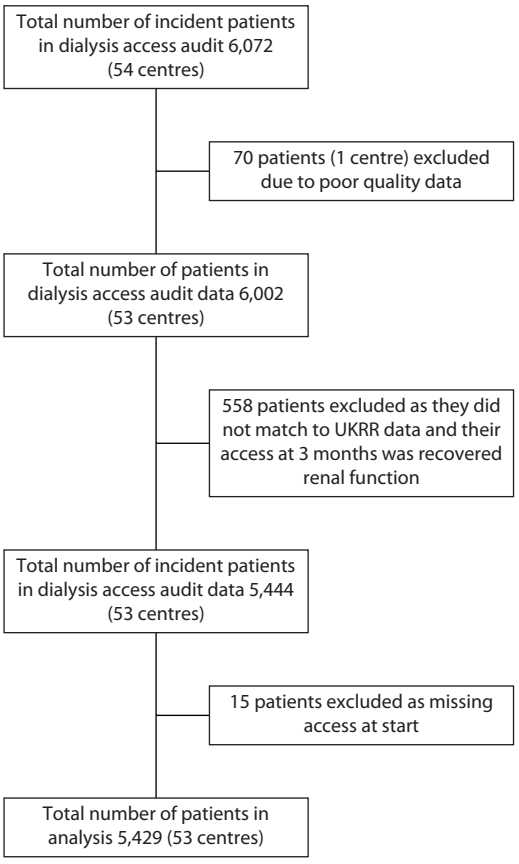

Fig. 11.1. STROBE flow diagram of exclusions

For HD:

- AVF was the initial access for 34.8% of patients, with 1.2% with an AVG, 34.0% on a tunnelled line and 30.0% on a non-tunnelled line. The percentage of patients starting with an AVF had been stable for the previous three years but has since fallen from 40.7% in 2013. The majority of centres are failing to achieve the target as stated in the Renal Association guidelines (65% of all patients commencing haemodialysis should commence with an AVF).
- Patients aged 65 or over were more likely to start RRT with an AVF (36.2%) when compared to patients <65 years (32.8%). Similarly, older patients were less likely to start on a tunnelled line (30.3% vs. 38.7%).
- BMI had a positive impact on vascular access with 48.9% of the patients with BMI >30 starting on AVF compared to 36.8% of the patients with BMI ⩽30.
- Patients with polycystic kidney disease (PKD) as primary renal diagnosis were most likely to start with an AVF (66.1%).
- Patients, who were referred at least 90 days prior to commencing dialysis, were more likely to start on AVF compared to those starting more acutely (48.4% vs. 3.8%).
- A high proportion of patients who were referred at least 90 days prior to commencing dialysis, start

Table 11.2. Patient demographics

Variable		Total *N = 5,429*	HD *N = 4,339*	PD *N = 1,090*
Age	Median (IQR)	66 (53, 76)	68 (55, 77)	61 (48, 72)
BMI	Median (IQR)	27 (24, 32)	27 (24, 32)	27 (24, 31)
		N (%)	***N (%)***	***N (%)***
Gender	Female	1,972 (36.3)	1,588 (36.6)	384 (35.2)
	Male	3,457 (63.7)	2,751 (63.4)	706 (64.8)
Diabetes	Missing	625 (11.5)	528 (12.2)	97 (8.9)
	Yes	2,908 (53.6)	2,267 (52.2)	641 (58.8)
	No	1,896 (34.9)	1,544 (35.6)	352 (32.3)
PRD	Missing	247 (4.5)	202 (4.7)	45 (4.1)
	Diabetes	1,423 (26.2)	1,124 (25.9)	299 (27.4)
	Glomerulonephritis	624 (11.5)	448 (10.3)	176 (16.1)
	Hypertension	324 (6.0)	261 (6.0)	63 (5.8)
	Other	1,090 (20.1)	957 (22.1)	133 (12.2)
	Polycystic kidney	243 (4.5)	165 (3.8)	78 (7.2)
	Pyelonephritis	264 (4.9)	225 (5.2)	39 (3.6)
	Renal vascular disease	347 (6.4)	283 (6.5)	64 (5.9)
	Uncertain	867 (16.0)	674 (15.5)	193 (17.7)

IQR = interquartile range; BMI = body mass index; PRD = primary renal diagnosis; HD = haemodialysis; PD = peritoneal dialysis

Table 11.3. Patient characteristics stratified by type of first dialysis access

		HD patients					PD patients				
Variable	**HD *N***	AVF	AVG	TL	NTL	**PD *N***	Open surgery	Laparo-scopic	Peritoneo-scopic	Percuta-neous	Missing
Total patients	**4,339**	1,508	54	1,474	1,303	**1,090**	415	197	20	309	149
%		34.8	1.2	34.0	30.0		38.1	18.1	1.8	28.3	13.7
Age at first dialysis		%					%				
<65	**1,889**	32.8	1.2	38.7	27.3	**640**	38.3	18.1	2.2	28.6	12.8
⩾65	**2,450**	36.2	1.3	30.3	32.2	**450**	37.8	18.0	1.3	28.0	14.9
BMI (kg/m^2)											
⩽30	**1,403**	36.8	1.9	36.3	25.1	**423**	43.7	14.9	3.8	22.7	14.9
>30	**745**	48.9	1.3	29.4	20.4	**161**	49.1	18.0	1.9	14.9	16.1
No BMI	**605**	18.5	1.0	29.6	50.9	**84**	44.0	20.2	1.2	23.8	10.7
PRD											
Diabetes	**1,124**	40.9	1.3	37.5	20.2	**299**	36.5	18.4	1.7	29.1	14.4
GN	**448**	34.2	0.4	41.5	23.9	**176**	39.8	19.9	2.8	27.8	9.7
Hypertension	**261**	50.6	0.8	28.4	20.3	**63**	33.3	17.5	1.6	34.9	12.7
No PRD	**202**	17.8	0.5	33.2	48.5	**45**	31.1	8.9	0.0	40.0	20.0
Other	**957**	15.7	0.8	30.8	52.7	**133**	35.3	21.1	1.5	24.1	18.0
PKD	**165**	66.1	3.0	26.1	4.8	**78**	56.4	19.2	1.3	14.1	9.0
Pyelo	**225**	41.3	2.2	33.3	23.1	**39**	35.9	20.5	2.6	25.6	15.4
RVD	**283**	38.2	1.1	31.1	29.7	**64**	43.8	9.4	3.1	28.1	15.6
Uncertain	**674**	39.6	1.9	33.2	25.2	**193**	35.2	18.1	1.6	32.1	13.0
Referral time (days)											
<90	**1,275**	3.8	0.2	37.3	58.7	**127**	26.0	22.0	1.6	38.6	11.8
⩾90	**3,002**	48.4	1.7	32.6	17.3	**962**	39.7	17.6	1.9	27.0	13.8
No ref	**62**	8.1	1.6	32.3	58.1	**1**	0.0	0.0	0.0	0.0	100
Assessed by surgeon											
Missing	**59**	25.4	0.0	42.4	32.2	**81**	66.7	13.6	0.0	18.5	1.2
No	**2,290**	5.6	0.5	44.8	49.1	**439**	29.6	14.1	2.5	41.2	12.5
Yes	**1,910**	70.2	2.0	21.2	6.7	**557**	39.3	22.3	1.6	20.3	16.5

Patients from centres with more than 50% missing data for a variable are excluded from the table for that variable
AVF = arteriovenous fistula; AVG = arteriovenous graft; TL = tunnelled line; NTL = non-tunnelled line; GN = glomerulonephritis; BMI = body mass index; PRD = primary renal diagnosis; PKD = polycystic kidney disease; Pyelo = pyelonephritis; RVD = renal-vascular disease

dialysis on a tunnelled (32.6%) or a non-tunnelled (17.3%) line.

- Patients who had been seen by a surgeon at least three months before starting dialysis were more likely to start with an AVF than those not assessed (70.2% vs. 5.6%).

For PD:

- For 1,090 first PD catheters, the insertion techniques were 38.1% open surgical, 18.1% laparoscopic, 1.8% peritoneoscopic and 28.3% percutaneous. Insertion technique was not reported for the remaining 13.7%.
- There was a greater proportion of patients who underwent percutaneous PD catheter insertion in the BMI ⩽30 group in comparison with those with BMI >30 (22.7% vs. 14.9%).
- Referral time had an influence on PD catheter insertion technique; 38.6% of patients referred less than 90 days before starting dialysis underwent percutaneous insertion compared to 27.0% of patients known longer to the service. These data were reversed for general surgical insertion: 26.0% of patients who presented late versus 39.7% of patients who did not present late.
- Patients who were assessed by a surgeon at least three months before starting dialysis were more likely to undergo open surgical placement (39.3% vs. 29.6% for non-surgical assessment).

Figure 11.2 shows haemodialysis access stratified by PRD. The proportional distribution of PD access was reasonably similar for different primary renal disease

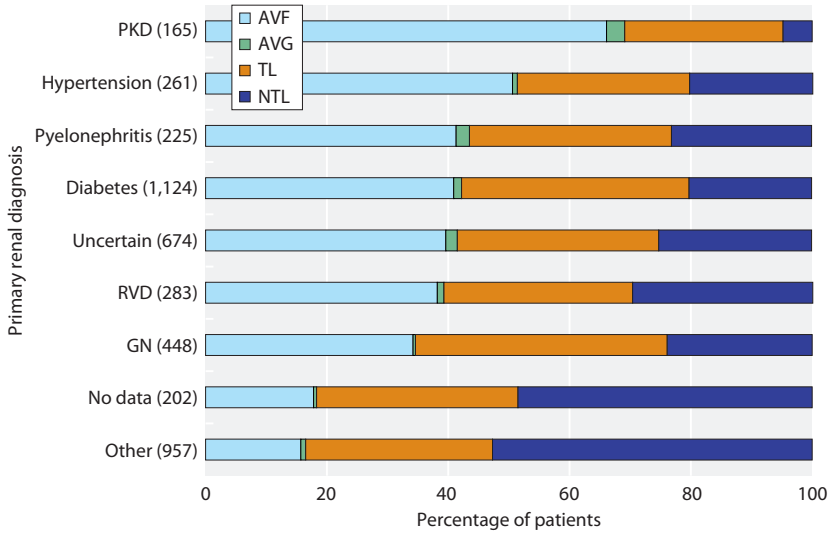

Fig. 11.2. Type of haemodialysis access stratified by primary renal disease
Number of patients in each primary renal diagnosis group in brackets
Primary renal diagnosis groups sorted by percentage of arteriovenous fistula
AVF = arteriovenous fistula; AVG = arteriovenous graft; TL = tunnelled line; NTL = non-tunnelled line; GN = glomerulonephritis; RVD = reno-vascular disease; PKD = polycystic kidney disease

but varied for HD access modality. Of note, patients with polycystic kidney disease were more likely to start HD with an AVF (66.1%). Where no primary renal diagnosis was available, patients were more likely to start dialysis with a non-tunnelled dialysis venous catheter (48.5%).

Figure 11.3 shows the distribution of haemodialysis access modality and PD catheter insertion technique stratified by BMI. As noted in table 11.2, unexpectedly BMI had a positive impact on type of vascular access with only 49.8% of the patients with BMI >30 kg/m^2 starting on a catheter compared to 61.4% of the patients with BMI ⩽30 kg/m^2. In relation to peritoneal dialysis access, patients with BMI >30 kg/m^2 were more likely to undergo open surgical placement (58.5%) than those with BMI ⩽30 kg/m^2 (51.4%). The percutaneous approach was less likely to be used in patients in the higher BMI category (17.8%) compared to those with a lower BMI (26.7%). The peritoneoscopic or laparoscopic approach was used in a similar proportion of patients in both BMI groups. It should be noted that the analysis was limited due to a high proportion of missing data for BMI.

Figure 11.4 shows PD catheter insertion technique by centre. Centres reporting less than five patients on PD were not considered for analysis ($n = 8$). Seven centres

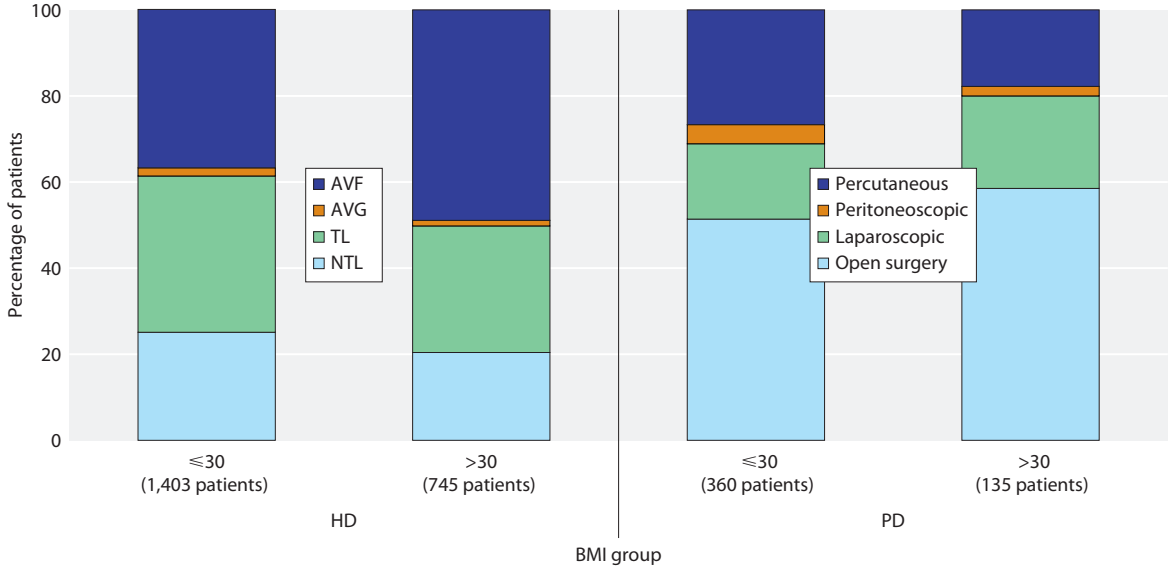

Fig. 11.3. Distribution of haemodialysis access modality and PD catheter insertion technique stratified by body mass index
BMI = body mass index
All patients from centres with more than 50% missing data for BMI were excluded
AVF = arteriovenous fistula; AVG = arteriovenous graft; TL = tunnelled line; NTL = non-tunnelled line

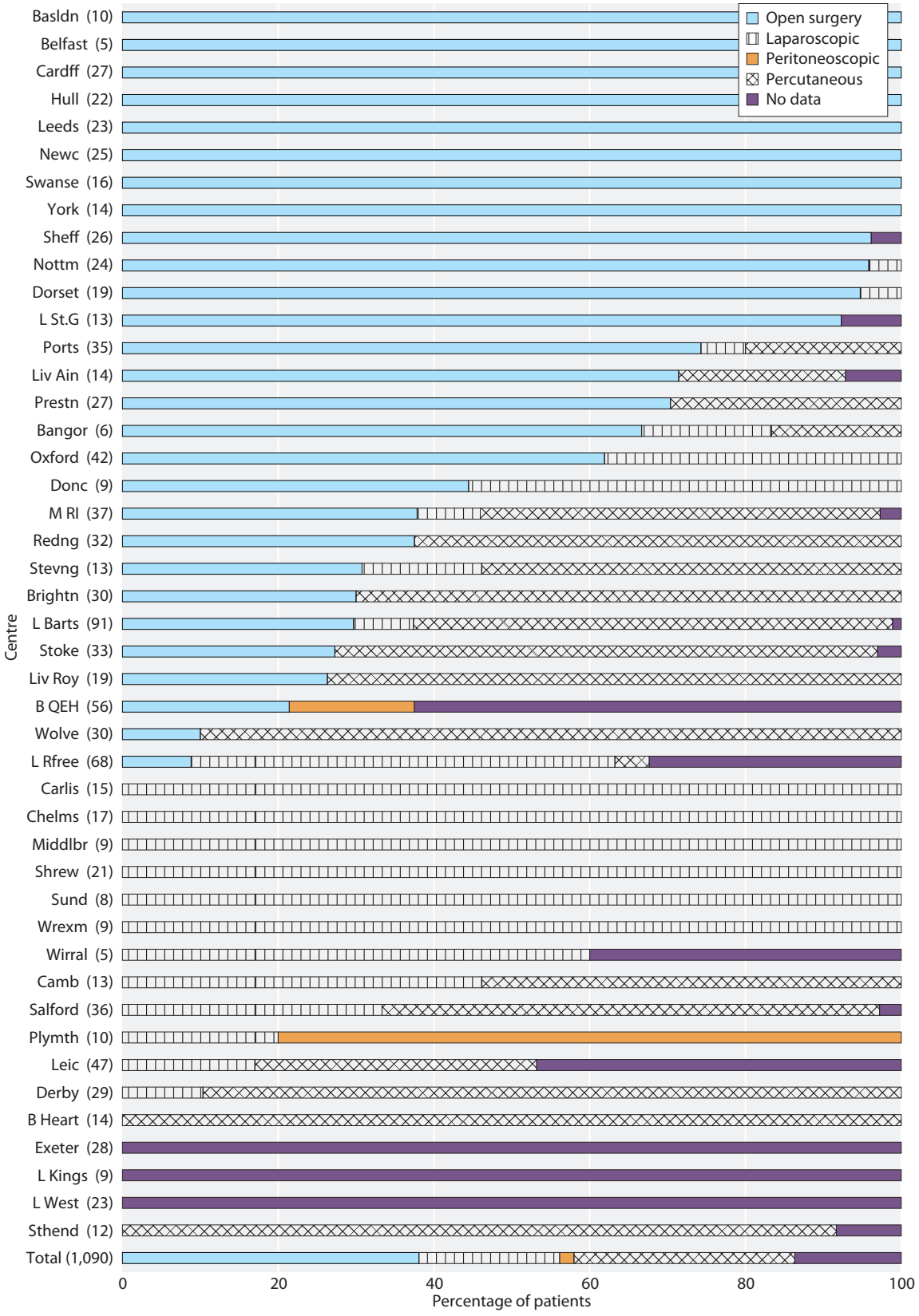

Fig. 11.4. PD catheter insertion technique stratified by centre

reported less than five patients using PD catheters for first dialysis in 2013. There continues to be a strong tendency for many centres to rely on one single approach to PD catheter placement, with 15 centres reporting use of a single technique for all of their patients mainly open surgical or laparoscopic. Two centres (Birmingham Heartlands, Southend) used percutaneous technique close to all of their PD catheter insertions with a further two centres (Derby, Wolverhampton) employing this technique in about 90% of cases. Fifteen other centres reported using the physician led percutaneous insertion technique. Thirteen of the nineteen centres (68.4%) using the physician led percutaneous insertion technique had over 20% of their incident patients starting on PD with three centres (Southend, Derby, Wolverhampton) having close to 40% of their incident patients starting on PD. By comparison only seven out of fourteen centres (50.0%) using single technique (open surgical or laparoscopic) had over 20% of their incident patients starting on PD (figure 11.5).

First dialysis access by renal centre

Figure 11.5 shows type of first dialysis access by centre. Approximately a quarter of the patients started with an AVF (27.8%) with over half of patients starting with a TL or NTL (51.2%) with approximately a 50–50 split between the two access types. Variations were apparent between centres when considering patients commencing dialysis via an AVF, ranging from <15% (London West, Carlisle) to >50% (Doncaster, Clwyd). Some centres had over 50% of patients starting dialysis on a tunnelled line (London West, Colchester). The use of arteriovenous graft as the first dialysis access was between 0–11 percent with only 21 of the 53 centres opting to use this.

Use of a PD catheter as first access varied between >40% (Derby, Southend) and 0% (Clwyd).

The Renal Association (RA) guidelines on vascular access for haemodialysis recommends 65% of all patients commencing haemodialysis should commence with an AV fistula. This is depicted in figure 11.6 with patients who presented late excluded for this analysis. Eight of the 49 centres (Chelmsford, York, Basildon, Derby, Liverpool Aintree, Doncaster, Stoke, Sheffield) reporting incident vascular access data were achieving close to the RA recommendations (>60%) with one centre achieving above 2 standard deviations (Stoke). However, there were 12 centres below 2 standard deviations and a further 15 centres below 3 standard deviations. These centres can be identified using figure 11.11. The results have to be cautiously interpreted due to non-adjustment for any patient related factors.

First dialysis access and referral time

Figure 11.7 shows a clear association between time known to a nephrologist and a patient starting haemodialysis with an AVF. A greater proportion of patients who were known to a nephrologist for over one year started dialysis with an AVF, as compared to those who were referred between 90–365 days (39.2% vs. 24.6%). Similarly, patients who were known to a nephrologist between 90 days to one year were more likely to start on PD when compared to patients who were referred <90 days prior to dialysis start (26.9% vs. 9.1%).

Figure 11.8 shows PD catheter insertion technique by referral time. Patients who were first seen by a nephrologist <90 days before starting RRT were more likely to undergo percutaneous insertion when compared to patients who were known between 90–365 days and >365 days (38.6% vs. 32.8% vs. 25.6%). These results may be due to centre effect and a reflection of practice patterns within the centre. Of the 13 centres that used the percutaneous insertion technique for over 50% of their PD catheters, five (Derby, London Barts, Manchester Royal Infirmary, Stoke, Wolverhampton) had over 20% of their patients presenting late starting on PD (figures 11.4 and 11.10). Open surgical technique was less likely to be used in the patients presenting late when compared to the patients who were known over 365 days, probably because of having a lesser likelihood of seeing a surgeon (26.0% vs. 40.2%).

Figure 11.9 shows first access for centres providing data for patients presenting to a nephrologist ⩾90 days prior to dialysis start. Amongst the 4,027 patients, only 36.2% started with an AVF, below the Renal Association target and 23.9% started with a PD catheter. Despite being known to a nephrologist for over three months 38.6% of the patients started on a TL or NTL. As illustrated in figure 11.9 there was a significant variation between centres.

Figure 11.10 shows first access for centres providing data for patients presenting late (known to renal services for <90 days). Amongst the 1,402 patients for whom data were reported, 33.9% started dialysis on a tunnelled line, 53.4% on a non-tunnelled line and 9.1% using a PD catheter with only 3.5% having first access documented as an AVF.

In nine centres, more than 15% of patients presenting late had a peritoneal dialysis catheter inserted for use as first dialysis access and as a result had a lower requirement for tunnelled or non-tunnelled lines. The overall proportion of patients presenting late starting with an AVF for all of the centres was 3.5%. Three centres

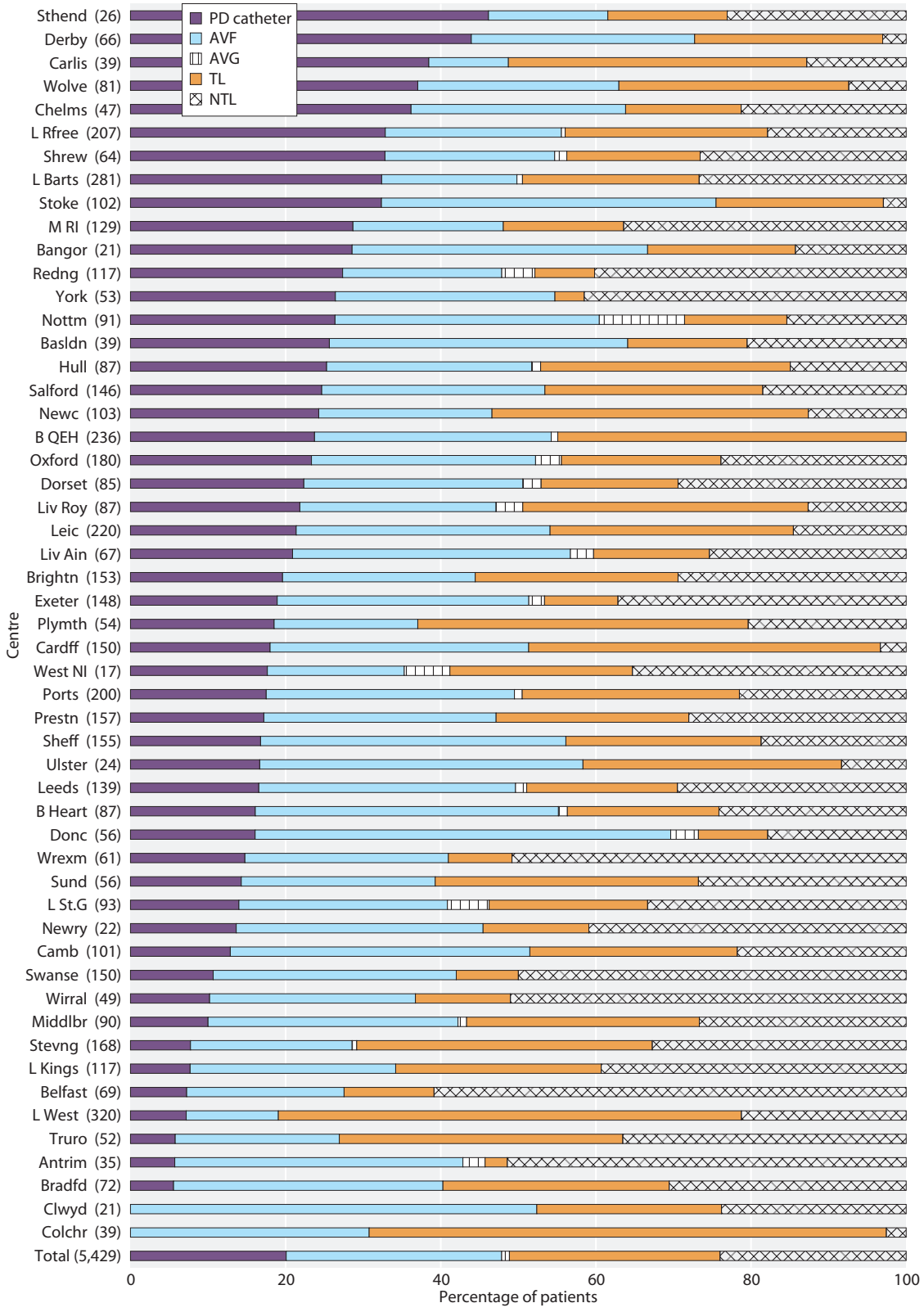

Fig. 11.5. Type of first dialysis access stratified by centre
Centres are ordered by the percentage of patients starting dialysis with a PD catheter
PD = peritoneal dialysis; AVF = arteriovenous fistula; AVG = arteriovenous graft; TL = tunnelled line; NTL = non-tunnelled line

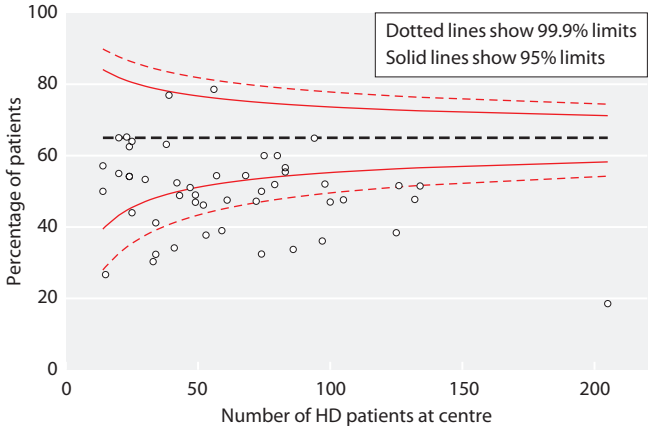

Fig. 11.6 Funnel plot of the percentage of HD patients who commenced dialysis using an AVF

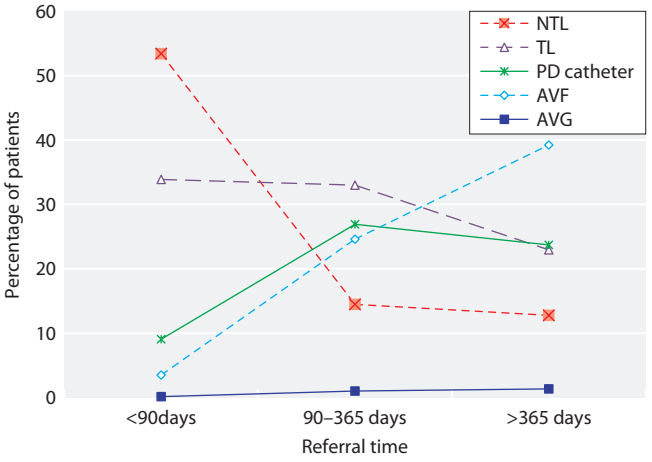

Fig. 11.7. Type of first dialysis access by referral time
NTL = non-tunnelled line; TL = tunnelled line; PD = peritoneal dialysis; AVF = arteriovenous fistula; AVG = arteriovenous graft

however had over 15% of the patients who presented late starting with an AVF (Shrewsbury 27.5%, Colchester 20.0%, Derby 17.6%). This could be explained by a multitude of factors ranging from surgical access assessment and formation to ongoing evaluation of an AVF to enhance maturation and earlier cannulation. The number of patients presenting late reported in some centres was extremely small and it is difficult to make firm observations about clinical pathways for the development of dialysis access in this cohort.

Figure 11.11 shows the type of haemodialysis access in patients known to the renal service for at least 90 days. There was variation for patients starting haemodialysis with an AVF, with five centres (Ulster, Stoke, Doncaster, York, Chelmsford) achieving 65% or over with London West and Shrewsbury at the other end at <20%. The centres with highest tunnelled line use were London West (72.7%), Colchester (67.6%) and Carlisle (66.7%) with over twice the overall proportion of all the centres combined (32.6%). There were eleven centres who reported over 30% of patients as starting on non-tunnelled lines despite being known to the centre for at least 90 days (Shrewsbury (40.0%), London St Georges (39.2%), Belfast (48.8%), London Kings (34.9%), Wrexham (33.3%), Wirral (33.3%), Reading (38.8%), Antrim (37.5%), Manchester Royal (32.7%), Swansea (32.0%), York (30.4%)). It will be important to understand the variations in practice patterns that lie behind these statistics, which were not provided by current data.

First dialysis access and surgical assessment

Figure 11.12 highlights the proportion of patients referred for surgical assessment at least three months prior to starting dialysis. There was considerable

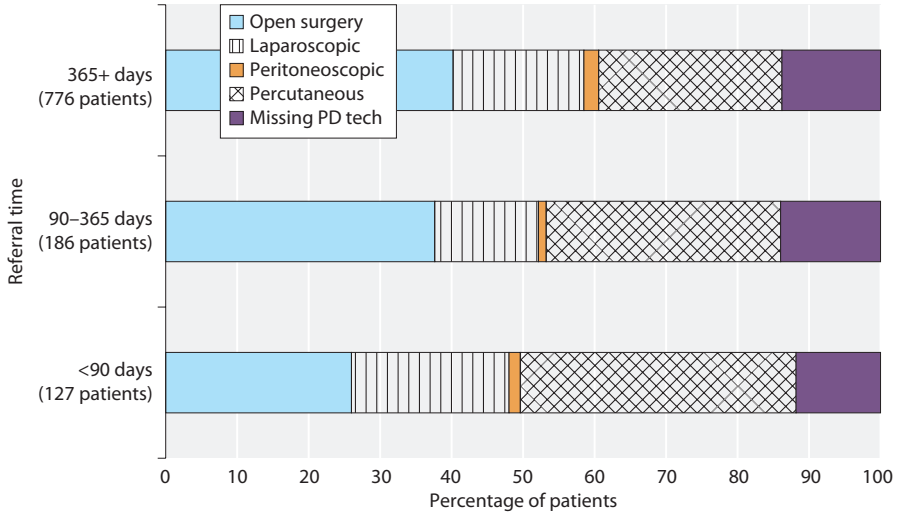

Fig. 11.8. PD catheter insertion technique by referral time

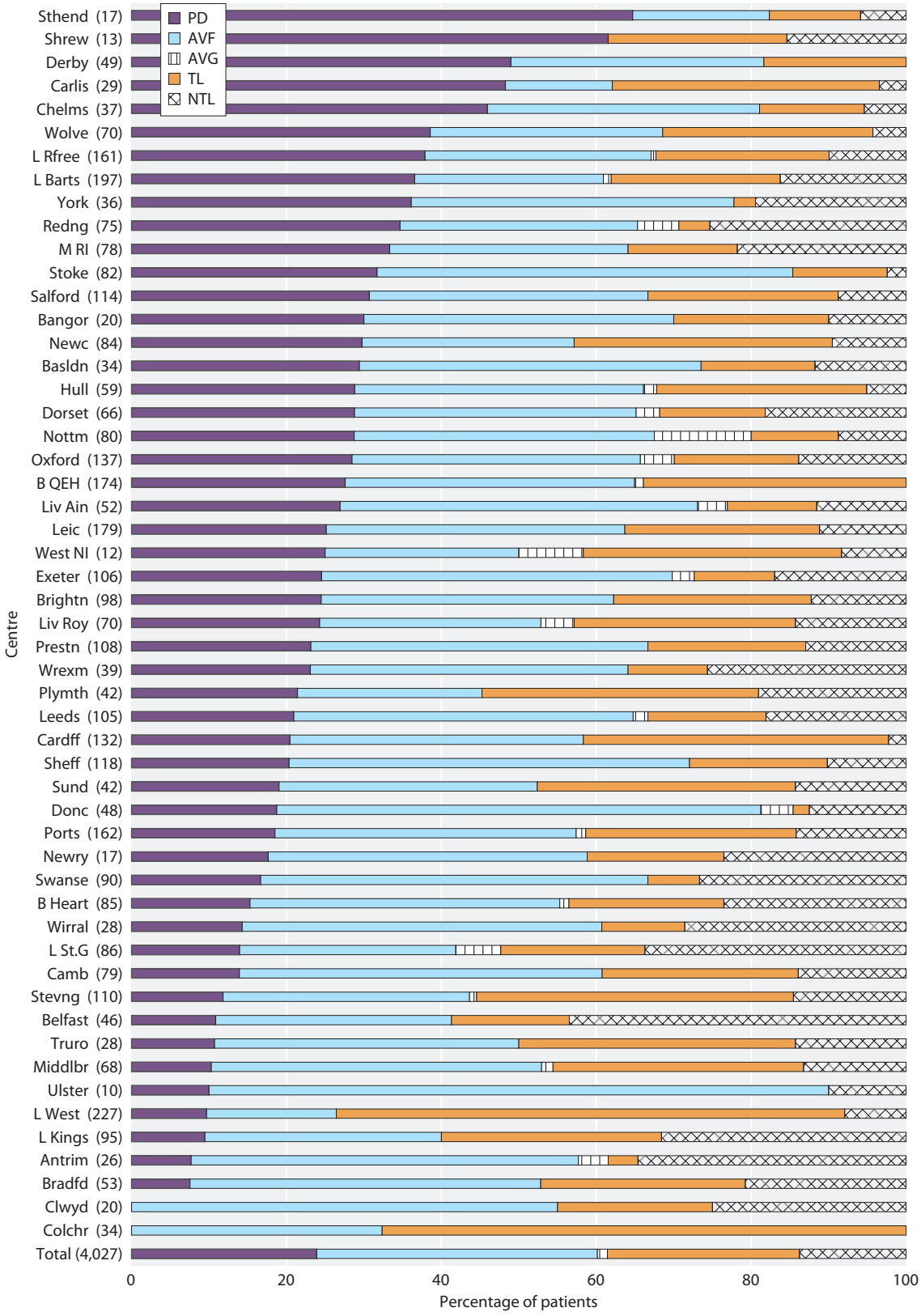

Fig. 11.9. Type of access used for first dialysis in patients presenting to a nephrologist ⩾90 days prior to dialysis start
PD = peritoneal dialysis; AVF = arteriovenous fistula; AVG = arteriovenous graft; TL = tunnelled line; NTL = non-tunnelled line

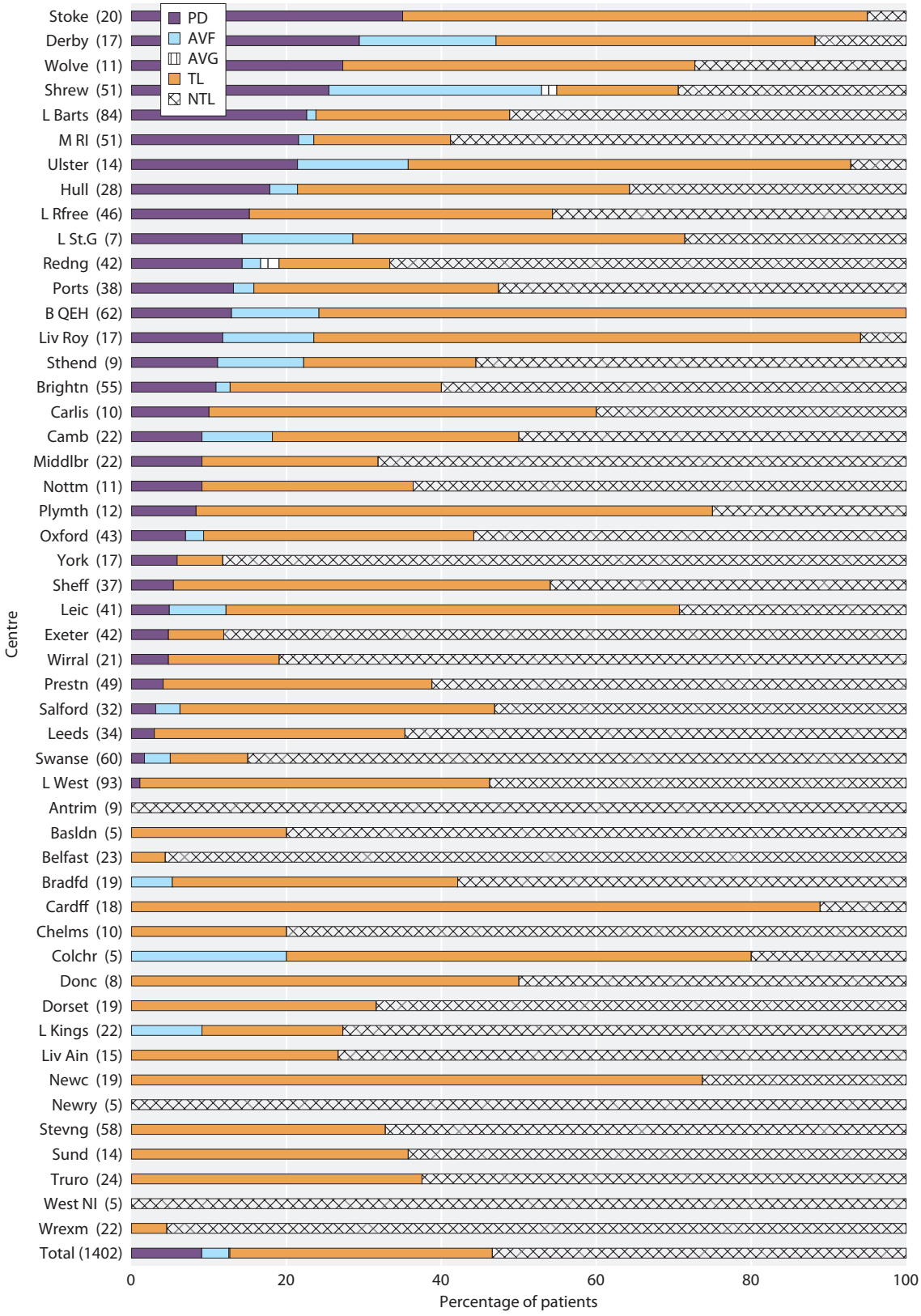

Fig. 11.10. Type of access used for first dialysis in patients presenting to a nephrologist <90 days prior to dialysis start
PD = peritoneal dialysis; AVF = arteriovenous fistula; AVG = arteriovenous graft; TL = tunnelled line; NTL = non-tunnelled line

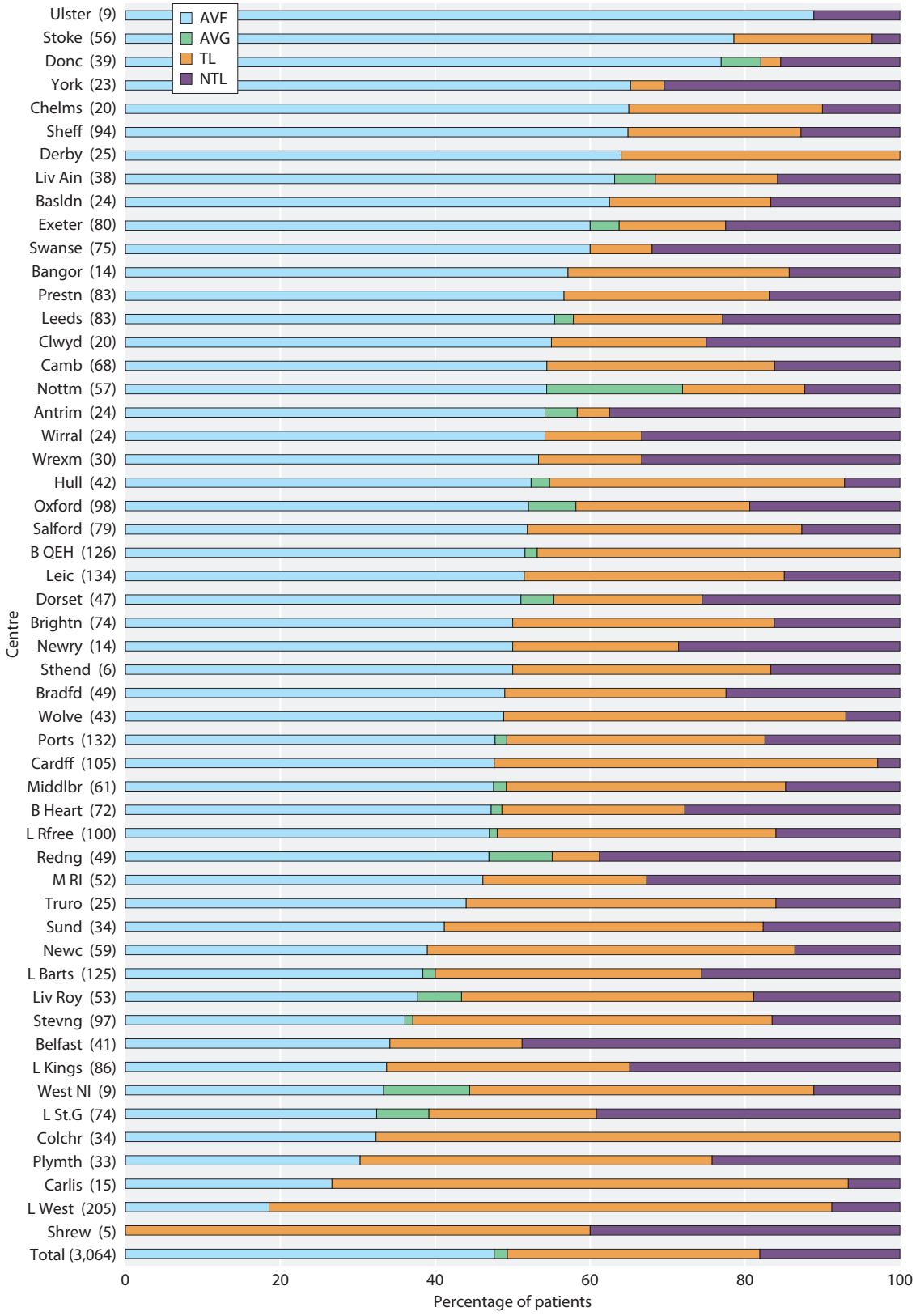

Fig. 11.11. Type of first access for haemodialysis patients stratified by centre restricted to patients known at ⩾90 days prior to dialysis start
AVF = arteriovenous fistula; AVG = arteriovenous graft; TL = tunnelled line; NTL = non-tunnelled line

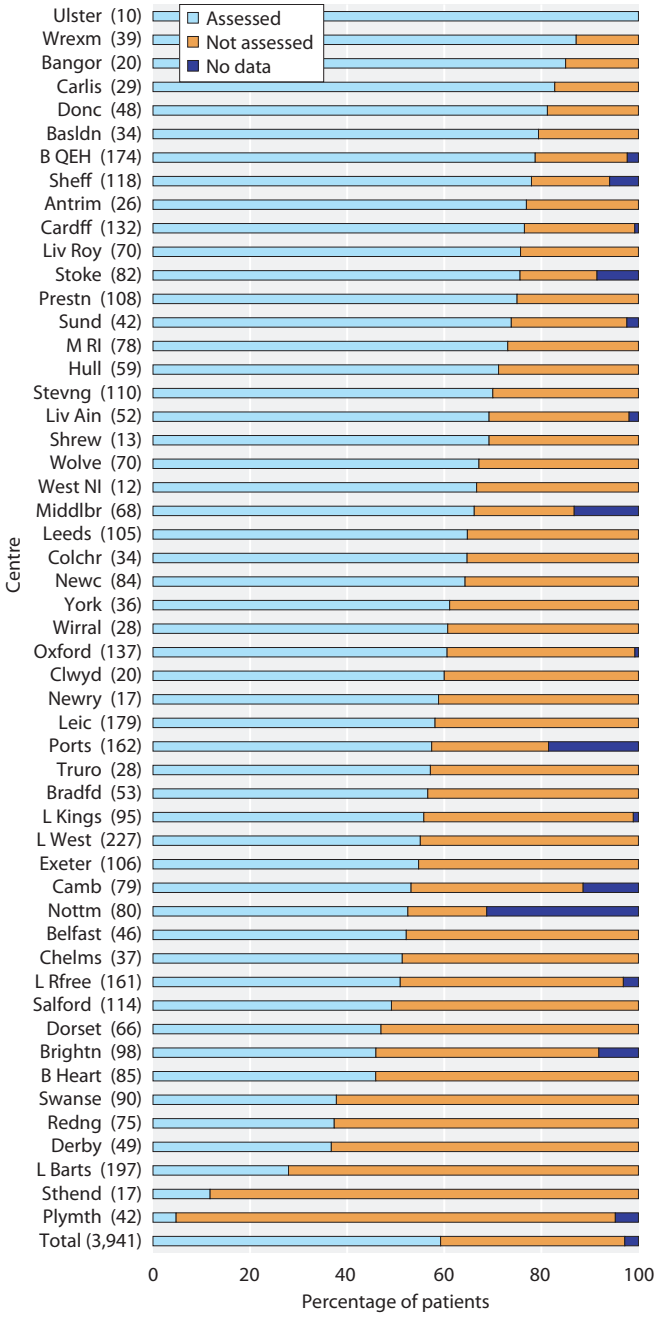

Fig. 11.12. Proportion of patients undergoing surgical assessment more than three months prior to starting dialysis

variation between the renal centres. Overall, the proportion referred to a surgeon was highest in Ulster (100%), Wrexham (87.2%), Bangor (85.0%), Carlisle (82.8%) and Doncaster (81.3%). This usually resulted in a high proportion of patients starting with either an AVF or PD catheter. Carlisle had only 13.8% starting with an AVF but had 48.3% starting on PD (refer to figure 11.9). Conversely, some centres despite having

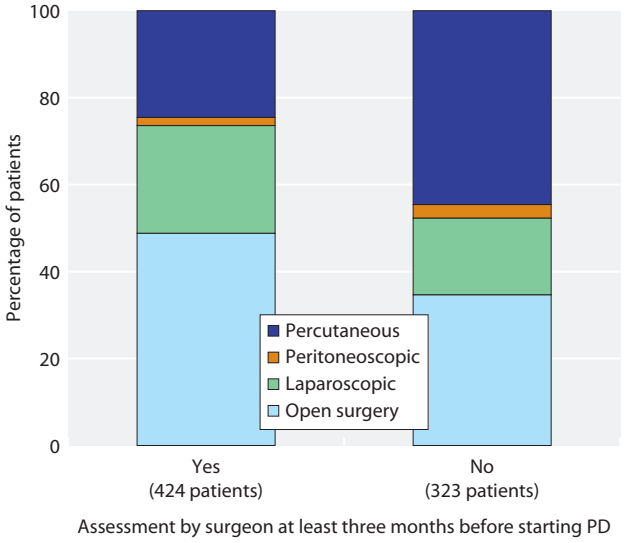

Fig. 11.13. PD catheter insertion technique stratified by surgical assessment

low rates of surgical assessment, performed well on their PD catheter rates (figure 11.9) as they utilised percutaneous PD catheter insertion technique (figure 11.4). For example, three of the centres with lowest surgical assessment, Derby (36.7%), London Barts (27.9%) and Southend (11.8%) all achieved high PD rates in their patients who were known to the centre for over three months (Derby 49.0%, Southend 64.7%, London Barts 36.5%) as these centres utilised percutaneous PD catheter insertion technique (Derby 89.7%, Southend 91.7%,

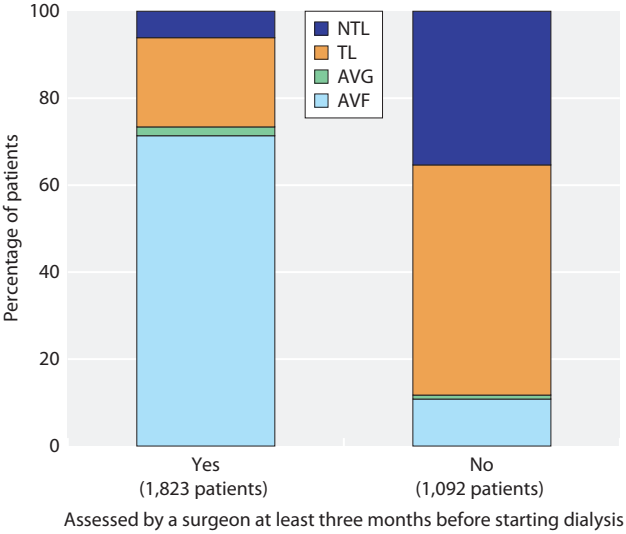

Fig. 11.14. Type of haemodialysis access stratified by surgical assessment

AVF = arteriovenous fistula; NTL = non-tunnelled line; TL = tunnelled line; AVG = arteriovenous graft

Table 11.4. Type of dialysis access at three months since dialysis start stratified by first access type

Access in use at first dialysis (*N*)	Access in use at three months (%)								
	AVF	AVG	TL	NTL	PD catheter	Transplanted	Died	Stopped/LTFU	No data
AVF (1,494)	88.4	0.3	4.8	0.1	0.1	1.1	3.6	1.2	0.3
AVG (54)	3.7	79.6	5.6	0.0	0.0	3.7	5.6	1.9	0.0
TL (1,455)	9.8	0.5	74.8	0.3	3.3	0.8	7.4	2.7	0.3
NTL (1,288)	6.1	0.3	54.1	2.7	5.4	0.2	22.9	7.8	0.5
PD (1,082)	0.7	0.0	6.0	0.4	84.3	2.2	1.6	1.3	3.5

AVF = arteriovenous fistula; AVG = arteriovenous graft; TL = tunnelled line; NTL = non-tunnelled line; PD = peritoneal dialysis; LTFU = lost to follow up

London Barts 61.5%). The end point of achieving definitive access (AVF or PD catheter), is being used here as a surrogate of the surgical pathway. However, the variation seen may not be solely or indeed largely down to the surgical assessment. Firstly, a detailed understanding of factors that prevent patients from being assessed for access in a timely fashion is required. Secondly, the variation may be due to organisational factors e.g. if physicians insert Tenckhoff catheters then patients starting on PD may not be referred to the surgeons and therefore those centres will show lower rates of surgical assessment for AVF in the audit.

In the 2014 audit returns, a greater proportion of patients who received surgical assessment at least three months prior to commencing dialysis underwent open surgical insertion (48.8% vs. 34.7%) compared to those who did not (figure 11.13). This figure also provides evidence that the percutaneous PD catheter insertion technique is utilised where surgeons have not seen the patient, since it is surgeon independent.

Figure 11.14 demonstrates a strong relationship between being assessed by a surgeon at least three months before starting dialysis and the likelihood of starting with an AVF. This relationship was much stronger than that between surgical assessment and method of PD catheter placement. This suggests that the role of surgical assessment was more important in relation to AVF placement. Of those assessed by a surgeon at least three months prior to starting dialysis, 71.4% started dialysis with an AVF whereas of those who were not seen by a surgeon only 10.8% did.

Dialysis access at three months after starting RRT

The type of access used three months after starting dialysis gives an important insight into the responsiveness of the access formation pathway. Table 11.4 expresses the proportion of patients still dialysing using a particular form of access as a percentage of the access they originally started dialysis with. For example, 88.4% of patients starting dialysis with an AVF were still using this at three months and 84.3% of patients starting on PD remained on this modality at three months. Of patients starting dialysis via a tunnelled line, the majority continued to use this form of access at three months (74.8%) and of 1,288 patients who commenced dialysis via a non-tunnelled line, 697 (54.1%) were dialysing through a tunnelled line at three months with a significant proportion 22.9% ($n = 295$) dying within three months. This data suggests that obtaining definitive access for HD (AVF/AVG) within three months of starting treatment continues to remain a big challenge.

Figure 11.15 demonstrates the differences in access outcomes stratified by centre. By three months, 33.2% of patients were dialysing using an AVF (range 12.8% London West to 55.6% Doncaster); 1.3% were using an AVG (0% many sites to 10.1% Nottingham); 41.2% tunnelled lines (8.2% York to 79.2% London West); 1.0% non-tunnelled lines; 22.1% were using a PD catheter (0% Leicester to 51.6% Carlisle) and 1.2% transplanted (0% many sites to 8.1% Leeds).

Access at three months in patients referred to renal centres <90 days before starting dialysis was analysed. Only 45 centres were included in this analysis. The majority (71.9%) of patients presenting late were being dialysed using tunnelled lines at three months after dialysis start (figure 11.16). The between centre range was from 21.4% in York to 98.9% at London West. Amongst patients presenting late, only 9.9% were using an AVF at three months (individual centres ranged from 0% in 14 centres to 42.9% in York). PD catheters were used by 15.5% of patients (range 0% in six centres to 44.4% in Nottingham). It is interesting to note that in some centres late presentation was not always associated with a temporary access such as a TL or a NTL, for instance in York despite presenting late, 42.9% of their HD patients were dialysing via AVF at three months.

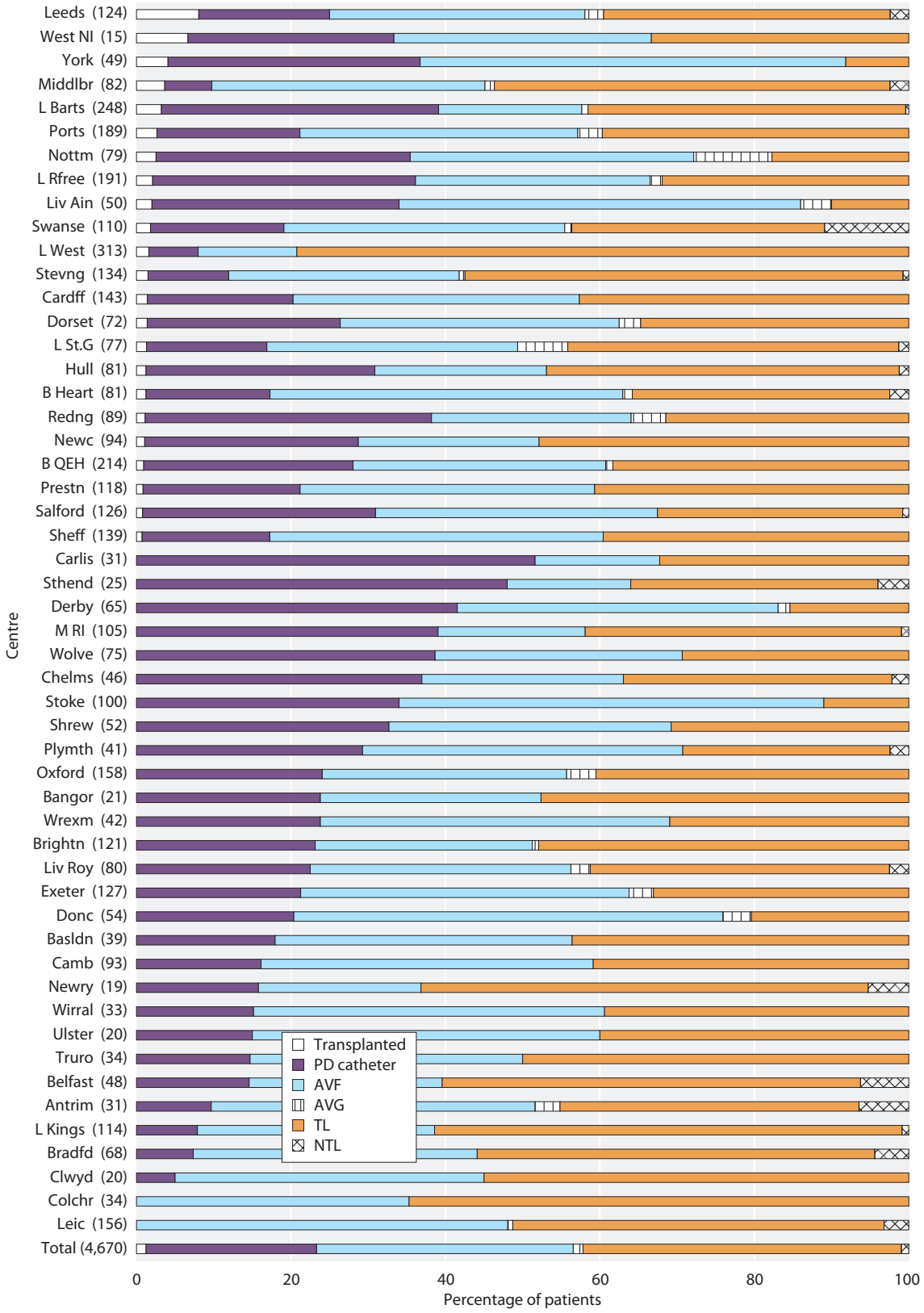

Fig. 11.15. Type of dialysis access at three months stratified by centre
AVF = arteriovenous fistula; AVG = arteriovenous graft; TL = tunnelled line; NTL = non-tunnelled line; PD = peritoneal dialysis

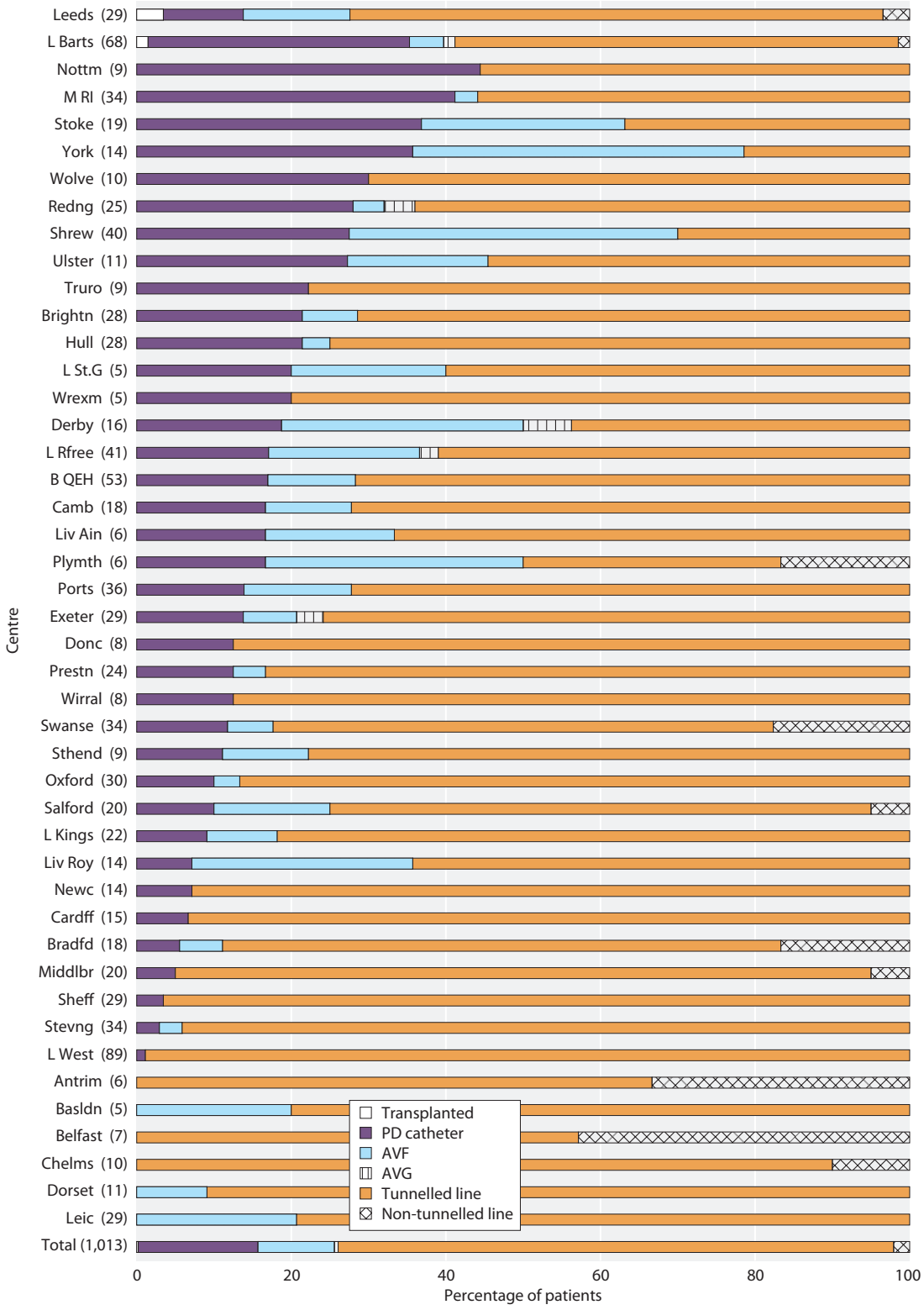

Fig. 11.16. Type of dialysis access at three months in patients referred to renal services less than 90 days before starting dialysis, stratified by centre

Centres reporting on fewer than five patients were excluded

PD = peritoneal dialysis; AVF = arteriovenous fistula; AVG = arteriovenous graft

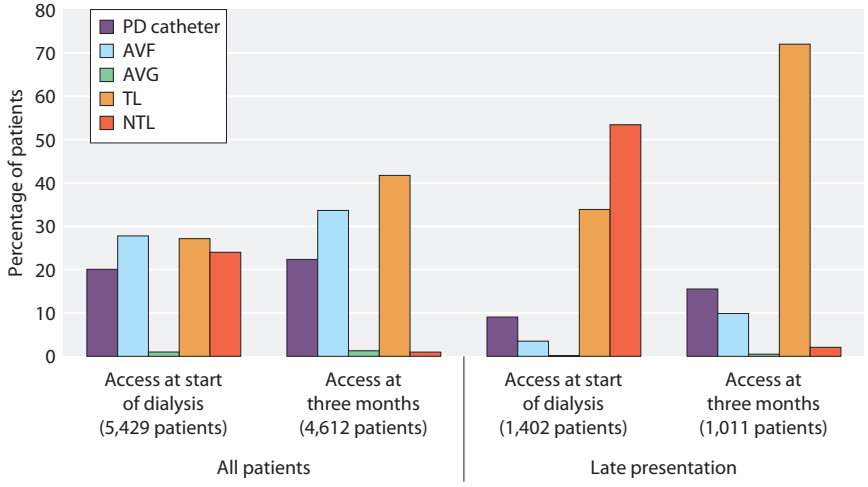

Fig. 11.17. Access in use at start of dialysis and after three months for those still on dialysis, displayed for all patients and also restricted to patients presenting late
PD = peritoneal dialysis; AVF = arteriovenous fistula; AVG = arteriovenous graft; TL = tunnelled line; NTL = non-tunnelled line

Whilst the reported numbers of patients presenting late tended to be low in many centres, it will be interesting to examine the practice pattern that underlies these data.

Figure 11.17 shows access in use at start of dialysis and at three months after commencing dialysis, displayed for all patients and also restricted to patients presenting late. There was a small increase in the proportion of patients dialysing with an AVF at three months for all patients, 27.8% to 33.7%. In the late presenters, patients dialysing with an AVF, increased from 3.5% at dialysis start to 9.9% at three months. Use of a tunnelled line increased at three months in all patients by 14.6% and in late presenters by 38.1%, which is a reflection of conversion from NTL to TL. PD catheter use saw only a small increase for all patients (2.3%) and for late presenters (6.5%).

Figure 11.18 shows the percentage access type at dialysis start from 2012 to 2014 with the analysis restricted to patients referred at least 90 days prior to start of dialysis and patients who have not been transplanted by three months. The use of an AV fistula as the incident access dropped by 1.7% between 2012 and 2014 despite the publication of the Renal Association guidelines in 2011. Reported use of AV graft, tunnelled line, non-tunnelled line and peritoneal dialysis catheter has been fairly static over the three-year period.

Prevalent access

Nine centres did not submit prevalent numbers and six centres were excluded from the analysis as the reported prevalent access numbers did not match with the number of prevalent patients at each of the centres in the UKRR database.

The Renal Association guidelines on vascular access for haemodialysis recommends 85% of all prevalent patients on haemodialysis should dialyse using an AV fistula. Only seven of the 38 centres (Birmingham Heartlands,

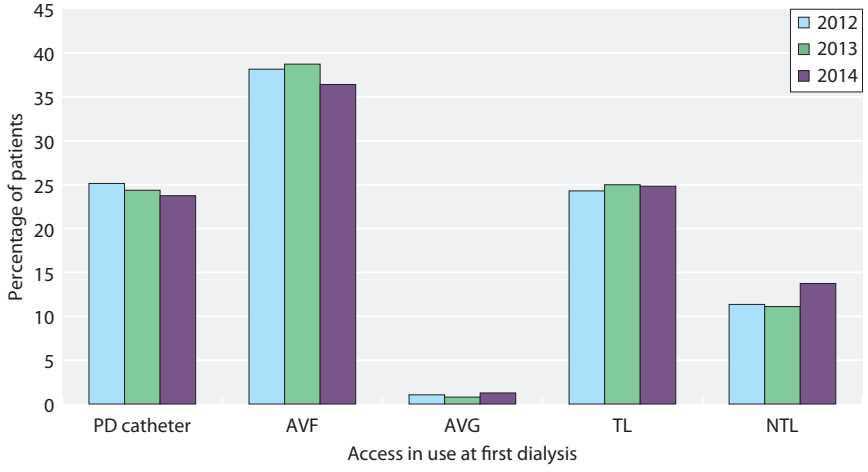

Fig. 11.18. Percentage trend in incident dialysis access use at first dialysis
PD = peritoneal dialysis catheter; AVF = arteriovenous fistula; AVG = arteriovenous graft; TL = tunnelled line; NTL = non-tunnelled line

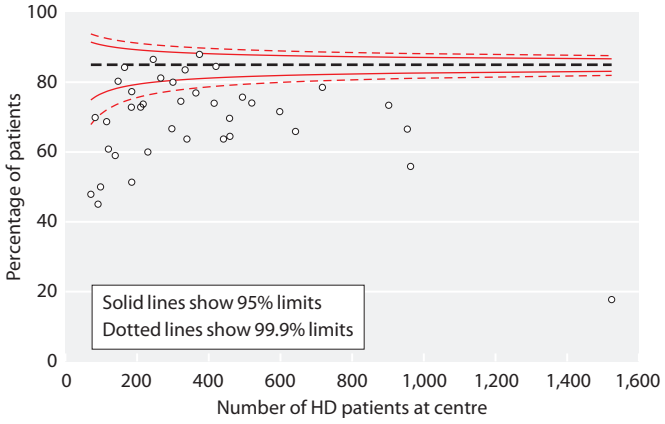

Fig. 11.19. Funnel plot of the percentage of prevalent HD patients dialysing using an AVF

Derby, Stoke, Truro, York, Dorset, Salford) reporting prevalent data were achieving close to the RA recommendations. Twenty-eight centres were more than three standard deviations and three centres were more than two standard deviations below this target (figure 11.19). The significant variation between centres could be possibly due to factors in the vascular access pathway (system factors) which can be modified. Equally, there has to be some caution exercised in interpreting these results due to non-adjustment for any of the measured and unmeasured confounders (patient related factors) and warrants further analysis.

Figure 11.20 shows type of dialysis access in prevalent patients by centre. Variations were apparent between centres when considering prevalent patients with an AV fistula, ranging from less than 20% (London West) to over 65% in 13 centres. One centre had over 70% of prevalent patients on a tunnelled or non-tunnelled line (London West) with two centres (Birmingham Heartlands, Derby) at the other end of the spectrum with less than 10% of patients. The use of an AV graft was between 0% and 10.8% with 35 centres opting to use this.

Use of a PD catheter in prevalent patients varied between 27.0% (Carlisle, Derby) and 3.7% at Middlesbrough (Colchester does not have any PD patients).

Figure 11.21 shows the percentage of prevalent dialysis patients with each access type, by year. The percentage of prevalent patients on PD has shown a decline in trend, in the three years of the combined access audit with use of PD declining at 1% every year. The observed fall in AVF use might be due to a different cohort of centres having contributed to the prevalent access data. For example, a large centre such as London West which has 82.2% (1252/1524) of its haemodialysis patients that dialyse via a catheter could be potentially skewing the data.

Access failure

Figure 11.22 shows comparative access failure for the different access types within three months of start. Access failure was defined as a documented date of failure/discontinuation recorded within three months of starting dialysis unless a centre comment indicated that it was a planned discontinuation. However there were deficiencies in the way that failure was recorded in this audit. Failure rates were generally higher in the peritoneal dialysis group with fairly similar failure rates between open surgical and percutaneous at 10%. Failure rates were generally around 5% for AVF and AVG demonstrating its superiority with failure rates for tunnelled line similar to PD (close to 10%).

The number of HD access failures reported were small. This may reflect poor local documentation procedures and these data are not included in this report.

Again, numbers of PD access failure were small and hence drawing any inferences is difficult. However, it can be seen from figure 11.23 that peritoneoscopic technique had one documented failure within three months. As previously mentioned, percutaneous technique had fairly comparable failure rates compared to either open surgical or laparoscopic technique. There was no evidence to suggest differences in failure rates due to leaks or hernia between the different insertion techniques. Twelve out of 941 (1.3%) PD patients were reported as failure of PD due to infection with no obvious difference in infection rates between the different PD insertion techniques. This was significantly lower than the national target of 5%.

2013 PD access audit one-year follow-up

Centres who reported on PD patients in the 2013 vascular and peritoneal access audits were asked to complete a one year follow up of their PD patients. The additional information requested was the date of catheter failure, the reason for catheter failure, the number of catheters used during the year, and the modality in use at one year after starting PD. Of 57 centres who reported data on PD patients in 2013, 32 completed the one year follow up, returning data on 753 (73.7%) patients. Plymouth was excluded from analysis due to over 50% missing data. The analysis therefore included 719 patients from 31 centres. In these patients, 402 (55.9%) were still on PD at one year with 87% of these (280/322) still on their first catheter.

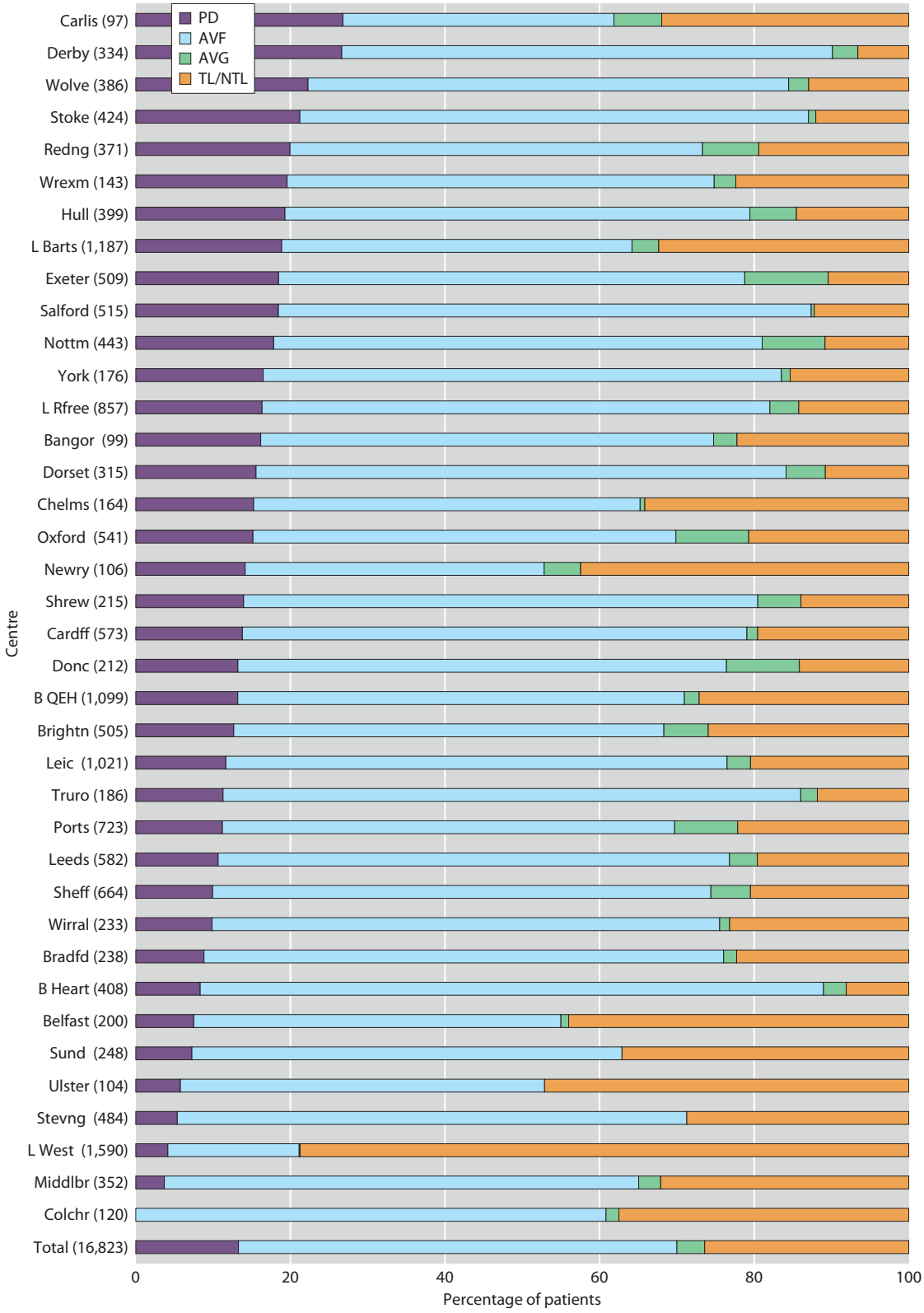

Fig. 11.20. Type of dialysis access in prevalent patients stratified by centre
Centres are ordered by the percentage of patients starting dialysis with a PD catheter
AVF = arteriovenous fistula; AVG = arteriovenous graft; TL = tunnelled line; NTL = non-tunnelled line; PD = peritoneal dialysis

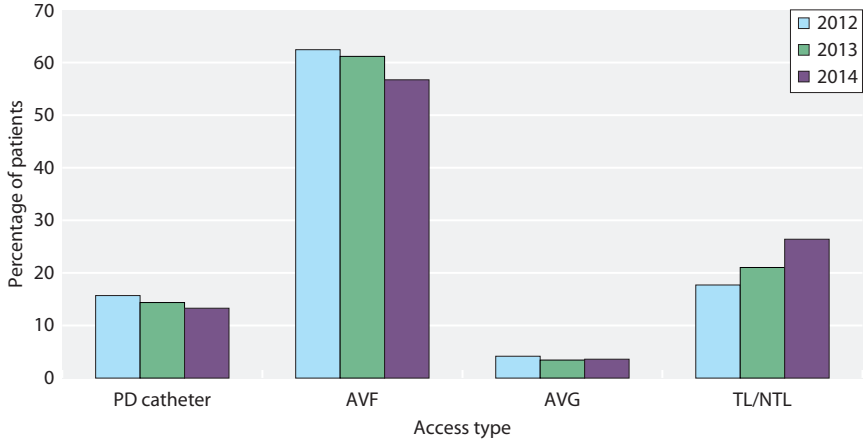

Fig. 11.21. Percentage of prevalent dialysis patients with each access type, by year
PD = peritoneal dialysis catheter;
AVF = arteriovenous fistula;
AVG = arteriovenous graft; TL = tunnelled line;
NTL = non-tunnelled line

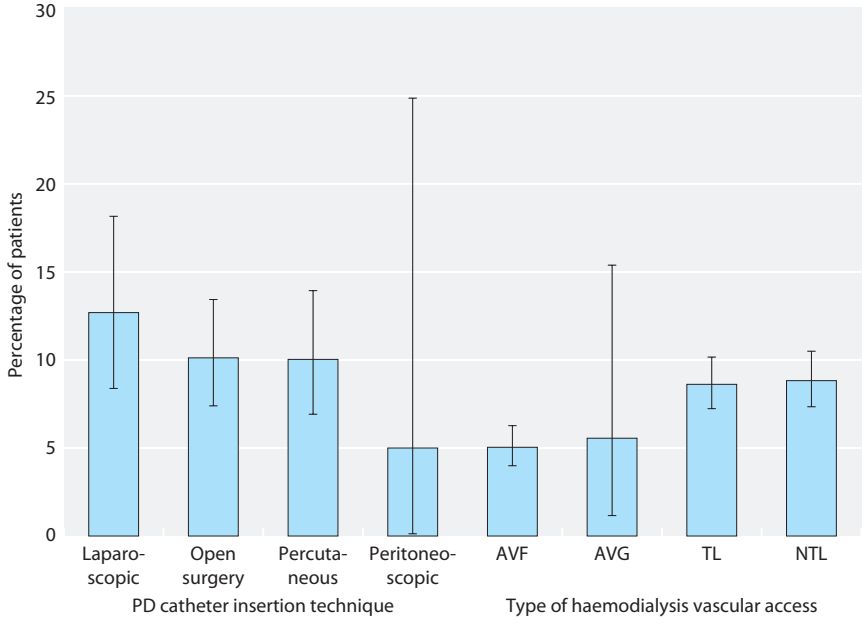

Fig. 11.22. Percentage of patients experiencing failure of first access within three months, by type of first access
AVF = arteriovenous fistula; AVG = arteriovenous graft; TL = tunnelled line; NTL = non-tunnelled line; PD = peritoneal dialysis catheter

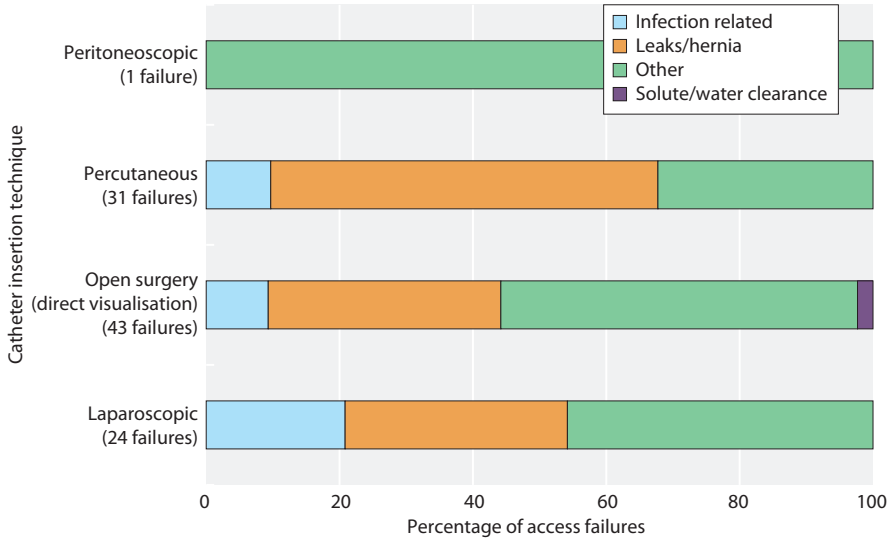

Fig. 11.23. Reported causes of peritoneal dialysis access failure within three months stratified by catheter insertion technique

There was a significant variation in PD technique survival with the majority of centres ($n = 21$) maintaining $\geqslant 50\%$ of patients on PD at one year, however only one centre maintained $\geqslant 80\%$ on PD at one year (York). Although in general where it is particularly low, transplantation seems to be the main beneficiary with variation between centres ranging from 0% to 42.9%. Having censored for transplantation the proportion of patients who were on PD was 66.1% with 28 centres maintaining $\geqslant 50\%$ of patients on PD at one year. Modality change to haemodialysis varied from 0% (Middleborough, Swansea) to >25% (Birmingham Heartlands, Sheffield, Doncaster, Dorset, Sunderland, Leeds) (figure 11.24).

Causes of PD access failure within one year of starting on PD were analysed. There was no evidence to suggest a difference in the PD failure rates when analysed by percutaneous and all of the three other techniques combined. The reported numbers were too low to draw firm conclusions ($n = 152$). Unsurprisingly the principal causes of catheter failure were mechanical or infection related (figure 11.25).

Figure 11.26. is a funnel plot which graphically displays the unadjusted percentage of PD patients experiencing a catheter failure within one year of commencement of RRT across multiple renal centres. PD catheter failure was censored for transplantation, elective transfer to HD or death. The results have to be cautiously interpreted due to the extent of and variation in missing data, small numbers of patients in some centres and non-adjustment for any patient related factors.

Of the centres for which data were available ($n = 27$), no outlier centres were identified with failure rates above the upper 95% 'alert' or 99.9% 'alarm' limits for PD catheter failures. Two renal centres reported one-year catheter failure rate below the 99% control limit (Truro, Bradford). The mean one-year catheter failure rate was

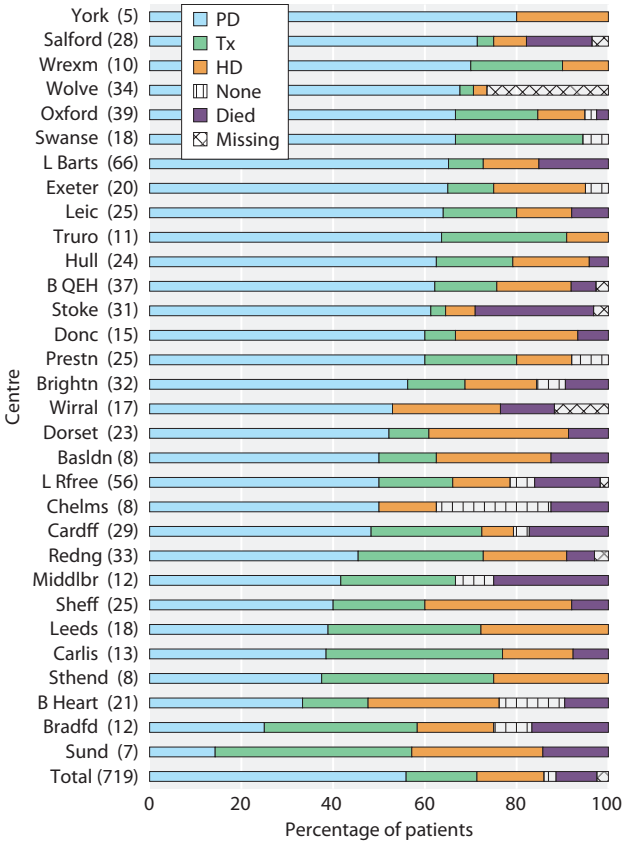

Fig. 11.24. Modality at one year after commencing PD, by centre
PD = peritoneal dialysis catheter; Tx = transtplated; HD = haemodialysis

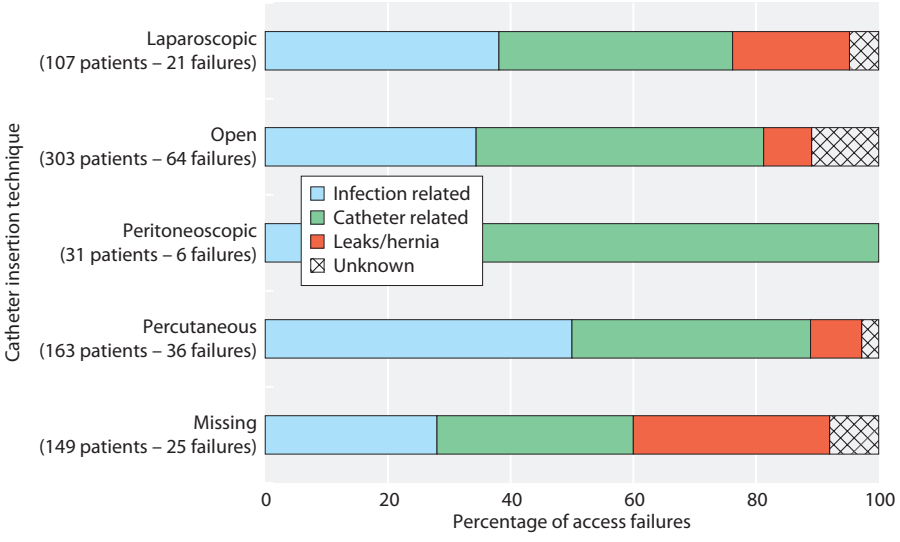

Fig. 11.25. Causes of PD access failure within one year of PD catheter insertion

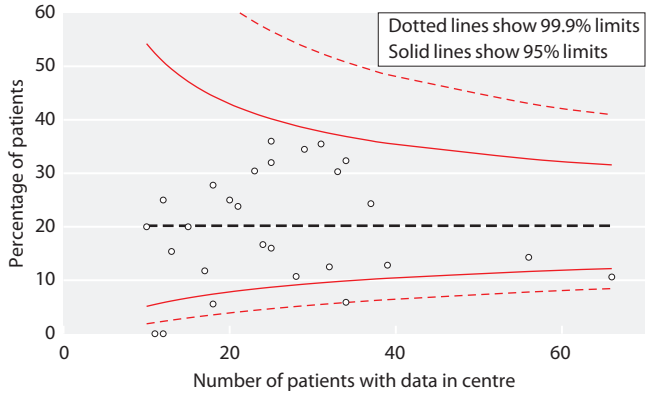

Fig. 11.26. Funnel plot of the percentage of PD catheter failures within one year of insertion

20.2% which all but met the rate recommended in the guidelines issued by the RA (20%).

Conclusions

This third multisite dialysis access audit from England, Wales and Northern Ireland has provided important information regarding the variation in access provision and failure. Data collection is still not optimal, as missing data across a range of fields exist.

Haemodialysis catheter (TL, NTL) use continued to remain high in incident and prevalent haemodialysis patients. In incident dialysis patients, tunnelled lines were used in approximately 41% of patients three months' post dialysis start and this figure was higher for patients presenting late. Particularly in the late presenters, this report highlights an opportunity for use of percutaneous PD access technique in order to increase the uptake of PD and reduce catheter use.

This audit has shown that age had a bigger impact on the type of vascular access but not on PD access with older patients more likely to start dialysis with an AVF and less likely using a tunnelled line. This data is contrary to what has been published in the literature with the HEMO study showing a lower likelihood of having a fistula in the elderly (37.5% in $<$65 years vs. 27.8% in $>$65 years; OR 0.64, 95% CI, 0.52 to 0.79) [3]. The distribution of patients starting RRT in the 2014 incident cohort was 46.6% vs. 53.4% in the under 65's and over 65's respectively when compared to 64.7% vs. 35.3% in the HEMO study. Hence the above observation in the audit could be down to elderly patients more likely to start RRT on haemodialysis via an AVF when compared to the younger patients who have a higher likelihood of starting with a transplant and may use haemodialysis via a catheter as a bridge to transplantation. Patients with polycystic kidney disease were more likely to start HD with an AVF and demonstrate the effect of PKD as a marker for planned care, as these patients are often known to renal services for many years before dialysis is required.

An interesting finding from the vascular access audit over the last couple of years has been the relationship between BMI and AVF rates. The 2013 and 2014 audits have shown that there were a higher proportion of patients starting haemodialysis on an AVF in the BMI $>$30 category when compared to the BMI $\leqslant$30 group with a difference of 12% between the two groups (audit 2013: 54.9% vs. 42.6%; audit 2014: 48.9% vs. 36.8%) [4]. There has been conflicting evidence in the literature, with the HEMO study showing a lower likelihood of having a fistula (adjusted odds ratio 0.76, 95% CI, 0.65 to 0.87) [3]. On the other hand, recent studies have shown that obesity may not be associated with increased failure rates except at the highest BMI quartile and with the use of peri-operative vein mapping similar success may be achieved in the higher BMI group [5, 6].

Several guideline statements such as the US Fistula First Breakthrough Initiative, NKF-KDOQI (National Kidney Foundation Kidney Disease Outcomes Quality Initiative), and European Renal Best Practice (ERBP) Guidelines) strongly promote the use of arteriovenous fistulae (AVF) and discourage the use of catheters (CVC); with UK Renal Association recommendations for a centre to achieve AVF in $>$65% of the incident patients and over 85% in prevalent patients [1, 7–9]. A few centres have demonstrated that these targets are indeed achievable; the majority of these centres have implemented local quality improvement projects directed at the vascular access pathway. The differences in AVF use in both incident and prevalent patients may be due to variation in local processes for access planning and delivery which needs further investigation.

This audit has highlighted that there has been a fall in the AVF rates both in incident and prevalent patients. There is also a significant disparity between the data from this audit and the DOPPS data with regards to prevalent haemodialysis access, with audit data showing AVF 65.4%, AVG 4.1% and catheter 30.5% respectively when compared to the DOPPS 4 data for the UK showing AVF 75%, AVG 6.6% and catheter 18.5% [10–12]. The vascular access tariff returns have also suggested a AVF/AVG rate of approximately 75%. The reason for

this disparity is likely to be due to sampling errors. Firstly, DOPPS only samples 20 UK centres and secondly, due to a slightly different group of centres contributing to the data in this year's and in previous years' data UKRR returns.

The latest Renal Association vascular access guidelines published in May 2015 reduced the targets to 60% of all incident patients commencing planned haemodialysis via AVF/AVG and 80% of all prevalent dialysis patients should dialyse via definitive access AVF/AVG/PD [13]. The reduction in targets were intended to encourage more centres to dialyse their patients using definitive access rather than to make it easier for the centres to achieve the new targets. These targets have not been used in the funnel plots since they were published in the period not covered by the report. Despite the revised targets most renal centres continued to fall significantly below the recommendations. There needs to be a consolidated effort from all specialties that are involved with provision of vascular access if the vascular access standards are to be achieved.

This audit has shown that in many centres percutaneous insertion of PD catheters is not used at all or is underutilised with 42% of the centres using this technique. However, in those centres using the physician led percutaneous insertion technique, 68% of them had over a fifth of their incident patients starting on PD. The audit data has also shown that patients who were first seen by a nephrologist $<$90 days before starting RRT, were more likely to undergo percutaneous insertion when compared to patients who were known between 90–365 days and $>$365 days. Therefore, some centres that are unable to place PD access in their unplanned starts probably resort to TL use, clearly this pathway is unresponsive and presents an ideal opportunity for a percutaneous initiative in order to increase PD uptake. Centres with a successful percutaneous PD pathway (Derby, Stoke, Southend, Wolverhampton), were able to achieve less than 40% catheter use (TL/NTL) in their incident patients when compared to a national average of 51%. Therefore, in centres with low PD penetrance a successful percutaneous pathway at those centres might have a big impact on PD uptake and reduce TL use. Another important point noted in this audit is that many centres rely only on one technique, usually a general surgical approach, which may limit responsiveness to PD. Several studies have demonstrated equivalent outcomes between percutaneous and surgical insertion [14–16]. Hence, the use of the percutaneous technique pathway whilst being safe, might have a better impact on achieving responsive PD access service. The work of Castledine et al has shown that in the UK, PD access use is multifactorial and depends not only on the ease of PD catheter placement but also individual patient characteristics and is also associated with modifiable centre factors [17]. Therefore, improving the ease of PD catheter placement via implementation of percutaneous insertion technique in more centres might help to get over the first hurdle towards improving the uptake of PD.

The audit has shown that without surgical assessment, patients are more likely to require temporary haemodialysis access such as a tunnelled or non-tunnelled dialysis catheter. Timely surgical assessment is a key component of the clinical pathway to fistula placement which usually leads to a successful procedure followed by successful cannulation. The other improvements identified by the DOPPS practice patterns were better prevalent AVF rates, better skilled surgeons, quicker referral to operation time and earlier cannulation [12, 18]. The relationship between surgical assessment and AVF formation was very different from that of PD catheter placement. It is quite possible that the time required to plan PD catheter placement is shorter because there are fewer steps on the PD pathway compared to that required for AVF formation. For instance, the need for vein mapping may influence the timing of AVF placement. Many of the centres that are not able to arrange timely surgical review resort to TL, this presents an opportunity to recommend percutaneous PD access to avoid complications related to the use of haemodialysis catheters.

This audit has also shown that both AVF and the PD catheter offer similar sustainability in terms of access at three months. Percutaneous PD catheter technique had similar failure rates to the other techniques combined and hence is a recommendable technique that should be better exploited.

Several DOPPS studies looked into understanding the variation in provision of vascular access. In these studies, time to surgery, cannulation and willingness to take on more difficult cases came out as very powerful factors [12, 19]. Similarly, the UKRR needs to firstly consider, a survey of the practice patterns and staffing for provision of vascular and PD access, in all the renal centres to explore the reason behind the wide variation in haemodialysis access provision between centres which could lead to potential improvements in access service provision. Secondly, using statistical techniques such as Instrument Variable (IV) analysis to explore variations in centre level survival stratified by AVF rates at the

centres with adjustments made for the captured practice patterns at the centre along with comorbidity, ethnicity, and deprivation. This approach is the subject of the UK PD Catheter Study (UKCRN ID 17940) [20].

Similarly, it would be valuable to undertake a case study exploring the role of percutaneous PD catheter insertion for primary access comparing high performing with low performing centres to understand differences in pathways of care. This presents a quality improvement opportunity in line with recommendations from CG125 (NICE technology appraisal) with the potential to increase PD uptake and reduce TL use with beneficial effects on MSSA bacteraemia rates and cost.

In summary, 100 percent coverage and better data returns in the subsequent audits from all renal centres is needed. There were still significant variations between centres in provision of dialysis access in patients with established renal failure. Further work is needed to explore the reasons behind these variations in order to define the best practice.

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Conflicts of interest: the authors declare no conflicts of interest

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UK Renal Registry 18th Annual Report: Chapter 12 Epidemiology of Reported Infections amongst Patients Receiving Dialysis for Established Renal Failure in England 2013 to 2014: a Joint Report from Public Health England and the UK Renal Registry

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Key Words

Clostridium Difficile · Dialysis · Epidemiology · *Escherichia Coli* · Established renal failure · Infection · MRSA · MSSA · *Staphylococcus*

Summary

- From 1st May 2013 to 30th April 2014 there were 35 episodes of Methicillin resistant *Staphylococcus aureus* (MRSA) bacteraemia in established renal failure patients on dialysis.
- This is now fairly stable year-on-year equating to a rate of 0.15 episodes per 100 dialysis patient years, following an initial decline in rates from 4.0 episodes per 100 dialysis patient years in 2005 when reporting began.
- Methicillin sensitive *Staphylococcus aureus* (MSSA) bacteraemia rates were slightly higher this year at 2.23 per 100 dialysis patient years (compared with 1.59 episodes per 100 dialysis patient years last year) with 526 episodes of blood stream infection reported. In 2005, the first year this was reported, there were 1,114 MSSA bacteraemias in 54 centres.
- There were 247 *Clostridium difficile* infection episodes with a rate of 1.05 per 100 dialysis patient years, slightly higher than last year at 0.55 episodes per 100 dialysis patient years.
- *Escherichia coli* infections occurred at a rate of 1.49 per 100 dialysis patient years, very similar to the rate reported last year (1.32 episodes per 100 dialysis patient years).
- This report has utilised a new methodology to identify cases, linking all established renal failure cases known to the UK Renal Registry (UKRR) with all infections reported to Public Health England and avoids the need for the local microbiology team to flag the patient as a renal patient. This may have increased the reliability of diagnosis at the UKRR level.
- In each infection for which access data were collected, the presence of a central venous catheter appeared to correlate with increased risk.

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Introduction

Infection remains the second leading cause of death in patients with established renal failure (ERF) who received renal replacement therapy (RRT). The high rates of systemic infection reported in haemodialysis (HD) patients are related to their impaired immune system, the high number of invasive procedures they are exposed to and the type of vascular access used [1]. This report covers one year of reporting for Methicillin resistant *Staphylococcus aureus* (MRSA), Methicillin sensitive *Staphylococcus aureus* (MSSA), *Escherichia coli* (*E. coli*) bloodstream infections (BSI) and *Clostridium difficile* infections (CDI) in adult patients with ERF who were receiving dialysis in England.

Previous UK Renal Registry (UKRR) reports have detailed the epidemiology of *Staphylococcus aureus* bacteraemias, *E. coli* BSIs and CDIs in patients with ERF receiving dialysis [2]. As well as the mandatory reporting of MRSA BSIs, reporting of MSSA has been mandated since January 2011 and *E. coli* BSIs since June 2011; CDI reporting has been mandatory for all patients aged two and above since 2007. CDIs are reported according to a national testing protocol although during the timeframe of this report there may have been some inter-hospital variation in testing approaches [3].

The data were supplied by clinical staff and captured using a secure web-based system, the Healthcare Associated Infection Data Capture System (HCAI-DCS). Previous reports have confirmed that whilst dialysis patients remained at increased risk from MRSA there has been a continued year on year decline in the number of reported episodes of bacteraemia [2].

Methods

This report covers the period of 1st May 2013 to 30th April 2014. It should be noted that although reporting is mandatory for these data collections (MRSA, MSSA and *E. coli* BSI and CDI), completion of documentation of information relating to renal failure is currently conducted on a voluntary basis depending on the data entry policy within the reporting NHS acute Trust. The methods used for the reporting of infections to Public Health England (PHE) have been described in previous UKRR reports (see appendix 1) [4, 5].

In last year's report the number of alterations made by renal centres varied considerably and the extent to which this reflected differences in the accuracy of PHE data for their renal centre was not known [2]. This year to standardise the case identification process and minimise the number of alterations made by centres, for the first time UKRR data were used to identify adult patients with ERF who were receiving dialysis. This meant that identification was not dependent on the reporting of dialysis status by individual NHS acute Trusts via PHE's HCAI-DCS. A list of all adult patients identified in the UKRR database as receiving dialysis between 1st May 2013 and 30th April 2014 was sent to PHE for identification of bacteraemias and CDI associated with these patients. Records of positive blood cultures of the identified patients were then passed back to the UKRR. As this was the first year that the UKRR data was linked to PHE data for identification of infectious episodes in patients receiving dialysis the additional validation and data capture step was again implemented to ensure all records were accurately captured and completed. This additional validation step involved emailing clinical or infection control leads in the renal centre with the records reported to PHE and requesting they complete the following actions:

1 Confirm that each of the cases in the PHE file was correct, i.e. that it related to a dialysis patient receiving treatment at their centre at the time of the infection and
   a Remove any cases that occurred in patients not on dialysis and receiving treatment at their centre at the time of the infection
   b Add any cases that were not known to PHE but occurred in patients on dialysis and receiving treatment at their centre at the time of the infection
2 For all MRSA and MSSA cases, to confirm details on the dialysis modality and provide details on access in use at the time of the infection.

PHE report positive blood cultures as opposed to infectious episodes. For this report repeatedly positive blood cultures in the same individual within four weeks were treated as the same episode, beyond four weeks they were treated as new or re-infection. This additional step was implemented by the UKRR after the centre validation process. This is slightly more conservative than the approach taken for the Renal Indicator Dashboard, which defines separate infections as being positive cultures more than two weeks apart.

Centre-specific rates for each infection are presented per 100 dialysis patient years. The denominator for this rate was calculated at each centre by summing the number of days that every adult dialysis patient contributed between the 1st May 2013 and 30th April 2014. For example, a patient who started dialysis on the 1st April 2014 and remained on dialysis until at least the 30th April 2014 would contribute 30 days to the total. Similarly, when calculating the modality specific rates, the number of days that every dialysis patient spent on each modality during the collection period was summed. Number of patient years at risk by access type was estimated using data from the 2013 dialysis access audit. The percentage of prevalent patients on each form of vascular access on 31st December 2013 was multiplied by the total number of patients on HD on 31st December 2013 to give an estimate of the overall number of patient years at risk.

In order to adjust for variation in precision of estimated rate, the rate of bacteraemia/CDI per 100 dialysis patient years has been plotted against the centre size in a funnel plot. This process has been repeated for each infection. In the case of MRSA, a comparative box plot to demonstrate the overall trend is also shown. Table 12.1 lists the summary of audit measures stated in the Renal Association clinical practice guidelines.

Table 12.1. Summary of all audit measures stated in Renal Association (RA) clinical practice guidelines relating to infection

RA audit measure	Reported	Reason for non-inclusion
1 Centres should audit all *Staphylococcus aureus* bacteraemia (MRSA and MSSA) episodes recorded as episodes per 100 patient years or episodes per 100 catheter days or episodes per 100 AVF years	Yes	
2 The annual *Staphylococcus aureus* bacteraemia rate should be less than 2.5 episodes per 100 HD patients and less than 1.0 for MRSA over two years	Yes	
3 Centres should audit all episodes of *Clostridium Difficile* toxin (CDT) and express rates as per 100 patient years	Yes	
4 Data should be collected on all episodes of VRE and ESBL bacteraemia episodes per 100 patient years	Partly	Only data on *E. coli* received from PHE

ESBL = Extended-Spectrum betaLactamase; VRE = vancomycin-resistant enterococci

Results

Validation

This was the first year that UKRR data were used to identify patients with ERF who were receiving dialysis to link with PHE data and the second year that the UKRR performed the additional validation and data capture step in which centres were requested to add any additional episodes which were not captured by PHE. Table 12.2 displays the number of positive blood cultures reported to PHE and the changes to the data that occurred during the validation process. The majority of episodes were rejected because the patient was not receiving dialysis for established renal failure at the time of the infection e.g. they were an acute dialysis patient or a transplant patient at the time of infection. (Acute dialysis patients will be included from January 2016.) The majority of additions were cases which were not known to PHE. There were a number of positive blood cultures reported to PHE which related to one infectious episode, these were removed during the data validation step.

Table 12.2. Number of infectious episodes reported to Public Health England (PHE) and validated by renal centres

	MRSA	MSSA	CDI	*E. coli*
Number of positive blood cultures reported to PHE	37	565	242	381
Number of episodes rejected by centres during validation	0	3	2	5
Number of episodes added by centres during validation	2	3	11	1
Number of duplicate episodes removed	4	39	4	25
Total number of episodes after validation process	35	526	247	352

There was some variation in the response from centres to the validation process with some centres adding additional episodes, and other centres not adding any. However the number of alterations made by renal centres was considerably lower than in the previous year's report, with 147 episodes added by centres during validation last year compared with 17 episodes added by centres this year [2].

Methicillin resistant Staphylococcus aureus

Thirty-five MRSA bacteraemias were recorded as being associated with dialysis patients during the time frame of this report, at a rate of 0.15 (95% CI 0.10–0.21) per 100 dialysis patient years (table 12.3). This rate was similar to the rate of 0.13 per 100 patients reported last year. In previous years there has been a steady reduction in the MRSA rates which this year appears to have plateaued (figure 12.1). However, this year for the first time the identification of cases did not rely on local flagging, so an actual continued reduction in MRSA cannot be ruled out. The modality in use at the time of infection was completed for all episodes but statistically valid comparisons between the modalities are difficult due to small numbers.

Centre level data can be seen in table 12.4 and includes the absolute number of episodes and rates per 100 dialysis patient years. The majority of centres did not report any MRSA bacteraemia episodes and only one centre had an infection rate in excess of 1 per 100 dialysis patient years. Figure 12.2 plots each centre's estimated rate against the number of patient years to take into account the greater variation expected as centre size decreases. The extremely

Table 12.3. Number and rate of infectious episodes in patients with established renal failure between 1/05/2013 and 30/04/2014, by modality

	Infection			
	MRSA	MSSA	CDI	*E. coli*
Number of episodes				
Total	**35**	**526**	**247**	**352**
HD	32	514	222	333
PD	3	12	25	19
Rate (95% CI) per 100 patient years				
Total	**0.15 (0.10–0.21)**	**2.23 (2.05–2.43)**	**1.05 (0.92–1.19)**	**1.49 (1.34–1.66)**
HD	0.16 (0.11–0.22)	2.53 (2.32–2.76)	1.09 (0.96–1.25)	1.64 (1.47–1.83)
PD	0.09 (0.02–0.27)	0.37 (0.19–0.64)	0.77 (0.50–1.13)	0.58 (0.35–0.91)

HD = haemodialyis; PD = peritoneal dialysis

low numbers of episodes at each centre makes the comparison of rates uncertain.

The Renal Association (RA) audit standard states that the annual MRSA rate should be less than 1.0 per 100 HD patients averaged over two years. Figure 12.3 displays a funnel plot of MRSA rate per 100 prevalent HD patients across the two year period from 1st May 2012 to 30th April 2014. Only one centre had a rate higher than this standard.

Methicillin sensitive Staphylococcus aureus

In total, 526 episodes of MSSA bacteraemia were recorded in the period covered by this report, at a rate of 2.23 per 100 dialysis patient years (95% CI 2.05–2.43). This was higher than last year's rate of 1.59 per 100 dialysis patient years. One centre did not report any MSSA episodes and the highest reported rate was 5.63 per 100 dialysis patient years (table 12.4). Based on

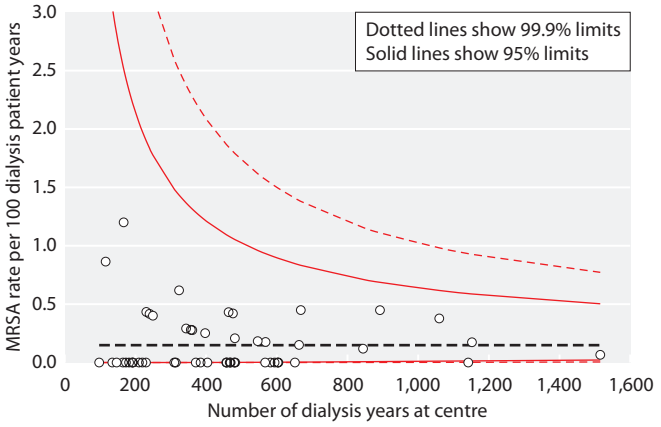

Fig. 12.2. Funnel plot of the MRSA bacteraemia rate per 100 dialysis patient years by renal centre, 1st May 2013 to 30th April 2014

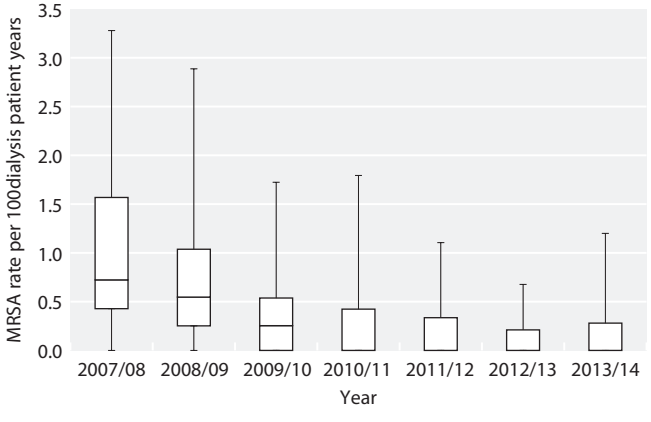

Fig. 12.1. Box and whisker plot of renal centres' MRSA rates per 100 dialysis patient years by reporting year

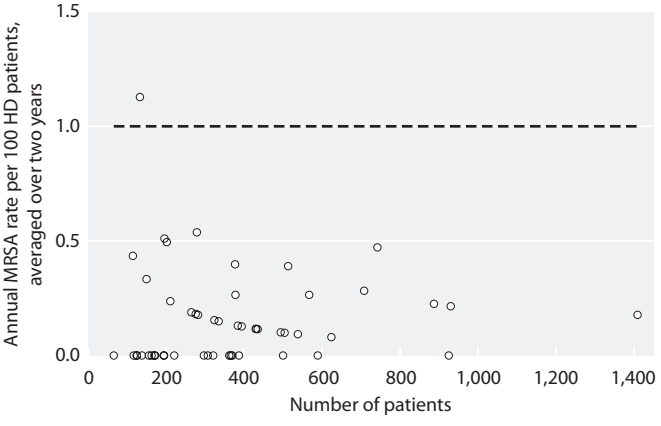

Fig. 12.3. Funnel plot of the MRSA bacteraemia two-year rate per 100 prevalent HD patients, 1st May 2012 to 30th April 2014 Dotted line depicts Renal Association standard

Table 12.4. Number and rate of infectious episodes in patients with established renal failure by renal centre

Centre	Dialysis patient years	Number of episodes (1/05/2013–30/04/2014)				Rate per 100 dialysis patient years			
		MRSA	MSSA	CDI	*E. coli*	MRSA	MSSA	CDI	*E. coli*
B Heart	467	0	13	6	11	0.00	2.79	1.29	2.36
B QEH	1,152	2	32	13	14	0.17	2.78	1.13	1.22
Basldn	191	0	5	1	2	0.00	2.62	0.52	1.05
Bradfd	231	1	13	2	5	0.43	5.63	0.87	2.17
Brightn	481	1	21	6	9	0.21	4.36	1.25	1.87
Bristol	582	0	10	7	4	0.00	1.72	1.20	0.69
Camb	479	0	11	6	13	0.00	2.29	1.25	2.71
Carlis	97	0	3	2	0	0.00	3.08	2.05	0.00
Carsh	892	4	9	7	11	0.45	1.01	0.78	1.23
Chelms	147	0	0	1	1	0.00	0.00	0.68	0.68
Colchr	116	1	3	0	1	0.86	2.59	0.00	0.86
Covnt	469	0	7	11	11	0.00	1.49	2.34	2.34
Derby	314	0	9	2	3	0.00	2.86	0.64	0.95
Donc	193	0	10	3	0	0.00	5.18	1.56	0.00
Dorset	310	0	11	3	2	0.00	3.55	0.97	0.65
Dudley	230	0	3	4	6	0.00	1.31	1.74	2.61
Exeter	482	0	5	5	10	0.00	1.04	1.04	2.07
Glouc	249	1	4	6	8	0.40	1.60	2.41	3.21
Hull	404	0	11	9	7	0.00	2.73	2.23	1.73
Ipswi	154	0	5	1	3	0.00	3.25	0.65	1.95
Kent	457	0	7	6	9	0.00	1.53	1.31	1.97
L Barts	1,142	0	30	3	19	0.00	2.63	0.26	1.66
L Guys	663	1	7	10	11	0.15	1.06	1.51	1.66
L Kings	594	0	6	2	1	0.00	1.01	0.34	0.17
L Rfree	844	1	16	4	16	0.12	1.90	0.47	1.90
L St.G	343	1	6	0	5	0.29	1.75	0.00	1.46
L West	1,515	1	25	15	18	0.07	1.65	0.99	1.19
Leeds	567	0	15	10	5	0.00	2.65	1.76	0.88
Leic	1,060	4	22	7	14	0.38	2.08	0.66	1.32
Liv Ain	182	0	4	3	2	0.00	2.20	1.65	1.10
Liv Roy	458	0	9	6	12	0.00	1.96	1.31	2.62
M RI	602	0	17	2	13	0.00	2.82	0.33	2.16
Middlbr	357	1	11	2	8	0.28	3.08	0.56	2.24
Newc	323	2	12	2	3	0.62	3.71	0.62	0.93
Norwch	371	0	3	4	6	0.00	0.81	1.08	1.62
Nottm	464	2	14	2	10	0.43	3.02	0.43	2.16
Oxford	546	1	9	10	4	0.18	1.65	1.83	0.73
Plymth	167	2	9	3	4	1.20	5.40	1.80	2.40
Ports	668	3	14	8	12	0.45	2.10	1.20	1.80
Prestn	604	0	18	11	6	0.00	2.98	1.82	0.99
Redng	361	1	8	3	6	0.28	2.22	0.83	1.66
Salford	476	2	10	6	3	0.42	2.10	1.26	0.63
Sheff	651	0	15	9	7	0.00	2.30	1.38	1.07
Shrew	220	0	8	4	5	0.00	3.64	1.82	2.28
Stevng	568	1	13	3	5	0.18	2.29	0.53	0.88
Sthend	135	0	5	0	0	0.00	3.72	0.00	0.00
Stoke	397	1	6	6	8	0.25	1.51	1.51	2.01
Sund	210	0	3	2	2	0.00	1.43	0.95	0.95
Truro	173	0	5	4	5	0.00	2.89	2.31	2.89
Wirral	240	1	6	2	4	0.42	2.50	0.83	1.67
Wolve	384	0	6	1	3	0.00	1.56	0.26	0.78
York	165	0	2	2	5	0.00	1.22	1.22	3.04
England	**23,546**	**35**	**526**	**247**	**352**	**0.15**	**2.23**	**1.05**	**1.49**

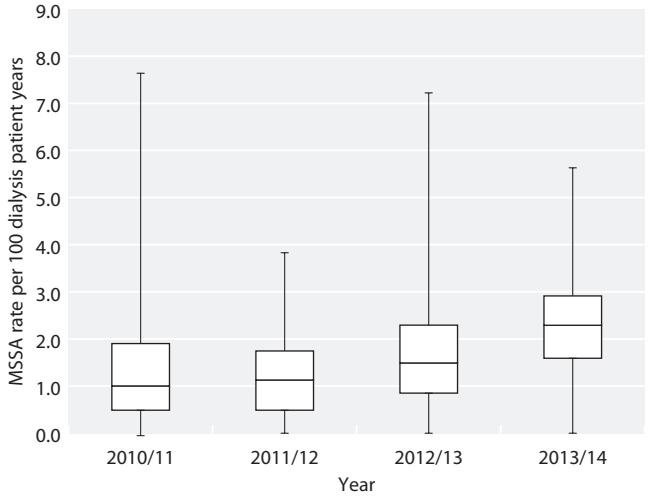

Fig. 12.4. Box and whisker plot of renal centres' MSSA rates per 100 dialysis patient years by reporting year

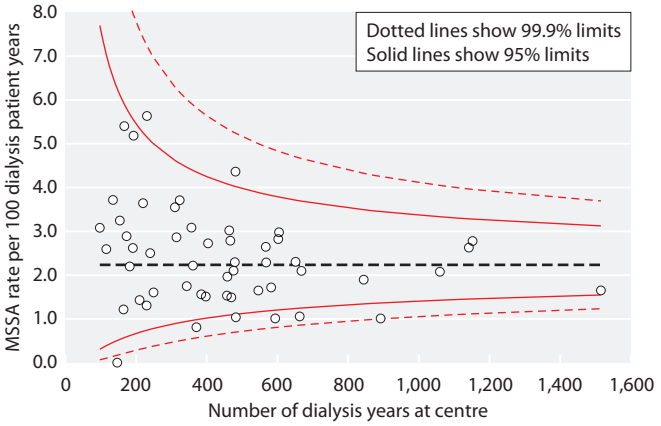

Fig. 12.5. Funnel plot of the MSSA bacteraemia rate per 100 dialysis patient years by renal centre, 1st May 2013 to 30th April 2014

the reported data, 46% of centres in England reported rates of MSSA higher than the Renal Association standard. The rates have remained fairly steady over the past three years although with a slight increasing trend (figure 12.4). Again, caution must be exercised when making year on year comparisons as the apparent variation in rates may be a reflection on the differences in the way the data has been collected and validated over the years, with the data validation step by centres adopted in the past two years and UKRR data linked with PHE data for the first time this year. Figure 12.5 plots each centre's estimated rate against the number of patient years to take into account the greater variation expected as centre size decreases.

The peritoneal dialysis (PD) cohort had a lower rate of MSSA bacteraemia per 100 patient years than the HD cohort (0.37, 95% CI 0.19–0.64 compared with 2.53, 95% CI 2.32–2.76) (table 12.3).

Type of dialysis access and infection

There were major variations in the number of episodes of both MRSA and MSSA bacteraemia according to access type. Patients dialysing through a central venous catheter (CVC) at the time of the infection were subject to more episodes of bacteraemia than those with other types of access (table 12.5). Absolute rates cannot be calculated because vascular access has until now only been captured at one point every 12 months, so the time at risk on each form of access was not available. The estimated number of patient years at risk is provided only as an estimate of the time at risk and rates derived from this should be treated with caution. It is based on the distribution of access types using data on the 33 centres in England who provided prevalent access data in the 2013 dialysis access audit return. This distribution was then applied to the total number of patients on HD in England on 31st December 2013 to give an overall estimate for England.

Clostridium difficile

In total, 247 episodes of CDI were recorded in the period covered by this report, at a rate of 1.05 (95% CI 0.92–1.19) per 100 dialysis patient years. Based on the reported data, this was higher than last year's rate of 0.55 per 100 dialysis patient years, however this may be a reflection on the change in the way the data has been collected and validated this year. Three centres did not report any CDI episodes and the highest reported rate was 2.41 per 100 dialysis patient years (table 12.4). Figure 12.6 plots each centre's estimated rate against

Table 12.5. Type of dialysis access in use at the time of infection for HD patients

	Number of episodes (1/05/2013–30/04/2014)				
	AVF	AVG	CVC	PD	No data
Estimated number of patient years at risk	14,492	850	4,754	3,176	
MRSA	6	4	21	3	1
MSSA	183	36	250	10	47

AVF = arteriovenous fistula; AVG = arteriovenous graft; CVC = central venous catheter; PD = peritoneal dialysis

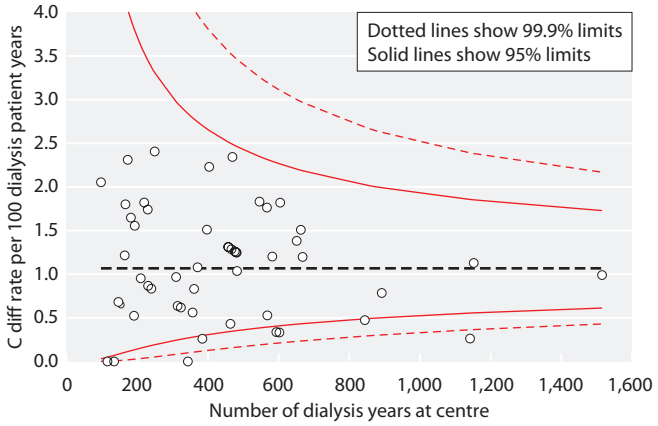

Fig. 12.6. Funnel plot of the CDI rate per 100 dialysis patient years by renal centre, 1st May 2013 to 30th April 2014

the number of patient years to take into account the greater variation expected as centre size decreases. Rates were higher in the HD than the PD cohort (1.09, 95% CI 0.96–1.25 compared with 0.77, 95% CI 0.50–1.13, respectively) (table 12.3).

Escherichia coli

A total of 352 episodes of *E. coli* bacteraemia were recorded in the period covered by this report, at a rate of 1.49 per 100 dialysis patient years (95% CI 1.34–1.66). This was slightly higher than last year's rate of 1.32 per 100 dialysis patient years, however this may be a reflection on the change in the way the data has been collected and validated this year.

Centre level data are displayed in table 12.4 with considerable between-centre variation in *E. coli* bacteraemia rates. Three centres did not report any episodes and the highest reported rate was 3.21 per 100 dialysis patient years. Figure 12.7 plots each centre's estimated rate against the number of patient years to take into account the greater variation expected as centre size decreases.

Here too, PD was associated with a lower rate of infection per 100 patient years than HD (0.58, 95% CI 0.35–0.91 compared with 1.64, 95% CI 1.47–1.83, respectively) (table 12.3).

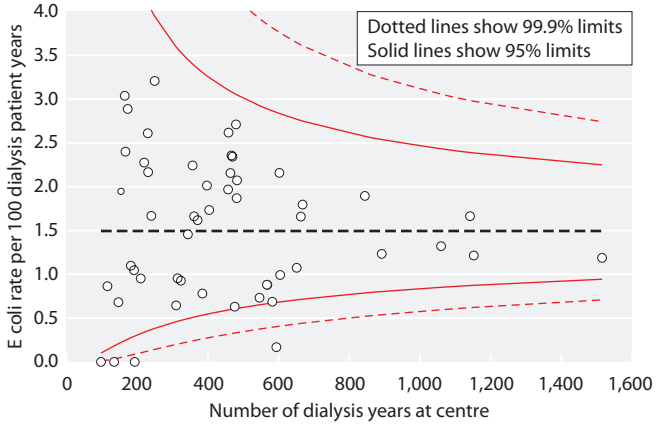

Fig. 12.7. Funnel plot of the *Escherichia coli* bacteraemia rate per 100 dialysis patient years by renal centre, 1st May 2013 to 30th April 2014

Conclusions

This report has presented data from one year of infections in adult ERF patients receiving dialysis and extends the work done in previous reports from Public Health England and the UK Renal Registry [2]. In previous reports the numbers and rates of MRSA BSIs in dialysis patients had fallen. However this year the rate has remained similar to that of last year. This change has mirrored the general improvement in MRSA rates seen across England over the same time period. General measures have included increased training, awareness and screening. In addition, there are dialysis specific factors that have led to improvement. These include enhanced screening programmes and increased attention to care of access. Despite the change in the reporting mechanism this sustained improvement is welcome.

This report also presents the third full year of reporting of MSSA bacteraemia episodes although MSSA was reported in the 2005 vascular access report. The rate of MSSA bacteraemia remained significantly higher than for MRSA with a 15 fold increased reporting rate. When *Staphylococcal aureus* infections were first reported in the 2004 cohort about 1/3 were due to MRSA. This change in pattern of resistance requires further study.

The presence of a central venous catheter remained a significant risk factor for MSSA bacteraemia when compared to an arteriovenous fistula. However, there were a significant number of MSSA infections in people using an AVF. This study is limited in determining whether an infection was a direct consequence of the access and there are no data on outcomes. The discrepancy between the rates of MRSA and MSSA is notable and suggests that MSSA continues to be a significant issue in the dialysis population. A recent meta-analysis suggested that the use of mupirocin is associated with a reduced risk of

bacteraemia in a screened population but practice within the UK may vary considerably [6]. For example, a single centre UK study suggested that eradication can be effective in just 36% of individuals but is associated with a reduced risk of MSSA bacteraemia in those who do respond [7]. Screening programmes, eradication therapy and access care policies for both CVC and AVF may vary between centres. Patients remained vulnerable to MSSA and a study of practice patterns may yield useful insights to improve care.

Data availability on CDI and *E. Coli* are relatively new. The survey this year did not ask for data on access for these episodes but may be of indirect relevance. The report again demonstrates centre variation. The reasons for this are not immediately clear. CDI risk may be associated with antibiotic exposure and data on centre antibiotic usage may be useful. *E. coli* bacteraemia is also relatively frequent. Further, there is nearly a three fold increased risk of *E. Coli* bacteraemia in HD compared to PD patients and while this could reflect haemodynamic stress and gut translocation in HD patients [8], it could also simply reflect the fact that HD patients tend to be frailer and that PD is contraindicated when there is significant bowel disease.

The introduction of the data linkage between PHE and UKRR this year has contributed to improved data accuracy and completeness of the data. It has minimised the data collection burden on centres by minimising the number of alterations required by centres during the data validation step. Consistency of data collection, validation and reporting in future years will enable trends to be more clearly identified. However, there is a need to interpret variation between centres by exploring practice patterns and thereby improve care.

Conflicts of interest: the authors declare no conflicts of interest

Acknowledgements

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Appendix 1

Processes for reporting of infections to Public Health England

All cases of Methicillin Resistant *Staphylococcus aureus* (MRSA), Methicillin Susceptible *Staphylococcus aureus* (MSSA), *Escherichia coli* and *Clostridium difficile* which satisfy the criteria below are reported via the Healthcare Associated Infection Data Capture System (HCAI-DCS) which is a real-time, secure web enabled system. Criteria for what constitutes an infection are as follows:

1 MRSA bacteraemia: The following MRSA positive blood cultures must be reported to PHE:
   All cases of MRSA bacteraemia caused by *S. aureus* resistant to methicillin, oxacillin, cefoxitin or flucloxacillin. Further details on surveillance of MRSA bacteraemia in patients with renal disease are available online [1].
   All reported MRSA bacteraemia are subject to a post infection review [2]. The included renal data includes *all* cases regardless of whether they were assigned to a Trust, CCG or Third party via the PIR process.
2 MSSA bacteraemia: The following MSSA positive blood cultures must be reported to PHE:
   All cases of MSSA bacteraemia caused by *S. aureus* which are not resistant to methicillin, oxacillin, cefoxitin, or flucloxacillin i.e. not subject to MRSA reporting.
3 *E. coli* bacteraemia: The following *E. coli* positive blood cultures must be reported to PHE:
   All laboratory confirmed cases of *E. coli* bacteraemia
4 *C. difficile* Infection: Any of the following defines a *C. difficile* infection case in patients aged 2 years and above and must be reported to PHE [3]:
   a Diarrhoeal stools (Bristol Stool types 5–7) where the specimen is *C. difficile* toxin positive.
   b Toxic megacolon or ileostomy where the specimen is *C. difficile* toxin positive.
   c Pseudomembranous colitis revealed by lower gastro-intestinal endoscopy or Computed Tomography.
   d Colonic histopathology characteristic of *C. difficile* infection (with or without diarrhoea or toxin detection) on a specimen obtained during endoscopy or colectomy.
   e Faecal specimens collected post-mortem where the specimen is *C. difficile* toxin positive or tissue specimens collected post-mortem where pseudomembranous colitis is revealed or colonic histopathology is characteristic of *C. difficile* infection.

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UK Renal Registry 18th Annual Report: Appendix A The UK Renal Registry Statement of Purpose

A:1 Executive summary

1.1 The UK Renal Registry (UKRR) was established by the Renal Association to act as a resource in the development of patient care in renal disease.

1.2 The UKRR acts as a source of comparative data for audit, benchmarking, planning, policy and research. The collection and analysis of sequential biochemical and haematological data is a unique feature of the UKRR.

1.3 The UK Renal Registry Database System Specification (RRDSS) defines the data items that are required to be sent from participating renal centres for analysis by the UKRR.

1.4 Data is collected quarterly to maintain centre-level quality assurance, with the results being published in an annual report.

1.5 Core activity is funded from commissioning agencies by a capitation fee per renal patient.

1.6 The UKRR provides data to Trusts, commissioning authorities and the European Renal Association – European Dialysis and Transplant Association (ERA–EDTA) Registry.

1.7 The development of the UKRR is open to influence from all interested parties, including clinicians, Trusts, commissioning authorities, patient groups, researchers and academics.

1.8 The UKRR is non-profit making and has a registered charitable status through the Renal Association.

A:2 Introduction

2.1 Registry-based national specialty comparative audit is one of the cornerstones of NHS development. The Renal National Service Framework (NSF), published in two sections in 2004 and 2005, recommended the participation of all renal centres in comparative audit through the UKRR.

2.2 The Chief Executives of Trusts are responsible for clinical governance and audit is an essential part of that agenda [1].

2.3 Demographic information on patients receiving renal replacement therapy (RRT) throughout Europe was collected from 1965 in the Registry of the ERA-EDTA. This voluntary exercise was conducted on paper and by post, demanded considerable effort and time from participating centres and eventually proved impossible to sustain. Latterly, the incompleteness of UK data returns to the ERA-EDTA made it impossible to build a picture of the activity of RRT in the UK for planning and policy purposes.

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Subsequently, national data collections from England & Wales were solicited from renal centres in 1992, 1996, 1999, 2002 and 2004 to fill this gap. The UKRR published its first report in 1998 and through its quarterly returns has established a system to place routine data collection and analysis on a permanent basis. The next stage is in progress incorporating data from the earlier stages of chronic kidney disease and acute kidney injury.

2.4 Together with the need to know demographic and structural elements, the NHS has developed a need to underpin clinical activity more rigorously through the scientific evidence base (for example, the Cochrane Initiative) and by quality assurance activity through audit. These initiatives require comprehensive information about the structures, processes and outcomes of RRT, which go well beyond the detail previously compiled by the ERA-EDTA.

2.5 The UKRR is recognised as one of the very few high quality clinical databases available for general use [2]. The collection of data by download of electronic records from routine clinical databases, has been highly successful and is being imitated worldwide.

2.6 The Renal Association publishes guidelines in renal Clinical Standards documents. It was apparent during the development of the standards that many of the desirable criteria of clinical performance were uncertain or unknown and that only the accumulated data of practicing renal centres could provide the evidence for advice on best practice and what might be achievable. A common data registration provides the simplest device for such an exercise. The data currently gathered audits a proportion of the Renal Association standards, partly due to some data items required not being available in the dataset and partly due to data not being either completed in or extracted from renal systems. The dataset is subject to regular review and a drive is required for more complete data returns by renal centres.

2.7 It can be seen that the need for a RRT registry developed for a variety of reasons: international comparisons, national planning, local Trust and health authority management, standard setting, audit and research. The opportunity for data gathering arises partly from improvements in information technology. Although it was possible to see the need for a national renal database over 25 years ago, the circumstances have become ideal for the maintenance of a data repository, supported by the clinical users and resourced for national benchmarking as a routine part of RRT management.

2.8 The provisional expectations of the earlier UKRR Annual Reports can now be replaced by confident assertions, built on the experience of seventeen years of publication, about the role and potential of the UKRR. The integration of the various elements of Renal Association strategy is being pursued through the Clinical Affairs Board (CAB) and Academic Affairs Board (AAB).

A:3 Statement of intent

The UKRR provides a focus for the collection and analysis of standardised data relating to the incidence, clinical management and outcome of renal disease. Data will be accepted quarterly by automatic downloading from renal centre databases. There will be a core dataset, with optional elements of special interest that may be entered by agreement for defined periods. A report will be published annually to allow a comparative audit of facilities, patient demographics, quality of care and outcome measures. Reports using the data collected can be generated at centre, regional and national level by interested parties via the data portal on the UKRR website www.renalreg.org. Participation is mandated in England through the recommendation in the Renal National Service Framework and the NHS Commissioning document A06 Renal Dialysis. During the earlier years of the UKRR there was a focus on RRT, including transplantation, this now extends to other areas of nephrology. The UKRR provides an independent source of data and analysis on national activity in renal disease.

A:4 Relationships of the UK Renal Registry

4.1 The UKRR is a registered charity through the Renal Association (No. 2229663). It was established by a committee of the Renal Association, with additional representation from the British Transplantation Society, the British Association for Paediatric Nephrology, the Scottish Renal Registry, Wales and Northern Ireland. The UKRR maintains links with the Department of Health, the National Kidney Federation (NKF), the British Kidney Patient Association (BKPA), the Royal Colleges, the

Association for Clinical Biochemistry and Health and Social Care Commissioners.

4.2 A number of sub-committees were instituted as the database and renal centre participation developed, in particular for data analysis and interpretation for inclusion in the Annual Report. Further specialised panels may be developed for publications and the dissemination of UKRR analyses.

4.3 The Scottish Renal Registry sends data to the UK Renal Registry for joint reporting and comparison.

4.4 The return of English, Welsh and Northern Irish data to the EDTA-ERA Registry will be through the Renal Registry. The Scottish Renal Registry already sends data directly to the EDTA-ERA Registry.

4.5 A paediatric database has been developed in collaboration with the UKRR. The two databases are in the process of being integrated, which will allow long-term studies of renal cohorts over a wide age range.

4.6 Close collaboration with NHS Blood and Transplant gives joint benefits. Data aggregation and integration has led to joint presentations and publications. The description of the entire patient pathway in RRT by this means is a source of continuing insight and usefulness.

4.7 The retention of patient identifiable information, necessary in particular for the adequate tracing of patients, has been approved by the Health Research Authority's Confidentiality Advisory Group (CAG). This is renewed on an annual basis along with audit of the information governance arrangements within the UKRR through completion of the Health and Social Care Information Centre's (HSCIC) Information Governance Toolkit.

A:5 The role of the UK Renal Registry for patients

5.1 The goal of the UKRR is to improve care for patients with renal disease. The appropriate use of UKRR information should improve equity of access to care, adequacy of facilities, availability of important but high cost therapies and the efficient use of resources. The continuing comparative audit of the quality of care should facilitate the improvement of care and care outcomes.

5.2 A patient leaflet and poster produced in collaboration with the NKF and the BKPA are available on the UKRR website (www.renalreg.org), explaining how patients may opt out of the collection of identifiable data by the UKRR if they wish. This was renewed in 2015 as part of the UKRR's CAG submission. Patient opt out remains low.

5.3 Information from the UKRR complements the records available on 'PatientView' www.patientview.org.

5.4 A patient council has been convened. The role of the Patient Council is to:

- Act as representatives for kidney patients and their carers.
- Guide and influence methods of delivery of care.
- Advise on opportunities for new work ideas and initiatives for the UKRR.
- Contribute to the development of new audit, research and survey proposals.
- Provide an arena that will encourage discussions between patients and clinical teams to promote patient involvement at renal centre, regional and national levels.
- Monitor and review patient facing initiatives recommended by the Department of Health.
- Review applications and contribute towards the production of patient leaflets, posters, reports and other patient information products developed by the Renal Association.
- Support the UKRR in issues relating to information governance and patient consent.
- Use personal networks to spread awareness of the UKRR and its work with the council.
- Represent the Patient Council and the UKRR at other external meetings.

A:6 The role of the UK Renal Registry for nephrologists

6.1 The clinical community have become increasingly aware of the need to define and understand their activities, particularly in relation to national standards and in comparison with other renal centres.

6.2 In 2013, the UKRR Committee was disbanded and the UKRR is now governed by the Renal Information Governance Board of the Renal Association.

6.3 The Renal Standards documents are designed to give a basis for centre structure and performance, as well as patient-based elements such as case mix and outcomes. It is anticipated that Standards will become increasingly based on research evidence.

6.4 The UKRR data are available to allow the comparative review of many elements of renal centre practice. Centre data are presented to allow a contrast of individual centre activity and results against national aggregated data. Sophisticated analyses of patient survival for example, are a unique resource to exclude any anomalies of performance and standardise for centre caseload.

6.5 Reports of demographic and treatment variables are available to the participating centres for distribution to Trusts, Strategic Health Authorities and Commissioners, as well as renal networks, as required and agreed with the centre. Reports should facilitate discussion between clinicians, Trust officers and commissioners.

6.6 The UKRR welcomes suggestions for topics of national audit or research that colleagues feel are of sufficiently widespread interest for the UKRR to undertake.

6.7 The database has been designed to provide research facilities and for future participation in national and international trials. Members of the Renal Association and other interested parties are welcome to apply to the UKRR study groups to conduct local or national audit and research using the database, further information is available at www.renalreg.org/about-us/working-with-us/. All such projects will need the agreement of the UKRR study group concerned and any costs involved may need to be met by the applicants.

6.8 These facilities will be sustainable only through co-operation between nephrologists and the UKRR. There is a need for high-quality and comprehensive data entry at source.

6.9 Centres will need to develop an 'annual informatics plan', to review the maintenance and improvement of data collection, organisation and returns to the UKRR. This will help maintain the accuracy, timeliness and completeness of clinical data and also in parallel, support the career development of informatics staff.

A:7 The role of the UK Renal Registry for Trust managers

7.1 As the basis of the clinical governance initiative, the gathering and presentation of clinical data are regarded as essential parts of routine patient management in the health service.

7.2 One of the principles of health service informatics is that the best data are acquired from clinical information recorded at the point of health care delivery.

7.3 Renal services data entered on local systems by staff directly engaged with patients are likely to be of the highest quality and it is these that the UKRR intends to capture.

7.4 The UKRR provides a cost-effective source of detailed information on renal services.

7.5 The regular reports of the UKRR supply details of patient demographics, treatment numbers, treatment quality and outcomes. Data are compared with both national standards and national performance, for benchmarking and quality assurance. The assessment of contract activity and service delivery is possible through these data returns, without the need for further costly Trust or commissioner administrative activity. These data should be particularly valuable to contracts managers and those responsible for clinical governance.

7.6 Data are available on centre case mix, infrastructure and facilities.

7.7 Work is progressing on the data capture and analysis from patients with renal disease other than those requiring RRT and will become available in time (e.g. chronic kidney disease and acute kidney injury).

A:8 The role of the UK Renal Registry for Commissioners of health care

8.1 Commissioners have confirmed the powerful role accurate data plays in their decisions.

8.2 The Renal Dialysis Service Specification states 'The provider will ensure that the required patient, activity and outcomes data are provided in accordance with the requirements of the UK Renal Registry'.

8.3 The UKRR provides validated, comparative reports of renal centre activity on a regular basis to participating centres. These allow assessment of centre performance across a wide range of variables relating to structure, process and outcome measures.

8.4 There are economies of scale in the performance of audit through the UKRR, since multiple local audits are not required.

8.5 The incidence of RRT treated locally, mortality and renal transplant rates should also be of interest. The assessment of referral and treatment patterns of patients with established (end stage) renal failure by postcode analysis indicates the geographical origin. This information also allows the expression of differences relating to geography, ethnicity and social deprivation. These data may also identify potential unmet needs in the population and permit assessment on the equity of service provision. In the future, the UKRR database should also provide information on nephrology and pre-dialysis patients (CKD). This will allow a prediction of the need for RRT facilities, as well as indicating the opportunities for beneficial intervention.

8.6 UKRR data are used to track patient incidence and prevalence rates over time, which allows the modelling of future demand and the validation of these predictions.

8.7 Information on the clinical diagnosis of new and existing RRT patients may help identify areas where possible preventive measures may have maximal effect.

8.8 The higher acceptance rates in the elderly, and the increasing demand from ethnic groups due to a high prevalence of renal, circulatory and diabetic disease, are measurable.

8.9 Comparative data are available in all categories for national and regional benchmarking.

8.10 The UKRR offers independent expertise in the analysis of renal services data and their interpretation, a resource that is widely required but difficult to otherwise obtain.

8.11 In 2016 the cost of supporting the UKRR core work on RRT, AKI and CKD audit will be £30 per registered RRT patient per annum, which is less than 0.08% of the typical cost of a dialysis patient per annum. It is expected that this cost will need to be made explicit within the renal services contract.

A:9 The role of the UK Renal Registry for national quality assurance agencies

9.1 The UKRR audit is listed as an audit of the Healthcare Quality Improvement Partnership national clinical audit programme.

9.2 The demographic, diagnostic and outcomes data can support the investigation of clinical effectiveness.

9.3 The case mix information and comorbidity data that would allow better assessment of survival statistics remains incomplete. There is also some clinical scepticism whether 'correction' of outcome data would reflect the realities of clinical practice.

A:10 References

1 Black N. Clinical governance: fine words or action? Br Med J 1998;316:297–8

2 Black N. High-quality clinical databases: breaking down barriers [Editorial]. Lancet 1999;353:1205–6

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UK Renal Registry 18th Annual Report: Appendix B Definitions and Analysis Criteria

B:1 Definition of the incident (take-on) population

The take-on population is defined as all patients over 18 who started renal replacement therapy (RRT) at UK renal centres and did not have a recovery lasting more than 90 days within 90 days of starting RRT.

The treatment timeline is used to define take-on patients as follows.

If a patient has timeline entries from more than one centre then these are all combined and sorted by date. Then, the first treatment entry from any centre gives the first date when they received RRT. This is defined as a 'start date'. However, in the following situations there is evidence that the patient was already receiving RRT before this 'start date' and these people are not classed as incident patients:

- patients with an initial entry on the timeline of transferred in (modality codes 39 to 69)
- those with an initial entry of transferred out (modality code 38)
- those with an initial treatment of lost to follow up (modality code 95)
- those who had graft acute rejection (modality code 31) and did not have a transplant on the same day
- those with an initial entry of transfer to adult nephrology (modality code 37)
- those with an initial entry of graft functioning (modality code 72)
- those with an initial entry of nephrectomy transplant (modality code 76)

Where none of the above apply, the entry is defined as a take-on (providing there is no recovery of more than 90 days within 90 days of the start date).

If there is a recovery lasting more than 90 days which begins **more** than 90 days after starting RRT then the program looks at the modality codes after this date to see if the patient restarted RRT. If they did, then this second (or third etc.) starting point is defined as their take-on date. This definition is different to that used in earlier reports. In previous reports a person could be counted as an incident patient two (or more) times. For example, a patient may start RRT in 2010, recover and then restart RRT in 2011. Providing that they do not have a recovery lasting more than 90 days within 90 days of start on either occasion, such patients would have been counted twice in previous years but are now only counted as an incident patient in 2011.

See section B:4 'Start of established renal failure' below for information on 'acute' codes such as 81 'acute haemodialysis'.

Provided the UK Renal Registry (UKRR) received a modality code 36 from the work-up centre, pre-emptive transplants are allocated as incident patients of the work-up centre and not of the centre where the transplant took place.

Note: patients restarting dialysis after a failed transplant are not counted as incident patients.

B:2 Definition of the prevalent population for each year

The adult prevalent population for a year is defined as all RRT patients over 18, being treated at centres returning data to the UKRR for that year and who were alive on 31 December of that year. It includes both incident patients for that year and patients who had

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been on treatment for longer. Note that any patients over 18 still being treated at paediatric centres are excluded.

Patients who had transferred out, recovered function, stopped treatment without recovery of function or been lost to follow up before the end of the quarter are excluded.

When quarterly data are received from more than one centre (often when there is joint care of renal transplant recipients between the referring centre and the transplant centre) the patient is only included under one of these. The centre to be used is defined by the steps below (as many steps as necessary are followed in this order until data is only left from one centre):

(a) the treatment timeline is used to eliminate any centre(s) which the patient was not still at at the end of the quarter.
(b) a centre with biochemistry data (at least 1 of the 6 fields – creatinine, haemoglobin, albumin, albuminium, serum potassium, urea) is favoured over one without.
(c) a centre with quarterly modality of transplant is favoured over one without.
(d) non-transplanting centres are favoured over transplanting centres.
(e) the centre with the most of the six biochemistry fields (listed above) populated is favoured.
(f) if the above steps do not decide between centres (unusual) then the choice is made based on the sort order of the centre codes.

In some situations (generally where timeline data is seen to be inaccurate/incomplete) then the centre used is set manually on an ad hoc basis.

Further exclusions when analysing quarterly biochemistry or blood pressure data

For these analyses, further restrictions are made to the prevalent cohort for each quarter.

Patients who had 'transferred in' to the centre in that particular quarter are excluded.

Patients who had changed treatment modality in that particular quarter are excluded.

Patients who had been on RRT for less than 90 days are excluded.

Note: the length of time on RRT is calculated from the most recent start date (i.e. the point at which they are defined as an incident patient using the new (from 18th Annual Report) definition–see above). So if a patient starts, then recovers and then starts again, this second start date is used. Also, for patients who are not defined as incident patients because their start date is unknown (for example, if their first timeline entry is a transfer in code) it is assumed that they have been on RRT for longer than 90 days and they are included for every quarter.

B:3 Statistical definitions

Death rate calculation

A death rate per 100 patient years is calculated by counting the number of deaths and dividing by the person years exposed. This includes all patients, including those who died within the first three months of therapy. The person years at risk are calculated by adding, for each patient, the number of days at risk (until they died or transferred out) and dividing by 365.

Odds ratio

This is the odds of an event in one group divided by the odds in a reference group. For example, if the event is death (within a certain time) and phosphate groups are being compared, then for phosphate group 1.8 to 2.1 mmol/L the odds of the event are:

$$\frac{\text{(probability of dying for someone with a phosphate of 1.8–2.1 mmol/L)}}{\text{(probability of surviving for someone with a phosphate of 1.8–2.1 mmol/L)}}$$

The odds ratio is then:

$$\frac{\text{(odds of dying if phosphate 1.8–2.1 mmol/L)}}{\text{(odds of dying for reference group)}}$$

Note that when the event being analysed is death, often the odds ratio would not be used but a 'survival analysis' used instead. This takes into account the time when the event occurs and also allows for censoring (for example if people are lost to follow up). Such an analysis gives hazard ratios (see below) rather than odds ratios.

Hazard function

The hazard function is the probability of dying in a short time interval, conditional on survival up to that point.

Hazard ratio

For the same example as above, the hazard ratio is the:

$$\frac{\text{(probability of dying in the next interval for a phosphate of 1.8–2.1 mmol/L)}}{\text{(probability of dying in the next interval for a phosphate in the reference range)}}$$

Funnel plots

Percentages achieving Renal Association and other standards are displayed in several ways in the annual report. Caterpillar plots show the percentage meeting the targets along with 95% confidence intervals (CIs) for each centre and overall. Funnel plots show the percentage meeting the target plotted against the size of the centre (the number of people with a measurement). 'Funnels' are plotted around the average percentage meeting the target. Any centres which fall outside the funnels are significantly different from the average. The funnel shape of the limits reflects the fact that for smaller centres, for which the percentage meeting the target is less reliably estimated, a greater observed difference from the average is required for it to be statistically significantly different.

In survival analyses the funnel plot methodology is similar except that the funnel plots show the percentage survival plotted against the size of the centre (the number of patients in the cohort) and funnels are plotted around the average survival. Survival for any centres falling outside the funnels is significantly different from the average survival.

B:4 General and modality definitions

Definitions of analysis quarters

Quarter	Dates
1	1 January–31 March
2	1 April–30 June
3	1 July–30 September
4	1 October–31 December

The quarterly biochemistry data are extracted from renal centre systems as the last data item stored for that quarter. If the patient treatment modality was haemodialysis, the software should try to select a pre-dialysis value (unless otherwise specified in the data specification).

Home haemodialysis

Home haemodialysis patients cease to be classed as such if they need longer than two weeks of hospital dialysis when not an inpatient.

Satellite dialysis unit

A renal satellite unit is defined as a haemodialysis facility that is linked to a main renal centre, is not autonomous for medical decisions and provides chronic outpatient maintenance haemodialysis but with no acute or inpatient nephrology beds on site.

Start of established renal failure

Established renal failure (also known as end stage renal failure or end stage renal disease) was defined as the date of the first dialysis (or of pre-emptive transplant).

A patient starting RRT on 'chronic' haemodialysis should be entered on the UKRR timeline on the date of the first HD episode.

If a patient started RRT with an episode of acute (or acute-on-chronic) kidney injury in which it was felt that kidney function had potential to recover, then acute haemodialysis (or acute haemofiltration or acute peritoneal dialysis where appropriate) should be entered on the UKRR timeline. If subsequently it is felt that kidney function is no longer likely to recover, a timeline modality should be added of 'chronic dialysis' at the time when this becomes apparent (accepting that the timing of this change will vary between clinicians). The UKRR will interrogate the timeline of patients starting 'chronic' RRT and if there is evidence of recent 'acute' RRT, will back-date the date of start of RRT to the first episode of 'acute' RRT provided there has been less than 90 days recovery of kidney function between acute and chronic episodes.

If a patient was started on dialysis and dialysis was temporarily stopped for less than 90 days for any reason (including access failure and awaiting the formation of further access), the date of start of RRT in UKRR analyses remained the date of first dialysis.

The date of start of peritoneal dialysis is defined as the date of first PD fluid exchange given with the intention of causing solute or fluid clearance. This is in contrast with a flush solely for confirming or maintaining PD catheter patency. In general, exchanges which are part of PD training should be considered as the start of PD (unless earlier exchanges have already been given). However, if it is not planned that the patient starts therapy until a later date, exchanges as part of PD training need not necessarily be considered the start of RRT.

Change of modality from PD to HD

Sites are requested to log in their timeline changes from PD to HD if the modality switch is for longer than 30 days.

Date first seen by a nephrologist

This is the date the patient first attended clinic or was an inpatient under the care of a dialysing nephrologist (whichever is the earlier). If a patient transfers into a renal centre from another renal centre then this date should be left blank by the new renal centre.

Date of CKD5

When a patient has two eGFRs recorded as <15 ml/min/1.73 m^2 over a time period of greater than three months apart without an intervening eGFR >15, then the earlier of these two dates is defined as the date the patient reached CKD5.

If the patient dies or goes onto RRT within the three month period of eGFR reaching <15, then the date of eGFR <15 is still the date of CKD5.

B:5 Comorbidity definitions

Angina

History of chest pain on exercise with or without ECG changes, ETT, radionucleotide imaging or angiography.

Previous MI within last three months

Detection of rise and/or fall of a biomarker (CK, CK-MB or Troponin) with at least one value above the 99th percentile together with evidence of myocardial ischaemia with at least one of either:

(a) ischaemic symptoms,
(b) ECG changes indicative of new ischaemia (new ST-T changes or new left bundle branch block),
(c) development of pathological Q waves,
(d) imaging evidence of new loss of viable myocardium or new regional wall motion abnormality.

This definition is from the European Society of Cardiology and American College of Cardiology.

Previous MI >3 months ago

Any previous MI at least three months prior to start of renal replacement therapy.

Previous CABG or coronary angioplasty

Previous episode of heart failure

Whether or not due to fluid overload.

Cerebrovascular disease

Any history of strokes (whatever cause) and including transient ischaemic attacks caused by carotid disease.

Diabetes (not causing established renal failure)

This includes diet controlled diabetics.

Chronic obstructive pulmonary disease

Chronic obstructive pulmonary disease (COPD) is characterised by airflow obstruction. The airflow obstruction is usually progressive, not fully reversible and does not change markedly over several months.

- Airflow obstruction is defined as a reduced FEV1 (forced expiratory volume in 1 second) and a reduced FEV1/FVC ratio (where FVC is forced vital capacity), such that FEV1 is less than 80% predicted and FEV1/FVC is less than 0.7.
- The airflow obstruction is due to a combination of airway and parenchymal damage.
- The damage is the result of chronic inflammation that differs from that seen in asthma and which is usually the result of tobacco smoke.

There is no single diagnostic test for COPD. Making a diagnosis relies on clinical judgement based on a combination of history, (exertional breathlessness, chronic cough, regular sputum production, frequent winter 'bronchitis', wheeze) physical examination and confirmation of the presence of airflow obstruction using spirometry (source: British Thoracic Society guidelines).

Liver Disease

Persistent enzyme evidence of hepatic dysfunction or biospy evidence or HbeAg or hepatitis C antigen (polymerase chain reaction) positive serology.

Malignancy

Defined as any history of malignancy (even if curative) e.g. removal of melanoma, excludes basal cell carcinoma.

Claudication

Current claudication based on a history, with or without Doppler or angiographic evidence.

Ischaemic/neuropathic ulcers

Current presence of these ulcers.

Angioplasty, stenting, vascular graft (all non coronary)

This category now includes vascular grafts (e.g. aortic bifurcation graft) and renal artery stents.

Amputation for peripheral vascular disease

Smoking

Current smoker or history of smoking within the last year.

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UK Renal Registry 18th Annual Report: Appendix C Renal Services Described for Non-physicians

This appendix provides information on the issues discussed in this report, background information on renal failure and discusses the services available for its treatment.

The role of the kidneys

1.1 The kidneys are paired organs located behind the abdominal cavity. Their primary function is to produce urine, which allows the removal of metabolism-related waste products from the blood. The kidneys also have a role in controlling fluid balance, blood pressure, red blood cell production and the maintenance of healthy bones.

Kidney diseases

1.2 At least 13,000 people die from kidney (renal) disease in the UK each year, although this is an underestimation as many deaths of patients with renal failure are not recorded as such in mortality statistics. Kidney diseases can occur suddenly ('acute') or over months and years ('chronic'). Chronic kidney disease is relatively common, with the majority of patients being elderly and having mild impairment of their renal function.

Acute kidney injury

1.3 Acute kidney injury (AKI) has replaced the previous term 'acute renal failure'. AKI, which is often a reversible process, occurs when there is a rapid loss of renal function due to kidney damage. The causes of AKI can be divided into three categories: pre-renal (interference with the renal blood supply), intrinsic (damage to the kidney itself) and post-renal (obstructive causes in the urinary tract). Some patients with AKI require dialysis for a few days or weeks until their renal function improves, although a small proportion of individuals never recover kidney function. AKI normally occurs in the context of other illnesses and patients are often unwell; approximately 50% of patients with AKI who receive dialysis do not survive.

Chronic kidney disease (CKD) and established renal failure (ERF)

1.4 Chronic kidney disease affects approximately three million people in the UK and occurs because of slow damage to the kidneys over a number of months or years. The incidence increases with age and is higher in certain ethnic groups, such as people of South Asian and African descent. In the initial stages of CKD, patients are usually well and there is little to find on clinical examination. Early abnormal findings may include blood (haematuria) and protein (proteinuria) in the urine or elevated blood pressure (hypertension). However, the lack of symptoms means many patients present to medical services with advanced disease. In the latter stages of CKD, patients may complain of tiredness, a loss of appetite, feeling sick (nausea) and itching

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(pruritus). Other symptoms, such as ankle swelling (oedema), may be present depending on the underlying condition causing CKD.

1.5 Other terms used for chronic kidney disease include chronic renal impairment, chronic renal insufficiency and chronic renal failure. Established renal failure (ERF) refers to kidney function that has deteriorated to a level where treatment is required to sustain life. Treatment options include dialysis and renal transplantation but some patients decide not to receive dialysis and opt for conservative management. Conservative care involves input from specialist nurses and palliative care services, and focuses on treating the complications of kidney disease and managing symptoms.

Causes of CKD

1.6 Most renal diseases that cause renal failure fall into five categories.

1. Generalised (systemic) disease. Diabetes mellitus is by far the most common systemic disease that affects the kidneys (around 20% of all renal disease). Diabetic patients often develop progressive kidney damage over many years, particularly if blood glucose levels and blood pressure are poorly controlled. Careful lifelong supervision of diabetes has a major impact in preventing kidney damage. Other systemic diseases that can cause kidney damage include auto-immune conditions (e.g. systemic lupus erythematous and vasculitis), amyloidosis and multiple myeloma.
2. Glomerulonephritis. This term describes conditions that damage the glomeruli (the filtering units of the kidneys that start the process of urine formation). There are many different causes of glomerulonephritis and treatment depends on the form of the disease. Some types of glomerulonephritis are relatively benign and unlikely to progress to established renal failure. Other forms are more aggressive with treatment making only a small impact on disease progression and the development of established renal failure.
3. High blood pressure (hypertension). Severe ('accelerated') hypertension causes chronic kidney disease, but early recognition and treatment of high blood pressure can halt (and to some extent reverse) the associated kidney damage. Hypertension is a common cause of renal failure in patients of African origin.
4. Obstruction. CKD can be a consequence of any pathology that obstructs the free flow of urine through the urinary system. Most often obstruction is secondary to enlargement of the prostate gland in elderly men, but other causes include kidney stones, bladder tumours, and congenital abnormalities of the renal tract.
5. Genetic disease. The commonest genetic disease causing CKD is polycystic kidney disease. This condition, along with many rare inherited diseases affecting the kidneys, accounts for about 8% of all kidney failure in the UK.

Prevention and management

1.7 Within the UK, risk factors for CKD, such as diabetes, obesity and hypertension are becoming more common. Consequently, the NHS is increasingly focusing on the prevention, early detection and treatment of CKD. Although many of the diseases causing CKD are not preventable, their recognition is important to allow appropriate treatment of any complications and preparation for renal replacement therapy. Some diseases, such as urinary obstruction, may be reversible to some extent and intervention is appropriate. Good diabetic control and blood pressure management may halt the rate of future renal function decline.

1.8 Clear guidelines are in place for the management of CKD by both general practitioners and hospital kidney specialists (nephrologists) [1]. Currently there is no general population screening for renal disease; instead, targeted screening of patients groups 'at-risk' of renal disease, such as diabetic or hypertensive patients, occurs. This normally involves testing the urine for the presence of blood or protein, plus blood tests for the level of substances normally excreted by the kidney such as creatinine and urea.

Complications and comorbidity

1.9 Patients with chronic kidney disease often have accompanying illnesses (comorbidities). Some are due to the primary disease, e.g. diabetes may cause

blindness and diseases of the nerves and blood vessels. Others, such as anaemia, bone disease and heart failure, are consequences of the renal failure. In addition, many patients with established renal failure, have diseases affecting the heart and blood vessels (vascular) particularly ischaemic heart disease and peripheral vascular disease. Comorbidity can influence the choice of treatment for renal failure and may reduce its benefits. Early and aggressive management of CKD-related complications, such as bone mineral abnormalities (hyperparathyroidism), may reduce the incidence of vascular disease.

Renal replacement therapy

1.10 The term renal replacement therapy (RRT) encompasses the three treatments used in established renal failure: haemodialysis, peritoneal dialysis and kidney transplantation. Both forms of dialysis remove waste products from the blood, but the other complications of established renal failure, such as anaemia and abnormal bone metabolism (hyperparathyroidism), require treatment with medications. Patients, usually (but not always) under 70 years of age, may undergo kidney transplantation as a form of treatment. If successful, a kidney transplant returns an individual to good health and removes the need for dialysis.

Renal dialysis

1.11 Dialysis involves the removal of waste products from the blood by allowing these products to diffuse across a thin membrane into dialysis fluid, which is then discarded along with the toxic waste products. The fluid is chemically composed to draw or 'attract' excess salts and water from the blood to cross the membrane, without the blood itself being in contact with the fluid.

Haemodialysis

1.12 The method first used to achieve dialysis was the artificial kidney, or haemodialysis. This involves the attachment of the patient's circulation to a machine through which fluid is passed and exchange can take place. A disadvantage of this method is that some form of permanent access to the circulation must be produced to be used at every treatment. The majority of patients on haemodialysis receive three four-hour sessions a week, at either a hospital-based dialysis unit or a community-based unit (satellite unit) away from the main renal centre. A small number of patients perform their own dialysis at home (home haemodialysis) and the number and duration of treatments will vary.

Peritoneal dialysis

1.13 An alternative form of dialysis is peritoneal dialysis, most commonly in the form of continuous ambulatory peritoneal dialysis (CAPD). In this technique, dialysis fluid is inserted, via a plastic tube (catheter), into the peritoneal cavity (which lies around the bowel) for approximately six hours before being removed and replaced. The fluid must be sterile in order to avoid infection and inflammation of the peritoneum (peritonitis), which is the main complication of the treatment. Each fluid exchange takes 30 to 40 minutes to perform and is repeated three or four times daily.

Renal transplantation

1.14 Renal transplantation replaces all the kidneys' functions, so erythropoietin and vitamin D supplementation are unnecessary. Transplantation involves the placement of a single kidney in the pelvis, close to the bladder, to which the ureter is connected. The immediate problem is the body's immune system recognising the new organ as foreign tissue–a process known as rejection. Consequently, all patients receiving a kidney transplant require anti-rejection drugs, such as tacrolimus, cyclosporine and mycophenolate mofetil, for the lifetime of the transplant. These drugs, known as immunosuppressants, have many undesirable side effects, including the acceleration of vascular disease, increased risk of infection and higher rates of cancer (malignancy). This often means that myocardial infarctions and strokes are

commoner in transplant patients than in healthy individuals of the same age. As transplants get older, there is a progressive loss of function due to chronic rejection (chronic allograft nephropathy). The average lifespan of a kidney transplant is between 10 and 15 years, which means some younger patients, will receive more than one transplant during their lifetime, often with periods of dialysis in-between.

1.15 For many patients, renal transplantation, from both live and deceased donors, is the best treatment in terms of survival and quality of life. Unfortunately, despite changes in policy and legislation there remains a shortage of kidneys for transplant; it appears likely that whatever social and medical structures are present, there will inevitably be a shortage of kidneys from humans.

Nature of renal services

1.16 The work of a nephrologist includes the early detection and diagnosis of renal disease and the long-term management of its complications such as high blood pressure, anaemia and bone disease. The nephrologist may share the management with the general practitioner or local hospital physician; relying on them to refer patients early for initial diagnosis and specific treatment. At any one time, perhaps only 5% of patients under their care are inpatients in wards with a further 20% attending the renal centre regularly for haemodialysis. However, inpatient nephrology and the care of patients receiving centre-based dialysis are specialised, complex and require experienced medical advice to be available on a 24 hour basis. Other renal work is sustained on an outpatient basis; this includes renal replacement therapy by dialysis and the care of transplant patients.

1.17 There are six major components to renal medicine.

1. Renal replacement therapy. The most significant element of work relates to the preparation of patients with advanced CKD for RRT and their medical supervision for the remainder of their lives. The patient population will present increasing challenges for renal staffing as more elderly and diabetic patients are accepted for treatment.
2. Emergency work. The emergency work associated with the specialty consists of:
   i. Treatment of acute renal failure, often involving multiple organ failure and acute-on-chronic renal failure. Close co-operation with other medical specialties, including critical care, is therefore a vital component of this aspect of the service.
   ii. Management of medical emergencies arising from an established renal failure programme. This workload is expanding as the number, age and comorbidity of patients on renal replacement therapy increases.
3. Routine nephrology. A substantial workload is associated with the immunological and metabolic nature of renal disease which requires investigative procedures in an inpatient setting. It is estimated that ten inpatient beds per million of the population are required for this work.
4. Investigation and management of fluid and electrolyte disorders. This makes up a variable proportion of the nephrologists work, depending on the other expertise available in the hospital.
5. Outpatient work. The outpatient work in renal medicine consists of the majority of general nephrology together with clinics for dialysis and renal transplant patients.
6. Research activities. Many nephrologists have clinical or laboratory-based research interests.

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UK Renal Registry 18th Annual Report: Appendix D Methodology for Analyses of CCG/HB Incidence and Prevalence Rates and of Standardised Ratios

This appendix describes the methods used for calculating the standardised incidence ratios for the incident UK RRT cohort, the standardised prevalence ratios for the total UK RRT cohort and the standardised ratios for prevalent transplant patients.

Patients

For the incidence rate analyses, all new cases recorded by the UK Renal Registry (UKRR) as starting RRT in each year were included. For the prevalence rate analyses, prevalent patients at the end of the year were included.

Years used

Analyses have been completed for each of the last six years. Combined analyses over the six years have also been done for the incidence rates and rate ratio analyses as there can be small numbers of incident patients particularly in the smaller areas.

Geography

The areas used were the 211 English Clinical Commissioning Groups (CCGs), the seven Welsh Local Health Boards, the 14 Scottish Health Boards and the five Health and Social Care Trusts in Northern Ireland – these different types of area are collectively called CCG/HBs here. Patients were allocated to CCG/HBs using the patients' postcodes (rather than the GP postcode). For the incidence rate analyses the patients' postcodes at start of RRT were used. For the prevalence rate analyses the postcodes at the end of the relevant year were used. Each postcode was linked to the ONS postcode directory (ONSPD) to give the CCG/HB code. The ONSPD contains National Statistics data © Crown copyright and database right 2015 and also Ordnance Survey data © Crown copyright and database right 2015.

Areas included in the UK Renal Registry 'covered' population

This year the UKRR again received data from all renal centres so coverage of the UK is complete for the six years used in these analyses (2009 to 2014).

Population data

Mid-2013 population estimates by CCG/HB, gender and age group were obtained from the Office for National Statistics (ONS) website (www.statistics.gov.uk), the Northern Ireland Statistics and Research Agency (NISRA) website (www.nisra.gov.uk) and the National Records of Scotland website (www.nrscotland.gov.uk). These mid-2013 population estimates are projections based on the 2011 Census data. The CCG/HB populations range from 21,600 (Orkney) to 1.14 million (Greater Glasgow and Clyde).

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The analysis for each year uses this mid-2013 population data. As the analyses only cover six years this was a reasonable approximation.

Calculation of rates and rate ratios

Crude rates

The crude rates, per million population (pmp), were calculated for each CCG/HB for each year:

$$1{,}000{,}000 \times (\text{observed number})/(\text{population size})$$

For the combined years analyses the observed cases are summed over the available years and the population is multiplied by the number of years that the area has been covered. This is a rate per million population **per year**. It is an average over the available years.

Confidence intervals have not been calculated for these (single or combined years) rates but, if required, an assessment can be made of whether the rate for a given area is consistent with the rate in the whole covered population. This can be done by using the figures provided here showing the confidence intervals around the overall average rates for a range of CCG/HB population sizes. These are figures D.1 and D.2 for incidence rates, and D.3 and D.4 for prevalence rates.

Note that when using the confidence interval figures to assess how different an area's combined years crude incidence rate is from the overall average, the population looked up on the x-axis should be the area's population multiplied by the number of years of data that has been used (i.e. six). In doing this, the confidence intervals obtained become narrower, consistent with the analysis now being based on more than one year of data.

These confidence intervals have been obtained using the Normal approximation to the Poisson distribution. For the incident analyses, confidence intervals have only been calculated around the overall average for populations of over 80,000. This is because below this level the number of cases you would expect per area is low–with low expected numbers the Poisson distribution is skewed and the Normal approximation to it is not appropriate. Due to prevalence rates being higher, confidence intervals

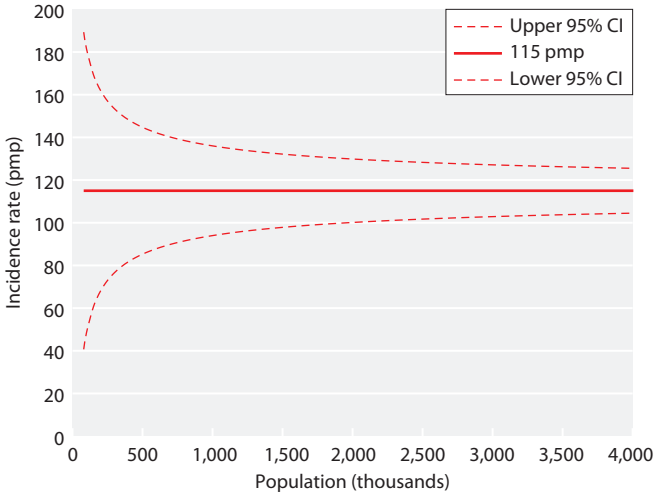

Fig. D.2. 95% confidence limits for incidence rate of 115 pmp for population size 80,000–4 million

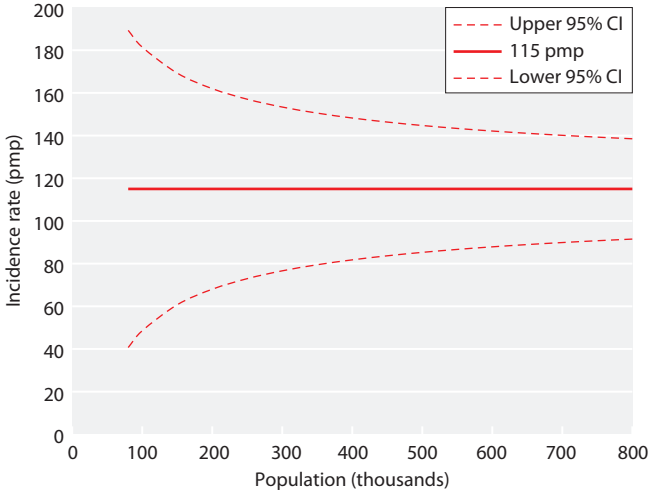

Fig. D.1. 95% confidence limits for incidence rate of 115 pmp for population size 80,000–800,000

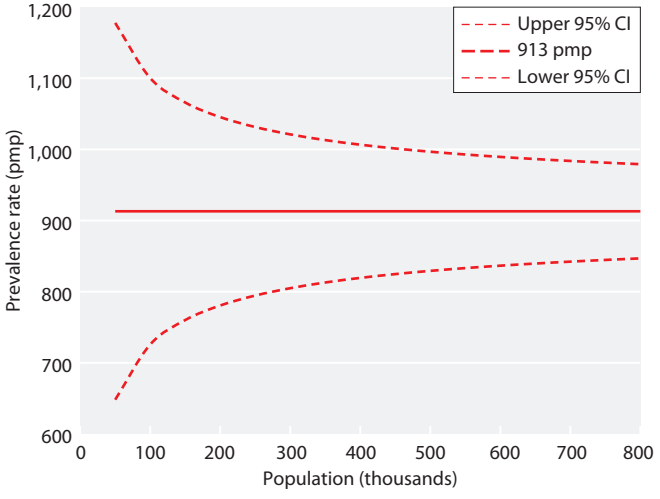

Fig. D.3. 95% confidence limits for prevalence rate of 913 pmp for catchment population size 50,000–800,000

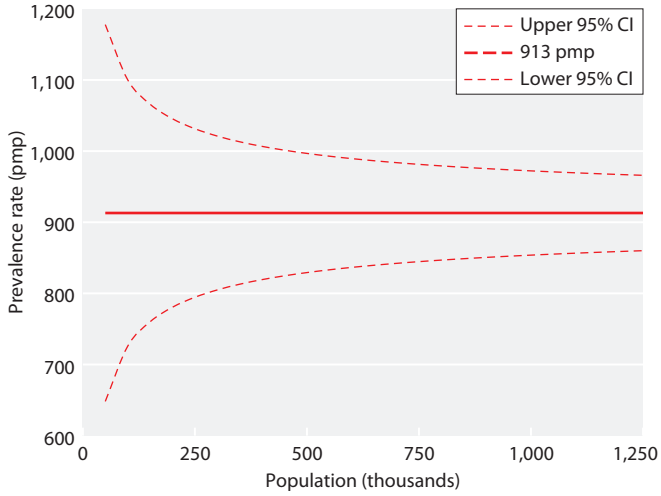

Fig. D.4. 95% confidence limits for prevalence rate of 913 pmp for catchment population size 50,000–1.25 million

can be obtained using this method for lower population sizes.

Standardised incidence/prevalence ratios (SIR/SPR or SR)

There are large differences in incidence and prevalence rates for RRT between age and gender groups. As there are also differences in the age/gender breakdowns of the different areas it is useful to produce estimates standardised for age and gender. The method used is *indirect* standardisation.

Observed cases (O_i) were calculated by summing all cases in all age and gender bands for each CCG/HB. Expected cases (E_i) for each CCG/HB were calculated as follows:

Overall crude rates (for each year) were calculated for the whole covered population (the *standard population*) by summing the observed numbers, over the CCG/HBs, for each age/gender band and dividing this by the total covered population in that age/gender band. These crude rates (by age/gender band) were then multiplied by the population each CCG/HB has in each band to give the number of cases expected in that band if that CCG/HB had the same rates as the standard population.

These expected numbers were then summed over the age/gender bands to give an expected total number of cases in each CCG/HB. The age/gender standardised ratio (SR) for CCG/HB *i* is then O_i/E_i.

The expected number of cases is the number you would see if the rates seen in the standard population applied to that individual CCG/HB's age/gender breakdown. 95% confidence intervals were calculated for each area using an error factor (EF) as follows:

$$LCL = SR/EF$$

$$UCL = SR \times EF$$

Where $EF = \exp(1.96/\sqrt{(O_i)})$.

A standardised ratio (SR) of 1 indicates that the area's rate was as expected if the age/gender rates found in the total covered population applied to the CCG/HB area's population structure; a value above 1 indicates that the observed rate was greater than expected given the area's population structure, if the lower confidence limit was above one this was statistically significant at the 5% level. The converse applies to standardised ratios below one. It should be noted that with over 200 areas it would be expected for some to be 'significant' at the 5% level by chance.

The combined years analyses are similar to the above except that the observed and expected numbers are summed over the years.

Remaining variability between rates

Even after standardisation there remains a large amount of variability between CCG/HBs–as can be seen by the large numbers of significantly low or high standardised ratios. This is partly because these ratios have only been adjusted for age and gender and not for ethnicity or any other factors. Higher rates are expected in populations with a high percentage of patients from South Asian or Black backgrounds and so it is hoped that in the future the UKRR will also do analyses further standardised for ethnicity.

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UK Renal Registry 18th Annual Report: Appendix E Methodology for Estimating Catchment Populations of Renal Centres in the UK for Dialysis Patients

Introduction

Providing accurate centre-level incidence and prevalence rates for patients receiving renal replacement therapy (RRT) in the UK was limited until the 13th Annual Report by the difficulty in estimating the catchment population from which the RRT population was derived. One reason for this was that the geographical boundaries separating renal centres are relatively arbitrary and dependent upon a number of factors including referral practice, patient choice and patient movement. Previously, incidence and prevalence rates had been calculated at Local Authority/Primary Care Trust/Health Board level for which denominator data were available, but not at renal centre level.

UK Renal Registry (UKRR) Annual Reports prior to the 13th suggested an estimate of the size of the catchment populations. These were extrapolated figures originally derived from data in the 1992 National Renal Survey undertaken by Professor Paul Roderick.

The purpose of this appendix is to present an estimate of the dialysis catchment population for all renal centres in the UK. It also contains a methodological description and discussion of the limitations of these methods. Previous UKRR Annual Reports contained estimates for English renal centres using 2001 Census data and a similar methodology as outlined here [1]. For the 16th Annual Report the methodology was repeated using data from the 2011 Census in order to obtain more up to date estimates and also to include renal centres in Wales. Last year, estimates for renal centres in Scotland and Northern Ireland were calculated thus completing full coverage of the UK.

Methods

The UKRR database of the incident dialysis population between 1st January 2008 and 31st December 2012 was used to estimate the size of each renal centre's catchment population. This used the postcode and centre for each individual at the time of starting RRT on dialysis.

Polygons were constructed to define an area around the geographical location of each dialysis patient. The lines of the polygons, representing the boundaries between areas, were drawn such that they were equidistant between adjacent patients, creating a map of non-overlapping polygons covering the entire area of England, Northern Ireland, Scotland and Wales (the process was done separately for each country). This method produces Thiessen polygons which have the property that all locations within each polygon share the same nearest dialysis patient [2].

The polygons of all patients starting at the same renal centre were combined to create the catchment area for that centre. The catchment area for one centre might comprise multiple unconnected polygons as a result of adjacent patients attending different renal centres. The Office for National Statistics (ONS) map of 2011 Census merged wards contains population estimates for England and Wales divided into 8,546 wards. The Northern Ireland Statistics and Research Agency (NISRA) published population estimates based on the 2011 Census for 4,537 geographical regions referred to as Small Areas. The General Register Office for Scotland published 2011 population estimates at 6,505 data zone level areas. Wards, Small Areas and data zones will collectively be referred to as wards in the following paragraph.

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The wards were overlaid on the map of renal centre catchment areas, enabling the proportion of each ward's area covered by each of the renal centre catchment areas to be calculated. Each ward's population was then allocated to the renal centres in proportions equal to the proportions of the overlaid areas. Summing these proportions of populations across all of the wards for each renal centre produced the estimates of the total catchment population for each centre.

Results

The estimated dialysis catchment populations for renal centres in England, Wales, Northern Ireland and Scotland are shown in Tables E.1, E.2, E.3 and E.4 respectively.

Table E.1. Estimated dialysis catchment populations of English renal centres based upon 2011 Census ONS Census ward population estimates (rounded to nearest 1,000)

Centre	Estimate	Centre	Estimate
B Heart	738,000	Leeds	1,670,000
B QEH	1,699,000	Leic	2,436,000
Basldn	415,000	Liv Ain	484,000
Bradfd	652,000	Liv Roy	1,000,000
Brightn	1,297,000	M RI	1,531,000
Bristol	1,439,000	Middlbr	1,004,000
Camb	1,158,000	Newc	1,121,000
Carlis	321,000	Norwch	787,000
Carsh	1,913,000	Nottm	1,088,000
Chelms	510,000	Oxford	1,690,000
Colchr	299,000	Plymth	470,000
Covnt	892,000	Ports	2,024,000
Derby	703,000	Prestn	1,493,000
Donc	410,000	Redng	910,000
Dorset	862,000	Salford	1,490,000
Dudley	442,000	Sheff	1,372,000
Exeter	1,089,000	Shrew	501,000
Glouc	587,000	Stevng	1,204,000
Hull	1,020,000	Sthend	317,000
Ipswi	399,000	Stoke	890,000
Kent	1,224,000	Sund	618,000
L Barts	1,830,000	Truro	413,000
L Guys	1,082,000	Wirral	572,000
L Kings	1,171,000	Wolve	669,000
L Rfree	1,518,000	York	492,000
L St G	797,800	**England**	**53,399,000**
L West	2,399,000		

Table E.2. Estimated dialysis catchment populations of Welsh renal centres based upon 2011 Census ONS Census Ward population estimates (rounded to nearest 1,000)

Centre	Estimate	Centre	Estimate
Bangor	218,000	Swanse	885,000
Cardff	1,420,000	Wrexm	240,000
Clwyd	190,000	**Wales**	**2,953,000**

Table E.3. Estimated dialysis catchment populations of renal centres in Northern Ireland based upon 2011 Census NISRA Small Area population estimates (rounded to nearest 1,000)

Centre	Estimate	Centre	Estimate
Antrim	295,000	Ulster	266,000
Belfast	637,000	West NI	352,000
Newry	261,000	**N Ireland**	**1,811,000**

Uses small area population estimates from NISRA (www.nisra.gov.uk)

Table E.4. Estimated dialysis catchment populations of renal centres in Scotland based upon 2011 Census NRS data zone area population estimates (rounded to nearest 1,000)

Centre	Estimate	Centre	Estimate
Abrdn	600,000	Glasgw	1,624,000
Airdrie	552,000	Inverns	270,000
D & Gall	148,000	Klmarnk	361,000
Dundee	463,000	Krkcldy	317,000
Edinb	964,000	**Scotland**	**5,300,000**

Discussion

These results show estimates for the size of the catchment areas for each of the renal centres in the UK.

There are some limitations to these results. The main one is that the ward/small area/data zone allocated to each renal centre was based upon dialysis patients only. Therefore it is possible that non-dialysis patients may come from a different catchment population. This is more likely where a renal centre provides specialist services and especially likely for patients undergoing renal transplantation. The catchment population for renal transplant patients will depend largely upon the distribution of workload between the referral centre and

the transplanting centre for pre-transplant work-up, donor nephrectomy work-up and post-transplant care (including if and when care is returned to the referring centre).

Despite the limitations, this is the most valid methodology to date to estimate the size of the catchment populations for renal centres in the UK. The results of this analysis allow the UKRR to calculate estimates of the incidence and prevalence rates of RRT at renal centre level, rather than only at CCG/HB level.

These results also provide other opportunities for study of the catchment populations. The ONS provides data on gender, age and ethnicity of the population at ward level. It should be possible to use this information to consider centre differences in the demographics of patients commencing or receiving RRT with adjustment for the catchment population characteristics.

Acknowledgements

Thanks are expressed to Andrew Judge for calculating these catchment populations for the UK Renal Registry.

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UK Renal Registry 18th Annual Report (December 2015): Appendix F Additional Data Tables for 2014 new and existing patients

F:1 Patients starting renal replacement therapy in 2014

Table F1.1. Number of patients on dialysis at 90 days (incident cohort 1/10/2013 to 30/09/2014)

	Aged <65		Aged ⩾65	
	HD *N*	PD *N*	HD *N*	PD *N*
England	1,846	705	2,204	516
N Ireland	37	10	69	8
Scotland	196	47	194	36
Wales	91	38	164	27
UK	**2,170**	**800**	**2,631**	**587**

Table F1.2. Number of patients per treatment modality at 90 days (incident cohort 1/10/2013 to 30/09/2014)

	HD	PD	Transplant	Died
England	4,050	1,221	614	291
N Ireland	106	18	21	6
Scotland	390	83	47	21
Wales	255	65	23	18
UK	**4,801**	**1,387**	**705**	**336**

Table F1.3. First treatment modality (2014 incident cohort)

Centre	% HD	% PD	% transplant
England			
B Heart	82	14	4
B QEH	71	22	7
Basldn	78	20	2
Bradfd	82	5	13
Brightn	72	22	5
Bristol	76	14	10
Camb	69	9	23
Carlis	55	42	3
Carsh	79	17	4
Chelms	62	38	
Colchr	100		
Covnt	63	28	9
Derby	51	44	5
Donc	83	17	
Dorset	68	26	5
Dudley	54	46	
Exeter	71	24	4
Glouc	53	47	
Hull	68	23	8
Ipswi	73	27	
Kent	72	22	6
Prestn	76	19	5
Redng	64	32	5
Salford	69	30	1
Sheff	75	16	9
Shrew	66	32	2
Stevng	85	10	5
Sthend	60	40	
Stoke	72	27	1
Sund	79	13	8
Truro	82	13	5
Wirral	73	14	13
Wolve	62	34	4
York	63	20	17
N Ireland			
Antrim	94	6	
Belfast	62	8	30
Newry	84	16	
Ulster	80	20	
West NI	77	23	
Scotland			
Abrdn	83	17	
Airdrie	94	6	

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Table F1.3. Continued

Centre	% HD	% PD	% transplant
L Barts	66	29	5
L Guys	72	9	19
L Kings	70	25	5
L Rfree	60	30	10
L St.G	76	16	8
L West	84	6	10
Leeds	67	14	19
Leic	70	19	11
Liv Ain	75	22	3
Liv Roy	55	23	21
M RI	56	24	20
Middlbr	78	9	14
Newc	73	22	6
Norwch	86	14	
Nottm	64	23	14
Oxford	66	22	12
Plymth	72	19	9
Ports	73	17	9
D & Gall	57	43	
Dundee	82	18	
Edinb	76	10	13
Glasgw	76	10	14
Inverns	64	36	
Klmarnk	75	25	
Krkcldy	82	18	
Wales			
Bangor	73	27	
Cardff	74	17	9
Clwyd	72	21	7
Swanse	80	18	2
Wrexm	76	21	2
England	**71**	**21**	**8**
N Ireland	**76**	**13**	**11**
Scotland	**78**	**15**	**7**
Wales	**76**	**19**	**5**
UK	**72**	**20**	**8**

Table F1.4. First treatment modality, patient numbers (2014 incident cohort)

	HD	PD	Transplant
England	4,486	1,305	533
N Ireland	131	22	19
Scotland	424	81	37
Wales	278	69	20
UK	**5,319**	**1,477**	**609**

Table F1.5. Gender breakdown by treatment modality at 90 days (2014 incident cohort)

	HD			PD		
Centre	% male	% female	M:F Ratio	% male	% female	M:F Ratio
England						
B Heart	60	40	1.5	67	33	2.0
B QEH	61	39	1.6	59	42	1.4
Basldn	62	39	1.6	83	17	5.0
Bradfd	66	35	1.9	75	25	3.0
Brightn	66	34	1.9	77	23	3.3
Bristol	61	39	1.6	65	35	1.9
Camb	65	35	1.9	75	25	3.0
Carlis	55	45	1.2	63	38	1.7
Carsh	64	36	1.8	54	46	1.2
Chelms	64	36	1.8	77	23	3.3
Colchr	58	42	1.4			
Covnt	68	32	2.2	67	33	2.0
Derby	62	38	1.6	79	21	3.8
Donc	72	28	2.5	69	31	2.2
Dorset	67	33	2.1	71	29	2.4
Dudley	68	32	2.1	52	48	1.1
Exeter	69	32	2.2	47	53	0.9
Glouc	65	35	1.9	65	35	1.9
Hull	70	30	2.4	72	28	2.6
Ipswi	86	14	6.4	75	25	3.0
Kent	62	38	1.6	68	32	2.1

Table F1.5. Continued

	HD			PD		
Centre	% male	% female	M:F Ratio	% male	% female	M:F Ratio
L Barts	69	31	2.2	76	24	3.1
L Guys	63	37	1.7	58	42	1.4
L Kings	68	32	2.1	69	31	2.2
L Rfree	63	37	1.7	72	28	2.5
L St.G	63	37	1.7	47	53	0.9
L West	66	34	2.0	59	41	1.4
Leeds	62	38	1.6	94	6	14.9
Leic	65	35	1.8	61	39	1.6
Liv Ain	63	38	1.7	60	40	1.5
Liv Roy	52	48	1.1	56	44	1.3
M RI	66	34	2.0	59	42	1.4
Middlbr	63	37	1.7	83	17	5.0
Newc	60	40	1.5	55	46	1.2
Norwch	48	52	0.9	57	43	1.3
Nottm	62	38	1.7	61	39	1.5
Oxford	72	28	2.6	69	31	2.2
Plymth	75	25	3.0	60	40	1.5
Ports	57	43	1.3	63	38	1.7
Prestn	71	29	2.4	71	29	2.4
Redng	69	31	2.2	73	27	2.7
Salford	67	33	2.0	52	48	1.1
Sheff	64	36	1.8	63	38	1.7
Shrew	62	39	1.6	58	42	1.4
Stevng	65	35	1.9	56	44	1.3
Sthend	68	32	2.2	80	20	4.0
Stoke	69	31	2.2	54	46	1.2
Sund	49	51	1.0	57	43	1.3
Truro	61	39	1.6	63	38	1.7
Wirral	52	49	1.1	75	25	3.0
Wolve	56	44	1.3	70	30	2.3
York	63	38	1.7	71	29	2.5
N Ireland						
Antrim	74	26	2.9		100	
Belfast	59	41	1.5	60	40	1.5
Newry	25	75	0.3	67	33	2.0
Ulster	75	25	3.0	50	50	1.0
West NI	58	42	1.4	80	20	4.0
Scotland						
Abrdn	73	28	2.6	50	50	1.0
Airdrie	69	31	2.2	50	50	1.0
D & Gall	63	38	1.7	64	36	1.7
Dundee	50	50	1.0	44	56	0.8
Edinb	61	39	1.5	38	63	0.6
Glasgw	58	42	1.4	41	59	0.7
Inverns	50	50	1.0	60	40	1.5
Klmarnk	77	23	3.3	60	40	1.5
Krkcldy	52	48	1.1	60	40	1.5
Wales						
Bangor	80	20	4.0	80	20	4.0
Cardff	58	42	1.4	79	21	3.8
Clwyd	64	36	1.7	100		
Swanse	68	32	2.1	50	50	1.0
Wrexm	61	39	1.6	57	43	1.3
England	**64**	**36**	**1.8**	**65**	**35**	**1.9**
N Ireland	**61**	**39**	**1.6**	**61**	**39**	**1.6**
Scotland	**61**	**39**	**1.6**	**51**	**49**	**1.0**
Wales	**63**	**37**	**1.7**	**71**	**29**	**2.4**
UK	**64**	**36**	**1.8**	**65**	**35**	**1.8**

F:2 Prevalent patients on 31/12/2014

Table F2.1. Treatment modalities for 2014 prevalent patients aged under and 65 and over

	Patients aged <65				Patients aged ⩾65			
Centre	% HD	% PD	% transplant	HD:PD	% HD	% PD	% transplant	HD:PD
England								
B Heart	54	5	41	10.6	79	6	15	14.0
B QEH	35	6	59	5.8	64	8	28	8.1
Basldn	51	11	38	4.8	75	9	16	8.1
Bradfd	33	4	64	9.2	61	5	34	13.4
Brightn	35	6	59	6.0	63	9	28	7.2
Bristol	21	4	75	5.3	60	5	34	10.9
Camb	14	1	85	11.0	57	5	38	12.2
Carlis	19	8	73	2.3	48	16	36	2.9
Carsh	36	8	56	4.6	69	10	21	7.0
Chelms	39	9	53	4.5	66	12	22	5.4
Colchr	100	0	0	0.0	100	0	0	0.0
Covnt	25	8	67	3.0	62	12	27	5.2
Derby	34	17	49	2.0	63	16	21	4.0
Donc	54	10	36	5.4	76	9	16	8.5
Dorset	25	5	69	4.6	58	10	32	5.9
Dudley	47	20	33	2.4	69	15	15	4.5
Exeter	25	8	67	3.2	66	12	22	5.3
Glouc	28	11	61	2.6	70	9	21	7.5
Hull	28	9	63	3.2	63	11	26	5.7
Ipswi	27	5	69	5.9	46	14	40	3.2
Kent	24	5	71	4.9	62	9	29	7.2
L Barts	35	8	57	4.2	65	16	19	4.1
L Guys	26	1	73	23.0	56	3	41	20.4
L Kings	45	8	48	5.9	66	11	23	6.0
L Rfree	23	5	72	4.3	59	11	31	5.6
L St.G	30	4	66	7.6	54	10	36	5.3
L West	32	1	66	24.3	65	3	32	20.4
Leeds	26	4	70	6.3	54	4	42	12.2
Leic	29	5	66	6.5	63	7	30	8.5
Liv Ain	60	28	12	2.1	87	10	3	8.3
Liv Roy	22	4	75	6.2	46	7	47	6.2
M RI	21	3	76	6.2	48	7	46	7.3
Middlbr	27	1	72	20.9	60	3	37	24.0
Newc	23	4	73	5.9	42	8	50	5.2
Norwch	31	5	64	6.7	68	6	27	12.1
Nottm	20	7	74	3.0	60	10	30	5.9
Oxford	18	3	78	5.5	49	8	43	5.8
Plymth	15	6	79	2.5	45	10	45	4.7
Ports	29	4	67	7.4	56	7	37	8.2
Prestn	37	4	59	9.3	66	7	28	10.1
Redng	28	8	64	3.4	54	12	35	4.6
Salford	35	8	57	4.2	57	11	32	5.3
Sheff	30	4	67	8.5	66	6	27	10.3
Shrew	44	10	46	4.2	70	8	22	9.1
Stevng	48	2	49	20.8	80	5	16	16.5
Sthend	36	6	57	5.6	62	11	27	5.9
Stoke	30	8	63	3.8	65	15	20	4.3
Sund	37	4	60	9.7	65	4	30	14.9
Truro	25	4	70	5.7	55	7	38	8.2
Wirral	78	11	10	7.0	88	8	0	11.4
Wolve	43	11	46	3.7	73	17	10	4.2
York	21	6	74	3.4	51	7	42	7.4

Table F2.1. Continued

	Patients aged <65				Patients aged ⩾65			
Centre	% HD	% PD	% transplant	HD:PD	% HD	% PD	% transplant	HD:PD
N Ireland								
Antrim	29	5	66	5.8	80	6	14	12.6
Belfast	16	1	83	12.0	57	4	40	15.0
Newry	34	5	61	6.3	62	12	26	5.3
Ulster	47	3	50	16.0	83	2	15	33.5
West NI	28	3	69	8.8	64	8	28	8.0
Scotland								
Abrdn	29	6	65	5.0	70	5	26	15.4
Airdrie	35	2	63	18.8	68	3	29	22.7
D & Gall	28	8	64	3.5	49	19	32	2.5
Dundee	31	5	64	6.4	61	7	32	8.4
Edinb	31	2	67	17.1	51	6	43	8.2
Glasgw	24	2	74	10.4	63	3	33	18.9
Inverns	17	7	76	2.5	67	8	25	8.6
Klmarnk	36	10	54	3.7	64	16	20	3.9
Krkcldy	33	6	61	5.9	76	7	18	11.6
Wales								
Bangor	79	16	5	4.9	83	15	2	5.4
Cardff	20	4	76	5.1	52	7	41	7.1
Clwyd	48	2	49	20.5	63	13	25	5.0
Swanse	32	7	61	4.6	64	8	28	7.6
Wrexm	25	10	64	2.5	61	11	28	5.5
England	**30**	**5**	**65**	**5.6**	**62**	**8**	**30**	**7.4**
N Ireland	**24**	**3**	**74**	**8.9**	**67**	**6**	**27**	**11.3**
Scotland	**28**	**4**	**68**	**7.5**	**63**	**6**	**31**	**10.1**
Wales	**26**	**5**	**68**	**4.8**	**59**	**9**	**32**	**6.7**
UK	**29**	**5**	**66**	**5.8**	**62**	**8**	**30**	**7.6**

Table F2.2. Number of 2014 prevalent patients under and 65 and over per treatment modality

	Patients aged <65			Patients aged ⩾65		
	HD	PD	Transplant	HD	PD	Transplant
England	9,328	1,651	20,609	11,237	1,518	5,496
N Ireland	239	27	750	395	35	162
Scotland	889	119	2,143	963	95	467
Wales	447	93	1,169	668	100	368
UK	**10,903**	**1,890**	**24,671**	**13,263**	**1,748**	**6,493**

Table F2.3. Dialysis modalities for 2014 prevalent patients aged under 65

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
England						
B Heart	7	80	4	4	0	5
B QEH	7	13	65	5	0	10
Basldn	0	78	4	6	0	11
Bradfd	3	79	8	3	0	7
Brightn	16	35	34	8	0	6
Bristol	6	23	55	7	0	8
Camb	12	46	34	0	8	0
Carlis	0	49	21	7	0	23
Carsh	4	28	49	4	0	13
Chelms	0	82	0	9	3	6
Colchr	0	100	0	0	0	0
Covnt	6	70	0	25	0	0
Derby	11	56	0	24	0	9
Donc	7	44	33	2	0	14
Dorset	3	20	59	4	2	12
Dudley	14	42	15	21	0	8
Exeter	2	13	61	14	0	10
Glouc	2	60	10	4	0	24
Hull	5	39	33	13	0	10
Ipswi	1	72	12	4	0	10
Kent	9	28	46	16	0	1
L Barts	2	40	39	2	0	17
L Guys	12	10	73	2	0	2
L Kings	3	20	62	3	0	11
L Rfree	3	4	75	5	0	14
L St.G	2	44	42	2	1	8
L West	2	22	71	2	0	2
Leeds	6	21	59	1	0	13
Leic	10	20	56	3	0	10
Liv Ain	10	4	54	5	0	26
Liv Roy	11	41	35	9	0	5
M RI	14	30	42	7	0	7
Middlbr	7	37	52	5	0	0
Newc	11	74	0	0	0	15
Norwch	12	49	27	12	0	1
Nottm	15	40	20	6	0	19
Oxford	6	31	47	3	0	12
Plymth	5	65	2	9	0	20
Ports	13	22	54	12	0	0
Prestn	8	21	61	1	0	8
Redng	4	33	41	14	1	8
Salford	5	32	44	8	0	12
Sheff	13	34	42	11	0	0
Shrew	11	47	23	15	0	4
Stevng	9	25	61	5	0	0
Sthend	0	85	0	15	0	0
Stoke	15	42	23	2	2	17
Sund	1	62	28	3	0	6
Truro	10	42	33	3	0	12
Wirral	7	40	40	0	0	12
Wolve	7	38	33	12	2	7
York	14	35	29	16	0	6
N Ireland						
Antrim	2	83	0	0	0	15
Belfast	13	79	0	1	0	7

Table F2.3. Continued

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
Newry	2	84	0	0	0	14
Ulster	9	85	0	0	0	6
West NI	4	86	0	0	0	10
Scotland*						
Abrdn	3	80	0	6	0	10
Airdrie	0	95	0	3	0	2
D & Gall	7	70	0	15	0	7
Dundee	4	82	0	8	0	6
Edinb	3	92	0	2	0	4
Glasgw	8	84	0	2	0	7
Inverns	5	67	0	18	0	10
Klmarnk	4	74	0	1	0	20
Krkcldy	0	85	0	0	0	15
Wales						
Bangor	27	41	15	7	0	10
Cardff	12	15	58	10	0	6
Clwyd	5	91	0	2	0	2
Swanse	21	37	25	13	0	5
Wrexm	2	59	10	0	0	29
England	**7**	**34**	**44**	**6**	**0**	**9**
N Ireland	**7**	**83**	**0**	**0**	**0**	**10**
Scotland*	**4**	**84**	**0**	**4**	**0**	**8**
Wales	**14**	**34**	**36**	**9**	**0**	**8**
UK	**7**	**39**	**39**	**6**	**0**	**9**

*All haemodialysis patients in centres in Scotland are shown as receiving treatment at home or in centre as no data is available regarding satellite dialysis

Table F2.4. Dialysis modalities for 2014 prevalent patients aged 65 and over

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
England						
B Heart	1	83	9	5	0	1
B QEH	2	10	77	4	0	7
Basldn	0	86	3	6	0	6
Bradfd	1	67	25	2	0	5
Brightn	5	38	45	10	0	3
Bristol	2	14	75	5	0	4
Camb	3	42	47	0	8	0
Carlis	0	51	24	17	0	8
Carsh	1	18	68	3	1	9
Chelms	1	83	0	11	0	4
Colchr	0	100	0	0	0	0
Covnt	0	83	0	16	0	0
Derby	11	69	0	14	0	6
Donc	1	44	45	1	0	10
Dorset	1	18	66	4	0	10
Dudley	1	57	24	14	0	4
Exeter	0	10	74	6	0	9
Glouc	1	67	20	3	0	9
Hull	0	38	47	7	0	7
Ipswi	3	61	12	11	0	12
Kent	1	25	62	9	0	3
L Barts	0	38	42	5	0	15
L Guys	2	15	78	2	0	3
L Kings	0	15	71	8	0	6

Table F2.4. Continued

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
L Rfree	1	2	81	7	0	8
L St.G	1	30	53	5	1	10
L West	0	22	73	3	0	2
Leeds	0	13	79	1	0	7
Leic	4	15	71	4	0	7
Liv Ain	1	8	80	1	0	10
Liv Roy	3	33	49	12	0	2
M RI	2	23	62	4	0	9
Middlbr	2	20	75	4	0	0
Newc	1	83	0	3	0	14
Norwch	6	48	38	6	0	1
Nottm	2	40	43	7	0	7
Oxford	1	33	51	3	0	12
Plymth	4	77	2	6	0	12
Ports	1	17	71	11	0	0
Prestn	4	21	66	2	0	7
Redng	0	41	41	12	0	6
Salford	1	25	58	5	0	10
Sheff	1	40	50	9	0	0
Shrew	3	52	35	7	0	2
Stevng	2	24	68	6	0	0
Sthend	1	84	0	14	0	0
Stoke	3	50	28	3	7	9
Sund	0	60	33	3	0	4
Truro	3	43	44	7	0	4
Wirral	1	42	49	1	0	7
Wolve	2	37	42	10	4	5
York	0	33	55	11	0	1
N Ireland						
Antrim	0	93	0	1	0	6
Belfast	1	93	0	1	0	5
Newry	2	82	0	0	0	16
Ulster	1	96	0	0	0	3
West NI	1	88	0	0	1	10
Scotland*						
Abrdn	2	92	0	3	0	3
Airdrie	0	96	0	2	0	2
D & Gall	0	72	0	21	0	8
Dundee	0	89	0	6	0	4
Edinb	1	88	0	3	0	8
Glasgw	1	93	0	1	0	4
Inverns	2	88	0	8	0	2
Klmarnk	8	72	0	2	0	18
Krkcldy	0	92	0	1	0	7
Wales						
Bangor	3	43	38	9	0	7
Cardff	2	11	74	9	0	3
Clwyd	5	78	0	8	0	8
Swanse	4	48	37	10	0	2
Wrexm	0	70	14	0	0	15
England	**2**	**33**	**54**	**6**	**0**	**6**
N Ireland	**1**	**91**	**0**	**0**	**0**	**7**
Scotland*	**2**	**90**	**0**	**3**	**0**	**6**
Wales	**3**	**37**	**47**	**8**	**0**	**5**
UK	**2**	**39**	**48**	**6**	**0**	**6**

*All haemodialysis patients in centres in Scotland are shown as receiving treatment at home or in centre as no data is available regarding satellite dialysis

Table F2.5. Prevalent patient 2014, age ranges by centre (%)

Centre	18–24	25–34	35–44	45–54	55–64	65–74	75–84	85 +
England								
B Heart	1	5	12	17	20	21	20	3
B QEH	3	7	12	22	24	18	12	2
Basldn	3	5	10	18	18	24	18	5
Bradfd	3	10	15	22	21	17	10	1
Brightn	1	5	11	20	21	22	16	3
Bristol	3	7	11	19	21	22	14	3
Camb	2	7	14	20	20	20	13	3
Carlis	2	8	8	22	23	20	15	2
Carsh	1	5	10	21	19	23	16	5
Chelms	2	5	7	15	25	23	17	6
Colchr	2	3	3	7	15	30	33	8
Covnt	2	7	13	22	21	20	14	3
Derby	1	8	9	20	20	26	14	2
Donc	2	4	8	16	22	22	21	4
Dorset	1	6	8	17	18	26	20	4
Dudley	1	5	6	19	22	23	19	5
Exeter	2	6	8	17	20	24	16	6
Glouc	1	4	10	17	17	26	17	7
Hull	2	7	11	21	22	20	14	2
Ipswi	1	5	10	21	23	24	12	4
Kent	2	5	10	20	20	24	15	3
L Barts	2	8	15	23	24	17	10	1
L Guys	4	9	15	23	22	16	8	2
L Kings	1	5	12	22	23	19	15	3
L Rfree	2	9	13	21	21	19	13	3
L St.G	1	5	13	19	25	20	13	3
L West	1	6	12	20	26	21	12	2
Leeds	3	8	13	23	21	19	11	1
Leic	2	6	12	22	20	22	13	3
Liv Ain	1	3	9	17	17	21	24	8
Liv Roy	3	8	14	24	24	18	8	1
M RI	4	8	14	25	22	19	9	1
Middlbr	2	7	11	22	21	22	12	3
Newc	3	7	12	23	22	20	11	1
Norwch	2	5	8	20	21	23	16	5
Nottm	4	7	12	21	20	20	13	3
Oxford	2	7	14	24	21	18	11	3
Plymth	2	6	11	17	24	24	12	3
Ports	1	7	11	22	23	21	14	2
Prestn	1	6	11	21	22	24	13	1
Redng	1	4	12	18	23	23	15	3
Salford	2	6	14	23	23	20	13	1
Sheff	2	7	11	21	23	19	13	3
Shrew	1	5	10	20	19	24	17	3
Stevng	2	5	9	21	18	21	21	3
Sthend	2	5	10	16	20	25	18	5
Stoke	1	8	13	18	21	20	15	4
Sund	1	5	14	22	23	23	11	1
Truro	2	5	11	17	19	23	19	4
Wirral	2	4	8	17	16	26	22	5
Wolve	1	6	11	19	23	19	18	3
York	4	9	12	18	22	19	12	3
N Ireland								
Antrim	1	5	10	17	19	22	21	4
Belfast	4	8	14	25	20	15	11	2
Newry	2	6	13	19	24	21	14	1
Ulster	1	3	13	11	17	21	23	9
West NI	1	8	16	19	15	24	16	1

Table F2.5. Continued

Centre	18–24	25–34	35–44	45–54	55–64	65–74	75–84	85 +
Scotland								
Abrdn	3	9	14	20	24	17	12	2
Airdrie	2	8	13	24	20	19	13	1
D & Gall	4	7	11	23	12	22	19	2
Dundee	1	4	14	21	20	21	14	5
Edinb	2	7	14	27	23	18	8	1
Glasgw	2	7	13	22	24	19	10	1
Inverns	1	4	17	25	24	16	11	2
Klmarnk	1	4	11	24	24	22	9	5
Krkcldy	3	3	13	19	19	23	18	2
Wales								
Bangor	1	7	10	9	16	29	25	4
Cardff	2	7	13	23	21	20	11	2
Clwyd	2	7	4	18	21	28	17	4
Swanse	2	5	9	15	22	23	21	4
Wrexm	4	7	11	16	20	16	20	5
England	**2**	**7**	**12**	**21**	**22**	**21**	**13**	**3**
N Ireland	**3**	**7**	**13**	**21**	**19**	**19**	**15**	**3**
Scotland	**2**	**6**	**13**	**23**	**22**	**19**	**11**	**2**
Wales	**2**	**7**	**11**	**19**	**21**	**21**	**15**	**3**
UK	**2**	**7**	**12**	**21**	**22**	**20**	**13**	**3**

Table F2.6. Dialysis modalities for 2014 prevalent patients without diabetes (all ages)

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
England						
B Heart	4	81	8	3	0	3
B QEH	5	11	69	5	0	9
Basldn	0	85	3	5	0	6
Bradfd	3	70	16	3	0	8
Brightn	10	34	42	10	0	4
Bristol	4	16	68	6	0	6
Camb	6	41	45	0	8	0
Carlis	0	46	22	16	0	16
Carsh	4	17	66	3	0	10
Chelms	1	85	0	11	0	3
Covnt	3	78	0	19	0	0
Derby	11	63	0	18	0	8
Donc	4	45	38	1	0	12
Dorset	2	18	64	4	1	11
Dudley	7	47	22	19	0	6
Exeter	1	11	69	10	0	10
Glouc	2	68	15	4	0	11
Hull	3	34	44	11	0	8
Ipswi	3	67	12	8	0	10
Kent	4	26	56	11	0	2
L Barts	2	40	40	3	0	15
L Guys	11	11	75	1	0	2
L Kings	2	17	66	6	0	9
L Rfree	3	3	78	6	0	10
L St.G	2	36	47	4	1	10
L West	2	21	73	3	0	2
Leeds	4	17	68	1	0	11
Leic	8	17	65	4	0	7

Table F2.6. Continued

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
Liv Ain	5	7	71	4	0	14
Liv Roy	9	37	41	10	0	4
M RI	11	24	53	4	0	8
Middlbr	5	27	64	4	0	0
Newc	8	78	0	1	0	14
Norwch	9	49	33	8	0	1
Nottm	8	37	36	8	0	11
Oxford	4	31	49	3	0	12
Plymth	4	69	3	8	0	16
Ports	7	18	63	12	0	0
Prestn	7	19	64	1	0	8
Redng	2	38	43	11	0	6
Salford	5	31	46	5	0	13
Sheff	8	35	47	10	0	0
Shrew	8	51	29	10	0	3
Stevng	6	24	64	6	0	0
Sthend	0	86	0	14	0	0
Stoke	9	44	27	3	5	13
Sund	1	61	31	3	0	5
Truro	4	39	44	6	0	6
Wirral	4	41	46	1	0	8
Wolve	5	36	39	11	2	7
York	7	36	43	12	0	2
N Ireland						
Antrim	1	90	0	1	0	8
Belfast	8	86	0	1	0	5
Newry	3	82	0	0	0	16
Ulster	5	91	0	0	0	4
West NI	3	85	0	0	1	11
Scotland*						
Abrdn	3	85	0	6	0	7
Airdrie	0	96	0	2	0	2
D & Gall	2	78	0	15	0	4
Dundee	3	84	0	8	0	6
Edinb	3	90	0	2	0	6
Glasgw	5	89	0	1	0	5
Inverns	4	79	0	12	0	4
Klmarnk	8	71	0	1	0	20
Krkcldy	0	90	0	1	0	10
Wales						
Bangor	17	40	24	8	0	11
Cardff	6	14	66	10	0	4
Clwyd	5	83	0	6	0	6
Swanse	11	43	31	11	0	3
Wrexm	1	62	13	0	0	24
England	**5**	**32**	**49**	**6**	**0**	**7**
N Ireland	**4**	**86**	**0**	**1**	**0**	**8**
Scotland*	**3**	**87**	**0**	**3**	**0**	**7**
Wales	**8**	**35**	**42**	**9**	**0**	**7**
UK	**5**	**38**	**44**	**6**	**0**	**7**

Excluded one centre with $\geqslant$40% primary renal diagnosis aetiology uncertain (Colchester)
Patients with diabetes as their primary renal disease and patients with a missing primary renal diagnosis code are excluded from this table
*All haemodialysis patients in centres in Scotland are shown as receiving treatment at home or in centre as no data is available regarding satellite dialysis

Table F2.7. Number of 2014 prevalent patients without diabetes by treatment modality

	HD	PD	Transplant
England	14,849	2,276	22,624
N Ireland	474	48	836
Scotland	1,434	159	2,355
Wales	852	156	1,338
UK	**17,609**	**2,639**	**27,153**

Excluded one centre with ⩾40% primary renal diagnosis aetiology uncertain (Colchester)
Patients with diabetes as their primary renal disease and patients with a missing primary renal diagnosis code are excluded from this table

Table F2.8. Dialysis modalities for 2014 prevalent patients without diabetes aged under 65

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
England						
B Heart	6	82	5	2	0	5
B QEH	7	13	63	6	0	11
Basldn	0	79	5	5	0	11
Bradfd	5	77	7	3	0	8
Brightn	17	33	34	10	0	6
Bristol	8	22	53	8	0	9
Camb	14	45	33	0	9	0
Carlis	0	44	22	9	0	25
Carsh	6	28	51	3	0	11
Chelms	0	86	0	11	0	2
Covnt	7	70	0	23	0	0
Derby	12	56	0	23	0	9
Donc	8	46	31	1	0	14
Dorset	4	19	61	3	3	11
Dudley	13	35	18	25	0	8
Exeter	3	13	59	14	0	11
Glouc	3	67	6	5	0	19
Hull	6	34	36	15	0	8
Ipswi	2	75	11	4	0	9
Kent	11	27	45	16	0	1
L Barts	3	42	37	2	0	16
L Guys	17	9	71	1	0	2
L Kings	4	19	62	4	0	11
L Rfree	3	4	74	4	0	14
L St.G	3	39	44	2	2	10
L West	3	22	71	3	0	2
Leeds	7	20	58	1	0	14
Leic	12	20	56	3	0	9
Liv Ain	10	6	58	7	0	18
Liv Roy	13	41	34	9	0	4
M RI	18	31	40	4	0	7
Middlbr	9	41	48	3	0	0
Newc	14	73	0	0	0	13
Norwch	14	46	27	12	0	1
Nottm	17	36	21	8	0	17
Oxford	8	31	46	3	0	11

Table F2.8. Continued

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
Plymth	8	54	3	15	0	21
Ports	15	19	55	12	0	0
Prestn	9	21	61	1	0	8
Redng	5	30	43	14	0	9
Salford	7	33	42	4	0	13
Sheff	15	33	40	11	0	0
Shrew	14	44	23	16	0	2
Stevng	12	25	59	4	0	0
Sthend	0	85	0	15	0	0
Stoke	20	39	21	1	1	19
Sund	1	60	30	2	0	7
Truro	9	40	35	2	0	14
Wirral	7	40	42	0	0	11
Wolve	8	37	34	11	1	8
York	15	40	25	17	0	3
N Ireland						
Antrim	4	86	0	0	0	11
Belfast	16	78	0	1	0	4
Newry	3	85	0	0	0	12
Ulster	20	73	0	0	0	7
West NI	5	84	0	0	0	12
Scotland*						
Abrdn	4	79	0	7	0	10
Airdrie	0	95	0	3	0	3
D & Gall	6	72	0	11	0	11
Dundee	6	79	0	9	0	6
Edinb	4	90	0	2	0	4
Glasgw	8	85	0	1	0	6
Inverns	7	63	0	22	0	7
Klmarnk	6	69	0	2	0	23
Krkcldy	0	85	0	0	0	15
Wales						
Bangor	34	31	14	7	0	14
Cardff	11	17	56	10	1	6
Clwyd	6	88	0	3	0	3
Swanse	25	36	23	12	0	4
Wrexm	2	56	12	0	0	30
England	**9**	**33**	**44**	**6**	**0**	**8**
N Ireland	**10**	**81**	**0**	**1**	**0**	**8**
Scotland*	**5**	**83**	**0**	**4**	**0**	**8**
Wales	**14**	**33**	**35**	**9**	**0**	**9**
UK	**9**	**38**	**39**	**6**	**0**	**8**

Excluded one centre with $\geqslant$40% primary renal diagnosis aetiology uncertain (Colchester)
Patients with diabetes as their primary renal disease and patients with a missing primary renal diagnosis code are excluded from this table
*All haemodialysis patients in centres in Scotland are shown as receiving treatment at home or in centre as no data is available regarding satellite dialysis

Table F2.9. Number of 2014 prevalent patients without diabetes aged under 65 by treatment modality

	HD	PD	Transplant
England	6,761	1,167	17,686
N Ireland	176	17	679
Scotland	665	87	1,906
Wales	338	71	1,009
UK	**7,940**	**1,342**	**21,280**

Excluded one centre with ⩾40% primary renal diagnosis aetiology uncertain (Colchester)
Patients with diabetes as their primary renal disease and patients with a missing primary renal diagnosis code are excluded from this table

Table F2.10. Dialysis modalities for 2014 prevalent patients without diabetes aged 65 and over

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
England						
B Heart	1	81	12	5	0	1
B QEH	2	9	77	5	0	7
Basldn	0	89	2	6	0	2
Bradfd	1	58	30	3	0	7
Brightn	5	35	48	10	0	3
Bristol	2	12	77	5	0	5
Camb	2	40	50	0	8	0
Carlis	0	48	22	20	0	10
Carsh	2	11	75	3	0	8
Chelms	1	85	0	11	0	3
Covnt	0	85	0	15	0	0
Derby	11	69	0	14	0	7
Donc	1	44	44	1	0	11
Dorset	1	18	66	5	0	10
Dudley	1	57	26	13	0	3
Exeter	0	10	73	8	0	9
Glouc	1	69	19	3	0	7
Hull	1	33	51	7	0	7
Ipswi	4	62	13	12	0	10
Kent	0	26	62	9	0	3
L Barts	0	37	44	5	0	14
L Guys	3	13	81	2	0	2
L Kings	0	14	70	9	0	7
L Rfree	2	2	81	8	0	6
L St.G	0	32	51	7	1	9
L West	1	20	74	3	0	2
Leeds	0	13	79	1	0	7
Leic	4	15	72	4	0	5
Liv Ain	1	7	80	1	0	11
Liv Roy	4	32	49	12	0	3
M RI	3	16	68	3	0	10

Table F2.10. Continued

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
Middlbr	2	17	77	5	0	0
Newc	2	83	0	2	0	14
Norwch	6	51	36	5	1	1
Nottm	2	37	46	8	0	7
Oxford	2	32	51	3	0	13
Plymth	3	77	3	4	0	13
Ports	1	17	71	11	0	0
Prestn	5	18	67	2	0	9
Redng	1	44	42	10	0	3
Salford	2	27	51	7	0	13
Sheff	2	36	52	10	0	0
Shrew	3	55	33	6	0	3
Stevng	2	23	68	6	0	0
Sthend	0	87	0	13	0	0
Stoke	2	47	31	4	8	8
Sund	0	61	32	3	0	3
Truro	2	39	49	8	0	2
Wirral	1	43	50	1	0	5
Wolve	2	35	44	10	3	6
York	0	32	57	9	0	1
N Ireland						
Antrim	0	92	0	1	0	7
Belfast	1	91	0	1	0	6
Newry	2	79	0	0	0	19
Ulster	2	95	0	0	0	3
West NI	2	86	0	0	2	11
Scotland*						
Abrdn	2	90	0	4	0	3
Airdrie	0	97	0	1	0	1
D & Gall	0	82	0	18	0	0
Dundee	0	88	0	6	0	5
Edinb	1	89	0	2	0	8
Glasgw	2	93	0	2	0	4
Inverns	2	89	0	7	0	2
Klmarnk	10	73	0	1	0	16
Krkcldy	0	93	0	1	0	6
Wales						
Bangor	5	47	30	9	0	9
Cardff	2	11	73	9	0	4
Clwyd	4	79	0	9	0	9
Swanse	4	47	36	10	0	3
Wrexm	0	67	14	0	0	19
England	**2**	**32**	**54**	**6**	**0**	**6**
N Ireland	**1**	**89**	**0**	**1**	**0**	**9**
Scotland*	**2**	**90**	**0**	**3**	**0**	**5**
Wales	**3**	**36**	**46**	**9**	**0**	**6**
UK	**2**	**38**	**48**	**6**	**0**	**6**

Excluded one centre with ⩾40% primary renal diagnosis aetiology uncertain (Colchester)
Patients with diabetes as their primary renal disease and patients with a missing primary renal diagnosis code are excluded from this table
*All haemodialysis patients in centres in Scotland are shown as receiving treatment at home or in centre as no data is available regarding satellite dialysis

Table F2.11. Number of 2014 prevalent patients without diabetes aged 65 and over by treatment modality

	HD	PD	Transplant
England	8,088	1,109	4,938
N Ireland	298	31	157
Scotland	769	72	449
Wales	514	85	329
UK	**9,669**	**1,297**	**5,873**

Excluded one centre with ⩾40% primary renal diagnosis aetiology uncertain (Colchester)
Patients with diabetes as their primary renal disease and patients with a missing primary renal diagnosis code are excluded from this table

Table F2.12. Dialysis modalities for 2014 prevalent patients with diabetes

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
England						
B Heart	5	84	3	6	0	2
B QEH	4	13	75	3	0	5
Basldn	0	76	4	7	0	13
Bradfd	0	86	11	2	0	2
Brightn	9	49	34	3	0	4
Bristol	2	19	71	3	0	4
Camb	5	42	42	0	11	0
Carlis	0	71	18	0	0	12
Carsh	2	17	69	5	1	7
Chelms	0	76	0	9	4	11
Covnt	0	74	0	26	0	0
Derby	9	64	0	20	0	7
Donc	0	42	47	3	0	8
Dorset	2	22	61	5	0	10
Dudley	9	57	13	13	0	9
Exeter	0	10	74	7	0	9
Glouc	0	48	25	0	0	28
Hull	1	52	27	6	0	14
Ipswi	0	60	12	8	0	20
Kent	2	27	56	13	0	2
L Barts	0	37	41	4	0	18
L Guys	2	20	76	1	0	1
L Kings	0	20	67	5	0	9
L Rfree	0	2	80	5	0	12
L St.G	1	37	48	5	0	10
L West	1	24	72	2	0	2
Leeds	2	19	74	0	0	6
Leic	2	26	61	3	0	8
Liv Ain	5	5	58	0	0	32
Liv Roy	2	39	45	10	0	3
M RI	1	35	53	4	0	6

Table F2.12. Continued

Centre	% home HD	% hospital HD	% satellite HD	% CAPD	% unknown type of PD	% APD
Middlbr	0	28	66	6	0	0
Newc	0	81	0	3	0	16
Norwch	6	44	38	12	0	0
Nottm	4	55	24	1	0	16
Oxford	1	35	51	2	0	11
Plymth	0	79	0	11	0	11
Ports	4	24	65	7	0	0
Prestn	3	28	60	2	0	6
Redng	1	36	36	18	1	8
Salford	1	31	55	8	0	5
Sheff	2	46	45	6	0	0
Shrew	2	49	34	12	0	2
Stevng	4	24	68	5	0	0
Sthend	3	80	0	17	0	0
Stoke	8	52	23	2	6	8
Sund	0	62	30	4	0	4
Truro	9	56	24	6	0	6
Wirral	2	39	43	0	0	15
Wolve	3	39	34	15	7	2
York	6	27	39	18	0	9
N Ireland						
Antrim	0	89	0	0	0	11
Belfast	0	96	0	0	0	4
Newry	0	88	0	0	0	13
Ulster	0	97	0	0	0	3
West NI	0	96	0	0	0	4
Scotland*						
Abrdn	0	90	0	3	0	7
Airdrie	0	94	0	4	0	2
D & Gall	5	55	0	25	0	15
Dundee	0	93	0	5	0	2
Edinb	0	92	0	3	0	5
Glasgw	3	87	0	3	0	7
Inverns	0	77	0	8	0	15
Klmarnk	0	83	0	3	0	14
Krkcldy	0	89	0	0	0	11
Wales						
Bangor	4	46	46	4	0	0
Cardff	6	10	71	9	0	4
Clwyd	5	84	0	5	0	5
Swanse	7	44	35	11	0	3
Wrexm	0	85	4	0	0	12
England	**2**	**34**	**50**	**6**	**0**	**7**
N Ireland	**0**	**93**	**0**	**0**	**0**	**7**
Scotland*	**1**	**88**	**0**	**4**	**0**	**7**
Wales	**6**	**36**	**46**	**8**	**0**	**4**
UK	**2**	**40**	**45**	**5**	**0**	**7**

Excluded one centre with ⩾40% primary renal diagnosis aetiology uncertain (Colchester)
Only patients with diabetes as their primary renal disease included in this table
*All haemodialysis patients in centres in Scotland are shown as receiving treatment at home or in centre as no data is available regarding satellite dialysis

Table F2.13. Number of 2014 prevalent patients with diabetes by treatment modality

	HD	PD	Transplant
England	4,634	692	2,686
N Ireland	158	12	73
Scotland	412	52	254
Wales	255	36	192
UK	**5,459**	**792**	**3,205**

Excluded one centre with ⩾40% primary renal diagnosis aetiology uncertain (Colchester)
Only patients with diabetes as their primary renal disease included in this table

Table F2.14. Demography of 2014 prevalent patients with diabetes

Centre	M:F ratio	Median age on 31/12/2014	Median age at start of treatment	Median time on RRT in days	Median time on RRT in years
England					
B Heart	1.5	66	62	987	2.7
B QEH	1.5	62	56	1,642	4.5
Basldn	1.6	61	58	1,059	2.9
Bradfd	2.0	63	59	1,259	3.4
Brightn	1.8	61	56	928	2.5
Bristol	1.8	63	56	1,366	3.7
Camb	2.2	50	42	2,047	5.6
Carlis	3.0	59	56	1,020	2.8
Carsh	1.9	65	59	1,723	4.7
Chelms	3.0	65	63	523	1.4
Covnt	1.7	61	56	1,468	4.0
Derby	1.4	63	60	1,093	3.0
Donc	1.9	61	57	1,183	3.2
Dorset	1.7	63	59	1,099	3.0
Dudley	3.2	66	61	1,242	3.4
Exeter	1.9	62	59	1,100	3.0
Glouc	1.5	58	54	1,345	3.7
Hull	1.8	63	58	1,271	3.5
Ipswi	2.1	61	51	1,510	4.1
Kent	1.7	59	56	1,039	2.8
L Barts	1.6	63	59	1,103	3.0
L Guys	1.3	56	48	2,430	6.7
L Kings	1.5	65	62	1,085	3.0
L Rfree	1.8	66	61	1,178	3.2
L St.G	1.3	67	62	1,547	4.2
L West	1.8	64	58	1,472	4.0
Leeds	1.9	61	56	1,282	3.5
Leic	1.7	62	56	1,279	3.5
Liv Ain	1.7	59	58	718	2.0
Liv Roy	1.1	57	48	1,672	4.6
M RI	1.6	60	53	1,496	4.1
Middlbr	1.4	58	54	1,125	3.1
Newc	1.4	55	49	1,660	4.5
Norwch	1.5	62	57	1,493	4.1
Nottm	1.4	58	52	1,934	5.3
Oxford	1.7	57	51	1,289	3.5
Plymth	1.8	58	49	2,430	6.7

Table F2.14. Continued

Centre	M:F ratio	Median age on 31/12/2014	Median age at start of treatment	Median time on RRT in days	Median time on RRT in years
Ports	1.8	60	57	1,166	3.2
Prestn	1.7	63	59	1,085	3.0
Redng	1.7	62	59	1,413	3.9
Salford	2.2	62	57	1,262	3.5
Sheff	2.4	61	56	1,223	3.3
Shrew	1.2	64	59	1,254	3.4
Stevng	1.6	64	60	1,209	3.3
Sthend	1.9	62	59	1,718	4.7
Stoke	1.4	65	60	1,112	3.0
Sund	1.7	58	56	897	2.5
Truro	1.3	57	52	1,422	3.9
Wirral	1.5	63	56	811	2.2
Wolve	1.9	60	53	1,811	5.0
York	1.2	60	53	1,260	3.4
N Ireland					
Antrim	1.2	66	63	1,446	4.0
Belfast	1.9	61	56	1,332	3.6
Newry	1.4	62	59	1,378	3.8
Ulster	3.1	62	57	1,158	3.2
West NI	1.6	65	56	1,232	3.4
Scotland					
Abrdn	1.4	60	54	1,224	3.4
Airdrie	1.4	59	56	995	2.7
D & Gall	1.2	63	57	1,059	2.9
Dundee	1.2	58	51	1,729	4.7
Edinb	1.3	53	49	1,269	3.5
Glasgw	1.3	59	54	1,115	3.1
Inverns	2.0	51	42	2,693	7.4
Klmarnk	1.7	56	50	1,089	3.0
Krkcldy	1.1	65	61	1,365	3.7
Wales					
Bangor	1.4	68	64	888	2.4
Cardff	1.7	59	54	1,353	3.7
Clwyd	1.0	62	53	1,182	3.2
Swanse	2.2	63	58	1,217	3.3
Wrexm	3.2	59	51	1,427	3.9
England	**1.7**	**62**	**56**	**1,333**	**3.6**
N Ireland	**1.7**	**62**	**58**	**1,307**	**3.6**
Scotland	**1.3**	**57**	**52**	**1,233**	**3.4**
Wales	**1.9**	**61**	**55**	**1,274**	**3.5**
UK	**1.7**	**61**	**56**	**1,322**	**3.6**

Excluded one centre with ⩾40% primary renal diagnosis aetiology uncertain (Colchester)
Only patients with diabetes as their primary renal disease included in this table

Table F2.15. Transplant gender ratios in 2014 prevalent patients

	% male	% female	*N* male	*N* female	M:F ratio
England	60.6	39.4	15,812	10,293	1.5
N Ireland	61.5	38.5	561	351	1.6
Scotland	59.7	40.3	1,558	1,052	1.5
Wales	62.5	37.5	960	577	1.7
UK	**60.6**	**39.4**	**18,891**	**12,273**	**1.5**

F:3 Trends by CCG/HB between 2009 and 2014

Table F3.1. Number of incident patients by year of RRT start and CCG/HB

Blank cells are values of 1 or 2 – these have been suppressed

UK area	CCG/HB name	Code	Incident numbers					
			2009	2010	2011	2012	2013	2014
Cheshire, Warrington and Wirral	NHS Eastern Cheshire	E38000056	18	20	18	17	16	20
	NHS South Cheshire	E38000151	14	14	15	12	24	22
	NHS Vale Royal	E38000189	10	9	10	9	15	
	NHS Warrington	E38000194	22	13	10	19	16	24
	NHS West Cheshire	E38000196	24	31	28	22	26	25
	NHS Wirral	E38000208	30	32	35	22	38	27
Durham, Darlington and Tees	NHS Darlington	E38000042	11	11	11	15	10	7
	NHS Durham Dales, Easington and Sedgefield	E38000047	31	32	35	27	33	33
	NHS Hartlepool and Stockton-on-Tees	E38000075	21	24	28	33	27	31
	NHS North Durham	E38000116	14	13	15	35	18	16
	NHS South Tees	E38000162	23	31	28	29	37	27
Greater Manchester	NHS Bolton	E38000016	24	39	27	26	26	20
	NHS Bury	E38000024	16	13	14	27	16	24
	NHS Central Manchester	E38000032	22	25	14	21	28	31
	NHS Heywood, Middleton & Rochdale	E38000080	24	16	26	27	26	29
	NHS North Manchester	E38000123	22	12	20	20	20	21
	NHS Oldham	E38000135	19	18	23	16	22	30
	NHS Salford	E38000143	22	30	17	20	26	20
	NHS South Manchester	E38000158	11	13	16	16	17	13
	NHS Stockport	E38000174	17	29	28	21	17	31
	NHS Tameside and Glossop	E38000182	23	24	26	16	30	25
	NHS Trafford	E38000187	26	30	12	28	28	22
	NHS Wigan Borough	E38000205	20	25	35	27	26	33
Lancashire	NHS Blackburn with Darwen	E38000014	12	13	20	17	13	11
	NHS Blackpool	E38000015	16	10	14	24	19	20
	NHS Chorley and South Ribble	E38000034	24	10	18	14	25	18
	NHS East Lancashire	E38000050	33	29	37	22	36	47
	NHS Fylde & Wyre	E38000060	19	15	12	17	18	23
	NHS Greater Preston	E38000065	14	11	11	21	18	20
	NHS Lancashire North	E38000093	11	10	18	12	11	12
	NHS West Lancashire	E38000200	8	7	11	10	9	9
Merseyside	NHS Halton	E38000068	14	11	20	13	13	15
	NHS Knowsley	E38000091	11	13	17	20	11	28
	NHS Liverpool	E38000101	54	38	50	55	47	59
	NHS South Sefton	E38000161	14	23	25	19	24	27
	NHS Southport and Formby	E38000170	12	9	14	11	21	14
	NHS St Helens	E38000172	14	18	15	18	13	21
Cumbria, Northumberland, Tyne and Wear	NHS Cumbria	E38000041	38	45	36	39	59	55
	NHS Gateshead	E38000061	20	17	17	20	12	17
	NHS Newcastle North and East	E38000111	13	11	11	9	6	11
	NHS Newcastle West	E38000112	12	9	12	12	13	17
	NHS North Tyneside	E38000127	20	20	15	20	22	16
	NHS Northumberland	E38000130	24	23	32	30	25	38
	NHS South Tyneside	E38000163	22	12	18	9	13	11
	NHS Sunderland	E38000176	29	31	23	27	19	30

Table F3.1. Continued

UK area	CCG/HB name	Code	Incident numbers					
			2009	2010	2011	2012	2013	2014
North Yorkshire and Humber	NHS East Riding of Yorkshire,	E38000052	37	27	29	29	19	32
	NHS Hambleton, Richmondshire and Whitby	E38000069	17	14	13	23	18	17
	NHS Harrogate and Rural District	E38000073	19	12	18	18	10	22
	NHS Hull	E38000085	25	23	19	19	24	27
	NHS North East Lincolnshire	E38000119	15	12	24	12	15	19
	NHS North Lincolnshire	E38000122	14	13	29	22	21	10
	NHS Scarborough and Ryedale	E38000145	13	8	8	13	10	12
	NHS Vale of York	E38000188	25	26	42	36	31	35
South Yorkshire and Bassetlaw	NHS Barnsley	E38000006	23	30	21	27	28	37
	NHS Bassetlaw	E38000008	9	12	11	14	17	13
	NHS Doncaster	E38000044	34	30	35	27	39	48
	NHS Rotherham	E38000141	27	31	20	24	22	26
	NHS Sheffield	E38000146	71	56	55	68	54	57
West Yorkshire	NHS Airedale, Wharfedale and Craven	E38000001	19	10	9	12	16	23
	NHS Bradford City	E38000018		17	10	14	14	18
	NHS Bradford Districts	E38000019	30	36	34	44	34	39
	NHS Calderdale	E38000025	21	11	13	17	24	15
	NHS Greater Huddersfield	E38000064	18	20	23	28	24	28
	NHS Leeds North	E38000094	16	14	18	17	19	21
	NHS Leeds South and East	E38000095	14	16	21	17	22	24
	NHS Leeds West	E38000096	27	17	17	21	34	22
	NHS North Kirklees	E38000121	26	19	23	9	28	17
	NHS Wakefield	E38000190	21	31	32	40	32	39
Arden, Herefordshire and Worcestershire	NHS Coventry and Rugby	E38000038	65	54	61	74	56	51
	NHS Herefordshire	E38000078	26	16	19	21	19	20
	NHS Redditch and Bromsgrove	E38000139	26	19	16	25	15	16
	NHS South Warwickshire	E38000164	24	22	31	20	18	28
	NHS South Worcestershire	E38000166	30	23	25	30	28	35
	NHS Warwickshire North	E38000195	20	33	23	17	16	35
	NHS Wyre Forest	E38000211	14	11	13	11	8	19
Birmingham and the Black Country	NHS Birmingham CrossCity	E38000012	100	87	106	98	98	105
	NHS Birmingham South and Central	E38000013	32	25	32	27	29	34
	NHS Dudley	E38000046	49	28	30	43	44	35
	NHS Sandwell and West Birmingham	E38000144	86	76	72	63	68	80
	NHS Solihull	E38000149	32	23	16	24	22	23
	NHS Walsall	E38000191	31	54	35	39	47	30
	NHS Wolverhampton	E38000210	29	37	30	39	28	43
Derbyshire and Nottinghamshire	NHS Erewash	E38000058	14	9	12	14	14	8
	NHS Hardwick	E38000071	13	5	9	11	10	11
	NHS Mansfield & Ashfield	E38000103	23	19	16	18	18	24
	NHS Newark & Sherwood	E38000109	13	13	18	13	7	11
	NHS North Derbyshire	E38000115	16	22	31	26	26	22
	NHS Nottingham City	E38000132	33	40	29	32	34	36
	NHS Nottingham North & East	E38000133	19	14	13	12	12	10
	NHS Nottingham West	E38000134	14	12	7	14	16	12
	NHS Rushcliffe	E38000142	10	12	15	5	14	6
	NHS Southern Derbyshire	E38000169	60	52	57	63	50	57

Table F3.1. Continued

UK area	CCG/HB name	Code	Incident numbers					
			2009	2010	2011	2012	2013	2014
East Anglia	NHS Cambridgeshire and Peterborough	E38000026	94	67	81	60	98	77
	NHS Great Yarmouth & Waveney	E38000063	23	28	31	26	26	23
	NHS Ipswich and East Suffolk	E38000086	39	31	29	42	44	36
	NHS North Norfolk	E38000124	11	18	12	18	20	22
	NHS Norwich	E38000131	24	23	23	18	16	20
	NHS South Norfolk	E38000159	17	19	28	24	29	23
	NHS West Norfolk	E38000203	15	18	14	15	14	21
	NHS West Suffolk	E38000204	22	21	18	23	22	17
Essex	NHS Basildon and Brentwood	E38000007	24	23	28	34	25	30
	NHS Castle Point, Rayleigh and Rochford	E38000030	12	18	16	15	26	17
	NHS Mid Essex	E38000106	37	35	42	35	32	38
	NHS North East Essex	E38000117	33	37	47	36	33	46
	NHS Southend	E38000168	12	12	16	18	22	15
	NHS Thurrock	E38000185	7	17	18	12	14	18
	NHS West Essex	E38000197	26	19	23	38	34	38
Hertfordshire and the South Midlands	NHS Bedfordshire	E38000010	38	38	33	44	47	47
	NHS Corby	E38000037	8	8	7	5	4	7
	NHS East and North Hertfordshire	E38000049	39	49	60	40	64	65
	NHS Herts Valleys	E38000079	54	48	46	52	55	70
	NHS Luton	E38000102	19	19	25	22	37	30
	NHS Milton Keynes	E38000107	21	24	23	27	22	31
	NHS Nene	E38000108	53	48	59	72	67	69
Leicestershire and Lincolnshire	NHS East Leicestershire and Rutland	E38000051	20	26	27	37	35	32
	NHS Leicester City	E38000097	42	47	51	46	50	37
	NHS Lincolnshire East	E38000099	21	23	27	23	34	19
	NHS Lincolnshire West	E38000100	15	16	19	11	21	16
	NHS South Lincolnshire	E38000157	14	20	17	16	12	13
	NHS South West Lincolnshire	E38000165	14	13	14	10	13	8
	NHS West Leicestershire	E38000201	39	45	38	22	35	46
Shropshire and Staffordshire	NHS Cannock Chase	E38000028	7	16	17	12	18	12
	NHS East Staffordshire	E38000053	9	20	13	10	16	13
	NHS North Staffordshire	E38000126	28	17	28	15	23	28
	NHS Shropshire	E38000147	26	34	37	29	40	37
	NHS South East Staffs and Seisdon and Peninsular	E38000153	21	18	26	19	17	22
	NHS Stafford and Surrounds	E38000173	20	20	15	17	17	17
	NHS Stoke on Trent	E38000175	37	36	28	23	31	42
	NHS Telford & Wrekin	E38000183	21	23	19	21	22	24
London	NHS Barking & Dagenham	E38000004	21	20	25	31	25	34
	NHS Barnet	E38000005	42	58	49	52	44	50
	NHS Camden	E38000027	27	32	23	24	28	26
	NHS City and Hackney	E38000035	36	30	34	41	38	47
	NHS Enfield	E38000057	38	38	57	47	48	49
	NHS Haringey	E38000072	21	30	37	50	50	39
	NHS Havering	E38000077	18	9	31	28	22	27
	NHS Islington	E38000088	25	25	27	36	27	21
	NHS Newham	E38000113	46	50	50	45	52	59
	NHS Redbridge	E38000138	44	37	35	55	53	41
	NHS Tower Hamlets	E38000186	31	26	32	37	41	47

Table F3.1. Continued

UK area	CCG/HB name	Code	Incident numbers					
			2009	2010	2011	2012	2013	2014
London	NHS Waltham Forest	E38000192	30	26	40	28	38	50
	NHS Brent	E38000020	60	71	58	68	56	78
	NHS Central London (Westminster)	E38000031	21	20	21	19	23	19
	NHS Ealing	E38000048	69	58	57	68	51	59
	NHS Hammersmith and Fulham	E38000070	19	22	21	22	15	23
	NHS Harrow	E38000074	48	49	53	38	26	40
	NHS Hillingdon	E38000082	32	38	39	40	39	29
	NHS Hounslow	E38000084	36	40	42	40	48	32
	NHS West London (Kensington and Chelsea, Queen's Park and Paddington)	E38000202	24	25	25	19	21	34
	NHS Bexley	E38000011	31	32	29	21	26	27
	NHS Bromley	E38000023	33	37	23	24	29	37
	NHS Croydon	E38000040	55	47	43	69	69	70
	NHS Greenwich	E38000066	29	44	23	27	55	30
	NHS Kingston	E38000090	14	13	15	17	18	19
	NHS Lambeth	E38000092	43	32	43	41	35	49
	NHS Lewisham	E38000098	52	33	42	44	36	38
	NHS Merton	E38000105	25	21	28	32	23	27
	NHS Richmond	E38000140	15	16	13	15	19	16
	NHS Southwark	E38000171	34	41	46	41	54	47
	NHS Sutton	E38000179	19	27	25	30	16	36
	NHS Wandsworth	E38000193	48	35	30	33	24	41
Bath, Gloucestershire, Swindon and Wiltshire	NHS Bath and North East Somerset	E38000009	24	12	11	18	19	15
	NHS Gloucestershire	E38000062	79	61	62	83	51	48
	NHS Swindon	E38000181	23	22	25	27	21	28
	NHS Wiltshire	E38000206	42	43	35	26	44	49
Bristol, North Somerset, Somerset and South Gloucestershire	NHS Bristol	E38000022	49	57	56	48	55	46
	NHS North Somerset	E38000125	24	24	22	26	27	29
	NHS Somerset	E38000150	70	69	56	45	38	61
	NHS South Gloucestershire	E38000155	19	31	18	24	35	22
Devon, Cornwall and Isles of Scilly	NHS Kernow	E38000089	72	59	55	65	59	60
	NHS North, East, West Devon	E38000129	109	101	96	105	89	102
	NHS South Devon and Torbay	E38000152	31	44	32	40	37	33
Kent and Medway	NHS Ashford	E38000002	12	12	11	17	15	14
	NHS Canterbury and Coastal	E38000029	24	21	19	13	22	29
	NHS Dartford, Gravesham and Swanley	E38000043	30	25	23	26	40	27
	NHS Medway	E38000104	24	19	24	21	31	28
	NHS South Kent Coast	E38000156	17	22	25	15	20	29
	NHS Swale	E38000180	15	12	7	16	10	14
	NHS Thanet	E38000184	19	23	14	17	27	17
	NHS West Kent	E38000199	41	35	44	31	37	52
Surrey and Sussex	NHS Brighton & Hove	E38000021	28	21	24	30	21	32
	NHS Coastal West Sussex	E38000036	42	30	40	49	50	66
	NHS Crawley	E38000039	14	19	5	8	11	14
	NHS East Surrey	E38000054	13	24	14	24	18	17
	NHS Eastbourne, Hailsham and Seaford	E38000055	12	14	20	25	29	19
	NHS Guildford and Waverley	E38000067	22	15	16	26	12	19
	NHS Hastings & Rother	E38000076	14	17	22	18	29	16

Table F3.1. Continued

UK area	CCG/HB name	Code	Incident numbers					
			2009	2010	2011	2012	2013	2014
Surrey and Sussex	NHS High Weald Lewes Havens	E38000081	15	13	14	19	13	22
	NHS Horsham and Mid Sussex	E38000083	19	18	20	13	20	23
	NHS North West Surrey	E38000128	30	40	47	33	35	48
	NHS Surrey Downs	E38000177	35	30	31	28	35	34
	NHS Surrey Heath	E38000178	12	8	8	8	5	5
Thames Valley	NHS Aylesbury Vale	E38000003	12	20	22	16	15	18
	NHS Bracknell and Ascot	E38000017	10	13	10	5	16	14
	NHS Chiltern	E38000033	40	23	24	26	35	30
	NHS Newbury and District	E38000110	12	7	7	8	13	11
	NHS North & West Reading	E38000114	3	3	10	10	7	12
	NHS Oxfordshire	E38000136	68	59	69	67	62	62
	NHS Slough	E38000148	21	22	25	20	21	21
	NHS South Reading	E38000160	11	11	10	10	21	15
	NHS Windsor, Ascot and Maidenhead	E38000207	17	13	18	9	20	19
	NHS Wokingham	E38000209	13	13	22	8	14	14
Wessex	NHS Dorset	E38000045	59	56	68	67	69	73
	NHS Fareham and Gosport	E38000059	25	25	18	18	24	27
	NHS Isle of Wight	E38000087		11	14	16	24	17
	NHS North East Hampshire and Farnham	E38000118	19	18	18	25	26	21
	NHS North Hampshire	E38000120	12	16	16	11	17	25
	NHS Portsmouth	E38000137	12	10	25	21	22	19
	NHS South Eastern Hampshire	E38000154	26	26	19	16	25	30
	NHS Southampton	E38000167	17	26	25	19	14	23
	NHS West Hampshire	E38000198	43	30	44	41	45	54
Wales	Betsi Cadwaladr University	W11000023	78	78	68	83	77	95
	Powys Teaching	W11000024	18	12	22	22	13	11
	Hywel Dda	W11000025	36	51	58	42	52	58
	Abertawe Bro Morgannwg University	W11000026	88	85	68	84	63	47
	Cwm Taf	W11000027	40	31	46	29	37	39
	Aneurin Bevan	W11000028	61	81	77	76	69	82
	Cardiff and Vale University	W11000029	53	59	47	47	53	46
Scotland	Ayrshire and Arran	S08000015	39	48	36	42	45	40
	Borders	S08000016	13	15	8	8	7	9
	Dumfries and Galloway	S08000017	21	11	11	20	9	24
	Fife	S08000018	50	50	48	36	43	43
	Forth Valley	S08000019	32	33	27	28	34	33
	Grampian	S08000020	52	51	51	52	58	51
	Greater Glasgow and Clyde	S08000021	120	103	129	133	111	122
	Highland	S08000022	28	24	20	24	27	23
	Lanarkshire	S08000023	57	64	58	76	68	69
	Lothian	S08000024	71	52	62	65	54	71
	Orkney	S08000025	3		0	5		0
	Shetland	S08000026				0		3
	Tayside	S08000027	59	47	56	32	42	48
	Western Isles	S08000028	3	5	0	0	4	6
Northern Ireland	Belfast	ZC010	26	43	36	56	40	30
	Northern	ZC020	39	50	59	54	51	52
	Southern	ZC030	26	34	44	28	30	28
	South Eastern	ZC040	24	25	34	29	35	29
	Western	ZC050	35	24	28	17	29	33

Table F3.2 Number of prevalent patients on HD in-centre by year and CCG/HB

UK area	CCG/HB name	Code	Prevalent numbers on HD in-centre					
			2009	2010	2011	2012	2013	2014
Cheshire, Warrington and Wirral	NHS Eastern Cheshire	E38000056	35	45	43	51	49	51
	NHS South Cheshire	E38000151	60	58	59	53	52	56
	NHS Vale Royal	E38000189	23	23	26	23	29	27
	NHS Warrington	E38000194	55	53	48	50	49	59
	NHS West Cheshire	E38000196	83	84	90	83	83	84
	NHS Wirral	E38000208	94	97	95	105	111	102
Durham, Darlington and Tees	NHS Darlington	E38000042	36	33	25	32	29	27
	NHS Durham Dales, Easington and Sedgefield	E38000047	92	93	102	98	107	104
	NHS Hartlepool and Stockton-on-Tees	E38000075	67	64	83	92	90	96
	NHS North Durham	E38000116	51	44	49	65	68	69
	NHS South Tees	E38000162	83	85	91	91	100	96
Greater Manchester	NHS Bolton	E38000016	60	72	78	72	72	67
	NHS Bury	E38000024	38	42	44	43	49	53
	NHS Central Manchester	E38000032	71	78	76	84	89	97
	NHS Heywood, Middleton & Rochdale	E38000080	61	53	52	56	66	74
	NHS North Manchester	E38000123	56	54	59	60	53	56
	NHS Oldham	E38000135	58	53	52	56	60	66
	NHS Salford	E38000143	50	55	52	53	56	55
	NHS South Manchester	E38000158	45	46	42	42	47	45
	NHS Stockport	E38000174	48	58	66	69	57	70
	NHS Tameside and Glossop	E38000182	63	62	54	62	62	60
	NHS Trafford	E38000187	50	57	52	55	61	63
	NHS Wigan Borough	E38000205	77	68	75	81	84	94
Lancashire	NHS Blackburn with Darwen	E38000014	67	71	71	73	78	74
	NHS Blackpool	E38000015	40	38	41	49	56	63
	NHS Chorley and South Ribble	E38000034	40	39	41	54	63	61
	NHS East Lancashire	E38000050	118	121	116	112	121	128
	NHS Fylde & Wyre	E38000060	59	61	65	66	63	68
	NHS Greater Preston	E38000065	62	68	65	62	64	57
	NHS Lancashire North	E38000093	29	31	36	32	26	34
	NHS West Lancashire	E38000200	37	39	37	35	30	30
Merseyside	NHS Halton	E38000068	37	38	47	40	42	44
	NHS Knowsley	E38000091	51	44	51	51	46	48
	NHS Liverpool	E38000101	177	173	174	166	159	158
	NHS South Sefton	E38000161	46	45	61	53	52	61
	NHS Southport and Formby	E38000170	41	39	45	44	41	46
	NHS St Helens	E38000172	59	61	61	58	50	48
Cumbria, Northumberland, Tyne and Wear	NHS Cumbria	E38000041	102	103	100	103	111	116
	NHS Gateshead	E38000061	52	53	44	47	42	47
	NHS Newcastle North and East	E38000111	28	28	30	30	31	28
	NHS Newcastle West	E38000112	45	43	38	43	39	39
	NHS North Tyneside	E38000127	39	38	34	39	53	53
	NHS Northumberland	E38000130	71	69	70	69	61	75
	NHS South Tyneside	E38000163	50	43	49	46	43	40
	NHS Sunderland	E38000176	87	92	88	94	84	95

Table F3.2 Continued

UK area	CCG/HB name	Code	Prevalent numbers on HD in-centre					
			2009	2010	2011	2012	2013	2014
North Yorkshire and Humber	NHS East Riding of Yorkshire,	E38000052	88	87	83	85	79	80
	NHS Hambleton, Richmondshire and Whitby	E38000069	32	29	30	40	45	43
	NHS Harrogate and Rural District	E38000073	41	35	34	34	33	38
	NHS Hull	E38000085	81	79	77	69	71	82
	NHS North East Lincolnshire	E38000119	53	55	60	53	58	58
	NHS North Lincolnshire	E38000122	50	51	57	64	73	65
	NHS Scarborough and Ryedale	E38000145	34	29	27	33	34	36
	NHS Vale of York	E38000188	90	98	94	88	92	90
South Yorkshire and Bassetlaw	NHS Barnsley	E38000006	101	111	114	110	101	102
	NHS Bassetlaw	E38000008	30	34	34	43	40	40
	NHS Doncaster	E38000044	100	104	113	110	106	109
	NHS Rotherham	E38000141	113	115	106	103	104	99
	NHS Sheffield	E38000146	221	234	228	241	242	250
West Yorkshire	NHS Airedale, Wharfedale and Craven	E38000001	34	31	36	36	36	46
	NHS Bradford City	E38000018	40	44	45	46	47	58
	NHS Bradford Districts	E38000019	95	100	113	121	111	111
	NHS Calderdale	E38000025	65	66	60	46	44	46
	NHS Greater Huddersfield	E38000064	62	67	61	75	75	81
	NHS Leeds North	E38000094	66	68	70	67	65	59
	NHS Leeds South and East	E38000095	59	64	70	73	71	84
	NHS Leeds West	E38000096	69	68	64	56	65	65
	NHS North Kirklees	E38000121	63	66	70	69	73	67
	NHS Wakefield	E38000190	88	93	102	102	106	106
Arden, Herefordshire and Worcestershire	NHS Coventry and Rugby	E38000038	170	184	183	190	199	190
	NHS Herefordshire	E38000078	63	60	61	63	63	63
	NHS Redditch and Bromsgrove	E38000139	57	56	55	57	53	57
	NHS South Warwickshire	E38000164	82	74	83	73	75	73
	NHS South Worcestershire	E38000166	79	80	87	99	100	100
	NHS Warwickshire North	E38000195	71	81	69	59	66	75
	NHS Wyre Forest	E38000211	30	30	30	28	29	37
Birmingham and the Black Country	NHS Birmingham CrossCity	E38000012	411	396	414	419	420	429
	NHS Birmingham South and Central	E38000013	127	124	136	148	146	143
	NHS Dudley	E38000046	109	103	96	113	116	110
	NHS Sandwell and West Birmingham	E38000144	369	368	362	354	354	353
	NHS Solihull	E38000149	96	87	84	85	86	79
	NHS Walsall	E38000191	134	146	135	133	135	141
	NHS Wolverhampton	E38000210	133	132	122	113	111	117
Derbyshire and Nottinghamshire	NHS Erewash	E38000058	39	43	42	39	33	29
	NHS Hardwick	E38000071	41	40	38	40	41	36
	NHS Mansfield & Ashfield	E38000103	67	62	61	55	59	54
	NHS Newark & Sherwood	E38000109	39	36	37	29	28	25
	NHS North Derbyshire	E38000115	75	78	83	76	77	76
	NHS Nottingham City	E38000132	130	130	114	107	107	117
	NHS Nottingham North & East	E38000133	43	43	39	41	39	38
	NHS Nottingham West	E38000134	44	42	40	40	42	41
	NHS Rushcliffe	E38000142	34	32	32	29	31	29
	NHS Southern Derbyshire	E38000169	182	169	151	148	147	158

Table F3.2 Continued

UK area	CCG/HB name	Code	Prevalent numbers on HD in-centre					
			2009	2010	2011	2012	2013	2014
East Anglia	NHS Cambridgeshire and Peterborough	E38000026	252	256	274	263	294	279
	NHS Great Yarmouth & Waveney	E38000063	95	107	105	104	97	90
	NHS Ipswich and East Suffolk	E38000086	117	121	122	127	130	128
	NHS North Norfolk	E38000124	72	72	69	68	76	83
	NHS Norwich	E38000131	68	70	61	65	61	59
	NHS South Norfolk	E38000159	66	63	63	71	73	74
	NHS West Norfolk	E38000203	66	61	56	55	56	52
	NHS West Suffolk	E38000204	52	61	65	52	59	58
Essex	NHS Basildon and Brentwood	E38000007	83	82	90	90	97	106
	NHS Castle Point, Rayleigh and Rochford	E38000030	57	59	56	59	63	60
	NHS Mid Essex	E38000106	103	95	94	96	101	113
	NHS North East Essex	E38000117	112	115	122	120	115	120
	NHS Southend	E38000168	69	63	66	64	64	58
	NHS Thurrock	E38000185	51	55	55	57	57	62
	NHS West Essex	E38000197	53	59	67	81	99	109
Hertfordshire and the South Midlands	NHS Bedfordshire	E38000010	104	115	112	108	118	131
	NHS Corby	E38000037	16	18	18	20	17	20
	NHS East and North Hertfordshire	E38000049	148	145	164	155	155	168
	NHS Herts Valleys	E38000079	210	204	199	190	179	186
	NHS Luton	E38000102	93	92	98	97	96	96
	NHS Milton Keynes	E38000107	55	54	57	55	62	76
	NHS Nene	E38000108	160	168	169	167	174	181
Leicestershire and Lincolnshire	NHS East Leicestershire and Rutland	E38000051	78	80	78	79	78	78
	NHS Leicester City	E38000097	157	171	185	184	192	182
	NHS Lincolnshire East	E38000099	71	71	81	83	80	79
	NHS Lincolnshire West	E38000100	66	63	71	65	72	70
	NHS South Lincolnshire	E38000157	39	41	45	47	43	41
	NHS South West Lincolnshire	E38000165	26	33	32	33	32	31
	NHS West Leicestershire	E38000201	95	96	99	101	103	108
Shropshire and Staffordshire	NHS Cannock Chase	E38000028	45	44	49	41	47	45
	NHS East Staffordshire	E38000053	34	33	27	34	31	35
	NHS North Staffordshire	E38000126	68	64	68	60	64	61
	NHS Shropshire	E38000147	112	109	97	105	98	101
	NHS South East Staffs and Seisdon and Peninsular	E38000153	83	78	81	75	73	76
	NHS Stafford and Surrounds	E38000173	40	41	48	43	38	44
	NHS Stoke on Trent	E38000175	99	97	104	98	101	115
	NHS Telford & Wrekin	E38000183	77	80	80	71	73	77
London	NHS Barking & Dagenham	E38000004	59	67	81	84	84	86
	NHS Barnet	E38000005	163	174	163	165	165	175
	NHS Camden	E38000027	81	88	84	80	86	88
	NHS City and Hackney	E38000035	116	131	143	151	143	153
	NHS Enfield	E38000057	139	145	154	147	151	145
	NHS Haringey	E38000072	123	122	132	138	147	149
	NHS Havering	E38000077	67	68	80	76	64	72
	NHS Islington	E38000088	62	69	74	84	87	82
	NHS Newham	E38000113	148	168	189	189	211	213
	NHS Redbridge	E38000138	103	114	126	125	137	125
	NHS Tower Hamlets	E38000186	108	105	116	125	139	148

Table F3.2 Continued

UK area	CCG/HB name	Code	Prevalent numbers on HD in-centre					
			2009	2010	2011	2012	2013	2014
London	NHS Waltham Forest	E38000192	102	115	136	132	143	140
	NHS Brent	E38000020	241	270	279	278	265	281
	NHS Central London (Westminster)	E38000031	52	55	66	63	71	69
	NHS Ealing	E38000048	232	239	248	263	262	262
	NHS Hammersmith and Fulham	E38000070	76	73	79	81	74	80
	NHS Harrow	E38000074	146	154	178	180	172	165
	NHS Hillingdon	E38000082	121	121	133	139	154	147
	NHS Hounslow	E38000084	117	123	136	140	153	151
	NHS West London (Kensington and Chelsea, Queen's Park and Paddington)	E38000202	94	90	102	105	107	116
	NHS Bexley	E38000011	87	86	93	97	98	107
	NHS Bromley	E38000023	82	83	88	78	81	86
	NHS Croydon	E38000040	191	202	217	238	250	264
	NHS Greenwich	E38000066	91	106	112	107	119	117
	NHS Kingston	E38000090	56	58	62	62	57	57
	NHS Lambeth	E38000092	191	190	203	208	208	230
	NHS Lewisham	E38000098	168	173	187	195	189	184
	NHS Merton	E38000105	83	88	87	93	88	95
	NHS Richmond	E38000140	42	49	47	44	47	45
	NHS Southwark	E38000171	159	171	187	189	194	208
	NHS Sutton	E38000179	81	83	90	91	84	93
	NHS Wandsworth	E38000193	138	146	136	122	117	131
Bath, Gloucestershire, Swindon and Wiltshire	NHS Bath and North East Somerset	E38000009	58	61	63	65	59	57
	NHS Gloucestershire	E38000062	179	191	190	223	214	215
	NHS Swindon	E38000181	41	38	46	53	55	60
	NHS Wiltshire	E38000206	105	107	109	103	111	108
Bristol, North Somerset, Somerset and South Gloucestershire	NHS Bristol	E38000022	150	145	154	167	180	186
	NHS North Somerset	E38000125	49	53	59	67	69	79
	NHS Somerset	E38000150	142	157	163	165	163	171
	NHS South Gloucestershire	E38000155	59	76	72	71	82	86
Devon, Cornwall and Isles of Scilly	NHS Kernow	E38000089	182	183	178	172	174	178
	NHS North, East, West Devon	E38000129	254	267	277	290	286	296
	NHS South Devon and Torbay	E38000152	98	109	105	114	122	117
Kent and Medway	NHS Ashford	E38000002	36	36	38	38	38	39
	NHS Canterbury and Coastal	E38000029	58	53	53	49	59	71
	NHS Dartford, Gravesham and Swanley	E38000043	59	64	69	77	81	87
	NHS Medway	E38000104	55	55	67	71	77	79
	NHS South Kent Coast	E38000156	62	66	65	69	58	61
	NHS Swale	E38000180	32	36	31	36	32	29
	NHS Thanet	E38000184	36	50	44	45	52	51
	NHS West Kent	E38000199	120	112	125	139	131	146
Surrey and Sussex	NHS Brighton & Hove	E38000021	64	60	60	64	65	77
	NHS Coastal West Sussex	E38000036	129	133	127	143	141	143
	NHS Crawley	E38000039	42	55	47	44	43	41
	NHS East Surrey	E38000054	34	46	42	51	57	56
	NHS Eastbourne, Hailsham and Seaford	E38000055	48	55	47	56	57	69
	NHS Guildford and Waverley	E38000067	36	39	40	45	42	46
	NHS Hastings & Rother	E38000076	48	51	50	51	59	58

Table F3.2 Continued

UK area	CCG/HB name	Code	Prevalent numbers on HD in-centre					
			2009	2010	2011	2012	2013	2014
Surrey and Sussex	NHS High Weald Lewes Havens	E38000081	34	32	33	38	41	46
	NHS Horsham and Mid Sussex	E38000083	49	44	53	53	55	45
	NHS North West Surrey	E38000128	106	110	109	107	105	115
	NHS Surrey Downs	E38000177	81	82	86	85	91	87
	NHS Surrey Heath	E38000178	26	28	26	24	23	21
Thames Valley	NHS Aylesbury Vale	E38000003	48	49	42	50	47	51
	NHS Bracknell and Ascot	E38000017	25	25	24	25	32	38
	NHS Chiltern	E38000033	69	66	79	74	81	86
	NHS Newbury and District	E38000110	18	20	20	14	23	30
	NHS North & West Reading	E38000114	25	20	20	21	21	25
	NHS Oxfordshire	E38000136	129	139	160	155	153	154
	NHS Slough	E38000148	55	59	71	72	64	68
	NHS South Reading	E38000160	37	36	32	31	38	39
	NHS Windsor, Ascot and Maidenhead	E38000207	42	41	36	38	38	39
	NHS Wokingham	E38000209	45	39	47	43	45	41
Wessex	NHS Dorset	E38000045	198	204	207	227	226	234
	NHS Fareham and Gosport	E38000059	43	45	49	47	58	56
	NHS Isle of Wight	E38000087	18	21	29	38	55	56
	NHS North East Hampshire and Farnham	E38000118	53	51	57	61	66	61
	NHS North Hampshire	E38000120	40	45	42	41	38	49
	NHS Portsmouth	E38000137	55	47	56	60	63	64
	NHS South Eastern Hampshire	E38000154	60	65	69	60	68	70
	NHS Southampton	E38000167	58	68	71	76	69	60
	NHS West Hampshire	E38000198	121	108	125	134	136	143
Wales	Betsi Cadwaladr University	W11000023	223	220	218	242	230	255
	Powys Teaching	W11000024	52	47	43	53	53	46
	Hywel Dda	W11000025	133	132	130	122	128	134
	Abertawe Bro Morgannwg University	W11000026	223	233	221	206	201	178
	Cwm Taf	W11000027	109	90	102	96	91	94
	Aneurin Bevan	W11000028	178	186	194	177	181	204
	Cardiff and Vale University	W11000029	137	139	132	132	137	129
Scotland	Ayrshire and Arran	S08000015	144	151	143	141	130	126
	Borders	S08000016	49	50	46	38	35	35
	Dumfries and Galloway	S08000017	51	58	51	53	46	46
	Fife	S08000018	130	138	153	158	153	145
	Forth Valley	S08000019	107	117	109	99	101	92
	Grampian	S08000020	172	181	196	216	203	185
	Greater Glasgow and Clyde	S08000021	395	398	409	406	388	371
	Highland	S08000022	95	87	79	73	74	68
	Lanarkshire	S08000023	207	217	213	236	227	219
	Lothian	S08000024	221	214	199	213	223	221
	Orkney	S08000025	6	8	6	6	8	6
	Shetland	S08000026	3	4	4	3	3	4
	Tayside	S08000027	161	170	176	167	161	158
	Western Isles	S08000028	8	11	8	6	5	8
Northern Ireland	Belfast	ZC010	141	144	141	138	137	136
	Northern	ZC020	174	170	183	184	181	181
	Southern	ZC030	113	123	127	100	99	100
	South Eastern	ZC040	105	93	95	99	91	83
	Western	ZC050	126	125	114	97	79	83

Table F3.3. Number of prevalent patients on home-therapies by year and CCG/HB

Blank cells are values of 1 or 2 – these have been suppressed

UK Area	CCG/HB Name	Code	Prevalent numbers on home-therapies					
			2009	2010	2011	2012	2013	2014
Cheshire, Warrington and Wirral	NHS Eastern Cheshire	E38000056	26	18	21	21	19	19
	NHS South Cheshire	E38000151	16	12	12	17	18	17
	NHS Vale Royal	E38000189	13	13	13	10	8	6
	NHS Warrington	E38000194	14	15	15	14	13	16
	NHS West Cheshire	E38000196	16	20	19	20	21	18
	NHS Wirral	E38000208	17	14	21	14	18	10
Durham, Darlington and Tees	NHS Darlington	E38000042	3	3	4		3	3
	NHS Durham Dales, Easington and Sedgefield	E38000047	9	14	13	11	10	11
	NHS Hartlepool and Stockton-on-Tees	E38000075	7	7	8	8	8	10
	NHS North Durham	E38000116	8	14	13	17	8	12
	NHS South Tees	E38000162	4	4	3	5	6	6
Greater Manchester	NHS Bolton	E38000016	19	27	25	26	24	21
	NHS Bury	E38000024	23	18	20	21	19	17
	NHS Central Manchester	E38000032	21	19	17	14	15	17
	NHS Heywood, Middleton & Rochdale	E38000080	16	16	23	20	18	25
	NHS North Manchester	E38000123	17	15	9	10	12	12
	NHS Oldham	E38000135	16	18	21	18	13	13
	NHS Salford	E38000143	16	12	13	10	16	13
	NHS South Manchester	E38000158	14	13	12	14	11	11
	NHS Stockport	E38000174	37	34	36	34	30	23
	NHS Tameside and Glossop	E38000182	22	24	28	23	24	20
	NHS Trafford	E38000187	16	24	23	22	19	13
	NHS Wigan Borough	E38000205	23	28	26	28	25	23
Lancashire	NHS Blackburn with Darwen	E38000014	14	12	15	11	3	
	NHS Blackpool	E38000015	7	7	7	7	7	8
	NHS Chorley and South Ribble	E38000034	19	12	13	13	10	11
	NHS East Lancashire	E38000050	24	25	31	29	25	26
	NHS Fylde & Wyre	E38000060	11	11	10	9	12	12
	NHS Greater Preston	E38000065	8	6	5	12	10	16
	NHS Lancashire North	E38000093	8	8	10	17	17	11
	NHS West Lancashire	E38000200	9	6	6	4	8	8
Merseyside	NHS Halton	E38000068	8	8	12	14	13	11
	NHS Knowsley	E38000091	11	11	7	13	12	18
	NHS Liverpool	E38000101	34	29	30	32	34	37
	NHS South Sefton	E38000161	10	15	11	17	18	20
	NHS Southport and Formby	E38000170	7	8	10	8	11	11
	NHS St Helens	E38000172	16	15	14	22	21	18
Cumbria, Northumberland, Tyne and Wear	NHS Cumbria	E38000041	30	29	37	37	36	40
	NHS Gateshead	E38000061	10	11	14	15	13	14
	NHS Newcastle North and East	E38000111	8	6	5	6	3	4
	NHS Newcastle West	E38000112	5	4	4	6	9	9
	NHS North Tyneside	E38000127	15	14	11	13	11	11
	NHS Northumberland	E38000130	19	23	15	21	21	24
	NHS South Tyneside	E38000163	11	12	9	8		6
	NHS Sunderland	E38000176	16	16	8	6	7	6

Table F3.3. Continued

UK Area	CCG/HB Name	Code	Prevalent numbers on home-therapies					
			2009	2010	2011	2012	2013	2014
North Yorkshire and Humber	NHS East Riding of Yorkshire,	E38000052	34	29	36	30	20	23
	NHS Hambleton, Richmondshire and Whitby	E38000069	7	11	13	7	8	4
	NHS Harrogate and Rural District	E38000073	6	7	9	11	12	14
	NHS Hull	E38000085	18	18	17	16	15	17
	NHS North East Lincolnshire	E38000119	16	15	19	22	15	13
	NHS North Lincolnshire	E38000122	14	11	19	23	27	24
	NHS Scarborough and Ryedale	E38000145	9	9	7	8	10	7
	NHS Vale of York	E38000188	10	15	24	35	28	25
South Yorkshire and Bassetlaw	NHS Barnsley	E38000006	17	14	13	14	21	18
	NHS Bassetlaw	E38000008	15	10	13	12	12	10
	NHS Doncaster	E38000044	28	22	21	22	25	27
	NHS Rotherham	E38000141	16	21	17	20	16	16
	NHS Sheffield	E38000146	44	40	38	41	41	33
West Yorkshire	NHS Airedale, Wharfedale and Craven	E38000001	7	8	5	6	9	7
	NHS Bradford City	E38000018	5	7	5	4		
	NHS Bradford Districts	E38000019	18	20	18	24	26	23
	NHS Calderdale	E38000025	20	20	14	15	15	14
	NHS Greater Huddersfield	E38000064	16	19	20	15	14	12
	NHS Leeds North	E38000094	13	14	7	8	5	4
	NHS Leeds South and East	E38000095	17	12	10	6	6	5
	NHS Leeds West	E38000096	24	19	16	9	8	9
	NHS North Kirklees	E38000121	12	11	12	11	12	10
	NHS Wakefield	E38000190	22	17	18	23	20	21
Arden, Herefordshire and Worcestershire	NHS Coventry and Rugby	E38000038	38	43	56	71	63	51
	NHS Herefordshire	E38000078	15	15	18	18	19	20
	NHS Redditch and Bromsgrove	E38000139	19	19	23	25	25	19
	NHS South Warwickshire	E38000164	25	22	23	19	17	25
	NHS South Worcestershire	E38000166	30	30	30	30	20	26
	NHS Warwickshire North	E38000195	22	18	23	27	24	23
	NHS Wyre Forest	E38000211	14	15	20	19	17	23
Birmingham and the Black Country	NHS Birmingham CrossCity	E38000012	68	66	66	67	66	56
	NHS Birmingham South and Central	E38000013	15	18	20	23	22	19
	NHS Dudley	E38000046	41	50	47	60	58	61
	NHS Sandwell and West Birmingham	E38000144	52	58	67	70	59	71
	NHS Solihull	E38000149	11	18	16	11	11	12
	NHS Walsall	E38000191	27	36	46	46	47	40
	NHS Wolverhampton	E38000210	26	27	29	44	38	38
Derbyshire and Nottinghamshire	NHS Erewash	E38000058	10	5	11	13	8	8
	NHS Hardwick	E38000071	12	9	8	9	8	11
	NHS Mansfield & Ashfield	E38000103	23	23	19	14	13	20
	NHS Newark & Sherwood	E38000109	17	17	26	27	22	20
	NHS North Derbyshire	E38000115	25	24	24	22	28	30
	NHS Nottingham City	E38000132	27	25	31	35	36	31
	NHS Nottingham North & East	E38000133	13	11	15	13	11	14
	NHS Nottingham West	E38000134	12	13	11	16	17	18
	NHS Rushcliffe	E38000142	13	13	12	6	5	6
	NHS Southern Derbyshire	E38000169	77	77	89	80	78	82

Table F3.3. Continued

UK Area	CCG/HB Name	Code	Prevalent numbers on home-therapies					
			2009	2010	2011	2012	2013	2014
East Anglia	NHS Cambridgeshire and Peterborough	E38000026	34	36	45	41	42	42
	NHS Great Yarmouth & Waveney	E38000063	10	14	18	15	13	13
	NHS Ipswich and East Suffolk	E38000086	38	29	24	23	24	28
	NHS North Norfolk	E38000124	19	20	16	21	15	14
	NHS Norwich	E38000131	14	12	11	10	12	16
	NHS South Norfolk	E38000159	21	15	28	26	24	19
	NHS West Norfolk	E38000203	12	13	14	8	6	8
	NHS West Suffolk	E38000204	13	12	10	17	14	13
Essex	NHS Basildon and Brentwood	E38000007	21	18	18	17	16	16
	NHS Castle Point, Rayleigh and Rochford	E38000030	9	11	11	10	10	13
	NHS Mid Essex	E38000106	24	25	21	21	20	20
	NHS North East Essex	E38000117	20	16	16	15	12	12
	NHS Southend	E38000168	10	10	11	9	12	10
	NHS Thurrock	E38000185	10	10	11	11	16	13
	NHS West Essex	E38000197	17	12	7	15	12	16
Hertfordshire and the South Midlands	NHS Bedfordshire	E38000010	21	24	27	28	28	21
	NHS Corby	E38000037	3		4	5	6	7
	NHS East and North Hertfordshire	E38000049	17	21	22	21	29	30
	NHS Herts Valleys	E38000079	14	13	10	18	24	24
	NHS Luton	E38000102	5	8	9	10	20	15
	NHS Milton Keynes	E38000107	18	19	17	16	19	15
	NHS Nene	E38000108	53	43	50	63	60	43
Leicestershire and Lincolnshire	NHS East Leicestershire and Rutland	E38000051	21	23	26	25	28	22
	NHS Leicester City	E38000097	29	31	25	31	23	27
	NHS Lincolnshire East	E38000099	24	23	21	26	33	25
	NHS Lincolnshire West	E38000100	18	22	22	20	18	24
	NHS South Lincolnshire	E38000157	7	10	12	12	14	13
	NHS South West Lincolnshire	E38000165	10	14	15	14	13	11
	NHS West Leicestershire	E38000201	31	28	29	26	30	29
Shropshire and Staffordshire	NHS Cannock Chase	E38000028	12	13	18	19	22	27
	NHS East Staffordshire	E38000053	12	18	21	18	16	17
	NHS North Staffordshire	E38000126	23	26	33	34	32	35
	NHS Shropshire	E38000147	23	20	35	35	31	34
	NHS South East Staffs and Seisdon and Peninsular	E38000153	17	19	27	27	22	18
	NHS Stafford and Surrounds	E38000173	11	21	17	23	23	23
	NHS Stoke on Trent	E38000175	21	24	27	24	27	28
	NHS Telford & Wrekin	E38000183	7	8	11	21	20	16
London	NHS Barking & Dagenham	E38000004	23	26	20	29	25	31
	NHS Barnet	E38000005	26	32	37	36	36	39
	NHS Camden	E38000027	7	8	9	11	11	13
	NHS City and Hackney	E38000035	7	13	15	19	26	21
	NHS Enfield	E38000057	19	18	22	29	30	36
	NHS Haringey	E38000072	6	5	14	23	27	26
	NHS Havering	E38000077	21	17	17	29	25	25
	NHS Islington	E38000088	6	8	11	17	19	21
	NHS Newham	E38000113	30	37	43	45	34	40
	NHS Redbridge	E38000138	47	41	29	32	37	46
	NHS Tower Hamlets	E38000186	18	22	20	24	26	27

Table F3.3. Continued

UK Area	CCG/HB Name	Code	Prevalent numbers on home-therapies					
			2009	2010	2011	2012	2013	2014
London	NHS Waltham Forest	E38000192	30	28	23	25	23	39
	NHS Brent	E38000020	6	6	6	9	13	16
	NHS Central London (Westminster)	E38000031	3	0	3	3	7	9
	NHS Ealing	E38000048	10	12	7	12	17	15
	NHS Hammersmith and Fulham	E38000070	3		4	5	4	3
	NHS Harrow	E38000074	4	7	5	9	10	9
	NHS Hillingdon	E38000082	6	7	8	9	9	11
	NHS Hounslow	E38000084	6	8	10	14	14	12
	NHS West London (Kensington and Chelsea, Queen's Park and Paddington)	E38000202	7	4	4	7	5	7
	NHS Bexley	E38000011	23	24	22	22	19	21
	NHS Bromley	E38000023	21	24	24	25	26	28
	NHS Croydon	E38000040	35	28	27	30	35	37
	NHS Greenwich	E38000066	16	20	14	13	26	23
	NHS Kingston	E38000090	13	12	13	11	10	12
	NHS Lambeth	E38000092	22	25	21	25	28	22
	NHS Lewisham	E38000098	17	19	20	23	21	23
	NHS Merton	E38000105	12	12	15	15	12	16
	NHS Richmond	E38000140	10	6	6	6	5	6
	NHS Southwark	E38000171	13	15	14	18	22	16
	NHS Sutton	E38000179	10	9	7	7	10	11
	NHS Wandsworth	E38000193	24	19	18	17	18	19
Bath, Gloucestershire, Swindon and Wiltshire	NHS Bath and North East Somerset	E38000009	5	9	6	7	8	7
	NHS Gloucestershire	E38000062	45	44	48	43	39	47
	NHS Swindon	E38000181	28	26	23	22	21	18
	NHS Wiltshire	E38000206	30	25	26	23	28	28
Bristol, North Somerset, Somerset and South Gloucestershire	NHS Bristol	E38000022	26	24	30	28	28	27
	NHS North Somerset	E38000125	23	16	16	14	12	11
	NHS Somerset	E38000150	45	48	44	42	36	44
	NHS South Gloucestershire	E38000155	16	14	14	16	18	18
Devon, Cornwall and Isles of Scilly	NHS Kernow	E38000089	53	54	49	46	49	47
	NHS North, East, West Devon	E38000129	56	62	66	60	57	63
	NHS South Devon and Torbay	E38000152	20	24	28	24	26	30
Kent and Medway	NHS Ashford	E38000002	12	12	9	9	9	7
	NHS Canterbury and Coastal	E38000029	20	26	24	19	19	18
	NHS Dartford, Gravesham and Swanley	E38000043	26	25	27	24	29	29
	NHS Medway	E38000104	16	15	10	11	13	14
	NHS South Kent Coast	E38000156	11	10	16	9	11	14
	NHS Swale	E38000180	8	6	6	10	12	15
	NHS Thanet	E38000184	14	12	17	16	14	11
	NHS West Kent	E38000199	22	24	21	16	19	20
Surrey and Sussex	NHS Brighton & Hove	E38000021	17	12	14	23	18	20
	NHS Coastal West Sussex	E38000036	45	40	29	36	34	42
	NHS Crawley	E38000039	9	9	9	8	8	9
	NHS East Surrey	E38000054	19	17	14	17	19	18
	NHS Eastbourne, Hailsham and Seaford	E38000055	17	19	23	27	31	23
	NHS Guildford and Waverley	E38000067	15	15	15	14	12	11
	NHS Hastings & Rother	E38000076	16	17	14	17	20	20

Table F3.3. Continued

UK Area	CCG/HB Name	Code	Prevalent numbers on home-therapies					
			2009	2010	2011	2012	2013	2014
Surrey and Sussex	NHS High Weald Lewes Havens	E38000081	17	12	13	13	10	9
	NHS Horsham and Mid Sussex	E38000083	17	18	23	16	15	17
	NHS North West Surrey	E38000128	13	12	20	23	26	31
	NHS Surrey Downs	E38000177	23	24	29	31	26	23
	NHS Surrey Heath	E38000178	6	5	5	7	7	10
Thames Valley	NHS Aylesbury Vale	E38000003	7	9	12	5	8	4
	NHS Bracknell and Ascot	E38000017	8	8	5	3	8	10
	NHS Chiltern	E38000033	31	28	15	11	16	16
	NHS Newbury and District	E38000110	9	7	7	11	8	9
	NHS North & West Reading	E38000114	10	9	11	9	7	8
	NHS Oxfordshire	E38000136	40	38	38	39	48	40
	NHS Slough	E38000148	21	19	20	23	19	13
	NHS South Reading	E38000160	13	15	14	13	16	17
	NHS Windsor, Ascot and Maidenhead	E38000207	10	8	14	7	7	14
	NHS Wokingham	E38000209	5	6	10	10	13	9
Wessex	NHS Dorset	E38000045	55	51	43	45	51	54
	NHS Fareham and Gosport	E38000059	15	20	19	23	17	20
	NHS Isle of Wight	E38000087	5	4	4		6	9
	NHS North East Hampshire and Farnham	E38000118	12	12	9	9	11	16
	NHS North Hampshire	E38000120	10	9	6	7	16	17
	NHS Portsmouth	E38000137	4	3	6	8	12	9
	NHS South Eastern Hampshire	E38000154	13	10	13	11	13	7
	NHS Southampton	E38000167	8	12	10	8	7	11
	NHS West Hampshire	E38000198	37	40	33	27	30	31
Wales	Betsi Cadwaladr University	W11000023	73	72	68	74	71	76
	Powys Teaching	W11000024	10	9	15	14	12	14
	Hywel Dda	W11000025	30	27	34	35	34	42
	Abertawe Bro Morgannwg University	W11000026	56	56	55	62	49	54
	Cwm Taf	W11000027	38	34	37	27	25	26
	Aneurin Bevan	W11000028	53	56	51	50	48	49
	Cardiff and Vale University	W11000029	30	26	30	19	26	30
Scotland	Ayrshire and Arran	S08000015	44	49	54	50	50	47
	Borders	S08000016	7	7	5	5	5	4
	Dumfries and Galloway	S08000017	14	8	14	17	18	18
	Fife	S08000018	30	30	31	21	23	17
	Forth Valley	S08000019	18	17	12	14	11	13
	Grampian	S08000020	32	33	26	28	32	33
	Greater Glasgow and Clyde	S08000021	47	49	52	52	42	39
	Highland	S08000022	30	29	26	30	22	22
	Lanarkshire	S08000023	23	18	18	18	21	15
	Lothian	S08000024	56	48	39	41	28	23
	Orkney	S08000025	3					
	Shetland	S08000026						
	Tayside	S08000027	20	18	15	18	17	22
	Western Isles	S08000028						3
Northern Ireland	Belfast	ZC010	15	9	13	20	19	12
	Northern	ZC020	27	24	27	29	26	22
	Southern	ZC030	26	23	21	27	28	22
	South Eastern	ZC040	17	20	21	18	17	12
	Western	ZC050	13	13	22	21	19	15

Table F3.4 Number of prevalent patients on transplant by year and CCG/HB

UK area	CCG/HB name	Code	Prevalent numbers on transplant					
			2009	2010	2011	2012	2013	2014
Cheshire, Warrington and Wirral	NHS Eastern Cheshire	E38000056	59	70	76	81	87	91
	NHS South Cheshire	E38000151	60	69	69	71	79	89
	NHS Vale Royal	E38000189	28	28	29	32	37	38
	NHS Warrington	E38000194	81	74	78	83	95	99
	NHS West Cheshire	E38000196	82	88	93	98	106	113
	NHS Wirral	E38000208	108	110	112	111	116	118
Durham, Darlington and Tees	NHS Darlington	E38000042	33	35	41	42	47	52
	NHS Durham Dales, Easington and Sedgefield	E38000047	110	112	123	126	138	150
	NHS Hartlepool and Stockton-on-Tees	E38000075	117	123	118	125	134	142
	NHS North Durham	E38000116	91	97	96	100	103	105
	NHS South Tees	E38000162	142	144	155	158	158	163
Greater Manchester	NHS Bolton	E38000016	119	127	140	149	153	161
	NHS Bury	E38000024	72	73	76	82	83	92
	NHS Central Manchester	E38000032	52	60	64	67	78	85
	NHS Heywood, Middleton & Rochdale	E38000080	82	85	93	98	104	99
	NHS North Manchester	E38000123	39	46	52	58	64	69
	NHS Oldham	E38000135	81	87	91	93	106	105
	NHS Salford	E38000143	72	81	86	98	99	106
	NHS South Manchester	E38000158	32	38	45	51	55	61
	NHS Stockport	E38000174	108	115	118	123	131	133
	NHS Tameside and Glossop	E38000182	98	104	114	116	121	130
	NHS Trafford	E38000187	66	75	80	87	93	105
	NHS Wigan Borough	E38000205	112	126	147	157	174	178
Lancashire	NHS Blackburn with Darwen	E38000014	48	49	56	60	67	73
	NHS Blackpool	E38000015	51	49	49	57	68	74
	NHS Chorley and South Ribble	E38000034	52	60	69	69	76	80
	NHS East Lancashire	E38000050	152	152	164	166	177	183
	NHS Fylde & Wyre	E38000060	56	55	57	64	69	70
	NHS Greater Preston	E38000065	63	64	66	75	79	85
	NHS Lancashire North	E38000093	51	52	53	53	55	58
	NHS West Lancashire	E38000200	34	38	40	43	43	44
Merseyside	NHS Halton	E38000068	44	49	52	57	58	63
	NHS Knowsley	E38000091	54	56	55	58	61	62
	NHS Liverpool	E38000101	152	163	176	184	196	209
	NHS South Sefton	E38000161	54	57	60	67	72	73
	NHS Southport and Formby	E38000170	29	35	36	33	40	41
	NHS St Helens	E38000172	54	59	63	64	72	82
Cumbria, Northumberland, Tyne and Wear	NHS Cumbria	E38000041	185	197	201	213	227	238
	NHS Gateshead	E38000061	77	77	84	88	87	88
	NHS Newcastle North and East	E38000111	60	61	67	63	65	70
	NHS Newcastle West	E38000112	47	44	46	48	51	52
	NHS North Tyneside	E38000127	105	114	117	117	117	111
	NHS Northumberland	E38000130	129	121	135	138	150	156
	NHS South Tyneside	E38000163	70	70	75	76	83	77
	NHS Sunderland	E38000176	113	119	129	136	142	144

Table F3.4 Continued

UK area	CCG/HB name	Code	Prevalent numbers on transplant					
			2009	2010	2011	2012	2013	2014
North Yorkshire and Humber	NHS East Riding of Yorkshire,	E38000052	118	122	127	134	154	155
	NHS Hambleton, Richmondshire and Whitby	E38000069	44	44	49	51	57	69
	NHS Harrogate and Rural District	E38000073	68	73	74	83	84	89
	NHS Hull	E38000085	92	96	101	108	118	123
	NHS North East Lincolnshire	E38000119	59	59	67	71	74	73
	NHS North Lincolnshire	E38000122	46	46	49	49	53	60
	NHS Scarborough and Ryedale	E38000145	45	48	51	49	47	51
	NHS Vale of York	E38000188	133	140	149	168	180	190
South Yorkshire and Bassetlaw	NHS Barnsley	E38000006	90	94	95	97	102	112
	NHS Bassetlaw	E38000008	33	35	35	36	37	44
	NHS Doncaster	E38000044	101	104	115	122	123	136
	NHS Rotherham	E38000141	92	102	111	117	126	140
	NHS Sheffield	E38000146	179	199	213	220	233	240
West Yorkshire	NHS Airedale, Wharfedale and Craven	E38000001	66	72	69	71	75	78
	NHS Bradford City	E38000018	31	32	33	40	45	46
	NHS Bradford Districts	E38000019	142	153	157	174	188	195
	NHS Calderdale	E38000025	89	97	104	111	110	106
	NHS Greater Huddersfield	E38000064	89	96	104	111	114	122
	NHS Leeds North	E38000094	72	76	84	87	89	98
	NHS Leeds South and East	E38000095	84	92	97	101	112	113
	NHS Leeds West	E38000096	92	102	109	125	137	150
	NHS North Kirklees	E38000121	88	89	93	94	109	122
	NHS Wakefield	E38000190	101	110	115	122	128	133
Arden, Herefordshire and Worcestershire	NHS Coventry and Rugby	E38000038	154	167	177	186	193	215
	NHS Herefordshire	E38000078	54	53	56	62	63	68
	NHS Redditch and Bromsgrove	E38000139	60	63	64	70	72	78
	NHS South Warwickshire	E38000164	93	105	106	120	125	128
	NHS South Worcestershire	E38000166	85	95	99	102	110	115
	NHS Warwickshire North	E38000195	73	77	85	84	86	86
	NHS Wyre Forest	E38000211	35	35	35	37	40	38
Birmingham and the Black Country	NHS Birmingham CrossCity	E38000012	246	260	274	292	308	332
	NHS Birmingham South and Central	E38000013	69	74	72	71	84	97
	NHS Dudley	E38000046	93	94	95	89	100	106
	NHS Sandwell and West Birmingham	E38000144	165	170	174	185	213	217
	NHS Solihull	E38000149	59	62	66	70	72	78
	NHS Walsall	E38000191	99	103	111	117	129	139
	NHS Wolverhampton	E38000210	75	76	74	79	96	103
Derbyshire and Nottinghamshire	NHS Erewash	E38000058	25	27	27	28	38	41
	NHS Hardwick	E38000071	30	31	30	30	29	35
	NHS Mansfield & Ashfield	E38000103	61	69	78	88	92	98
	NHS Newark & Sherwood	E38000109	47	53	54	60	66	71
	NHS North Derbyshire	E38000115	86	90	97	109	109	111
	NHS Nottingham City	E38000132	69	95	100	107	118	123
	NHS Nottingham North & East	E38000133	45	51	57	61	65	59
	NHS Nottingham West	E38000134	44	51	53	54	61	65
	NHS Rushcliffe	E38000142	37	37	42	44	50	47
	NHS Southern Derbyshire	E38000169	162	184	202	214	229	240

Table F3.4 Continued

UK area	CCG/HB name	Code	Prevalent numbers on transplant					
			2009	2010	2011	2012	2013	2014
East Anglia	NHS Cambridgeshire and Peterborough	E38000026	294	317	339	349	370	391
	NHS Great Yarmouth & Waveney	E38000063	64	64	67	72	92	102
	NHS Ipswich and East Suffolk	E38000086	121	133	146	147	170	176
	NHS North Norfolk	E38000124	63	62	68	63	84	81
	NHS Norwich	E38000131	52	54	59	58	76	80
	NHS South Norfolk	E38000159	84	91	86	91	113	116
	NHS West Norfolk	E38000203	57	57	58	65	68	74
	NHS West Suffolk	E38000204	76	81	83	91	92	93
Essex	NHS Basildon and Brentwood	E38000007	81	92	97	98	120	120
	NHS Castle Point, Rayleigh and Rochford	E38000030	65	62	62	64	72	85
	NHS Mid Essex	E38000106	141	148	163	159	180	183
	NHS North East Essex	E38000117	103	109	120	125	137	155
	NHS Southend	E38000168	53	60	63	71	81	87
	NHS Thurrock	E38000185	49	52	58	60	61	65
	NHS West Essex	E38000197	95	106	108	119	123	133
Hertfordshire and the South Midlands	NHS Bedfordshire	E38000010	161	172	176	200	208	225
	NHS Corby	E38000037	20	21	23	21	21	22
	NHS East and North Hertfordshire	E38000049	178	195	203	220	234	250
	NHS Herts Valleys	E38000079	194	221	234	241	258	279
	NHS Luton	E38000102	71	79	90	98	109	124
	NHS Milton Keynes	E38000107	88	98	108	116	117	133
	NHS Nene	E38000108	228	246	256	252	269	297
Leicestershire and Lincolnshire	NHS East Leicestershire and Rutland	E38000051	118	120	126	132	139	155
	NHS Leicester City	E38000097	168	168	179	187	206	226
	NHS Lincolnshire East	E38000099	77	84	85	90	97	102
	NHS Lincolnshire West	E38000100	75	75	79	82	91	97
	NHS South Lincolnshire	E38000157	34	40	40	44	44	52
	NHS South West Lincolnshire	E38000165	32	31	38	41	44	46
	NHS West Leicestershire	E38000201	145	158	168	174	182	189
Shropshire and Staffordshire	NHS Cannock Chase	E38000028	46	45	44	44	48	49
	NHS East Staffordshire	E38000053	26	29	32	31	41	41
	NHS North Staffordshire	E38000126	75	76	82	88	95	95
	NHS Shropshire	E38000147	105	107	111	106	110	114
	NHS South East Staffs and Seisdon and Peninsular	E38000153	81	90	88	85	95	101
	NHS Stafford and Surrounds	E38000173	48	48	52	55	61	66
	NHS Stoke on Trent	E38000175	99	106	105	112	112	119
	NHS Telford & Wrekin	E38000183	47	48	49	48	56	56
London	NHS Barking & Dagenham	E38000004	59	64	76	75	88	94
	NHS Barnet	E38000005	159	171	190	214	224	227
	NHS Camden	E38000027	87	90	101	107	108	109
	NHS City and Hackney	E38000035	83	87	87	91	104	117
	NHS Enfield	E38000057	143	155	174	191	198	215
	NHS Haringey	E38000072	103	111	121	132	139	153
	NHS Havering	E38000077	72	75	79	82	95	93
	NHS Islington	E38000088	97	99	107	116	122	130
	NHS Newham	E38000113	84	97	101	117	137	158
	NHS Redbridge	E38000138	101	119	126	143	151	170
	NHS Tower Hamlets	E38000186	59	72	73	83	89	104

Table F3.4 Continued

UK area	CCG/HB name	Code	Prevalent numbers on transplant					
			2009	2010	2011	2012	2013	2014
London	NHS Waltham Forest	E38000192	99	108	115	115	125	144
	NHS Brent	E38000020	173	182	187	203	226	236
	NHS Central London (Westminster)	E38000031	66	73	74	77	81	91
	NHS Ealing	E38000048	181	195	203	214	220	242
	NHS Hammersmith and Fulham	E38000070	69	77	75	78	84	88
	NHS Harrow	E38000074	158	171	171	176	178	195
	NHS Hillingdon	E38000082	134	144	159	168	170	188
	NHS Hounslow	E38000084	120	129	133	137	155	169
	NHS West London (Kensington and Chelsea, Queen's Park and Paddington)	E38000202	88	103	102	101	106	114
	NHS Bexley	E38000011	106	118	121	124	134	137
	NHS Bromley	E38000023	138	151	151	160	167	174
	NHS Croydon	E38000040	121	126	136	141	155	165
	NHS Greenwich	E38000066	85	92	101	111	121	143
	NHS Kingston	E38000090	64	65	67	73	76	82
	NHS Lambeth	E38000092	96	97	110	124	139	152
	NHS Lewisham	E38000098	108	106	109	112	134	146
	NHS Merton	E38000105	81	82	88	96	109	115
	NHS Richmond	E38000140	56	59	64	69	75	80
	NHS Southwark	E38000171	131	140	149	163	177	190
	NHS Sutton	E38000179	78	85	88	95	97	98
	NHS Wandsworth	E38000193	95	102	113	120	129	141
Bath, Gloucestershire, Swindon and Wiltshire	NHS Bath and North East Somerset	E38000009	53	51	51	52	65	72
	NHS Gloucestershire	E38000062	208	213	232	229	255	257
	NHS Swindon	E38000181	75	90	96	98	106	114
	NHS Wiltshire	E38000206	154	169	182	191	193	208
Bristol, North Somerset, Somerset and South Gloucestershire	NHS Bristol	E38000022	192	203	206	216	232	240
	NHS North Somerset	E38000125	88	95	97	104	110	110
	NHS Somerset	E38000150	193	204	221	223	234	243
	NHS South Gloucestershire	E38000155	117	122	126	128	135	135
Devon, Cornwall and Isles of Scilly	NHS Kernow	E38000089	242	248	262	283	298	310
	NHS North, East, West Devon	E38000129	366	371	377	398	429	440
	NHS South Devon and Torbay	E38000152	122	129	134	136	152	164
Kent and Medway	NHS Ashford	E38000002	54	56	59	65	65	70
	NHS Canterbury and Coastal	E38000029	76	81	86	100	102	112
	NHS Dartford, Gravesham and Swanley	E38000043	119	120	117	122	129	138
	NHS Medway	E38000104	103	110	111	117	127	130
	NHS South Kent Coast	E38000156	63	70	75	79	85	95
	NHS Swale	E38000180	45	46	57	60	67	68
	NHS Thanet	E38000184	50	56	63	74	81	86
	NHS West Kent	E38000199	161	162	169	180	191	201
Surrey and Sussex	NHS Brighton & Hove	E38000021	88	97	99	101	103	108
	NHS Coastal West Sussex	E38000036	184	189	203	202	219	230
	NHS Crawley	E38000039	28	28	31	32	32	35
	NHS East Surrey	E38000054	57	58	60	61	67	65
	NHS Eastbourne, Hailsham and Seaford	E38000055	55	58	60	62	66	68
	NHS Guildford and Waverley	E38000067	60	59	56	64	67	70
	NHS Hastings & Rother	E38000076	55	59	64	63	67	72

Table F3.4 Continued

UK area	CCG/HB name	Code	Prevalent numbers on transplant					
			2009	2010	2011	2012	2013	2014
Surrey and Sussex	NHS High Weald Lewes Havens	E38000081	54	56	57	67	68	72
	NHS Horsham and Mid Sussex	E38000083	69	73	73	74	80	92
	NHS North West Surrey	E38000128	140	143	146	154	162	168
	NHS Surrey Downs	E38000177	106	112	113	114	123	129
	NHS Surrey Heath	E38000178	43	45	48	51	48	44
Thames Valley	NHS Aylesbury Vale	E38000003	96	98	104	108	112	115
	NHS Bracknell and Ascot	E38000017	51	56	61	64	67	67
	NHS Chiltern	E38000033	127	136	135	150	159	159
	NHS Newbury and District	E38000110	57	53	60	60	61	60
	NHS North & West Reading	E38000114	35	41	41	44	50	49
	NHS Oxfordshire	E38000136	258	276	285	306	315	339
	NHS Slough	E38000148	79	86	87	91	109	116
	NHS South Reading	E38000160	55	54	55	54	58	64
	NHS Windsor, Ascot and Maidenhead	E38000207	48	57	61	71	78	83
	NHS Wokingham	E38000209	62	64	66	70	71	76
Wessex	NHS Dorset	E38000045	297	305	311	309	316	333
	NHS Fareham and Gosport	E38000059	78	78	81	80	92	96
	NHS Isle of Wight	E38000087	47	49	50	52	49	49
	NHS North East Hampshire and Farnham	E38000118	68	76	76	80	86	94
	NHS North Hampshire	E38000120	69	72	78	81	84	88
	NHS Portsmouth	E38000137	67	77	77	80	85	85
	NHS South Eastern Hampshire	E38000154	81	87	85	91	94	107
	NHS Southampton	E38000167	80	79	90	98	108	117
	NHS West Hampshire	E38000198	206	218	225	231	240	244
Wales	Betsi Cadwaladr University	W11000023	240	250	250	246	236	248
	Powys Teaching	W11000024	50	55	54	47	50	51
	Hywel Dda	W11000025	155	154	165	163	187	189
	Abertawe Bro Morgannwg University	W11000026	234	255	284	299	313	319
	Cwm Taf	W11000027	168	186	196	203	219	216
	Aneurin Bevan	W11000028	270	289	302	337	346	350
	Cardiff and Vale University	W11000029	196	211	223	238	244	242
Scotland	Ayrshire and Arran	S08000015	149	147	144	154	162	173
	Borders	S08000016	46	53	53	60	62	63
	Dumfries and Galloway	S08000017	55	55	60	59	59	66
	Fife	S08000018	116	122	132	138	150	154
	Forth Valley	S08000019	89	95	103	111	119	133
	Grampian	S08000020	210	216	224	235	254	257
	Greater Glasgow and Clyde	S08000021	473	482	500	552	594	624
	Highland	S08000022	149	155	154	155	162	170
	Lanarkshire	S08000023	253	266	279	301	314	344
	Lothian	S08000024	280	295	309	318	327	348
	Orkney	S08000025	9	8	8	8	8	6
	Shetland	S08000026	6	6	5	6	6	6
	Tayside	S08000027	168	167	172	175	184	189
	Western Isles	S08000028	7	7	8	8	8	8
Northern Ireland	Belfast	ZC010	122	134	138	150	160	178
	Northern	ZC020	159	167	174	179	193	213
	Southern	ZC030	106	112	126	142	153	171
	South Eastern	ZC040	125	126	136	138	147	163
	Western	ZC050	97	103	105	107	130	155

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UK Renal Registry 18th Annual Report: Appendix G UK Renal Registry dataset specification

This appendix is available on the UK Renal Registry website only. The current version of this document can be found under the downloads menu at www.renalreg.org/datasets/the-uk-renal-registry-dataset/.

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UK Renal Registry 18th Annual Report: Appendix H Coding: Ethnicity, EDTA Primary Renal Diagnoses, EDTA Causes of Death

H1: Ethnicity coding

In some renal centres ethnicity data is recorded in the clinical information systems in the individual renal centres in the format of 9S. . . read codes. In other centres it is extracted from local PAS systems in a different format and should be recoded to the 9S. . . format by the centre, before being sent to the UK Renal Registry (UKRR). For report analyses, ethnic categories are condensed into five groups (White, South Asian, Black, Chinese and Other). For some analyses Chinese are grouped into Other.

Read code	Ethnic category	Assigned group	Old PAS	New PAS
9S1..	White	White	0	A1
9SA9.	Irish (NMO)	White		B1
9SAA.	Greek Cypriot (NMO)	White		CG
9SAB.	Turkish Cypriot (NMO)	White		CJ
9SAC.	Other European (NMO)	White		C1
9S6..	Indian	S Asian	4	H1
9S7..	Pakistani	S Asian	5	J1
9S8.	Bangladeshi	S Asian	6	K1
9SA6.	East African Asian	S Asian		
9SA7.	Indian Subcontinent	S Asian		
9SA8.	Other Asian	S Asian		L1
9S2..	Black Caribbean	Black	1	M1
9S3..	Black African	Black	2	N1
9S4..	Black/Other/non-mixed origin	Black	3	P1
9S41.	Black British	Black		PD
9S42.	Black Caribbean	Black		
9S43.	Black North African	Black		
9S44.	Black other African country	Black		
9S45.	Black East African Asian	Black		
9S46.	Black Indian subcontinent	Black		
9S47.	Black Other Asian	Black		
9S48.	Black Black Other	Black		PE
9S5..	Black other/mixed	Black		
9S51.	Other Black Black/White origin	Black		GC
9S52.	Other Black – Black/Asian origin	Black		GA
9S9..	Chinese	Chinese	7	R1
9T1C.	Chinese	Chinese		
9SA..	Other ethnic non-mixed (NMO)	Other		
9SA1.	British ethnic minority specified (NMO)	Other		

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Read code	Ethnic category	Assigned group	Old PAS	New PAS
9SA2.	British ethnic minority unspecified (NMO)	Other		
9SA3.	Caribbean Island (NMO)	Other		
9SA4.	North African Arab (NMO)	Other		
9SA5.	Other African countries (NMO)	Other		
9SAD.	Other ethnic NEC (NMO)	Other		S1
9SB..	Other ethnic/mixed origin	Other	8	
9SB1.	Other ethnic/Black/White origin	Other		E1
9SB2.	Other ethnic/Asian/White origin	Other		F1
9SB3.	Other ethnic/mixed White origin	Other		
9SB4.	Other ethnic/Other mixed origin	Other		G1

NMO denotes non-mixed origin

H2: EDTA primary renal diagnoses

New primary renal diagnosis codes (PRD) were produced in 2012 [1]. The data used for this report included a mixture of old and new ERA-EDTA codes. The split was about 50:50 for 2014 incident patients. For those people without an old code, new codes (where available) were mapped back to old codes using the mapping available on the ERA-EDTA website. As recommended in the notes for users in the ERA-EDTA's PRD code list document the mapping of new to old codes is provided for guidance only and has not been validated; therefore care must be taken not to over interpret data from this mapping.

The old codes (both those received from centres and those mapped back from new codes) were then grouped into the same eight categories as in previous reports as shown in the table below.

EDTA code	Title	UKRR category
0	Chronic renal failure; aetiology uncertain unknown/unavailable	Uncertain
10	Glomerulonephritis; histologically NOT examined	Glomerulonephritis*
11	Focal segmental glomerulosclerosis with nephrotic syndrome in children	Glomerulonephritis
12	IgA nephropathy (proven by immunofluorescence, not code 76 and not 85)	Glomerulonephritis
13	Dense deposit disease; membrano-proliferative GN; type II (proven by immunofluorescence and/or electron microscopy)	Glomerulonephritis
14	Membranous nephropathy	Glomerulonephritis
15	Membrano-proliferative GN; type I (proven by immunofluorescence and/or electron microscopy – not code 84 or 89)	Glomerulonephritis
16	Crescentic (extracapillary) glomerulonephritis (type I, II, III)	Glomerulonephritis
17	Focal segmental glomerulosclerosis with nephrotic syndrome in adults	Glomerulonephritis
19	Glomerulonephritis; histologically examined, not given above	Glomerulonephritis
20	Pyelonephritis – cause not specified	Pyelonephritis
21	Pyelonephritis associated with neurogenic bladder	Pyelonephritis
22	Pyelonephritis due to congenital obstructive uropathy with/without vesico-ureteric reflux	Pyelonephritis
23	Pyelonephritis due to acquired obstructive uropathy	Pyelonephritis
24	Pyelonephritis due to vesico-ureteric reflux without obstruction	Pyelonephritis
25	Pyelonephritis due to urolithiasis	Pyelonephritis
29	Pyelonephritis due to other cause	Pyelonephritis
30	Interstitial nephritis (not pyelonephritis) due to other cause, or unspecified (not mentioned above)	Other
31	Nephropathy (interstitial) due to analgesic drugs	Other
32	Nephropathy (interstitial) due to cis-platinum	Other
33	Nephropathy (interstitial) due to cyclosporin A	Other
34	Lead induced nephropathy (interstitial)	Other
39	Drug induced nephropathy (interstitial) not mentioned above	Other
40	Cystic kidney disease – type unspecified	Polycystic
41	Polycystic kidneys; adult type (dominant)	Polycystic
42	Polycystic kidneys; infantile (recessive)	Polycystic
43	Medullary cystic disease; including nephronophtisis	Other

EDTA code	Title	UKRR category
49	Cystic kidney disease – other specified type	Other
50	Hereditary/Familial nephropathy – type unspecified	Other
51	Hereditary nephritis with nerve deafness (Alport's Syndrome)	Other
52	Cystinosis	Other
53	Primary oxalosis	Other
54	Fabry's disease	Other
59	Hereditary nephropathy – other specified type	Other
60	Renal hypoplasia (congenital) – type unspecified	Other
61	Oligomeganephronic hypoplasia	Other
63	Congenital renal dysplasia with or without urinary tract malformation	Other
66	Syndrome of agenesis of abdominal muscles (Prune Belly)	Other
70	Renal vascular disease – type unspecified	Renal vascular disease
71	Renal vascular disease due to malignant hypertension	Hypertension
72	Renal vascular disease due to hypertension	Hypertension
73	Renal vascular disease due to polyarteritis	Renal vascular disease
74	Wegener's granulomatosis	Other
75	Ischaemic renal disease/cholesterol embolism	Renal vascular disease
76	Glomerulonephritis related to liver cirrhosis	Other
78	Cryoglobulinemic glomerulonephritis	Other
79	Renal vascular disease – due to other cause (not given above and not code 84-88)	Renal vascular disease
80	Type 1 diabetes with diabetic nephropathy	Diabetes
81	Type 2 diabetes with diabetic nephropathy	Diabetes
82	Myelomatosis/light chain deposit disease	Other
83	Amyloid	Other
84	Lupus erythematosus	Other
85	Henoch-Schoenlein purpura	Other
86	Goodpasture's syndrome	Other
87	Systemic sclerosis (scleroderma)	Other
88	Haemolytic Ureaemic Syndrome (including Moschcowitz syndrome)	Other
89	Multi-system disease – other (not mentioned above)	Other
90	Tubular necrosis (irreversible) or cortical necrosis (different from 88)	Other
91	Tuberculosis	Other
92	Gout nephropathy (urate)	Other
93	Nephrocalcinosis and hypercalcaemic nephropathy	Other
94	Balkan nephropathy	Other
95	Kidney tumour	Other
96	Traumatic or surgical loss of kidney	Other
98	Not known	Missing
99	Other identified renal disorders	Other
199	Code not sent	Missing

*Prior to the 15th Annual Report categorised as 'uncertain'

H3: EDTA cause of death

EDTA code	Cause	UKRR category
0	Cause of death uncertain/not determined	Uncert
11	Myocardial ischaemia and infarction	Heart
12	Hyperkalaemia	Other
13	Haemorrhagic pericarditis	Other
14	Other causes of cardiac failure	Heart
15	Cardiac arrest/sudden death; other cause or unknown	Heart
16	Hypertensive cardiac failure	Heart
17	Hypokalaemia	Other
18	Fluid overload/pulmonary oedema	Heart
21	Pulmonary embolus	Other

EDTA code	Cause	UKRR category
22	Cerebro-vascular accident, other cause or unspecified	CVA
23	Gastro-intestinal haemorrhage (digestive)	Other
24	Haemorrhage from graft site	Other
25	Haemorrhage from vascular access or dialysis circuit	Other
26	Haemorrhage from ruptured vascular aneurysm (not code 22 or 23)	Other
27	Haemorrhage from surgery (not codes 23,24,26)	Other
28	Other haemorrhage, (not codes 2327)	Other
29	Mesenteric infarction	Other
31	Pulmonary infection bacterial (not code 73)	Infect
32	Pulmonary infection (viral)	Infect
33	Pulmonary infection (fungal or protozoal; parasitic)	Infect
34	Infections elsewhere except viral hepatitis	Infect
35	Septicaemia	Infect
36	Tuberculosis (lung)	Infect
37	Tuberculosis (elsewhere)	Infect
38	Generalized viral infection	Infect
39	Peritonitis (all causes except for peritoneal dialysis)	Infect
41	Liver disease due to hepatitis B virus	Other
42	Liver disease due to other viral hepatitis	Other
43	Liver disease due to drug toxicity	Other
44	Cirrhosis not viral (alcoholic or other cause)	Other
45	Cystic liver disease	Other
46	Liver failure cause unknown	Other
47	Patient refused further treatment for end stage renal failure (ESRF)	Trt_stop
51	Patient refused further treatment for end stage renal failure (ESRF)	Trt_stop
52	Suicide	Other
53	ESRF treatment ceased for any other reason	Trt_stop
54	ESRF treatment withdrawn for medical reasons	Trt_stop
61	Uraemia caused by graft failure	Trt_stop
62	Pancreatitis	Other
63	Bone marrow depression (Aplasia)	Other
64	Cachexia	Other
66	Malignant disease in patient treated by immunosuppressive therapy	Malignant
67	Malignant disease: solid tumours except those of 66	Malignant
68	Malignant disease: lymphoproliferative disorders (Except 66)	Malignant
69	Dementia	Other
70	Peritonitis (sclerosing, with peritoneal dialysis)	Other
71	Perforation of peptic ulcer	Other
72	Perforation of colon	Other
73	Chronic obstructive pulmonary disease	Other
81	Accident related to ESRF treatment (not 25)	Other
82	Accident unrelated to ESRF treatment	Other
90	Uraemia caused by graft failure	Trt_stop
99	Other identified cause of death	Other*
100	Peritonitis (bacterial, with peritoneal dialysis)	Infect
101	Peritonitis (fungal, with peritoneal dialysis)	Infect
102	Peritonitis (due to other cause, with peritoneal dialysis)	Infect

*Prior to the 15th Annual Report categorised as 'uncertain'

Reference

1 Venkat-Raman G et al. New Primary diagnosis codes for the ERA-EDTA. Nephrol Dial Transplant 2012;27(12):4414–9

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UK Renal Registry 18th Annual Report: Appendix I Acronyms and Abbreviations used in the Report

AAB	Academic Affairs Board (Renal Association)
ACE (inhibitor)	Angiotensin converting enzyme (inhibitor)
AKI	Acute kidney injury
ANZDATA	Australia and New Zealand Dialysis and Transplant Registry
APD	Automated peritoneal dialysis
ADPKD	Autosomal dominant polycystic kidney disease
APKD	Adult polycystic kidney disease
ATTOM	Access to transplant and transplant outcome measures
AV	Arteriovenous
AVF	Arteriovenous fistula
AVG	Arteriovenous graft
BAPN	British Association of Paediatric Nephrology
BCG	Bromocresol green
BCP	Bromocresol purple
Bicarb	Bicarbonate
BMD	Bone mineral disease
BMI	Body mass index
BP	Blood pressure
BSI	Blood stream infection
BTS	British Transplant Society
Ca	Calcium
CAB	Clinical Affairs Board (Renal Association)
CABG	Coronary artery bypass grafting
CAPD	Continuous ambulatory peritoneal dialysis
CCG	Clinical Commissioning Group
CCL	Clinical Computing Limited
CCPD	Cycling peritoneal dialysis
CDI	Clostridium difficile infection
Chol	Cholesterol
CHr	Target reticulocyte Hb content
CI	Confidence interval
CK	Creatine kinase
CKD	Chronic kidney disease
CKD-EPI	Chronic kidney disease epidemiology collaboration
CK-MB	Creatine kinase isoenzyme MB
COPD	Chronic obstructive pulmonary disease
Creat	Creatinine
CRF	Chronic renal failure
cRF	Calculated HLA antibody reaction frequency
CRP	C-reactive protein
CRVF	Cardiovascular risk factor

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CVVH	Continuous veno-venous haemofiltration
CXR	Chest x-ray
DBP	Diastolic blood pressure
DCCT	Diabetes Control and Complications Trial
DH	Department of Health
DM	Diabetes mellitus
DOB	Date of birth
DOPPS	Dialysis Outcomes and Practice Patterns Study
E & W	England and Wales
E, W & NI	England, Wales and Northern Ireland
EBPG	European Best Practice Guidelines
ECG	Electrocardiogram
EDTA	European Dialysis and Transplant Association
EF	Error factor
eGFR	Estimated glomerular filtration rate
E_i	Expected cases in area i
ECD	Extended Criteria Donor
EDTA	European Dialysis and Transplant Association
eKt/V	Equilibrated Kt/V
EPO	Erythropoietin
ERA	European Renal Association
ERA-EDTA	European Renal Association – European Dialysis and Transplant Association
ERF	Established renal failure
ESA	Erythropoiesis stimulating agent
ESRD	End stage renal disease
ESRF	End stage renal failure
EWNI	England, Wales and Northern Ireland
Ferr	Ferritin
FEV1	Forced expiratory volume in 1 second
FVC	Forced vital capacity
GFR	Glomerular filtration rate
GH	Growth hormone
GN	Glomerulonephritis
HA	Health Authority
HB	Health board
Hb	Haemoglobin
HbA1c	Glycated Haemoglobin
HBeAg	Hepatitis B e antigen
HCAI-DCS	Healthcare-associated infection data collection system
HD	Haemodialysis
HDF	Haemodialysis filtration
HDL	High-density lipoprotein
HLA	Human leucocyte antigen
HPA	Health Protection Agency
HQIP	Health Quality Improvement Partnership
HR	Hazard ratio
HRC	Hypochromic red blood cells
Ht	Height
ICU	Intensive care unit
IDMS	Isotope dilution mass spectrometry
IDOPPS	International Dialysis Outcomes and Practice Patterns Study
IFCC	International Federation of Clinical Chemistry & Laboratory Medicine
IHD	Ischaemic heart disease
IMD	Index of Multiple Deprivation
IOTF	International Obesity Taskforce
IPD	Intermittent peritoneal dialysis
IQR	Inter-quartile range
ISPD	International Society for Peritoneal Dialysis
IT	Information technology
IU	International units

IV	Intra venous
KDIGO	Kidney Disease: Improving Global Outcomes
KDOQI	Kidney Disease Outcomes Quality Initiative
KM	Kaplan Meier
Kt/V	Ratio between the product of urea clearance (K, in ml/min) and dialysis session duration (t, in minutes) divided by the volume of distribution of urea in the body (V, in ml)
LA	Local Authority
LCL	Lower confidence limit
LDL	Low-density lipoprotein
LTFU	Lost to follow-up
M:F	Male:Female
MAP	Mean arterial blood pressure
MDRD	Modification of diet in renal disease
MI	Myocardial infarction
MMF	Mycophenolate mofetil
MRSA	Methicillin resistant Staphylococcal aureus
MSSA	Methicillin sensitive Staphylococcal aureus
N	Number
N Ireland	Northern Ireland
NE	North East
NEQAS	UK National External Quality Assessment Scheme
NHBPEP	National high blood pressure education programme
NHS	National Health Service
NHS BT	National Health Service Blood and Transplant
NI	Northern Ireland
NICE	National Institute for Health and Care Excellence
NISRA	Northern Ireland Statistic and Research Agency
NMO	Non-mixed origin
NRS	National Records of Scotland
NSF	National service framework
NTC	Non-tunnelled dialysis catheter
NTL	Non-tunnelled line
NW	North West
O/E	Observed/expected
ODT	Organ Donation and Transplantation (a Directorate of NHS Blood and transplant)
O_i	Observed cases in area i
ONS	Office for National Statistics
ONSPD	ONS postcode directory
OR	Odds ratio
PAS	Patient Administration System
PCT	Primary Care Trust
PD	Peritoneal dialysis
PEx	Plasma exchange
PHE	Public Health England
Phos	Phosphate
PIAG	Patient Information Advisory Group
PKD	Polycystic kidney disease
PMARP	Per million age related population
PMCP	Per million child population
PMP	Per million population
PP	Pulse pressure
PRD	Primary renal disease
PTH	Parathyroid hormone
PUV	Posterior urethral valves
PVD	Peripheral vascular disease
QOF	Quality and Outcomes Framework
QUEST	Quality European Studies
RA	Renal Association
rhGH	Recombinant human growth hormone
RI	Royal Infirmary

RNSF	Renal National Service Framework (or NSF)
RR	Relative risk
RRDSS	Renal Registry data set specification
RRT	Renal replacement therapy
RVD	Renovascular disease
SAR	Standardised acceptance ratio (= O/E)
SAS	Statistical Analysis System
SBP	Systolic blood pressure
SD	Standard deviation
SES	Socio-economic status
SHA	Strategic health authority
SHARP	Study of Heart and Renal Protection
SI	System International (units)
SMR	Standardised mortality ratios
spKt/V	Single pool Kt/V
SPC	Statistical process control
SR	Standardised ratio (used to cover either SAR or SPR)
SRR	Scottish Renal Registry
SUS	Secondary uses service
SW	South West
TC	Tunnelled dialysis catheter
TL	Tunnelled line
TSAT	Transferrin saturation
TWL	Transplant waiting list
Tx	Transplant
UCL	Upper confidence limit
UK	United Kingdom
UKRR	UK Renal Registry
UKT	UK Transplant (now ODT)
URR	Urea reduction ratio
US	United States
USA	United States of America
USRDS	United States Renal Data System
WHO	World health organization
Wt	Weight

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UK Renal Registry 18th Annual Report: Appendix J Laboratory Conversion Factors

	Conversion factors from SI units
Albumin	g/dl = g/L × 0.1
Aluminium	μg/L = μmol/L × 27.3
Bicarbonate	mg/dl = mmol/L × 6.1
Calcium	mg/dl = mmol/L × 4
Calcium × phosphate	$mg^2/dl^2 = mmol^2/L^2 \times 12.4$
Cholesterol	mg/dl = mmol/L × 38.6
Creatinine	mg/dl = μmol/L × 0.011
Glucose	mg/dl = mmol/L × 18.18
Phosphate	mg/dl = mmol/L × 3.1
PTH	ng/L = pmol/L × 9.5
Urea	mg/dl = mmol/L × 6.0
Urea nitrogen	mg/dl = mmol/L × 2.8

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UK Renal Registry 18th Annual Report: Appendix K Renal Centre Names and Abbreviations used in the Figures and Data Tables

Adult Centres

City	Hospital	Abbreviation
England		
Basildon	Basildon Hospital	Basldn
Birmingham	Heartlands Hospital	B Heart
Birmingham	Queen Elizabeth Hospital	B QEH
Bradford	St Luke's Hospital	Bradfd
Brighton	Royal Sussex County Hospital	Brightn
Bristol	Southmead Hospital	Bristol
Cambridge	Addenbrooke's Hospital	Camb
Carlisle	Cumberland Infirmary	Carlis
Carshalton	St Helier Hospital	Carsh
Chelmsford	Broomfield Hospital	Chelms
Colchester	Colchester General Hospital	Colchr
Coventry	University Hospital Coventry	Covnt
Derby	Royal Derby Hospital	Derby
Doncaster	Doncaster Royal Infirmary	Donc
Dorset	Dorset County Hospital	Dorset
Dudley	Russells Hall Hospital	Dudley
Exeter	Royal Devon and Exeter Hospital	Exeter
Gloucester	Gloucestershire Royal Hospital	Glouc
Hull	Hull Royal Infirmary	Hull
Ipswich	Ipswich Hospital	Ipswi
Kent	Kent and Canterbury Hospital	Kent
Leeds	St James's University Hospital and Leeds General Infirmary	Leeds
Leicester	Leicester General Hospital	Leic
Liverpool	Aintree University Hospital	Liv Ain
Liverpool	Royal Liverpool University Hospital	Liv Roy
London	St. Bartholomew's Hospital and The Royal London Hospital	L Barts
London	St George's Hospital and Queen Mary's Hospital	L St. G
London	Guy's Hospital and St Thomas' Hospital	L Guys
London	Hammersmith, Charing Cross,St Mary's	L West
London	King's College Hospital	L Kings
London	Royal Free, Middlesex and UCL Hospitals	L Rfree
Manchester	Manchester Royal Infirmary	M RI
Middlesbrough	The James Cook University Hospital	Middlbr
Newcastle	Freeman Hospital and Royal Victoria Infirmary	Newc
Norwich	Norfolk and Norwich University Hospital	Norwch

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City	Hospital	Abbreviation
Nottingham	Nottingham City Hospital	Nottm
Oxford	John Radcliffe Hospital and Churchill Hospital	Oxford
Plymouth	Derriford Hospital	Plymth
Portsmouth	Queen Alexandra Hospital	Ports
Preston	Royal Preston Hospital	Prestn
Reading	Royal Berkshire Hospital	Redng
Salford	Salford Royal Hospital	Salford
Sheffield	Northern General Hospital	Sheff
Shrewsbury	Royal Shrewsbury Hospital	Shrew
Southend	Southend Hospital	Sthend
Stevenage	Lister Hospital	Stevng
Stoke	Royal Stoke University Hospital	Stoke
Sunderland	Sunderland Royal Hospital	Sund
Truro	Royal Cornwall Hospital	Truro
Wirral	Arrowe Park Hospital	Wirral
Wolverhampton	New Cross Hospital	Wolve
York	The York Hospital	York
Wales		
Bangor	Ysbyty Gwynedd	Bangor
Cardiff	University Hospital of Wales	Cardff
Clwyd	Glan Clwyd Hospital	Clwyd
Swansea	Morriston Hospital	Swanse
Wrexham	Wrexham Maelor Hospital	Wrexm
Scotland		
Aberdeen	Aberdeen Royal Infirmary	Abrdn
Airdrie	Monklands Hospital	Airdrie
Dumfries	Dumfries & Galloway Royal Infirmary	D & Gall
Dundee	Ninewells Hospital	Dundee
Edinburgh	Royal Infirmary of Edinburgh	Edinb
Glasgow	Queen Elizabeth University Hospital, Glasgow Royal Infirmary and Stobhill Hospitals	Glasgw
Inverness	Raigmore Hospital	Inverns
Kilmarnock	University Hospital Crosshouse	Klmarnk
Kirkcaldy	Victoria Hospital	Krkcldy
Northern Ireland		
Antrim	Antrim Area Hospital	Antrim
Belfast	Belfast City Hospital	Belfast
Londonderry & Omagh	Altnagelvin Area and Tyrone County Hospitals	West NI
Newry	Daisy Hill Hospital	Newry
Ulster	Ulster Hospital	Ulster

Paediatric Centres

City	Hospital	Abbreviation	Country
Belfast	Royal Belfast Hospital for Sick Children	Blfst_P	N Ireland
Birmingham	Birmingham Children's Hospital	Bham_P	England
Bristol	Bristol Royal Hospital for Children	Brstl_P	England
Cardiff	KRUF Children's Kidney Centre	Cardf_P	Wales
Glasgow	Royal Hospital for Children	Glasg_P	Scotland
Leeds	Leeds Children's Hospital	Leeds_P	England
Liverpool	Alder Hey Children's Hospital	Livpl_P	England
London	Guy's Hospital – Paediatric	L Eve_P	England
London	Great Ormond Street Hospital for Children	LGOSH_P	England
Manchester	Royal Manchester Children's Hospital	Manch_P	England
Newcastle	Great North Children's Hospital	Newc_P	England
Nottingham	Nottingham Children's Hospital	Nottm_P	England
Southampton	Southampton General Hospital – Paediatric	Soton_P	England