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Foreword

Welcome to the Renal Registry report for 2012. Although the renal community has become used to the annual publication of this document, we should not take it for granted. The huge effort that goes into production of the report places nephrology ahead of most other specialties in terms of national audit. We should be proud of what our registry has achieved in its short history. A recent article in the BMJ, which discussed publication of information on the performance of doctors and institutions since the Bristol inquiry into paediatric cardiac surgery, praised our efforts [1]. Benchmarking against the achievements of the cardiothoracic surgeons, the author notes "so far, other specialities have been reluctant to follow suit" but goes on to state that "Nephrology is the notable exception", describing how we publish our outcomes on adequacy of dialysis, haemoglobin and blood pressure to allow "clinical staff, commissioners and patients to… see how their renal centre is performing [against] specific national targets". This culture of transparency is likely to be driven forward by public and patient pressure to improve quality of care in the light of the Francis enquiry.

In our speciality, we teach our patients to be interested in their "numbers" and to track these on Renal Patient View, but blood test results are often somewhat peripheral to the patient experience. The drive to collect patient reported outcome/experience measures (PROMs and PREMs) follows publication of a report entitled "High Quality Care for All – NHS Next Stage Review" by Lord Darzi. As usual, the Registry is ahead of the game and will shortly be conducting a pilot study to assess the feasibility and cost of collecting these measures in the dialysis population. Other Registry projects include collection of data in stage 4–5 CKD patients, which will allow us to gain a better picture of what happens to patients with end-stage kidney disease, particularly those who, for whatever reason, do not get offered or decline renal replacement therapy. The establishment of Renal RaDaR, the national registry for rare kidney disease, is progressing well and has already proven to be of value in supporting research projects. As these activities progress, we can look forward to a broader dataset being published in future annual reports. We can also expect more timely reporting. According to current projections, we will also be seeing the 2013 report published before the end of this calendar year.

On behalf of the Renal Association, I would like to thank all those who have contributed towards collecting, processing, analysing and publishing the data contained in this 2012 report. This is, of course, a huge collaborative effort involving all renal units in the UK, but special thanks must go to the team in Bristol. The Registry has certainly come a long way in the last 20 years and we can expect some exciting times ahead.

David Wheeler
President, Renal Association

1 Tavere A, Measure your team's performance, and publish the results. BMJ 2012;345:e4464

Chapters and appendices

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UK Renal Registry 15th Annual Report: Introduction

Ron Cullen, Damian Fogarty

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The UK Renal Registry (UKRR) continues to build on its established role as the national source of NHS healthcare data on patients dependent on renal replacement therapy (RRT) across the four nations. Using electronic reporting and substantial integration with the 71 adult and 13 paediatric renal centres the UKRR provides independent audit and analysis of dialysis and transplant activity and care across the UK. The Registry is part of the UK Renal Association and is funded directly by participating renal centres through an annual capitation fee per patient per annum, currently £19. The UKRR remains relatively unique amongst renal registries in publishing both centre-specific analyses of indicators of quality of care, such as haemoglobin and also age-adjusted survival statistics for each renal centre. Details of how the UKRR extracts, analyses and reports on data for patients on RRT have been described previously [1].

This year data on 53,207 adult patients and 856 children and young people (<18 years) receiving RRT in the UK at the end of December 2011 were analysed. This represents an increase of 4% from last years report and indeed since the new millennia started the UK prevalence of RRT has grown from 523 per million of the UK population to 842 per million population (pmp). This substantial increase represents increased investment in renal services as it is now well recognised that RRT, although often traumatic for individuals, offers a life-line to those with a range of conditions that cause end-stage renal or kidney failure. Some of this increase is also down to increasing survival of our patients often when managed across a range of specialties and of course primary care. In addition there is now greater recognition that older patients can and do tolerate dialysis and transplantation; elderly patients aged over 85 accepted onto RRT nearly doubled between 2006 and 2011. Finally, some of the increase in prevalent numbers noted above is due to increased acceptance of new incident patients as reported in chapter 2. *Please pay particular attention to your catchment area rates as these often are helpful in local service development and reconfigurations.*

The data derives from quarterly reports from each of the 71 adult renal centres, whereas in previous reports there have been 72. This is due to a merging of the Derry and Tyrone renal centres in the Western Health and Social Care Board area of Northern Ireland. This report contains analyses of data related to patient care up to the end of 2011. Although this may appear somewhat dated it is only possible to collect the last quarter's data for 2011 in April 2012 to reflect the definition of ESRD needed to differentiate acute dialysis from those on long-term renal replacement therapy.

Completeness of data returns from UK renal centres

Table 1 shows the completeness of some key items over five years. In contrast to elsewhere in this report, the 2007 to 2010 columns show the percentages as they were published in previous reports rather than as the

Table 1. Percentage completeness of data returns for ethnicity, date first seen by a nephrologist and comorbidity (all for incident patients, E, W & NI) and cause of death (for deaths in 2011 amongst incident or existing patients, UK)

	2007	2008	2009	2010	2011
Ethnicity	75.9	73.2	77.0	94.3	92.9
Date first seen	34.7	42.3	39.9	76.9	80.6
Comorbidity	40.0	40.0	44.4	49.1	52.0
Cause of death	35.7	38.4	42.2	60.1	65.2

data stands now. This is because the work on improving data collection and validation has also improved the 'historical' completeness, e.g. more information on date first seen for incident patients in 2009 is now available than when it was published in the relevant report. Large improvements were seen from the 2009 to the 2010 data for ethnicity, date first seen and cause of death and these improvements have enabled better and more comprehensive analyses. However, data were still incomplete and as there were only small further improvements from 2010 to 2011, this remains the case. Completeness continues to be particularly low for comorbidity at the start of RRT. These deficiencies limit the UKRR's ability to perform analyses that are fully adjusted for case-mix; it is of major importance that returns of these data items are improved.

Table 2 gives centre level completeness of data returns on ethnic origin, primary renal diagnosis, date first seen by a nephrologist and comorbidity at the start of RRT in 2011, and also for cause of death for deaths in 2011. There were many centres with good completeness but there were also a number of centres which had very poor completeness for one or more data items.

Data collection and validation

As stated in recent reports, the UKRR continues to review the processes used for collection and validation of data and its communications with renal centres. Last year an extensive review inevitably meant some delay in processing 2010 and 2011 data. At the time of writing (May 2012), 75% of the 2012 data has been submitted and validated by centres and UKRR staff and the UKRR are on schedule to publish the 2013 Report in December 2013. It remains our intention to publish data following initial validation on the data portal (www.renalreg.com).

The Registry is also running a project to pilot a new way to retrieve data from renal centres, perhaps on a more frequent basis akin to how Renal PatientView uploads laboratory and other data. Dr Keith Simpson is leading this work and if successful this would facilitate the production of timely interim audit reports pending publication of the detailed annual analysis.

Interpretation of centre-specific survival comparisons

The Registry 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 'significant difference' between the highest achiever of a standard and the lowest achiever, as these centres were not identified in advance of looking at the data and statistically this approach can be invalid. As in previous reports, the 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 adjustment cannot be made for the range of factors known to influence the measured variable. This is the major reason behind the requests for the return of additional data items such as ethnicity, primary renal disease and comorbidity. The major use of these items would be in the reporting of mortality outcomes for RRT patients. For a number of years de-anonymised centre specific reports on survival of RRT patients have been published. This has taken on significant gravitas given the Francis Enquiry of patient care and outcomes at the Mid-Staffordshire Hospital. Last year, letters were sent to six centres with lower than expected survival at one year for patients on RRT, this year, letters were required for only three centres. Experience of this process suggests that these centres are often taking on cohorts of patients that may be sicker than some of their benchmarked peers but can only assess this if the data to support this contention is available, hence the critical importance in getting other data items such as comorbidity. As centres push the boundaries of their practice and perhaps offer RRT to sicker patients than in previous times (quoted examples

Table 2. Percentage completeness of data returns for ethnicity, primary renal diagnosis, date first seen by a nephrologist and comorbidity at the start of RRT (incident patients 2011) and for cause of death (for deaths in 2011 amongst incident or existing patients)

Centre	Ethnicity	Primary diagnosis	Date first seen	Comorbidity	Cause of death	Average completeness	Country
Newry	100.0	100.0	100.0	100.0	100.0	100.0	N Ireland
Nottm	100.0	100.0	97.4	98.3	100.0	99.1	England
Dorset	100.0	100.0	100.0	100.0	94.9	99.0	England
Ulster	100.0	100.0	100.0	97.1	95.2	98.5	N Ireland
Middlbr	99.0	98.0	99.0	98.0	97.5	98.3	England
Bradfd	100.0	100.0	98.2	94.8	97.6	98.1	England
Leeds	98.8	99.4	97.4	95.6	99.1	98.1	England
L Kings	97.8	100.0	96.4	98.6	96.4	97.8	England
Kent	92.7	99.2	100.0	100.0	96.2	97.6	England
Wolve	97.3	98.7	100.0	96.0	94.1	97.2	England
Sund	98.2	100.0	94.5	98.2	95.1	97.2	England
B Heart	99.1	100.0	97.2	92.9	96.1	97.0	England
Wrexm	100.0	100.0	88.0	100.0	96.2	96.8	Wales
York	100.0	98.0	98.0	90.2	97.3	96.7	England
Truro	100.0	100.0	97.4	89.7	94.9	96.4	England
Bangor	95.0	100.0	100.0	95.0	90.0	96.0	Wales
Stevng	96.4	100.0	96.4	100.0	85.2	95.6	England
Sthend	100.0	100.0	100.0	86.2	90.0	95.2	England
Basldn	100.0	97.6	100.0	92.9	84.6	95.0	England
West NI	100.0	100.0	94.1	91.2	87.0	94.4	N Ireland
Antrim	100.0	100.0	96.6	72.4	100.0	93.8	N Ireland
Swanse	94.7	97.4	96.5	92.1	87.5	93.6	Wales
Oxford	100.0	98.9	94.3	98.9	68.7	92.1	England
Bristol	95.0	97.1	86.1	86.3	95.2	91.9	England
Donc	100.0	100.0	100.0	62.8	91.7	90.9	England
Exeter	80.4	99.1	99.1	88.4	84.6	90.3	England
Derby	89.9	91.1	96.2	78.5	88.5	88.8	England
Carlis	100.0	96.6	89.7	62.1	92.9	88.2	England
Glouc	100.0	98.3	100.0	46.6	93.6	87.7	England
Hull	100.0	97.2	65.7	77.8	89.2	86.0	England
Clwyd[a]					85.7	85.7	Wales
Prestn	100.0	100.0	98.6	20.0	98.9	83.5	England
Belfast	91.2	100.0	95.6	35.3	80.0	80.4	N Ireland
Shrew	100.0	96.7	100.0	100.0	0.0	79.3	England
Norwch	95.3	91.8	90.6	44.7	70.3	78.5	England
L West	100.0	100.0	92.9	1.1	95.0	77.8	England
Chelms	90.7	90.7	97.7	18.6	87.0	76.9	England
Dudley	97.6	100.0	97.6	0.0	88.1	76.7	England
Leic	94.4	78.7	96.6	48.1	60.4	75.6	England
Sheff	100.0	96.3	100.0	77.8	0.8	75.0	England
L Guys	90.5	98.3	94.8	3.5	84.2	74.3	England
Carsh	89.5	87.1	94.3	72.9	25.0	73.8	England
Ipswi	96.6	100.0	92.9	0.0	77.8	73.4	England
Newc	99.0	99.0	94.0	28.0	45.0	73.0	England
Redng	30.1	99.0	57.3	75.7	96.7	71.8	England
Stoke	100.0	94.6	100.0	0.0	57.9	70.5	England
Ports	96.8	79.7	97.8	35.8	23.3	66.7	England
L Barts	98.5	82.6	0.8	68.2	82.6	66.5	England
Liv Ain	90.4	84.9	61.1	0.0	95.7	66.4	England
Cardff	97.8	98.9	97.3	27.5	4.3	65.2	Wales
Plymth	94.9	78.0	32.2	67.8	43.6	63.3	England
B QEH	99.5	100.0	97.7	14.8	2.0	62.8	England

Table 2. Continued

Centre	Ethnicity	Primary diagnosis	Date first seen	Comorbidity	Cause of death	Average completeness	Country
L St.G	85.3	90.7	33.3	50.7	47.9	61.6	England
Camb	100.0	[b] 43.2	97.6	0.0	62.0	60.6	England
Colchr	100.0	[b] 18.2	86.7	0.0	82.6	57.5	England
M RI	96.2	82.7	58.4	35.3	3.1	55.1	England
Covnt	100.0	99.1	72.0	0.9	1.4	54.7	England
L Rfree	93.0	40.1	61.5	11.5	0.0	41.2	England
Liv RI	40.7	[b] 13.3	4.5	3.5	76.4	27.7	England
Wirral	88.1	17.9	[c]	0.0	0.0	26.5	England
Salford	100.0	18.4	0.8	0.0	0.0	23.8	England
Brightn	3.4	27.1	10.3	9.3	1.1	10.2	England
Abrdn		100.0			100.0		Scotland
Airdrie		97.9			97.0		Scotland
D & Gall		100.0			100.0		Scotland
Dundee		100.0			59.5		Scotland
Dunfn		100.0			90.0		Scotland
Edinb		98.6			95.1		Scotland
Glasgw		100.0			98.5		Scotland
Inverns		100.0			100.0		Scotland
Klmarnk		100.0			97.1		Scotland

[a] completeness not shown for Clywd for incident patients as there were only seven patients in the full data extract (out of 21)
[b] data from these centres included a high proportion of patients whose primary renal diagnosis was 'uncertain'. This appears to have been largely because software in these centres was defaulting missing values to 'uncertain'. For these centres the value given is the percentage with a specific diagnosis
[c] as in previous reports, all 'first seen' dates have been set to 'missing' because at least 10% 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

include intractable heart failure and myeloma related ESRD) the UKRR needs to ensure that these benchmarking activities do not create a negative pressure such that centres do not offer treatment to such patients if a local clinical decision has deemed this appropriate. So, such differences between centres' practice need to be interpreted in the light of measured and unmeasured variables that may account for these differences, the clinical impact of the differences and trend in these variables over time. For instance the one year survival of a centre may be in the lowest quartile of centres but be improving faster than others and may reflect excellent care given the case-mix and socio-demographic population base of the region. Furthermore the interpretation of survival in RRT patients needs to be seen in the context of the total population with advanced CKD (symptomatic stage 5 CKD) that may merit RRT. Since conservative care is used for many patients in whom there is a choice not to start dialysis, the selection of sicker (and/or) older patients in one centre versus the practice in another centre may result in unmeasured differences in survival due to this potential selection bias. For this important reason and the need to understand the quality of conservative care the UKRR has applied for and received approval to expand its remit (technically and with appropriate information governance) to capture routine data on those patients with CKD stages 2–5.

The UKRR has no statutory powers. However, the fact that it provides centre-specific de-anonymised analyses of important clinical outcomes, including survival, makes it important to define how it responds to apparent under-performance. The UKRR Director, Medical Director and Head of Research communicate with those centres identified as outliers in advance of publication. The centres are asked to provide evidence that the Clinical Governance department and Chief Executive of the Trust housing the service are informed. In the event that no such evidence is provided, the 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. These procedures are followed even if there is evidence that further adjustment, for instance for comorbidity, might explain outlier status. Coupled with open publication of the analyses this should by itself drive up the quality of care provided.

Information governance

At present 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 appointed as the Lead for Governance, with the UKRR Director the accountable officer responsible for day to day management of governance compliance. The UKRR Head of Systems is the operational information governance lead. The Framework is based on good practice, as described in the Information Governance Framework:

(http://www.connectingforhealth.nhs.uk/systemsandservices/infogov/igap/igaf)

and the Research Governance Framework for Health and Social Care (2005):

(http://www.dh.gov.uk/en/Aboutus/Researchanddevelopment/A-Z/Researchgovernance/DH_4002112).

The Registry has temporary exemption, granted by the Secretary of State under section 251 of The National Health Service Act (2006), to hold patient identifiable data. This exemption is reviewed annually. The registry has successfully completed the Connecting for Health information governance toolkit to a satisfactory standard.

Recently following a request from the Secretary of State for Health, Dame Fiona Caldicott carried out a new independent review of information sharing to ensure that there is an appropriate balance between the protection of patient information and the use and sharing of information to improve patient care. This review is available at

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/192572/2900774_InfoGovernance_accv2.pdf.

This so called Caldicott 2 review is likely to shape data-sharing in many domains including healthcare registries.

Paediatric and vascular access data items

The UKRR continues to provide a service for collecting paediatric data. It is hoped that this task will become easier as the Hospital Trusts for those centres invest more resources into appropriate clinical information systems needed for day-to-day patient care and reporting structures.

Over the last few years the Vascular Access Audit was funded by Healthcare Quality Improvement Partnership (HQIP) and run by the NHS Information Centre. The funding for this project came to an end in 2012 with the expectation that the centres would have established systems and processes that record access data for all incident dialysis patients. The Renal Association and the UKRR always considered that this project should fall to its systems and resident renal EPRs. Although all UK renal centres have IT systems capable of collecting the ~400 item UKRR dataset the additional items required for paediatrics or detailed vascular access for instance are not uniformly available. The dataset is under review and discussions with the 3rd party suppliers of such systems continue. In the meantime, with support from renal centres, NHS Kidney Care and the Department of Health, key items important to and available for collection, for vascular access audit were identified and it was agreed that a spreadsheet exercise was again prudent until further refinements in data recording, extraction and transmission to the UKRR can be implemented.

Peer-reviewed publications since the last annual report

The primary role of the UKRR is to use data to develop high-quality analyses to drive a cycle of continuous improvement in the care of patients with kidney disease in the UK. Research is an important part of improving the quality of existing analyses and developing new ones. Research from the UKRR and in collaboration with other organisations appears in peer-reviewed journals [2–21]. A list of publications involving

analyses of UKRR data is available on the UKRR website at www.renalreg.com.

Comment

With the progressive improvement in survival of patients on RRT documented in this report it seems inevitable that the prevalence of RRT will continue to increase, even with continuing improvements in preventive care, earlier referral of patients with advanced CKD and where appropriate, provision of supportive care in place of RRT for those who wish for it. RRT is a high cost therapy and this will pose a challenge to the NHS and to the UK renal community. This will make it more important than ever to submit high quality data on the outcomes of RRT and to develop reliable analyses of the epidemiology and outcomes of conservative management of advanced CKD.

Conflicts of interest: none

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UK Renal Registry 15th Annual Report: Chapter 1 UK RRT Incidence in 2011: national and centre-specific analyses

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Key Words

Acceptance rates · Comorbidity · Dialysis · End stage renal disease · End stage renal failure · Established renal failure · Haemodialysis · Incidence · Peritoneal dialysis · Primary Care Trust · Renal replacement therapy · Transplantation · Treatment modality

Summary

- In 2011 the incidence rate in the UK was stable at 108 per million population (pmp).
- From 2006 to 2011 the incidence rate pmp was stable for England but had increased from 95 pmp in 2001.
- The median age of all incident patients was 64.9 years and for non-Whites 58.4 years.
- Diabetic renal disease remained the single most common cause of renal failure (25%).
- By 90 days, 67.1% of patients were on haemodialysis, 19.2% on peritoneal dialysis, 7.8% had had a transplant and 5.8% had died or stopped treatment.
- The mean eGFR at the start of RRT was 8.7 ml/min/1.73 m^2 similar to the previous four years.
- Late presentation (<90 days) fell from 23.9% in 2006 to 19.6% in 2011.
- There was no relationship between social deprivation and presentation pattern.

Introduction

This chapter contains analyses of adult patients starting renal replacement therapy (RRT) in the UK in 2011. It describes regional and national variations in incidence rates of RRT, the demographic and clinical characteristics of all patients starting RRT and analyses of late presentation and delayed referral. The methodology and results for these analyses are in three separate sections.

Definitions

The definition of incident patients is given in detail in appendix B: Definitions and Analysis Criteria (www.renalreg.com). In brief, it is all patients over 18 who commenced RRT in the UK in 2011 and who did not recover renal function within 90 days: this does not include those with a failed renal transplant who returned to dialysis (as they had already started RRT).

Differences may be seen in the 2006 to 2010 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) used within 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. Patient groups have disliked the term 'end stage' which reflected the inevitable outcome of this disease.

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). Hope Hospital has been renamed Salford Royal and so is now abbreviated in the report as 'Salford' rather than as 'M Hope'. There are only five Northern Irish centres in the report this year as 'Tyrone' and 'Derry' are now grouped together as 'West NI'. 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 2011.

1. Geographical variation in incidence rates

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 as well as showing crude rates. It also gives the ethnic minority percentage of each area as this influences incidence rates. More detailed analyses at the Registry investigated the effect of socio-demographic, population health status and access to care factors on RRT incidence. These suggested that population age, socio-economic deprivation and the proportion of non-White residents were able to explain 22% of the observed variation in RRT incidence. The prevalence of diabetes in an area explained a further 4% of the variation and access to complex health procedures (CABG/coronary angioplasty) a further 6% [1]. Despite accounting for all these factors much of the observed variation remains unexplained and is thought to be due to practice patterns in place at individual renal centres.

Methods

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

Results

In 2011, the number of adult patients starting RRT in the UK was 6,835 equating to an incidence rate of 108 pmp (table 1.1), slightly higher than in 2010. Wales remained the country with the highest incidence rate although the rate has fallen since 2006 and in 2011 was closer to the UK average (figure 1.1). For England, incidence rates have been stable for the last 6 years. There continued to be very marked gender differences in incidence rates which were 139 pmp (95% CI 135–143) in males and 79 pmp (95% CI 76–82) in females. When incident patients aged under 18 were included, the UK rate was 110 pmp.

Table 1.2 shows incidence rates and standardised incidence ratios for PCT/HBs. The ratios calculated using combined data from up to six years have been used to determine areas with significantly high or low

Table 1.1. Number of new adult patients starting RRT in the UK in 2011

	England	N Ireland	Scotland	Wales	**UK**
Number starting RRT	5,774	203	495	363	**6,835**
Total estimated population mid-2011 (millions)*	53.0	1.8	5.3	3.1	**63.2**
Incidence rate (pmp)	109	112	93	118	**108**
(95% CI)	(106–112)	(97–128)	(85–102)	(106–131)	**(106–111)**

* Data from the Office for National Statistics – based on the 2011 census.

incidence rates. Significantly high areas have been shaded with bold text and significantly low areas shaded a lighter grey with italicised text. There were wide variations between areas, with 53 being significantly high and 48 being significantly low out of a total of 177 areas. Last year these numbers were 52 and 54 areas respectively. The standardised incidence ratios ranged from 0.42 to 2.52 (IQR 0.85, 1.20).

As would be expected, urban areas with high percentages of non-White residents tended to have high incidence rates. Figure 1.2 shows the positive correlation ($r = 0.84$, $p < 0.001$) between the standardised incidence ratio and the percentage of the PCT/HB population that was non-White.

Confidence intervals are not presented for the crude rates per million population but figures D1 and D2 in appendix D can be used to determine if a PCT/HB falls within the 95% confidence interval around the national average rate.

The number of new patients starting RRT at each renal centre from 2006 to 2011 is shown in table 1.3. For most centres there was a lot of variability in the numbers of incident patients from one year to the next making it harder 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 co-morbid conditions and recognition of ERF), changes to treatment thresholds or the introduction of conservative care programmes. Centre level incidence rates (per million population) were presented for the first time in the 13th Annual Report (www.renalreg.com) after a piece of work was done to estimate the English centres' catchment populations (using 2007 prevalent dialysis patients). These rates are again reported this year. For a description of the methodology used to estimate the catchment populations and discussion of some limitations see appendix E: Methodology for Estimating Catchment Populations Analyses (www.renalreg.com). Estimates of the catchment populations in Wales, Northern Ireland and Scotland were supplied by personal communication from Dr K Donovan, Dr A Williams, Dr D Fogarty and the Scottish Renal Registry.

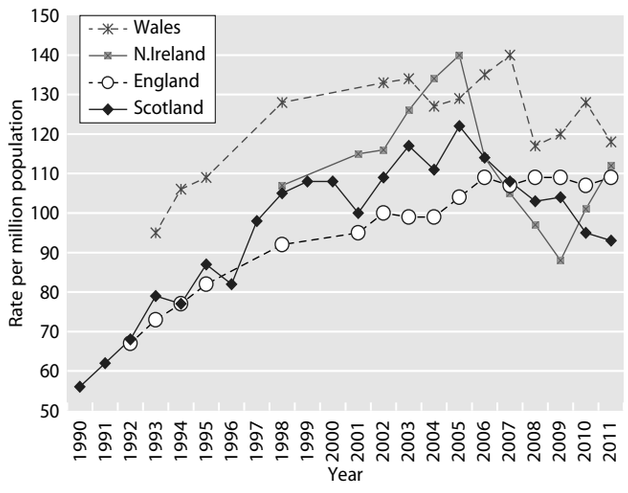

Fig. 1.1. RRT incidence rates in the countries of the UK 1990–2011

There were falls of over 10% in the number of new patients for Scotland and Wales from 2007 to 2011. There was an increase of about 5% in new patients for England and 8% for Northern Ireland from 2007 to 2011. Across all four countries the change from 2007 to 2011 was an increase of 2.5%.

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. Centre level

Table 1.2. Crude adult incidence rates (pmp) and age/gender standardised incidence ratios 2006–2011

PCT/HB – PCT 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 significantly low incidence ratios over six years are italicised in greyed areas, those with significantly high incidence ratios over six years are bold in greyed areas
Blank cells – no data returned to the UKRR for that year
% non-White – percentage of the PCT/HB population that is non-White, from 2001 census (revised by ONS to 2007 for England)
For those areas not covered by the Registry for the entire period 2006–2011, the combined years standardised incidence ratios and incidence rates are averages for the years covered by the registry

								2011		2006–2011				
UK Area	PCT/HB	Tot pop (2010)	2006 O/E	2007 O/E	2008 O/E	2009 O/E	2010 O/E	O/E	Crude rate pmp	O/E	95% LCL	95% UCL	Crude rate pmp*	% non-White
North	*County Durham*	*510,800*	*0.88*	*0.67*	*0.69*	*0.76*	*0.78*	*0.83*	*96*	*0.77*	*0.68*	*0.87*	*88*	*2.5*
East	Darlington	100,600	0.62	1.16	1.07	0.96	0.99	0.96	109	0.96	0.75	1.22	108	3.3
	Gateshead	*192,000*	*0.91*	*0.78*	*0.55*	*0.86*	*0.79*	*0.81*	*94*	*0.78*	*0.65*	*0.95*	*89*	*3.8*
	Hartlepool	91,400	1.48	0.50	1.30	0.79	0.60	0.49	55	0.86	0.66	1.13	95	2.6
	Middlesbrough	142,100	1.53	1.19	1.26	0.69	1.49	0.69	70	1.14	0.93	1.39	115	8.6
	Newcastle	292,200	0.82	1.19	0.97	0.89	0.73	0.81	79	0.90	0.77	1.06	86	9.7
	North Tyneside	*198,400*	*0.79*	*0.76*	*0.49*	*0.92*	*0.99*	*0.61*	*71*	*0.76*	*0.63*	*0.92*	*87*	*3.6*
	Northumberland	*312,100*	*0.71*	*0.75*	*0.67*	*0.61*	*0.62*	*0.84*	*106*	*0.70*	*0.60*	*0.82*	*88*	*2.2*
	Redcar and Cleveland	137,300	0.92	0.99	0.74	0.85	0.69	1.09	131	0.88	0.71	1.09	104	3.0
	South Tyneside	154,100	1.08	1.15	0.58	1.25	0.70	0.96	110	0.95	0.78	1.16	108	4.8
	Stockton-on-Tees Teaching	192,600	0.87	0.64	0.83	0.63	0.89	1.11	119	0.83	0.68	1.01	88	4.7
	Sunderland Teaching	283,400	0.70	1.06	0.87	0.92	1.01	0.70	78	0.88	0.75	1.02	96	3.3
North	*Ashton, Leigh and Wigan*	*307,200*	*0.67*	*0.56*	*0.83*	*0.56*	*0.78*	*0.91*	*101*	*0.72*	*0.61*	*0.85*	*79*	*2.9*
West	Blackburn with Darwen Teaching	140,000	1.29	1.31	0.54	0.91	1.09	1.51	143	1.11	0.90	1.37	104	22.7
	Blackpool	140,200	0.54	0.98	0.92	0.96	0.61	0.90	107	0.82	0.66	1.02	96	3.7
	Bolton Teaching	266,500	0.82	0.90	0.93	0.82	1.45	0.96	101	0.98	0.84	1.14	103	12.3
	Bury	*183,500*	*0.56*	*0.67*	*0.77*	*0.71*	*0.73*	*0.66*	*71*	*0.68*	*0.55*	*0.85*	*73*	*8.5*
	Central and Eastern Cheshire	*457,200*		*0.62*	*0.66*	*0.72*	*0.77*	*0.79*	*94*	*0.71*	*0.62*	*0.82*	*84*	*3.4*
	Central Lancashire	*459,200*	*0.57*	*0.79*	*0.89*	*0.94*	*0.60*	*0.78*	*87*	*0.76*	*0.67*	*0.87*	*84*	*6.7*
	Cumbria Teaching	*494,400*	*0.63*	*0.62*	*0.73*	*0.59*	*0.72*	*0.61*	*77*	*0.65*	*0.57*	*0.74*	*81*	*2.0*
	East Lancashire Teaching	*381,200*	*0.94*	*0.73*	*0.66*	*0.84*	*0.71*	*0.88*	*97*	*0.79*	*0.69*	*0.91*	*86*	*9.4*
	Halton and St Helens	296,700	1.22	1.02	0.56	0.89	0.91	1.10	121	0.95	0.82	1.10	104	2.1
	Heywood, Middleton and Rochdale	205,000		0.91	1.01	1.13	0.82	1.22	127	1.02	0.84	1.23	104	12.6
	Knowsley	149,200	0.89	1.03	0.52	0.76	0.91	1.08	114	0.87	0.70	1.08	90	2.8
	Liverpool	**445,300**	**1.20**	**1.12**	**1.16**	**1.22**	**0.97**	**1.27**	**128**	**1.16**	**1.03**	**1.29**	**115**	**8.3**
	Manchester Teaching	**498,800**		**1.24**	**1.28**	**1.41**	**1.31**	**1.26**	**102**	**1.30**	**1.15**	**1.47**	**103**	**23.4**
	North Lancashire Teaching	*329,100*	*0.49*	*0.60*	*0.52*	*0.73*	*0.65*	*0.73*	*91*	*0.62*	*0.53*	*0.73*	*76*	*4.2*
	Oldham	219,600	0.85	0.90	1.09	0.89	0.92	0.98	100	0.94	0.79	1.12	95	12.2
	Salford	229,100	0.96	0.62	1.01	1.00	1.34	0.69	70	0.94	0.79	1.11	93	7.7
	Sefton	272,800	0.78	0.55	0.88	0.77	1.01	1.45	180	0.91	0.78	1.05	111	2.6
	Stockport	*284,700*		*0.84*	*0.78*	*0.61*	*0.88*	*0.83*	*95*	*0.79*	*0.66*	*0.94*	*89*	*6.4*
	Tameside and Glossop	250,700		1.33	0.76	0.90	0.96	0.97	104	0.98	0.83	1.17	104	5.9
	Trafford	217,100		1.13	0.61	0.98	1.35	0.55	60	0.92	0.76	1.11	99	11.2
	Warrington	*199,100*	*0.73*	*0.74*	*0.60*	*1.05*	*0.61*	*0.46*	*50*	*0.70*	*0.57*	*0.86*	*76*	*3.5*
	Western Cheshire	234,300	0.89	0.87	0.54	0.89	1.23	1.13	137	0.93	0.79	1.08	110	3.1
	Wirral	*308,800*	*0.78*	*0.76*	*0.79*	*0.83*	*0.90*	*1.05*	*123*	*0.85*	*0.74*	*0.98*	*99*	*2.8*

Table 1.2. Continued

UK Area	PCT/HB	Tot pop (2010)	2006 O/E	2007 O/E	2008 O/E	2009 O/E	2010 O/E	2011 O/E	2011 Crude rate pmp	2006–2011 O/E	2006–2011 95% LCL	2006–2011 95% UCL	2006–2011 Crude rate pmp*	% non-White
Yorkshire and the Humber	Barnsley	227,500	1.02	0.88	1.15	0.94	1.21	0.82	92	1.00	0.86	1.18	111	2.7
	Bradford and Airedale Teaching	512,700	0.89	1.44	1.06	0.97	1.31	1.00	96	1.11	0.99	1.24	104	25.0
	Calderdale	*202,800*	*0.87*	*0.84*	*0.83*	*1.01*	*0.56*	*0.59*	*64*	*0.78*	*0.65*	*0.95*	*84*	*9.8*
	Doncaster	290,900	0.82	0.62	0.80	1.03	0.93	1.09	124	0.88	0.76	1.03	99	4.3
	East Riding of Yorkshire	*338,500*	*0.63*	*0.64*	*0.97*	*0.90*	*0.71*	*0.74*	*95*	*0.76*	*0.66*	*0.88*	*97*	*3.0*
	Hull Teaching	263,800	0.73	1.05	1.01	0.96	0.90	0.68	68	0.89	0.75	1.05	87	5.8
	Kirklees	409,900	1.14	0.75	0.77	1.07	0.93	1.09	112	0.96	0.85	1.09	98	16.0
	Leeds	*798,700*	*0.85*	*0.82*	*0.98*	*0.79*	*0.63*	*0.78*	*76*	*0.81*	*0.73*	*0.89*	*78*	*11.8*
	North East Lincolnshire	158,800	1.06	1.07	1.07	0.78	0.68	1.38	157	1.01	0.84	1.22	113	3.1
	North Lincolnshire	157,500	1.02	0.65	0.82	0.75	0.71	1.44	171	0.90	0.74	1.10	106	3.2
	North Yorkshire and York	*802,100*	*0.86*	*0.82*	*0.71*	*0.78*	*0.64*	*0.86*	*103*	*0.78*	*0.71*	*0.85*	*92*	*3.7*
	Rotherham	254,300	0.91	1.03	1.32	0.92	1.12	0.74	83	1.00	0.86	1.17	111	5.2
	Sheffield	**555,700**	**1.11**	**1.14**	**1.12**	**1.25**	**1.05**	**0.96**	**99**	**1.11**	**1.00**	**1.22**	**112**	**12.2**
	Wakefield District	*325,500*	*0.99*	*0.53*	*0.75*	*0.64*	*0.88*	*0.88*	*98*	*0.78*	*0.67*	*0.91*	*86*	*4.3*
East Midlands	Bassetlaw	112,100	0.60	1.67	0.61	0.67	0.76	0.82	98	0.85	0.67	1.08	101	3.1
	Derby City	**247,100**	**1.22**	**1.00**	**1.63**	**1.30**	**1.08**	**1.36**	**142**	**1.27**	**1.10**	**1.46**	**130**	**15.0**
	Derbyshire County	*729,900*	*0.67*	*0.82*	*1.04*	*0.78*	*0.74*	*0.89*	*107*	*0.82*	*0.75*	*0.91*	*97*	*3.2*
	Leicester City	**306,800**	**1.52**	**1.76**	**1.65**	**1.37**	**1.82**	**1.91**	**169**	**1.67**	**1.48**	**1.88**	**146**	**38.2**
	Leicestershire County and Rutland	*687,200*	*0.86*	*0.86*	*0.70*	*0.79*	*0.94*	*0.84*	*97*	*0.83*	*0.75*	*0.92*	*95*	*7.7*
	Lincolnshire Teaching	*705,000*	*0.78*	*0.79*	*0.69*	*0.72*	*0.85*	*0.88*	*111*	*0.79*	*0.71*	*0.87*	*98*	*3.3*
	Northamptonshire Teaching	687,600	0.88	0.98	1.20	0.82	0.79	0.91	97	0.93	0.84	1.02	99	7.4
	Nottingham City	**306,300**	**1.39**	**0.97**	**1.32**	**1.43**	**1.53**	**1.10**	**95**	**1.29**	**1.12**	**1.48**	**109**	**18.7**
	Nottinghamshire County Teaching	668,000	1.17	1.06	0.89	1.03	0.89	0.90	105	0.99	0.90	1.09	114	5.1
West Midlands	**Birmingham East and North**	**409,300**	**1.85**	**1.46**	**1.74**	**1.49**	**1.42**	**1.88**	**183**	**1.64**	**1.49**	**1.81**	**158**	**23.8**
	Coventry Teaching	**315,700**	**1.07**	**1.34**	**1.53**	**1.71**	**1.29**	**1.47**	**146**	**1.40**	**1.24**	**1.58**	**137**	**19.6**
	Dudley	307,500	0.92	0.96	0.82	1.39	0.77	0.78	91	0.94	0.82	1.08	109	8.5
	Heart of Birmingham Teaching	**285,100**	**2.40**	**2.60**	**2.97**	**2.87**	**2.31**	**2.00**	**151**	**2.52**	**2.26**	**2.82**	**188**	**61.8**
	Herefordshire	179,400	0.73	0.87	0.91	1.06	0.70	0.81	106	0.85	0.71	1.01	110	2.4
	North Staffordshire	211,900		0.56	0.84	1.22	0.68	1.13	137	0.89	0.74	1.07	106	3.5
	Sandwell	**292,900**	**1.32**	**1.58**	**2.18**	**1.78**	**1.86**	**1.68**	**174**	**1.73**	**1.55**	**1.94**	**178**	**21.8**
	Shropshire County	293,400	0.91	0.79	1.07	0.73	0.93	0.94	119	0.89	0.78	1.03	112	3.0
	Solihull	206,300	1.29	0.76	0.97	1.37	0.98	0.70	82	1.01	0.86	1.19	117	9.0
	South Birmingham	**342,200**	**1.10**	**1.30**	**1.53**	**1.37**	**1.09**	**1.27**	**126**	**1.28**	**1.13**	**1.44**	**125**	**17.9**
	South Staffordshire	611,300		0.96	0.89	0.81	1.03	1.00	118	0.94	0.84	1.04	109	4.7
	Stoke on Trent	**248,000**		**1.25**	**1.02**	**1.38**	**1.33**	**1.04**	**113**	**1.20**	**1.03**	**1.40**	**129**	**7.1**
	Telford and Wrekin	**162,400**	**1.35**	**1.60**	**1.07**	**1.23**	**1.56**	**1.05**	**111**	**1.31**	**1.11**	**1.55**	**136**	**6.6**
	Walsall Teaching	**256,800**	**1.41**	**1.15**	**1.40**	**1.03**	**1.88**	**1.16**	**129**	**1.34**	**1.17**	**1.52**	**146**	**14.7**
	Warwickshire	536,200	1.04	1.02	0.97	0.97	1.14	1.07	125	1.04	0.94	1.14	120	6.7
	Wolverhampton City	**239,300**	**1.32**	**1.02**	**1.46**	**1.12**	**1.47**	**1.12**	**121**	**1.25**	**1.09**	**1.44**	**134**	**23.8**
	Worcestershire	*557,300*	*0.63*	*0.83*	*0.95*	*1.07*	*0.79*	*0.81*	*99*	*0.85*	*0.76*	*0.94*	*101*	*4.4*
East of England	*Bedfordshire*	*416,300*	*1.03*	*0.59*	*0.72*	*0.83*	*0.87*	*0.73*	*79*	*0.79*	*0.69*	*0.91*	*85*	*9.3*
	Cambridgeshire	*616,400*	*1.10*	*0.82*	*0.71*	*1.01*	*0.78*	*0.97*	*105*	*0.90*	*0.81*	*1.00*	*97*	*7.4*
	Hertfordshire	*1,107,500*	*0.93*	*0.73*	*0.95*	*0.81*	*0.87*	*0.94*	*99*	*0.87*	*0.81*	*0.95*	*91*	*9.9*
	Great Yarmouth and Waveney	214,700	1.34	1.14	1.07	0.87	1.11	1.15	149	1.11	0.96	1.28	142	3.5
	Luton	**198,900**	**1.16**	**1.50**	**1.11**	**0.99**	**1.12**	**1.36**	**126**	**1.21**	**1.02**	**1.43**	**110**	**31.5**
	Mid Essex	374,500	0.93	0.92	0.84	0.88	0.85	0.95	107	0.90	0.79	1.02	100	5.1
	Norfolk	*764,800*	*0.98*	*1.06*	*0.86*	*0.68*	*0.81*	*0.78*	*99*	*0.86*	*0.79*	*0.94*	*108*	*3.9*

Table 1.2. Continued

UK Area	PCT/HB	Tot pop (2010)	2006 O/E	2007 O/E	2008 O/E	2009 O/E	2010 O/E	2011 O/E	2011 Crude rate pmp	2006–2011 O/E	2006–2011 95% LCL	2006–2011 95% UCL	2006–2011 Crude rate pmp*	% non-White
East of England	North East Essex	329,500			1.48	0.78	0.90	1.20	146	1.09	0.94	1.26	131	6.4
	Peterborough	173,600	1.28	1.11	1.05	1.27	0.71	0.92	92	1.06	0.88	1.28	105	13.0
	South East Essex	338,200	1.23	1.04	0.91	0.62	0.82	0.77	92	0.90	0.79	1.03	105	5.7
	South West Essex	410,000	1.03	0.93	1.09	0.68	0.89	1.03	107	0.94	0.83	1.07	97	7.6
	Suffolk	*601,900*	*0.78*	*0.93*	*0.74*	*0.86*	*0.74*	*0.64*	*76*	*0.78*	*0.70*	*0.87*	*92*	*5.7*
	West Essex	*286,400*	*0.73*	*0.74*	*0.45*	*0.82*	*0.68*	*0.76*	*84*	*0.70*	*0.59*	*0.83*	*76*	*7.9*
London	**Barking and Dagenham**	**179,700**	**0.80**	**1.21**	**1.54**	**1.46**	**1.43**	**1.71**	**145**	**1.36**	**1.14**	**1.62**	**113**	**23.7**
	Barnet	**348,000**	**1.30**	**1.87**	**1.40**	**1.35**	**1.78**	**1.46**	**144**	**1.52**	**1.36**	**1.70**	**148**	**29.4**
	Bexley	**228,300**	**1.12**	**1.05**	**1.21**	**1.28**	**1.31**	**1.15**	**123**	**1.18**	**1.02**	**1.38**	**125**	**13.0**
	Brent Teaching	**256,300**	**1.85**	**2.16**	**2.16**	**2.38**	**3.03**	**2.37**	**226**	**2.32**	**2.09**	**2.58**	**219**	**53.5**
	Bromley	312,400	0.92	0.72	1.25	0.97	1.11	0.67	74	0.94	0.82	1.08	101	11.9
	Camden	**235,500**	**1.20**	**1.09**	**1.09**	**1.35**	**1.65**	**1.24**	**102**	**1.27**	**1.08**	**1.49**	**103**	**24.9**
	City and Hackney Teaching	**231,000**	**1.27**	**1.38**	**1.27**	**1.76**	**1.65**	**1.98**	**156**	**1.55**	**1.34**	**1.81**	**121**	**35.7**
	Croydon	**345,400**	**0.99**	**1.72**	**1.36**	**1.61**	**1.41**	**1.37**	**133**	**1.41**	**1.25**	**1.58**	**136**	**34.5**
	Ealing	**318,300**	**1.74**	**1.99**	**1.64**	**2.32**	**2.17**	**1.83**	**167**	**1.95**	**1.75**	**2.17**	**175**	**40.7**
	Enfield	**295,000**	**1.45**	**1.14**	**1.39**	**1.30**	**1.37**	**1.97**	**190**	**1.44**	**1.27**	**1.63**	**137**	**28.0**
	Greenwich Teaching	**228,100**	**1.01**	**1.63**	**1.73**	**1.36**	**2.28**	**1.10**	**96**	**1.51**	**1.31**	**1.75**	**131**	**26.1**
	Hammersmith and Fulham	**169,800**	**1.03**	**1.59**	**0.62**	**1.37**	**1.56**	**1.44**	**124**	**1.27**	**1.05**	**1.53**	**108**	**21.0**
	Haringey Teaching	**225,100**	**1.37**	**1.32**	**1.74**	**1.15**	**1.62**	**1.99**	**169**	**1.53**	**1.32**	**1.78**	**129**	**33.1**
	Harrow	**230,300**	**1.35**	**0.48**	**1.71**	**1.99**	**2.22**	**2.37**	**239**	**1.69**	**1.48**	**1.92**	**168**	**44.7**
	Havering	*236,100*	*0.99*	*0.69*	*0.81*	*0.60*	*0.39*	*1.17*	*131*	*0.78*	*0.65*	*0.93*	*86*	*8.8*
	Hillingdon	**266,200**	**1.62**	**0.96**	**1.44**	**1.26**	**1.41**	**1.61**	**154**	**1.38**	**1.21**	**1.59**	**131**	**25.9**
	Hounslow	**236,700**	**1.67**	**1.54**	**1.20**	**1.72**	**1.96**	**2.00**	**177**	**1.68**	**1.47**	**1.93**	**148**	**37.8**
	Islington	**193,900**	**1.74**	**1.29**	**1.03**	**1.61**	**1.66**	**1.92**	**155**	**1.54**	**1.31**	**1.82**	**123**	**22.9**
	Kensington and Chelsea	169,500	0.82	0.47	1.12	0.76	0.96	0.81	83	0.82	0.66	1.02	83	22.6
	Kingston	169,000		0.90	1.42	0.70	0.85	0.95	89	0.97	0.77	1.21	89	19.9
	Lambeth	**284,400**	**1.42**	**1.95**	**1.64**	**1.99**	**1.51**	**1.94**	**155**	**1.74**	**1.53**	**1.98**	**138**	**32.0**
	Lewisham	**266,400**	**1.62**	**1.85**	**1.63**	**2.34**	**1.53**	**1.88**	**158**	**1.81**	**1.59**	**2.05**	**150**	**34.4**
	Newham	**240,200**	**2.26**	**1.94**	**2.11**	**2.32**	**2.83**	**2.79**	**212**	**2.38**	**2.10**	**2.69**	**178**	**57.0**
	Redbridge	**270,300**	**1.04**	**1.28**	**1.61**	**1.83**	**1.59**	**1.43**	**133**	**1.46**	**1.28**	**1.67**	**135**	**40.9**
	Richmond and Twickenham	190,800		0.76	0.76	0.80	0.93	0.75	73	0.80	0.64	1.00	78	11.7
	Southwark	**287,100**	**1.51**	**2.29**	**1.98**	**1.42**	**1.77**	**1.97**	**160**	**1.82**	**1.61**	**2.06**	**147**	**34.1**
	Sutton and Merton	**403,000**		**1.21**	**1.44**	**1.22**	**1.33**	**1.37**	**132**	**1.32**	**1.16**	**1.49**	**125**	**20.8**
	Tower Hamlets	**238,100**	**1.31**	**1.78**	**1.96**	**1.96**	**1.53**	**2.01**	**143**	**1.76**	**1.52**	**2.04**	**124**	**22.8**
	Waltham Forest	**227,400**	**1.91**	**2.59**	**1.45**	**1.80**	**1.32**	**2.05**	**176**	**1.86**	**1.62**	**2.12**	**158**	**36.6**
	Wandsworth	**289,200**		**1.76**	**1.67**	**2.00**	**1.59**	**1.32**	**107**	**1.67**	**1.45**	**1.92**	**134**	**19.7**
	Westminster	**253,400**	**1.41**	**0.62**	**1.28**	**1.63**	**1.18**	**1.40**	**126**	**1.25**	**1.08**	**1.46**	**112**	**27.8**
South East Coast	Brighton and Hove City	258,400	0.92	0.85	1.09	1.19	0.86	0.95	93	0.98	0.83	1.15	94	8.7
	East Sussex Downs and Weald	*336,100*	*1.00*	*0.91*	*0.65*	*0.61*	*0.58*	*0.70*	*92*	*0.74*	*0.64*	*0.85*	*96*	*4.9*
	Eastern and Coastal Kent	**742,200**		**1.33**	**1.20**	**1.05**	**1.06**	**0.91**	**106**	**1.11**	**1.01**	**1.21**	**128**	**5.3**
	Hastings and Rother	*179,700*	*1.02*	*0.61*	*0.91*	*0.68*	*0.74*	*0.97*	*128*	*0.82*	*0.68*	*0.99*	*107*	*5.2*
	Medway	256,600		1.47	0.70	1.00	0.79	0.88	90	0.97	0.81	1.15	97	7.5
	Surrey	*1,114,400*	*0.75*	*0.81*	*0.96*	*0.99*	*1.04*	*0.98*	*109*	*0.92*	*0.86*	*0.99*	*101*	*8.3*
	West Kent	685,100		1.01	1.02	0.95	0.78	0.89	99	0.93	0.84	1.03	103	6.8
	West Sussex	*800,000*	*0.85*	*0.88*	*0.87*	*0.76*	*0.74*	*0.66*	*81*	*0.79*	*0.72*	*0.87*	*96*	*5.8*

Table 1.2. Continued

UK Area	PCT/HB	Tot pop (2010)	2006 O/E	2007 O/E	2008 O/E	2009 O/E	2010 O/E	2011 O/E	2011 Crude rate pmp	2006–2011 O/E	2006–2011 95% LCL	2006–2011 95% UCL	2006–2011 Crude rate pmp*	% non-White
South Central	**Berkshire East**	**406,500**	**1.07**	**1.34**	**1.21**	**1.32**	**1.28**	**1.29**	**125**	**1.25**	**1.12**	**1.40**	**120**	**18.9**
	Berkshire West	471,500	0.94	0.90	1.12	0.87	0.76	1.06	106	0.94	0.83	1.06	93	10.1
	Buckinghamshire	*512,100*	*0.71*	*0.75*	*0.82*	*0.94*	*0.76*	*0.83*	*92*	*0.80*	*0.71*	*0.90*	*88*	*10.4*
	Hampshire	*1,297,200*	*0.90*	*0.78*	*0.82*	*0.82*	*0.78*	*0.73*	*86*	*0.80*	*0.75*	*0.86*	*93*	*4.2*
	Isle of Wight National Health Service	*140,200*	*0.43*	*0.22*	*0.32*	*0.16*	*0.60*	*0.79*	*107*	*0.42*	*0.31*	*0.56*	*56*	*3.6*
	Milton Keynes	247,000	0.69	1.17	0.95	0.95	1.06	0.99	93	0.97	0.82	1.15	90	12.7
	Oxfordshire	*624,200*	*0.75*	*0.73*	*0.68*	*1.04*	*0.94*	*1.05*	*111*	*0.86*	*0.78*	*0.96*	*90*	*8.1*
	Portsmouth City Teaching	207,200	0.78	0.78	0.83	0.72	0.58	1.27	121	0.83	0.68	1.01	77	8.0
	Southampton City	239,800	0.69	0.87	1.19	0.64	1.21	1.12	104	0.95	0.80	1.13	87	11.4
South West	Bath and North East Somerset	179,800	0.86	0.98	0.72	1.36	0.67	0.60	67	0.87	0.71	1.05	95	5.8
	Bournemouth and Poole Teaching	*310,800*	*0.67*	*0.67*	*0.87*	*0.58*	*0.56*	*0.74*	*87*	*0.68*	*0.58*	*0.80*	*79*	*5.0*
	Bristol	**441,100**	**1.40**	**1.03**	**1.50**	**1.19**	**1.42**	**1.35**	**125**	**1.31**	**1.18**	**1.47**	**119**	**11.6**
	Cornwall and Isles of Scilly	537,900	1.06	0.95	0.90	1.03	0.88	0.80	102	0.94	0.85	1.04	119	2.8
	Devon	749,700	0.92	1.07	1.15	1.01	0.94	0.86	112	0.99	0.91	1.08	127	3.3
	Dorset	*404,900*	*0.55*	*0.69*	*0.90*	*0.69*	*0.61*	*0.65*	*91*	*0.68*	*0.60*	*0.77*	*94*	*3.5*
	Gloucestershire	*593,600*	*1.01*	*0.88*	*0.66*	*1.12*	*0.87*	*0.89*	*104*	*0.90*	*0.82*	*1.00*	*105*	*4.7*
	North Somerset	212,100	0.85	0.78	1.13	0.88	0.94	0.80	99	0.90	0.76	1.06	109	3.6
	Plymouth Teaching	**258,900**	**1.80**	**1.71**	**1.02**	**1.16**	**1.22**	**1.07**	**112**	**1.33**	**1.16**	**1.52**	**136**	**4.4**
	Somerset	*525,500*	*0.76*	*0.69*	*0.75*	*1.07*	*1.06*	*0.81*	*103*	*0.86*	*0.77*	*0.95*	*107*	*3.2*
	South Gloucestershire	264,900	1.00	0.84	0.98	0.65	1.13	0.62	68	0.87	0.74	1.02	94	5.0
	Swindon	206,900	0.76	0.57	1.10	1.09	1.06	1.18	121	0.96	0.80	1.15	97	7.1
	Torbay	134,400	0.80	0.87	1.56	0.68	1.45	0.84	112	1.03	0.85	1.24	134	3.1
	Wiltshire	*459,800*	*0.71*	*0.63*	*0.85*	*0.75*	*0.82*	*0.65*	*76*	*0.73*	*0.65*	*0.83*	*85*	*3.4*
Wales	Betsi Cadwaladr University	678,500	1.11	1.11	0.95	0.87	0.92	0.87	106	0.97	0.89	1.06	117	1.0
	Powys Teaching	131,100	0.63	0.98	0.93	1.02	0.70	1.24	168	0.92	0.75	1.12	122	0.9
	Hywel Dda	374,800	0.91	1.10	1.25	0.78	1.17	1.12	141	1.05	0.94	1.18	132	1.0
	Abertawe Bro Morgannwg Univ.	**504,800**	**1.40**	**1.50**	**1.20**	**1.55**	**1.48**	**1.11**	**129**	**1.37**	**1.25**	**1.50**	**157**	**1.6**
	Cwm Taf	**290,600**	**1.68**	**1.61**	**1.07**	**1.31**	**0.96**	**1.43**	**158**	**1.34**	**1.19**	**1.52**	**147**	**1.1**
	Aneurin Bevan	**561,300**	**1.10**	**1.35**	**0.95**	**0.96**	**1.32**	**1.17**	**134**	**1.14**	**1.04**	**1.25**	**129**	**1.9**
	Cardiff and Vale University	**466,100**	**1.40**	**1.45**	**1.01**	**1.15**	**1.38**	**0.99**	**99**	**1.23**	**1.11**	**1.37**	**121**	**6.7**
Scotland	Ayrshire & Arran	366,900	1.39	0.85	0.83	0.89	1.09	0.79	95	0.97	0.86	1.10	116	0.7
	Borders	113,000	0.91	1.21	1.07	0.98	1.07	0.56	71	0.97	0.78	1.20	121	0.6
	Dumfries and Galloway	148,100	1.13	0.83	1.14	1.07	0.57	0.56	74	0.89	0.73	1.07	116	0.7
	Fife	364,800	1.02	1.00	0.95	1.18	1.19	1.13	129	1.08	0.96	1.22	122	1.3
	Forth Valley	293,100	1.02	1.35	0.78	0.99	1.01	0.80	89	0.99	0.86	1.14	109	1.1
	Grampian	*550,500*	*0.82*	*0.86*	*0.88*	*0.90*	*0.85*	*0.81*	*91*	*0.85*	*0.76*	*0.96*	*94*	*1.6*
	Greater Glasgow & Clyde	1,204,100	1.11	1.09	0.94	1.00	0.88	1.03	109	1.01	0.94	1.08	105	3.4
	Highland	*310,700*	*0.86*	*0.87*	*0.84*	*0.75*	*0.64*	*0.49*	*61*	*0.74*	*0.64*	*0.86*	*91*	*0.8*
	Lanarkshire	*562,700*	*0.92*	*0.81*	*0.74*	*0.85*	*0.99*	*0.82*	*89*	*0.85*	*0.76*	*0.95*	*92*	*1.2*
	Lothian	*837,000*	*1.04*	*0.88*	*0.98*	*0.82*	*0.63*	*0.69*	*72*	*0.84*	*0.77*	*0.92*	*86*	*2.8*
	Orkney	19,800	0.82	0.42	1.66	1.23	0.42	0.00	0	0.76	0.42	1.37	93	0.4
	Shetland	22,500	0.00	1.58	0.00	0.39	0.40	0.78	89	0.52	0.26	1.05	59	1.1
	Tayside	**402,400**	**1.06**	**1.24**	**1.17**	**1.28**	**1.01**	**1.13**	**134**	**1.15**	**1.03**	**1.28**	**135**	**1.9**
	Western Isles	26,500	0.88	1.78	0.30	0.88	1.49	0.00	0	0.88	0.56	1.40	113	0.6
N Ireland	**Belfast**	**335,700**	**1.58**	**1.29**	**1.02**	**0.80**	**1.28**	**1.12**	**113**	**1.18**	**1.04**	**1.34**	**118**	**1.1**
	Northern	**458,600**	**1.27**	**1.39**	**1.13**	**0.81**	**1.17**	**1.22**	**126**	**1.17**	**1.05**	**1.30**	**119**	**0.6**
	Southern	357,700	0.66	0.60	0.96	0.78	1.07	1.31	123	0.90	0.77	1.04	83	0.4
	South Eastern	*347,100*	*1.02*	*0.89*	*0.86*	*0.69*	*0.71*	*0.91*	*95*	*0.85*	*0.73*	*0.98*	*88*	*0.7*
	Western	299,900	1.26	1.03	0.85	1.20	0.83	0.98	93	1.03	0.88	1.19	97	0.5

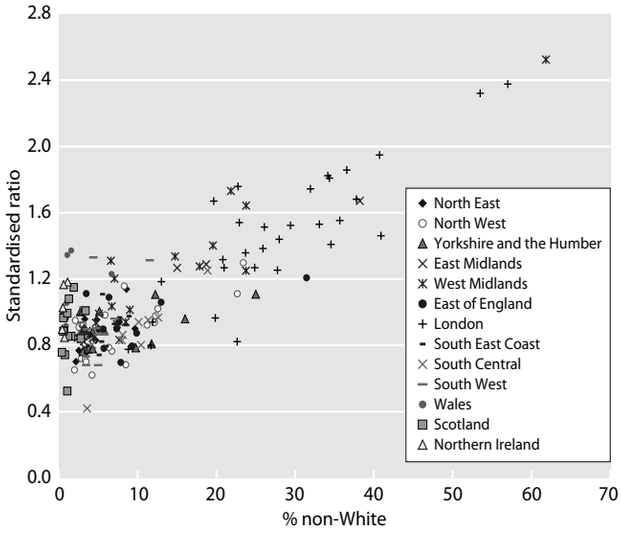

Fig. 1.2. Age/gender standardised incidence ratio (2006–2011) by percentage non-White

results are not shown for any centre with fewer than 10 incident patients in the year. Individual EDTA codes for primary diagnoses were grouped into eight categories, the details are given in appendix H: Ethnicity and ERA-EDTA Coding (www.renalreg.com). EDTA code 10, 'Glomerulonephritis biopsy unproven', was now put in the 'Glomerulonephritis' group rather than into the 'Uncertain' aetiology group as was done in previous year's reports.

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 Whites, South Asians, Blacks, Chinese and Others. 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.com). Chi-squared, Fisher's exact, ANOVA and Kruskal Wallis tests were used as appropriate to test for significant differences.

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 [2]. For the purpose of the eGFR calculation, patients who had missing ethnicity but a valid serum creatinine measurement were classed as Whites. The eGFR values were log transformed in order to normalise the data. Patients with an eGFR >20 ml/min/1.73 m^2 were excluded from the eGFR analyses due to concerns about possible data extraction errors.

Results

Age

Overall, incidence rates have levelled off in the last five years (figure 1.3).

Figure 1.4 shows RRT incidence rates for 2011 by age group and gender. For both men and women, the peak rate was in the 75–79 age group.

In 2011, the median age of patients starting renal replacement therapy was 64.9 years (table 1.4) and this had changed little over the previous six years (data not shown). The median age of non-White patients was considerably lower at 58.4 years. This reflects the younger age distribution of ethnic minority populations in general compared with the White population (5.1% of ethnic minorities were over 65 years old compared to 16.9% of Whites) [3] and the higher rates of diabetes in South Asian and Black populations.

Figure 1.5 shows that the 55–64 and 65–74 age groups contained the most patients starting on peritoneal dialysis whereas the 65–74 age group contained the most patients starting on haemodialysis closely followed by the 75–84 age group. The figure also gives the numbers for 2010 showing that there was an increase in 2011 in the numbers starting PD, most notably in the 65–74 age group.

There were large differences between centres in the median age of incident patients (figure 1.6). This reflects differences in the age and ethnic structure of the catchment populations and also chance fluctuations, particularly in small centres. The median age of patients treated at transplant centres was 63.8 years (IQR 49.5, 74.3) and at non-transplanting centres 66.2 years (IQR 52.4, 76.0) ($p < 0.0001$).

Whilst the median age of patients had risen only slightly over the last 10 years the percentage of patients aged over 75 years rose from 22.3% to 25.2%.

Averaged over 2006–2011, crude incidence rates in the over 75 years age group varied from 0 per million age related population (pmarp) (Shetland) to 989 pmarp (Heart of Birmingham).

Excluding four areas which had much higher or lower rates than the rest there was 6–fold variation (104 pmarp to 637 pmarp). The wide range of treatment rates suggests there was geographical variation in the prevalence of comorbid and predisposing renal conditions within the UK as well as uncertainty within the renal community about the suitability of older patients for dialysis. The 6–fold variation seen in the over 75s was much greater than the 2.4-fold variation (73 pmp to 178 pmp) seen in the overall analysis although a proportion of this difference is likely to be due to the smaller numbers included in the over 75s analysis.

The median age of new patients with diabetes was similar to the overall median and has not varied greatly over the last 5 years.

Table 1.3. Number of patients starting RRT by renal centre 2006–2011

Centre	Year						Catchment population (millions)	2011 crude rate pmp	(95% CI)
	2006	2007	2008	2009	2010	2011			
England									
B Heart	115	101	105	99	95	112	0.72	155	(126–183)
B QEH	187	222	268	255	197	216	1.62	133	(115–151)
Basldn	45	39	40	27	32	42	0.41	103	(72–134)
Bradfd	50	88	62	59	67	58	0.58	100	(74–126)
Brightn	131	120	119	117	106	118	1.20	99	(81–117)
Bristol	176	153	175	157	168	139	1.57	88	(74–103)
Camb[a]	155	125	94	134	105	125	1.27[a]	99[a]	(81–116)
Carlis	28	26	30	28	23	29	0.31	92	(59–126)
Carsh	180	194	214	206	220	210	1.92	110	(95–124)
Chelms[a]	50	51	36	51	45	43	0.47[a]	92[a]	(65–120)
Colchr[b]	n/a	n/a	58	21	32	45	[b]	[b]	[b]
Covnt	102	111	113	118	115	109	0.87	125	(102–149)
Derby	70	62	97	76	79	79	0.65	122	(95–149)
Donc[b]	n/a	20	26	40	44	43	[b]	[b]	[b]
Dorset	53	62	82	74	71	74	0.73	102	(79–125)
Dudley	45	40	46	69	43	41	0.42	99	(69–129)
Exeter	105	126	135	145	140	112	1.03	109	(89–129)
Glouc	73	59	45	79	61	58	0.58	101	(75–127)
Hull	101	99	111	100	87	108	0.99	109	(89–130)
Ipswi[a]	42	40	38	38	33	29	0.56[a]	52[a]	(33–70)
Kent		171	140	129	134	123	1.16	106	(87–124)
L Barts	191	215	207	238	204	264	1.68	157	(138–176)
L Guys	135	167	161	172	135	116	1.15	101	(82–119)
L Kings	109	122	151	127	144	139	0.97	143	(119–167)
L Rfree	194	185	173	170	207	227	1.50	151	(131–171)
L St.G		89	99	110	86	75	0.59	128	(99–157)
L West	312	273	317	356	366	366	2.23	164	(148–181)
Leeds	169	124	159	153	125	160	1.65	97	(82–112)
Leic	240	244	242	228	245	268	2.32	116	(102–129)
Liv Ain[c]	34	35	42	39	51	73	0.51[c]	144	(111–177)
Liv RI	140	112	102	110	99	113	1.20	94	(77–112)
M RI		159	131	147	161	156	1.47	106	(90–123)
Middlbr	108	99	92	95	98	98	1.01	97	(78–116)
Newc	107	106	101	98	94	100	1.11	90	(73–108)
Norwch	110	111	84	72	86	85	0.79	107	(84–130)
Nottm	137	129	115	133	116	116	1.14	102	(83–120)
Oxford	154	143	148	174	165	176	1.68	105	(89–120)
Plymth	92	75	69	56	56	59	0.48	124	(92–156)
Ports	175	157	170	149	149	187	2.00	93	(80–107)
Prestn	119	132	113	146	124	140	1.51	93	(77–108)
Redng	84	93	103	96	89	103	0.80	128	(103–153)
Salford[d]	129	110	139	124	149	125	1.42	88	(73–103)
Sheff[a]	169	165	181	149	143	135	1.49[a]	91[a]	(75–106)
Shrew	54	58	60	48	58	61	0.39	156	(117–195)
Stevng	121	88	102	98	107	110	1.09	101	(82–120)
Sthend	48	34	36	23	29	29	0.32	92	(58–125)
Stoke		87	81	110	95	93	0.90	104	(83–125)
Sund	57	62	45	64	55	55	0.59	93	(69–118)
Truro	52	45	41	58	46	39	0.41	95	(65–124)
Wirral	51	53	39	63	61	67	0.52	129	(98–159)
Wolve	84	68	89	65	106	75	0.61	124	(96–152)
York	48	36	36	43	38	51	0.51	101	(73–129)

Table 1.3. Continued

Centre	Year						Catchment population (millions)	2011 crude rate pmp	(95% CI)
	2006	2007	2008	2009	2010	2011			
N Ireland									
Antrim	33	37	41	21	41	29	0.30	97	(61–132)
Belfast	121	90	70	59	72	68	0.55	123	(94–152)
Newry	13	15	21	19	21	38	0.28	134	(92–177)
Ulster	8	17	14	13	20	34	0.30	113	(75–151)
West NI[e]	33	29	31	37	26	34	0.35	96	(64–129)
Scotland[f]									
Abrdn	53	56	56	55	51	49	0.60	82	(59–105)
Airdrie	55	48	39	48	56	48	0.56	85	(61–109)
D & Gall	20	17	19	17	10	10	0.15	68	(26–109)
Dundee	51	62	64	69	50	57	0.41	140	(104–177)
Dunfn	37	37	30	33	45	43	0.37	117	(82–152)
Edinb	106	95	103	98	68	72	0.96	75	(58–92)
Glasgw	186	187	159	174	154	171	1.51	114	(97–131)
Inverns	26	26	25	21	27	12	0.34	35	(15–56)
Klmarnk	57	36	33	39	43	33	0.37	90	(59–121)
Wales									
Bangor	42	36	41	30	26	20	0.25	80	(45–115)
Cardff	203	220	150	177	186	182	1.45	126	(107–144)
Clwyd[g]	18	21	15	18	15	21[g]	0.20	105	(60–150)
Swanse	116	127	125	116	137	114	0.80	143	(116–169)
Wrexm	26	27	21	20	25	26	0.30	87	(53–120)
							% change since 2007[i]		
England	**5,131**[h]	**5,485**	**5,662**	**5,736**	**5,584**	**5,774**	**5.3**		
N Ireland	**208**	**188**	**177**	**149**	**180**	**203**	**8.0**		
Scotland	**591**	**564**	**528**	**554**	**504**	**495**	**−12.2**		
Wales	**405**	**431**	**352**	**361**	**389**	**363**	**−15.8**		
UK	**6,335**[h]	**6,668**	**6,719**	**6,800**	**6,657**	**6,835**	**2.5**		

Blank cells – no data returned to the registry for that year
n/a – renal centre not yet operational
pmp – per million population
[a] Some reduction required to the population and increase to the rate after the opening of Colchester renal centre and the expansion of Doncaster renal centre
[b] Colchester renal centre was opened in 2007, Doncaster was still expanding and so catchment populations could not be calculated (2007 data was used for catchment population estimations)
[c] Population changed from 0.29 to 0.51 at the centre's request. Therefore the populations given for nearby centres are probably somewhat too high
[d] Salford previously named M Hope
[e] West NI is the amalgamation of Derry and Tyrone
[f] Populations for Scottish centres based on mid-2011 populations of Health Boards (from the General Register Office for Scotland) and an approximate mapping of renal centres to HBs supplied by the Scottish Renal Registry
[g] Clywd had 21 incident patients in 2011 but only 7 of these were included in the data extract. The extra 14 patients have been included in tables 1.1, 1.2 and 1.3 but not in the remainder of this chapter. Clywd are therefore not shown in any of the subsequent tables or figures as there were fewer than 10 patients with full data
[h] Does not include Kent, L St.G, M RI or Stoke as they were not reporting to the registry for 2006
[i] Change shown from 2007 not 2006 as not all centres included in 2006 data

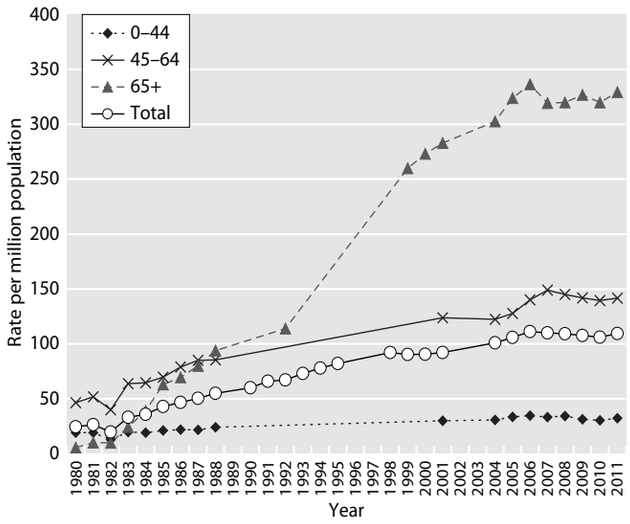

Fig. 1.3. RRT incidence rates between 1980 and 2011

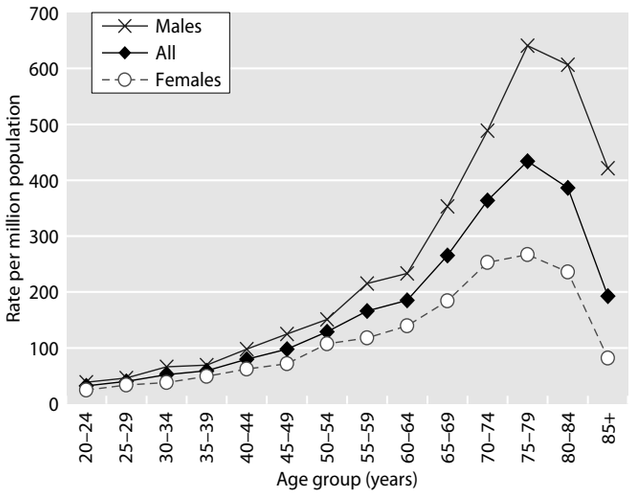

Fig. 1.4. RRT incidence rates in 2011 by age and gender

Table 1.4. Median and inter-quartile range of the age of patients starting renal replacement therapy in 2011 by country

Country	Median	IQR
England	64.9	(50.7–75.0)
N Ireland	64.7	(49.9–74.0)
Scotland	64.8	(53.1–74.4)
Wales	66.4	(52.9–76.3)
UK	**64.9**	**(50.9–75.1)**

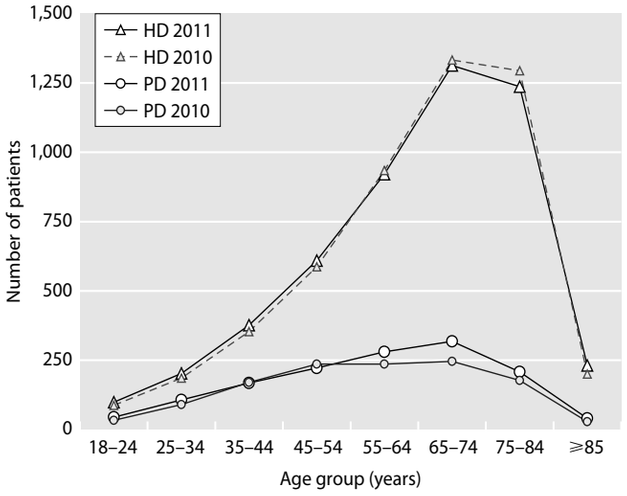

Fig. 1.5. Number of incident RRT patients in 2011 (and 2010), by age group and initial dialysis modality

Gender

As in previous years, more men than women started RRT (63.0% male). The male percentage was above 50 for all age groups and increased with increasing age group after age 45 (figure 1.7). The male to female

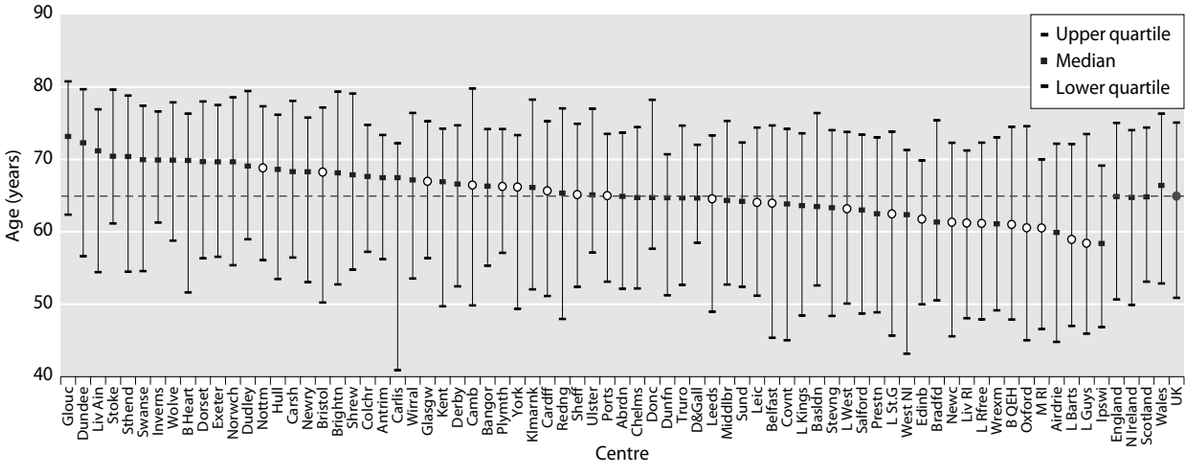

Fig. 1.6. Median age of incident RRT patients by centre in 2011
White points indicate transplant centres

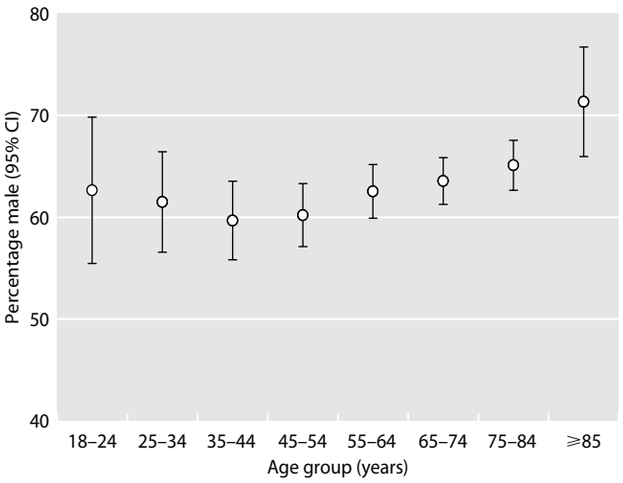

Fig. 1.7. Percentage of patients starting RRT in 2011 who were male, by age group

ratio which had been consistently stable at 1.6 since 1998 has increased over the last 2 years to 1.7.

Ethnicity

The completeness of ethnicity data was similar to that seen for 2010 incident patients. Fifty-nine centres returned ethnicity data that were 50% or more complete (table 1.5). This compared with 61 centres last year. Fifty-three of these 59 centres provided ethnicity data for 90% or more of their incident patients compared with 52 centres last year. Ethnicity completeness was low in the Scottish Renal Registry and Scotland has not been included in the table. The low completeness for some centres means that the overall breakdowns should still be interpreted with some caution. There was great variation between centres in the percentage of incident patients who were non-White ranging from zero in Carlisle, Dorset, Exeter, Truro, Newry and West NI to over 50% in Barts, the Royal Free and London West.

Primary renal diagnosis

The distribution of primary renal disease (PRD) by centre is shown in table 1.6. Data for PRD were missing for 10.2% of patients and there remained marked differences between centres in completeness of data. Sixty centres provided data on over 90% of incident patients and 32 of these had 100% completeness. There was only a small amount of missing data for Scotland and Wales and none for Northern Ireland, whilst England had 12.0% missing. The overall percentage missing was slightly up on 2010 (10.2% from 9.8%) and was similar in under and over 65 year olds (10.0% and 10.4% respectively). Four centres had missing PRD for more than 25% of new patients and for these centres the percentages in the diagnostic categories are not shown in table 1.6.

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

Table 1.5. Percentage of incident RRT patients (2011) in different ethnic groups by centre

Centre	% data not available	N with data	Percentage in each ethnic group				
			White	Black	South Asian	Chinese	Other
England							
B Heart	0.9	111	62.2	4.5	32.4		0.9
B QEH	0.5	215	65.6	10.2	20.5	0.9	2.8
Basldn	0.0	42	83.3	9.5	4.8		2.4
Bradfd	0.0	58	62.1		37.9		
Brightn	96.6	4					
Bristol	5.0	132	85.6	7.6	5.3		1.5
Camb	0.0	125	96.8	2.4			0.8
Carlis	0.0	29	100.0				
Carsh	10.5	188	72.3	10.6	13.8	0.5	2.7
Chelms	9.3	39	89.7	5.1	2.6		2.6
Colchr	0.0	45	93.3	2.2			4.4
Covnt	0.0	109	78.9	9.2	11.9		
Derby	10.1	71	83.1	5.6	9.9	1.4	
Donc	0.0	43	97.7				2.3
Dorset	0.0	74	100.0				

Table 1.5. Continued

Centre	% data not available	N with data	Percentage in each ethnic group				
			White	Black	South Asian	Chinese	Other
Dudley	2.4	40	90.0		10.0		
Exeter	19.6	90	100.0				
Glouc	0.0	58	93.1	1.7	3.4		1.7
Hull	0.0	108	98.1		0.9	0.9	
Ipswi	3.4	28	96.4	3.6			
Kent	7.3	114	95.6	0.9	1.8		1.8
L Barts	1.5	260	36.5	36.5	25.8	0.8	0.4
L Guys	9.5	105	56.2	42.9			1.0
L Kings	2.2	136	53.7	34.6	9.6		2.2
L Rfree	7.0	211	46.9	24.6	16.1	1.4	10.9
L St.G	14.7	64	53.1	23.4	15.6	1.6	6.3
L West	0.0	366	43.2	15.8	38.0	1.9	1.1
Leeds	1.3	158	81.6	4.4	13.3		0.6
Leic	5.6	253	78.3	2.8	17.4		1.6
Liv Ain	9.6	66	92.4			6.1	1.5
Liv RI	59.3	46					
M RI	3.8	150	78.0	10.7	9.3	0.7	1.3
Middlbr	1.0	97	91.8		8.2		
Newc	1.0	99	93.9		6.1		
Norwch	4.7	81	96.3	1.2	1.2		1.2
Nottm	0.0	116	87.9	4.3	5.2		2.6
Oxford	0.0	176	84.7	3.4	9.7	0.6	1.7
Plymth	5.1	56	96.4		1.8		1.8
Ports	3.2	181	92.3	0.6	4.4		2.8
Prestn	0.0	140	82.1	0.7	17.1		
Redng	69.9	31					
Salford	0.0	125	81.6	2.4	15.2	0.8	
Sheff	0.0	135	90.4	3.7	5.2		0.7
Shrew	0.0	61	93.4		4.9	1.6	
Stevng	3.6	106	71.7	7.5	16.0	0.9	3.8
Sthend	0.0	29	89.7	3.4		3.4	3.4
Stoke	0.0	93	93.5		5.4		1.1
Sund	1.8	54	96.3	1.9	1.9		
Truro	0.0	39	100.0				
Wirral	11.9	59	96.6			1.7	1.7
Wolve	2.7	73	71.2	9.6	19.2		
York	0.0	51	96.1		2.0		2.0
N Ireland							
Antrim	0.0	29	96.6		3.4		
Belfast	8.8	62	98.4		1.6		
Newry	0.0	38	100.0				
Ulster	0.0	34	94.1		2.9	2.9	
West NI	0.0	34	100.0				
Wales							
Bangor	5.0	19	94.7			5.3	
Cardff	2.2	178	94.4	0.6	4.5	0.6	
Swanse	5.3	108	98.1	0.9	0.9		
Wrexm	0.0	26	96.2	3.8			
England	**7.5**	**5,340**	**76.8**	**8.8**	**12.2**	**0.5**	**1.7**
N Ireland	**3.0**	**197**	**98.0**		**1.5**	**0.5**	
Wales	**3.4**	**337**	**95.8**	**0.9**	**2.7**	**0.6**	
E, W & NI	**7.1**	**5,874**	**78.6**	**8.0**	**11.3**	**0.5**	**1.5**

The percentage breakdown is not shown for centres with less than 50% data completeness but these centres are included in national averages

Table 1.6. Distribution of primary renal diagnosis by centre in the 2011 incident RRT cohort

			Percentage							
Centre	% data not available	N with data	Uncertain aetiology*	Diabetes	Glomerulo-nephritis*	Hyper-tension	Other	Polycystic kidney	Pyelo-nephritis	Renal vascular disease
England										
B Heart	0.0	112	22.3	35.7	12.5	8.9	8.9	4.5	4.5	2.7
B QEH	0.0	216	15.3	21.3	13.4	7.9	23.2	8.8	2.3	7.9
Basldn	2.4	41	9.8	26.8	14.6	9.8	12.2	7.3	9.8	9.8
Bradfd	0.0	58	29.3	27.6	8.6	12.1	6.9	6.9	5.2	3.5
Brightn	72.9	32								
Bristol	2.9	135	15.6	22.2	15.6	3.7	17.8	10.4	6.7	8.2
Camb	0.0	125	56.8							
Carlis	3.5	28	3.6	32.1	3.6	14.3	25.0	7.1	3.6	10.7
Carsh	12.9	183	29.0	16.9	9.3	9.3	19.7	3.3	8.2	4.4
Chelms	9.3	39	25.6	18.0	18.0	12.8	18.0	2.6	2.6	2.6
Colchr	2.2	44	79.6							
Covnt	0.9	108	13.9	18.5	15.7	11.1	13.0	5.6	7.4	14.8
Derby	8.9	72	22.2	30.6	12.5	1.4	12.5	2.8	15.3	2.8
Donc	0.0	43	25.6	18.6	4.7	16.3	11.6	11.6	9.3	2.3
Dorset	0.0	74	12.2	20.3	9.5	6.8	20.3	9.5	12.2	9.5
Dudley	0.0	41	14.6	24.4	12.2	7.3	26.8	4.9	2.4	7.3
Exeter	0.9	111	12.6	20.7	15.3	13.5	11.7	6.3	7.2	12.6
Glouc	1.7	57	29.8	21.1	8.8	1.8	15.8	7.0	1.8	14.0
Hull	2.8	105	17.1	21.9	7.6	6.7	23.8	10.5	8.6	3.8
Ipswi	0.0	29	34.5	27.6	10.3	0.0	3.5	13.8	6.9	3.5
Kent	0.8	122	21.3	27.1	16.4	4.9	18.0	4.9	4.9	2.5
L Barts	17.4	218	17.4	33.9	9.2	12.4	13.8	6.4	4.6	2.3
L Guys	1.7	114	12.3	29.8	14.0	9.7	19.3	5.3	7.0	2.6
L Kings	0.0	139	12.2	41.0	9.4	12.2	9.4	3.6	7.9	4.3
L Rfree	59.9	91								
L St.G	9.3	68	14.7	25.0	20.6	8.8	16.2	8.8	1.5	4.4
L West	0.0	366	12.3	36.3	12.3	4.1	21.0	4.4	4.9	4.6
Leeds	0.6	159	16.4	20.1	11.3	13.8	15.1	9.4	10.7	3.1
Leic	21.3	211	18.0	20.9	14.2	4.3	14.7	9.0	12.3	6.6
Liv Ain	15.1	62	30.7	17.7	8.1	8.1	11.3	9.7	9.7	4.8
Liv RI	0.0	113	86.7							
M RI	17.3	129	17.8	20.9	13.2	14.0	17.1	7.8	6.2	3.1
Middlbr	2.0	96	26.0	25.0	9.4	4.2	18.8	12.5	0.0	4.2
Newc	1.0	99	13.1	11.1	16.2	1.0	25.3	14.1	9.1	10.1
Norwch	8.2	78	32.1	15.4	14.1	1.3	11.5	10.3	5.1	10.3
Nottm	0.0	116	17.2	22.4	12.9	6.0	24.1	4.3	6.9	6.0
Oxford	1.1	174	21.8	25.3	13.8	5.8	10.9	10.3	9.2	2.9
Plymth	22.0	46	21.7	17.4	28.3	4.4	4.4	4.4	8.7	10.9
Ports	20.3	149	11.4	24.8	15.4	10.7	16.1	8.1	6.0	7.4
Prestn	0.0	140	13.6	22.9	14.3	10.0	15.0	10.7	10.7	2.9
Redng	1.0	102	15.7	25.5	11.8	2.9	19.6	2.9	9.8	11.8
Salford	81.6	23								
Sheff	3.7	130	20.8	20.8	12.3	5.4	12.3	9.2	10.0	9.2
Shrew	3.3	59	17.0	28.8	10.2	6.8	23.7	5.1	1.7	6.8
Stevng	0.0	110	18.2	21.8	7.3	2.7	31.8	8.2	5.5	4.6
Sthend	0.0	29	13.8	20.7	20.7	0.0	20.7	10.3	10.3	3.5
Stoke	5.4	88	17.1	28.4	2.3	9.1	22.7	3.4	9.1	8.0
Sund	0.0	55	0.0	30.9	20.0	16.4	14.6	5.5	10.9	1.8
Truro	0.0	39	12.8	23.1	20.5	5.1	10.3	2.6	15.4	10.3
Wirral	82.1	12								
Wolve	1.3	74	23.0	23.0	14.9	1.4	13.5	8.1	5.4	10.8
York	2.0	50	6.0	18.0	18.0	8.0	14.0	10.0	10.0	16.0

Table 1.6. 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	29	17.2	31.0	10.3	6.9	3.5	6.9	17.2	6.9
Belfast	0.0	68	14.7	19.1	13.2	2.9	16.2	5.9	16.2	11.8
Newry	0.0	38	15.8	26.3	10.5	0.0	15.8	13.2	0.0	18.4
Ulster	0.0	34	8.8	26.5	14.7	8.8	26.5	5.9	2.9	5.9
West NI	0.0	34	11.8	17.7	14.7	5.9	17.7	5.9	14.7	11.8
Scotland										
Abrdn	0.0	49	8.2	34.7	8.2	4.1	16.3	10.2	8.2	10.2
Airdrie	2.1	47	12.8	23.4	19.2	12.8	6.4	6.4	10.6	8.5
D & Gall	0.0	10	20.0	20.0	30.0	20.0	0.0	0.0	10.0	0.0
Dundee	0.0	57	24.6	28.1	12.3	5.3	8.8	8.8	7.0	5.3
Dunfn	0.0	43	11.6	23.3	27.9	0.0	14.0	9.3	7.0	7.0
Edinb	1.4	71	12.7	28.2	14.1	5.6	8.5	14.1	8.5	8.5
Glasgw	0.0	171	15.2	22.8	18.7	2.3	10.5	9.4	5.3	15.8
Inverns	0.0	12	25.0	8.3	16.7	0.0	25.0	0.0	8.3	16.7
Klmarnk	0.0	33	6.1	15.2	21.2	15.2	3.0	6.1	15.2	18.2
Wales										
Bangor	0.0	20	30.0	15.0	20.0	10.0	15.0	10.0	0.0	0.0
Cardff	1.1	180	24.4	28.9	18.9	3.3	12.2	3.9	3.9	4.4
Swanse	2.6	111	9.0	28.8	14.4	1.8	10.8	4.5	7.2	23.4
Wrexm	0.0	26	19.2	30.8	11.5	3.9	11.5	3.9	15.4	3.9
England	**12.0**	**5,114**	**17.6**	**24.7**	**12.7**	**7.6**	**17.3**	**7.2**	**7.0**	**6.0**
N Ireland	**0.0**	**203**	**13.8**	**23.2**	**12.8**	**4.4**	**16.3**	**7.4**	**10.8**	**11.3**
Scotland	**0.4**	**493**	**14.4**	**24.5**	**17.4**	**5.3**	**10.1**	**9.1**	**7.7**	**11.4**
Wales	**1.5**	**344**	**19.3**	**28.2**	**16.9**	**3.3**	**11.9**	**4.5**	**5.6**	**10.4**
UK	**10.2**	**6,154**	**17.3**	**24.8**	**13.3**	**7.0**	**16.3**	**7.2**	**7.1**	**6.9**

* presumed glomerulonephritis not biopsy proven has now been grouped into glomerulonephritis rather than into uncertain as in previous years

The percentage in each category has been calculated after excluding those patients with data not available

For those centres with >25% missing primary diagnoses, the percentages in the diagnostic categories have not been calculated

For those centres judged to have high % uncertain aetiology, the percentages in the other diagnostic categories have not been calculated and the centres have not been included in the country and UK averages

patients will vary between clinicians and centres as the definitions of e.g. renal vascular disease and hypertensive renal disease remain relatively subjective. 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, data was not used from three centres which had diagnosis 'uncertain' for over 50% of their incident patients with non-missing data (Cambridge, Colchester, Royal Liverpool). 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 1.6 or used in the country and UK averages. These centres have also been excluded where PRD is used to stratify analyses.

There was a lot of variability between centres in the percentages with the specific diagnoses. For example, the percentage with diabetes as PRD varied from about 10% to just over 40% of incident patients. The percentage with glomerulonephritis varied from below 5% to 30%.

The overall percentage with uncertain aetiology was lower than last year (17.3 versus 19.8%) but about two-thirds of this decrease was due to the reclassification of those with EDTA code 10 (Glomerulonephritis biopsy not proven) from uncertain into glomerulonephritis (when including this group in uncertain as last year the relevant percentage was 18.9%).

The overall UK distribution of PRDs is shown in table 1.7. Diabetic nephropathy was the most common

Table 1.7. Percentage distribution of primary renal diagnosis by age in the 2011 incident RRT cohort

	Percentage with diagnosis		
Diagnosis	Age <65	Age ⩾65	All patients
Diabetes	27.2	22.4	24.8
Glomerulonephritis*	17.4	9.2	13.3
Pyelonephritis	7.8	6.5	7.1
Hypertension	6.7	7.4	7.0
Polycystic kidney	10.6	3.8	7.2
Renal vascular disease	2.3	11.5	6.9
Other	16.1	16.6	16.3
Uncertain aetiology*	12.0	22.6	17.3

* Presumed glomerulonephritis not biopsy proven has now been grouped into glomerulonephritis rather than into uncertain as in previous years
Percentages calculated after excluding those patients with data not available

specific renal diagnosis in both the under and over 65 year age groups, accounting for 25% of all (non-missing) incident diagnoses. Glomerulonephritis and autosomal dominant polycystic kidney disease (ADPKD) made up higher proportions of the younger than the older incident cohorts (17% vs. 9% and 11% vs. 4% respectively), whilst patients with renal vascular disease comprised a much higher percentage of the older rather than the younger patients (12% vs. 2%). Uncertainty about the underlying diagnosis was also much more likely in the older rather than the younger cohort (23% vs. 12%).

For all primary renal diagnoses except ADPKD, the male to female ratio was 1.3 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 1.8 shows the incidence rates for each PRD per million population for the 2011 cohort. In both the 2010 and 2011 cohorts, the incidence of RRT due to diabetes as PRD was noticeably higher in Wales than in the other countries. As there were some missing data, the rates for at least some of the diagnoses will be underestimates.

First established treatment modality

The first treatment recorded, irrespective of any later change, was haemodialysis (HD) in 73.1% of patients, peritoneal dialysis (PD) in 20.3% and pre-emptive transplant in 6.6% in 2011. As seen last year, this continues the decrease in HD (76.3%, 74.8%, 73.1%) and increase in PD (17.9%, 18.3%, 20.3%) seen respectively for 2009, 2010 and 2011). For pre-emptive transplant the percentages were 5.9, 6.9 and 6.6 for the three years. Table F.1.3 in appendix F: Additional Data Tables for 2011 new and existing patients (www.renalreg.com) 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 these analyses, the incident cohort from 1st October 2010 to 30th September 2011 was used so that follow up to 90 days was possible for all patients. By 90 days, 5.5% of incident patients had died and a further 0.3% had stopped treatment, leaving 94.1% of the original cohort still on RRT. Table 1.9 shows the percentages on each

Table 1.8. Primary renal diagnosis RRT incidence rates (2011) per million population (unadjusted)

Diagnosis	England	N Ireland	Scotland	Wales	UK
Diabetes	23.7	26.0	22.9	33.2	24.2
Glomerulonephritis*	12.2	14.4	16.2	19.9	12.9
Pyelonephritis	6.8	12.1	7.2	6.6	6.9
Hypertension	7.3	5.0	4.9	3.8	6.8
Polycystic kidney	6.9	8.3	8.5	5.2	7.0
Renal vascular disease	5.7	12.7	10.6	12.2	6.7
Other	16.6	18.2	9.4	14.0	15.9
Uncertain aetiology*	16.9	15.5	13.4	22.7	16.8
Data not available	13.1	0.0	0.4	1.7	11.0
All	**109**	**112**	**93**	**119**	**108**

* Presumed glomerulonephritis not biopsy proven has now been grouped into glomerulonephritis rather than into uncertain as in previous years
The overall rates per country may be slightly different to those in table 1.1 as those centres whose PRD data has not been used have been excluded from both the numerator and the denominator here

Table 1.9. RRT modality at 90 days by centre (incident cohort 1/10/2010 to 30/09/2011)

		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	Stopped treatment	Died	HD	PD	Tx
England									
B Heart	104	79.8	15.4	1.9	0.0	2.9	82.2	15.8	2.0
B QEH	194	65.5	23.7	6.7	0.0	4.1	68.3	24.7	7.0
Basldn	36	69.4	27.8	0.0	0.0	2.8	71.4	28.6	0.0
Bradfd	59	74.6	13.6	5.1	0.0	6.8	80.0	14.6	5.5
Brightn	111	65.8	21.6	1.8	0.0	10.8	73.7	24.2	2.0
Bristol	141	69.5	12.1	14.9	0.0	3.6	72.1	12.5	15.4
Camb	125	60.0	11.2	24.8	0.0	4.0	62.5	11.7	25.8
Carlis	27	44.4	40.7	11.1	0.0	3.7	46.2	42.3	11.5
Carsh	208	72.1	13.9	7.7	0.0	6.3	76.9	14.9	8.2
Chelms	49	61.2	24.5	2.0	2.0	10.2	69.8	27.9	2.3
Colchr	40	97.5	0.0	0.0	0.0	2.5	100.0	0.0	0.0
Covnt	109	51.4	26.6	10.1	0.0	11.9	58.3	30.2	11.5
Derby	83	45.8	42.2	1.2	0.0	10.8	51.4	47.3	1.4
Donc	41	80.5	9.8	2.4	0.0	7.3	86.8	10.5	2.6
Dorset	78	60.3	23.1	5.1	5.1	6.4	68.1	26.1	5.8
Dudley	43	58.1	30.2	0.0	4.7	7.0	65.8	34.2	0.0
Exeter	120	73.3	20.0	0.8	0.8	5.0	77.9	21.2	0.9
Glouc	65	67.7	16.9	9.2	1.5	4.6	72.1	18.0	9.8
Hull	105	52.4	37.1	1.9	1.0	7.6	57.3	40.6	2.1
Ipswi	37	64.9	27.0	8.1	0.0	0.0	64.9	27.0	8.1
Kent	123	73.2	13.8	5.7	1.6	5.7	79.0	14.9	6.1
L Barts	221	62.0	27.2	8.6	0.0	2.3	63.4	27.8	8.8
L Guys	120	70.8	7.5	19.2	0.0	2.5	72.7	7.7	19.7
L Kings	147	71.4	23.1	2.7	0.0	2.7	73.4	23.8	2.8
L Rfree	219	69.9	16.4	10.1	0.0	3.7	72.5	17.1	10.4
L St.G	77	71.4	14.3	10.4	0.0	3.9	74.3	14.9	10.8
L West	357	79.6	4.8	12.3	0.0	3.4	82.3	4.9	12.8
Leeds	156	62.8	23.7	7.1	0.0	6.4	67.1	25.3	7.5
Leic	278	60.4	21.2	13.0	0.0	5.4	63.9	22.4	13.7
Liv Ain	76	77.6	11.8	0.0	0.0	10.5	86.8	13.2	0.0
Liv RI	109	50.5	22.9	17.4	0.9	8.3	55.6	25.3	19.2
M RI	150	64.0	20.0	10.7	0.0	5.3	67.6	21.1	11.3
Middlbr	89	77.5	11.2	4.5	0.0	6.7	83.1	12.1	4.8
Newc	96	53.1	17.7	19.8	0.0	9.4	58.6	19.5	21.8
Norwch	84	59.5	27.4	1.2	1.2	10.7	67.6	31.1	1.4
Nottm	123	51.2	30.1	6.5	2.4	9.8	58.3	34.3	7.4
Oxford	167	53.3	21.6	19.8	0.0	5.4	56.3	22.8	20.9
Plymth	53	60.4	18.9	17.0	0.0	3.8	62.8	19.6	17.7
Ports	175	68.0	21.1	6.3	0.0	4.6	71.3	22.2	6.6
Prestn	144	77.1	13.9	6.3	0.7	2.1	79.3	14.3	6.4
Redng	92	48.9	34.8	7.6	0.0	8.7	53.6	38.1	8.3
Salford	141	55.3	29.1	9.9	0.0	5.7	58.7	30.8	10.5
Sheff	146	76.0	13.0	4.8	0.0	6.2	81.0	13.9	5.1
Shrew	66	62.1	25.8	1.5	1.5	9.1	69.5	28.8	1.7
Stevng	114	77.2	14.0	7.9	0.0	0.9	77.9	14.2	8.0
Sthend	29	62.1	27.6	6.9	0.0	3.5	64.3	28.6	7.1
Stoke	78	68.0	23.1	1.3	0.0	7.7	73.6	25.0	1.4
Sund	46	67.4	15.2	10.9	2.2	4.4	72.1	16.3	11.6
Truro	45	64.4	17.8	8.9	0.0	8.9	70.7	19.5	9.8
Wirral	71	70.4	19.7	1.4	0.0	8.5	76.9	21.5	1.5
Wolve	92	67.4	25.0	1.1	0.0	6.5	72.1	26.7	1.2
York	44	52.3	29.6	13.6	0.0	4.6	54.8	31.0	14.3

Table 1.9. 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	Stopped treatment	Died	HD	PD	Tx
N Ireland									
Antrim	25	60.0	20.0	8.0	4.0	8.0	68.2	22.7	9.1
Belfast	71	77.5	14.1	7.0	0.0	1.4	78.6	14.3	7.1
Newry	31	74.2	19.4	3.2	0.0	3.2	76.7	20.0	3.3
Ulster	35	85.7	5.7	0.0	2.9	5.7	93.8	6.3	0.0
West NI	35	77.1	17.1	2.9	0.0	2.9	79.4	17.7	2.9
Scotland									
Abrdn	51	82.4	11.8	0.0	0.0	5.9	87.5	12.5	0.0
Airdrie	41	90.2	4.9	2.4	0.0	2.4	92.5	5.0	2.5
D & Gall	10	40.0	60.0	0.0	0.0	0.0	40.0	60.0	0.0
Dundee	59	84.8	8.5	0.0	0.0	6.8	90.9	9.1	0.0
Dunfn	46	71.7	17.4	0.0	0.0	10.9	80.5	19.5	0.0
Edinb	68	72.1	17.7	4.4	1.5	4.4	76.6	18.8	4.7
Glasgw	161	73.3	14.3	5.6	0.0	6.8	78.7	15.3	6.0
Inverns	17	76.5	23.5	0.0	0.0	0.0	76.5	23.5	0.0
Klmarnk	32	56.3	18.8	3.1	0.0	21.9	72.0	24.0	4.0
Wales									
Bangor	26	73.1	26.9	0.0	0.0	0.0	73.1	26.9	0.0
Cardff	192	67.7	19.3	9.9	0.0	3.1	69.9	19.9	10.2
Swanse	120	70.8	22.5	0.8	0.0	5.8	75.2	23.9	0.9
Wrexm	26	65.4	19.2	7.7	0.0	7.7	70.8	20.8	8.3
England	**5,703**	**66.0**	**19.6**	**8.5**	**0.4**	**5.6**	**70.2**	**20.9**	**9.0**
N Ireland	**197**	**76.1**	**14.7**	**4.6**	**1.0**	**3.6**	**79.8**	**15.4**	**4.8**
Scotland	**485**	**75.1**	**14.9**	**2.9**	**0.2**	**7.0**	**80.9**	**16.0**	**3.1**
Wales	**371**	**69.3**	**20.5**	**5.9**	**0.0**	**4.3**	**72.4**	**21.4**	**6.2**
UK	**6,756**	**67.1**	**19.2**	**7.8**	**0.3**	**5.5**	**71.3**	**20.4**	**8.3**

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, 67.1% were on HD at 90 days, 19.2% were on PD and 7.8% had received a transplant. Expressed as percentages of those still receiving RRT at 90 days, 71.3% were on HD, 20.4% on PD and 8.3% had received a transplant. Last year it was reported that the percentage receiving peritoneal dialysis at 90 days had increased from the previous year for the first time since the start of the Renal Registry, this percentage further increased from 2010 to 2011 (from 19.2 to 20.4%).

The percentage of patients on PD at 90 days increased greatly for Northern Ireland (from 6% to 15%) making it much closer to the percentages seen in the other countries. Figure 1.8 shows the modality breakdown with the HD patients further subdivided. Of those still on RRT at 90 days, 43% were treated with main centre HD and 28% with satellite HD.

The percentage of incident patients who had died by 90 days varied considerably between centres (0% to 22%, table 1.9). Differences in the definition of whether patients have acute or chronic renal failure 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

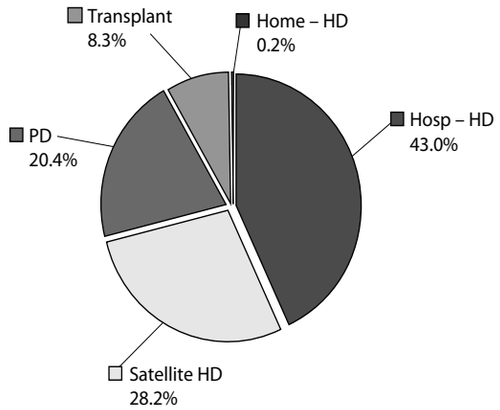

Fig. 1.8. RRT modality at 90 days (incident cohort 1/10/2010 to 30/09/2011)

centres from 0% to 26%. The mean percentage of the incident cohort with a functioning transplant by 90 days was significantly greater in transplanting compared to non-transplanting centres (11.4% vs. 4.4%: $p < 0.0001$). 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 (as mentioned earlier).

Table 1.10 gives the HD/PD breakdown for those incident patients on dialysis at 90 days. The breakdown is given by age group and overall. The percentage on PD at 90 days was about 60% higher in patients aged under 65 years than in older patients (27.8% vs. 17.1%). This was a change from 2010 when the percentage on PD was twice as high in the younger group than in the older group. The percentage on PD fell slightly from 2010 to 2011 in the younger age group (28.2 to 27.8%) but increased markedly in the over 65 age group (14.0% to 17.1%). For the younger age group, four centres (Derby, Hull, Nottm, Sthend) had over twice the average percentage on PD. Derby also had over twice the average percentage on PD in the older age group.

The median age at start for those on HD at 90 days was 67.3 years compared with 60.2 years for PD. For PD, this was an increase in median age at start of almost two years from 2010 to 2011. There were 11 centres where the percentage of patients treated with PD was the same as or higher in the over 65s than the under 65s (compared with four centres for 2010).

Modality change over time

Table 1.11 gives the breakdown of status/treatment modality at four subsequent time points by initial treatment type for patients starting RRT in 2006. Fifty-four percent of patients who started on HD had died within five years of starting. This compared to 33% and 6% for those starting on PD or transplant respectively. Of those patients starting on PD, 92% were on PD at 90 days but this percentage dropped sharply at the later time points. In contrast, 90% of patients starting with

Table 1.10. Modality split of patients on dialysis at 90 days (incident cohort 1/10/2010 to 30/09/2011)

		Age <65 (%)		Age ⩾65 (%)		All patients (%)	
Centre	N	HD	PD	HD	PD	HD	PD
England							
B Heart	99	78.3	21.7	88.7	11.3	83.8	16.2
B QEH	173	62.0	38.0	86.4	13.6	73.4	26.6
Basldn	35	63.2	36.8	81.3	18.8	71.4	28.6
Bradfd	52	84.4	15.6	85.0	15.0	84.6	15.4
Brightn	97	68.9	31.1	80.8	19.2	75.3	24.7
Bristol	115	78.7	21.3	89.7	10.3	85.2	14.8
Camb	89	65.4	34.6	92.1	7.9	84.3	15.7
Carlis	23	50.0	50.0	53.3	46.7	52.2	47.8
Carsh	179	80.6	19.4	86.0	14.0	83.8	16.2
Chelms	42	57.9	42.1	82.6	17.4	71.4	28.6
Colchr	39	100.0	0.0	100.0	0.0	100.0	0.0
Covnt	85	62.2	37.8	70.0	30.0	65.9	34.1
Derby	73	40.0	60.0	60.5	39.5	52.1	47.9
Donc	37	84.2	15.8	94.4	5.6	89.2	10.8
Dorset	65	69.2	30.8	74.4	25.6	72.3	27.7
Dudley	38	53.3	46.7	73.9	26.1	65.8	34.2
Exeter	112	68.0	32.0	87.1	12.9	78.6	21.4
Glouc	55	66.7	33.3	85.0	15.0	80.0	20.0
Hull	94	41.7	58.3	69.0	31.0	58.5	41.5
Ipswi	34	66.7	33.3	75.0	25.0	70.6	29.4
Kent	107	79.6	20.4	87.9	12.1	84.1	15.9
L Barts	197	66.7	33.3	73.5	26.5	69.5	30.5
L Guys	94	86.0	14.0	95.5	4.5	90.4	9.6
L Kings	139	72.0	28.0	79.7	20.3	75.5	24.5
L Rfree	189	81.2	18.8	80.7	19.3	81.0	19.0

Table 1.10. Continued

		Age <65 (%)		Age ⩾65 (%)		All patients (%)	
Centre	N	HD	PD	HD	PD	HD	PD
L St.G	66	75.0	25.0	93.3	6.7	83.3	16.7
L West	301	96.8	3.2	91.7	8.3	94.4	5.6
Leeds	135	60.6	39.4	84.1	15.9	72.6	27.4
Leic	227	74.5	25.5	73.6	26.4	74.0	26.0
Liv Ain	68	82.8	17.2	89.7	10.3	86.8	13.2
Liv RI	80	54.5	45.5	86.1	13.9	68.8	31.3
M RI	126	71.4	28.6	82.1	17.9	76.2	23.8
Middlbr	79	89.5	10.5	85.4	14.6	87.3	12.7
Newc	68	70.3	29.7	80.6	19.4	75.0	25.0
Norwch	73	60.6	39.4	75.0	25.0	68.5	31.5
Nottm	100	42.9	57.1	73.8	26.2	63.0	37.0
Oxford	125	58.2	41.8	86.2	13.8	71.2	28.8
Plymth	42	62.5	37.5	84.6	15.4	76.2	23.8
Ports	156	68.8	31.2	83.5	16.5	76.3	23.7
Prestn	131	80.6	19.4	89.1	10.9	84.7	15.3
Redng	77	51.2	48.8	67.6	32.4	58.4	41.6
Salford	119	52.4	47.6	80.4	19.6	65.5	34.5
Sheff	130	86.4	13.6	84.4	15.6	85.4	14.6
Shrew	58	50.0	50.0	83.3	16.7	70.7	29.3
Stevng	104	81.1	18.9	88.2	11.8	84.6	15.4
Sthend	26	42.9	57.1	78.9	21.1	69.2	30.8
Stoke	71	65.4	34.6	80.0	20.0	74.6	25.4
Sund	38	72.7	27.3	93.8	6.3	81.6	18.4
Truro	37	78.9	21.1	77.8	22.2	78.4	21.6
Wirral	64	69.7	30.3	87.1	12.9	78.1	21.9
Wolve	85	73.0	27.0	72.9	27.1	72.9	27.1
York	36	60.0	40.0	68.8	31.3	63.9	36.1
N Ireland							
Antrim	20	66.7	33.3	78.6	21.4	75.0	25.0
Belfast	65	83.3	16.7	85.7	14.3	84.6	15.4
Newry	29	80.0	20.0	78.9	21.1	79.3	20.7
Ulster	32	85.7	14.3	100.0	0.0	93.8	6.3
West NI	33	77.8	22.2	86.7	13.3	81.8	18.2
Scotland							
Abrdn	48	82.6	17.4	92.0	8.0	87.5	12.5
Airdrie	39	92.9	7.1	100.0	0.0	94.9	5.1
D & Gall	10	66.7	33.3	0.0	100.0	40.0	60.0
Dundee	55	91.3	8.7	90.6	9.4	90.9	9.1
Dunfn	41	75.0	25.0	85.7	14.3	80.5	19.5
Edinb	61	80.0	20.0	81.0	19.0	80.3	19.7
Glasgw	141	80.3	19.7	86.7	13.3	83.7	16.3
Inverns	17	57.1	42.9	90.0	10.0	76.5	23.5
Klmarnk	24	80.0	20.0	71.4	28.6	75.0	25.0
Wales							
Bangor	26	64.3	35.7	83.3	16.7	73.1	26.9
Cardff	167	73.8	26.3	81.6	18.4	77.8	22.2
Swanse	112	58.3	41.7	89.1	10.9	75.9	24.1
Wrexm	22	60.0	40.0	91.7	8.3	77.3	22.7
England	**4,884**	**71.3**	**28.7**	**82.4**	**17.6**	**77.1**	**22.9**
N Ireland	**179**	**80.8**	**19.2**	**86.1**	**13.9**	**83.8**	**16.2**
Scotland	**436**	**81.6**	**18.4**	**85.4**	**14.6**	**83.5**	**16.5**
Wales	**333**	**67.5**	**32.5**	**85.5**	**14.5**	**77.2**	**22.8**
UK	**5,832**	**72.2**	**27.8**	**82.9**	**17.1**	**77.8**	**22.2**

Table 1.11. Initial and subsequent modalities for patients starting RRT in 2006

First treatment	N	Later modality	Percentage			
			90 days	1 year	3 years	5 years
HD	4,853	HD	86	70	46	29
		PD	3	4	2	1
		Transplant	0	3	10	15
		Other*	1	1	1	1
		Died	9	22	40	54
PD	1,267	HD	4	15	22	19
		PD	92	68	31	12
		Transplant	1	10	26	35
		Other*	0	1	1	1
		Died	2	7	21	33
Transplant	215	HD	1	1	3	3
		PD	0	0	0	1
		Transplant	97	94	91	90
		Died	2	4	6	6

* Other e.g. stopped treatment

a transplant continued to be transplant patients after 5 years.

Renal function at the time of starting RRT

The mean eGFR at initiation of RRT in 2011 was 8.7 ml/min/1.73 m^2. This was highest in the 65–74 and 75–84 age groups at about 8.9 ml/min/1.73 m^2 (figure 1.9). By contrast, in the United States 54% of patients starting RRT in 2009 had an eGFR greater than 10 ml/min/1.73 m^2 [4].

Figure 1.10 shows serial data from centres reporting annually to the UKRR since 2002. For HD patients, average eGFR at start of RRT in 2011 was similar to that for 2010. For the six years prior to 2011 there was higher average eGFR at start of RRT for PD than HD patients but there was a small fall in the eGFR for PD patients for 2011 bringing the average just below that for HD patients.

Some caution should be applied to the analysis of eGFR at the start of RRT 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

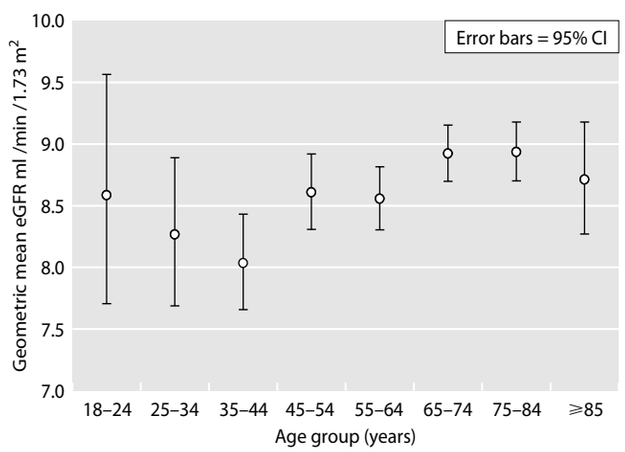

Fig. 1.9. Geometric mean eGFR at start of RRT (2011) by age group

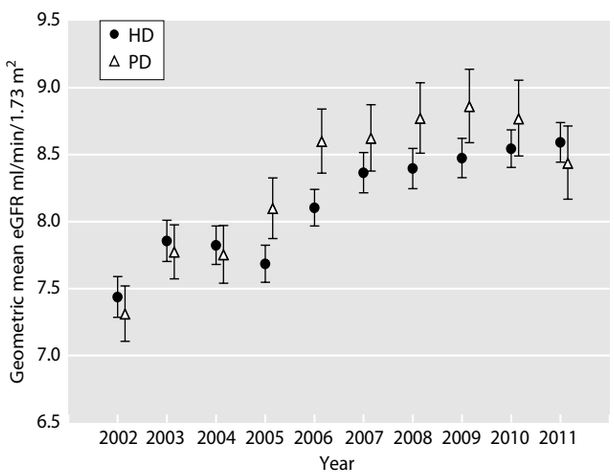

Fig. 1.10. eGFR on starting RRT 2002 to 2011, PD and HD (restricted to centres reporting since 2002)

receiving RRT. For details see the 12th Annual Report chapter 13: The UK Renal Registry Advanced CKD Study 2009 [5].

3. Late presentation and delayed referral of incident patients

Introduction

Late presentation to a nephrologist is regarded as a negative aspect in renal centres. 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 with rapidly progressive glomerulonephritis. 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 (shown in table 1.13) attempts to capture 'late referrals'. In this table the percentage presenting within 90 days of starting RRT is shown after excluding an acute renal disease group. This group is made up of those people with conditions likely to present with rapidly deteriorating renal function: crescentic 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, haemolytic ureaemic syndrome (including Moschcowitz syndrome), multi-system disease – other, tubular necrosis (irreversible) or cortical necrosis, Balkan nephropathy, kidney tumour and traumatic or surgical loss of kidney.

Methods

Data were included from all incident patients in the years 2010 to 2011. 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 were excluded because of actual or potential inconsistencies. Only data from those centres with 75% or more completeness for the relevant year were used. Data were excluded for centres for any year where 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 9,118 patients were available for analysis. Presentation times of 90 days or more were defined as early presentation and times of less than 90 days were defined as late presentation.

Results

Table 1.12 shows the percentage completeness of data for 2010 and 2011. Last year's report showed a big improvement in the reporting of presentation time data from 2009 to 2010 (from about 50% to about 80% complete). The completeness for 2011 was again about 80%. The 2010–2011 cohort available for analysis was therefore substantially larger than the 2009–2010 cohort used in last year's report. Nevertheless, a two year cohort is again 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.

Late presentation by centre

Figure 1.11 shows that late presentation varied between centres from 9–35% in patients starting RRT in 2010 to 2011. The overall rate of late presentation was 20.1% and was 14.9% once those people with diseases likely to present acutely were excluded. Table 1.13 shows the overall percentage presenting late for the combined 2010–2011 incident cohort, the percentages presenting late amongst those patients defined as not having an 'acute diagnosis' and the percentages amongst non-diabetics (as PRD).

Late presentation in 2011 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 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.

In 2011, 67.3% of incident patients presented over a year before they needed to start RRT. There were 8.4% of patients presenting within 6–12 months, 4.7% within 3–6 months and 19.6% within 3 months. These figures have remained stable over the last 2 years. Figure 1.12 shows this breakdown by year for those 18 centres supplying data over 75% complete for each of

Table 1.12. Percentage completeness of time of presentation data (2010 and 2011 incident RRT patients) by centre

	N		Percentage completeness	
Centre	2010	2011	2010	2011
England				
B Heart	95	112	95.8	97.2
B QEH	197	216	94.9	97.7
Basldn	32	42	93.8	100.0
Bradfd	67	58	98.5	98.2
Brightn	106	118	1.9	10.3
Bristol	168	139	98.8	86.1
Camb	105	125	99.0	97.6
Carlis	23	29	0.0	89.7
Carsh	220	210	86.7	94.3
Chelms	45	43	100.0	97.7
Colchr	32	45	84.4	86.7
Covnt	115	109	95.6	72.0
Derby	79	79	100.0	96.2
Donc	44	43	97.7	100.0
Dorset	71	74	91.5	100.0
Dudley	43	41	92.9	97.6
Exeter	140	112	65.7	99.1
Glouc	61	58	91.8	100.0
Hull	87	108	65.5	65.7
Ipswi	33	29	93.9	92.9
Kent	134	123	100.0	100.0
L Barts	204	264	[a]	0.8
L Guys	135	116	91.8	94.8
L Kings	144	139	93.8	96.4
L Rfree	207	227	90.3	61.5
L St.G	86	75	88.4	33.3
L West	366	366	0.5	92.9
Leeds	125	160	100.0	97.4
Leic	245	268	98.8	96.6
Liv Ain	51	73	[a]	61.1
Liv RI	99	113	48.5	4.5
M RI	161	156	95.0	58.4
Middlbr	98	98	95.9	99.0
Newc	94	100	93.6	94.0
Norwch	86	85	85.9	90.6
Nottm	116	116	97.4	97.4
Oxford	165	176	96.3	94.3
Plymth	56	59	1.8	32.2
Ports	149	187	98.6	97.8
Prestn	124	140	96.0	98.6
Redng	89	103	94.4	57.3
Salford	149	125	[a]	0.8
Sheff	143	135	98.6	100.0
Shrew	58	61	100.0	100.0
Stevng	107	110	97.2	96.4
Sthend	29	29	93.1	100.0
Stoke	95	93	98.9	100.0
Sund	55	55	94.5	94.5
Truro	46	39	100.0	97.4
Wirral	61	67	88.3	[a]
Wolve	106	75	99.0	100.0
York	38	51	92.1	98.0
N Ireland				
Antrim	41	29	100.0	96.6
Belfast	72	68	94.4	95.6
Newry	21	38	95.2	100.0
Ulster	20	34	100.0	100.0
West NI	26	34	100.0	94.1
Wales				
Bangor	26	20	92.0	100.0
Cardff	186	182	95.1	97.3
Clwyd	15	21	60.0	[b]
Swanse	137	114	100.0	96.5
Wrexm	25	26	100.0	88.0
England	**5,584**	**5,774**	**76.4**	**78.3**
N Ireland	**180**	**203**	**97.2**	**97.1**
Wales	**389**	**363**	**95.6**	**90.9**
E, W & NI	**6,153**	**6,340**	**78.8**	**80.6**

[a] data not shown as >10% of patients reported as starting RRT on the same date as first presentation
[b] Clwyd not shown for 2011 as less than 10 patients with full data
Date first seen by a nephrologist has not been collected from the Scottish Renal Registry and so Scottish centres were excluded from these analyses

the last six years. The percentage of patients presenting late in these centres fell steadily until 2009 alongside an increase in those presenting 12 months or more before starting RRT. There was less change between 2009 and 2011.

Age and late presentation

In the 2010 to 2011 cohort, patients who presented late were not significantly older or younger than patients who presented earlier (>90 days before RRT initiation) (median age 65.3 vs. 65.4 years: $p = 0.3$). Except for the two youngest age groups, the median duration of pre-RRT care did not vary greatly with age (figure 1.13).

Gender and late presentation

In the 2010 to 2011 cohort, there was no significant difference in the ratio of males to females by time of presentation (male:female ratio 1.72 in early presentation, 1.81 in late presentation, $p = 0.32$).

Ethnicity, social deprivation and late presentation

In the 2010 to 2011 cohort, the percentage of South Asian and Black patients presenting late (<90 days)

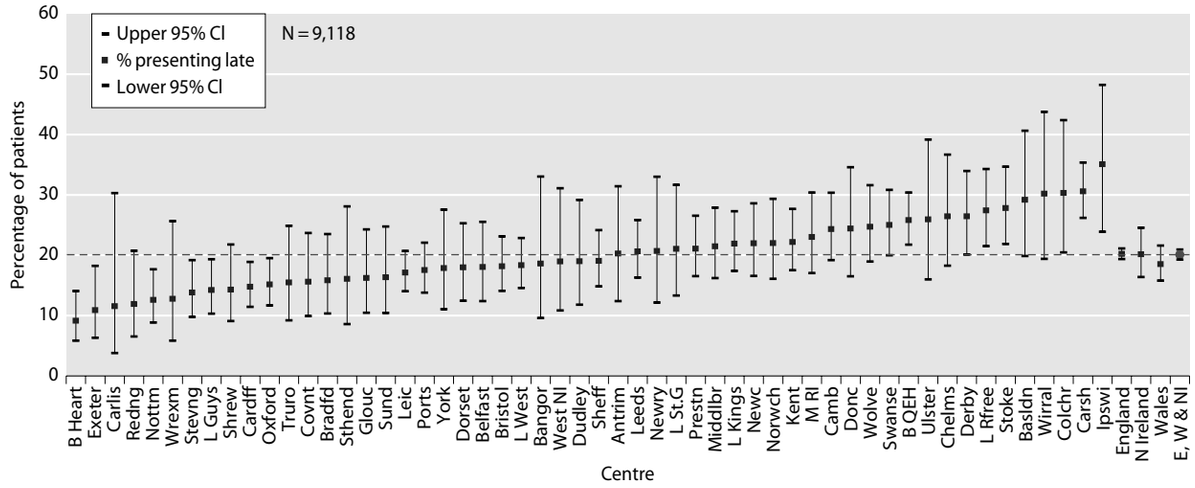

Fig. 1.11. Percentage presenting late (2010/2011)

was significantly lower than in Whites (17.6% vs. 20.3%: $p = 0.02$). The high incidence of diabetes in non-Whites (as discussed below, patients with diabetes tended to present earlier) explains most of the difference in presentation time between the ethnic groups. When patients with diabetes were excluded, the percentages presenting late (<90 days) became 22.8% in South Asian and Black patients vs. 23.3% in Whites ($p = 0.8$). There was no relationship between social deprivation and presentation pattern.

Primary renal disease and late presentation

In the 2010 to 2011 cohort, late presentation differed significantly between primary renal diagnoses (Chi-squared test $p < 0.0001$) (table 1.14). Patients in the acute group or with data not available had high rates of late presentation. Those with diabetes and pyelonephritis or adult polycystic kidney disease had low rates. There was a notable 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.

Modality and late presentation

In the 2010 to 2011 cohort, late presentation was associated with initial modality. The percentage of patients

Table 1.13 Percentage of patients presenting to a nephrologist less than 90 days before RRT initiation (2010–2011 incident patients) by centre

		Percentage presenting late			
Centre	N with data	Overall	(95% CI)	Non-acute*	Non-diab PRD
England					
B Heart	197	9.1	(5.8–14.0)	7.3	13.5
B QEH	395	25.8	(21.8–30.4)	21.7	26.0
Basldn	72	29.2	(19.9–40.6)	22.7	32.7
Bradfd	120	15.8	(10.3–23.5)	14.2	17.1
Bristol	281	18.2	(14.1–23.1)	13.6	20.2
Camb	226	24.3	(19.2–30.4)		
Carlis	26	11.5	(3.8–30.3)	13.6	5.9
Carsh	386	30.6	(26.2–35.4)	24.1	33.5
Chelms	87	26.4	(18.2–36.7)	21.1	25.7
Colchr	66	30.3	(20.5–42.4)	25.0	29.2
Covnt	109	15.6	(9.9–23.7)	11.2	16.8
Derby	155	26.5	(20.1–34.0)	18.5	32.8
Donc	86	24.4	(16.5–34.6)	18.4	29.9
Dorset	139	18.0	(12.5–25.3)	14.1	20.9
Dudley	79	19.0	(11.8–29.1)	17.1	24.1

Table 1.13 Continued

		Percentage presenting late			
Centre	N with data	Overall	(95% CI)	Non-acute*	Non-diab PRD
Exeter	110	10.9	(6.3–18.2)	8.9	12.6
Glouc	111	16.2	(10.5–24.3)	11.3	19.3
Ipswi	57	35.1	(23.9–48.2)	34.6	44.4
Kent	257	22.2	(17.5–27.7)	15.2	25.7
L Guys	232	14.2	(10.3–19.3)	12.1	16.0
L Kings	269	21.9	(17.4–27.3)	18.0	29.0
L Rfree	186	27.4	(21.5–34.3)	24.4	28.2
L St.G	76	21.1	(13.3–31.6)	15.4	24.1
L West	338	18.3	(14.6–22.8)	14.9	21.9
Leeds	276	20.7	(16.3–25.8)	14.8	24.2
Leic	491	17.1	(14.0–20.7)	9.7	20.1
M RI	152	23.0	(17.0–30.4)	17.7	26.3
Middlbr	191	21.5	(16.2–27.9)	19.1	22.2
Newc	182	22.0	(16.6–28.6)	14.7	25.3
Norwch	150	22.0	(16.1–29.3)	14.2	24.2
Nottm	222	12.6	(8.9–17.7)	10.3	14.9
Oxford	323	15.2	(11.7–19.5)	11.4	17.7
Ports	325	17.5	(13.8–22.1)	10.0	19.7
Prestn	256	21.1	(16.5–26.5)	15.3	22.7
Redng	84	11.9	(6.5–20.7)	8.7	13.6
Sheff	273	19.1	(14.8–24.1)	12.3	22.5
Shrew	119	14.3	(9.1–21.8)	10.4	16.9
Stevng	210	13.8	(9.8–19.2)	9.8	17.4
Sthend	56	16.1	(8.6–28.1)	12.8	19.6
Stoke	187	27.8	(21.9–34.7)	21.6	32.4
Sund	104	16.4	(10.4–24.7)	11.0	19.7
Truro	84	15.5	(9.2–24.9)	14.1	20.0
Wirral	53	30.2	(19.4–43.7)	21.1	34.9
Wolve	178	24.7	(18.9–31.6)	21.8	29.2
York	84	17.9	(11.1–27.5)	11.0	21.4
N Ireland					
Antrim	69	20.3	(12.4–31.4)	17.5	22.2
Belfast	133	18.1	(12.4–25.5)	10.3	21.2
Newry	58	20.7	(12.1–33.0)	13.2	19.1
Ulster	54	25.9	(16.0–39.2)	20.0	28.2
West NI	58	19.0	(10.8–31.1)	17.0	18.8
Wales					
Bangor	43	18.6	(9.6–33.0)	16.7	20.6
Cardff	352	14.8	(11.4–18.9)	11.7	18.0
Swanse	244	25.0	(20.0–30.8)	18.2	30.2
Wrexm	47	12.8	(5.9–25.6)	11.6	17.7
England	**8,060**	**20.2**	**(19.4–21.1)**	**15.0**	**23.0**
N Ireland	**372**	**20.2**	**(16.4–24.6)**	**14.6**	**21.6**
Wales	**686**	**18.5**	**(15.8–21.6)**	**14.3**	**22.6**
E, W & NI	**9,118**	**20.1**	**(19.3–20.9)**	**14.9**	**22.9**
(min, max)		**(9.1–35.1)**		**(7.3–34.6)**	**(5.9–44.4)**
(IQR)		**(15.9–24.4)**		**(11.4–18.4)**	**(18.8–26.3)**

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

* 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 (including Moschcowitz syndrome), multi-system disease – other, tubular necrosis (irreversible) or cortical necrosis, Balkan nephropathy, kidney tumour, and traumatic or surgical loss of kidney

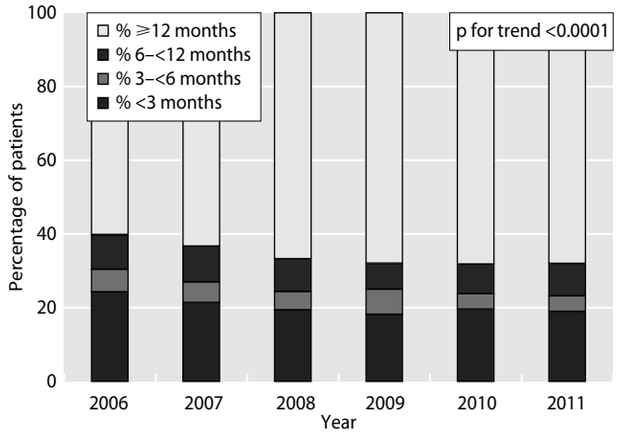

Fig. 1.12. Late presentation rate by year (2006–2011)
Restricted to centres reporting continuous data for 2006–2011

whose first modality was PD was significantly lower in the late presentation group than in those presenting earlier (9.1% vs. 21.6%: $p < 0.0001$). By 90 days after RRT initiation this difference was reduced, although it was still highly significant (12.2% vs. 21.6%: $p < 0.0001$).

Comorbidity and late presentation

In the 2010 to 2011 cohort, the percentage of patients who were assessed as having no comorbidity was roughly the same in those who presented late and those presenting earlier (45.1% vs. 46.9%: $p = 0.3$). Ischaemic heart disease, cerebrovascular disease and peripheral vascular disease were significantly less common in the group presenting late (table 1.15). Malignancy was significantly more common in those presenting late; perhaps because of the potential for rapid decline in renal function in this group.

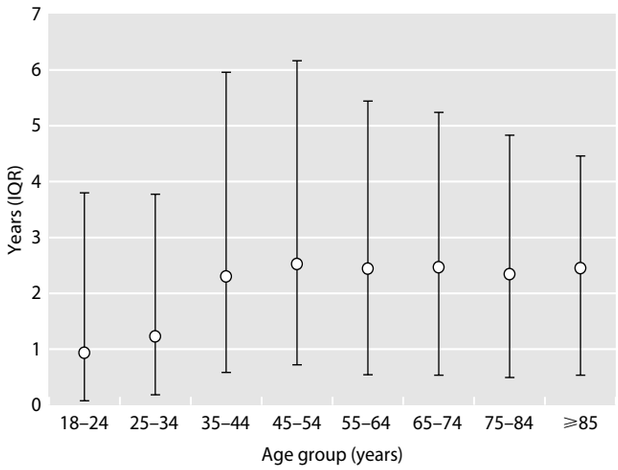

Fig. 1.13. Median duration of pre-RRT care by age group (incident patients 2010–2011)

Table 1.14. Late presentation by primary renal diagnosis (2010–2011 incident patients)

		Late presentation	
Diagnosis	N	N	%
Uncertain aetiology*	1,440	316	21.9
Diabetes	2,044	201	9.8
Glomerulonephritis*	1,071	153	14.3
Other identified category	714	160	22.4
Polycystic kidney or pyelonephritis	1,209	126	10.4
Renal vascular disease	1,069	167	15.6
Acute group	816	457	56.0
Data not available	459	172	37.5

* Presumed glomerulonephritis not biopsy proven has now been grouped into glomerulonephritis rather than into uncertain as in previous years
Unlike elsewhere in the report, the RVD group includes hypertension and polycystic 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 (including Moschcowitz syndrome), multi-system disease – other, tubular necrosis (irreversible) or cortical necrosis, Balkan nephropathy, kidney tumour, and traumatic or surgical loss of kidney

Haemoglobin and late presentation

In the 2010 to 2011 cohort, patients presenting late had a significantly lower average haemoglobin concentration at RRT initiation than patients presenting earlier (9.4 vs. 10.3 g/dl: $p < 0.0001$). This may reflect inadequate pre-dialysis care with limited anaemia management, but alternatively those presenting late may be more likely to have anaemia because of multi-system disease or inter-current illness. More detailed analyses of haemoglobin at start of RRT and late

Table 1.15. Percentage prevalence of specific comorbidities amongst patients presenting late (<3 months) compared with those presenting early (⩾3 months) (2010–2011 incident patients)

Comorbidity	<3 months	⩾3 months	p-value
Ischaemic heart disease	16.8	20.9	0.004
Cerebrovascular disease	7.9	10.3	0.02
Peripheral vascular disease	7.7	12.2	<0.0001
Diabetes (not a cause of ERF)	8.0	9.2	0.2
Liver disease	3.6	2.7	0.1
Malignancy	19.2	11.0	<0.0001
COPD	7.9	7.0	0.3
Smoking	14.6	13.4	0.3

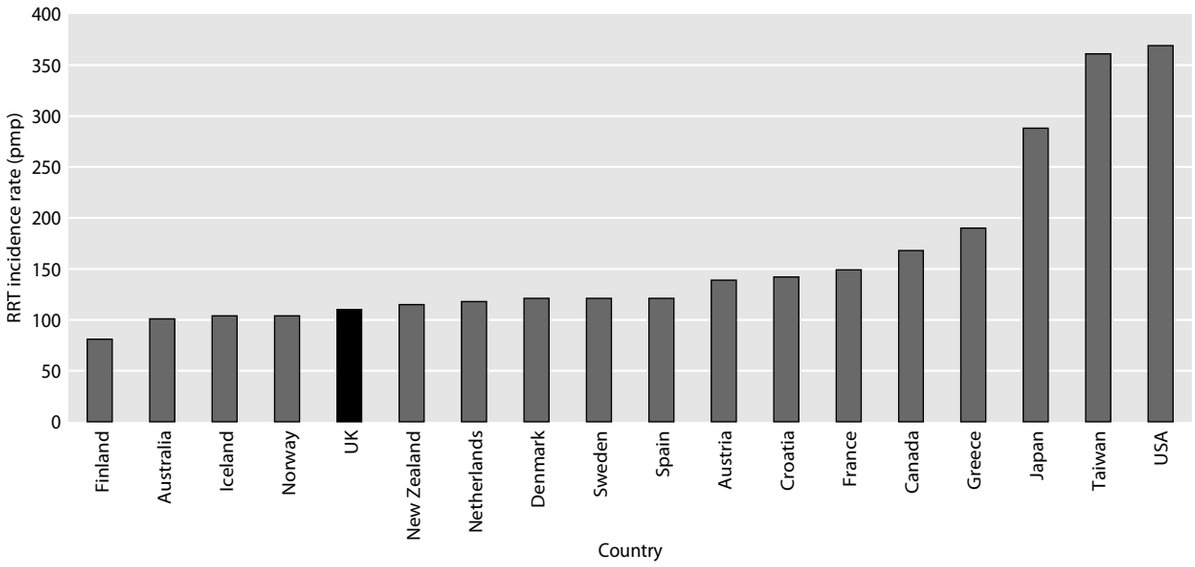

Fig. 1.14. International comparison of RRT incidence rates in 2010
Non UK data from USRDS

presentation can be found in chapter 6: Haemoglobin, Ferritin and Erythropoietin amongst UK Adult Dialysis Patients in 2011: national and centre-specific analyses.

eGFR at start of RRT and late presentation

In the 2010 to 2011 cohort, eGFR at start of RRT was significantly lower in patients presenting late than those presenting earlier (8.0 vs. 8.9 ml/min/1.73 m^2: $p < 0.0001$).

Survival of incident patients

See chapter 5: Survival and Causes of Death of UK Adult Patients on Renal Replacement Therapy in 2011.

International comparisons

Figure 1.14 shows the crude RRT incidence rates (including children) for 2010 for several countries. The data is from the USRDS; 2010 was the latest year available at time of writing. The UK incidence rate was similar to many other Northern European countries and Australia and New Zealand but remains markedly lower than other countries, most notably Greece, Japan, Taiwan and the USA. These differences are likely to be due to the rate of advanced kidney disease in these populations as well as lower mortality from competing risks for RRT, such as cardiovascular disease in southern Europe and the Far East. The healthcare system in use in these countries may also influence RRT incidence.

Summary

RRT incidence rates for 2011 were similar to 2010 for England and for the UK as a whole. At least partly because of the smaller numbers involved, rates have been more variable over the last few years for Northern Ireland, Scotland and Wales. Wales continues to have the highest incidence rate. There remain large centre variations in incidence rates for RRT. There was a further increase from 2010 to 2011 in the percentage on PD at 90 days. Significant numbers of patients continue to present late to renal centres.

Conflicts of interest: none

Acknowledgements

The Registry would like to acknowledge the significant contribution made by Andy Judge, Dan Ford, David Ansell, Charlie Tomson, Paul Roderick and Yoav Ben-Shlomo who developed the methodology for estimating catchment populations for England.

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4 U.S. Renal Data System, USRDS 2011 Annual Data Report: Atlas of Chronic Kidney Disease and End-Stage Renal Disease in the United States, National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 2011. Publications based upon USRDS data reported here or supplied upon request must include this citation and the following notice: The data reported here have been supplied by the United States Renal Data System (USRDS)

5 Ford DJ, Fogarty DG, Steenkamp R, Tomson CRV, Ben-Shlomo Y, Ansell D. Chapter 13: The UK Renal Registry Advanced CKD Study: frequency of incorrect reporting of date of start of RRT. Nephron Clinical Practice; 115(Suppl. 1):c271–c78

6 http://www.renal.org/CKDguide/full/UKCKDfull.pdf

UK Renal Registry 15th Annual Report: Chapter 2 UK RRT Prevalence in 2011: national and centre-specific analyses

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Key Words

Chronic kidney disease · Comorbidity · Diabetes · Dialysis · End stage renal disease · Established renal failure · Ethnicity · Haemodialysis · Peritoneal dialysis · Prevalence · Primary Care Trust · Renal replacement therapy · Transplantation · Treatment modality

Summary

- There were 53,207 adult patients receiving RRT in the UK on 31st December 2011, an increase of 4% from 2010. The UK prevalence of RRT was 842 pmp. The reported prevalence in 2000 was 523 pmp. Growth rate from 2010 to 2011 for prevalent patients was an increase of 1.7% for haemodialysis (HD), a fall of 2.2% for peritoneal dialysis (PD) and an increase of 4.7% with a functioning transplant.
- The number of patients receiving home HD increased by 23% from 736 patients in 2010 to 905 patients in 2011.
- The median age of prevalent patients was 58 years (HD 67 years, PD 63 years, transplant 52 years). In 2000 the median age was 55 years (HD 63 years, PD 58 years, transplant 48 years).
- For all ages, the prevalence rate in men exceeded that in women, peaking in age group 75–79 years at 2,918 pmp and for females in age group 65–69 years at 1,460 pmp.
- The most common identifiable renal diagnosis was glomerulonephritis (biopsy proven or not biopsy proven) (19%), followed by aetiology uncertain (17%).
- Transplantation continued as the most common treatment modality (48.6%), HD was used in 43.9% and PD in 7.6% of RRT patients.
- The length of time a patient survived on a given therapy (vintage) varied substantially reflecting age and comorbidity of patients. For instance the median time that prevalent patients were on haemodialysis was 3.3 years versus 10.3 years for those with a transplant.
- Prevalence rates in patients aged >85 years nearly doubled between 2006 and 2011 (524 pmp age related to 952 pmp). There was 17 fold variation in prevalence rates in patients aged >80 years suggesting there was uncertainty regarding the risks and benefits of RRT in the elderly.
- There were national, regional and dialysis centre level variations in prevalence rates. A significant factor in this variation was the ethnic mix of local populations, but a large amount of the variation remains unexplained. Assessment of conservatively managed stage 5 CKD patients might explain more of this variation.

Introduction

This chapter presents data on all adult patients on RRT in the UK at the end of 2011. The UK Renal Registry (UKRR) received data returns for 2011 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. 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 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

These analyses relate to the prevalent RRT cohort in the UK in 2011. The cohort was defined as all adult patients receiving RRT on the UKRR database on 31st December 2011. Population estimates were obtained from the UK Office of National Statistics (ONS) [1].

The number of adult prevalent RRT patients was calculated for the UK as a whole and for each UK country, using UKRR data from all renal centres. Crude prevalence rates were calculated per million population (pmp) and standardised prevalence ratios were calculated as detailed in appendix D: Methodology used for Analyses (www.renalreg.com) for Primary Care Trusts (PCT) in England, Health & Social Care Areas in Northern Ireland, Local Health Boards in Wales and Health Boards in Scotland. These areas will be referred to in this report as 'PCT/HBs'. Briefly, data from all areas were used to calculate overall age and gender specific prevalence rates. The age and gender breakdown of the population in each PCT/HB were obtained from the mid-2010 population estimate based on 2001 Census data from the ONS [1]. The population breakdown and the overall prevalence rates were used to calculate the expected age and gender specific prevalence numbers for each PCT/HB. The age and gender standardised prevalence ratio was the observed prevalence number divided by the expected prevalence number. A ratio below 1 indicated that the observed rate was less than expected given the area's population structure. This was statistically significant at the 5% level if the upper confidence limit was less than 1. Analyses were done for each of the last 6 years and as the prevalent numbers for one year can be small for smaller areas, a combined years' analysis was also done. To enable assessment of whether a centre was an outlier in this regard, funnel plots for smaller and larger populations have been included (appendix D: figures D3, D4) which show the 95% confidence intervals around the national average prevalence. The proportion of non-Whites in each PCT/HB was obtained from the ONS [1].

This year there are a total of 71 renal centres, whereas in previous reports there have been 72. This is due to a merging of the Derry and Tyrone renal centres in Northern Ireland. The prevalence rate per million population for each centre was calculated using a derived catchment population. This was calculated from the postcode of each prevalent patient in 2007 and the population within that postcode assigned to the renal centre where that patient was treated. For a full description of the methodology used to estimate the catchment populations see appendix E: Methodology for Estimating Catchment Populations Analyses (www.renalreg.com). In brief, the patient postcode for each prevalent dialysis patient in 2007 was used to create a series of overlapping areas corresponding to each renal centre. These small areas were then assigned to a Census Area Statistics ward using geographical information system technology and the population in each area assigned to its respective renal centre. These estimates will not be accurate for new centres and centres with changes in catchment populations since 2007 (e.g. Bristol, Cambridge and Ipswich, which have lost catchment population since 2007 and Dorset which gained catchment population); in addition the analysis used dialysis patients only and transplant patients may come from a different catchment population. Estimation of catchment populations therefore remains an inexact science and these figures should be regarded as indicative only. This methodology was used for England only. Estimates of the catchment populations in Wales and Northern Ireland were supplied by personal communication from Dr K Donovan, Dr A Williams and Dr D Fogarty.

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 allocated to the centre which saw the patient most frequently, usually the referring centre. 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 has occurred.

Prevalent patients on RRT in 2011 were examined by time on RRT, age group, gender, ethnic origin, primary renal disease, presence of diabetes and treatment modality (2009 Report appendix H: Coding (www.renalreg.com)). In this year's analysis of prevalence, only adult patients on RRT contributed to the numerator. In previous years, children had been included in the numerator also. Data on the paediatric population is presented in Chapter 4. Some centres electronically upload ethnicity coding to their renal information technology (IT) system from the hospital

Table 2.1. Prevalence of adult RRT in the UK on 31/12/2011

	England	N Ireland	Scotland	Wales	UK
All UK centres	44,665	1,510	4,324	2,708	53,207
Total estimated population, mid-2010 (millions)*	53.0	1.8	5.3	3.1	63.2
Prevalence rate HD (pmp)	365	400	355	361	365
Prevalence rate PD (pmp)	62	43	47	72	61
Prevalence rate dialysis (pmp)	427	443	402	433	426
Prevalence rate transplant (pmp)	415	390	415	451	416
Prevalence rate total (pmp)	843	834	817	884	842
95% confidence intervals total (pmp)	835–850	792–876	792–841	851–917	835–849

* estimates from ONS web site
pmp = per million population

Patient Administration System (PAS). Ethnicity coding in these PAS systems is based on self-reported ethnicity and uses a different coding system to those centres not linked to PAS [2]. 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 Whites, South Asians, Blacks, Chinese and Others as described in appendix H: Coding (www.renalreg.com). This year, individuals with a primary renal diagnosis (PRD) 'glomerulonephritis biopsy unproven' were grouped within the 'glomerulonephritis' PRD group, rather than within 'uncertain' (as has been the case in previous reports) to reflect better coding and bringing the registry in line with coding methodology adopted in other renal registries. 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 patient numbers in each renal centre and these differ marginally from those quoted elsewhere when patients are allocated to geographical areas by their individual postcodes, as some centres treat patients across national boundaries.

There were 53,207 adult patients receiving RRT in the UK at the end of 2011, giving an adult UK population prevalence of 842 pmp (table 2.1) compared with 832 pmp in 2010 [3]. Prevalence rates increased in all of the UK countries in 2011 except Scotland were there was a small decline from 829 pmp in 2010 to 817 pmp in 2011. PD prevalence increased in Northern Ireland but decreased in the other three countries compared with 2010. The overall decline in PD prevalence in the UK has been a consistent pattern observed since 1997. Once more, the prevalence of transplanted patients increased in the UK. Northern Ireland had a higher RRT prevalence rate for patients aged 65 and older 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 1,220 per million age related population (pmarp) in 2006 to 1,824 pmarp in 2011 and in patients aged >85 years from 524 pmarp in 2006 to 952 pmarp in 2011. It is likely that this ageing of the prevalent population was due to an increasing numbers of older patients starting RRT, although improving patient survival will also contribute.

Prevalent patients by RRT centre

The number of prevalent patients in each renal centre and the distribution of their treatment modalities varied widely (table 2.2). Many factors including geography, local population density, age distribution, ethnic

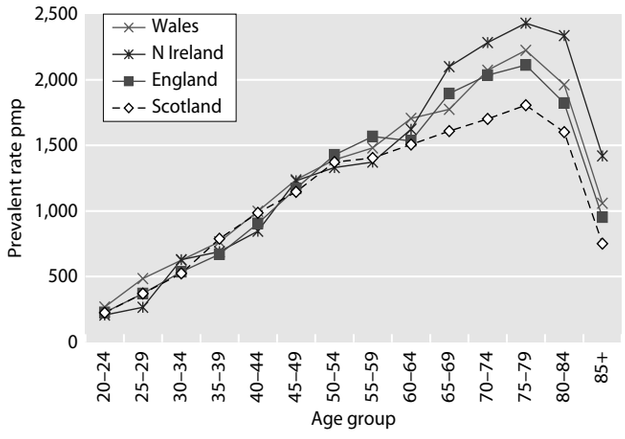

Fig. 2.1. Prevalence rates per million population by age group and UK country on 31/12/2011

Table 2.2. Number of prevalent RRT patients by treatment modality and centre on 31/12/2011

Centre	HD	PD	Dialysis	Transplant	RRT	Population (millions)	2011 crude rate pmp	(95% CI)
England								
B Heart	446	46	492	174	666	0.72	919	(849–989)
B QEH*	894	167	1,061	862	1,923	1.62	1,184	(1131–1237)
Basldn	155	26	181	57	238	0.41	583	(509–657)
Bradfd	196	32	228	244	472	0.58	815	(742–889)
Brightn	340	80	420	357	777	1.20	650	(604–696)
Bristol*	474	66	540	771	1,311	1.57	834	(789–880)
Camb*	371	41	412	674	1,086	1.27	858	(807–909)
Carlis	66	24	90	129	219	0.31	697	(604–789)
Carsh	753	103	856	554	1,410	1.92	736	(697–774)
Chelms	119	26	145	71	216	0.47	463	(401–525)
Colchr	120		120	.	120	**	**	**
Covnt*	362	90	452	434	886	0.87	1,019	(951–1086)
Derby	207	112	319	147	466	0.65	720	(655–785)
Donc[a]	162	26	188	60	248	**	**	**
Dorset	239	53	292	295	587	0.73	809	(744–875)
Dudley	146	53	199	88	287	0.42	691	(611–771)
Exeter	376	78	454	359	813	1.03	791	(736–845)
Glouc	194	39	233	157	390	0.58	678	(611–746)
Hull	323	89	412	352	764	0.99	774	(719–829)
Ipswi	125	31	156	184	340	0.56	605	(541–670)
Kent	376	68	444	421	865	1.16	744	(694–794)
L Barts*	899	171	1,070	830	1,900	1.68	1,131	(1080–1182)
L Guys*	607	33	640	1,040	1,680	1.15	1,456	(1386–1525)
L Kings	468	89	557	325	882	0.97	909	(849–969)
L Rfree*	711	94	805	968	1,773	1.50	1,179	(1124–1234)
L St.G*	294	55	349	370	719	0.59	1,228	(1138–1318)
L West*[b]	1,412	35	1,447	1,575	3,022	2.23	1,357	(1309–1405)
Leeds*	513	92	605	815	1,420	1.65	862	(818–907)
Leic*	854	159	1,013	913	1,926	2.32	831	(794–868)
Liv Ain[c]	179	15	194		194	0.51	383	(329–437)
Liv RI*	381	74	455	796	1,251	1.20	1,044	(986–1102)
M RI*	481	91	572	1,063	1,635	1.47	1,113	(1059–1167)
Middlbr	315	18	333	420	753	1.01	744	(691–797)
Newc*	265	48	313	603	916	1.11	828	(775–882)
Norwch	309	59	368	244	612	0.79	772	(710–833)
Nottm*	402	92	494	525	1,019	1.14	896	(841–950)
Oxford*[d]	419	92	511	933	1,444	1.68	859	(815–904)
Plymth*	132	47	179	286	465	0.48	978	(889–1066)
Ports*	524	95	619	775	1,394	2.00	696	(659–732)
Prestn	520	65	585	438	1,023	1.51	677	(635–718)
Redng	272	88	360	328	688	0.80	855	(791–919)
Salford[e]	363	113	476	370	846	1.42	596	(555–636)
Sheff*	591	62	653	607	1,260	1.49	846	(800–893)
Shrew	187	35	222	120	342	0.39	874	(781–966)
Stevng	412	30	442	196	638	1.09	586	(541–632)
Sthend	122	18	140	74	214	0.32	677	(587–768)
Stoke	318	82	400	295	695	0.90	775	(717–833)
Sund	178	17	195	195	390	0.59	662	(596–728)
Truro	152	26	178	179	357	0.41	867	(777–957)
Wirral	196	42	238	3	241	0.52	463	(404–521)
Wolve	307	71	378	138	516	0.61	851	(778–925)
York	144	25	169	197	366	0.51	724	(650–799)

Table 2.2. Continued

Centre	HD	PD	Dialysis	Transplant	RRT	Population (millions)	2011 crude rate pmp	(95% CI)
Northern Ireland								
Antrim	132	14	146	78	224	0.30	747	(649–844)
Belfast*	228	30	258	428	686	0.55	1,241	(1148–1333)
Newry	111	12	123	68	191	0.28	675	(579–771)
Ulster	105	3	108	29	137	0.30	457	(380–533)
West NI[f]	149	19	168	104	272	0.35	771	(679–862)
Scotland								
Abrdn	214	23	237	242	479	0.60	801	(729–873)
Airdrie	173	10	183	161	344	0.56	611	(546–675)
D & Gall	49	14	63	59	122	0.15	824	(678–970)
Dundee	183	22	205	195	400	0.41	986	(889–1083)
Dunfn	146	28	174	104	278	0.37	757	(668–846)
Edinb*	261	40	301	399	700	0.96	728	(674–782)
Glasgw*	622	49	671	806	1,477	1.51	981	(931–1031)
Inverns	83	18	101	123	224	0.34	663	(576–749)
Klmarnk	147	45	192	108	300	0.37	818	(725–910)
Wales								
Bangor	88	21	109		109	0.25	436	(354–518)
Cardff*	495	102	597	939	1,536	1.45	1,059	(1006–1112)
Clwyd	76	20	96	71	167	0.20	835	(708–962)
Swanse	358	58	416	243	659	0.80	824	(761–887)
Wrexm	88	20	108	129	237	0.30	790	(689–891)
England	**19,371**	**3,283**	**22,654**	**22,011**	**44,665**			
N Ireland	**725**	**78**	**803**	**707**	**1,510**			
Scotland[g]	**1,878**	**249**	**2,127**	**2,197**	**4,324**			
Wales	**1,105**	**221**	**1,326**	**1,382**	**2,708**			
UK	**23,079**	**3,831**	**26,910**	**26,297**	**53,207**			

Blank cells indicate no patients on that treatment attending that unit when data was collected
Centres prefixed 'L' are London centres
The numbers of patients calculated for each country quoted above differ marginally from those quoted elsewhere when patients are allocated to areas by their individual post codes, as some centres treat patients from across national boundaries
* Transplant centres
** Doncaster and Colchester were not established main renal centres when the catchment population work was undertaken
[a] Doncaster previously a satellite of Sheffield
[b] Hammersmith and Charing Cross amalgamated with St Mary's
[c] Liv Ain catchment population updated after correspondence with the centre
[d] Oxford transferred Northamptonshire local authority to Leicester
[e] Salford previously named Manchester Hope
[f] West NI is the amalgamation of Derry and Tyrone
[g] Scotland catchment populations correct as at 30 June 2011

composition, prevalence of diseases predisposing to kidney disease and the social deprivation index of that population may contribute to this.

Changes in prevalence

Overall growth in the prevalent UK RRT population from 2010 to 2011 was 4.3% (table 2.3), an annual growth rate which has been fairly consistent over the last 10–15 years (figure 2.2). Most of the growth in the prevalent RRT population was due to a continued increase in the size of the prevalent RRT population in England, Wales and Northern Ireland, with slower growth in the prevalent RRT population in Scotland. The most substantial changes in relative size of the prevalent population were in Northern Ireland, which increased from a 1.0% change in the size of the prevalent population in 2009–2010 to 4.4% in 2010–2011, and in Scotland, which saw a decline from an increase in the prevalent RRT population of 3.5% in 2009–2010 to 1.2% in the most recent analysis.

Table 2.3. Number of prevalent patients on RRT by centre at year end 2007–2011*

Centre	Date					% change 2010–2011	% annual change 2007–2011
	31/12/2007	31/12/2008	31/12/2009	31/12/2010	31/12/2011		
England							
B Heart	578	598	624	634	666	5.0	3.6
B QEH	1,626	1,714	1,821	1,832	1,923	5.0	4.3
Basldn	208	217	214	212	238	12.3	3.4
Bradfd	395	414	422	454	472	4.0	4.6
Brightn	686	722	737	759	777	2.4	3.2
Bristol	1,234	1,247	1,232	1,259	1,311	4.1	1.5
Camb	935	927	941	1,003	1,086	8.3	3.8
Carlis	202	205	205	207	219	5.8	2.0
Carsh	1,165	1,249	1,302	1,361	1,410	3.6	4.9
Chelms	195	207	225	235	216	−8.1	2.6
Colchr	100	118	116	115	120	4.3	4.7
Covnt	717	745	794	845	886	4.9	5.4
Derby	301	389	419	421	466	10.7	11.5
Donc[a]	109	154	196	221	248	12.2	22.8
Dorset	452	515	553	584	587	0.5	6.8
Dudley	259	275	292	297	287	−3.4	2.6
Exeter	664	708	731	770	813	5.6	5.2
Glouc	326	325	366	374	390	4.3	4.6
Hull	672	696	726	728	764	4.9	3.3
Ipswi	285	294	312	315	340	7.9	4.5
Kent	627	714	744	787	865	9.9	8.4
L Barts	1,473	1,526	1,638	1,779	1,900	6.8	6.6
L Guys	1,395	1,447	1,613	1,625	1,680	3.4	4.8
L Kings	712	784	786	820	882	7.6	5.5
L Rfree	1,437	1,510	1,546	1,642	1,773	8.0	5.4
L St.G	575	624	662	685	719	5.0	5.7
L West[b]	2,162	2,579	2,735	2,880	3,022	4.9	8.7
Leeds	1,379	1,342	1,348	1,389	1,420	2.2	0.7
Leic	1,594	1,660	1,739	1,809	1,926	6.5	4.8
Liv Ain	115	130	146	160	194	21.3	14.0
Liv RI	1,274	1,200	1,223	1,236	1,251	1.2	−0.5
M RI	1,402	1,424	1,452	1,553	1,635	5.3	3.9
Middlbr	687	682	707	711	753	5.9	2.3
Newc	902	901	898	902	916	1.6	0.4
Norwch	495	567	591	614	612	−0.3	5.4
Nottm	971	955	975	1,008	1,019	1.1	1.2
Oxford[c]	1,328	1,318	1,343	1,421	1,444	1.6	2.1
Plymth	421	443	456	461	465	0.9	2.5
Ports	1,182	1,268	1,301	1,333	1,394	4.6	4.2
Prestn	860	880	942	971	1,023	5.4	4.4
Redng	552	578	619	636	688	8.2	5.7
Salford[d]	759	758	786	822	846	2.9	2.8
Sheff	1,175	1,216	1,216	1,251	1,260	0.7	1.8
Shrew	285	325	337	343	342	−0.3	4.7
Stevng	548	580	583	608	638	4.9	3.9
Sthend	195	204	207	208	214	2.9	2.4
Stoke	590	603	643	658	695	5.6	4.2
Sund	344	343	368	366	390	6.6	3.2
Truro	288	297	320	335	357	6.6	5.5
Wirral	219	216	224	223	241	8.1	2.4
Wolve	452	491	492	533	516	−3.2	3.4
York	231	276	321	338	366	8.3	12.2

Table 2.3. Continued

Centre	Date					% change 2010–2011	% annual change 2007–2011
	31/12/2007	31/12/2008	31/12/2009	31/12/2010	31/12/2011		
N Ireland							
Antrim	200	220	215	214	224	4.7	2.9
Belfast	748	726	680	680	686	0.9	−2.1
Newry	148	163	171	179	191	6.7	6.6
Ulster	90	97	114	115	137	19.1	11.1
West NI[e]	216	236	258	258	272	5.4	5.9
Scotland							
Abrdn	452	456	452	463	479	3.5	1.5
Airdrie	231	245	310	309	344	11.3	10.5
D & Gall	77	113	118	115	122	6.1	12.2
Dundee	376	370	395	382	400	4.7	1.6
Dunfn	220	220	241	257	278	8.2	6.0
Edinb	720	695	721	731	700	−4.2	−0.7
Glasgw	1,605	1,568	1,469	1,505	1,477	−1.9	−2.1
Inverns	214	212	228	230	224	−2.6	1.1
Klmarnk	214	263	273	282	300	6.4	8.8
Wales							
Bangor	98	112	110	113	109	−3.5	2.7
Cardff	1,438	1,375	1,428	1,481	1,536	3.7	1.7
Clwyd	155	146	144	136	167	22.8	1.9
Swanse	545	602	598	630	659	4.6	4.9
Wrexm	213	223	219	221	237	7.2	2.7
England	**37,738**	**39,560**	**41,189**	**42,733**	**44,665**	**4.5**	**4.3**
N Ireland	**1,402**	**1,442**	**1,438**	**1,446**	**1,510**	**4.4**	**1.9**
Scotland	**4,109**	**4,142**	**4,207**	**4,274**	**4,324**	**1.2**	**1.3**
Wales	**2,449**	**2,458**	**2,499**	**2,581**	**2,708**	**4.9**	**2.5**
UK	**45,698**	**47,602**	**49,333**	**51,034**	**53,207**	**4.3**	**3.9**

[a] Doncaster previously a satellite of Sheffield
[b] Hammersmith and Charing Cross amalgamated with St Mary's
[c] Oxford transferred Northamptonshire local authority to Leicester
[d] Salford previously named Manchester Hope
[e] West NI is the amalgamation of Derry and Tyrone
* After confirmation of the numbers of patients with renal centres several inaccuracies were identified. In Kent 16 additional transplant patients and in York 27 additional transplant patients were identified. In Leeds the transplant population had been overestimated by 21. In Clwyd an additional 13 HD patients, 12 PD patients and 6 transplant patients were identified. These changes have been incorporated into tables 2.1, 2.2 and 2.3 but not any other analyses

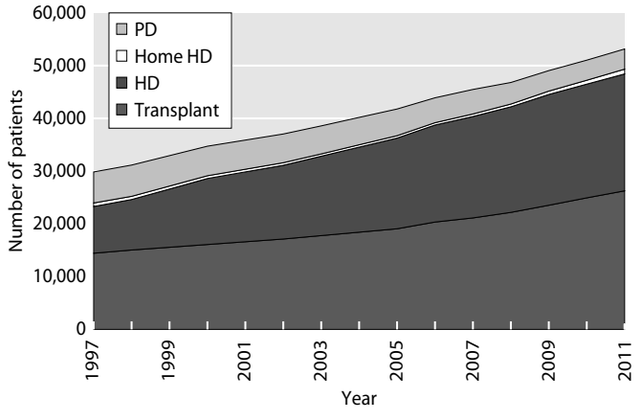

Fig. 2.2. Growth in prevalent patients by treatment modality at the end of each year 1997–2011

Across the different RRT modalities (HD, PD and transplant) there was heterogeneity in the prevalent growth per million population (pmp), as shown in table 2.4. From 2010 to 2011, there was a 1.7% growth in prevalent HD patients, a 4.7% growth in those with a functioning transplant and a 2.2% decline in patients on PD. Between 2006 and 2011 there was an average annual 3.3% pmp growth in HD, 4.9% pmp fall in PD, and 4.4% pmp growth in prevalent transplant patients in the UK (table 2.4). In the same period there was a 103% increase in the use of home haemodialysis (445 patients to 905 patients).

There were large variations in RRT prevalence between centres as well as countries. For example, from

Table 2.4. Change in RRT prevalence rates pmp 2006–2011 by modality*

	Prevalence					% growth in prevalence pmp				
Year	HD pmp	PD pmp	Dialysis pmp	Transplant pmp	RRT pmp	HD	PD	Dialysis	Tx	RRT
2006	311	78	389	336	724					
2007	323	76	399	346	746	3.9	−2.1	2.7	3.2	2.9
2008	342	69	411	363	774	5.8	−9.0	2.9	4.9	3.8
2009	354	64	417	377	794	3.5	−7.8	1.6	3.7	2.6
2010	359	62	421	397	818	1.5	−3.2	0.8	5.4	3.0
2011	365	60	426	416	841	1.7	−2.2	1.1	4.7	2.9
Average annual growth 2006–2011						3.3	−4.9	1.8	4.4	3.0

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

2010 to 2011 the number of prevalent patients on RRT at Liverpool Aintree increased by 21.3%, whilst in Chelmsford the number decreased by 8.1% (table 2.3). These changes could be related to re-allocation of patients from and to other local renal centres. Centre prevalence rates showed marked variation; from 457 pmp in Ulster to 1,456 pmp at London Guy's (table 2.2). The long-term (1997–2010) UK prevalence pattern by treatment modality is shown in figure 2.2. The steady growth in transplant numbers was maintained in 2011. The increase in transplant prevalence and the increase in haemodialysis patient numbers has been associated with a slow contraction in home-based therapies, particularly PD, in more recent years.

Prevalence of RRT in Primary Care Trusts (PCT) in England, Health and Social Care Areas in Northern Ireland (HB), Local Health Boards in Wales (HB) and Health Boards in Scotland (HB)

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 (SPR). The impact of social deprivation was reported in the 2003 UKRR Report [4].

There were substantial variations in the crude PCT/HB prevalence rate pmp, from 444 pmp (Shetland, population 22,500) to 1,904 pmp (Brent, population 256,300). There were similar variations in the standardised prevalence ratios (ratio of observed: expected prevalence rate given the age/gender breakdown of the PCT/HB) from 0.49 (Shetland) to 2.47 (Brent) (table 2.5). Confidence intervals are not presented for the rates per million population for 2011 but figures D3 and D4 in appendix D (www.renalreg.com) can be used to determine if a PCT/HB falls within the range representing the 95% confidence limit of the national average prevalence rate. The annual standardised prevalence ratios were inherently more stable than the annual standardised incidence ratios (chapter 1).

Factors associated with variation in standardised prevalence ratios (SPRs) in Primary Care Trusts (PCT) in England, Health and Social Care Areas (HB) in Northern Ireland, Local Health Boards in Wales (HB) and Health Boards in Scotland (HB)

Geographical considerations and ethnicity were major factors contributing to the variation in SPRs (table 2.5). In 2011, there were 61 PCT/HBs with a significantly low SPR, 70 with a 'normal' SPR and 46 with a significantly high SPR. The areas with high and low SPRs have been fairly consistent over the last few years. 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. Mean SPRs were significantly higher in the 58 PCT/HBs with an ethnic minority population greater than 10% than in those with lower ethnic minority populations ($p < 0.001$). The SPR (correlation coefficient $r = 0.89$ $p < 0.001$) was positively correlated with ethnicity. In 2011 for each 10% increase in ethnic minority population, the age standardised prevalence ratio increased by 0.24. In figure 2.3, the relationship between the ethnic composition of a PCT/HB and its SPR is demonstrated.

Only six of the 118 PCT/HBs with ethnic minority populations of less than 10% had high SPRs: Abertawe

Table 2.5. Prevalence of RRT and standardised prevalence ratios in PCT/HB areas

PCT/HB – PCT 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
Blank cells – no data returned to the UKRR for that year
Areas with significantly low prevalence ratios in 2011 are italicised in greyed areas, those with significantly high prevalence ratios in 2011 are bold in greyed areas
% non-White-percentage of the PCT/HB population that is non-White, from 2001 census (revised by ONS to 2007 for England)
* O/E for combined years, 2006–2011

UK area	Name	Total population	2006 O/E	2007 O/E	2008 O/E	2009 O/E	2010 O/E	2011 O/E	95% LCL	95% UCL	Crude rate pmp	O/E*	% non-White
North East	*County Durham*	*510,800*	***0.91***	***0.90***	***0.86***	***0.85***	***0.85***	***0.85***	*0.77*	*0.94*	***764***	***0.87***	*2.5*
	Darlington	100,600	**0.79**	**0.86**	**0.90**	**0.92**	**0.86**	**0.80**	0.63	1.01	**706**	**0.86**	3.3
	Gateshead	*192,000*	***0.93***	***0.88***	***0.83***	***0.87***	***0.86***	***0.84***	*0.71*	*0.99*	***745***	***0.87***	*3.8*
	Hartlepool	91,400	**0.97**	**0.88**	**0.92**	**0.91**	**0.84**	**0.82**	0.65	1.05	**711**	**0.89**	2.6
	Middlesbrough	142,100	**1.06**	**1.04**	**1.06**	**1.07**	**1.07**	**1.08**	0.91	1.29	**866**	**1.06**	8.6
	Newcastle	*292,200*	***0.93***	***0.96***	***0.97***	***0.93***	***0.87***	***0.85***	*0.74*	*0.98*	***647***	***0.92***	*9.7*
	North Tyneside	198,400	**1.05**	**0.99**	**0.94**	**0.96**	**0.98**	**0.92**	0.78	1.07	**817**	**0.97**	3.6
	Northumberland	*312,100*	***0.86***	***0.85***	***0.82***	***0.78***	***0.74***	***0.74***	*0.65*	*0.85*	***718***	***0.79***	*2.2*
	Redcar and Cleveland	137,300	**1.02**	**1.01**	**1.00**	**0.99**	**0.94**	**0.99**	0.83	1.18	**903**	**0.99**	3.0
	South Tyneside	154,100	**1.01**	**1.00**	**0.94**	**1.00**	**0.91**	**0.93**	0.78	1.11	**824**	**0.96**	4.8
	Stockton-on-Tees Teaching	*192,600*	***0.87***	***0.81***	***0.81***	***0.79***	***0.78***	***0.83***	*0.70*	*0.98*	***706***	***0.81***	*4.7*
	Sunderland Teaching	283,400	**0.94**	**0.94**	**0.97**	**0.95**	**0.94**	**0.91**	0.80	1.03	**787**	**0.94**	3.3
North West	Ashton, Leigh and Wigan	307,200	**0.67**	**0.86**	**0.80**	**0.81**	**0.83**	**0.89**	0.79	1.01	**781**	**0.81**	2.9
	Blackburn with Darwen Teaching	**140,000**	**1.19**	**1.38**	**1.29**	**1.30**	**1.27**	**1.31**	**1.11**	**1.55**	**993**	**1.29**	**22.7**
	Blackpool	*140,200*	***0.59***	***0.76***	***0.79***	***0.84***	***0.80***	***0.82***	*0.68*	*0.99*	***742***	***0.77***	*3.7*
	Bolton Teaching	266,500	**0.81**	**1.07**	**1.04**	**0.96**	**1.05**	**1.09**	0.96	1.23	**904**	**1.01**	12.3
	Bury	183,500	**0.47**	**0.89**	**0.83**	**0.92**	**0.88**	**0.89**	0.75	1.05	**752**	**0.82**	8.5
	Central and Eastern Cheshire	*457,200*		***0.81***	***0.78***	***0.78***	***0.78***	***0.79***	*0.71*	*0.88*	***722***	***0.79***	*3.4*
	Central Lancashire	*459,200*	***0.73***	***0.81***	***0.83***	***0.87***	***0.85***	***0.85***	*0.76*	*0.94*	***738***	***0.83***	*6.7*
	Cumbria Teaching	*494,400*	***0.75***	***0.75***	***0.74***	***0.72***	***0.71***	***0.70***	*0.63*	*0.78*	***672***	***0.73***	*2.0*
	East Lancashire Teaching	381,200	**0.94**	**1.08**	**1.03**	**1.00**	**0.97**	**0.97**	0.87	1.09	**837**	**1.00**	9.4
	Halton and St Helens	296,700	**0.94**	**0.96**	**0.89**	**0.91**	**0.93**	**0.97**	0.85	1.10	**839**	**0.93**	2.1
	Heywood, Middleton and Rochdale	205,000		**1.01**	**1.02**	**1.06**	**0.99**	**1.03**	0.89	1.20	**844**	**1.02**	12.6
	Knowsley	149,200	**1.16**	**1.11**	**1.05**	**1.02**	**0.94**	**0.92**	0.77	1.11	**764**	**1.03**	2.8
	Liverpool	**445,300**	**1.16**	**1.12**	**1.13**	**1.13**	**1.10**	**1.11**	**1.00**	**1.22**	**874**	**1.12**	**8.3**
	Manchester Teaching	**498,800**		**1.04**	**1.11**	**1.14**	**1.17**	**1.16**	**1.05**	**1.28**	**766**	**1.13**	**23.4**
	North Lancashire Teaching	*329,100*	***0.66***	***0.75***	***0.72***	***0.73***	***0.71***	***0.72***	*0.63*	*0.82*	***672***	***0.72***	*4.2*
	Oldham	219,600	**0.61**	**0.94**	**0.95**	**0.94**	**0.92**	**0.91**	0.78	1.06	**733**	**0.88**	12.2
	Salford	*229,100*	***0.64***	***0.79***	***0.85***	***0.83***	***0.85***	***0.85***	*0.73*	*0.99*	***672***	***0.81***	*7.7*
	Sefton	272,800	**0.90**	**0.87**	**0.84**	**0.83**	**0.86**	**0.90**	0.79	1.03	**839**	**0.87**	2.6
	Stockport	*284,700*		***0.87***	***0.88***	***0.83***	***0.86***	***0.87***	*0.76*	*1.00*	***776***	***0.86***	*6.4*
	Tameside and Glossop	250,700		**1.03**	**0.99**	**0.98**	**0.99**	**0.99**	0.87	1.14	**842**	**1.00**	5.9
	Trafford	*217,100*		***0.78***	***0.74***	***0.76***	***0.87***	***0.82***	*0.70*	*0.96*	***700***	***0.80***	*11.2*
	Warrington	*199,100*	***0.81***	***0.89***	***0.87***	***0.94***	***0.85***	***0.84***	*0.71*	*0.99*	***728***	***0.87***	*3.5*
	Western Cheshire	234,300	**0.93**	**0.93**	**0.93**	**0.96**	**0.98**	**1.00**	0.88	1.15	**922**	**0.96**	3.1
	Wirral	*308,800*	***1.04***	***0.96***	***0.89***	***0.85***	***0.82***	***0.82***	*0.72*	*0.93*	***735***	***0.89***	*2.8*
Yorkshire and the Humber	Barnsley	227,500	**1.13**	**1.06**	**1.07**	**1.10**	**1.14**	**1.12**	0.98	1.27	**980**	**1.10**	2.7
	Bradford and Airedale Teaching	**512,700**	**1.13**	**1.15**	**1.13**	**1.10**	**1.17**	**1.15**	**1.05**	**1.27**	**874**	**1.14**	**25.0**
	Calderdale	202,800	**1.10**	**1.11**	**1.08**	**1.09**	**1.10**	**1.03**	0.89	1.19	**878**	**1.08**	9.8
	Doncaster	290,900	**1.05**	**0.97**	**0.97**	**0.98**	**0.95**	**0.99**	0.87	1.11	**866**	**0.98**	4.3
	East Riding of Yorkshire	*338,500*	***0.82***	***0.80***	***0.81***	***0.84***	***0.81***	***0.80***	*0.71*	*0.90*	***774***	***0.81***	*3.0*
	Hull Teaching	263,800	**0.99**	**1.04**	**0.96**	**1.01**	**0.98**	**0.96**	0.84	1.10	**758**	**0.99**	5.8
	Kirklees	409,900	**1.17**	**1.11**	**1.03**	**1.04**	**1.05**	**1.04**	0.94	1.16	**849**	**1.07**	16.0

Table 2.5. Continued

UK area	Name	Total population	2006 O/E	2007 O/E	2008 O/E	2009 O/E	2010 O/E	2011 O/E	95% LCL	95% UCL	Crude rate pmp	O/E	% non-White
Yorkshire and the Humber	*Leeds*	*798,700*	***0.98***	***0.93***	***0.88***	***0.86***	***0.88***	***0.87***	*0.79*	*0.94*	***666***	***0.90***	*11.8*
	North East Lincolnshire	158,800	**1.01**	**0.98**	**1.00**	**0.98**	**0.96**	**1.02**	0.86	1.20	**888**	**0.99**	3.1
	North Lincolnshire	*157,500*	***0.91***	***0.87***	***0.84***	***0.75***	***0.71***	***0.79***	*0.66*	*0.95*	***724***	***0.81***	*3.2*
	North Yorkshire and York	*802,100*	***0.79***	***0.79***	***0.79***	***0.80***	***0.80***	***0.80***	*0.74*	*0.87*	***733***	***0.80***	*3.7*
	Rotherham	254,300	**1.10**	**1.11**	**1.14**	**1.10**	**1.14**	**1.07**	0.94	1.22	**936**	**1.11**	5.2
	Sheffield	555,700	**1.09**	**1.08**	**1.07**	**1.07**	**1.10**	**1.07**	0.97	1.17	**853**	**1.08**	12.2
	Wakefield District	*325,500*	***0.88***	***0.84***	***0.81***	***0.81***	***0.82***	***0.84***	*0.74*	*0.96*	***740***	***0.83***	*4.3*
East Midlands	*Bassetlaw*	*112,100*	***0.83***	***0.97***	***0.90***	***0.81***	***0.78***	***0.77***	*0.62*	*0.96*	***714***	***0.84***	*3.1*
	Derby City	247,100	**1.07**	**1.01**	**1.07**	**1.15**	**1.14**	**1.12**	0.98	1.28	**902**	**1.10**	15.0
	Derbyshire County	*729,900*	***0.83***	***0.87***	***0.88***	***0.86***	***0.84***	***0.85***	*0.79*	*0.93*	***789***	***0.86***	*3.2*
	Leicester City	**306,800**	**1.73**	**1.73**	**1.76**	**1.77**	**1.80**	**1.82**	**1.65**	**2.01**	**1,304**	**1.77**	**38.2**
	Leicestershire County and Rutland	*687,200*	***0.91***	***0.90***	***0.89***	***0.87***	***0.88***	***0.87***	*0.80*	*0.94*	***776***	***0.88***	*7.7*
	Lincolnshire Teaching	*705,000*	***0.79***	***0.79***	***0.78***	***0.76***	***0.78***	***0.80***	*0.73*	*0.87*	***757***	***0.78***	*3.3*
	Northamptonshire Teaching	*687,600*	***0.90***	***0.91***	***0.91***	***0.91***	***0.90***	***0.91***	*0.83*	*0.99*	***774***	***0.91***	*7.4*
	Nottingham City	**306,300**	**1.21**	**1.15**	**1.17**	**1.20**	**1.28**	**1.22**	**1.08**	**1.37**	**836**	**1.20**	**18.7**
	Nottinghamshire County Teaching	668,000	**1.02**	**1.00**	**0.99**	**0.96**	**0.94**	**0.94**	0.87	1.02	**847**	**0.97**	5.1
West Midlands	**Birmingham East and North**	**409,300**	**1.63**	**1.54**	**1.58**	**1.56**	**1.50**	**1.53**	**1.40**	**1.68**	**1,165**	**1.56**	**23.8**
	Coventry Teaching	**315,700**	**1.18**	**1.17**	**1.19**	**1.23**	**1.28**	**1.31**	**1.18**	**1.46**	**1,014**	**1.23**	**19.6**
	Dudley	*307,500*	***0.91***	***0.92***	***0.88***	***0.93***	***0.90***	***0.85***	*0.74*	*0.96*	***758***	***0.89***	*8.5*
	Heart of Birmingham Teaching	**285,100**	**2.38**	**2.34**	**2.37**	**2.41**	**2.38**	**2.27**	**2.06**	**2.51**	**1,403**	**2.36**	**61.8**
	Herefordshire	*179,400*	***0.87***	***0.86***	***0.78***	***0.82***	***0.77***	***0.77***	*0.65*	*0.91*	***758***	***0.81***	*2.4*
	North Staffordshire	211,900		**0.89**	**0.89**	**0.92**	**0.88**	**0.91**	0.79	1.06	**845**	**0.90**	3.5
	Sandwell	**292,900**	**1.48**	**1.46**	**1.53**	**1.59**	**1.57**	**1.57**	**1.42**	**1.74**	**1,270**	**1.54**	**21.8**
	Shropshire County	*293,400*	***0.90***	***0.91***	***0.95***	***0.92***	***0.88***	***0.86***	*0.76*	*0.98*	***825***	***0.90***	*3.0*
	Solihull	206,300	**1.08**	**0.97**	**0.93**	**0.99**	**0.94**	**0.91**	0.79	1.06	**819**	**0.97**	9.0
	South Birmingham	**342,200**	**1.39**	**1.33**	**1.34**	**1.35**	**1.31**	**1.32**	**1.19**	**1.46**	**1,023**	**1.34**	**17.9**
	South Staffordshire	*611,300*		***0.92***	***0.92***	***0.89***	***0.89***	***0.92***	*0.84*	*1.00*	***836***	***0.91***	*4.7*
	Stoke on Trent	248,000		**1.11**	**1.07**	**1.11**	**1.11**	**1.12**	0.98	1.27	**944**	**1.10**	7.1
	Telford and Wrekin	162,400	**0.86**	**1.01**	**1.02**	**1.07**	**1.07**	**1.06**	0.90	1.25	**887**	**1.02**	6.6
	Walsall Teaching	**256,800**	**1.29**	**1.25**	**1.31**	**1.28**	**1.35**	**1.33**	**1.18**	**1.49**	**1,125**	**1.30**	**14.7**
	Warwickshire	536,200	**1.03**	**1.03**	**0.99**	**1.01**	**1.02**	**1.02**	0.93	1.11	**923**	**1.01**	6.7
	Wolverhampton City	239,300	**1.29**	**1.23**	**1.25**	**1.26**	**1.20**	**1.10**	0.97	1.26	**919**	**1.22**	23.8
	Worcestershire	*557,300*	***0.84***	***0.83***	***0.83***	***0.85***	***0.85***	***0.85***	*0.78*	*0.94*	***793***	***0.84***	*4.4*
East of England	*Bedfordshire*	*416,300*	***0.86***	***0.82***	***0.84***	***0.84***	***0.85***	***0.82***	*0.74*	*0.92*	***706***	***0.84***	*9.3*
	Cambridgeshire	*616,400*	***0.90***	***0.86***	***0.82***	***0.84***	***0.86***	***0.91***	*0.83*	*0.99*	***772***	***0.87***	*7.4*
	Hertfordshire	*1,107,500*	***0.80***	***0.81***	***0.91***	***0.91***	***0.92***	***0.92***	*0.86*	*0.98*	***772***	***0.88***	*9.9*
	Great Yarmouth and Waveney	214,700	**0.45**	**0.52**	**0.80**	**0.88**	**0.95**	**0.96**	0.83	1.10	**918**	**0.77**	3.5
	Luton	**198,900**	**1.18**	**1.22**	**1.28**	**1.26**	**1.28**	**1.35**	**1.17**	**1.55**	**990**	**1.26**	**31.5**
	Mid Essex	*374,500*	***0.83***	***0.86***	***0.84***	***0.84***	***0.82***	***0.82***	*0.73*	*0.92*	***721***	***0.83***	*5.1*
	Norfolk	*764,800*	***0.93***	***0.92***	***0.90***	***0.88***	***0.83***	***0.80***	*0.74*	*0.87*	***760***	***0.87***	*3.9*
	North East Essex	*329,500*			***0.82***	***0.82***	***0.82***	***0.84***	*0.74*	*0.95*	***762***	***0.82***	*6.4*
	Peterborough	173,600	**1.03**	**1.05**	**0.98**	**1.05**	**1.03**	**1.04**	0.89	1.23	**829**	**1.03**	13.0
	South East Essex	*338,200*	***0.95***	***0.93***	***0.92***	***0.91***	***0.88***	***0.85***	*0.75*	*0.96*	***766***	***0.90***	*5.7*
	South West Essex	410,000	**0.93**	**0.95**	**0.97**	**0.95**	**0.97**	**0.99**	0.89	1.11	**822**	**0.96**	7.6
	Suffolk	*601,900*	***0.84***	***0.84***	***0.82***	***0.83***	***0.82***	***0.82***	*0.75*	*0.90*	***748***	***0.83***	*5.7*
	West Essex	*286,400*	***0.81***	***0.76***	***0.70***	***0.72***	***0.76***	***0.76***	*0.66*	*0.88*	***663***	***0.75***	*7.9*
London	**Barking and Dagenham**	**179,700**	**1.12**	**1.17**	**1.16**	**1.22**	**1.31**	**1.44**	**1.24**	**1.66**	**991**	**1.25**	**23.7**
	Barnet	**348,000**	**1.20**	**1.39**	**1.43**	**1.40**	**1.46**	**1.46**	**1.32**	**1.61**	**1,152**	**1.40**	**29.4**
	Bexley	**228,300**	**1.15**	**1.15**	**1.16**	**1.20**	**1.23**	**1.23**	**1.08**	**1.40**	**1,029**	**1.19**	**13.0**
	Brent Teaching	**256,300**	**1.39**	**2.08**	**2.27**	**2.37**	**2.48**	**2.47**	**2.26**	**2.70**	**1,904**	**2.20**	**53.5**

Table 2.5. Continued

UK area	Name	Total population	2006 O/E	2007 O/E	2008 O/E	2009 O/E	2010 O/E	2011 O/E	95% LCL	95% UCL	Crude rate pmp	O/E	% non-White
London	Bromley	312,400	**1.01**	**0.97**	**1.02**	**0.98**	**1.02**	**1.01**	0.89	1.14	**861**	**1.00**	11.9
	Camden	**235,500**	**1.04**	**1.11**	**1.16**	**1.21**	**1.24**	**1.26**	**1.10**	**1.45**	**883**	**1.17**	**24.9**
	City and Hackney Teaching	**231,000**	**1.36**	**1.40**	**1.33**	**1.40**	**1.50**	**1.57**	**1.38**	**1.78**	**1,056**	**1.43**	**35.7**
	Croydon	**345,400**	**1.14**	**1.31**	**1.31**	**1.37**	**1.36**	**1.42**	**1.28**	**1.57**	**1,123**	**1.32**	**34.5**
	Ealing	**318,300**	**1.45**	**1.60**	**1.90**	**1.91**	**1.95**	**1.92**	**1.75**	**2.10**	**1,448**	**1.80**	**40.7**
	Enfield	**295,000**	**1.46**	**1.41**	**1.42**	**1.40**	**1.42**	**1.53**	**1.38**	**1.70**	**1,193**	**1.44**	**28.0**
	Greenwich Teaching	**228,100**	**1.10**	**1.14**	**1.23**	**1.26**	**1.40**	**1.43**	**1.26**	**1.63**	**1,035**	**1.27**	**26.1**
	Hammersmith and Fulham	**169,800**	**1.23**	**1.24**	**1.27**	**1.35**	**1.34**	**1.38**	**1.19**	**1.61**	**995**	**1.30**	**21.0**
	Haringey Teaching	**225,100**	**1.50**	**1.52**	**1.58**	**1.57**	**1.59**	**1.73**	**1.54**	**1.95**	**1,253**	**1.59**	**33.1**
	Harrow	**230,300**		**1.49**	**1.68**	**1.76**	**1.83**	**1.89**	**1.70**	**2.10**	**1,524**	**1.74**	**44.7**
	Havering	*236,100*		***0.80***	***0.81***	***0.82***	***0.80***	***0.85***	*0.73*	*0.98*	***737***	***0.82***	*8.8*
	Hillingdon	**266,200**	**1.08**	**0.94**	**1.31**	**1.32**	**1.33**	**1.41**	**1.25**	**1.58**	**1,082**	**1.24**	**25.9**
	Hounslow	**236,700**	**1.25**	**1.27**	**1.47**	**1.51**	**1.57**	**1.64**	**1.46**	**1.84**	**1,221**	**1.46**	**37.8**
	Islington	**193,900**	**1.45**	**1.36**	**1.29**	**1.31**	**1.41**	**1.47**	**1.28**	**1.69**	**1,016**	**1.38**	**22.9**
	Kensington and Chelsea	169,500		**0.80**	**0.98**	**0.97**	**1.00**	**0.99**	0.84	1.17	**814**	**0.95**	22.6
	Kingston	169,000		**1.04**	**1.15**	**1.12**	**1.10**	**1.11**	0.94	1.30	**846**	**1.11**	19.9
	Lambeth	**284,400**	**1.32**	**1.60**	**1.59**	**1.66**	**1.63**	**1.71**	**1.53**	**1.90**	**1,181**	**1.59**	**32.0**
	Lewisham	**266,400**	**1.62**	**1.66**	**1.63**	**1.71**	**1.66**	**1.72**	**1.55**	**1.92**	**1,239**	**1.67**	**34.4**
	Newham	**240,200**	**1.77**	**1.82**	**1.84**	**1.90**	**2.13**	**2.26**	**2.03**	**2.51**	**1,457**	**1.97**	**57.0**
	Redbridge	**270,300**	**1.18**	**1.18**	**1.31**	**1.37**	**1.45**	**1.42**	**1.27**	**1.60**	**1,080**	**1.33**	**40.9**
	Richmond and Twickenham	*190,800*		***0.62***	***0.69***	***0.74***	***0.76***	***0.76***	*0.64*	*0.91*	***618***	***0.72***	*11.7*
	Southwark	**287,100**	**1.46**	**1.58**	**1.61**	**1.63**	**1.68**	**1.78**	**1.61**	**1.98**	**1,247**	**1.63**	**34.1**
	Sutton and Merton	**403,000**		**1.13**	**1.16**	**1.21**	**1.23**	**1.23**	**1.12**	**1.36**	**965**	**1.20**	**20.8**
	Tower Hamlets	**238,100**	**1.13**	**1.22**	**1.27**	**1.40**	**1.46**	**1.51**	**1.33**	**1.73**	**932**	**1.34**	**22.8**
	Waltham Forest	**227,400**	**1.42**	**1.59**	**1.56**	**1.53**	**1.62**	**1.73**	**1.54**	**1.95**	**1,240**	**1.58**	**36.6**
	Wandsworth	**289,200**		**1.36**	**1.37**	**1.45**	**1.43**	**1.40**	**1.25**	**1.58**	**968**	**1.40**	**19.7**
	Westminster	**253,400**		**0.89**	**0.99**	**1.08**	**1.10**	**1.18**	**1.04**	**1.35**	**888**	**1.05**	**27.8**
South East Coast	*Brighton and Hove City*	*258,400*	***0.87***	***0.87***	***0.87***	***0.86***	***0.85***	***0.86***	*0.74*	*0.99*	***670***	***0.86***	*8.7*
	East Sussex Downs and Weald	*336,100*	***0.77***	***0.79***	***0.74***	***0.70***	***0.70***	***0.68***	*0.60*	*0.78*	***661***	***0.73***	*4.9*
	Eastern and Coastal Kent	742,200		**0.86**	**0.93**	**0.94**	**0.96**	**0.95**	0.88	1.03	**847**	**0.93**	5.3
	Hastings and Rother	*179,700*	***0.80***	***0.76***	***0.78***	***0.73***	***0.78***	***0.75***	*0.63*	*0.89*	***729***	***0.77***	*5.2*
	Medway	256,600		**0.85**	**0.90**	**0.91**	**0.88**	**0.91**	0.79	1.04	**740**	**0.89**	7.5
	Surrey	*1,114,400*	***0.77***	***0.85***	***0.87***	***0.88***	***0.89***	***0.88***	*0.82*	*0.94*	***767***	***0.86***	*8.3*
	West Kent	*685,100*		***0.85***	***0.88***	***0.89***	***0.86***	***0.85***	*0.78*	*0.93*	***744***	***0.87***	*6.8*
	West Sussex	*800,000*	***0.75***	***0.81***	***0.82***	***0.82***	***0.82***	***0.80***	*0.74*	*0.86*	***740***	***0.80***	*5.8*
South Central	**Berkshire East**	**406,500**	**1.01**	**1.14**	**1.13**	**1.16**	**1.21**	**1.22**	**1.11**	**1.35**	**962**	**1.15**	**18.9**
	Berkshire West	471,500	**1.01**	**1.09**	**1.09**	**1.10**	**1.04**	**1.03**	0.93	1.14	**829**	**1.06**	10.1
	Buckinghamshire	*512,100*	***0.97***	***0.95***	***0.94***	***0.93***	***0.91***	***0.87***	*0.79*	*0.96*	***760***	***0.93***	*10.4*
	Hampshire	*1,297,200*	***0.79***	***0.77***	***0.79***	***0.81***	***0.80***	***0.79***	*0.74*	*0.84*	***713***	***0.79***	*4.2*
	Isle of Wight National Health Service	*140,200*	***0.62***	***0.58***	***0.57***	***0.54***	***0.55***	***0.59***	*0.47*	*0.73*	***585***	***0.57***	*3.6*
	Milton Keynes	247,000	**0.84**	**0.91**	**0.92**	**0.90**	**0.92**	**0.94**	0.81	1.08	**737**	**0.91**	12.7
	Oxfordshire	624,200	**1.03**	**0.95**	**0.91**	**0.89**	**0.89**	**0.92**	0.84	1.01	**764**	**0.93**	8.1
	Portsmouth City Teaching	207,200	**0.98**	**0.97**	**0.96**	**0.92**	**0.90**	**0.95**	0.81	1.12	**709**	**0.94**	8.0
	Southampton City	239,800	**0.89**	**0.90**	**0.94**	**0.93**	**0.99**	**1.01**	0.87	1.17	**742**	**0.95**	11.4
South West	*Bath and North East Somerset*	*179,800*	***0.91***	***0.91***	***0.84***	***0.86***	***0.85***	***0.79***	*0.67*	*0.95*	***673***	***0.86***	*5.8*
	Bournemouth and Poole Teaching	*310,800*	***0.86***	***0.88***	***0.87***	***0.84***	***0.82***	***0.81***	*0.71*	*0.93*	***718***	***0.84***	*5.0*
	Bristol	**441,100**	**1.28**	**1.21**	**1.25**	**1.22**	**1.19**	**1.20**	**1.08**	**1.32**	**886**	**1.22**	**11.6**
	Cornwall and Isles of Scilly	537,900	**1.05**	**1.00**	**0.98**	**0.98**	**0.95**	**0.92**	0.84	1.00	**881**	**0.98**	2.8
	Devon	*749,700*	***0.82***	***0.83***	***0.85***	***0.87***	***0.86***	***0.85***	*0.79*	*0.92*	***823***	***0.85***	*3.3*
	Dorset	*404,900*	***0.81***	***0.83***	***0.85***	***0.85***	***0.83***	***0.79***	*0.70*	*0.88*	***800***	***0.83***	*3.5*

Table 2.5. Continued

UK area	Name	Total population	2006 O/E	2007 O/E	2008 O/E	2009 O/E	2010 O/E	2011 O/E	95% LCL	95% UCL	Crude rate pmp	O/E	% non-White
South West	*Gloucestershire*	*593,600*	***0.91***	***0.87***	***0.82***	***0.85***	***0.85***	***0.85***	*0.78*	*0.94*	***773***	***0.86***	*4.7*
	North Somerset	*212,100*	***0.97***	***0.91***	***0.91***	***0.86***	***0.84***	***0.84***	*0.72*	*0.98*	***787***	***0.89***	*3.6*
	Plymouth Teaching	**258,900**	**1.18**	**1.15**	**1.12**	**1.12**	**1.15**	**1.15**	**1.01**	**1.30**	**927**	**1.14**	**4.4**
	Somerset	*525,500*	***0.87***	***0.83***	***0.81***	***0.81***	***0.84***	***0.85***	*0.78*	*0.94*	***811***	***0.83***	*3.2*
	South Gloucestershire	264,900	**1.04**	**0.99**	**0.98**	**0.92**	**0.97**	**0.94**	0.82	1.08	**812**	**0.97**	5.0
	Swindon	206,900	**0.93**	**0.88**	**0.86**	**0.88**	**0.92**	**0.95**	0.81	1.10	**778**	**0.90**	7.1
	Torbay	134,400	**0.86**	**0.81**	**0.90**	**0.85**	**0.91**	**0.94**	0.79	1.12	**915**	**0.88**	3.1
	Wiltshire	*459,800*	***0.69***	***0.72***	***0.74***	***0.73***	***0.73***	***0.74***	*0.66*	*0.83*	***668***	***0.73***	*3.4*
Wales	*Betsi Cadwaladr University*	*678,500*	***1.00***	***0.95***	***0.94***	***0.91***	***0.88***	***0.85***	*0.78*	*0.93*	***789***	***0.92***	*1.0*
	Powys Teaching	131,100	**0.92**	**0.87**	**0.88**	**0.93**	**0.88**	**0.86**	0.71	1.03	**862**	**0.89**	0.9
	Hywel Dda	374,800	**1.02**	**0.95**	**1.00**	**0.95**	**0.90**	**0.92**	0.83	1.03	**872**	**0.95**	1.0
	Abertawe Bro Morgannwg University	**504,800**	**1.26**	**1.26**	**1.19**	**1.22**	**1.26**	**1.24**	**1.14**	**1.35**	**1,099**	**1.24**	**1.6**
	Cwm Taf	**290,600**	**1.46**	**1.52**	**1.43**	**1.40**	**1.31**	**1.35**	**1.22**	**1.51**	**1,163**	**1.41**	**1.1**
	Aneurin Bevan	**561,300**	**1.16**	**1.17**	**1.11**	**1.09**	**1.12**	**1.10**	**1.01**	**1.20**	**967**	**1.12**	**1.9**
	Cardiff and Vale University	466,100	**1.18**	**1.18**	**1.08**	**1.08**	**1.07**	**1.06**	0.96	1.17	**824**	**1.10**	6.7
Scotland	Ayrshire & Arran	366,900	**1.22**	**1.14**	**1.14**	**1.08**	**1.07**	**1.02**	0.92	1.13	**940**	**1.11**	0.7
	Borders	113,000	**0.86**	**0.96**	**0.99**	**1.02**	**1.06**	**0.95**	0.79	1.15	**920**	**0.98**	0.6
	Dumfries and Galloway	148,100	**1.03**	**0.95**	**0.96**	**0.93**	**0.89**	**0.86**	0.73	1.03	**858**	**0.93**	0.7
	Fife	364,800	**1.00**	**0.97**	**0.96**	**0.94**	**0.95**	**0.99**	0.89	1.10	**874**	**0.97**	1.3
	Forth Valley	293,100	**0.93**	**0.98**	**0.95**	**0.92**	**0.94**	**0.89**	0.78	1.01	**771**	**0.93**	1.1
	Grampian	550,500	**1.05**	**1.01**	**0.99**	**0.96**	**0.95**	**0.95**	0.86	1.04	**830**	**0.98**	1.6
	Greater Glasgow & Clyde	1,204,100	**1.21**	**1.17**	**1.13**	**1.09**	**1.06**	**1.05**	0.99	1.12	**879**	**1.11**	3.4
	Highland	310,700	**1.13**	**1.12**	**1.06**	**1.04**	**1.00**	**0.91**	0.81	1.03	**872**	**1.04**	0.8
	Lanarkshire	562,700	**1.07**	**0.99**	**0.97**	**0.96**	**0.96**	**0.93**	0.85	1.02	**803**	**0.98**	1.2
	Lothian	*837,000*	***0.98***	***0.95***	***0.92***	***0.89***	***0.85***	***0.81***	*0.74*	*0.88*	***668***	***0.90***	*2.8*
	Orkney	19,800	**1.15**	**0.95**	**1.14**	**1.09**	**0.99**	**0.84**	0.52	1.38	**808**	**1.02**	0.4
	Shetland	*22,500*	***0.50***	***0.71***	***0.50***	***0.54***	***0.57***	***0.49***	*0.27*	*0.92*	***444***	***0.55***	*1.1*
	Tayside	402,400	**1.22**	**1.14**	**1.06**	**1.07**	**1.04**	**1.02**	0.92	1.13	**924**	**1.09**	1.9
	Western Isles	26,500	**0.54**	**0.83**	**0.75**	**0.71**	**0.80**	**0.65**	0.41	1.05	**642**	**0.72**	0.6
Northern Ireland	**Belfast**	**335,700**	**1.38**	**1.37**	**1.31**	**1.22**	**1.21**	**1.17**	**1.05**	**1.31**	**923**	**1.27**	**1.1**
	Northern	458,600	**1.20**	**1.15**	**1.11**	**1.05**	**1.01**	**1.05**	0.95	1.16	**859**	**1.09**	0.6
	Southern	357,700	**1.05**	**0.99**	**1.00**	**0.98**	**1.00**	**1.04**	0.92	1.17	**788**	**1.01**	0.4
	South Eastern	347,100	**1.06**	**1.01**	**1.00**	**0.96**	**0.89**	**0.91**	0.81	1.03	**755**	**0.97**	0.7
	Western	299,900	**1.16**	**1.14**	**1.10**	**1.13**	**1.12**	**1.08**	0.95	1.22	**830**	**1.12**	0.5

Bro Morgannwg University, Aneurin Bevan, Belfast, Cwm Taf, Plymouth and Liverpool. Forty (69.0%) of the 58 PCT/HBs with ethnic minority populations greater than 10% had high SPRs, whereas only 4 (6.9%) (Trafford, Leeds, Richmond & Twickenham, Buckinghamshire) had low SPRs. However, not all PCT/HBs with a high (>15%) ethnic minority population also had higher than expected RRT prevalence rates. For example Kingston and Kensington had rates similar to average (1.11 and 0.95 respectively 2006–2011), possibly explained by lower levels of social deprivation in these areas. The standardised prevalence ratios in each region of England and in Wales, Northern Ireland and Scotland are presented in table 2.6. North East England, North West England, Yorkshire and Humber, East Midlands, East of England, South East England, South Central and South West England had lower than expected prevalence rates of RRT given the age and gender of their populations and this pattern has been similar for the last five years. West Midlands, London and Wales had higher than expected prevalence rates of RRT given the age and gender of their populations and again this pattern has remained similar for the last five years. Scotland and Northern Ireland previously had higher than expected prevalence rates but in more recent years were similar to their expected rates. There was marked variation (17–fold) in prevalence rates in over 80 year olds between PCT/HBs (data not shown).

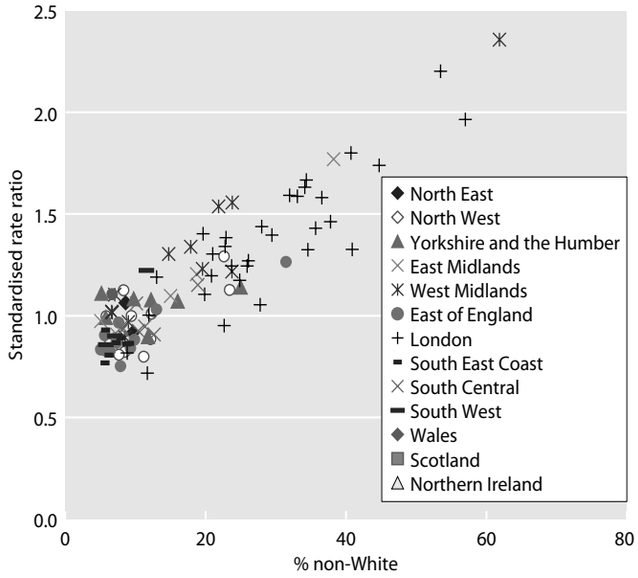

Fig. 2.3. Ethnicity and standardised prevalence ratios for all PCT/HB areas by percentage non-White on 31/12/2011 (excluding areas with <5% ethnic minorities)
SPR = standardised prevalence ratio

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 31/12/2011. Median time on RRT for all prevalent patients remained static at 5.6 years (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 functioning transplants had survived a median of 10.3 years on RRT whilst the median time on RRT of HD and PD patients was significantly less (3.3 and 1.8 years respectively, $p < 0.001$).

Table 2.7. Median time on RRT of prevalent patients on 31/12/2011

Modality	N	Median time treated (years)
Haemodialysis	22,706	3.3
Peritoneal dialysis	3,768	1.8
Transplant	25,014	10.3
All RRT	**51,488**	**5.6**

All patients without a treatment modality were excluded
Median time on 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

Age

The median age of prevalent UK patients on RRT at 31st December 2011 was slightly higher (58.2 years) compared with 2010 (57.9 years) (table 2.8) and significantly higher than in 2005 when it was 55 years. There were marked differences between modalities; the median age of HD patients (66.5 years) was greater than that of those on PD (62.7 years) and substantially higher than that of transplanted patients (51.7 years). About half (50.1%) of the UK prevalent RRT population was in the 40–64 years age group. Northern Ireland and Wales had a higher proportion of patients aged 75 years and older (16.9% and 17.2% respectively) compared with England (15.6%) and Scotland (13.6%) (table 2.9). Furthermore, there existed a wide range between centres

Table 2.6. Standardised rate ratio of RRT for each Strategic Health Authority in England and for Wales, Scotland and Northern Ireland in 2011

UK Area	Total population	O/E	95% LCL	95% UCL	Crude rate pmp
North East	2,607,000	0.87	0.83	0.91	758.3
North West	6,969,700	0.91	0.89	0.93	778.5
Yorkshire and the Humber	5,298,700	0.95	0.92	0.98	800.0
East Midlands	4,450,000	0.95	0.92	0.99	831.5
West Midlands	**5,455,000**	**1.12**	**1.09**	**1.15**	**955.6**
East of England	5,832,700	0.88	0.86	0.91	771.7
London	**7,824,900**	**1.48**	**1.45**	**1.51**	**1,108.4**
South East Coast	4,372,500	0.85	0.82	0.88	755.2
South Central	4,145,700	0.90	0.87	0.94	762.7
South West	5,280,300	0.89	0.86	0.91	804.5
Wales	**3,007,200**	**1.05**	**1.01**	**1.09**	**929.4**
Scotland	5,222,100	0.95	0.92	0.98	829.7
Northern Ireland	1,799,000	1.05	1.00	1.10	832.1

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 31/12/2011

	Median age			
Centre	HD	PD	Transplant	RRT
England				
B Heart	67.3	53.4	50.0	62.7
B QEH	64.0	58.0	50.5	56.5
Basldn	66.1	66.6	49.5	63.1
Bradfd	63.2	49.1	50.4	53.9
Brightn	69.6	68.2	52.9	62.2
Bristol	68.7	55.6	53.1	58.2
Camb	72.8	65.4	52.2	58.7
Carlis	69.3	67.4	51.3	58.5
Carsh	69.4	64.6	51.3	61.6
Chelms	67.4	66.1	57.9	63.3
Colchr	68.7			68.7
Covnt	66.2	65.1	49.8	57.2
Derby	70.0	64.8	54.6	63.3
Donc	66.9	62.3	56.9	63.4
Dorset	71.2	70.0	57.0	64.3
Dudley	66.7	62.2	58.9	62.2
Exeter	72.0	66.4	52.5	62.4
Glouc	72.4	67.4	53.7	64.5
Hull	67.1	62.7	51.0	58.0
Ipswi	66.1	66.8	53.2	58.9
Kent	70.0	65.1	52.3	60.7
L Barts	60.7	59.8	49.8	54.8
L Guys	61.6	61.8	49.6	53.6
L Kings	63.6	58.7	52.0	57.3
L Rfree	65.7	63.9	50.6	56.7
L St.G	66.5	65.1	52.9	59.3
L West	66.0	66.8	52.9	58.5
Leeds	67.3	59.4	51.5	56.9
Leic	66.7	66.4	51.7	59.4
Liv Ain	64.9	61.7		64.8
Liv RI	62.5	57.5	51.4	54.6
M RI	62.8	56.1	49.9	53.7
Middlbr	69.6	62.2	52.3	58.6
Newc	63.1	62.2	53.8	56.7
Norwch	71.6	64.0	52.8	63.0
Nottm	67.4	62.1	50.2	57.5
Oxford	67.2	62.6	50.7	55.0
Plymth	68.4	68.1	54.0	59.0
Ports	66.1	64.7	52.4	58.2
Prestn	63.6	61.4	52.1	57.9
Redng	69.4	58.9	55.7	60.0
Salford	61.7	58.4	51.3	56.7
Sheff	65.4	63.0	51.6	58.2
Shrew	68.7	63.1	53.4	62.3
Stevng	66.3	56.7	50.9	60.1
Sthend	70.5	63.0	55.5	64.6
Stoke	68.4	67.8	49.9	60.1
Sund	64.6	57.1	52.1	57.0
Truro	69.2	69.1	55.4	63.1
Wirral	67.2	59.8	49.6	65.5
Wolve	67.8	63.7	51.1	61.8
York	66.0	62.1	51.4	57.9
N Ireland				
Antrim	70.2	69.1	50.7	65.2
Belfast	64.3	54.9	50.1	52.8
Newry	67.7	65.2	54.6	62.6
Ulster	70.7	63.7	58.5	68.9
West NI	67.0	49.1	49.9	60.0
Scotland				
Abrdn	65.8	56.2	51.8	56.3
Airdrie	62.4	53.8	50.5	56.3
D & Gall	65.4	70.9	50.2	61.0
Dundee	69.0	64.5	52.3	60.9
Dunfn	65.7	64.7	51.5	60.0
Edinb	59.2	60.6	51.0	54.0
Glasgw	64.1	61.0	51.9	56.5
Inverns	70.8	65.4	46.8	55.0
Klmarnk	66.8	58.0	49.9	58.1
Wales				
Bangor	65.2	71.0		65.4
Cardff	68.7	65.1	51.4	57.2
Clwyd	64.1	57.0	56.3	60.1
Swanse	71.2	64.4	55.5	64.1
Wrexm	67.5	60.9	51.9	56.8
England	**66.5**	**62.7**	**51.7**	**58.2**
N Ireland	**67.7**	**58.6**	**50.8**	**58.8**
Scotland	**64.6**	**61.3**	**51.1**	**56.8**
Wales	**68.4**	**64.9**	**52.5**	**59.9**
UK	**66.5**	**62.7**	**51.7**	**58.2**
(min, max)	**(59.2, 72.8)**	**(49.1, 71.0)**	**(46.8, 58.9)**	**(52.8, 68.9)**

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

in the proportion of patients aged over 75 (8.4% in Edinburgh to 32.8% in Ulster).

There was inter-centre variation in the median age of patients on RRT. Ulster had the highest median age (68.9 years), whilst Belfast had the lowest median age (52.8 years) (table 2.8). This likely reflects either ethnic make up of the catchment populations or follow up of younger transplant patients (as above in the case of Belfast). The median age of the non-White dialysis population was lower than the overall dialysis population (60.6 vs. 65.9 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 is 27 years later than for prevalent transplant patients.

In the UK on 31st December 2011, 62.7% of patients aged less than 65 years on RRT had a functioning transplant (table 2.15), compared with only 25.0% aged 65 years and over. There was a similar pattern in all four UK countries.

Table 2.9. Percentage of prevalent RRT patients in each age group by centre on 31/12/2011

		Percentage of patients			
Centre	N	18–39 years	40–64 years	65–74 years	75+ years
England					
B Heart	666	12.3	41.9	25.2	20.6
B QEH	1,923	16.3	51.7	16.7	15.3
Basldn	238	13.4	40.8	21.4	24.4
Bradfd	472	21.2	48.5	18.0	12.3
Brightn	777	12.1	44.8	21.5	21.6
Bristol	1,311	16.1	48.5	19.8	15.6
Camb	1,086	15.1	50.7	17.8	16.4
Carlis	219	13.7	51.1	22.8	12.3
Carsh	1,410	11.4	46.2	22.1	20.3
Chelms	216	8.8	46.8	20.8	23.6
Colchr	120	5.8	30.8	31.7	31.7
Covnt	886	14.9	50.6	19.2	15.3
Derby	466	11.8	41.2	26.8	20.2
Donc	248	12.1	44.0	19.4	24.6
Dorset	587	10.1	42.1	27.6	20.3
Dudley	287	8.4	48.1	24.4	19.2
Exeter	813	10.6	45.3	20.5	23.6
Glouc	390	9.2	42.1	24.4	24.4
Hull	764	13.9	51.2	19.6	15.3
Ipswi	340	13.2	53.5	20.3	12.9
Kent*	849	12.5	45.1	24.7	17.7
L Barts	1,900	17.7	54.5	16.4	11.3
L Guys	1,680	20.1	53.8	15.2	10.8
L Kings	882	13.4	51.9	20.0	14.7
L Rfree	1,773	18.2	49.6	17.7	14.5
L St.G	719	14.0	50.8	19.6	15.6
L West	3,022	12.2	53.4	20.4	14.0
Leeds*	1,441	18.0	49.0	19.8	13.2
Leic	1,926	13.1	49.8	21.8	15.4
Liv Ain	194	9.3	41.8	21.1	27.8
Liv RI	1,251	15.7	58.5	16.5	9.4
M RI	1,635	19.4	56.4	15.1	9.1
Middlbr	753	13.5	50.1	19.3	17.1
Newc	916	16.0	53.6	21.0	9.4
Norwch	612	12.9	40.4	23.0	23.7
Nottm	1,019	17.1	49.2	19.2	14.5
Oxford	1,444	17.5	52.0	17.2	13.4
Plymth	465	13.1	48.8	23.2	14.8
Ports	1,394	14.3	51.5	20.3	13.8
Prestn	1,023	13.5	52.1	21.0	13.4
Redng	688	11.6	49.9	20.3	18.2
Salford	846	14.8	54.1	18.7	12.4
Sheff	1,260	14.0	51.3	19.0	15.7
Shrew	342	11.4	44.2	21.1	23.4
Stevng	638	12.1	46.9	20.8	20.2
Sthend	214	13.6	39.3	22.4	24.8
Stoke	695	15.1	45.2	20.0	19.7
Sund	390	14.9	53.6	19.0	12.6
Truro	357	12.0	44.3	21.3	22.4
Wirral	241	9.1	39.8	23.7	27.4
Wolve	516	10.7	46.3	23.1	20.0
York*	339	18.9	44.5	19.8	16.8

Table 2.9. Continued

Centre	N	Percentage of patients			
		18–39 years	40–64 years	65–74 years	75+ years
N Ireland					
Antrim	224	9.8	39.7	27.7	22.8
Belfast	686	19.4	53.8	15.3	11.5
Newry	191	12.6	43.5	23.6	20.4
Ulster	137	7.3	31.4	28.5	32.8
West NI	272	15.8	46.0	23.2	15.1
Scotland					
Abrdn	479	19.8	49.7	18.4	12.1
Airdrie	344	17.2	54.1	14.5	14.2
D & Gall	122	13.1	50.8	18.9	17.2
Dundee	400	12.8	46.8	21.3	19.3
Dunfn	278	12.9	46.4	22.7	18.0
Edinb	700	15.7	58.4	17.4	8.4
Glasgw	1,477	15.0	54.6	17.9	12.5
Inverns	224	15.6	54.0	13.4	17.0
Klmarnk	300	10.7	53.0	18.7	17.7
Wales					
Bangor	109	9.2	37.6	27.5	25.7
Cardff	1,536	15.4	52.1	18.4	14.2
Clwyd*	136	11.0	52.2	22.1	14.7
Swanse	659	10.9	41.7	24.1	23.2
Wrexm	237	16.9	48.5	16.9	17.7
England	**44,643**	**14.7**	**50.0**	**19.8**	**15.6**
N Ireland	**1,510**	**15.4**	**47.0**	**20.8**	**16.9**
Scotland	**4,324**	**15.1**	**53.1**	**18.1**	**13.6**
Wales	**2,677**	**13.9**	**48.6**	**20.2**	**17.2**
UK	**53,154**	**14.7**	**50.1**	**19.7**	**15.6**
(min, max)		**(5.8, 21.2)**	**(30.8, 58.5)**	**(13.4, 31.7)**	**(8.4, 32.8)**

* 16 transplant patients from Kent, 21 transplant patients from Leeds, 27 transplant patients from York, were not included in this analysis. 6 transplant patients, 13 HD patients and 12 PD patients from Clwyd were not included in this analysis

Gender

Standardising the age of the UK RRT prevalent patients, by using the age and gender distribution of the UK population by PCT/HB (from ONS mid-2010 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 2,099 pmp (a slight increase from

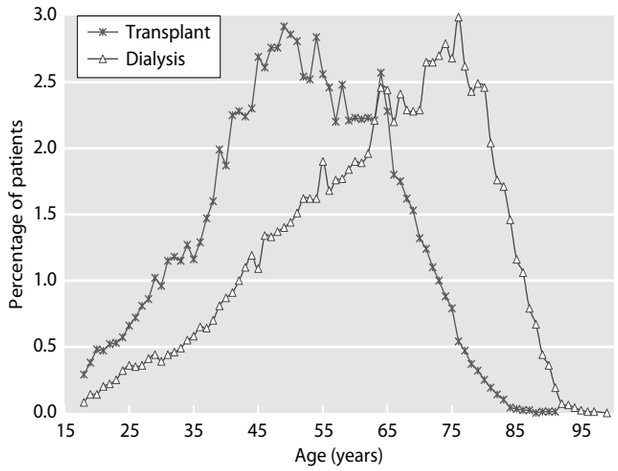

Fig. 2.4. Age profile of prevalent RRT patients by modality on 31/12/2011

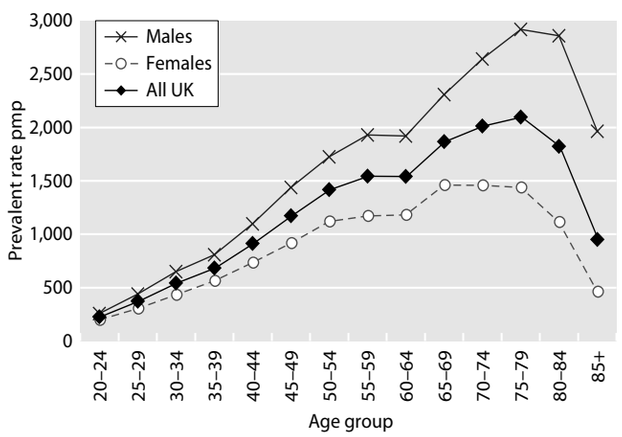

Fig. 2.5. Prevalence rate of RRT patients per million population by age and gender on 31/12/2011

Table 2.10. Ethnicity of prevalent RRT patients by centre on 31/12/2011

Centre	Data not available	N with data	Percentage in each ethnic group				
			White	Black	S Asian	Chinese	Other
England							
B Heart	0.2	665	62.3	6.3	29.8	0.6	1.1
B QEH	0.1	1,921	64.1	9.3	23.1	1.0	2.5
Basldn	0.0	238	88.7	7.1	3.4	0.0	0.8
Bradfd	3.0	458	57.0	2.4	39.5	0.0	1.1
Brightn	52.9	366					
Bristol	1.3	1,294	90.2	4.6	3.6	0.3	1.3
Camb	1.5	1,070	93.7	1.8	3.6	0.2	0.7
Carlis	1.4	216	99.5	0.0	0.5	0.0	0.0
Carsh	6.8	1,314	73.5	9.7	12.2	1.5	3.0
Chelms	2.8	210	91.4	2.9	1.9	1.4	2.4
Colchr	30.0	84	91.7	2.4	1.2	1.2	3.6
Covnt	2.6	863	82.3	3.8	13.1	0.5	0.3
Derby	3.4	450	84.9	3.8	10.4	0.4	0.4
Donc	0.0	248	98.0	0.4	0.8	0.4	0.4
Dorset	0.0	587	97.6	0.2	0.9	0.5	0.9
Dudley	0.0	287	88.2	2.4	7.7	0.7	1.0
Exeter	4.2	779	98.7	0.5	0.4	0.3	0.1
Glouc	0.0	390	94.1	2.3	2.3	0.3	1.0
Hull	42.5	439	97.7	0.5	0.9	0.2	0.7
Ipswi	2.6	331	93.7	2.4	3.0	0.3	0.6
Kent	5.3	804	95.8	0.7	2.5	0.1	0.9
L Barts	0.3	1,895	40.5	31.7	25.8	1.7	0.3
L Guys	18.9	1,362	65.7	29.0	3.1	1.3	0.9
L Kings	2.5	860	51.6	35.1	10.6	1.7	0.9
L Rfree	2.2	1,734	49.9	21.8	18.7	1.6	7.9
L St.G	11.7	635	56.9	22.7	11.5	2.4	6.6
L West	0.1	3,020	45.0	18.0	32.5	1.1	3.4
Leeds	6.6	1,346	80.8	3.9	13.8	0.0	1.5
Leic	4.0	1,849	77.3	3.5	17.7	0.3	1.1
Liv Ain	8.2	178	95.5	0.6	1.1	1.7	1.1
Liv RI	17.2	1,036	94.4	2.4	1.2	1.4	0.7
M RI	2.4	1,595	80.2	7.1	11.5	1.0	0.2
Middlbr	0.9	746	95.0	0.3	4.4	0.1	0.1
Newc	0.4	912	94.5	0.3	3.5	0.5	1.1
Norwch	9.3	555	97.3	0.5	1.1	0.7	0.4
Nottm	0.1	1,018	87.7	5.1	5.9	0.0	1.3
Oxford	5.2	1,369	85.8	3.6	7.9	0.7	2.0
Plymth	2.2	455	97.6	0.4	0.4	0.4	1.1
Ports	0.9	1,382	94.4	0.9	3.0	0.0	1.7
Prestn	0.0	1,023	84.8	1.0	13.6	0.0	0.7
Redng	10.9	613	70.1	6.5	20.1	0.7	2.6
Salford	0.2	844	82.2	1.5	14.6	0.5	1.2
Sheff	0.2	1,258	92.7	1.7	3.6	0.4	1.6
Shrew	0.0	342	95.0	1.2	2.9	0.3	0.6
Stevng	0.5	635	70.4	8.5	18.3	0.6	2.2
Sthend	0.0	214	83.6	5.6	3.3	1.9	5.6
Stoke	17.4	574	93.2	0.3	4.2	0.3	1.9
Sund	0.8	387	96.9	1.0	1.8	0.3	0.0
Truro	0.6	355	99.4	0.0	0.3	0.3	0.0
Wirral	2.5	235	94.9	0.0	2.6	1.3	1.3
Wolve	1.2	510	72.9	9.4	17.5	0.2	0.0
York	10.6	303	97.7	0.7	1.0	0.0	0.7

Table 2.10. Continued

Centre	Data not available	N with data	Percentage in each ethnic group				
			White	Black	S Asian	Chinese	Other
N Ireland							
Antrim	0.0	224	99.1	0.0	0.9	0.0	0.0
Belfast	1.3	677	99.0	0.1	0.7	0.1	0.0
Newry	0.0	191	99.5	0.0	0.0	0.5	0.0
Ulster	0.0	137	97.1	0.0	2.2	0.7	0.0
West NI	0.0	272	98.9	0.4	0.4	0.4	0.0
Scotland							
Abrdn	57.4	204					
Airdrie	67.4	112					
D & Gall	90.2	12					
Dundee	53.5	186					
Dunfn	80.9	53					
Edinb	92.9	50					
Glasgw	91.9	119					
Inverns	8.9	204	99.0	0.0	1.0	0.0	0.0
Klmarnk	55.0	135					
Wales							
Bangor	31.2	75	97.3	1.3	0.0	1.3	0.0
Cardff	21.5	1,205	93.6	1.1	4.0	0.6	0.7
Clwyd	22.8	105	99.0	0.0	0.0	1.0	0.0
Swanse	1.2	651	98.3	0.3	1.2	0.0	0.2
Wrexm	0.0	237	99.2	0.4	0.4	0.0	0.0
England	**5.4**	**42,254**	**77.4**	**8.3**	**11.9**	**0.7**	**1.7**
N Ireland	**0.6**	**1,501**	**98.9**	**0.1**	**0.7**	**0.3**	**0.0**
Scotland	**75.1**	**1,075**					
Wales	**15.1**	**2,273**	**95.9**	**0.7**	**2.5**	**0.4**	**0.4**
UK	**11.4**	**47,103**	**79.4**	**7.5**	**10.8**	**0.7**	**1.5**

Percentage breakdown is not shown for centres with less than 50% data completeness, but these centres are included in national averages
Blank cells – less than 50% data completeness
Appendix H ethnicity coding

2,007 pmp in 2010) in the age-group 75–79 years before showing a reducing prevalence rate in age groups over 80 years. Crude prevalence rates in males exceeded those of females for all age groups, peaking in age group 75–79 years at 2,918 pmp and for females in age group 65–69 years at 1,460 pmp. Survival of males and females on RRT is described in chapter 5.

Ethnicity

Fifty-one of the 71 centres (71.8%) provided ethnicity data that were at least 90% complete (table 2.10) and this was an improvement compared with 49 of 72 (68.1%) in 2010 and with 36 centres in 2006. Ethnicity completeness for prevalent RRT patients improved in the UK from 87.4% in 2010 to 88.6% in 2011 with 94.6% ethnicity completeness in England in 2011 and 99.4% in Northern Ireland. Completeness of ethnicity data was highest in prevalent transplant patients. This may relate to the fact that the intensive work-up for transplantation may increase the recording of data.

In 2011, 20.6% of the prevalent UK RRT population (with ethnicity assigned) were from ethnic minorities (22.6% 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 was a high level of missing ethnicity data in Scotland. The ONS estimates that approximately 12% of the UK general population are designated as belonging to an ethnic minority [1]. The number of patients reported to the UKRR as receiving RRT and belonging to an ethnic minority has doubled in the last 5 years which may be due to improvements in coding 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

Table 2.11. Primary renal diagnosis in prevalent RRT patients by age and gender on 31/12/2011

Primary diagnosis[a]	N	% all patients	Inter-centre range %	Age <65		Age ⩾65		M:F ratio
				N	%	N	%	
Aetiology uncertain	9,080	17.7	6.2–38.1	5,043	15.2	4,037	22.3	1.6
GN (biopsy proven)/GN (not biopsy proven)	9,744	19.0	1.1–22.8	7,218	21.8	2,526	14.0	2.1
Pyelonephritis	5,875	11.5	6.3–18.8	4,423	13.3	1,452	8.0	1.1
Diabetes	7,798	15.2	8.2–25.4	4,731	14.3	3,067	17.0	1.6
Polycystic kidney	5,033	9.8	1.7–16.8	3,382	10.2	1,651	9.1	1.1
Hypertension	2,946	5.8	0.5–14.9	1,644	5.0	1,302	7.2	2.5
Renal vascular disease	1,728	3.4	0.3–12.9	361	1.1	1,367	7.6	2.0
Other	7,775	15.2	5.0–39.4	5,550	16.7	2,225	12.3	1.3
Not sent	1,282	2.5	0.1–48.8	823	2.5	459	2.5	1.7

[a] Appendix H: ERA-EDTA coding
GN = glomerulonephritis
Excluded centres: ⩾40% primary renal diagnosis aetiology uncertain (Colchr), ⩾50% primary renal diagnosis not sent (L RFree)

from ethnic minorities, ranging from 0.5% in one centre (Carlisle) to over 50% in 3 centres: London Barts (59.5%), London West (55.0%) and London Royal Free (50.1%). Three additional centres had over 40% of prevalent patients from ethnic minorities: Bradford (43.0%), London Kings (48.4%) and London St Georges (43.1%). Thirteen of twenty-three (56.5%) transplanting centres had an ethnic minority population greater than 10% compared with 27.1% (13/48) of non-transplanting centres.

Ethnicity also impacted the median age of the prevalent cohort. Those centres with an ethnic minority population of >10% had a slightly lower median age (57 years vs. 59 years).

Primary renal diagnosis

Data for primary renal diagnosis (PRD) were not complete for 2.5% of patients and there remained a marked inter-centre difference in completeness of data returns (table 2.11). London Royal Free was excluded from the following analyses as it had ⩾50% primary renal diagnosis data missing. The UKRR remains concerned that some centres have very high rates of primary renal diagnosis coded as 'uncertain' (EDTA codes 00 and 10). It is accepted that inevitably there will be a number of patients with uncertain aetiology and that the proportion of these patients will vary as the definitions of renal vascular disease, hypertensive nephropathy and chronic glomerulonephritis (GN) without tissue diagnosis remain relatively subjective. However, some centres with very high rates of 'uncertain' as the primary renal diagnosis appear to also have fewer patients with the more objective diagnoses such as polycystic kidney disease or biopsy-proven GN. It is believed that the software in these centres defaults any missing data to 'uncertain' (EDTA code 00).

One centre with ⩾40% 'uncertain' primary renal diagnosis (Colchester, 47%) has been excluded from the inter-centre analysis and the UK and national totals have been adjusted. These centres with either a high proportion of primary renal diagnosis 'uncertain' or a high proportion of missing data have also been excluded from other analyses where PRD is included in the case-mix adjustment. There was wide inter-centre variation in the proportion of primary renal diagnoses in the RRT prevalent population not submitted, but this is improving in most centres. There were 4 centres with >15% not sent (Wirral 27.0%, Brighton 22.7%, Salford 17.4%, London Royal Free 50.2%). Uncertain primary renal diagnosis also ranged widely between centres and 3 centres had >30% uncertain diagnosis (Ipswich 30.6%, Liverpool RI 37.2%, Colchester 46.7%).

Glomerulonephritis remained the most common primary renal diagnosis in the 2011 prevalent cohort at 19.0% (table 2.11). The change in coding in this year's analysis from glomerulonephritis that is biopsy proven to including those that are not biopsy proven is reflected in an increase in prevalence from 16% in 2010 to 19% in 2011. Diabetes accounted for 15.2% of renal disease in the prevalent patients on RRT, although it was more common in the ⩾65 year age group compared to the younger group (17.0% vs. 14.3%). This contrasted with the pattern seen in incident patients where diabetes was the predominant specific diagnostic code in 25.0% of new RRT patients. This reflects the different ages and survival of patients with these diagnoses; it is the younger fitter patients who survive longest and contribute highly to the prevalent numbers. Younger

Table 2.12. Transplant:dialysis ratios by age and primary renal disease in the prevalent RRT population on 31/12/2011

	Transplant:dialysis ratio	
Primary diagnosis[a]	<65	⩾65
Aetiology uncertain	1.8	0.3
GN (biopsy proven)/GN (not biopsy proven)	2.2	0.7
Pyelonephritis	2.4	0.4
Diabetes	0.8	0.1
Polycystic kidney	2.2	1.3
Hypertension	1.1	0.3
Renal vascular disease	0.9	0.1
Other	1.8	0.3
Not sent	1.4	0.2

[a] Appendix H ERA-EDTA coding
GN = glomerulonephritis
Excluded centres: ⩾40% primary renal diagnosis aetiology uncertain (Colchr), ⩾50% primary renal diagnosis not sent (L RFree)

patients (age <65 years) are more likely to have GN or pyelonephritis and less likely to have renal vascular disease or hypertension as the cause of their renal failure.

The male:female ratio was greater than unity for all primary renal diagnoses (table 2.11). The gender imbalance may be influenced by the presence of factors such as hypertension, atheroma and renal vascular disease, which are more common in males, more common with increasing age and which may increase the rate of progression of kidney disease.

In individuals aged less than 65 years, renal transplantation to dialysis ratio was greater than 1 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 PKD (table 2.12).

Diabetes

Diabetes included all prevalent patients with type 1 or type 2 diabetes as 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 7% to 7,798 in 2011, from 7,282 in 2010, representing 14.7% of all prevalent patients (compared with 13.5% in 2006) (table 2.13). The median age at start of RRT for patients with diabetes (56 years) was 9 years higher compared with patients without diabetes (47 years), although the median age at the end of 2011 for prevalent diabetic patients was only 3.5 years higher than for individuals without diabetes. This reflects

Table 2.13. Age relationships in diabetic and non-diabetic patients and modality in prevalent RRT patients on 31/12/2011

	Diabetic patients	Non-diabetic patients
Number	7,798	42,181
M:F ratio	1.60	1.54
Median age on 31/12/2011	61	58
Median age at start of RRT	56	47
Median years on RRT	3.4	6.5
% HD	61	40
% PD	9	7
% transplant	30	53

Excluded centres: ⩾40% primary renal diagnosis aetiology uncertain (Colchr), ⩾50% primary renal diagnosis not sent (L RFree)
Diabetic patients: patients with a primary renal disease code of diabetes
Non-diabetic patients: all patients excluding diabetic patients and patients with a missing primary renal disease code
Median age at start of RRT was calculated from the most recent RRT start date
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
Patients without a treatment modality code were excluded from calculating the % per treatment modality

reduced survival for patients with diabetes compared with patients without diabetes on RRT. Median time on RRT for patients with diabetes was less when compared with patients without diabetes (3.4 years vs. 6.5 years) and this difference in survival between diabetic patients and non-diabetic patients has not changed over the last 5 years. Patients with diabetes starting RRT in Scotland were 3 years younger and in Northern Ireland 3 years older compared with the UK average age of patients with diabetes starting RRT (data not shown).

Diabetes as the primary renal diagnosis also influenced the modality distribution. The predominant mode of treatment for patients with diabetes was HD (61%) compared with 40% in individuals who had a different 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 (30% vs. 53%). However, the proportion of patients with diabetes as PRD with a functioning transplant has increased since 2004 when only 26% of patients with diabetes had a functioning transplant. For older patients with diabetes (age ⩾65 years), 9.0% had a functioning transplant compared with 28.8% of their peers without diabetes (table 2.14). In Northern Ireland, 23.4% of prevalent patients with diabetes had a functioning transplant compared with the UK average of 30.2%

Table 2.14. Treatment modalities by age and diabetes status in UK countries on 31/12/2011

	<65 years		⩾65 years	
	Diabetes	Non-diabetic	Diabetes	Non-diabetic
Number	4,731	27,621	3,067	14,560
% HD	47.9	28.4	81.1	62.2
% PD	8.1	5.7	9.9	9.0
% transplant	44.0	65.9	9.0	28.8

Excluded centres: ⩾40% primary renal diagnosis aetiology uncertain (Colchr), ⩾50% primary renal diagnosis not sent (L RFree)
Diabetic patients: patients with a primary renal disease code of diabetes
Non-diabetic patients: all patients excluding diabetic patients and patients with a missing primary renal disease code
Excludes all patients without a treatment modality code

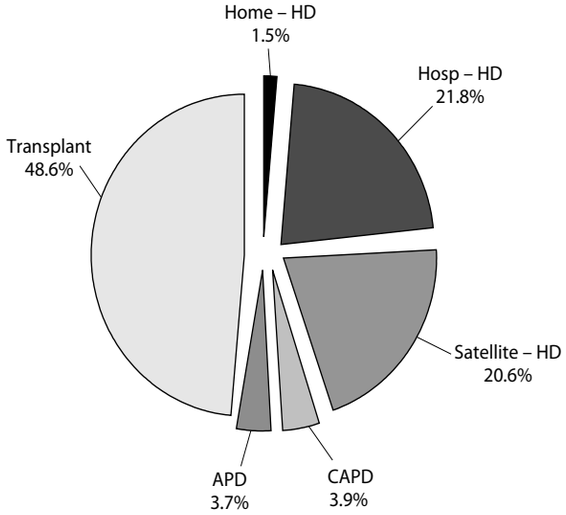

Fig. 2.6. Treatment modality in prevalent RRT patients on 31/12/2011

although on average the Northern Ireland patients with diabetes were older by three years (data not shown). A higher proportion of prevalent patients without diabetes (18.0%) were on home dialysis therapies (home HD and PD) compared with prevalent patients with diabetes (14.0%).

Modalities of treatment

Transplantation was the most common treatment modality (48.6%) for prevalent RRT patients in 2011, followed closely by centre-based HD (42.4%) in either hospital centre (21.8%) or satellite unit (20.6%) (figure 2.6). Home therapies made up the remaining 9.1% of treatment therapies, largely PD in its different formats (7.6%) which was similar to 2010. The proportion on continuous ambulatory peritoneal dialysis (CAPD) and automated PD (APD) was 3.9% and 3.7% respectively, though the proportion on APD may be an under-estimate due to centre level coding issues which mean the UKRR cannot always distinguish between these therapies. The term CAPD has been used for patients receiving non-disconnect as well as disconnect CAPD systems, because the proportion of patients using non-disconnect systems was very small.

As mentioned earlier, treatment modality was related to patient age. Younger patients (age <65 years), were more likely to have a functioning transplant (62.7%) when compared with patients aged over 65 years (25.0%) (table 2.15). HD was the principal modality in the older patients (65.7%). In the elderly using the proportion of renal replacement therapy patients transplanted can be misleading as this depends on approaches to dialysis and conservative care in this age group.

Figure 2.7 shows the association between age and RRT modality. Beyond 54 years of age, transplant prevalence declined, whilst HD prevalence increased. The proportion of each age group treated by PD remained more stable across the age spectrum.

The proportion of prevalent dialysis patients receiving HD, ranged from 64.9% in Derby to 100% in Colchester (table 2.16).

Table 2.15. Percentage of prevalent RRT patients by dialysis and transplant modality by centre on 31/12/2011

	<65 years				⩾65 years			
Country	N	% HD	% PD	% transplant	N	% HD	% PD	% transplant
England	28,854	31.3	6.2	62.5	15,789	65.5	9.4	25.1
N Ireland	941	32.7	4.8	62.5	569	73.3	5.8	20.9
Scotland	2,952	32.6	4.9	62.6	1,372	66.8	7.7	25.5
Wales	1,675	27.0	6.4	66.5	1,002	63.8	10.1	26.1
UK	**34,422**	**31.2**	**6.1**	**62.7**	**18,732**	**65.7**	**9.2**	**25.0**

All patients without a treatment modality code were excluded

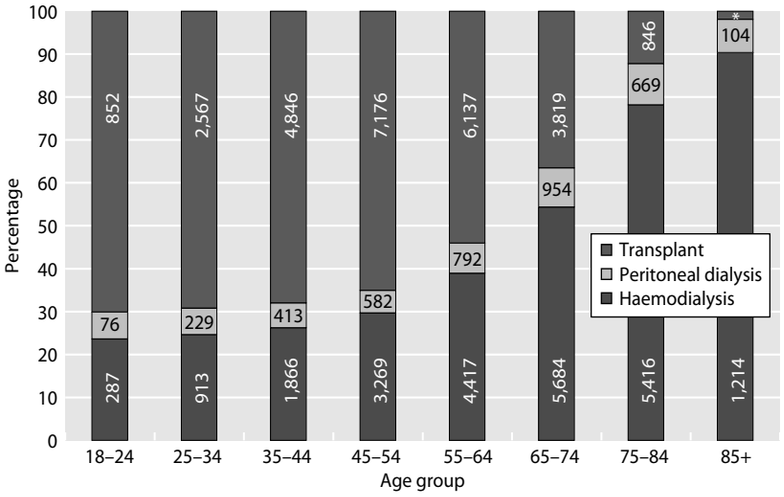

Fig. 2.7. Treatment modality distribution by age in prevalent RRT patients on 31/12/2011

Overall, the proportion of dialysis patients treated in a satellite haemodialysis unit has increased to 41.5% this year compared to 39.9% in 2010, and 36% in 2009. Although there are satellite units in Scotland, the data provided for 2011 did not distinguish between main centre and satellite unit haemodialysis. In 2011, the number of centres that had more than 50% of their haemodialysis activity taking place in satellite units was 25, a slight decline from 2010 (table 2.16 and figure 2.8). There was also wide variation between centres in the proportion of dialysis patients on APD treatment, ranging from 0% to 21.4% (table 2.16). Ten of the 70 centres with a PD programme had no patients on APD, whilst in four Northern Ireland centres almost all PD patients were on this form of the modality.

Home haemodialysis

The use of home HD as a RRT peaked in 1982 when almost 2,200 patients were estimated to be on this therapy, representing 61% of HD patients reported to the ERA-EDTA registry at that time. The fall in the use of this modality to just 445 patients (2.4% of HD patients) in 2006 was probably due to an increase in availability and uptake of renal transplantation, and also the similar expansion of hospital HD provision with the introduction of satellite units. In the last seven years there has been renewed interest in home HD and a target of 15% of HD patients on this modality has been suggested [5]. Equipment changes and patient choice has helped drive this change. Since 2006 there has been a gradual increase in the proportion of prevalent patients receiving haemodialysis in their own homes so that in 2011 it reached 3.9% of HD patients (n = 905, figure 2.2 and table 2.16). These numbers may be an under-estimate as some centres have been unable to submit data for patients coded as home HD and work is on-going to address this.

In 2011, the percentage of dialysis patients receiving home HD varied from 0% in 9 centres, to greater than 5% in 16 centres (table 2.16). In the UK, the overall prevalence of home haemodialysis has increased from 2.9% in 2010 to 3.4% in 2011.

The proportion of patients receiving home haemodialysis was greatest in Wales at 5.9%, compared with 3.7% in N.Ireland, 3.3% in England and 2.6% in Scotland (figure 2.8, table 2.16). These proportions are similar to 2010. Forty-three renal centres in England had an increase in the proportion of individuals on home haemodialysis compared with 2010.

In 2007, for comparison, the proportion of patients receiving home haemodialysis was 2% in each of the four UK countries.

Change in modality

The relative proportion of RRT modalities in prevalent patients has changed dramatically over the past decade. The main features are depicted in figure 2.9, which describes a sustained decrease in the proportion of patients treated by PD after 2000. Possible explanations for this change include recently published evidence indicating that the equivalent survival demonstrated between HD and PD was only maintained for the first 2–3 years [6] and recent concerns regarding the risk of encapsulating peritoneal sclerosis which might result in patients being switched from PD to HD after a fixed time interval. Analysis of UKRR data has not supported this explanation however as the vintage of PD patients has not changed substantially over the last 8 years. The

Table 2.16. Percentage of prevalent dialysis patients by dialysis modality by centre on 31/12/2011

		Haemodialysis				Peritoneal dialysis	
Centre	N	Total	Home	Hospital	Satellite	CAPD	APD
England							
B Heart	492	90.6	4.7	78.9	7.1	6.3	3.1
B QEH	1,061	84.3	4.4	10.7	69.2	8.0	7.7
Basldn	181	85.6	0.0	85.1	0.6	6.1	8.3
Bradfd	228	86.0	0.0	71.9	14.0	1.3	12.7
Brightn	420	81.0	6.2	41.0	33.8	9.1	10.0
Bristol	540	87.8	6.3	14.4	67.0	6.1	6.1
Camb	412	90.1	2.7	38.4	49.0	0.0	0.5
Carlis	90	73.3	0.0	54.4	18.9	14.4	12.2
Carsh	856	88.0	1.8	31.0	55.3	3.2	8.9
Chelms	145	82.1	0.0	82.1	0.0	9.7	7.6
Colchr	120	100.0	0.0	100.0	0.0	0.0	0.0
Covnt	452	80.1	3.1	77.0	0.0	19.9	0.0
Derby[a]	319	64.9	5.6	59.3	0.0	26.7	8.5
Donc	188	86.2	0.5	47.9	37.8	0.5	13.3
Dorset	292	81.9	0.7	20.6	60.6	5.8	12.0
Dudley	199	73.4	2.0	48.2	23.1	16.6	10.1
Exeter	454	82.8	0.7	9.3	72.9	8.6	8.6
Glouc	233	83.3	0.4	82.8	0.0	4.3	12.5
Hull	412	78.4	1.9	35.9	40.5	8.5	13.1
Ipswi	156	80.1	3.2	65.4	11.5	10.9	9.0
Kent	444	84.7	4.3	31.1	49.3	15.3	0.0
L Barts	1,070	84.0	1.1	32.4	50.5	6.4	9.6
L Guys	640	94.9	5.8	24.4	64.7	2.3	2.8
L Kings	557	84.0	1.1	19.4	63.6	5.9	10.1
L Rfree	805	88.3	1.7	2.6	84.0	2.7	8.9
L St.G	349	84.2	1.7	41.6	41.0	3.7	11.8
L West	1,447	97.6	0.8	24.3	72.4	1.2	1.2
Leeds	605	84.8	2.0	19.2	63.6	4.1	11.1
Leic	1,013	84.3	3.9	17.3	63.2	5.7	10.0
Liv Ain	194	92.3	2.6	17.5	72.2	1.0	6.7
Liv RI	455	83.7	5.7	37.1	40.9	7.5	8.8
M RI	572	84.1	11.5	31.1	41.4	3.3	12.6
Middlbr	333	94.6	3.6	32.1	58.9	5.1	0.3
Newc	313	84.7	6.4	78.3	0.0	2.9	12.5
Norwch	368	84.0	4.4	47.3	32.3	12.5	3.5
Nottm	494	81.4	6.3	38.7	36.4	9.7	8.9
Oxford	511	82.0	3.7	37.6	40.7	5.5	12.5
Plymth	179	73.7	2.8	71.0	0.0	21.2	4.5
Ports	619	84.7	0.7	21.2	62.8	15.4	0.0
Prestn	585	88.9	6.0	16.9	66.0	3.4	7.7
Redng	360	75.6	0.3	36.9	38.3	23.9	0.6
Salford	476	76.3	4.2	31.1	41.0	15.3	8.4
Sheff	653	90.5	6.6	36.6	47.3	9.5	0.0
Shrew	222	84.2	4.5	49.6	30.2	15.8	0.0
Stevng	442	93.2	5.0	48.2	40.1	6.8	0.0
Sthend	140	87.1	2.1	85.0	0.0	12.9	0.0
Stoke	400	79.5	3.8	54.5	21.3	4.3	16.3
Sund	195	91.3	1.0	67.2	23.1	4.6	4.1
Truro	178	85.4	0.6	49.4	35.4	4.5	10.1
Wirral	238	82.4	0.0	65.1	17.2	2.9	14.7
Wolve	378	81.2	2.7	23.0	55.6	18.8	0.0
York	169	85.2	4.1	53.3	27.8	14.8	0.0

Table 2.16. Continued

		Haemodialysis				Peritoneal dialysis	
Centre	N	Total	Home	Hospital	Satellite	CAPD	APD
N Ireland[b]							
Antrim	146	90.4	2.7	87.7	0.0	2.7	6.9
Belfast	258	88.4	5.8	82.6	0.0	1.2	10.1
Newry	123	90.2	2.4	87.8	0.0	0.0	9.8
Ulster	108	97.2	3.7	93.5	0.0	0.0	2.8
West NI	168	88.7	2.4	86.3	0.0	0.6	10.7
Scotland[c]							
Abrdn	237	90.3	1.7	88.6	0.0	4.6	5.1
Airdrie	183	94.5	0.0	94.5	0.0	1.6	3.8
D & Gall	63	77.8	1.6	76.2	0.0	6.4	15.9
Dundee	205	89.3	0.0	89.3	0.0	2.0	8.8
Dunfn	174	83.9	0.0	83.9	0.0	0.0	16.1
Edinb	301	86.7	2.0	84.7	0.0	4.0	9.3
Glasgw	671	92.7	4.9	87.8	0.0	2.1	5.2
Inverns	101	82.2	5.0	77.2	0.0	6.9	10.9
Klmarnk	192	76.6	3.7	72.9	0.0	2.1	21.4
Wales							
Bangor	109	80.7	11.9	52.3	16.5	5.5	13.8
Cardff	597	82.9	5.4	16.8	60.8	12.4	4.7
Clwyd[d]	71	88.7	5.6	83.1	0.0	9.9	1.4
Swanse	416	86.1	6.5	50.0	29.6	10.6	3.4
Wrexm	108	81.5	0.9	75.9	4.6	18.5	0.0
England	**22,654**	**85.5**	**3.3**	**35.2**	**47.0**	**7.5**	**6.8**
N Ireland[b]	**803**	**90.3**	**3.7**	**86.6**	**0.0**	**1.0**	**8.6**
Scotland[c]	**2,127**	**88.3**	**2.6**	**85.7**	**0.0**	**2.8**	**8.9**
Wales	**1,301**	**83.9**	**5.9**	**38.9**	**39.1**	**11.6**	**4.5**
UK	**26,885**	**85.8**	**3.4**	**40.9**	**41.5**	**7.1**	**6.9**

[a] In 2010 it was reported that Derby had a home haemodialysis prevalence of 14.3%. This was inaccurate due to a data error. The actual prevalence was 2.8%
[b] There are no satellite centres in Northern Ireland
[c] All haemodialysis patients in Scotland are shown as receiving treatment at home or in centre as no data is available regarding satellite dialysis
[d] 13 HD and 12 PD patients from Clwyd were not included in this analysis

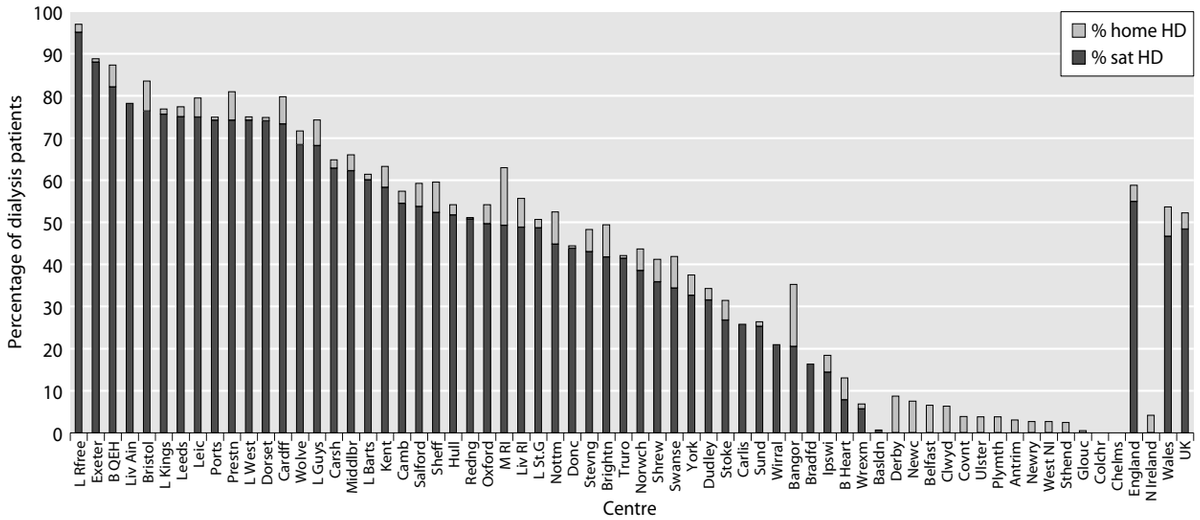

Fig. 2.8. Percentage of prevalent haemodialysis patients treated with satellite or home haemodialysis by centre on 31/12/2011
* Scottish centres excluded as information on satellite HD was not available. No centres in Northern Ireland have satellite dialysis units

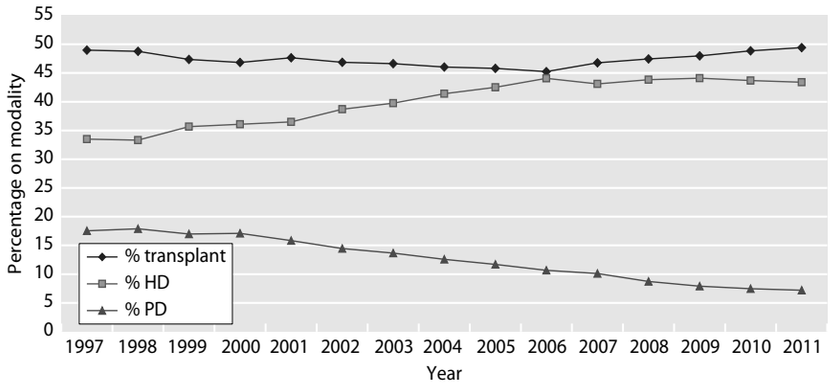

Fig. 2.9. Modality changes in prevalent RRT patients from 1997–2011

reduction in prevalent PD patients can be explained due to a decrease in the number of new patients who were started on peritoneal dialysis in 2010 and 2011 and also to the declining proportion of patients starting RRT on peritoneal dialysis since 2001. The determinants of this pattern may be multi-factorial and include: an increase in HD capacity with the proliferation of satellite units (figure 2.10), the effect of patient or physician choice regarding the treatment modality at start of RRT, the general health and fitness of patients starting RRT, some of whom may be deemed less capable of undertaking PD independently, and the rise in the number of patients receiving a live related transplant who may otherwise have gone onto PD. With the advent of assisted PD (more commonly used in France) [7] in conjunction with the increasing age of PD patients, there may be potential for some reversal or slowing in this decline. The proposed introduction of dialysis tariffs in England may well result in further changes to the types of treatment patients receive in England.

The proportion of patients treated with HD has plateaued in the last three years. The proportion of patients with a functioning transplant had been on a slight downward trend but this has reversed since 2007, probably due to continued increases in living organ and non-heart beating donation [8].

Figure 2.10 depicts in more detail the modality changes in the prevalent dialysis population during this time and highlights a sustained reduction in the proportion of patients treated by CAPD. There was a sustained increase in the proportion of prevalent HD patients treated at satellite units with a steady decline in hospital centre haemodialysis since 2004.

International comparisons

For international comparisons 2010 prevalence rates are given as 2011 data were not available from the other

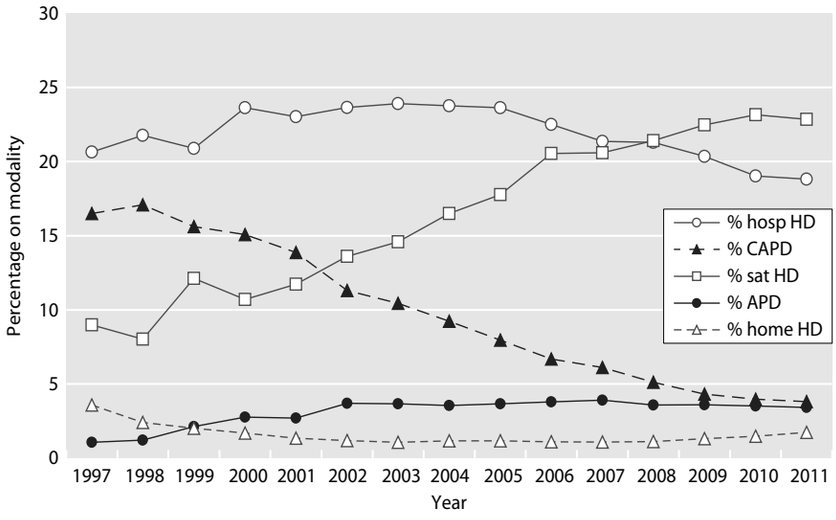

Fig. 2.10. Detailed dialysis modality changes in prevalent RRT patients from 1997–2011
* Scottish centres excluded as information on satellite HD was not available

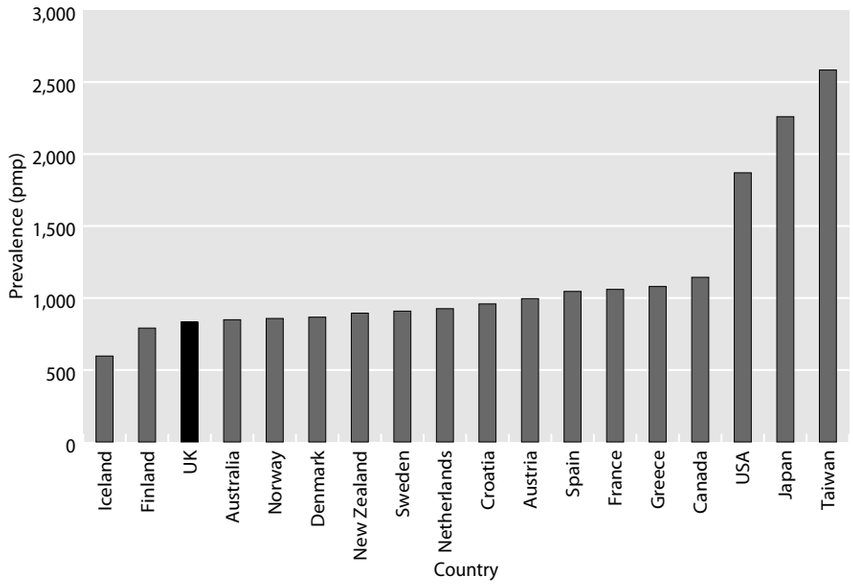

Fig. 2.11. RRT prevalence rates (pmp) by country in 2010
Non UK data from USRDS

countries. Prevalence rates in the UK were similar to those in most other Northern European countries but lower than in Southern Europe and Belgium and far lower than in the USA (figure 2.11). This will in part reflect differences in incidence rates and also conservative management practices between countries in addition to other individual level and health care system differences.

Summary

There continues to be growth across the UK in prevalent patients on RRT with regional and centre level variation. There was no real difference in prevalence rates between the four nations of the UK once adjusted for background population characteristics. In general, areas with large ethnic minority populations had higher standardised prevalence ratios. There were increasing numbers of patients on HD and those with a functioning transplant and falling numbers on PD. The prevalence rate in the over 80 year olds has doubled since 2005. There have been substantial increases in home HD use in some areas although several centres are still unable to offer this modality.

Conflicts of interest: none

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UK Renal Registry 15th Annual Report: Chapter 3 Demographic and Biochemistry Profile of Kidney Transplant Recipients in the UK in 2011: national and centre-specific analyses

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

Summary

- There was a small increase in overall renal transplant numbers in 2011, with a continuing rise in kidney donation from donors after circulatory death (8%) and a slight fall in kidney donation from brainstem death donors.
- In 2011, death-censored renal transplant failure rates in prevalent patients were similar to previous years at 2.2% 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 49.0 and 51.7 years respectively.
- The median eGFR of prevalent renal transplant recipients was 51.3 ml/min/1.73 m^2.
- The median eGFR of patients one year post transplantation was 55.9 ml/min/1.73 m^2 post live transplant, 51.8 ml/min/1.73 m^2 post brainstem death transplant and 49.4 ml/min/1.73 m^2 post circulatory death transplantation.
- 13.6% 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 -0.49 ml/min/1.73 m^2/year.
- In 2011, infection (23%), malignancy (21%), and cardiac disease (16%) remained amongst the commonest causes of death in patients with a functioning renal transplant.

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) causes of death in transplant recipients. Methodology, results and conclusions of these analyses are discussed in detail for all six sections separately.

The UK Renal Registry 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 2011.

Transplant activity, waiting list activity and survival data

Introduction

NHSBT prospectively collects donor and recipient data around the episode of transplantation. They also request 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 2011, there were 23 UK adult renal transplant centres, 19 in England, 2 in Scotland and 1 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 2011, 2,752 kidney or kidney plus other organ transplants were performed. The absolute number of living kidney donors showed little change in 2011 representing 37.3% of all transplants performed whilst donor after circulatory death transplants continued to increase and comprised 21.6% of all kidney transplants performed. The rise in numbers of transplants from donors after brainstem death noted in 2010 was reversed in 2011, showing a 4% decline (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).

Table 3.1. Kidney and kidney plus other organ transplant numbers in the UK, 1/1/2009–31/12/2011

Organ	2009	2010	2011	% change 2010–2011
Donor after brainstem death[a]	944	989	951	−4
Donor after circulatory death[b]	496	549	594	8
Living donor kidney	983	1,027	1,026	0
Kidney and liver	15	9	16	78
Kidney and heart	1	0	0	
Kidney and pancreas[c]	158	150	163	9
Small bowel (inc kidney)	3	1	2	100
Total kidney transplants	**2,600**	**2,725**	**2,752**	**1**

[a] Includes en bloc kidney transplants (3 in 2009, 7 in 2010, 7 in 2011) and double kidney transplants (6 in 2009, 6 in 2010, 5 in 2011)
[b] Includes en bloc kidney transplants (1 in 2009, 2 in 2010, 2 in 2011) and double kidney transplants (4 in 2009, 16 in 2010, 32 in 2011)
[c] Includes donor after circulatory death transplants (19 in 2009, 29 in 2010, 28 in 2011)

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	88	96	82	89	95	98	85	97
Belfast	92	96	88	92	94	100	97	93
Bristol	95	96	86	85	98	99	95	98
Camb	92	98	86	89	98	99	93	97
Cardff	94	98	86	88	94	98	86	97
Covnt	95	96	89	92	95	100	86	96
Edin	88	94	82	83	95	98	92	96
Glasgw	94	96	84	82	96	96	96	100
L Barts	92	93	86	91	97	98	86	94
L Guys	93	95	82	89	96	98	93	95
L Rfree	95	96	87	93	98	100	93	93
L St.G	94	98	86	92	100	100	89	97
L West	95	98	89	92	96	99	88	96
Leeds	94	96	85	89	96	100	91	97
Leic	91	89	84	83	95	97	92	93
Liv RI	91	97	80	94	95	100	88	92
M RI	95	95	85	88	98	98	92	97
Newc	93	94	83	86	98	99	92	95
Nottm	91	94	78	85	95	97	92	96
Oxford	95	97	89	86	97	96	96	95
Plymth	90	96	86	90	95	99	90	93
Ports	95	94	80	88	94	98	84	91
Sheff	90	99	81	92	100	100	88	100
All centres	**93**	**96**	**84**	**88**	**97**	**99**	**91**	**96**

* 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.organdonation.nhs.uk/ukt/statistics/statistics.asp)
Cohorts for survival rate estimation: 1 year survival: 1/1/2006–31/12/2010; 5 year survival: 1/1/2002–31/12/2006; 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

Using data from the UKRR on prevalent renal-only transplant patients on 1st January 2011, the death rate during 2011 was 2.2/100 patient years (CI 2.0–2.4) when censored for return to dialysis and 2.3/100 patient years (CI 2.2–2.5) without censoring for dialysis. These death rates are similar to those observed over the last few years.

During 2011, 2.2% of prevalent transplant patients experienced graft failure (excluding death as a cause of graft failure). This is the second consecutive year when graft failure rates have fallen. Whilst it might be premature to assume that graft failure rates are falling in the UK the 0.5% fall noted in the last 5 years is certainly encouraging.

Conclusions

In 2011, the increased number of kidney transplants performed was mostly due to the growing use of organs from donors after circulatory death. Graft failure rates have fallen for the second consecutive year to 2.2% per annum whilst the patient death rate of 2.3 per 100 patient years was similar to recent years.

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. Hope Hospital has been renamed Salford Royal and so is now abbreviated in the report as 'Salford' rather than as 'M Hope' and 'Tyrone' and 'Derry' are now grouped together as 'West NI'.

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 attributed to the referring centre. This process may result in some discrepancies in transplant numbers particularly in Oxford/Reading and Clywd/Liverpool RI.

Methods

Three centres (Bangor, Colchester and Liverpool Aintree) did not have any transplant patients and were excluded from some of the analyses. Their dialysis patients were included in the relevant dialysis population denominators. Wirral which previously was also excluded having not had any registered transplant patients has been included in this year's report having taken on transplant patients in 2011. The nine Scottish centres only submit limited laboratory data to the UKRR and were not included in the analyses on post-transplant outcomes.

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). This year, individuals with a primary renal diagnosis (PRD) 'glomerulonephritis biopsy unproven' were grouped within the 'glomerulonephritis' PRD group, rather than within 'uncertain' (as has been the case in previous reports) to reflect better coding and bringing the registry in line with coding methodology adopted in other renal registries.

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 2011. The prevalence of transplant patients in areas covered by individual primary care trusts (PCT) or Health Boards/Social Care Areas (HB) was estimated based on the post code 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 http://www.renalreg.com. The UKRR requires a standard set of data items regarding comorbid conditions at the time of commencement of renal replacement therapy and first registration of the patient with the UKRR.

Results and discussion

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

The prevalence of renal transplant recipients in each PCT/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 geographical differences in access to renal transplantation in the UK which is examined in greater detail in chapter 9 Access to Transplantation.

The proportion of prevalent RRT patients with a transplant relative to the number on dialysis has been relatively stable 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 had increased to 26,297 patients at the end of 2011. 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.

Table 3.3. The prevalence per million population (pmp) of renal transplants in adults in the UK on 31/12/2011

	England	N Ireland	Scotland	Wales	UK
All UK centres	22,011	707	2,197	1,382	26,297
Total population, mid-2011 estimates from ONS* (millions)	53.0	1.8	5.3	3.1	63.2
Prevalence pmp transplant	415	390	415	451	416

* Office of National Statistics, UK

Table 3.4. The prevalence per million population (pmp) of patients with a renal transplant and standardised rate ratio in the UK, as on 31st December 2007–2011

[a] PCT/HB = Primary Care Trust (England); Health and Social Care Trust Areas (Northern Ireland); Health Board (Scotland) and Local Health Board (Wales)
[b] Population numbers based on the 2010 mid-year estimates by age group and gender (data obtained from the Office of National Statistics)
[c] O/E = age and gender standardised acceptance rate ratio
PCTs with significantly high average rate ratios are bold in greyed areas
PCTs with significantly low average rate ratios are italicised in greyed areas
Blank cells = no data returned to the UKRR for that year
LCL = lower 95% confidence limit
UCL = upper 95% confidence limit

UK Area	PCT/HB[a]	Population covered[b]	Rate pmp					Age and gender standardised rate ratio 2011		
			2007	2008	2009	2010	2011	O/E[c]	LCL	UCL
North East	County Durham	510,800	378	390	397	413	431	0.99	0.86	1.12
	Darlington	100,600	358	378	338	368	417	0.97	0.72	1.31
	Gateshead	192,000	380	391	406	411	432	1.00	0.81	1.24
	Hartlepool	91,400	394	361	350	394	405	0.96	0.69	1.32
	Middlesbrough	**142,100**	**380**	**415**	**450**	**457**	**514**	**1.29**	**1.03**	**1.62**
	Newcastle	292,200	359	359	366	366	387	1.02	0.84	1.22
	North Tyneside	**198,400**	**484**	**494**	**514**	**565**	**590**	**1.35**	**1.13**	**1.62**
	Northumberland	312,100	401	407	407	391	442	0.96	0.81	1.13
	Redcar and Cleveland	**137,300**	**495**	**524**	**539**	**546**	**554**	**1.26**	**1.01**	**1.58**
	South Tyneside	154,100	422	422	428	415	461	1.07	0.85	1.35
	Stockton-on-Tees Teaching	192,600	337	384	400	395	384	0.90	0.72	1.14
	Sunderland Teaching	283,400	399	409	399	413	455	1.06	0.89	1.26
North West	Ashton, Leigh and Wigan	307,200	348	361	342	394	462	1.06	0.90	1.25
	Blackburn with Darwen Teaching	140,000	314	321	329	329	371	0.96	0.73	1.26
	Blackpool	140,200	285	335	342	342	342	0.79	0.60	1.05
	Bolton Teaching	**266,500**	**390**	**432**	**439**	**454**	**507**	**1.22**	**1.03**	**1.45**
	Bury	183,500	360	349	409	409	420	0.99	0.79	1.24
	Central and Eastern Cheshire	*457,200*	*302*	*304*	*306*	*341*	*361*	*0.81*	*0.69*	*0.94*
	Central Lancashire	459,200	296	318	329	359	388	0.90	0.78	1.04
	Cumbria Teaching	*494,400*	*316*	*332*	*372*	*394*	*394*	*0.86*	*0.75*	*0.99*
	East Lancashire Teaching	381,200	399	412	409	407	438	1.03	0.88	1.20
	Halton and St Helens	296,700	283	310	327	361	381	0.88	0.73	1.06
	Heywood, Middleton and Rochdale	205,000	390	405	420	429	468	1.14	0.93	1.39
	Knowsley	149,200	308	315	342	355	342	0.83	0.63	1.09
	Liverpool	445,300	310	332	350	375	409	1.03	0.89	1.19
	Manchester Teaching	498,800	233	247	249	297	333	0.95	0.81	1.10
	North Lancashire Teaching	*329,100*	*319*	*313*	*310*	*304*	*310*	*0.71*	*0.59*	*0.86*
	Oldham	219,600	351	369	387	410	414	1.02	0.83	1.25
	Salford	229,100	266	306	327	362	388	0.97	0.79	1.20
	Sefton	272,800	323	301	319	356	363	0.83	0.68	1.01
	Stockport	284,700	330	351	376	400	418	0.96	0.80	1.15
	Tameside and Glossop	250,700	415	415	423	459	503	1.18	0.99	1.40
	Trafford	217,100	290	309	299	336	359	0.85	0.68	1.06
	Warrington	199,100	387	387	417	387	402	0.92	0.74	1.14
	Western Cheshire	234,300	333	324	367	393	410	0.94	0.77	1.14
	Wirral	*308,800*	*298*	*324*	*340*	*350*	*353*	*0.83*	*0.68*	*1.00*
Yorkshire and the Humber	Barnsley	227,500	347	374	378	400	413	0.95	0.77	1.16
	Bradford and Airedale Teaching	**512,700**	**363**	**392**	**419**	**447**	**453**	**1.18**	**1.04**	**1.34**
	Calderdale	**202,800**	**414**	**454**	**464**	**498**	**533**	**1.24**	**1.03**	**1.50**
	Doncaster	290,900	313	333	358	364	395	0.92	0.77	1.10
	East Riding of Yorkshire	*338,500*	*301*	*331*	*357*	*369*	*381*	*0.83*	*0.70*	*0.99*
	Hull Teaching	263,800	322	341	364	371	394	0.98	0.81	1.19

Table 3.4. Continued

UK Area	PCT/HB[a]	Population covered[b]	Rate pmp					Age and gender standardised rate ratio 2011		
			2007	2008	2009	2010	2011	O/E[c]	LCL	UCL
Yorkshire and the Humber	Kirklees	409,900	403	403	415	432	456	1.11	0.96	1.28
	Leeds	798,700	287	300	318	344	369	0.95	0.85	1.07
	North East Lincolnshire	158,800	283	321	346	365	403	0.95	0.74	1.21
	North Lincolnshire	*157,500*	*273*	*279*	*260*	*267*	*273*	*0.61*	*0.46*	*0.83*
	North Yorkshire and York	802,100	322	363	385	403	423	0.96	0.87	1.07
	Rotherham	254,300	326	362	381	421	456	1.06	0.88	1.27
	Sheffield	555,700	266	299	319	355	378	0.95	0.83	1.09
	Wakefield District	325,500	304	323	320	353	372	0.85	0.71	1.02
East Midlands	*Bassetlaw*	*112,100*	*294*	*294*	*285*	*312*	*303*	*0.67*	*0.48*	*0.94*
	Derby City	247,100	239	259	308	364	393	0.99	0.81	1.20
	Derbyshire County	*729,900*	*281*	*296*	*300*	*319*	*353*	*0.79*	*0.70*	*0.89*
	Leicester City	**306,800**	**469**	**495**	**567**	**567**	**610**	**1.63**	**1.42**	**1.89**
	Leicestershire County and Rutland	687,200	354	386	391	418	435	1.00	0.89	1.12
	Lincolnshire Teaching	*705,000*	*278*	*292*	*296*	*312*	*333*	*0.75*	*0.66*	*0.85*
	Northamptonshire Teaching	687,600	305	352	368	394	414	0.97	0.86	1.08
	Nottingham City	306,300	232	235	248	323	340	0.95	0.78	1.15
	Nottinghamshire County Teaching	668,000	314	328	347	391	424	0.96	0.86	1.08
West Midlands	Birmingham East and North	409,300	327	352	366	381	408	1.08	0.93	1.26
	Coventry Teaching	315,700	323	348	361	383	409	1.06	0.89	1.26
	Dudley	*307,500*	*273*	*276*	*289*	*302*	*315*	*0.73*	*0.60*	*0.89*
	Heart of Birmingham Teaching	**285,100**	**372**	**396**	**400**	**414**	**414**	**1.25**	**1.05**	**1.50**
	Herefordshire	*179,400*	*290*	*284*	*307*	*307*	*318*	*0.69*	*0.54*	*0.90*
	North Staffordshire	211,900	316	335	359	363	387	0.87	0.70	1.08
	Sandwell	292,900	335	355	372	376	386	0.96	0.80	1.16
	Shropshire County	*293,400*	*293*	*307*	*348*	*358*	*372*	*0.82*	*0.68*	*0.99*
	Solihull	*206,300*	*291*	*301*	*305*	*310*	*330*	*0.77*	*0.60*	*0.97*
	South Birmingham	342,200	316	345	345	380	397	1.03	0.87	1.21
	South Staffordshire	*611,300*	*294*	*319*	*329*	*345*	*357*	*0.80*	*0.70*	*0.91*
	Stoke on Trent	248,000	319	359	387	419	415	1.00	0.82	1.21
	Telford and Wrekin	*162,400*	*216*	*246*	*289*	*302*	*308*	*0.73*	*0.55*	*0.96*
	Walsall Teaching	256,800	339	358	382	401	428	1.04	0.87	1.26
	Warwickshire	536,200	360	364	382	425	457	1.04	0.91	1.17
	Wolverhampton City	*239,300*	*272*	*288*	*309*	*309*	*305*	*0.75*	*0.60*	*0.95*
	Worcestershire	*557,300*	*280*	*291*	*316*	*341*	*350*	*0.78*	*0.68*	*0.90*
East of England	Bedfordshire	416,300	315	336	363	380	389	0.90	0.77	1.05
	Cambridgeshire	616,400	290	321	359	393	412	0.97	0.86	1.10
	Hertfordshire	1,107,500	276	331	351	395	415	0.99	0.90	1.08
	Great Yarmouth and Waveney	*214,700*	*163*	*224*	*284*	*303*	*317*	*0.72*	*0.57*	*0.91*
	Luton	198,900	342	357	367	402	458	1.21	0.98	1.48
	Mid Essex	374,500	296	318	360	379	425	0.97	0.83	1.13
	Norfolk	*764,800*	*306*	*310*	*329*	*339*	*350*	*0.80*	*0.71*	*0.90*
	North East Essex	329,500		285	307	325	355	0.84	0.70	1.00
	Peterborough	173,600	271	265	311	323	363	0.90	0.70	1.15
	South East Essex	*338,200*	*263*	*299*	*337*	*343*	*343*	*0.80*	*0.66*	*0.95*
	South West Essex	410,000	290	305	329	366	388	0.93	0.80	1.09
	Suffolk	*601,900*	*286*	*297*	*331*	*349*	*380*	*0.87*	*0.77*	*0.99*
	West Essex	286,400	276	279	328	360	367	0.85	0.71	1.04
London	Barking and Dagenham	179,700	262	273	339	362	428	1.19	0.95	1.48
	Barnet	**348,000**	**414**	**422**	**486**	**517**	**578**	**1.43**	**1.25**	**1.64**
	Bexley	**228,300**	**434**	**456**	**473**	**512**	**526**	**1.27**	**1.06**	**1.52**
	Brent Teaching	**256,300**	**476**	**648**	**706**	**741**	**757**	**1.90**	**1.65**	**2.19**

Table 3.4. Continued

UK Area	PCT/HB[a]	Population covered[b]	Rate pmp					Age and gender standardised rate ratio 2011		
			2007	2008	2009	2010	2011	O/E[c]	LCL	UCL
London	Bromley	312,400	416	435	448	483	493	1.17	1.00	1.37
	Camden	235,500	276	344	386	408	454	1.17	0.97	1.42
	City and Hackney Teaching	231,000	277	312	338	359	359	0.96	0.78	1.19
	Croydon	345,400	310	327	368	379	411	1.00	0.85	1.18
	Ealing	**318,300**	**437**	**566**	**587**	**631**	**653**	**1.62**	**1.41**	**1.85**
	Enfield	**295,000**	**414**	**461**	**468**	**505**	**573**	**1.43**	**1.23**	**1.66**
	Greenwich Teaching	**228,100**	**307**	**333**	**395**	**438**	**469**	**1.22**	**1.01**	**1.47**
	Hammersmith and Fulham	169,800	283	347	436	471	477	1.22	0.98	1.51
	Haringey Teaching	**225,100**	**360**	**413**	**466**	**511**	**555**	**1.40**	**1.17**	**1.66**
	Harrow	**230,300**	**456**	**595**	**664**	**725**	**738**	**1.79**	**1.54**	**2.08**
	Havering	*236,100*	*263*	*280*	*305*	*313*	*335*	*0.79*	*0.64*	*0.99*
	Hillingdon	**266,200**	**334**	**432**	**488**	**526**	**575**	**1.45**	**1.24**	**1.70**
	Hounslow	**236,700**	**342**	**444**	**515**	**566**	**575**	**1.43**	**1.21**	**1.69**
	Islington	**193,900**	**397**	**433**	**474**	**511**	**536**	**1.39**	**1.15**	**1.69**
	Kensington and Chelsea	169,500	277	342	360	431	448	1.06	0.85	1.33
	Kingston	169,000	349	373	391	396	414	1.03	0.81	1.30
	Lambeth	284,400	281	316	359	359	394	1.01	0.84	1.21
	Lewisham	266,400	402	398	420	439	458	1.15	0.96	1.37
	Newham	**240,200**	**287**	**316**	**387**	**441**	**466**	**1.31**	**1.09**	**1.58**
	Redbridge	**270,300**	**314**	**363**	**392**	**474**	**499**	**1.27**	**1.07**	**1.50**
	Richmond and Twickenham	190,800	204	257	294	309	341	0.80	0.63	1.02
	Southwark	**287,100**	**401**	**404**	**460**	**491**	**526**	**1.35**	**1.15**	**1.58**
	Sutton and Merton	403,000	362	375	409	427	442	1.08	0.93	1.25
	Tower Hamlets	238,100	235	231	265	315	323	0.92	0.74	1.15
	Waltham Forest	**227,400**	**378**	**405**	**431**	**475**	**510**	**1.32**	**1.10**	**1.59**
	Wandsworth	289,200	342	349	353	373	422	1.10	0.92	1.31
	Westminster	253,400	233	320	395	430	430	1.06	0.88	1.28
South East Coast	Brighton and Hove City	258,400	267	290	313	344	364	0.91	0.74	1.11
	East Sussex Downs and Weald	*336,100*	*271*	*301*	*318*	*327*	*342*	*0.78*	*0.65*	*0.93*
	Eastern and Coastal Kent	742,200	298	346	380	406	441	1.04	0.93	1.16
	Hastings and Rother	179,700	295	312	312	328	351	0.79	0.62	1.01
	Medway	256,600	316	378	413	417	429	1.02	0.85	1.24
	Surrey	1,114,400	337	354	371	386	391	0.91	0.83	1.00
	West Kent	685,100	343	371	401	404	410	0.95	0.85	1.07
	West Sussex	*800,000*	*318*	*338*	*345*	*364*	*381*	*0.88*	*0.78*	*0.98*
South Central	**Berkshire East**	**406,500**	**364**	**408**	**445**	**504**	**526**	**1.29**	**1.13**	**1.48**
	Berkshire West	**471,500**	**375**	**409**	**445**	**454**	**477**	**1.15**	**1.01**	**1.31**
	Buckinghamshire	512,100	414	420	426	453	467	1.08	0.96	1.23
	Hampshire	1,297,200	325	358	373	392	405	0.93	0.85	1.01
	Isle of Wight National Health Service	*140,200*	*257*	*307*	*321*	*335*	*335*	*0.74*	*0.55*	*0.98*
	Milton Keynes	247,000	312	332	352	393	429	1.03	0.85	1.24
	Oxfordshire	624,200	394	409	413	433	449	1.09	0.97	1.22
	Portsmouth City Teaching	207,200	333	362	362	405	401	1.05	0.85	1.30
	Southampton City	239,800	334	342	354	350	396	1.06	0.86	1.29
South West	*Bath and North East Somerset*	*179,800*	*284*	*289*	*323*	*311*	*306*	*0.75*	*0.58*	*0.98*
	Bournemouth and Poole Teaching	310,800	357	347	344	354	376	0.91	0.76	1.09
	Bristol	**441,100**	**385**	**419**	**431**	**460**	**472**	**1.23**	**1.07**	**1.41**
	Cornwall and Isles of Scilly	537,900	368	405	431	441	465	1.04	0.92	1.17
	Devon	749,700	328	351	384	400	403	0.90	0.81	1.01
	Dorset	404,900	403	427	437	454	452	1.00	0.86	1.16
	Gloucestershire	*593,600*	*322*	*334*	*335*	*345*	*382*	*0.88*	*0.77*	*1.00*

Table 3.4. Continued

UK Area	PCT/HB[a]	Population covered[b]	Rate pmp					Age and gender standardised rate ratio 2011		
			2007	2008	2009	2010	2011	O/E[c]	LCL	UCL
South West	North Somerset	212,100	344	368	391	415	424	0.96	0.78	1.18
	Plymouth Teaching	**258,900**	**417**	**463**	**498**	**506**	**537**	**1.35**	**1.14**	**1.59**
	Somerset	525,500	352	352	371	390	424	0.96	0.84	1.09
	South Gloucestershire	264,900	430	438	442	464	479	1.12	0.94	1.34
	Swindon	206,900	314	348	358	420	440	1.04	0.85	1.28
	Torbay	134,400	335	394	446	469	491	1.11	0.87	1.42
	Wiltshire	459,800	296	313	318	352	381	0.87	0.75	1.01
Wales	*Betsi Cadwaladr University*	*678,500*	*314*	*333*	*343*	*355*	*368*	*0.84*	*0.74*	*0.95*
	Powys Teaching	131,100	336	359	374	412	404	0.87	0.67	1.14
	Hywel Dda	374,800	358	382	398	398	424	0.96	0.82	1.12
	Abertawe Bro Morgannwg University	**504,800**	**428**	**442**	**468**	**501**	**563**	**1.32**	**1.17**	**1.48**
	Cwm Taf	**290,600**	**516**	**544**	**578**	**643**	**678**	**1.61**	**1.40**	**1.85**
	Aneurin Bevan	**561,300**	**433**	**451**	**472**	**515**	**534**	**1.25**	**1.12**	**1.40**
	Cardiff and Vale University	**466,100**	**390**	**408**	**414**	**446**	**478**	**1.22**	**1.07**	**1.39**
Scotland	Ayrshire & Arran	366,900	376	403	398	395	395	0.88	0.75	1.04
	Borders	113,000	310	363	372	434	434	0.94	0.71	1.24
	Dumfries and Galloway	148,100	344	371	392	392	412	0.89	0.69	1.14
	Fife	364,800	296	318	326	345	370	0.85	0.72	1.01
	Forth Valley	*293,100*	*297*	*307*	*304*	*324*	*348*	*0.80*	*0.66*	*0.97*
	Grampian	550,500	345	358	391	407	420	0.96	0.84	1.09
	Greater Glasgow & Clyde	**1,204,100**	**409**	**428**	**434**	**445**	**462**	**1.09**	**1.01**	**1.19**
	Highland	310,700	380	435	489	518	515	1.12	0.96	1.30
	Lanarkshire	562,700	370	389	411	423	448	1.04	0.92	1.17
	Lothian	*837,000*	*307*	*327*	*338*	*356*	*375*	*0.89*	*0.80*	*1.00*
	Orkney	19,800	455	556	455	404	404	0.86	0.43	1.73
	Shetland	22,500	267	222	267	267	222	0.49	0.21	1.19
	Tayside	402,400	417	432	430	432	440	1.02	0.88	1.18
	Western Isles	26,500	302	302	302	302	302	0.65	0.33	1.30
Northern Ireland	Belfast	335,700	375	378	399	441	450	1.15	0.98	1.35
	Northern	458,600	325	347	360	375	392	0.95	0.82	1.10
	Southern	357,700	296	296	299	319	358	0.91	0.77	1.09
	South Eastern	347,100	340	354	363	366	398	0.95	0.81	1.13
	Western	299,900	293	303	320	340	357	0.89	0.74	1.08

Primary renal diagnosis

The overall proportion of patients with a PRD of glomerulonephritis was slightly higher than that reported in previous reports as a consequence of reclassifying 'glomerulonephritis biopsy unproven' this year (as discussed in methods). This change in methodology notwithstanding 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 2006 and 2010 provided in this year's chapter are different from those in last year's chapter [2]; this reflects retrospective input of ethnicity data, improving data completeness.

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

Table 3.5. Distribution of prevalent patients on RRT by centre and modality on 31/12/2011

Centre	Total	% HD	% PD	% Transplant
Transplant centres				
B QEH	1,923	46	9	45
Belfast	686	33	4	62
Bristol	1,311	36	5	59
Camb	1,086	34	4	62
Cardff	1,536	32	7	61
Covnt	886	41	10	49
Edin	700	37	6	57
Glasgw	1,477	42	3	55
L Barts	1,900	47	9	44
L Guys	1,680	36	2	62
L Rfree	1,773	40	5	55
L St.G	719	41	8	51
L West	3,022	47	1	52
Leeds	1,420	36	6	57
Leic	1,926	44	8	47
Liv RI	1,251	30	6	64
M RI	1,635	29	6	65
Newc	916	29	5	66
Nottm	1,019	39	9	52
Oxford	1,444	29	6	65
Plymth	465	28	10	62
Ports	1,394	38	7	56
Sheff	1,260	47	5	48
Dialysis centres				
Abrdn	479	45	5	51
Airdrie	344	50	3	47
Antrim	224	59	6	35
B Heart	666	67	7	26
Bangor	109	81	19	
Basldn	238	65	11	24
Bradfd	472	42	7	52
Brightn	777	44	10	46
Carlis	219	30	11	59
Carsh	1,410	53	7	39
Chelms	216	55	12	33
Clwyd	167	46	12	43
Colchr	120	100		
D & Gall	122	40	11	48
Derby	466	44	24	32
Donc	248	65	10	24
Dorset	587	41	9	50
Dudley	287	51	18	31
Dundee	400	46	6	49
Dunfn	278	53	10	37
Exeter	813	46	10	44
Glouc	390	50	10	40
Hull	764	42	12	46
Inverns	224	37	8	55
Ipswi	340	37	9	54
Kent	865	43	8	49
Klmarnk	300	49	15	36
L Kings	882	53	10	37
Liv Ain	194	92	8	
Middlbr	753	42	2	56
Newry	191	58	6	36

Table 3.5. Continued

Centre	Total	% HD	% PD	% Transplant
Norwch	612	50	10	40
Prestn	1,023	51	6	43
Redng	688	40	13	48
Salford	846	43	13	44
Shrew	342	55	10	35
Stevng	638	65	5	31
Sthend	214	57	8	35
Stoke	695	46	12	42
Sund	390	46	4	50
Swanse	659	54	9	37
Truro	357	43	7	50
Ulster	137	77	2	21
West NI	272	55	7	38
Wirral	241	81	17	1
Wolve	516	60	14	27
Wrexm	237	37	8	54
York	366	39	7	54
England	44,665	43	7	49
N Ireland	1,510	48	5	47
Scotland	4,324	43	6	51
Wales	2,708	41	8	51
UK	53,207	43	7	49

Table 3.6. Median age and gender ratio of incident and prevalent transplant patients 2006–2011

	Incident transplants			Prevalent transplants*		
Year	N	Median age	M:F ratio	N	Median age	M:F ratio
2006	1,955	45.2	1.6	17,709	49.9	1.5
2007	2,118	45.6	1.6	20,793	50.2	1.5
2008	2,337	46.4	1.5	22,281	50.4	1.5
2009	2,481	48.4	1.6	23,534	50.7	1.5
2010	2,578	49.6	1.7	24,934	51.2	1.5
2011	2,549	49.0	1.7	26,269	51.7	1.6

* As on 31st December for given year

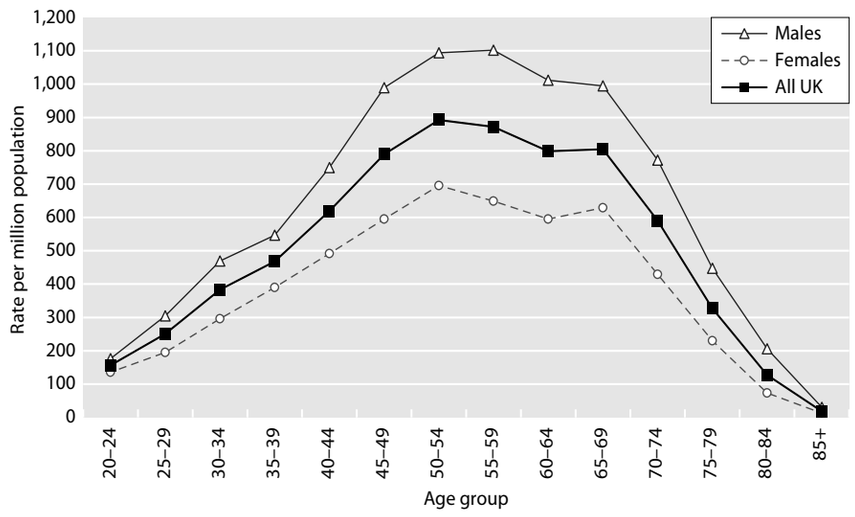

Fig. 3.1. Transplant prevalence rate per million population by age and gender on 31/12/2011

Table 3.7. Primary renal diagnosis in renal transplant recipients 2006–2011

	New transplants by year							Established transplants on 01/01/2011	
	2006	2007	2008	2009	2010	2011			
Primary diagnosis	%	%	%	%	%	%	N	%	N
Aetiology uncertain	14.4	14.0	13.2	13.6	13.5	14.1	329	16.3	3,921
Diabetes	13.2	14.4	12.8	12.5	11.7	11.9	277	9.2	2,205
Glomerulonephritis	22.0	23.6	22.5	23.7	19.9	23.0	537	23.6	5,670
Polycystic kidney disease	12.8	13.6	13.7	13.5	13.5	12.2	284	12.8	3,083
Pyelonephritis	12.6	12.0	12.2	11.4	9.4	10.4	243	14.4	3,456
Reno-vascular disease	6.1	5.4	7.0	6.2	6.7	6.5	151	5.7	1,381
Other	16.4	15.5	16.7	15.2	15.5	16.5	384	16.2	3,901
Not available	2.5	1.5	1.9	3.9	9.7	5.4	126	1.8	421

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, 5 in Wales, 5 in Northern Ireland and 9 in Scotland. Centres in Scotland only provide summary information and therefore laboratory outcome data for comparisons were not available for the Scottish renal centres. Three centres (Bangor, Colchester, Liverpool Aintree) were reported as having no transplanted patients and were therefore excluded. After exclusion of these 12 centres, prevalent patient data from 59 renal centres across the UK were analysed.

For the one year post-transplant analyses, in which patients were assigned to the centres that performed their transplant, the two Scottish transplant centres were excluded as they only submit limited biochemical data to the UKRR. After excluding these 2 transplant centres, one year outcomes are described for 21 transplant centres across the UK.

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 2004–2010, 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.

Prevalent patient data

Biochemical and clinical data for patients with a functioning transplant followed in either a transplanting or non-transplanting centre were included in the analyses. The cohort consisted of prevalent patients as on 31st December 2011. Patients were considered as having a functioning transplant if 'transplant' was listed as the last mode of RRT in the last quarter of 2011. 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 allocated to the non-transplant centre. Patients with a functioning transplant

Table 3.8. Ethnicity of patients who received a transplant in the years 2006–2011

Year	% White	% South Asian	% African Caribbean	% Other	% Unknown
2006	75.5	8.2	6.4	2.0	7.9
2007	75.6	7.9	5.9	2.0	8.7
2008	72.7	8.6	6.2	1.8	10.8
2009	71.4	10.1	6.7	2.3	9.5
2010	72.3	10.0	6.1	2.4	9.2
2011	72.6	9.3	6.6	2.1	9.5

Table 3.9a. Percentage completeness by centre for prevalent transplant patients on 31/12/2011[a]

Centre	N	Ethnicity	eGFR[b]	Blood pressure
England				
B Heart	162	100	93	0
B QEH	834	100	94	93
Basldn	55	100	98	13
Bradfd	237	98	87	74
Brightn	346	63	88	0
Bristol	745	99	99	68
Camb	626	98	100	98
Carlis	128	98	96	0
Carsh	541	96	90	0
Chelms	67	99	97	87
Covnt	417	99	90	51
Derby	133	99	98	82
Donc	60	100	100	95
Dorset	285	100	89	81
Dudley	85	100	98	35
Exeter	345	100	98	79
Glouc	154	100	97	88
Hull	335	62	95	0
Ipswi	178	99	99	85
Kent	392	95	49	87
L Barts	804	100	97	0
L Guys	1,001	81	97	0
L Kings	315	98	96	0
L RFree	928	98	94	0
L St.G	358	88	95	1
L West	1,542	100	97	0
Leeds	814	90	97	96
Leic	877	95	95	44
Liv RI	775	92	89	42
M RI	1,020	97	99	0
Middlbr	414	99	96	49
Newc	587	99	99	0
Norwch	239	97	97	47
Nottm	506	100	100	80
Oxford	902	92	99	16
Plymth	274	99	95	0
Ports	754	99	96	12
Prestn	432	100	97	0
Redng[c]	299	100	99	0
Salford	364	99	95	0
Sheff	594	100	99	96
Shrew	117	100	53	0
Stevng	192	100	69	35
Sthend	73	100	100	56
Stoke	289	59	99	0
Sund[c]	188	99	99	0
Truro	170	99	98	90
Wirral	3	100	100	0
Wolve	136	100	97	93
York	166	80	99	42
N Ireland				
Antrim	77	100	97	91
Belfast	415	100	99	47
Newry	67	100	94	90
Ulster	25	100	96	84
West NI	101	100	96	89
Wales				
Cardff	910	75	99	97
Clwyd	64	80	94	86
Swanse	230	99	97	99
Wrexm	128	100	79	0
England	**21,258**	**95**	**95**	**34**
N Ireland	**685**	**100**	**98**	**64**
Wales	**1,332**	**82**	**96**	**88**
E, W & NI	**23,275**	**94**	**95**	**38**

[a] Scottish centres not shown as a limited dataset was returned that could not be included for technical reasons
[b] Patients with missing ethnicity were classed as White for eGFR calculation
[c] Data relating to blood pressure could not be extracted from these centres due to technical problems

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 2011 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 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 2011. 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 2004 and 31st December 2010 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 (table 3.10).

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 2004–2010 were included as separate episodes provided each of the transplants functioned for a year

For each patient, the most recent laboratory or blood pressure

Table 3.9b. Percentage completeness by centre for prevalent transplant patients on 31/12/2011[a]

Centre	N	Haemoglobin	Total serum cholesterol	Adjusted serum calcium[b]	Serum phosphate	Serum PTH
England						
B Heart	162	93	41	86	86	13
B QEH	834	94	72	94	93	62
Basldn	55	95	44	96	85	53
Bradfd	237	79	43	85	83	27
Brightn	346	88	23	73	84	25
Bristol	745	99	70	99	99	98
Camb	626	99	72	99	99	89
Carlis	128	95	65	92	92	14
Carsh	541	71	51	89	89	0
Chelms	67	97	66	97	97	22
Covnt	417	89	0	89	64	26
Derby	133	94	58	93	89	77
Donc	60	100	85	100	100	32
Dorset	285	89	53	55	51	20
Dudley	85	98	61	69	98	59
Exeter	345	97	91	97	94	14
Glouc	154	97	39	96	94	31
Hull	335	94	24	92	92	18
Ipswi	178	99	30	99	99	58
Kent	392	96	52	93	93	7
L Barts	804	97	96	94	94	69
L Guys	1,001	97	31	92	92	31
L Kings	315	96	41	96	96	20
L RFree	928	61	74	94	94	57
L St.G	358	94	40	95	95	46
L West	1,542	98	26	98	98	7
Leeds	814	96	91	96	96	48
Leic	877	94	89	94	94	58
Liv RI	775	89	3	87	88	71
M RI	1,020	99	49	99	99	60
Middlbr	414	95	41	93	92	12
Newc	587	99	72	97	99	37
Norwch	239	97	94	96	96	29
Nottm	506	100	60	96	95	83
Oxford	902	99	52	99	99	27
Plymth	274	83	42	91	89	20
Ports	754	95	32	94	89	13
Prestn	432	96	47	93	91	38
Redng	299	99	78	99	85	59
Salford	364	95	82	95	95	82
Sheff	594	99	39	98	98	22
Shrew	117	85	71	77	76	5
Stevng	192	96	73	95	92	45
Sthend	73	99	30	99	95	8
Stoke	289	99	97	99	99	28
Sund	188	99	88	99	99	86
Truro	170	97	49	97	97	40
Wirral	3	100	100	33	100	67
Wolve	136	97	55	97	90	46
York	166	87	61	85	96	16

Table 3.9b. Continued

Centre	N	Haemoglobin	Total serum cholesterol	Adjusted serum calcium[b]	Serum phosphate	Serum PTH
N Ireland						
Antrim	77	96	94	95	96	94
Belfast	415	99	98	97	97	25
Newry	67	94	40	94	94	63
Ulster	25	96	96	96	96	68
West NI	101	97	92	94	94	69
Wales						
Cardff	910	99	51	99	98	15
Clwyd	64	92	86	94	94	53
Swanse	230	97	72	97	97	43
Wrexm	128	98	90	97	97	99
England	**21,258**	**94**	**55**	**94**	**93**	**42**
N Ireland	**685**	**98**	**91**	**96**	**96**	**45**
Wales	**1,332**	**98**	**60**	**98**	**98**	**30**
E, W & NI	**23,275**	**94**	**56**	**94**	**93**	**41**

[a] Scottish centres not shown as a limited dataset was returned that could not be included for technical reasons
[b] Serum calcium corrected for serum albumin

for the relevant 4th/5th quarter (10–15 months) 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 discussion

Post-transplant eGFR in prevalent transplant patients

When interpreting eGFR post-transplantation, it is important to remember that estimated GFR formulae

Table 3.10. Number of patients per transplant centre after allocation of patients in non-transplant centres* (transplanted between 2004–2010)

Transplant centre	Total number of patients per transplant centre	Non-transplant centre	Number of patients reallocated to a transplant centre
B QEH	848	Stoke	4
Belfast	261	Antrim	2
		Newry	7
		West NI	4
Bristol	684	Dorset	1
Camb	939	Stevng	2
Cardff	674		n/a
Covnt	333		n/a
L Barts	652		n/a
L Guys	1,076	Kent	3
L Rfree	476		n/a
L St.G	367	Carsh	14
L West	1,047		n/a
Leeds	910		n/a
Leic	479		n/a
Liv RI	541	Prestn	1
M RI	652	Salford	23
Newc	735		n/a
Nottm	334		n/a
Oxford	953		n/a
Plymth	388		n/a
Ports	412		n/a
Sheff	363		n/a
Total	**13,124**		**61**

* Only transplant centres in England, N Ireland and Wales included

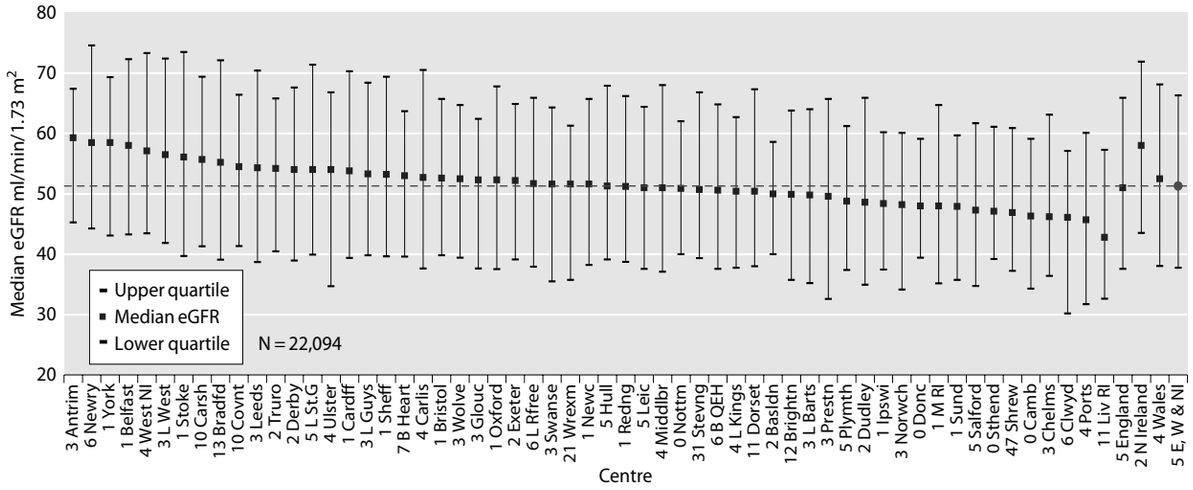

Fig. 3.2. Median eGFR in prevalent transplant patients by centre on 31/12/2011

only have a modest predictive performance in the transplant population [3]. 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 51.3 ml/min/1.73 m^2, with 13.6% of prevalent transplant recipients having an eGFR <30 ml/min/1.73 m^2. Table 3.11 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 ⩾60 ml/min/1.73 m^2 is questionable [4], 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 58 centres included and a normal distribution, 2–3 centres would be expected to fall between the 95%–99% 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 15 centres falling outside the 95% CI of which eight centres were outside the 99.9% CI. Five centres (Bristol, Belfast, Newry, London West,

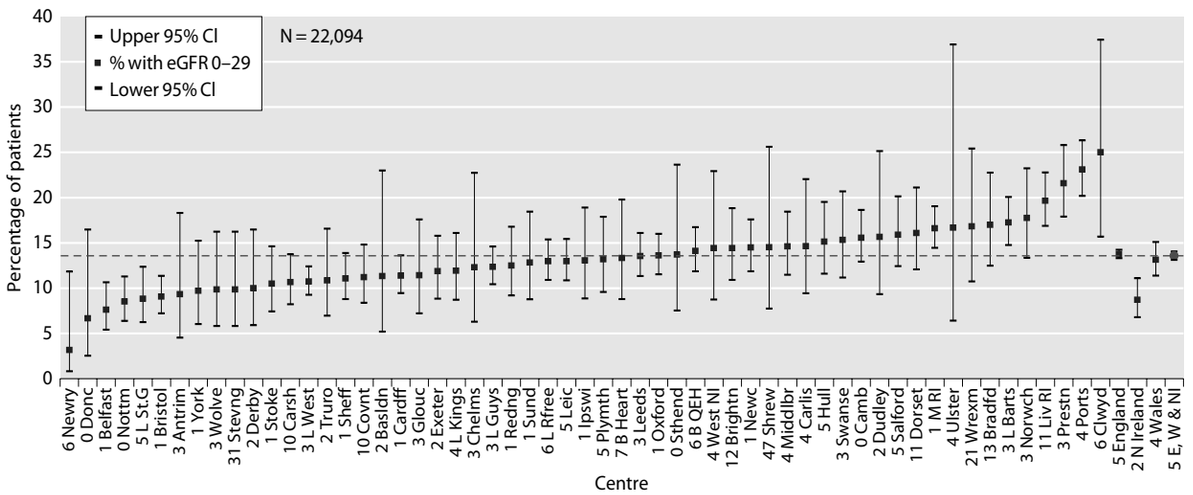

Fig. 3.3. Percentage of prevalent transplant patients by centre on 31/12/2011 with eGFR <30 ml/min/1.73 m^2

Table 3.11. Proportion of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 on 31/12/2011

Centre	N	% with eGFR <30	Centre	N	% with eGFR <30
Ulster	24	16.7	Redng	296	12.5
Basldn	53	11.3	L Kings	302	11.9
Clwyd	60	25	Brightn	305	14.4
Donc	60	6.7	Hull	317	15.1
Shrew	62	14.5	Exeter	337	11.9
Newry	63	3.2	L St.G	340	8.8
Chelms	65	12.3	Salford	346	15.9
Sthend	73	13.7	Covnt	375	11.2
Antrim	75	9.3	Middlbr	397	14.6
Dudley	83	15.7	Belfast	407	7.6
West NI	97	14.4	Prestn	417	21.6
Wrexm	101	16.8	Carsh	488	10.7
Carlis	123	14.6	Nottm	505	8.5
Derby	130	10	Newc	580	14.5
Stevng	132	9.8	Sheff	587	11.1
Wolve	132	9.8	Camb	623	15.6
Glouc	149	11.4	Liv RI	692	19.7
B Heart	150	13.3	Ports	727	23.1
York	165	9.7	Bristol	739	9.1
Truro	166	10.8	L Barts	777	17.2
Ipswi	176	13.1	B QEH	786	14.1
Sund	187	12.8	Leeds	791	13.5
Kent	191	15.2	Leic	833	13.0
Bradfd	206	17	L Rfree	872	13.0
Swanse	222	15.3	Oxford	897	13.6
Norwch	231	17.7	Cardff	897	11.4
Dorset	255	16.1	L Guys	971	12.4
Plymth	258	13.2	M RI	1,011	16.6
Stoke	286	10.5	L West	1,501	10.7

Nottingham) 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 RI, Portsmouth and Preston fell outside the upper 99.9% CI suggesting a higher than expected proportion of patients with eGFR <30 ml/min/1.73 m^2.

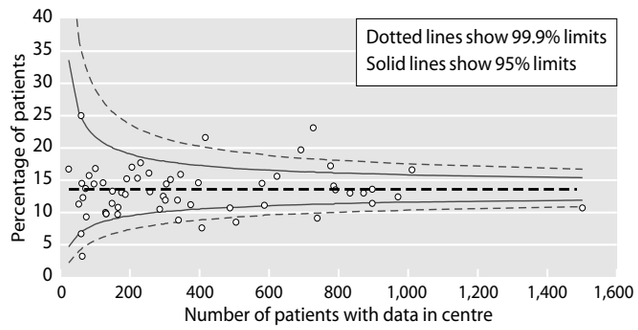

Fig. 3.4. Funnel plot of percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 by centre size on 31/12/2011

eGFR in patients one year after transplantation

Graft function at one year post-transplantation may predict subsequent long-term graft outcome [5]. Figures 3.5a, 3.5b, and 3.5c show the median one year post-transplant eGFR for patients transplanted between 2004–2010, by transplant type. Living kidney donation had the highest median eGFR at one year (55.9 ml/min/1.73 m^2), followed by donation after brainstem death (51.8 ml/min/1.73 m^2) and donation after circulatory death (49.4 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 ($p < 0.001$) over the time period was noticed with both live and donation after brainstem death transplant, but not with donation after circulatory death ($p = 0.1$).

Haemoglobin in prevalent transplant patients

Transplant patients have previously fallen under the remit of the UK Renal Association Complications of

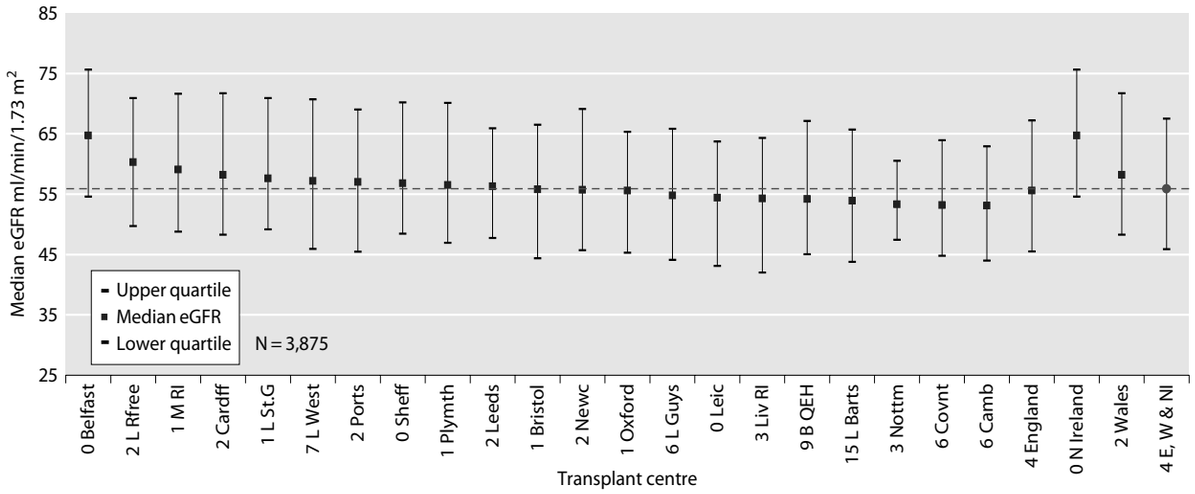

Fig. 3.5a. Median eGFR one year post-live donor transplant by transplant centre 2004–2010

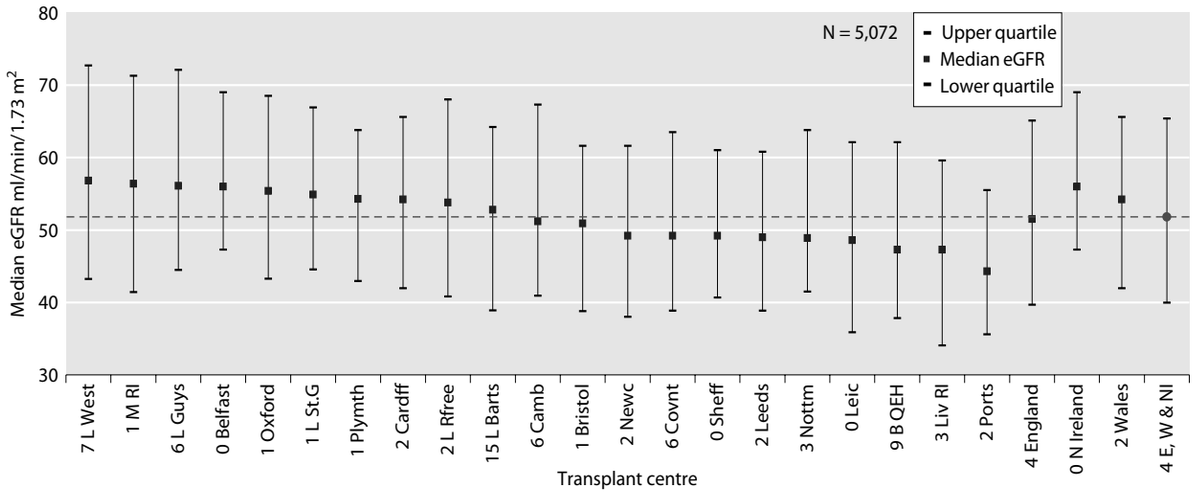

Fig. 3.5b. Median eGFR one year post-brainstem death donor transplant by transplant centre 2004–2010

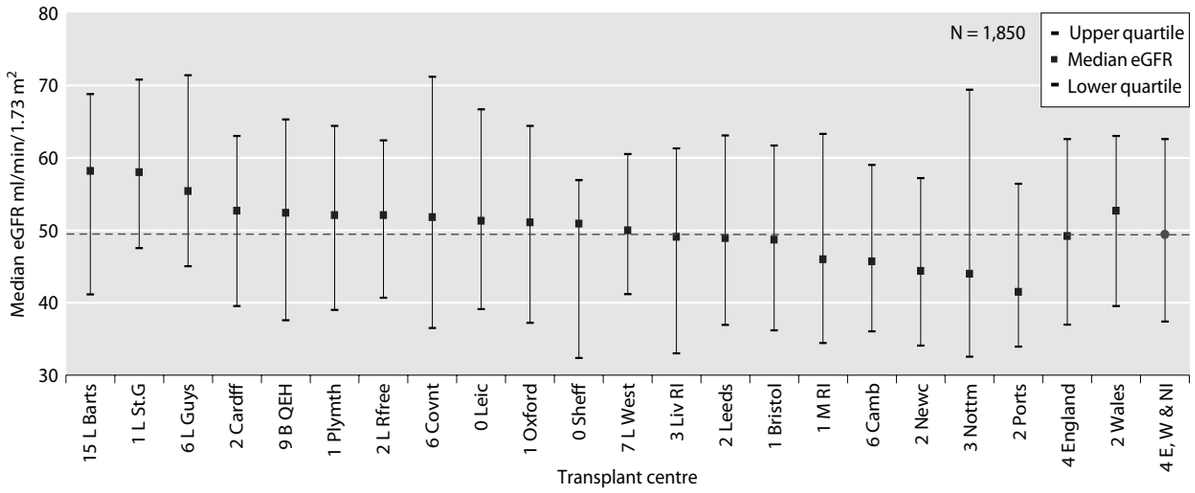

Fig. 3.5c. Median eGFR one year post-circulatory death donor transplant by transplant centre 2004–2010

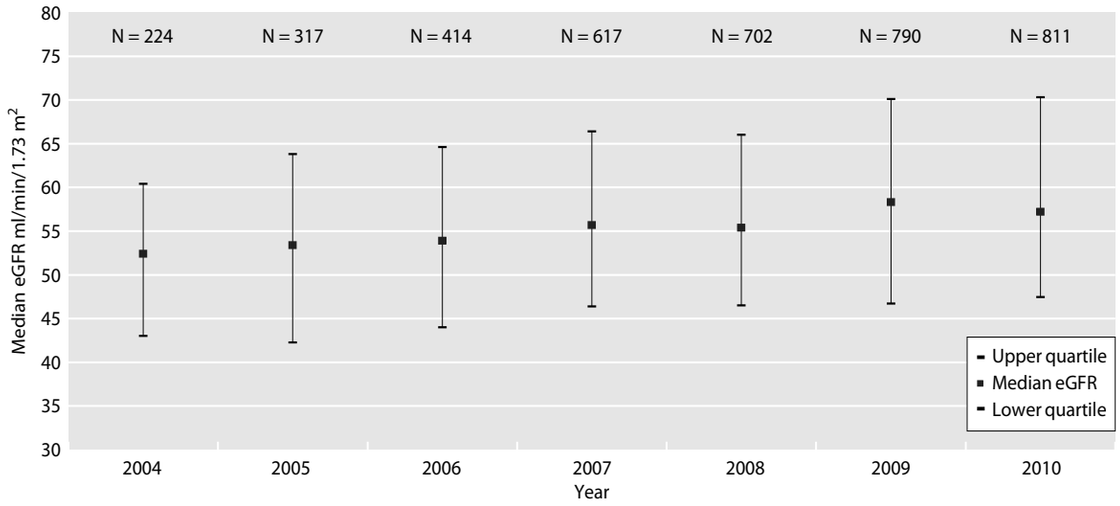

Fig. 3.6a. Median eGFR one year post-live donor transplant by year of transplantation 2004–2010

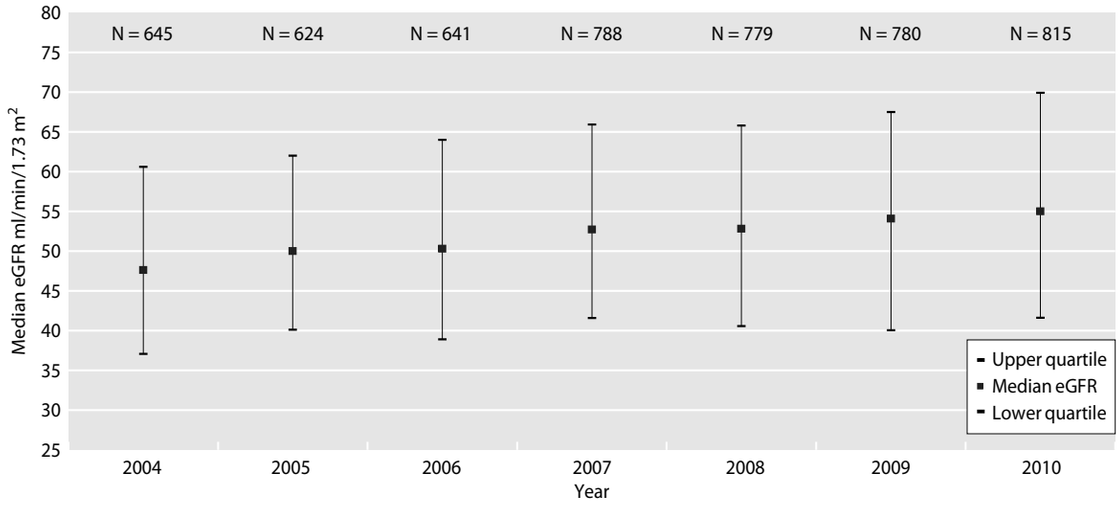

Fig. 3.6b. Median eGFR one year post-brainstem death donor transplant by year of transplantation 2004–2010

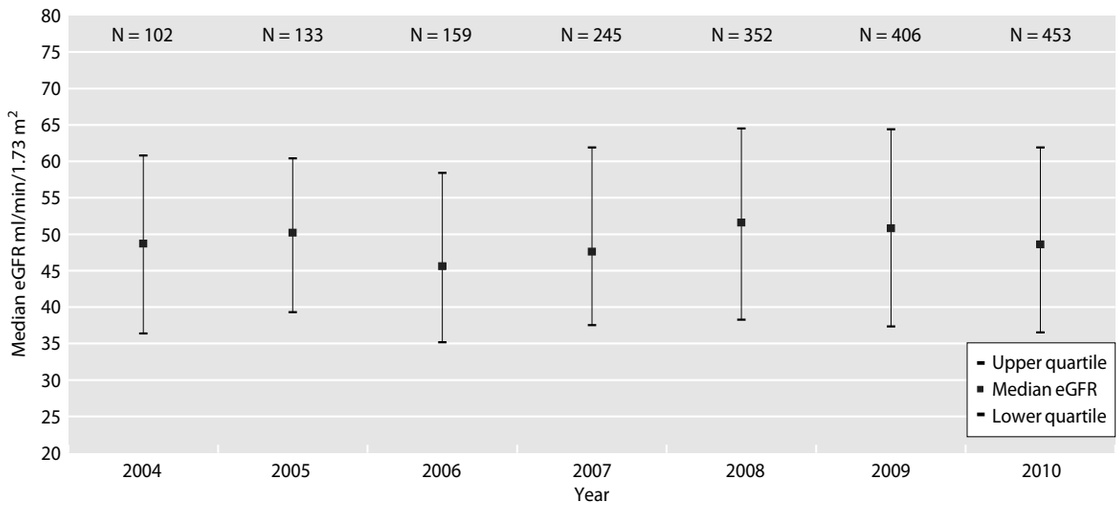

Fig. 3.6c. Median eGFR one year post-circulatory death donor transplant by year of transplantation 2004–2010

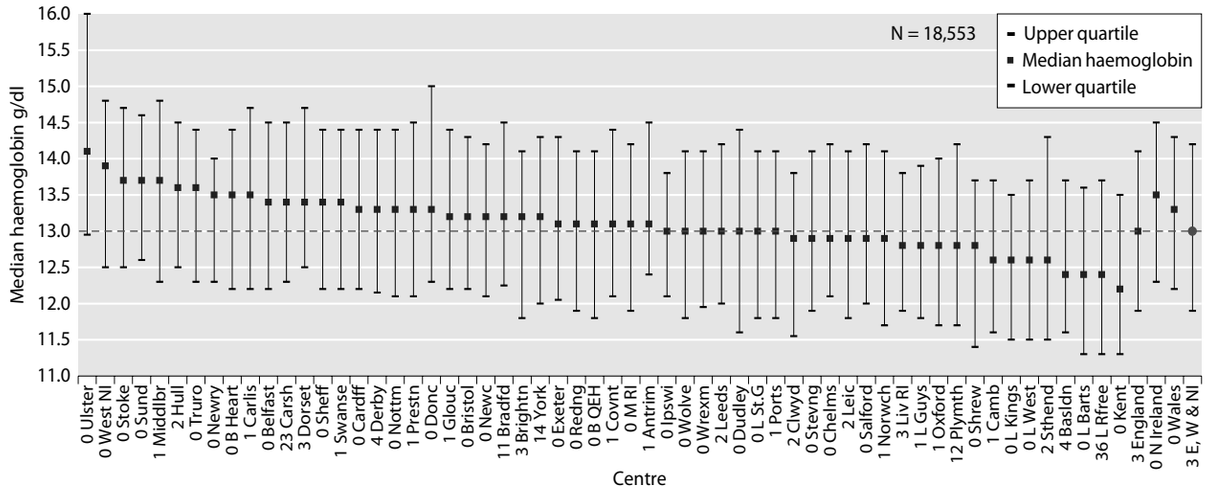

Fig. 3.7a. Median haemoglobin for prevalent transplant patients with eGFR $\geqslant 30$ ml/min/1.73 m^2 by centre on 31/12/2011

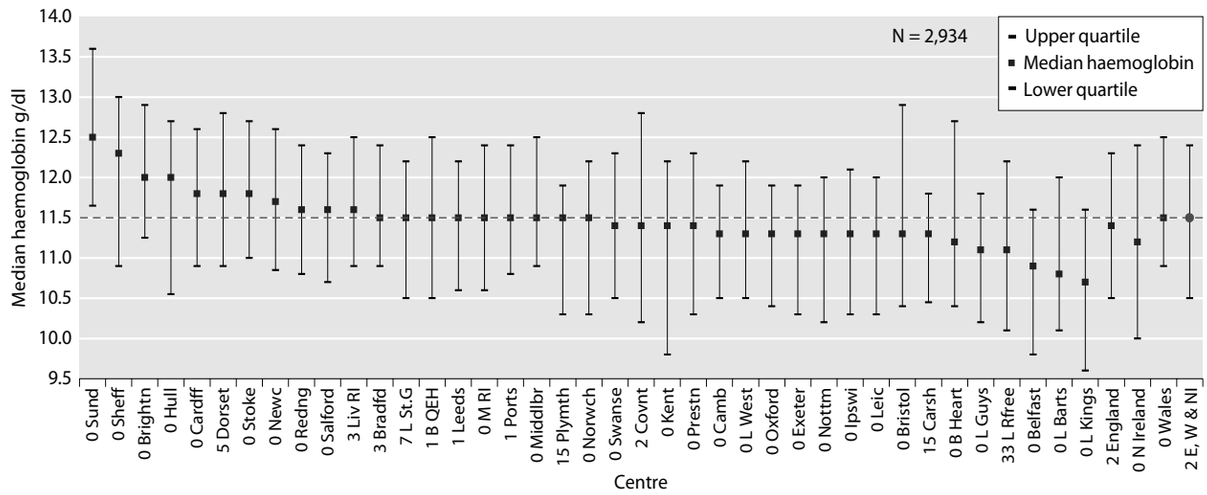

Fig. 3.7b. Median haemoglobin for prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 by centre on 31/12/2011

Chronic Kidney Disease (CKD) guidelines. Updated guidelines regarding the management of anaemia in CKD were published by the association in November 2010 [6] 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 [7]. However, many transplant patients with good transplant function will have haemoglobin concentrations >12 g/dl 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 percentage of prevalent transplant patients achieving Hb $\geqslant 10.0$ g/dl 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 <10.0 g/dl as a funnel plot enabling more reliable comparison of outcomes between centres across the UK. With 58 centres included and a normal distribution, 2–3 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.

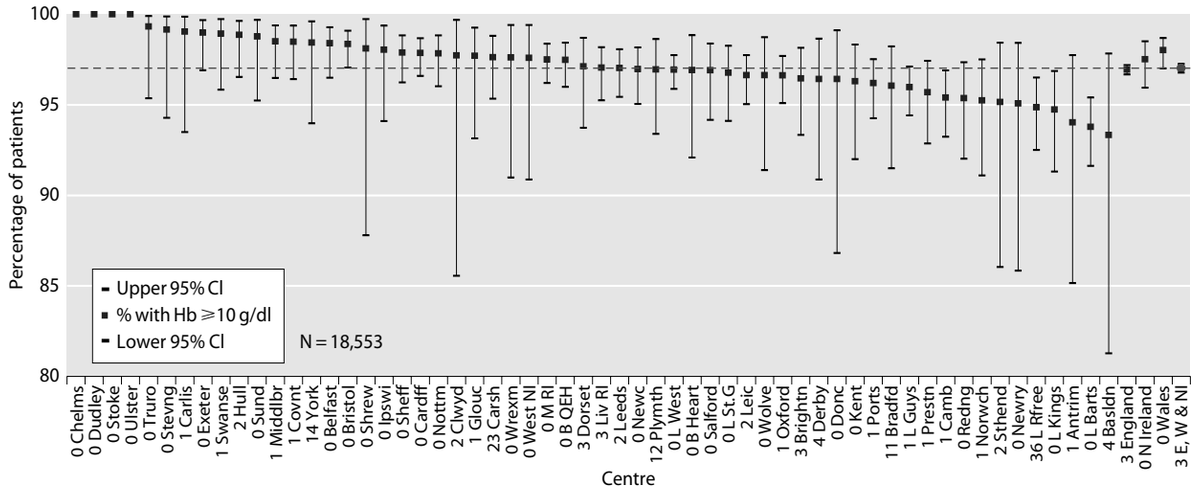

Fig. 3.8a. Percentage of prevalent transplant patients with eGFR ⩾30 ml/min/1.73 m^2 achieving haemoglobin ⩾10.0g/dl by centre on 31/12/2011

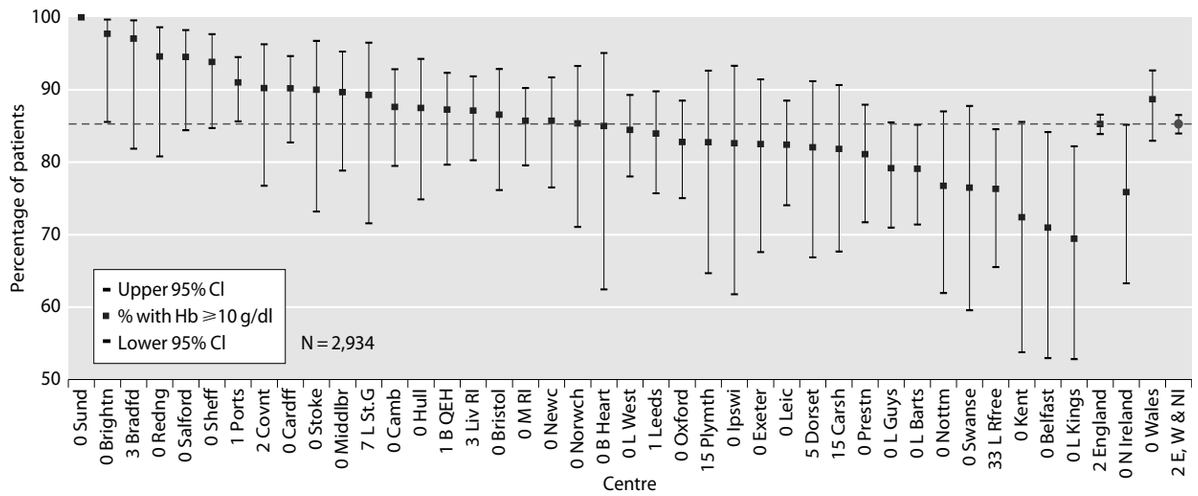

Fig. 3.8b. Percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 achieving haemoglobin ⩾10.0g/dl by centre on 31/12/2011

One centre (London Barts) fell outside the upper 99.9% CI and three further centres (London Kings, London Royal Free and Preston) fell outside the upper 95% CI indicating a higher than predicted proportion of transplant patients not achieving the haemoglobin target. Three centres fell outside the lower 99.9% CI, indicating they performed better than expected with fewer than predicted patients having a haemoglobin <10.0 g/dl.

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

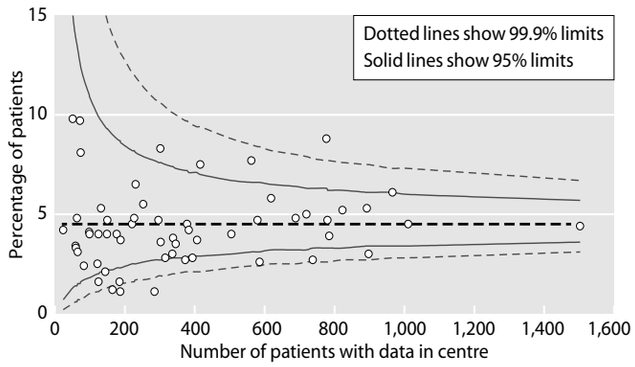

Fig. 3.9. Funnel plot of percentage of prevalent transplant patients with haemoglobin <10.0g/dl by centre size on 31/12/2011

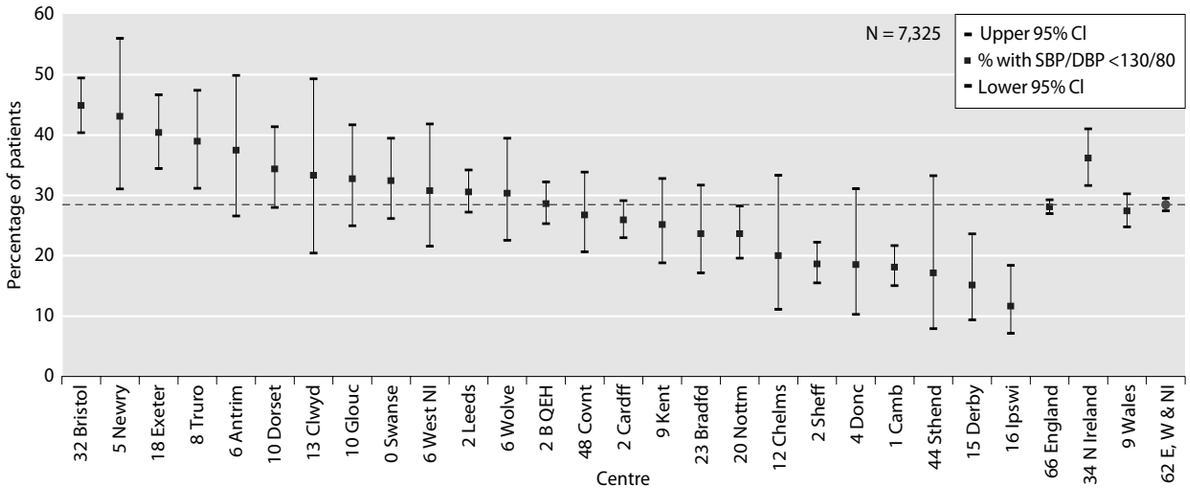

Fig. 3.10a. Percentage of prevalent transplant patients with eGFR $\geqslant 30$ ml/min/1.73 m^2 achieving blood pressure of <130/80 mmHg by centre on 31/12/2011

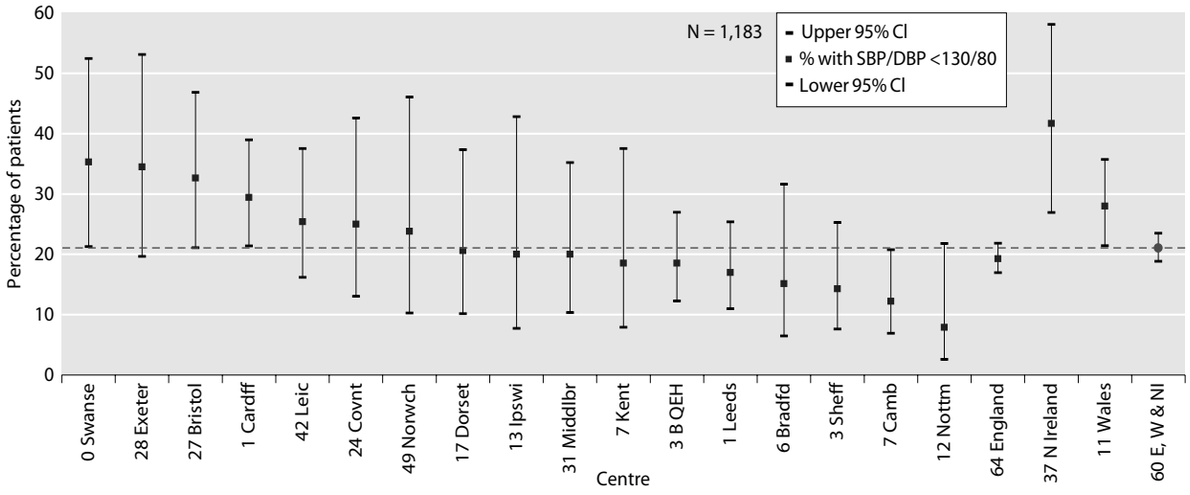

Fig. 3.10b. Percentage of prevalent transplant patients with eGFR <30 ml/min/1.73 m^2 achieving blood pressure of <130/80 mmHg by centre on 31/12/2011

the kidney transplant recipients is that ***'Blood pressure should be <130/80 mmHg (or <125/75 mmHg if proteinuria)'*** [8]. This blood pressure target is the same as that used in previous annual reports [9].

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 (28.5% vs. 21.1%) in those with better renal function (eGFR $\geqslant 30$ ml/min/1.73 m^2).

Analysis of prevalent patients by CKD stage

Introduction

Approximately 2.2% of prevalent transplant patients returned to dialysis in 2011, 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 2011 (N = 22,109) 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 2011, comprised the comparison dialysis cohort (N = 19,150) including 2,241 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 2011 laboratory data.

Results and discussion

Table 3.12 shows that 13.6% of the prevalent transplant population (3,005 patients), had moderate to advanced 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.

Table 3.12. Analysis by CKD stage for prevalent transplant patients compared with prevalent dialysis patients on 31/12/2011

	Stage 1–2T (⩾60)	Stage 3T (30–59)	Stage 4T (15–29)	Stage 5T (<15)	Stage 5D
Number of patients	7,603	11,501	2,635	370	19,150
% of patients	34.4	52.0	11.9	1.7	
eGFR ml/min/1.73 m^2 [a]					
mean ± SD	76.8 ± 15.2	45.6 ± 8.4	23.9 ± 4.2	11.9 ± 2.3	
median	72.7	45.8	24.5	12.2	
Systolic BP mmHg					
mean ± SD	133.3 ± 16.7	135.8 ± 17.5	139.3 ± 19.8	139.4 ± 18.2	130.5 ± 24.5
% ⩾130	56.4	63.5	70.0	72.7	48.6
Diastolic BP mmHg					
mean ± SD	77.8 ± 10.0	78.0 ± 10.1	78.0 ± 11.0	78.7 ± 11.3	68.4 ± 14.5
% ⩾80	45.8	46.9	48.2	51.0	21.7
Cholesterol mmol/L					
mean ± SD	4.5 ± 1.0	4.6 ± 1.1	4.7 ± 1.2	4.8 ± 1.3	4.0 ± 1.1
% ⩾5	30.1	33.5	35.6	39.5	17.4
Haemoglobin g/dl					
mean ± SD	13.6 ± 1.6	12.7 ± 1.6	11.6 ± 1.5	10.6 ± 1.6	11.2 ± 1.4
% <10.0	1.6	3.9	12.0	34.0	16.7
Phosphate mmol/L [b]					
mean ± SD	0.9 ± 0.2	1.0 ± 0.2	1.2 ± 0.3	1.5 ± 0.4	1.6 ± 0.4
% ⩾1.8	0.0	0.1	1.6	19.8	27.0
Corrected calcium mmol/L					
mean ± SD	2.4 ± 0.2	2.4 ± 0.2	2.4 ± 0.2	2.3 ± 0.2	2.3 ± 0.2
% >2.6	8.5	8.5	5.4	7.1	6.3
% <2.2	8.2	8.3	14.6	21.8	18.9
PTH pmol/L					
median	8.7	9.7	15.9	31.3	28.2
% ⩾32	3.6	5.7	19.7	48.4	44.2

[a] Prevalent transplant patients with no ethnicity data were classed as White
[b] Only PD patients included in stage 5D, N = 2,241

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

Patients from England, Wales or Northern Ireland aged ⩾18 years receiving a renal transplant between 1st January 2001 and 31st December 2009, 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 18 months 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 discussion

The study cohort consisted of 11,664 patients. The median GFR slope was –0.49 ml/min/1.73 m^2/year (table 3.13). The gradient was steeper for Black recipients (−1.17 ml/min/1.73 m^2/year), in keeping with previously published data suggesting poorer outcomes for this group [12, 13]. eGFR slope was steeper in recipients of deceased donor kidneys (−0.51 ml/min/1.73 m^2/year) compared to patients who received organs from live donors (−0.47 ml/min/1.73 m^2/year) although this did

Table 3.13. Differences in median eGFR slope between prevalent transplant patients

Patient characteristic		N	Median slope	Lower quartile	Upper quartile	p-value
Age at transplant	<40	3,893	−0.89	−3.95	1.20	<0.0001
	40–55	4,590	−0.33	−2.74	1.75	
	>55	3,181	−0.28	−2.70	1.85	
Ethnicity	Asian	980	−0.63	−3.81	1.90	0.0018
	Black	656	−1.17	−4.39	1.48	
	Other	205	−0.43	−4.24	2.05	
	White	9,284	−0.45	−2.92	1.58	
Gender	Male	7,129	−0.32	−2.81	1.70	<0.0001
	Female	4,535	−0.79	−3.64	1.49	
Diabetes	Non-diabetic	9,966	−0.40	−2.97	1.65	<0.0001
	Diabetic	1,431	−0.95	−3.88	1.35	
Donor	Cadaveric	7,828	−0.51	−3.02	1.57	0.90
	Live	3,836	−0.47	−3.24	1.72	
Year of transplant	2001	834	−0.61	−2.28	0.65	<0.001
	2002	804	−0.56	−2.38	0.62	
	2003	1,000	−0.58	−2.25	0.87	
	2004	1,177	−0.44	−2.18	1.09	
	2005	1,124	−0.19	−2.35	1.64	
	2006	1,475	−0.37	−2.82	1.48	
	2007	1,598	−0.42	−3.02	1.94	
	2008	1,785	−0.47	−3.67	2.53	
	2009	1,867	−0.93	−6.11	3.55	
Status of transplant at end of follow-up	Died	675	−1.16	−4.36	1.79	<0.0001
	Failed	793	−6.13	−11.65	−2.86	
	Re-transplanted	51	−3.48	−6.44	−1.47	
	Functioning	10,145	−0.23	−2.44	1.79	
All		**11,664**	**−0.49**	**−3.08**	**1.62**	

not reach statistical significance. Female patients had a steeper slope (−0.79 ml/min/1.73 m^2/year) than males (−0.32 ml/min/1.73 m^2/year), as did diabetic patients (−0.95 ml/min/1.73 m^2/year) compared to non-diabetic patients (−0.40 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 underway 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.

Causes 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 causes 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.

This year, individuals with an ERA code 99 (Other identified cause of death) have been removed from category 'Uncertain' (where they were previously coded) to category 'Other' to reflect better coding of the data and bringing the registry in line with the coding methodology adopted in other renal registries. This has substantially reduced the proportion of patient deaths due to 'Uncertain' cause of death with a rise noted in deaths from 'other' causes.

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.

Adult patients aged 18 years and over, from England or Wales, were included in the analyses on cause of death. Previous analyses were limited to data from centres with a high rate of return for cause of death. When this was compared with an analysis of all the cause of death data on the database, the percentages in corresponding ERA-EDTA categories remained unchanged so the latter data were therefore included. Analysis of prevalent patients included all those aged over 18 years and receiving RRT on 31st December 2011.

Results and discussion

Tables 3.14, 3.15 and figure 3.11 show the differences in the causes of death between prevalent dialysis and transplant patients. Death due to cardiovascular disease was less common in transplanted patients than in dialysis patients, perhaps reflecting the cardiovascular screening undertaken during transplant work-up; transplant recipients are a pre-selected lower risk group of patients. The re-classification of ERA code 99 this year (see methods) has meant that within this cohort the leading cause of death was from 'Other' causes, although similar proportions are seen to have the cause of death attributed to infection and malignancy across all age groups. There has been a reduction over time in the proportion of

Table 3.14. Cause of death by modality in prevalent RRT patients on 1/1/2011

	All modalities		Dialysis		Transplant	
Cause of death	N	%	N	%	N	%
Cardiac disease	584	21	522	22	62	16
Cerebrovascular disease	130	5	104	4	26	7
Infection	526	19	437	18	89	23
Malignancy	275	10	193	8	82	21
Treatment withdrawal	449	16	438	18	11	3
Other	684	25	582	25	102	26
Uncertain	115	4	95	4	20	5
Total	**2,763**		**2,371**		**392**	
No cause of death data	1,372	33	1,138	32	234	37

Table 3.15. Cause of death in prevalent transplant patients on 1/1/2011 by age

	All age groups		<65 years		⩾65 years	
Cause of death	N	%	N	%	N	%
Cardiac disease	62	16	34	16	28	16
Cerebrovascular disease	26	7	12	6	14	8
Infection	89	23	53	25	36	20
Malignancy	82	21	42	19	40	23
Treatment withdrawal	11	3	6	3	5	3
Other	102	26	59	27	43	24
Uncertain	20	5	10	5	10	6
Total	**392**		**216**		**176**	
No cause of death data	234	37	117	35	117	40

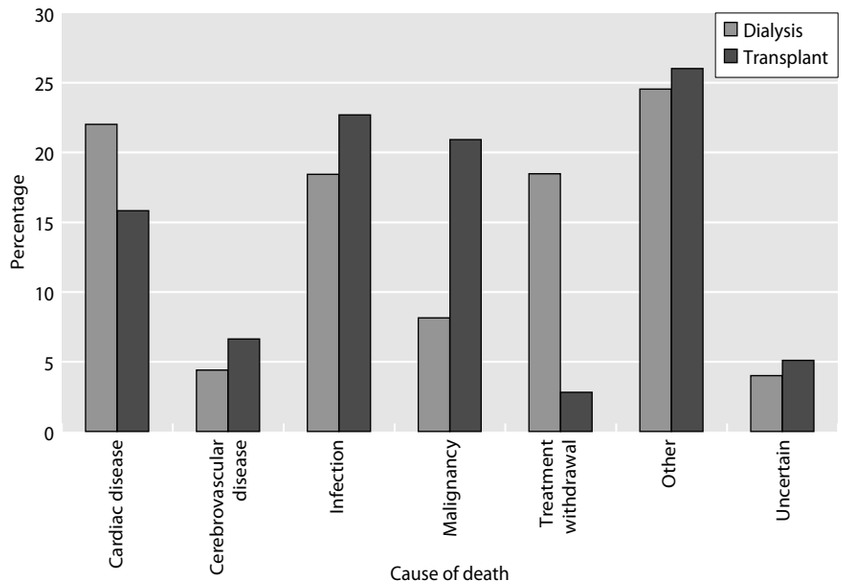

Fig. 3.11. Cause of death by modality for prevalent patients on 1/1/2011

deaths in transplant patients attributed to cardiovascular or stroke disease (43% in 2003 compared to 23% in 2011) with an increase in the proportion ascribed to infection or malignancy (30% in 2003 compared to 44% in 2011). 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 3.12 shows BP management remained suboptimal). 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.

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UK Renal Registry 15th Annual Report: Chapter 4 Demography of the UK Paediatric Renal Replacement Therapy population in 2011

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Key Words
Aetiology · Children · Demography · End stage renal disease · Established renal failure · Incidence · Prevalence · Ethnicity · Renal replacement therapy · Survival

Summary

- A total of 856 children and young people under 18 years with ERF were receiving treatment at paediatric nephrology centres in 2011.
- At the census date, 80.1% had a functioning kidney-transplant, 10.5% were receiving peritoneal dialysis (PD) and 9.4% were receiving haemodialysis (HD).
- In patients aged <16 years the prevalence of ERF was 56.8 pmarp and the incidence 8.3 pmarp.
- A third of patients had one or more reported comorbidities.
- At transfer to adult services, 86% of patients had a functioning kidney transplant.

Introduction

Established renal failure (ERF) requiring renal replacement therapy (RRT) is a rare but significant cause of long term morbidity and mortality during childhood, with specialist care being provided in 13 paediatric nephrology centres in the UK. All centres are equipped to provide peritoneal dialysis and haemodialysis, with ten centres also undertaking kidney transplantation for children. In the United Kingdom (UK), prevalence rates of treated ERF in children aged under 16 have risen steadily over the last 15 years to 59.3 per million age related population (pmarp) in 2010 [1]. Incidence rates for ERF have also shown an increasing trend during this time period rising to 8.1 pmarp in 2010 [1].

The objectives of this report are:

(i) To describe the UK prevalence, incidence, causes of ERF and modality of treatment of children on RRT on 31st December 2011
(ii) To describe trends of the same over the past 15 years, and
(iii) To describe pre-emptive transplantation rates and survival of children on RRT aged <16 years old in the UK.

Methods

Data collection was performed by all 13 paediatric nephrology centres managing children on RRT in the UK in 2011. Most centres submitted data electronically to the UK Renal Registry (UKRR) with only four centres submitting data using paper-based data returns this year. These data items were then manually entered into the current paediatric UKRR database. Southampton was only able to provide a limited electronic dataset due to recent implementation of a bespoke renal IT system.

In this report, patient groups are described as: (i) 'prevalent' group: patients who were receiving RRT on the 31st December 2011; (ii) 'incident' group: patients who started RRT between 1st January and 31st December 2011; and (iii) '5 year' groups: patients who started RRT in the periods of 1997–2001, 2002–2006 and 2007–2011.

The populations used to calculate the incidence and prevalence rates were obtained from the Office for National Statistics (ONS) [2]. The mid-2011 population estimate produced by the ONS, based on the 2011 Census, was used for calculating the 2011 incident and prevalent group rates; the 2001 Census data was used for the 1997–2001, 2002–2006 and 2007–2011 '5 year' groups.

Infants under the age of 3 months and 'late presenters' (defined as children commencing dialysis within three months following 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 1997 and 31st December 2010 were included to ensure a minimum of 1 year follow up at the date of census, 31st December 2011, and were followed up to a maximum age of 16 years.

Statistical analyses

Statistical analyses were performed using SAS 9.3, with group analyses using Chi-square test and median analyses using Kruskal-Wallis test. 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

Accuracy and completeness of data returns

Significant efforts to improve the overall accuracy of the entire paediatric dataset by clinical teams, data managers and statisticians have continued this year, resulting in improved accuracy of the database, analyses and conclusions. As for data returns, the procedures for data collection and processing are still evolving but are yielding consistent results, now with near 100% data completeness achieved by all centres for a range of data items including, gender, ethnicity, treatment modality at start of RRT and age at start of RRT. Data completeness for other core items was better than previous reports and is shown in table 4.1 [1].

The UK paediatric prevalent ERF population in 2011

A total of 856 children and young people under 18 years with ERF were receiving treatment at paediatric nephrology centres in 2011. At the census date, 80.1% had a functioning kidney transplant, 10.5% were receiving peritoneal dialysis (PD) and 9.4% were receiving haemodialysis (HD).

Patients aged 16–18 years may receive their medical care either in a paediatric or in an adult nephrology centre. As data were incomplete for the 16–18 year old adolescent patients they have been excluded from the majority of subsequent analyses (particularly when describing incidence and prevalence rates). This report therefore presents data largely relating to patients less than 16 years of age.

There were 675 children under 16 years of age receiving RRT in the UK in 2011. Table 4.2 shows the number of patients receiving RRT by age group and gender plus rate of RRT pmarp. The prevalence of RRT increased with age and was higher in males across all age groups

Table 4.1. Data completeness for paediatric prevalent ERF population in 2011

		Percentage completeness				
Centre	N	First seen date	Height at RRT start	Weight at RRT start	Creatinine at RRT start	Primary renal diagnosis
Blfst_P	32	93.8	87.5	87.5	93.8	100.0
Bham_P	88	96.6	94.3	98.9	100.0	100.0
Brstl_P	55	100.0	98.2	98.2	100.0	100.0
Cardf_P	22	95.5	100.0	100.0	95.5	100.0
Glasg_P	57	98.3	94.7	100.0	100.0	100.0
L Eve_P	99	99.0	63.6	69.7	70.7	100.0
L GOSH_P	178	98.9	81.5	88.2	89.3	99.4
Leeds_P	71	100.0	87.3	98.6	98.6	100.0
Livpl_P	37	91.9	75.7	81.1	78.4	94.6
Manch_P	70	100.0	88.6	100.0	100.0	100.0
Newc_P	35	100.0	74.3	88.6	91.4	100.0
Nottm_P	87	96.6	75.9	83.9	97.7	100.0
Soton_P	25	92.0	20.0	20.0	20.0	88.0
UK	**856**	**97.9**	**81.5**	**88.0**	**90.1**	**99.3**

Table 4.2. The UK paediatric prevalent ERF population in 2011, by age group and gender

	All patients		Males		Females		
Age group	N	pmarp	N	pmarp	N	pmarp	Ratio M:F
0–1.99 years	19	11.9	15	18.4	4	5.1	3.6
2–3.99 years	46	29.2	30	37.2	16	20.8	1.8
4–7.99 years	137	46.5	87	57.7	50	34.8	1.7
8–11.99 years	176	63.7	108	76.3	68	50.4	1.5
12–15.99 years	297	98.8	168	108.9	129	88.1	1.2
Under 16 years	**675**	**56.8**	**408**	**67.0**	**267**	**46.1**	**1.5**

pmarp – per million age related population

with an overall male to female prevalence ratio of 1.5. The reported prevalence rate in under 16 year olds was 56.8 pmarp.

Table 4.3 shows the ethnic origin of current RRT patients and their prevalence rates. Increasing prevalence pmarp was observed with increasing age in all ethnic groups. Children from ethnic minorities displayed higher prevalent rates of RRT when compared with White children, with South Asian children displaying the highest prevalence rates.

Table 4.3. The UK paediatric prevalent ERF population by age and ethnic group in 2011*

	White		South Asian		Black		Other**
Age group	N	pmarp	N	pmarp	N	pmarp	N
0–3.99 years	48	18.6	10	47.4	0	0.0	7
4–7.99 years	101	42.2	21	107.7	6	76.9	9
8–11.99 years	133	52.0	24	115.1	8	95.9	9
12–15.99 years	221	82.0	40	182.1	14	159.4	21
Under 16 years	**503**	**49.2**	**95**	**113.9**	**28**	**83.9**	**46**

pmarp-per million age related population
*ethnicity data missing in 3 children who are excluded from this table
**pmarp not expressed for group 'Other', as heterogeneous group

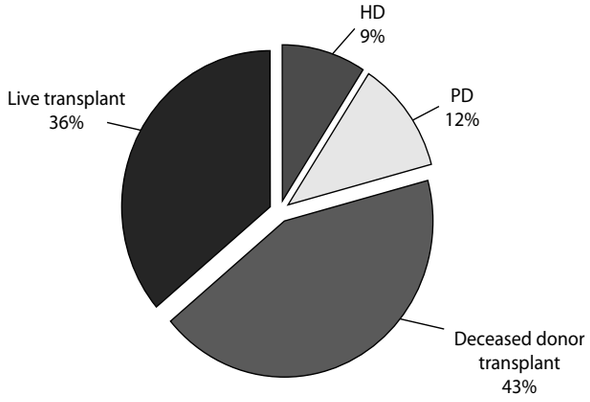

Fig. 4.1. RRT treatment used by prevalent paediatric patients <16 years old in 2011

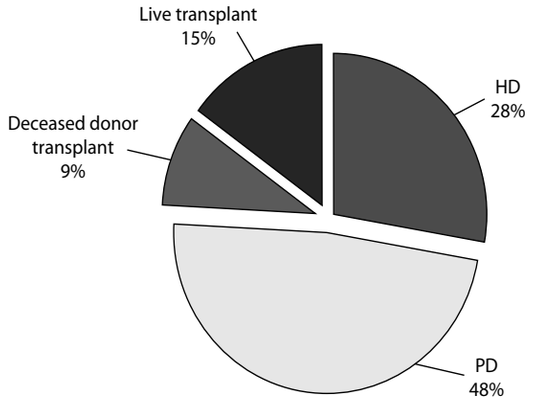

Fig. 4.2. Treatment modality at start of RRT in prevalent paediatric patients under 16 years of age in 2011

Modality of treatment

Current treatment modality in the prevalent paediatric population less than 16 years old in 2011 is displayed in figure 4.1. Of the 79% with a functioning transplant, 54% received deceased donor transplantations.

The treatment modality in use at the start of RRT is displayed in figure 4.2. This shows that 48% of patients were treated with PD at the start of RRT whilst 28% of patients were treated with HD. Twenty-four percent of children under 16 were reported to have received a pre-emptive transplant.

Further treatment modality analysis by age is shown in table 4.4 which demonstrates that in the under 2 year olds the majority of patients were being treated with PD (63.2%). This contrasts with older children in the 12 to 15.99 year age group where 85.9% had a functioning graft and where similar proportions were on HD and PD. Subsequent analysis of RRT modality by gender and ethnicity showed no difference. However as absolute sub-group numbers are small, caution is needed in conducting any comparative analyses.

Cause of ERF

Table 4.5 and figure 4.3 show the diagnostic categories for the prevalent ERF population under 16 years in 2011. There has been a marked improvement in data completeness in this category over the last few years with missing data falling to only 0.4% from 2.9% in the 2010 report [1]. Of the 675 patients, renal dysplasia ± reflux remained the commonest condition causing ERF (32.3%), whilst there were no documented patients with drug nephrotoxicity.

As for associated comorbidities at the onset of RRT, table 4.6 shows that congenital abnormalities were the

Table 4.4. Current treatment modality by age in the prevalent paediatric ERF population in 2011

	Current treatment							
	HD		PD		Live transplant		Deceased donor transplant	
Age group	N	%	N	%	N	%	N	%
0–1.99 years	5	26.3	12	63.2	2	10.5	0	0.0
2–3.99 years	10	21.7	17	37.0	15	32.6	4	8.7
4–7.99 years	13	9.5	18	13.1	52	38.0	54	39.4
8–11.99 years	10	5.7	14	8.0	64	36.4	88	50.0
12–15.99 years	24	8.1	18	6.1	111	37.4	144	48.5
16–17.99 years	19	10.5	11	6.1	57	31.5	94	51.9
Under 16 years	**62**	**9.2**	**79**	**11.7**	**244**	**36.1**	**290**	**43.0**
Under 18 years	**81**	**9.4**	**90**	**10.5**	**301**	**35.2**	**384**	**44.9**

Table 4.5. Number, percentage and gender by primary renal disease as cause of ERF in the prevalent paediatric ERF population under 16 years in 2011*

Diagnostic group	Total	%	Male	Female	M:F ratio
Renal dysplasia ± reflux	218	32.3	131	87	1.5
Obstructive uropathy	121	17.9	114	7	16.3
Glomerular disease	93	13.8	44	49	0.9
Congenital nephrotic syndrome	66	9.8	37	29	1.3
Tubulo-interstitial diseases	52	7.7	23	29	0.8
Uncertain aetiology	31	4.6	14	17	0.8
Renovascular disease	29	4.3	18	11	1.6
Polycystic kidney disease	26	3.9	10	16	0.6
Metabolic	22	3.3	11	11	1.0
Malignancy & associated disease	14	2.1	5	9	0.6
Missing	3	0.4	1	2	0.5
Total	**675**	**100.0**	**408**	**267**	**1.53**

*this year there were no patients with ERF secondary to 'drug nephrotoxicity'

commonest, reported in 9.2%, whilst both developmental delay and syndromic diagnoses each were reported in over 6% of patients. Prematurity was also frequently reported (7.1%), whilst neural tube defects were least common in 0.3% of patients. Overall 68.9% of patients had no registered comorbidities, with 20.4% having one comorbidity listed, and 10.7% having two or more comorbidities. Centre analysis showed significant variation in reporting of registered co-morbidities, with some centres, Birmingham (88%), Glasgow (83%), GOSH (80%) and Cardiff (80%) reporting no comorbidity in the majority of their patients, as compared to other centres which reported no comorbidity in a smaller proportion of patients, Bristol (43%) and Leeds (45%).

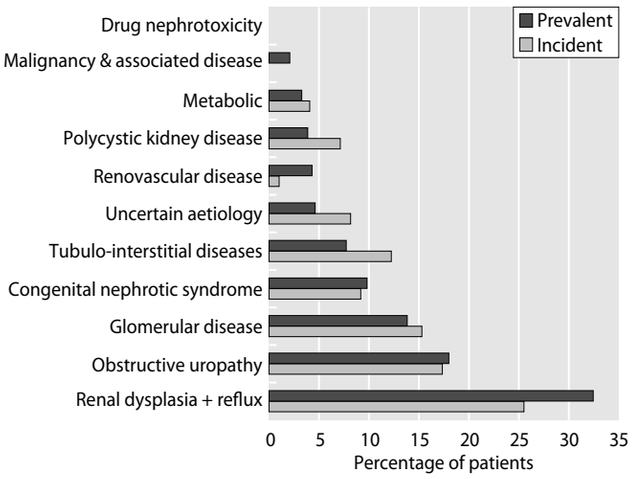

Fig. 4.3. Primary renal disease percentage in incident and prevalent paediatric ERF patients in 2011 for whom a causative diagnosis was reported

The UK incident paediatric ERF population in 2011

There were 114 patients under 18 years of age who commenced RRT at paediatric renal centres in 2011. As previously, the following analyses are restricted to the 99 patients who were under 16 years of age.

The incidence rate of RRT was 8.3 pmarp in 2011. Patients commencing RRT in 2011 are displayed by age and gender in table 4.7.

Table 4.8 shows that the reported incidence of RRT has been rising since 1997, with the highest incidence rates seen in the 12–15.99 year age group, with the 0–1.99 year age group having the next highest rates.

Table 4.6. Registered comorbidities at onset of RRT in prevalent paediatric patients aged <16 years with ERF in 2011

Comorbidity	N	Percentage all RRT patients
Cerebral palsy	11	1.6
Chromosomal abnormality	18	2.7
Congenital abnormality	62	9.2
Congenital heart disease	12	1.8
Consanguinity	24	3.6
Developmental delay	46	6.8
Diabetes	2	0.3
Family member with ERF	19	2.8
Liver disease	12	1.8
Malignancy	7	1.0
Neural tube defect	2	0.3
Prematurity	48	7.1
Psychological disorder	8	1.2
Syndromic diagnosis	43	6.4
No reported comorbidity	465	68.9
One reported comorbidity	138	20.4
Two or more comorbidities	72	10.7

Table 4.7. The incident paediatric ERF population in the UK in 2011, by age group and gender

	All patients		Male		Female		
Age group	N	pmarp	N	pmarp	N	pmarp	M:F ratio
0–1.99 years	16	10.1	12	14.7	4	5.1	2.9
2–3.99 years	10	6.3	9	11.2	1	1.3	8.6
4–7.99 years	14	4.8	9	6.0	5	3.5	1.7
8–11.99 years	25	9.0	12	8.5	13	9.6	0.9
12–15.99 years	34	11.3	21	13.6	13	8.9	1.5
Under 16 years	**99**	**8.3**	**63**	**10.4**	**36**	**6.2**	**1.7**

pmarp – per million age related population

Trends in ERF demographics

There were 1,656 children under 16 years of age who had received RRT in the UK over the 15-year period between 1997–2011. Analysis of ERF demographics for children less than 16 years of age over this period included 534 patients reported to the paediatric registry between 1997–2001, 527 between 2002–2006 and 595 between 2007–2011. Comparing the current 5 year period with the two previous 5 year periods there has been an overall increase in the number of children treated with RRT, particularly in children aged under 4 years (table 4.9). The percentage of children on RRT who are from South Asian or Black ethnic backgrounds has also increased during this period (table 4.10). The reported patient population at most paediatric renal centres has similarly grown in size since 1997–2001 with Belfast showing the largest proportional rise (table 4.11).

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

	Per million age related population		
Age group	1997–2001	2002–2006	2007–2011
0–1.99 years	11.6	11.7	13.2
2–3.99 years	6.3	4.7	8.2
4–7.99 years	5.3	6.5	6.4
8–11.99 years	8.3	7.6	9.1
12–15.99 years	13.1	13.4	14.6
Under 16 years	**8.9**	**9.1**	**10.3**

Table 4.12 shows the number and percentage of children receiving RRT with each of the major reported comorbidities over the last 15 years. Whilst congenital abnormalities (6.9%), developmental delay (6.2%) and syndromic diagnoses (6.4%) were the most common reported comorbidities in 2007–2011, there has been little change in the percentage of children receiving RRT with a reported comorbidity over the last 15 years.

As for changes in modality at the start of RRT, figure 4.4 shows that the percentage of children who were using PD at the start of RRT has fallen from 51.5% in 1997–2001 to 44% in 2007–2011 whilst the percentage commencing RRT on HD has increased from 22.8% in 1997–2001 to 29.4% in 2007–2011. During this period the overall percentage receiving a transplant at the start of RRT has remained largely unchanged though living donation has risen from 7.5% in 1997–2001 to 16.4% in 2007–2011, with a

Table 4.9. Number and percentage of children who commenced RRT, by age group and 5 year period, at start of RRT

	1997–2001		2002–2006		2007–2011		1997–2011
Age group	N	%	N	%	N	%	% change
0–1.99 years	82	15.4	81	15.4	104	17.5	2.1
2–3.99 years	46	8.6	31	5.9	61	10.3	1.6
4–7.99 years	80	15.0	92	17.5	89	15.0	0.0
8–11.99 years	130	24.3	113	21.4	126	21.2	−3.2
12–15.99 years	196	36.7	210	39.8	215	36.1	−0.6
Under 16 years	**534**		**527**		**595**		

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

	1997–2001		2002–2006		2007–2011		1997–2011
Ethnic group	N	%	N	%	N	%	% change
White	413	78.4	407	78.6	436	74.7	−3.7
South Asian	78	14.8	80	15.4	88	15.1	0.3
Black	14	2.7	13	2.5	24	4.1	1.5
Other	22	4.2	18	3.5	36	6.2	2.0
Under 16 years	**527**		**518**		**584**		

*There were 7 children in 1997–2001, 9 in 2002–2006 and 11 in 2007–2011 with no ethnicity recorded and these are excluded from this table

Table 4.11. Number and percentage of children under 16 years reported to the UKRR, by renal centre and 5 year period of starting RRT*

	1997–2001		2002–2006		2007–2011		1997–2011
Centre	N	%	N	%	N	%	% change
Blfst_P	15	2.8	15	2.9	27	4.5	1.7
Bham_P	50	9.4	54	10.3	62	10.4	1.0
Brstl_P	38	7.2	37	7.0	35	5.9	−1.3
Cardf _P	14	2.6	19	3.6	16	2.7	0.1
Glasg_P	42	7.9	29	5.5	46	7.7	−0.2
L Eve_P	55	10.4	45	8.6	68	11.4	1.1
L GOSH_P	94	17.7	101	19.2	114	19.2	1.5
Leeds_P	44	8.3	52	9.9	47	7.9	−0.4
Livpl_P	21	4.0	31	5.9	19	3.2	−0.8
Manch_P	52	9.8	51	9.7	50	8.4	−1.4
Newc_P	29	5.5	27	5.1	27	4.5	−0.9
Nottm_P	59	11.1	46	8.7	64	10.8	−0.4
Soton_P	18	3.4	19	3.6	20	3.4	0.0
Total <16	**531**		**526**		**595**		

*there were 3 children in 1997–2001 and 1 in 2002–2006 with unknown centre of RRT start and these are excluded from this table

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

	1997–2001		2002–2006		2007–2011		1997–2011
Comorbidity	N	%	N	%	N	%	% change
Cerebral palsy	5	0.9	9	1.7	9	1.5	0.6
Chromosomal abnormality	18	3.4	8	1.5	17	2.9	−0.5
Congenital abnormality	36	6.7	54	10.2	41	6.9	0.1
Congenital heart disease	15	2.8	7	1.3	17	2.9	0.0
Consanguinity	26	4.9	20	3.8	16	2.7	−2.2
Developmental delay	46	8.6	40	7.6	37	6.2	−2.4
Diabetes	3	0.6	5	0.9	2	0.3	−0.2
Family member with ERF	26	4.9	18	3.4	10	1.7	−3.2
Liver disease	0	0.0	9	1.7	13	2.2	2.2
Malignancy	8	1.5	7	1.3	2	0.3	−1.2
Neural tube defect	3	0.6	4	0.8	2	0.3	−0.2
Prematurity	35	6.6	23	4.4	29	4.9	−1.7
Psychological disorder	12	2.2	7	1.3	8	1.3	−0.9
Syndromic diagnoses	27	5.1	48	9.1	38	6.4	1.3
No reported comorbidity	363	68.0	341	64.7	440	73.9	6.0
One reported comorbidity	109	20.4	133	25.2	99	16.6	−3.8
Two or more comorbidities	62	11.6	53	10.1	56	9.4	−2.2

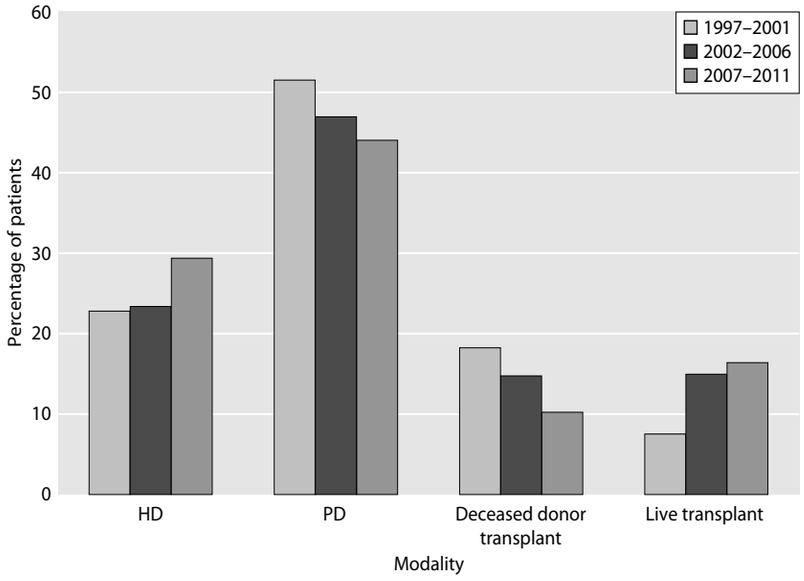

Fig. 4.4. Treatment modality at start of RRT by 5 year time period

corresponding fall in deceased donor transplantation from 18.2% to 10.2% for the same time period.

Table 4.13 shows the diagnostic categories for 523 of the 534 (97.9%) patients in 1997–2001, for 512 of the 528 (97%) patients in 2002–2006 and 582 of the 596 (97.7%) patients in 2007–2011 aged <16 years for whom a causative diagnosis was reported.

Overall there has been an increase in the percentage of children receiving RRT with unknown aetiology between 1997–2001 and 2007–2011 (1.3% vs. 6.0%) and a decrease in glomerular disease (22.2% vs. 20.1%) though absolute numbers are very small (table 4.13).

Pre-emptive transplantation

Of a total of 1,656 patients who started RRT between 1997–2011, 448 patients were excluded from analysis (93 patients were excluded due to being aged <3 months, and a further 355 patients were excluded due to being 'late presenters'). Of 1,208 patients identified as being aged 3 months to <16 years and having started RRT between 1997–201l, pre-emptive transplantation was seen to occur in 30.6% of patients and was significantly higher in males (33.6%) than females (25.8%), $p = 0.004$ (table 4.14). Ethnicity was also seen to be a significant factor, with children from Black (12.1%)

Table 4.13. Number and percentage of children under 16 years for whom a primary renal diagnosis had been reported as a cause of ERF, by 5 year time period and observed change in proportion of patients in each diagnostic group*

	1997–2001		2002–2006		2007–2011		1997–2011
Primary renal diagnosis	N	%	N	%	N	%	% change
Renal dysplasia ± reflux	163	31.2	175	34.2	173	29.7	−1.4
Obstructive uropathy	81	15.5	78	15.2	93	16.0	0.5
Glomerular disease	116	22.2	101	19.7	117	20.1	−2.1
Congenital nephrotic syndrome	33	6.3	23	4.5	38	6.5	0.2
Tubulo-interstitial diseases	41	7.8	42	8.2	46	7.9	0.1
Uncertain aetiology	7	1.3	28	5.5	35	6.0	4.7
Renovascular disease	22	4.2	15	2.9	20	3.4	−0.8
Polycystic kidney disease	14	2.7	15	2.9	21	3.6	0.9
Metabolic	30	5.7	19	3.7	29	5.0	−0.8
Malignancy & associated disease	4	0.8	10	2.0	8	1.4	0.6
Drug nephrotoxicity	12	2.3	6	1.2	2	0.3	−2.0

*there were 11 children in 1997–2001, 16 in 2002–2006 and 14 in 2007–2011 with no PRD recorded and these are excluded from this table

Table 4.14. Demographics of pre-emptive transplantation in children aged 3 months to 16 years in the UK between 1997–2011, 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 (1997–2011)	1,208	370 (30.6)
Time Period		
1997–2001	389	101 (26.0)
2002–2006	400	131 (32.8)
2007–2011	419	138 (32.9)
Gender		
Male	750	252 (33.6)
Female	458	118 (25.8)
Ethnicity		
Black	33	4 (12.1)
Other	49	13 (26.5)
South Asian	189	34 (18.0)
White	912	306 (33.6)
Age at start of RRT		
3 months–1.99 years	118	8 (6.8)
2–3.99 years	113	27 (23.9)
4–7.99 years	211	71 (33.7)
8–12.99 years	287	96 (33.5)
12–15.99 years	479	168 (35.1)
Primary Renal Diagnosis		
Renal dysplasia ± reflux	379	154 (40.6)
Glomerular disease	231	27 (11.7)
Obstructive uropathy	220	95 (43.2)
Tubulo-interstitial diseases	78	16 (20.5)
Congenital nephrotic syndrome	77	4 (5.2)
Metabolic	66	23 (34.9)
Polycystic kidney disease	39	16 (41.0)
Renovascular disease	32	11 (34.4)
Uncertain aetiology	31	7 (22.6)
Malignancy & associated disease	13	2 (15.4)
Drug nephrotoxicity	12	3 (25.0)

and South Asian (18%) ethnicity having significantly lower rates of transplantation than their White counterparts (33.6%), $p < 0.0001$. Analysis by age at start of RRT showed that as expected, the lowest rate of pre-emptive transplantation was in the 3 months to 2 year group (6.8%), whilst children aged 4 to 16 years had similar rates of pre-emptive transplantation. As for PRD, children with obstructive uropathy (43.2%), polycystic kidney disease (41%) and renal dysplasia ± reflux (40.6%) had the highest rates of pre-emptive transplantation, whilst those with congenital nephrotic syndrome (5.2%) and glomerular disease (11.7%) had the lowest rates. Over time there appears to have been a rise in pre-emptive transplantation rates, rising from 26% in 1997–2001 to 32.9% in 2007–2011, $p = 0.05$ (table 4.14).

Table 4.15. Modality, gender, ethnicity and primary renal diagnosis of patients transferred out of paediatric nephrology centres in 2011

	N	% distribution
Modality		
HD	8	8.6
PD	5	5.4
Transplant	80	86.0
Gender		
Female	32	65.6
Male	61	34.4
Ethnicity*		
Black	0	0.0
Other	2	2.2
South Asian	8	8.9
White	80	88.9
Primary renal diagnosis*		
Renal dysplasia ± reflux	33	36.3
Glomerular disease	22	24.2
Obstructive uropathy	11	12.1
Tubulo-interstitial diseases	7	7.7
Metabolic	6	6.6
Polycystic kidney disease	3	3.3
Renovascular disease	3	3.3
Congenital nephrotic syndrome	2	2.2
Uncertain aetiology	2	2.2
Drug nephrotoxicity	1	1.1
Malignancy & associated disease	1	1.1

*ethnicity missing in 1 patient, and PRD missing in 3 patients

Transfer of patients to adult renal services in 2011

A total of 93 patients were reported by paediatric nephrology centres to have been transferred to adult renal services in 2011. The median age of patients transferred out was 18.0 years with an inter-quartile range of 17.5 years to 18.8 years. Manchester, Leeds and Bristol had the largest numbers of adolescents transferred to adult services in 2011.

Table 4.15 shows that of the transferred patients 65.6% were male, with ethnic minorities constituting 11.1% of patients. The vast majority (86%) had a functioning renal transplant at the time of transfer to an adult renal centre. Renal dysplasia ± reflux was the primary renal diagnosis in over a third of patients.

Survival of children on RRT during childhood

Of patients under the age of 16, 1,551 were identified as starting RRT between 1997 and 2010 at paediatric

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

	Hazard ratio	Confidence interval	p-value
Age			
0–1.99 years	5.13	2.62–10.03	<0.0001
2–3.99 years	2.69	1.20–6.02	0.02
4–7.99 years	1.48	0.65–3.34	0.35
8–11.99 years	1.19	0.52–2.71	0.68
12–16 years	1.00	–	–
Gender			
Female	1.31	0.88–1.94	0.19
Male	1.00	–	–
RRT modality			
Dialysis	6.04	3.28–11.15	<0.0001
Transplant	1.00	–	–

centres in the UK and were included in the survival analyses. At the census date (31st December 2011) there were a total of 104 deaths within the cohort on RRT at age <16, with a median follow up time of 3.4 years (range of 1 day to 15 years). Table 4.16 shows the survival hazard ratios after adjustment for age at start of RRT, gender and RRT modality, and highlights that children starting RRT at 0–1.99 years have the worst survival outcomes with a hazard ratio of 5.13 (CI 2.62–10.03, $p < 0.0001$) when compared to 12–16 years olds. Outcomes in the 2–3.99 age group were also significantly lower with a hazard ratio of 2.69 (CI 1.2–6.02, $p = 0.02$). Gender was not seen to have any impact on survival although being on dialysis as expected was seen to lower survival significantly compared to having a functioning transplant with a hazard ratio of 6.04 (3.28–11.15, $p < 0.0001$). Figure 4.5 shows unadjusted Kaplan Meier survival probabilities. 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. This figure again highlights worse outcomes for those aged 0–1.99 years.

Mortality data in 2011

There were nine deaths in renal paediatric centres in 2011. The reported mortality of children with treated ERF in 2011 in the UK at paediatric centres was 1.3% (9/675). The median age at death was 7.8 years with a range of 1.7 years to 16.9 years. Sepsis was cited as a cause of death in four patients, two of which were associated with peritonitis and one due to bowel

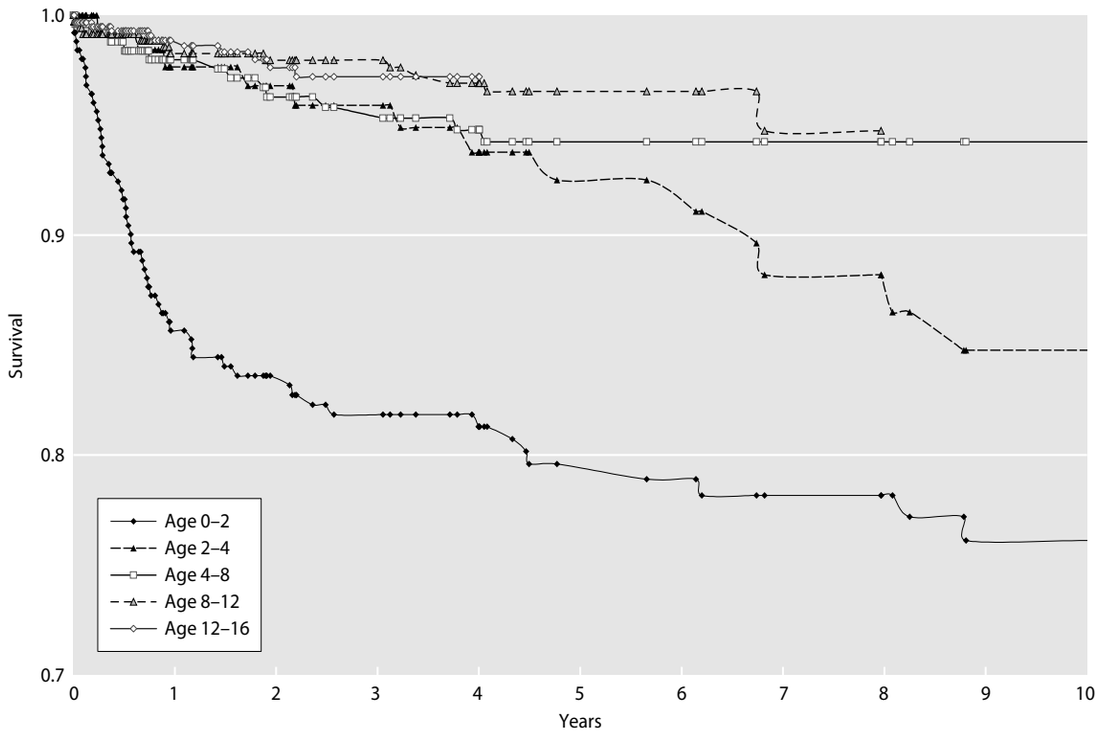

Fig. 4.5. Unadjusted KM in paediatric patients starting RRT between 1997 and 2010, by age at start

obstruction. Haemorrhage (gastrointestinal bleed and an intra-cerebral haemorrhage) was the cause of death in a further two patients. A clear cause of death could not be identified in the three remaining patients who died in 2011.

Discussion

This report from the Paediatric Renal Registry has focussed on the current demography and the demographic trends over the past 15 years of the UK paediatric ERF population.

This report includes 675 children and adolescents under 16 years of age, who were receiving RRT in 2011. The sub-section on the trends in demographics includes children and adolescents under 16 years of age on RRT; 534 from 1997–2001, 527 from 2002–2006 and 595 from 2007–2011.

Data completeness

The ongoing sustained effort to improve data accuracy must continue and the aim to move to full electronic annual returns from all centres remains. A revised data set (The NEW Paediatric Dataset) will be used for future registry returns. These ongoing efforts to improve the quality and consistency of the data received will be rewarded by enabling enhanced interpretation of centre specific measures of clinical performance.

Incidence, prevalence and trends

The incidence rate of RRT in the less than 16 year age group was 8.3 pmarp in 2011; this rate has been rising since 1997. The overall prevalence rate of RRT in the less than 16 year age group was 56.8 pmarp. The prevalence of RRT increased with age and was higher in males across all age groups. The number of children receiving RRT also continued to rise particularly in the under 2-year age group. Overall, there was a continuing trend of increased prevalence of children on RRT with increased age, in keeping with improved survival with increasing age. This coupled with an increase in the number of children receiving RRT over the past 15 years has led to a steady increase in the prevalent ERF population.

Treatment modality of ERF and observed trends 1997–2011

Peritoneal dialysis was the initial treatment modality for 48% of children at the start of treatment, 28% commenced HD and 24% received a pre-emptive transplant. Age influenced the modality of RRT with the majority of the under 2's (63%) receiving PD. Overall the majority of prevalent children (79%) on RRT had a functioning transplant.

Pre-emptive transplantation

Pre-emptive transplantation was seen to occur in 30% of children under 16 years age. The rate of pre-emptive transplantation has increased over the past 15 years (26.0% in 1997–2001 to 33% in 2007–2011). There were significantly lower rates of pre-emptive transplantation in girls and ethnic minorities and further detailed studies investigating these would be important.

Comorbidities

At the onset of RRT, 31% of patients had 1 or more associated comorbidity. This overall percentage has remained similar over the past 15 years. Of note is the significant variation in registered comorbidity rate between centres (43% to 88%, data not shown); it is likely that this is influenced by different reporting practices between centres. It is hoped that the recently agreed NEW Paediatric Dataset will help improve consistency and reliability of data submission thus improving report accuracy.

Causes of ERF and observed trends 1997–2011

As previously, renal dysplasia ± reflux (30%), glomerular disease (20%) and obstructive uropathy (16%) were the commonest listed aetiologies for children with ERF. These accounted for 66% of all patients for whom a primary diagnosis had been reported. Observation of trends over the 15-year period showed an increase in the percentage of children receiving RRT with unknown aetiology.

Transfer out and survival data

Data relating to transfer to adult renal services is included in the current report. The median age of transfer was 18.0 years. Of patients receiving RRT, 86% transferred with a functioning renal transplant. There appears to be variation in practice between centres regarding transition and transfer out arrangements; it is also likely that variability exists in reporting of 'transfer out' timelines to the registry for patients being transitioned to adult centres. Consensus regarding terminology will facilitate future comparative interpretation.

Survival data of children on ERF during childhood who commenced RRT between 1997 and 2010 highlights

the less favourable outcome for children less than 2 years of age. Longer term survival data up to 5 years was available for those <12 years and 10 year survival data for those <8 years only. For the majority of children on RRT long term survival data will need follow up in to young adulthood. This is the focus of an ongoing project of the UK Renal Registry.

Conflicts of interest: none

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UK Renal Registry 15th Annual Report: Chapter 5 Survival and Causes of Death of UK Adult Patients on Renal Replacement Therapy in 2011: national and centre-specific analyses

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Key Words

Cause of death · Comorbidity · Dialysis · End stage renal disease · Established renal failure · Haemodialysis (HD) · Median life expectancy · Outcome · Peritoneal dialysis (PD) · Renal replacement therapy (RRT) · Survival · Transplant · Vintage

Summary

- Unadjusted 1 year after 90 day survival for patients starting RRT in 2010 increased to 87.3% from 86.6% for those starting in 2009. This increase was mostly due to increased survival for patients starting RRT in 2010 aged <65 years, where survival increased to 93.5% from 92.4%.
- In incident patients aged ⩾65 years, unadjusted 1 year survival increased from 63.9% in 1997 to 77.0% in the 2010 cohort. An increase in survival was also observed between the 2009 cohort and 2010 cohort.
- In incident patients aged ⩾65 years the one year survival of diabetic patients was better than those of non-diabetic patients, and three year survival was similar.
- One year age adjusted survival for prevalent dialysis patients improved to 89.8% in the 2010 cohort from 89.1% in the 2009 cohort.
- One year survival for prevalent diabetic patients increased from 82.1% in the 2001 cohort to 84.7% in the 2010 cohort. An increase in survival was also observed between the 2009 cohort and 2010 cohort.
- RRT patients aged 30–34 had a mortality rate 18 times higher than the age matched general population, whereas RRT patients aged 85+ had a mortality rate only 2.5 times higher. The overall relative risk of death improved across most age groups in the 2010 cohort.
- In the prevalent RRT dialysis population, cardiovascular disease accounted for 22% of deaths, infection and treatment withdrawal 18% each and 25% were recorded as other causes of death.
- The median life years remaining for an incident patient aged 25–29 years was 18 years and approximately three years for a 75+ year old.

Introduction

The analyses presented in this chapter examine a) the survival from the start of renal replacement therapy (RRT); b) the survival amongst all prevalent RRT patients alive on 31st December 2010; c) the cause of death for incident and prevalent patients and d) the projected life years remaining for patients starting RRT. They encompass the outcomes from the total incident UK dialysis population reported to the UK Renal Registry (UKRR), including the 18% who started on peritoneal dialysis and the 7% who received a pre-emptive renal transplant. These results are therefore a true reflection of the outcomes in the whole UK RRT population. Analyses of survival within the 1st 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.

The prevalent patient group was defined as all patients over 18 years old, alive and receiving renal replacement therapy on 31st December 2010 who had been on RRT for at least 90 days at one of the UK adult renal centres.

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 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 members of a cohort of patients, without any adjustment for age or other factors 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.

To allow 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 been stable around an age of 65 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 in many analyses diabetic patients were also analysed separately and compared to non-diabetic patients. All analyses were undertaken using SAS 9.3.

Definition of renal replacement therapy start date

The incident survival figures quoted in this chapter are from the first day of renal replacement therapy 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 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 on 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

Patients were considered 'incident' at the time of their first RRT, thus patients re-starting dialysis after a failed transplant were not included.

Some patients recover renal function after more than 90 days but subsequently returned to RRT. If recovery was for less than 90 days, the start of renal replacement therapy was calculated from the date of the first episode and the recovery period ignored. If recovery was for 90 days or more, the length of time on RRT was calculated from the day on which the patient restarted RRT.

The incident survival cohort was **NOT** censored at the time of transplantation and therefore included the survival of the 7% 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].

The incident ('take-on') population in any specific year excludes those who recovered within 90 days from the start of RRT, but includes patients who recovered from ERF after 90 days. For 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.

The one year incident survival is for patients who started RRT in 2010 and followed up for one full year through 2010 and 2011 (e.g. patients starting RRT on 1st December 2010 were followed through to 30th November 2011). The 2011 incident patients could not be analysed as they had not yet been followed for a sufficient length of time.

For analysis of 1 year after 90 day survival, patients who started RRT in October through December 2010 were not included in the cohort, as data on these patients were not yet available to complete a full year of follow-up.

To help identify any centre differences in survival from the small centres (where confidence intervals are large), an analysis of 1 year after 90 day survival using a rolling 4 year combined incident cohort from 2007 to 2010 was also undertaken. For those centres which had joined the UKRR after 2007, data were not available for all the years but the available data were included.

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 days at risk for each patient (until death, recovery or lost to follow-up) expressed as years. All patients, even those who died within the first 90 days of RRT, were included in the death rate calculation.

Adjustment of 1 year after 90 day survival for the effect of comorbidity was undertaken using a rolling 5 year combined incident cohort from 2006 to 2010. Sixteen centres returned >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 all sixteen centres. The individual centre data were then further adjusted for average distribution of comorbidity present at these centres. The survival hazard function was calculated as the probability of dying in a short time interval considering survival to that interval.

Methodology for prevalent dialysis patient survival

For prevalent dialysis patients, all patients who had been established on dialysis for at least 90 days on 31st December 2010 were included in these analyses. Prevalent dialysis patients on 31st December 2010 were followed up in 2011 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 12% of the dialysis population aged under 65 and 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.

Methodology of cause of death

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

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

This year individuals with an ERA code 99 (Other identified cause of death) have been removed from category 'Uncertain' (where they were previously coded) to category 'Other' to reflect better coding of the data and bringing the registry in line with coding methodology adopted in other renal registries. This has substantially reduced the proportion of patient deaths due to 'Uncertain' cause of death with a rise noted in deaths from 'Other' causes.

Some centres had high completeness of data returns to the UKRR for cause of death, whilst others returned no information. Completeness of cause of death data was calculated for prevalent patients on RRT on 31st December 2010 as the percentage of patients that died in 2011 with cause of death data completed.

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 2000–2010. Previously, data analysis was limited to centres with a high rate of return for cause of death. When this was compared with an analysis of all the cause of death data reported to the UKRR, the percentages in the cause of death categories remained largely unchanged so the latter data were therefore included.

Analysis of prevalent patients included all those aged over 18 years and receiving RRT on 31st December 2010. The death rate was calculated for the UK general population (data from the Office of National Statistics) by age group and compared with the same age group for prevalent patients on RRT on 31st December 2010.

Methodology of median life expectancy (life table calculations)

Kaplan Meier survival analyses were used to calculate the hazard of death by age group (18–34, 35–44, 45–54, 55–64, 65–74, 75+) for incident patients starting RRT from 2000–2008, with at least three years follow-up from 2009 to 2011. The patient inclusion criteria are the same to that of the incident patient cohort described above. Patients were followed until death, censoring (recovery or lost to follow-up) or the end of the study period. Life expectancy which gives the probability of surviving until the next time period was calculated as: 1 – hazard of death. Median life years remaining is then the difference between the age when reaching the 50% probability of survival and the age of starting RRT.

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

Data on the UK population in mid-2011 and the number of deaths in each age group in 2011 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 2011 in RRT patients. The RRT observed death rate was calculated as number of deaths observed in 2011 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.

Results of incident (new RRT) patient survival

The 2010 incident cohort included 6,650 patients who started RRT, without any periods of renal function recovery lasting more than 90 days. The unadjusted 1 year after 90 day survival for incident patients starting RRT in 2010 (table 5.1) has increased to 87.3% compared to 86.6% in the 2009 cohort.

Comparison of survival between UK countries

Two years incident data have been combined to increase the size of the patient cohort, so that any differences between the four UK countries are more likely to be reliably identified (table 5.2). These data have 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 was no significant difference in the 90 day survival between the UK countries. One year after 90 day survival was significantly lower in Scotland compared to England. It has been postulated that a greater prevalence of cardiovascular disease in Scotland compared to England may account for the difference.

There are known regional differences in the life expectancy of the general population within the UK. Table 5.3 shows differences in life expectancy between the UK countries. These differences in life expectancy are not accounted for in these analyses and are likely to be one of the reasons behind the variation in survival between renal centres and UK countries.

Table 5.1. Unadjusted survival of incident patients, 2010 cohort

Interval	Survival (%)	*95% CI*	N
Survival at 90 day (%)	94.2	93.6–94.8	6,650
Survival 1 year after 90 days (%)	87.3	86.4–88.1	6,249

Table 5.2. Incident patient survival across the UK countries, combined 2 year cohort (2009–2010), adjusted to age 60

Interval	England	N Ireland	Scotland	Wales	UK
Survival at 90 days (%)	95.9	96.3	94.4	96.1	95.8
95% CI	*95.5–96.3*	*94.6–98.0*	*93.2–95.7*	*95.0–97.3*	*95.4–96.2*
Survival 1 year after 90 days (%)	90.0	90.7	87.5	87.8	89.7
95% CI	*89.4–90.7*	*88.0–93.6*	*85.6–89.4*	*85.7–90.0*	*89.1–90.4*

Table 5.3. Life expectancy in years in UK countries, 2008–2010 (source ONS [8])

	At birth		At age 65	
Country	Male	Female	Male	Female
England	78.6	82.6	18.2	20.8
Northern Ireland*	77.1	81.5	17.4	20.2
Scotland	75.8	80.4	16.8	19.3
Wales	77.6	81.8	17.7	20.3
UK	**78.2**	**82.3**	**18.0**	**20.6**

* provisional data from ONS

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 than those starting haemodialysis and were transplanted more quickly. The age adjusted 1 year survival estimates for incident patients starting RRT on HD and PD were 88.6% and 92.7% respectively, with 1 year survival increasing for HD patients from the previous year and remaining constant for PD patients (figure 5.1, table 5.4). The inclusion of Northern Ireland from 2005 did not significantly affect the survival for the UK in that year (table 5.4).

Table 5.4. One year after 90 day incident patient survival by first established modality 2004–2010 cohort (adjusted to age 60) (excluding patients whose first modality was transplantation)

	Age adjusted 1 year after 90 days % survival *95% CI*	
Year	HD	PD
2010	88.6	92.7
	87.6–89.7	*91.2–94.2*
2009	87.5	92.7
	86.4–88.6	*91.3–94.2*
2008	87.9	93.9
	86.9–89.0	*92.7–95.2*
2007	87.2	94.2
	86.1–88.3	*93.0–95.5*
2006	86.8	94.2
	85.7–88.0	*92.9–95.5*
2005	85.8	93.2
	84.6–87.0	*91.8–94.6*
2004*	85.7	90.4
	84.4–87.0	*88.7–92.1*

* Excludes Northern Ireland

Age

Tables 5.5 to 5.10 show survival of all incident patients, those aged 65 and above and those aged below 65 years, for up to ten years after start of renal replacement therapy. In the UK, short term survival (survival at 90 days) increased to 94.2% (93.9% for

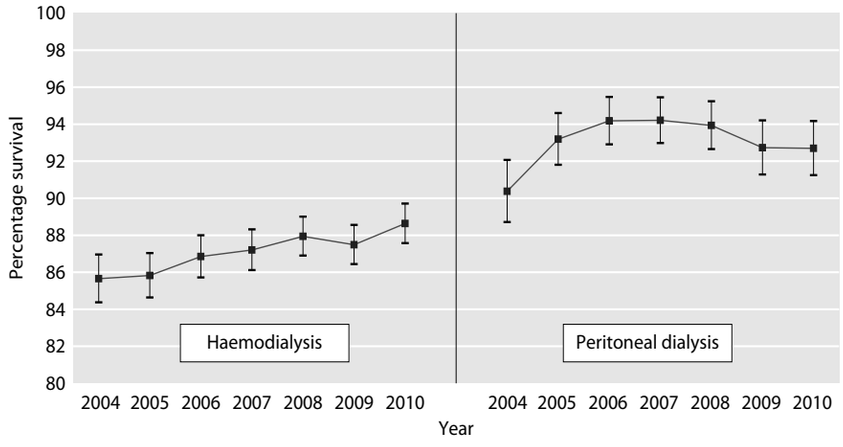

Fig. 5.1. Trend in 1 year after 90 day incident patient survival by first modality, 2004–2010 cohort (adjusted to age 60) (excluding patients whose first modality was transplantation)

Table 5.5. Unadjusted 90 day survival of incident patients, 2010 cohort, by age

Age	Survival (%)	*95% CI*	N
18–64	97.5	*97.0–98.0*	3,334
⩾65	90.9	*89.9–91.8*	3,316
All ages	94.2	*93.6–94.8*	6,650

Table 5.6. Unadjusted 1 year after day 90 survival of incident patients, 2010 cohort, by age

Age	Survival (%)	*95% CI*	N
18–64	93.5	*92.5–94.3*	3,241
⩾65	80.6	*79.1–82.0*	3,008
All ages	87.3	*86.4–88.1*	6,249

patients starting RRT in 2009) (table 5.5). Survival 1 year after 90 days also increased compared to last year and this was mainly due to an increase in survival for patients aged younger than 65 years (table 5.6). Longer term survival of patients on RRT continued to improve (tables 5.8, 5.9, 5.10). There was a steep decline in survival with advancing age (figures 5.2, 5.3).

Table 5.7. Increase in proportional hazard of death for each 10 year increase in age, 2010 incident cohort

Interval	Hazard of death for 10 year age increase	*95% CI*
First 90 days	1.65	*1.52–1.79*
1 year after first 90 days	1.58	*1.49–1.67*

Table 5.8. Unadjusted survival of incident patients, 1997–2010 cohort for patients aged 18–64

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
2010	**92.6**										***91.6–93.4***	**3,334**
2009	91.2	85.5									*84.2–86.6*	3,401
2008	91.9	86.5	81.8								*80.5–83.1*	3,472
2007	92.5	86.8	81.4	76.9							*75.5–78.3*	3,461
2006	91.4	85.7	80.9	76.3	72.8						*71.2–74.3*	3,158
2005	89.7	83.9	79.3	75.0	70.7	67.4					*65.6–69.0*	2,976
2004	89.9	84.0	77.9	72.3	67.8	63.8	60.6				*58.7–62.5*	2,638
2003	89.6	82.8	77.7	72.5	67.5	63.5	60.0	56.8			*54.7–58.8*	2,365
2002	88.6	81.7	76.3	71.2	66.5	62.8	59.2	56.5	53.9		*51.7–56.1*	2,078
2001	87.5	79.9	74.2	68.7	64.1	59.6	56.4	53.1	49.5	47.4	*45.1–49.7*	1,840
2000	89.4	81.9	75.3	70.4	65.1	60.3	56.2	53.0	50.7	48.1	*45.6–50.6*	1,586
1999	87.8	81.7	74.3	68.4	63.5	59.6	55.6	52.7	50.1	47.8	*45.1–50.4*	1,369
1998	86.9	79.7	72.9	67.7	61.8	56.9	53.0	50.7	47.9	46.6	*43.8–49.3*	1,271
1997	86.0	78.5	71.4	65.9	60.9	56.2	52.9	50.7	48.8	44.7	*41.2–48.1*	794

Table 5.9. Unadjusted survival of incident patients, 1997–2010 cohort for patients aged ⩾65

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
2010	**77.0**										***75.5–78.4***	**3,316**
2009	76.2	62.9									*61.2–64.5*	3,381
2008	75.8	62.9	52.2								*50.5–53.9*	3,234
2007	75.0	61.2	49.5	40.6							*38.9–42.3*	3,187
2006	72.5	59.4	48.4	38.4	30.8						*29.1–32.4*	3,154
2005	72.9	58.6	46.5	37.7	29.2	22.5					*21.1–24.0*	3,071
2004	68.6	54.7	43.3	34.3	26.8	20.7	16.1				*14.8–17.6*	2,713
2003	69.2	53.8	42.4	32.5	24.9	19.5	15.4	12.3			*11.0–13.7*	2,362
2002	65.9	51.3	40.8	32.7	25.3	19.0	14.6	11.8	9.2		*8.0–10.5*	2,168
2001	67.2	52.1	39.5	30.4	23.0	17.2	13.2	10.1	8.0	6.2	*5.2–7.4*	1,850
2000	66.4	53.1	40.2	29.3	23.0	18.3	14.2	10.3	8.1	6.0	*4.9–7.3*	1,505
1999	66.2	50.7	38.6	29.0	21.7	15.5	11.3	8.9	7.1	5.8	*4.6–7.2*	1,265
1998	64.0	47.0	36.7	27.8	20.8	15.0	10.9	7.5	5.4	4.1	*3.1–5.4*	1,139
1997	63.9	46.0	33.2	23.7	16.2	11.4	7.7	6.1	4.4	3.7	*2.4–5.5*	794

Table 5.10. Unadjusted survival of incident patients, 1997–2010 cohort for patients of all ages

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
2010	**84.8**										***83.9–85.6***	**6,650**
2009	83.8	74.2									*73.1–75.2*	6,782
2008	84.1	75.1	67.5								*66.4–68.7*	6,706
2007	84.1	74.5	66.1	59.5							*58.3–60.7*	6,648
2006	82.0	72.5	64.7	57.4	51.8						*50.5–53.0*	6,312
2005	81.2	71.1	62.7	56.1	49.6	44.6					*43.3–45.9*	6,047
2004	79.1	69.2	60.3	53.1	47.1	42.0	38.1				36.8–39.4	5,351
2003	79.4	68.4	60.1	52.6	46.3	41.6	37.8	34.7			*33.3–36.1*	4,727
2002	77.0	66.2	58.2	51.6	45.5	40.5	36.5	33.7	31.2		*29.8–32.6*	4,246
2001	77.4	66.0	56.9	49.6	43.6	38.4	34.8	31.7	28.9	26.9	*25.4–28.3*	3,690
2000	78.2	67.9	58.3	50.5	44.7	39.9	35.9	32.3	30.0	27.7	*26.1–29.3*	3,091
1999	77.4	66.8	57.2	49.5	43.4	38.4	34.3	31.7	29.4	27.6	*25.9–29.3*	2,634
1998	76.1	64.3	55.9	48.9	42.5	37.2	33.2	30.4	27.9	26.7	*24.9–28.4*	2,410
1997	76.7	64.8	55.3	48.1	42.1	37.4	33.9	32.0	30.1	27.4	*25.1–29.8*	1,375

There was a curvilinear increase in death rate per 1,000 patient years with age, shown in figure 5.3 for the period one year after 90 days. There were differences between the overall death rates across all age groups with the death rate in Scotland and Wales significantly higher than in England.

The effect of censoring age related survival at the time of transplantation

The current method for calculating survival for incident patients does not censor at transplantation. 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

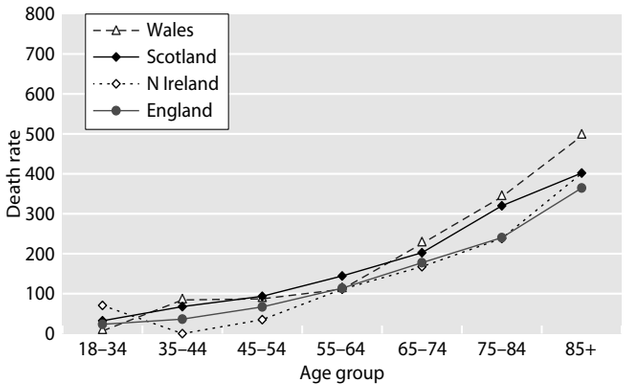

Fig. 5.3. One year after 90 days death rate per 1,000 patients years by UK country and age group for incident patients, 2007–2010 cohort

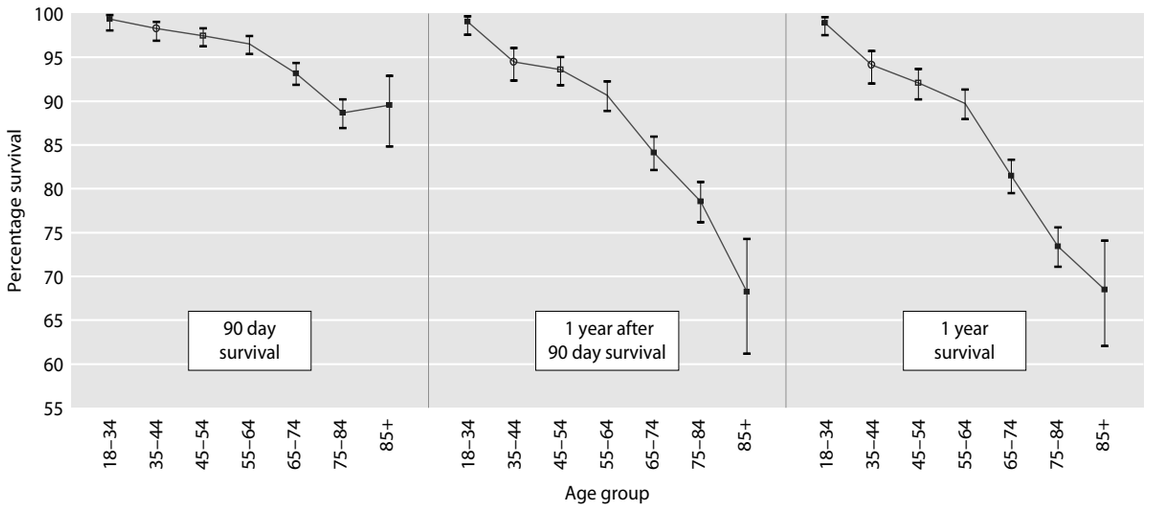

Fig. 5.2. Unadjusted survival of incident patients by age group, 2010 cohort

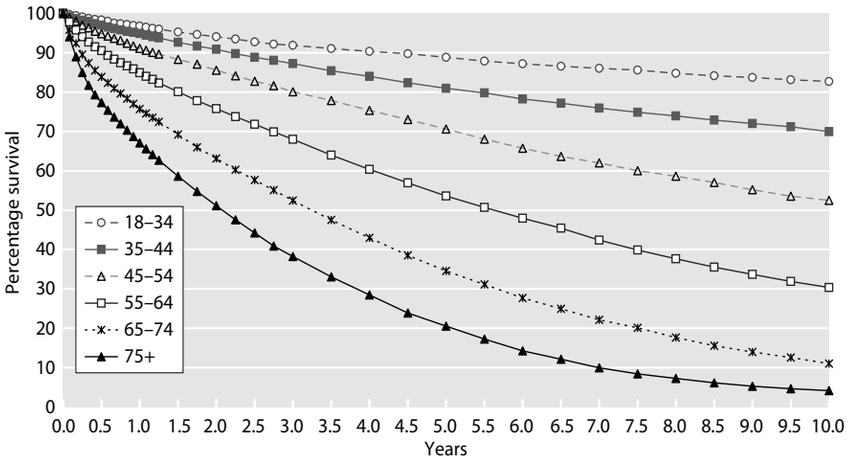

Fig. 5.4. Survival of incident patients (unadjusted), 1997–2010 cohort (from day 0), without censoring at transplantation

survived for 5.5 years and 50% of patients starting RRT aged between 65–74 survived for 3.3 years.

Figure 5.5 shows 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 6 years and 50% of patients aged between 65–74 years survived for 3.5 years.

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 82.7% (figure 5.4), which contrasts with a 59.1% survival if censoring at the time of transplantation (data not shown). For more detailed information on this effect, refer to the 2008 Report [9].

Age and hazard of death by age in the first 12 months

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.

A 10 year increase in patient age was associated with a 1.65 times increased risk of death within 90 days and a 1.58 times increased risk of death within 1 year after 90 days (table 5.7).

Changes in survival from 1997–2010 cohort

The death rate per 1,000 patient years in the first year of starting RRT from 1997 to 2010 is shown in figure 5.7. There was a declining trend in the overall death rate with a steeper rate of decline in the older age group (aged 65 years and older), although this appears to have levelled off during the last three 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 unadjusted survival analyses (tables 5.8, 5.9, 5.10, figures 5.7, 5.8, 5.9) and annual death rates show a large

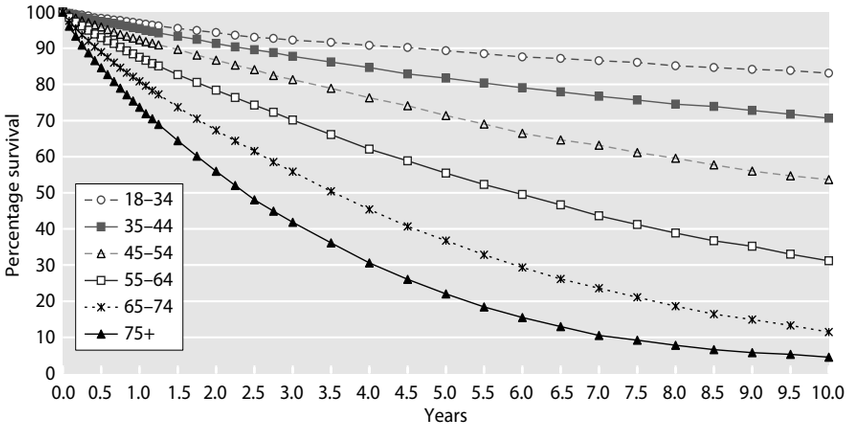

Fig. 5.5. Survival of incident patients (unadjusted), 1997–2010 cohort (from day 90), without censoring at transplantation

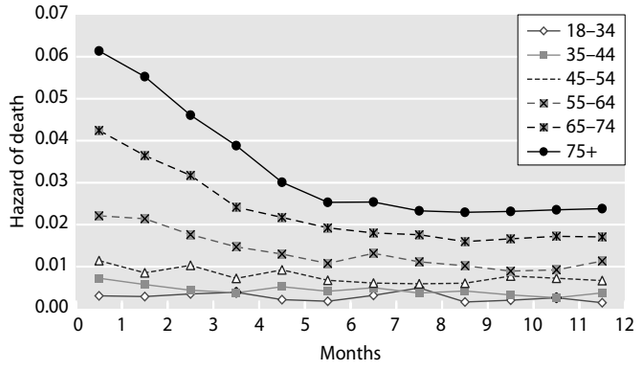

Fig. 5.6. First year monthly hazard of death, by age group 1997–2010 combined incident cohort

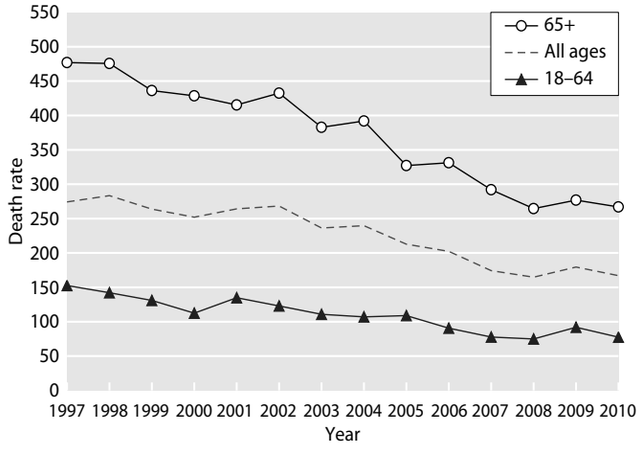

Fig. 5.7. One-year incident death rate per 1,000 patient years by age group, 1997–2010 cohort

improvement in 1 to 10 year survival across the years for both those aged under and over 65 years. One year survival amongst patients aged less than 65 years at start of RRT has improved from 86.0% in the 1997 cohort to 92.6% in the 2010 cohort.

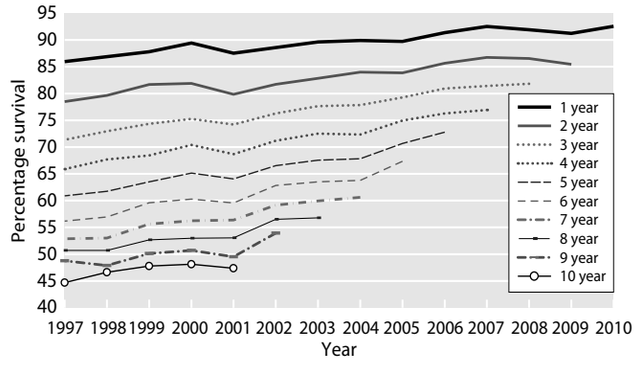

Fig. 5.8. Change in long term survival by year of starting RRT, for incident patients aged 18–64 years

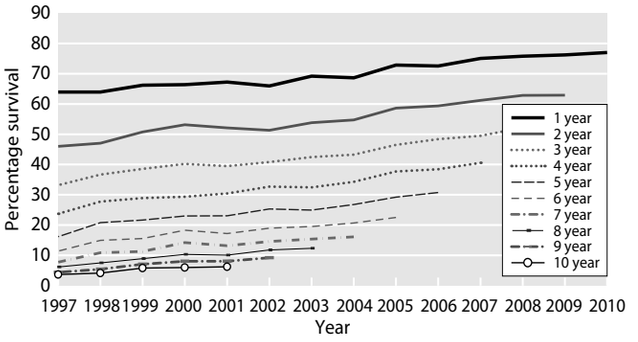

Fig. 5.9. Change in long term survival by year of starting RRT, for incident patients aged >65 years

Similarly, for patients aged 65 years and over there has been a 13.1% absolute improvement in one year survival from the 1997 to 2010 cohorts. As these are observational data it remains difficult to attribute this reduction in risk of death to any specific improvements in care.

Gender

There were no survival differences between genders and these data are shown in figure 5.10 in an incident cohort of patients starting RRT from 2000 to 2008 and followed up for a minimum of three years until 2011. Gender differences were investigated in the first 90 days and 1 year after the first 90 days and there was also no evidence of a survival difference (data not shown).

Change in survival on renal replacement therapy by vintage

Incident RRT patients in the UK continued to show little evidence of a worsening prognosis with time on RRT (vintage) when comparing survival without censoring for transplantation. Figure 5.11 shows the instantaneous hazard of death by age group. The apparent vintage

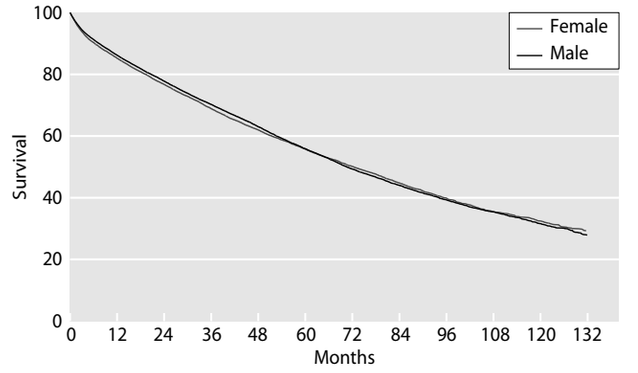

Fig. 5.10. Long term survival of incident patients by gender, 2000–2008 combined cohort, adjusted to age 60

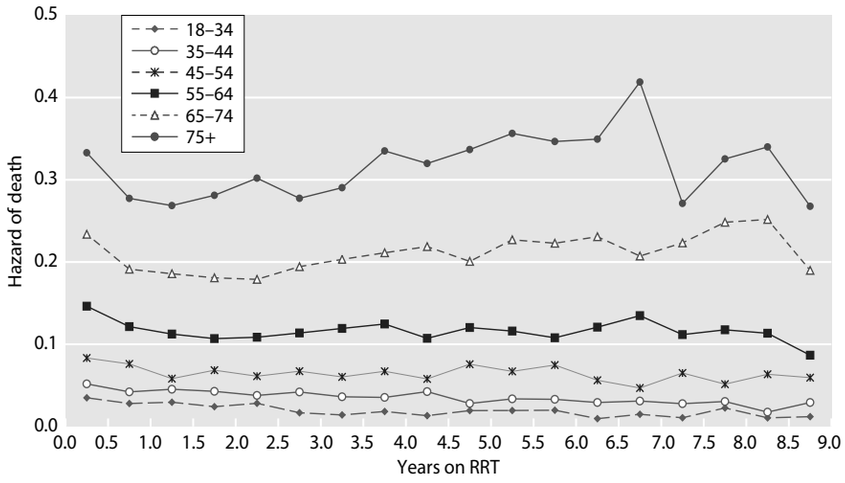

Fig. 5.11. Six monthly hazard of death, by vintage and age group, 1997–2010 incident cohort after day 90 (not censored at transplantation)

effect when censoring for transplantation is at least in part because these younger and healthier patients are only included in the survival calculation up to the date of transplantation (data not shown). In the older age groups there were decreasing numbers remaining alive beyond seven years accounting for the increased variability seen. Figures 5.12 and 5.13 show these data for the non-diabetic and diabetic patients respectively. Non-diabetic patients were defined as all incident patients excluding patients with diabetes as primary renal disease and with a missing primary renal diagnosis code.

Time trend changes in incident patient survival, 1999–2010 cohort

The time trend changes are shown in figure 5.14. The left hand plot, which includes only those centres that have been sending data continuously since 1999, shows a similar improvement in survival to the plot in which data from all renal centres are analysed.

Analysis of centre variability in 1 year after 90 days survival

The one year after 90 day survival for the 2010 incident cohort is shown in figure 5.15 for each renal centre. The tables for these data and for 90 day survival are given in appendix 1 at the end of this chapter (tables 5.25, 5.26). The age adjusted individual centre survival for each of the last nine years can also be found in appendix 1, table 5.27. There was much variability in survival between centres, but these results have to be interpreted cautiously as they were not adjusted for comorbidity, ethnicity or primary renal disease and patient numbers were small in many centres. Survival results for centres with less than 20 incident patients in 2010 (Clwyd, Dumfries & Galloway and Ulster) are not shown in figure 5.15, although they were included in the national and UK survival calculations.

In the analysis of 2010 incident cohort survival data, some of the smaller centres had wide confidence intervals (figure 5.15) due to small numbers of patients. This was

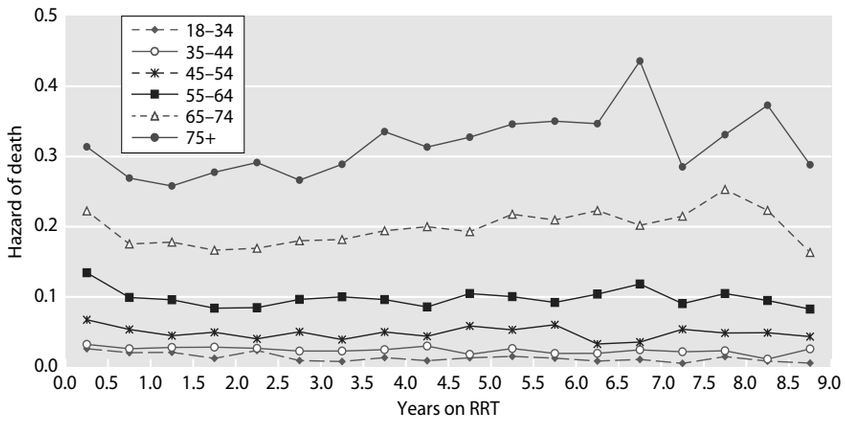

Fig. 5.12. Six monthly hazard of death, by vintage and age group, 1997–2010 non-diabetic incident cohort after day 90 (not censored at transplantation)

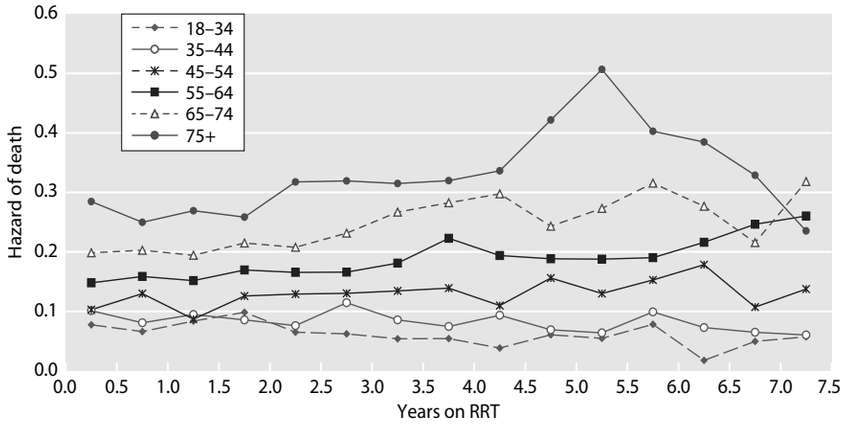

Fig. 5.13. Six monthly hazard of death, by vintage and age group, 1997–2010 diabetic incident cohort after day 90 (not censored at transplantation)

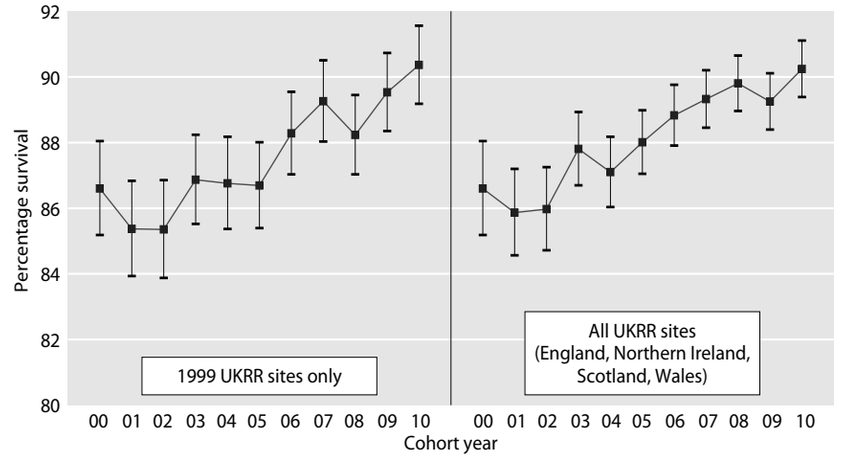

Fig. 5.14. Change in one-year after 90 day survival, 2000–2010 incident cohort (adjusted to age 60)
Showing 95% confidence intervals

addressed by including a larger cohort across several years, which will also assess sustained performance. Similar to previous years, this is shown as a rolling four year cohort from 2007 to 2010. These data are presented as a funnel plot in figure 5.16. For any number of patients in the incident cohort (x-axis) one can identify whether any given survival rate (y-axis) falls within, plus or minus 2 standard deviations (SDs) from the national mean (solid lines, 95% limits) or 3 SDs (dotted lines, 99.9% limits). Table 5.11 allows

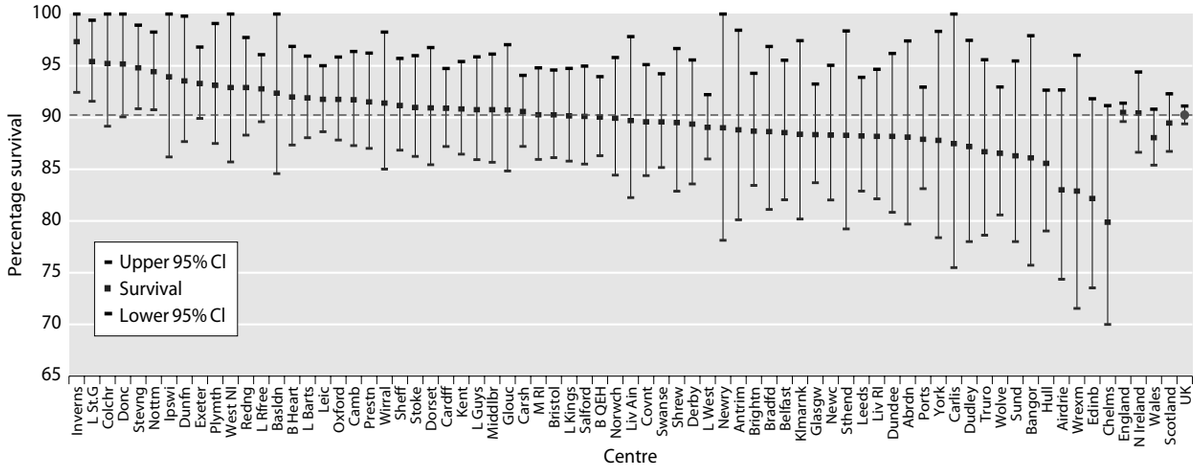

Fig. 5.15. Survival one-year after 90 days, adjusted to age 60, 2010 incident cohort

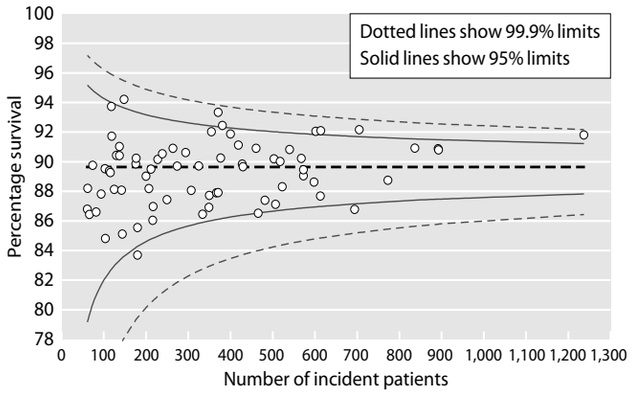

Fig. 5.16. Funnel plot for age adjusted 1 year after 90 days survival, 2007–2010 incident cohort

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. Two centres (Dudley and Cardiff) had survival below the 95% lower limit; this may be due to past performance as both were near average for the 2010 cohort. Seven centres (Ipswich, London St. George's, Stevenage, Sheffield, London Guys, London Royal Free and London West) had survival above the 95% upper limit. With 72 centres it would be expected that only three centres would be outside these limits by chance. It is 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

Table 5.11. Adjusted (to age 60) 1 year after 90 day survival, 2007–2010 incident cohort

Centre	N	1 year after 90 day survival %	Centre	N	1 year after 90 day survival %
D & Gall	61	86.8	Stoke	350	87.7
Ulster	62	88.2	Redng	355	92.0
Clwyd	66	86.4	Newc	367	87.9
Newry	74	89.7	Hull	371	87.9
Wrexm	82	86.6	L St.G	371	93.3
Inverns	94	87.8	B Heart	377	90.2
Colchr	103	89.5	Stevng	381	92.4
Carlis	104	84.8	Liv RI	400	91.9
Bangor	113	89.4	Covnt	419	91.1
Sthend	116	89.3	Camb	428	89.8
West NI	118	93.7	Brightn	430	89.7
Donc	119	91.7	Nottm	461	90.9
Basldn	125	88.1	Swanse	466	86.5
Antrim	130	90.4	Prestn	482	87.4
Dunfn	137	90.4	Exeter	503	90.2
York	137	91.0	Salford	507	87.1
Klmarnk	142	88.1	Leeds	518	90.0
Liv Ain	144	85.1	L Kings	523	88.3
Ipswi	148	94.2	Kent	540	90.8
Chelms	176	89.8	Oxford	568	90.2
Truro	177	90.2	M RI	573	89.5
Airdrie	180	85.5	Ports	573	89.0
Dudley	180	83.7	Bristol	598	88.6
Wirral	200	89.0	Sheff	602	92.1
Abrdn	207	88.2	Glasgw	613	87.7
Shrew	212	89.5	L Guys	614	92.1
Sund	216	86.0	Cardff	694	86.8
Dundee	217	87.0	L Rfree	705	92.2
Glouc	228	90.2	Carsh	773	88.7
Plymth	239	90.5	L Barts	837	90.9
Bradfd	250	87.4	B QEH	892	90.9
Dorset	264	90.9	Leic	893	90.8
Belfast	274	89.7	L West	1,237	91.8
Derby	294	90.6	**England**	**21,061**	**90.0**
Wolve	307	88.1	**N Ireland**	**658**	**90.4**
Norwch	325	89.7	**Scotland**	**1,985**	**87.5**
Edinb	334	86.4	**Wales**	**1,421**	**86.9**
Middlbr	349	86.9	**UK**	**25,125**	**89.6**

Table 5.12. The effect of adjustment for age, PRD and comorbidity on survival, 2006–2010 incident cohort, % survival 1 year after 90 days

Centre*	Unadjusted	Age adjusted	Age, PRD adjusted	Age, PRD and comorbidity adjusted
Swanse	81.5	87.5	88.5	90.1
Carlis	82.0	84.8	86.4	87.6
Ulster	83.1	88.9	89.6	89.5
Sund	83.7	86.1	87.0	87.3
Bradfd	84.9	86.7	87.7	88.7
Hull	85.6	88.8	89.6	90.0
Dorset	86.2	91.1	91.2	91.1
L Kings	86.3	88.4	89.6	89.7
Derby	87.1	90.8	91.7	91.9
Wolve	87.1	89.7	90.2	90.2
Middlbr	87.5	90.2	90.8	91.3
Bristol	87.9	90.8	91.4	91.5
York	88.7	91.7	92.2	91.7
Nottm	90.6	92.6	93.2	93.5
Truro	90.7	93.5	93.8	93.2
Kent	92.4	94.4	94.5	94.3
All 16 centres	87.0	90.0	90.8	91.0

* Centre included if >85% comorbidity data available

been censored at transplantation, so the effect of differing centre rates of transplantation was not taken into account. Variation in the proportion of patients with terminal illness receiving RRT between centres could also contribute to variations in survival and provide a possible explanation for lower survival than expected for that centre. The funnel plot analysis shows an improvement in survival from the previous year, when six centres were outliers below the 95% lower limits compared to two centres in this most recent analysis.

Analysis of the impact of adjustment for comorbidity on the 1 year after 90 day survival

Although comorbidity returns to the UKRR have remained poor, there was an increase in the number of centres returning more than 85% of comorbidity data to the UKRR for patients starting RRT in 2010. Using the combined incident cohort from 2006–2010, it was found that 16 centres had returned comorbidity data for more than 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 diagnoses for all 16 centres. Further adjustment was then made to the average distribution of comorbidities present at those centres.

Research has suggested that adjustment for comorbidity explains a modest part of the variance in ERF patient outcomes [10]. At centre level however, the prevalence of comorbidities could vary substantially between patient populations of different centres and it could be expected that adjustment for comorbidity may explain an increased amount of the variance in outcome. It can be seen that adjustment for age has the largest effect, most notably in those centres with the lower unadjusted survival figures. There were only minor differences for most centres after adjustment for primary renal diagnosis. In four centres (Swansea, Carlisle, Bradford and Middlesbrough) adjustment for comorbidity had a noticeable effect on adjusted survival (table 5.12, figure 5.17) helping explain the lower survival noted in figure 5.15.

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 (65 years and older) was worse compared to diabetic patients in the same age group during the first 90 days of starting RRT in 2010 (figure 5.18) and in the subsequent year (figure 5.19); this might be due to patient selection.

Long term survival for diabetic and non-diabetic patients was evaluated in a cohort of patients starting RRT from 2000 to 2008 with a minimum of three years follow-up until 2011. These data show large differences in the 18–44 year and 45–64 year age groups between diabetic and non-diabetic patient survival, but there

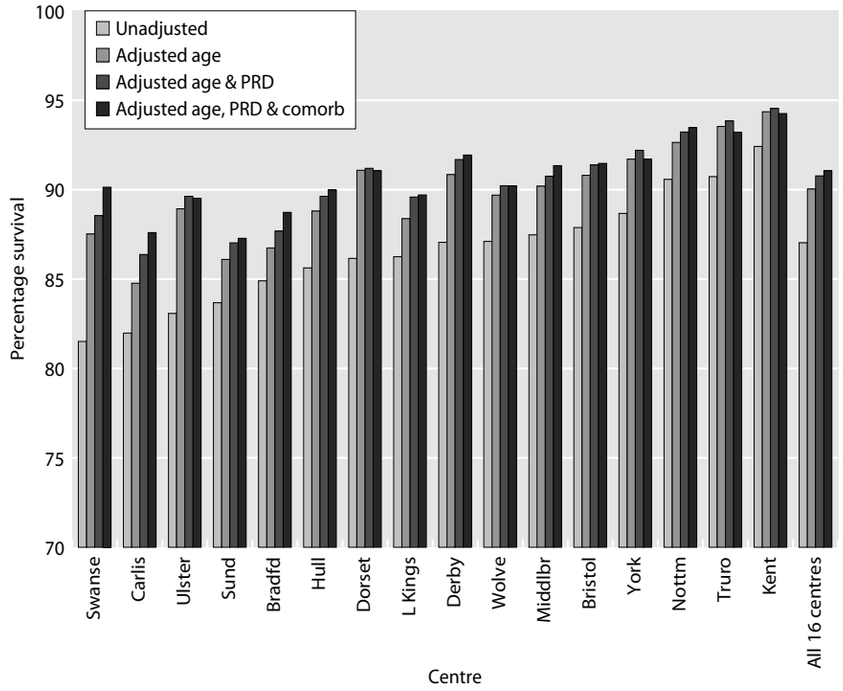

Fig. 5.17. The effect on survival after sequential adjustment for age, PRD and comorbidity, 2006–2010 incident cohort

was very little difference in three year survival between diabetics and non-diabetics in the older age group. In the age group 18–44, 90% of non-diabetic patients were alive five years after start of RRT compared to 70% for diabetic patients. In the age group 45–64, 67% of non-diabetic patients were alive 5 years after start of RRT compared to 48% for diabetic patients (figure 5.20).

Standard primary renal disease and survival

It is hard to set survival standards because these should be age, gender, ethnicity and comorbidity adjusted and this is not yet possible from UKRR data. The current 5th edition of the Renal Association Clinical Practice Guidelines [11] does not set any standards for audit of patient survival.

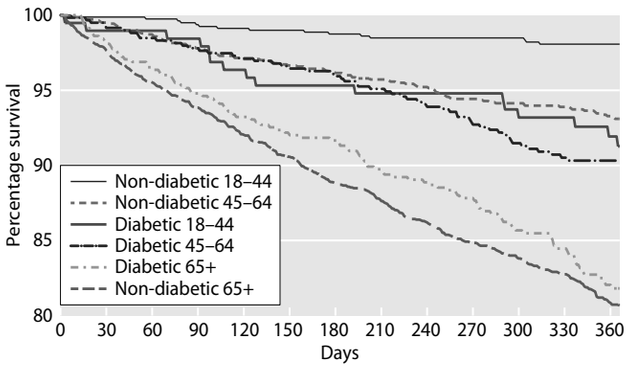

Fig. 5.19. Survival at 1 year after 90 days for incident diabetic and non-diabetic patients by age group for patients starting RRT in 2010

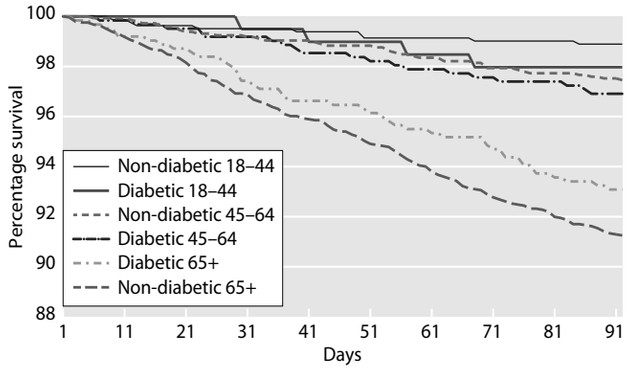

Fig. 5.18. Survival at 90 days for incident diabetic and non-diabetic patients by age group for patients starting RRT in 2010

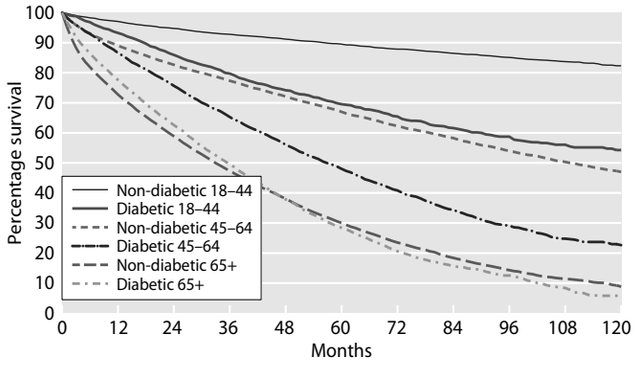

Fig. 5.20. Long term survival for incident diabetic and non-diabetic patients by age group, cohort 2000–2008, followed up for a minimum of 3 years

Table 5.13. One-year incident dialysis patient survival (from day 0–365), patients aged 18–54, 2010 and 2002 cohort (excludes patients whose first modality was transplantation)

	2010 cohort		2002 cohort	
First treatment	Standard primary renal disease[a]	All primary renal diseases except diabetes[b]	Standard primary renal disease[a]	All primary renal diseases except diabetes[b]
All dialysis %	96.1	94.3	95.4	93.9
95% CI	*94.6–97.2*	*93.0–95.4*	*93.7–97.1*	*92.2–95.5*
HD %	95.5	93.0	93.4	91.6
95% CI	*93.5–96.9*	*91.2–94.5*	*90.7–96.0*	*89.2–94.0*
PD %	97.3	97.3	98.6	97.9
95% CI	*94.7–98.7*	*95.2–98.5*	*71.1–100*	*96.3–99.6*

[a] Includes patients with EDTA diagnostic codes 00-49
[b] Excludes patients with diabetes as primary renal disease and patients with a missing primary renal disease code

The 3rd Renal Standards document defined standard primary renal disease using the EDTA-ERA diagnosis codes (including only codes 00–49); this excluded patients with renal disease due to diabetes and other systemic diseases. It is more widespread practice to simply exclude patients with diabetes, so these analyses are also included in this report to allow comparison with reports from other registries. The survival for patients starting RRT in 2010 in younger age groups (aged 18–54) and followed up for a maximum of one year is shown in table 5.13. For a longer term comparison, the 2002 cohort is also included (table 5.13).

Results of prevalent patient survival analyses

Tables 5.14 and 5.16 show the one year survival on dialysis, after censoring at the time of transplantation. Patients who have been on dialysis for less than 90 days were excluded. One year survival for prevalent dialysis patients improved to 89.8% in the 2010 cohort from 89.1% in the 2009 cohort.

Table 5.15 gives the 2010 cohort one year death rate for prevalent dialysis patients in each UK country. The one-year death rate in Scotland was significantly higher than in England.

Figure 5.21 shows the one year survival of dialysis patients who were alive and receiving dialysis on 31st December 2010, stratified by age group.

One year survival of prevalent dialysis patients by centre

The age-adjusted one year survival of dialysis patients in each centre is shown in table 5.14 and is illustrated in figures 5.22 and 5.23; the data for those patients aged <65 years and those aged 65 years and over are separated. Figure 5.24 shows the age adjusted (adjusted to age 60) data and in figure 5.25 as a funnel plot. The solid lines show the 2 standard deviation limits (95% limits) and the dotted lines the limits for 3 standard deviations (99.9% limits). With over 70 centres included, it would be expected by chance that three centres would fall outside the 95% (1 in 20) confidence limits. The survival for three centres (Sunderland, Newcastle and Edinburgh) was below the 95% confidence limits and for five centres (Middlesbrough, Cambridge, Stevenage, London Barts and London Guys) was above the 95% confidence limits. The funnel plot analysis shows an improvement in prevalent dialysis patient survival compared to the 2009 cohort when four centres were outliers below the 95% lower limits compared to three centres in this most recent analysis. The number of centres that were outliers above the 95% upper limit increased from two in the 2009 cohort to five in this most recent analysis.

The effect of censoring at transplantation on survival was investigated in the 2010 prevalent dialysis cohort. Results show that this had a minimal effect on prevalent dialysis patient 1 year survival and outlier status (data not shown). Table 5.14 allows centres in figure 5.25 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.

The one year death rate in prevalent dialysis patients in the 2010 cohort by age group

The death rates for prevalent patients on dialysis by age group are shown in figure 5.26. The younger patients included in this analysis are a selected higher risk group, as the similar aged transplanted patients have been

Table 5.14. One year survival of prevalent dialysis patients in each centre (adjusted to age 60), 2010 cohort

Centre	N	Adjusted 1 year survival	*Lower 95% CI*	*Upper 95% CI*
England				
B Heart	449	89.3	86.8	91.9
B QEH	1,020	91.1	89.5	92.7
Basldn	178	91.3	87.8	95.0
Bradfd	211	88.1	84.1	92.3
Brightn	429	88.4	85.8	91.1
Bristol	500	89.6	87.3	92.0
Camb	449	93.0	91.1	95.1
Carlis	71	93.3	88.3	98.6
Carsh	804	90.0	88.2	91.8
Chelms	163	84.1	79.3	89.1
Colchr	105	88.9	83.9	94.2
Covnt	425	90.9	88.5	93.4
Derby	324	90.2	87.4	93.1
Donc	160	91.7	88.1	95.5
Dorset	295	89.9	87.0	92.8
Dudley	207	87.6	83.6	91.8
Exeter	410	88.1	85.6	90.8
Glouc	224	89.5	86.2	92.9
Hull	388	89.9	87.3	92.7
Ipswi	147	92.0	88.1	96.0
Kent	417	89.9	87.4	92.5
L Barts	954	91.7	90.1	93.4
L Guys	603	93.8	92.1	95.6
L Kings	533	90.1	87.8	92.5
L Rfree	721	91.7	89.9	93.5
L St.G	334	91.9	89.4	94.5
L West	1,363	90.8	89.4	92.2
Leeds	571	88.8	86.5	91.2
Leic	906	89.8	88.0	91.6
Liv Ain	119	89.2	84.3	94.3
Liv RI	501	91.0	88.7	93.4
M RI	517	88.3	85.7	91.0
Middlbr	291	93.2	90.7	95.8
Newc	313	85.3	81.7	89.0
Norwch	357	91.1	88.7	93.6
Nottm	479	90.0	87.6	92.5
Oxford	501	88.0	85.4	90.6
Plymth	181	89.9	86.1	93.8
Ports	546	88.1	85.6	90.6
Prestn	542	88.2	85.7	90.7
Redng	319	89.7	86.8	92.7
Salford	473	87.6	84.8	90.5
Sheff	641	88.8	86.6	91.0
Shrew	210	87.7	83.8	91.7
Stevng	477	92.6	90.6	94.8
Sthend	140	90.5	86.4	94.8
Stoke	366	90.9	88.3	93.5
Sund	195	83.8	79.1	88.8
Truro	168	89.0	85.2	93.0
Wirral	220	90.6	87.2	94.2
Wolve	362	89.2	86.4	92.1
York	149	84.0	79.0	89.3
N Ireland				
Antrim	156	92.8	89.5	96.2
Belfast	295	90.2	87.2	93.3
Newry	120	92.0	87.8	96.5
Ulster	101	90.4	85.9	95.2
West NI	170	91.4	87.8	95.1
Scotland				
Abrdn	229	89.2	85.5	93.0
Airdrie	185	88.5	84.2	93.0
D & Gall	62	91.2	85.6	97.2
Dundee	205	88.4	84.8	92.2
Dunfn	167	90.1	86.3	94.2
Edinb	338	83.3	79.6	87.1
Glasgw	672	88.1	85.9	90.4
Inverns	107	86.8	81.5	92.4
Klmarnk	189	89.0	85.2	93.0
Wales				
Bangor	111	86.8	81.5	92.6
Cardff	567	88.4	86.1	90.8
Clwyd	70	92.3	86.9	97.9
Swanse	406	89.4	86.8	92.0
Wrexm	107	87.3	82.0	93.0
England	**21,428**	**89.9**	**89.5**	**90.4**
N Ireland	**842**	**91.2**	**89.5**	**92.9**
Scotland	**2,154**	**87.8**	**86.6**	**89.1**
Wales	**1,261**	**88.7**	**87.2**	**90.3**
UK	**25,685**	**89.8**	**89.3**	**90.2**

Table 5.15. One-year death rate per 1,000 prevalent dialysis patient years in the 2010 cohort and median age of prevalent patients by country

	England	N Ireland	Scotland	Wales
Death rate	142	131	171	171
95% CI	137–148	107–160	153–190	148–197
Median age	65.7	67.8	64.6	67.9

excluded. The increase in the death rate was not linear with age; with a 10 year increase in age in the younger patients, the death rate increased by about 20 deaths per 1,000 patient years compared with an increase of 100 deaths per 1,000 patient years in the older age groups. The apparent differences between the countries were not statistically significant except for Scotland where the death rate was significantly higher compared to England.

Table 5.16. One-year survival of prevalent RRT patients in the UK (unadjusted unless indicated otherwise)

Patient group	Patients	Deaths	Survival	*95% CI*
Dialysis patients 2010 cohort				
All	25,685	3,342	86.5	*86.0–86.9*
All–adjusted age 60	25,685	3,342	89.8	*89.3–90.2*
2 year survival dialysis patients				
All patients on 31/12/2009	25,232	6,099	73.9	*73.4–74.5*
Dialysis patients 2010 cohort				
All age <65	12,419	900	92.2	*91.7–92.7*
All age 65+	13,266	2,442	81.4	*80.7–82.0*
Non-diabetic <55	5,864	227	95.8	*95.2–96.3*
Non-diabetic 55–64	3,639	309	91.0	*90.0–91.9*
Non-diabetic 65–74	4,536	634	85.7	*84.6–86.7*
Non-diabetic 75+	5,662	1,238	78.0	*76.9–79.1*
Non-diabetic <65	9,503	536	93.9	*93.4–94.4*
Diabetic <65	2,479	339	85.7	*84.3–87.1*
Non-diabetic 65+	10,198	1,872	81.4	*80.6–82.1*
Diabetic 65+	2,600	497	80.8	*79.2–82.2*

Cohorts of patients alive on 31/12/2010 unless indicated otherwise

One year survival of prevalent dialysis patients by UK country, 1999 to 2010 cohort

One year survival for prevalent patients seemed to be improving in most of the UK countries (figure 5.27). In Northern Ireland and Wales numbers were much smaller, the death rate was therefore more variable with very wide confidence intervals and it is difficult to draw conclusions on trends in these countries. The change in prevalent survival by centre over the cohort years 2001 to 2010 is shown in this chapter, appendix 1, table 5.28.

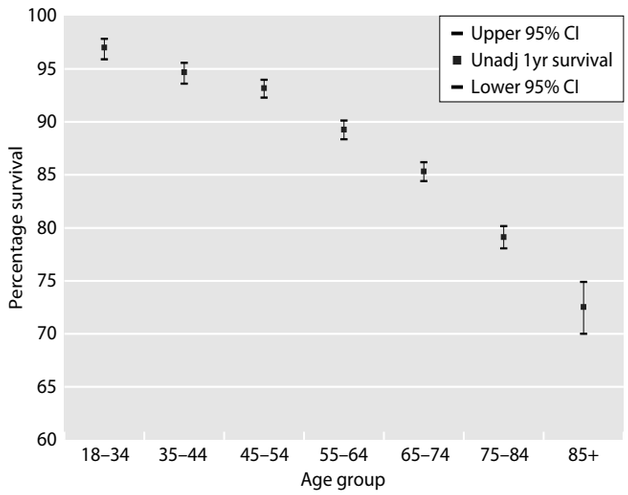

Fig. 5.21. One year survival of prevalent dialysis patients by age group, 2010 cohort

One year survival of prevalent dialysis patients with a primary diagnosis of diabetes, 2001 to 2010 cohort years

The age-adjusted survival for patients with diabetic renal disease in the UK has increased in the 2010 cohort year after a slow down in the preceding three years (table 5.17).

Death rate on RRT compared with the UK general population

The death rate compared to the general population is shown in table 5.18. Figure 5.28 shows that the relative risk of death on RRT decreased with age from 18 times that of the general population at age 30–34 years to 2.5 times the general population at age 85 and over. Figure 5.28 also shows that the relative risk of death has decreased substantially for the younger age groups (<50 years of age) compared to the relative risk of death in the 1998–2001 cohort. The relative risk of death decreased to 6.1 in the 2010 cohort compared to 6.6 in the 2009 cohort. With the reduction in rates of death on RRT over the last 10 years, the relative risk of death is falling (7.7 in 1998–2001 cohort, 6.1 in 2010 cohort).

Results of analyses on causes of death

Data completeness

Data completeness for cause of death data in the UK has increased by about 5% compared with the 2009

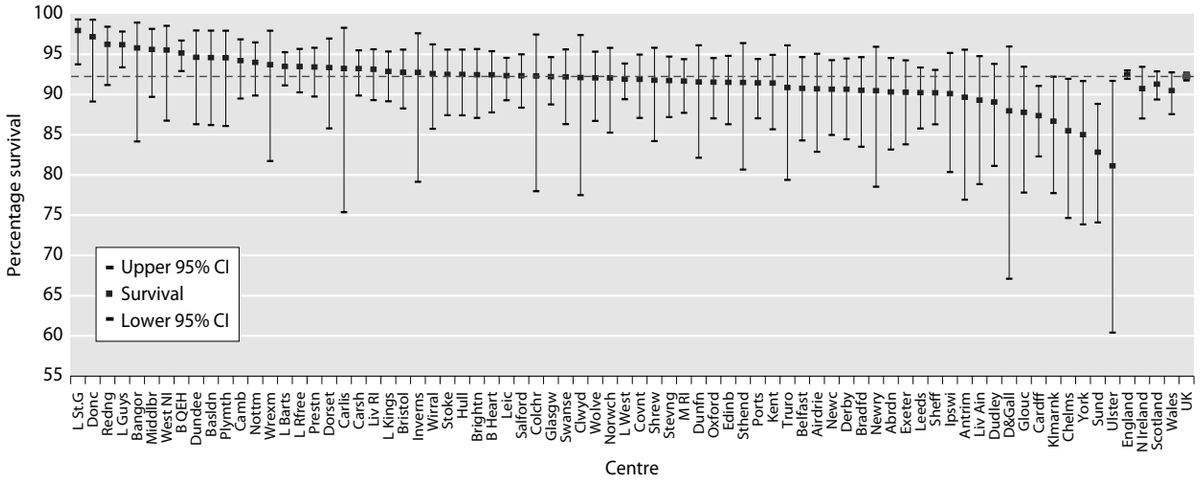

Fig. 5.22. One year survival of prevalent dialysis patients aged under 65 by centre, 2010 cohort

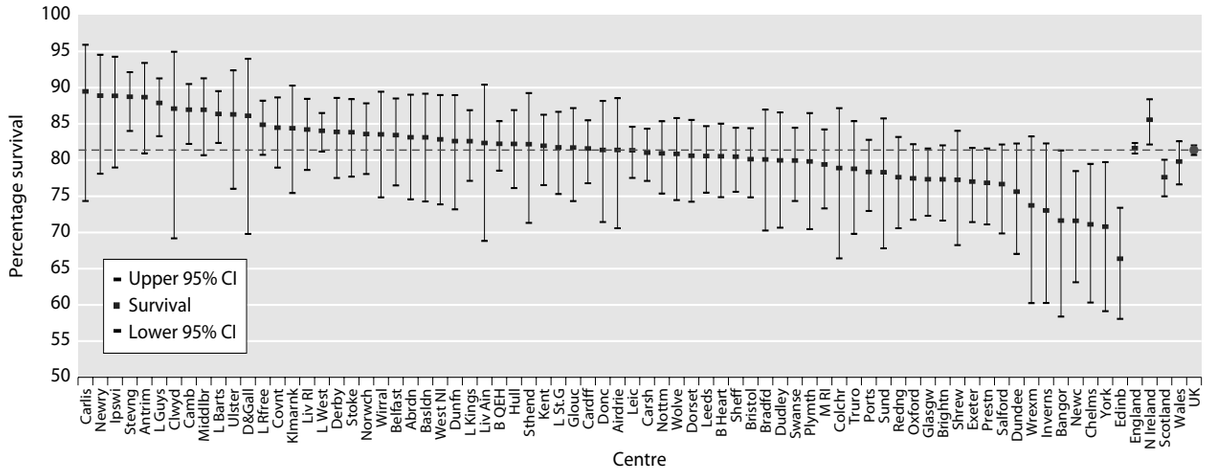

Fig. 5.23. One year survival of prevalent dialysis patients aged 65 years and over by centre, 2010 cohort

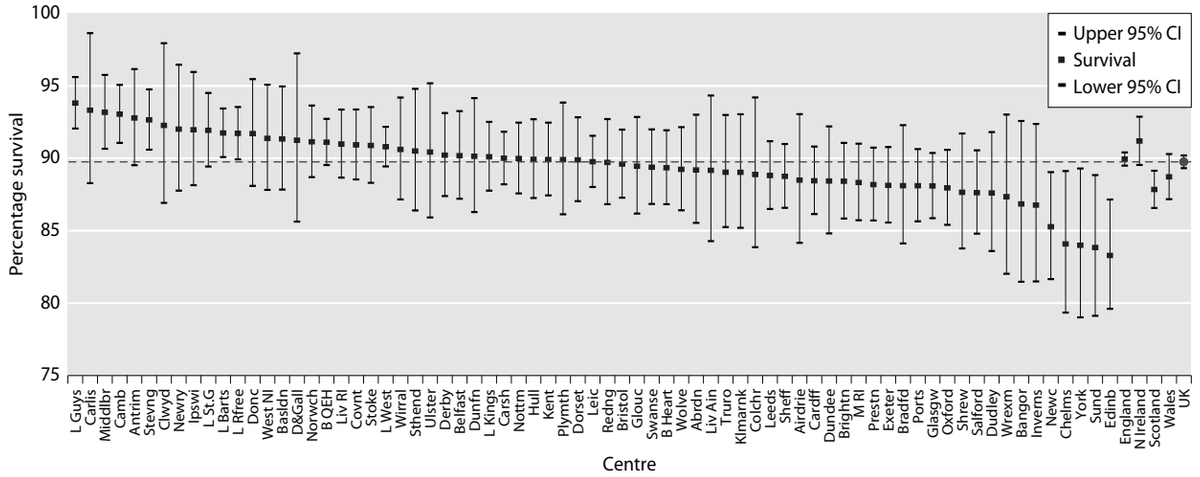

Fig. 5.24. One year survival of prevalent dialysis patients by centre adjusted to age 60, 2010 cohort

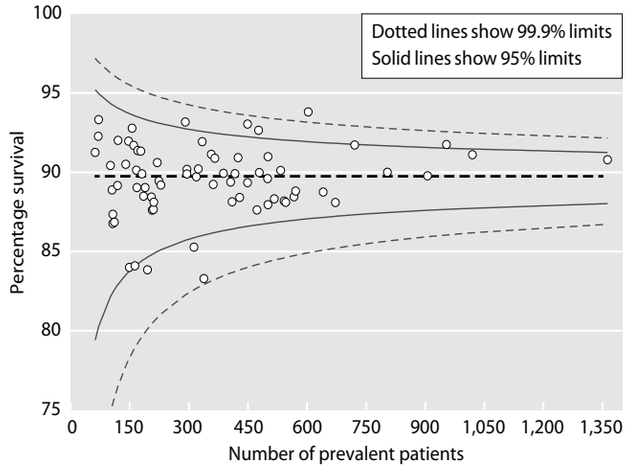

Fig. 5.25. One year survival funnel plot of prevalent dialysis patients by centre adjusted to age 60, 2010 cohort

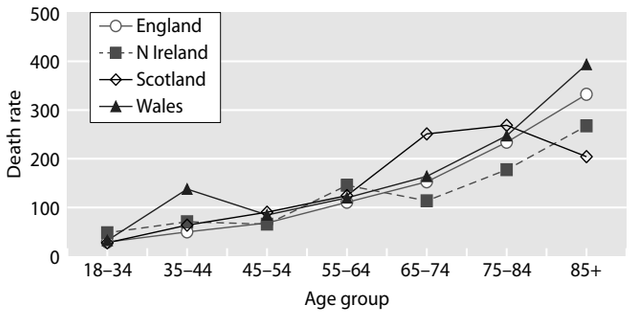

Fig. 5.26. One year death rate per 1,000 patient years by UK country and age group for prevalent dialysis patients, 2010 cohort

cohort (table 5.19) with both Northern Ireland and Scotland recording more than 85% of cause of death data. Scottish centres overall had the highest rate of data return for cause of death (93.5%) and their cause of death completeness improved by about 11% compared with the 2009 cohort. Patterns of cause of death must be cautiously interpreted, as there are significant differences between the causes of death for centres with a high proportion of non returns when compared to centres with good returns (⩾70% causes of death returned). Some centres consistently achieve a very high rate of data return for cause of death because a process is in place to ensure that these data were entered. Several centres have shown significant improvement in data returns, but unfortunately some centres that were reporting these data in previous years have stopped reporting cause of death data. 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 (table 5.19).

Causes of death in incident RRT patients

This year individuals with an ERA code 99 (Other identified cause of death) have been removed from category 'Uncertain' (where they were previously coded) to category 'Other' to reflect better coding of the data and bringing the registry in line with coding methodology adopted in other renal registries. This has substantially reduced the proportion of patient deaths due to

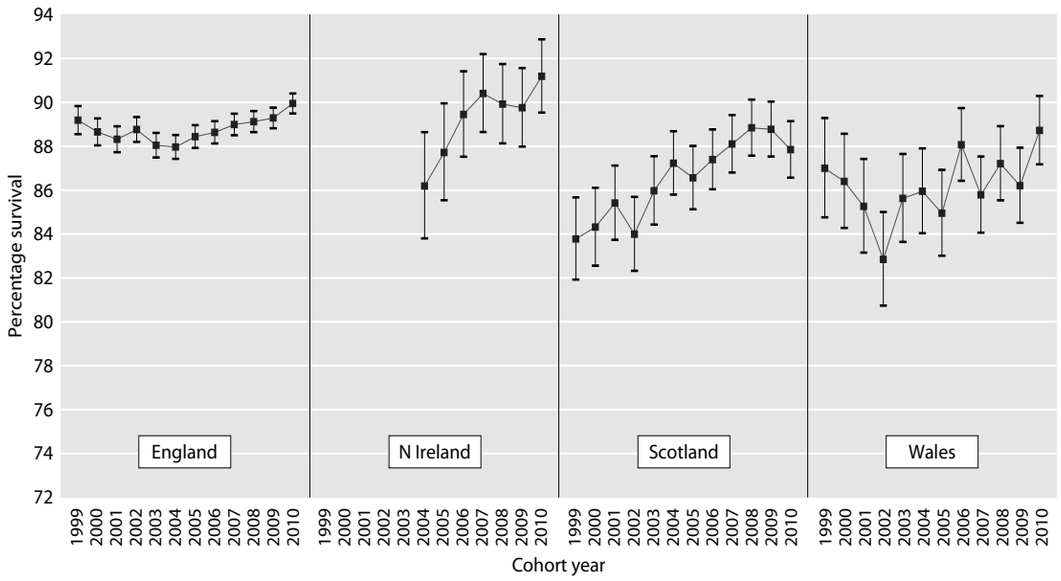

Fig. 5.27. Serial 1 year survival for prevalent dialysis patients by UK country, 1999 to 2010 cohort years, adjusted to age 60

Table 5.17. Serial 1 year survival of prevalent dialysis patients with a primary diagnosis of diabetes, 2001–2010 cohort years

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1 year survival %	82.1	81.7	81.9	82.9	82.5	84.8	83.5	83.8	83.2	84.7

Table 5.18. Death rate by age for all prevalent RRT patients, 2010 cohort, compared with the general population and with previous analyses in the 1998–2001 cohort

Age group	UK population mid 2011 (thousands)	UK deaths in 2011	Death rate per 1,000 population	Expected number of deaths in UKRR population	UKRR deaths in 2011	UKRR death rate per 1,000 prevalent RRT patients	Relative risk of death* 2010 cohort	Relative risk of death* 1998–2001 cohort
20–24	4,297	1,655	0.4	0	9	10	24.6	41.1
25–29	4,307	2,108	0.5	1	19	13	25.6	41.8
30–34	4,126	2,728	0.7	1	24	12	17.9	31.2
35–39	4,194	4,046	1.0	3	53	18	18.9	26.0
40–44	4,624	6,709	1.5	6	101	24	16.6	22.6
45–49	4,643	9,748	2.1	11	142	28	13.2	19.0
50–54	4,095	13,565	3.3	17	196	37	11.3	12.8
55–59	3,614	18,897	5.2	27	330	65	12.5	10.1
60–64	3,808	30,634	8.0	44	412	75	9.3	10.4
65–69	3,019	38,833	12.9	61	529	111	8.6	7.9
70–74	2,463	52,234	21.2	94	618	139	6.5	7.2
75–79	2,006	70,576	35.2	127	742	205	5.8	5.3
80–84	1,498	93,544	62.4	135	593	274	4.4	4.0
85+	1,394	201,272	144.4	146	366	363	2.5	3.0
Total	**48,088**	**546,549**	**11.4**	**674**	**4,134**	**85**	**6.1**	**7.7**

* Relative risk of death for prevalent RRT patients compared with the UK general population

'Uncertain' cause of death with a rise noted in deaths from 'Other' causes.

Causes of death within the first 90 days

See table 5.20.

Causes of death within one year after 90 days

Treatment withdrawal as a cause of death (tables 5.20, 5.21) in incident patients in the first 90 days and one year after 90 days was more common in older (aged 65+) patients and malignancy more common in younger patients (<65 years old). Infection within the first 90 days as the cause of death was more common in older patients.

Causes of death in prevalent RRT patients in the 2010 cohort

Table 5.22, figures 5.29 and 5.30 show the causes of death for both prevalent dialysis and transplant patients

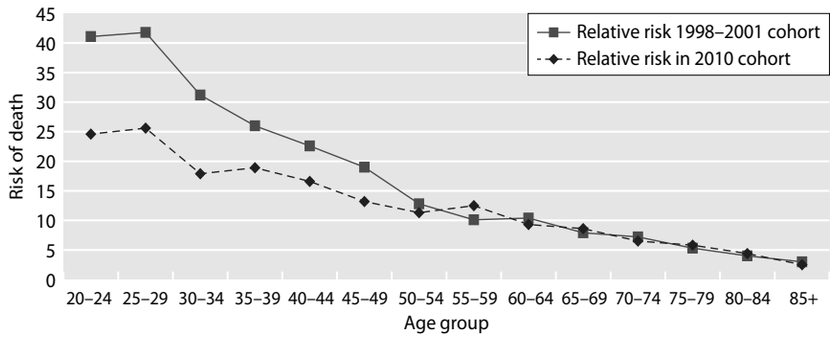

Fig. 5.28. Relative risk of death in all prevalent RRT patients in the 2010 cohort compared with the UK general population

Table 5.19. Percentage completeness of EDTA causes of death for prevalent patients by centre and cohort year

Centre	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
England										
B Heart	83.0	76.3	75.0	68.1	83.1	84.5	93.9	100.0	96.6	96.1
B QEH			0.0	60.2	3.4	3.2	2.3	0.7	0.6	2.0
Basldn		96.0	84.0	47.4	23.8	45.5	47.6	80.0	68.8	84.6
Bradfd	71.4	86.0	83.3	87.8	90.0	88.2	92.5	79.5	97.0	97.6
Brightn			0.0	0.0	0.0	12.0	0.0	1.1	2.4	1.1
Bristol	60.9	85.0	89.9	76.7	60.2	58.7	65.8	70.0	89.4	95.2
Camb	0.0	0.0	1.6	1.5	1.3	0.0	0.0	2.5	10.3	62.0
Carlis	36.8	44.0	68.2	78.3	82.6	65.2	38.1	71.0	100.0	92.9
Carsh	0.0	0.0	0.0	0.0	0.0	0.8	0.8	0.8	6.7	25.0
Chelms			35.0	69.7	64.0	76.5	71.4	86.7	86.7	87.0
Colchr							0.0	0.0	72.7	82.6
Covnt	43.3	3.0	1.7	0.0	0.0	0.0	1.2	0.0	0.0	1.4
Derby	5.9	11.1	69.0	77.6	75.6	83.3	97.8	71.4	84.2	88.5
Donc							100.0	94.3	90.9	91.7
Dorset		0.0	30.6	61.5	66.7	87.2	88.9	85.2	95.7	94.9
Dudley	39.5	0.0	12.2	0.0	0.0	0.0	0.0	0.0	94.3	88.1
Exeter	23.0	35.1	38.0	31.6	15.8	3.5	2.1	3.0	89.5	84.6
Glouc	71.4	63.0	43.2	48.4	36.1	48.9	52.1	65.8	97.2	93.6
Hull	90.7	38.4	83.6	81.5	77.3	76.5	48.4	16.0	90.8	89.2
Ipswi	60.0	47.1	30.4	10.3	21.9	35.5	13.6	18.8	70.0	77.8
Kent							54.3	87.8	89.0	96.2
L Barts			87.4	83.3	87.3	74.6	77.0	70.1	74.6	82.6
L Guys	0.9	1.2	0.0	0.0	0.0	2.4	0.0	0.0	69.5	84.2
L Kings	100.0	31.9	66.7	85.7	90.6	75.6	88.2	67.1	96.1	96.4
L Rfree					0.0	0.0	0.0	0.9	1.7	0.0
L St.G						16.7	14.8	21.4	77.6	47.9
L West	76.4	79.1	67.5	79.7	31.3	16.7	5.8	2.2	0.5	95.0
Leeds	52.4	58.6	67.7	67.2	64.7	27.0	26.5	31.0	99.0	99.1
Leic	78.4	76.3	88.2	71.7	74.7	64.1	62.9	64.7	69.6	60.4
Liv Ain	100.0	100.0	66.7	50.0	81.3	73.3	66.7	100.0	85.0	95.7
Liv RI	81.4	72.2	69.9	39.8	64.4	76.8	74.4	79.2	71.6	76.4
M RI						4.0	0.9	0.0	4.7	3.1
Middlbr	92.2	66.7	42.0	76.1	61.9	52.1	18.2	41.3	88.2	97.5
Newc	80.0	28.6	27.4	19.4	29.8	48.7	35.7	40.8	14.0	45.0
Norwch			30.8	21.0	21.4	18.2	21.2	44.4	75.8	70.3
Nottm	93.9	89.6	93.3	96.0	87.5	85.9	98.8	97.1	98.8	100.0
Oxford	3.8	0.8	1.9	1.8	0.0	0.0	1.0	0.0	84.6	68.7
Plymth	44.9	41.5	42.9	35.1	39.6	56.7	68.3	40.0	78.7	43.6
Ports	30.4	32.7	32.6	9.3	4.5	14.6	5.0	41.8	67.0	23.3
Prestn	83.1	73.8	75.9	50.0	55.4	47.8	38.1	17.9	95.7	98.9
Redng	46.9	86.0	77.1	81.5	77.1	97.8	89.6	83.0	100.0	96.7
Salford		1.7	1.3	0.0	0.0	1.3	0.0	1.3	0.0	0.0
Sheff	95.7	97.6	19.6	0.0	0.9	0.8	0.9	0.9	3.0	0.8
Shrew			25.0	63.6	53.1	82.1	56.3	20.5	46.0	0.0
Stevng	63.4	63.8	63.2	73.8	54.8	46.4	59.6	64.3	87.5	85.2
Sthend	48.4	66.7	25.0	41.2	9.4	3.2	57.7	75.0	92.3	90.0
Stoke						16.1	21.0	28.6	53.9	57.9
Sund	68.3	51.0	54.8	56.3	60.0	60.5	50.0	78.9	93.5	95.1
Truro	67.5	80.6	57.1	2.3	6.9	0.0	18.4	26.3	93.3	94.9
Wirral	45.5	85.7	64.5	31.3	79.4	60.5	84.4	3.0	54.1	0.0
Wolve	98.2	98.5	96.6	89.1	43.9	52.3	63.2	70.9	96.9	94.1
York	33.3	82.5	67.6	41.4	83.3	38.5	62.1	60.7	96.6	97.3
N Ireland										
Antrim				4.3	10.0	8.8	3.8	26.9	100.0	100.0
Belfast				17.5	34.8	39.1	20.7	26.2	84.2	80.0
Newry				0.0	42.9	16.7	15.4	85.7	95.2	100.0
Ulster				100.0	85.7	92.9	90.0	78.9	95.0	95.2
West NI				46.2	57.7	38.9	25.0	45.8	100.0	87.0

Table 5.19. Continued

Centre	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Scotland										
Abrdn	41.4	38.6	24.4	2.8	0.0	0.0	82.9	97.6	89.2	100.0
Airdrie	52.9	26.7	10.3	40.0	26.3	26.8	79.3	100.0	96.8	97.0
D & Gall	61.5	69.2	76.9	80.0	76.9	100.0	93.3	94.1	100.0	100.0
Dundee	47.1	92.1	92.1	88.6	2.8	0.0	50.0	90.6	85.7	59.5
Dunfn	95.5	80.0	66.7	81.3	50.0	53.8	61.9	89.3	71.4	90.0
Edinb	58.2	60.4	44.2	50.9	29.3	45.0	85.9	96.2	98.3	95.1
Glasgw	53.6	49.6	41.9	40.2	53.2	55.3	75.4	88.0	66.2	98.5
Inverns	0.0	0.0	0.0	0.0	0.0	0.0	65.2	90.0	91.7	100.0
Klmarnk	4.0	4.0	10.0	0.0	11.1	9.4	95.8	93.3	93.9	97.1
Wales										
Bangor	37.5	39.1	42.1	66.7	35.0	86.2	52.4	76.9	73.9	90.0
Cardff	0.9	2.1	0.9	2.8	2.2	2.5	0.0	0.0	0.7	4.3
Clwyd	28.6	22.2	0.0	0.0	11.1	45.5	84.2	83.3	100.0	85.7
Swanse	96.2	92.0	89.2	85.7	92.4	97.3	94.8	89.8	96.9	87.5
Wrexm	10.3	0.0	0.0	3.8	0.0	18.2	69.2	100.0	95.7	96.2
England	**53.8**	**51.0**	**50.1**	**45.7**	**39.7**	**35.6**	**35.0**	**36.3**	**57.8**	**62.4**
N Ireland				**20.5**	**39.3**	**33.8**	**22.8**	**42.4**	**92.7**	**89.0**
Scotland	**49.9**	**49.5**	**41.7**	**40.4**	**32.3**	**33.5**	**75.2**	**92.5**	**82.8**	**93.5**
Wales	**36.7**	**32.4**	**29.5**	**28.3**	**30.0**	**42.2**	**36.4**	**46.5**	**50.2**	**47.0**
UK	**51.8**	**49.2**	**47.6**	**43.3**	**38.3**	**35.7**	**38.5**	**42.2**	**60.6**	**65.2**

Blank cells, data not available for that year

Table 5.20. Cause of death in the first 90 days for incident patients by age group, 2000–2010 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	N	%	N	%	N	%
Cardiac disease	576	27	139	30	437	26
Cerebrovascular disease	105	5	23	5	82	5
Infection	361	17	65	14	296	18
Malignancy	185	9	53	12	132	8
Treatment withdrawal	321	15	46	10	275	17
Other	497	24	123	27	374	23
Uncertain	69	3	11	2	58	4
Total	**2,114**		**460**		**1,654**	
No cause of death data	2,462	54	543	54	1,919	54

Table 5.21. Cause of death in 1 year after 90 days for incident patients by age group, 2000–2010 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	N	%	N	%	N	%
Cardiac disease	871	23	272	25	599	22
Cerebrovascular disease	201	5	51	5	150	6
Infection	691	18	201	19	490	18
Malignancy	399	11	144	13	255	9
Treatment withdrawal	618	16	88	8	530	20
Other	844	22	263	25	581	21
Uncertain	158	4	52	5	106	4
Total	**3,782**		**1,071**		**2,711**	
No cause of death data	4,233	52.8	1,210	53.1	3,023	52.7

Table 5.22 Cause of death in prevalent RRT patients by modality, 2010 cohort

	All modalities		Dialysis		Transplant	
Cause of death	N	%	N	%	N	%
Cardiac disease	584	21	522	22	62	16
Cerebrovascular disease	130	5	104	4	26	7
Infection	526	19	437	18	89	23
Malignancy	275	10	193	8	82	21
Treatment withdrawal	449	16	438	18	11	3
Other	684	25	582	25	102	26
Uncertain	115	4	95	4	20	5
Total	**2,763**		**2,371**		**392**	
No cause of death data	1,372	33	1,138	32	234	37

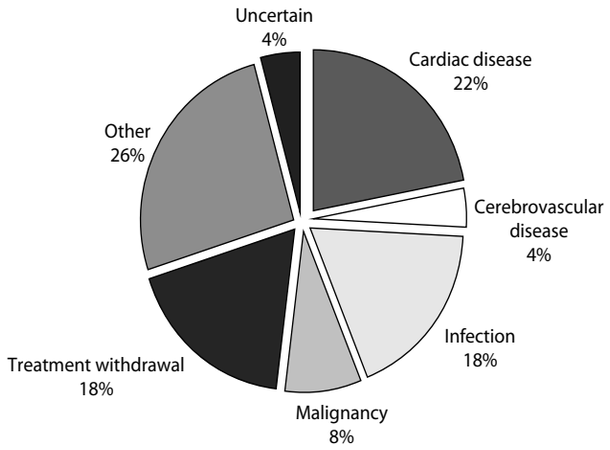

Fig. 5.29. Percentage contribution to cause of death for prevalent dialysis patients, 2010 cohort

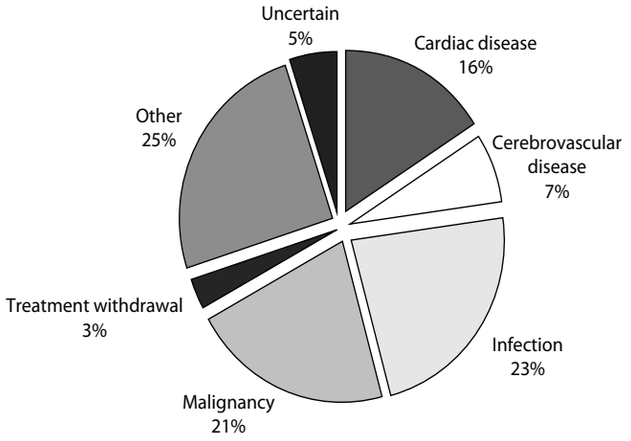

Fig. 5.30. Percentage contribution to cause of death for prevalent transplant patients, 2010 cohort

in the 2010 cohort. These data are neither age adjusted nor adjusted for differences in the comorbidity between the two groups. Cardiac disease as a cause of death was less common in transplanted patients as these 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 common cause of death in the prevalent dialysis population.

Table 5.23 shows that infection as the cause of death in prevalent transplant patients was much more common in younger (<65 years old) transplanted patients and

Table 5.23. Cause of death in prevalent transplanted patients by age group, 2010 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	N	%	N	%	N	%
Cardiac disease	62	16	34	16	28	16
Cerebrovascular disease	26	7	12	6	14	8
Infection	89	23	53	25	36	20
Malignancy	82	21	42	19	40	23
Treatment withdrawal	11	3	6	3	5	3
Other	102	26	59	27	43	24
Uncertain	20	5	10	5	10	6
Total	**392**		**216**		**176**	
No cause of death data	234	37	117	35	117	40

Table 5.24. Cause of death in prevalent dialysis patients by age group, 2010 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	N	%	N	%	N	%
Cardiac disease	522	22	163	25	359	21
Cerebrovascular disease	104	4	26	4	78	5
Infection	437	18	128	20	309	18
Malignancy	193	8	55	9	138	8
Treatment withdrawal	438	18	59	9	379	22
Other	582	25	189	29	393	23
Uncertain	95	4	24	4	71	4
Total	**2,371**		**644**		**1,727**	
No cause of death data	1,138	32	310	32	828	32

malignancy more common in older (⩾65 years old) transplanted patients.

Table 5.24 shows the cause of death for prevalent dialysis patients in the 2010 cohort. Prevalent dialysis patients aged 65 years and over were substantially more likely to withdraw from treatment than younger patients and cardiac disease was much more common as a cause of death in younger (<65 years old) dialysis patients. Figure 5.31 shows cause of death for prevalent patients in the 1997–2010 cohort. Over time, cardiac disease as cause of death has decreased markedly and cerebrovascular disease as cause of death declined gradually. The proportion of patients coded with 'other' cause of death has increased, as has treatment withdrawal (16% in the 2010 cohort). Infection as cause of death remained at a similar level to the 1997 cohort (figure 5.31).

Median life expectancy on RRT

The statistical methodology for this analysis is described in the methodology section at the start of this chapter. Figure 5.32 shows median life expectancy by age group. All incident patients starting RRT from 2000 to 2008 have been included in this analysis and patients were followed up for a minimum of 3 years.

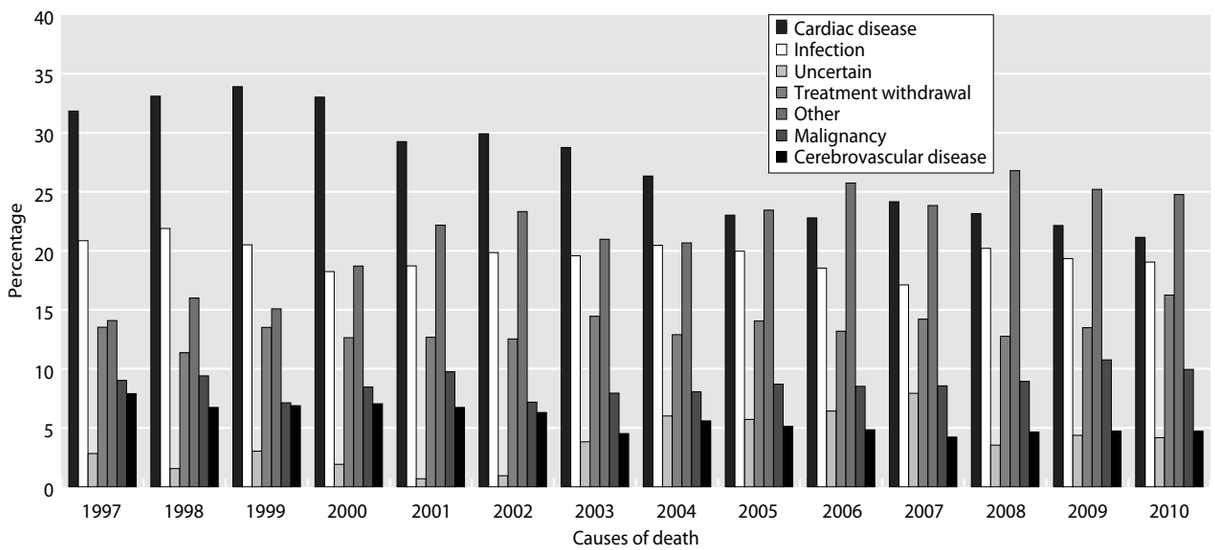

Fig. 5.31. Cause of death in prevalent RRT patients by cohort year

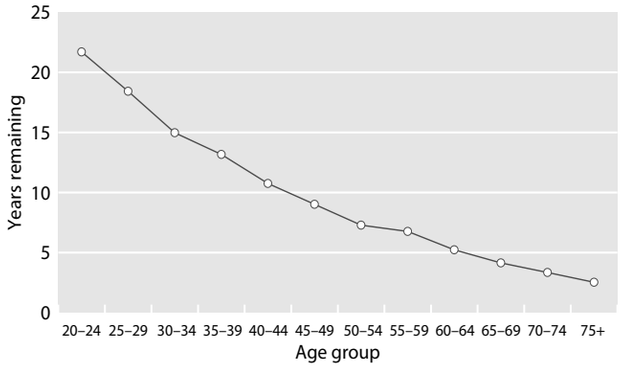

Fig. 5.32. Median life expectancy on RRT by age group, incident patients starting RRT from 2000–2008 cohort

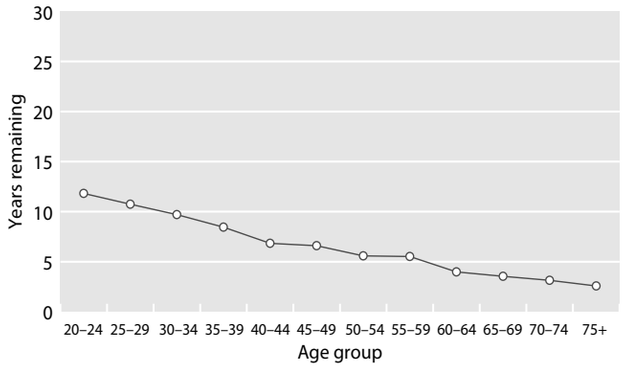

Fig. 5.33. Median life expectancy on RRT by age group, incident diabetic patients starting RRT from 2000–2008 cohort

The estimated median survival will be different for low risk patients (e.g. polycystic kidney disease with a transplant) vs. high risk patients (diabetes with previous myocardial infarction on dialysis) even within the same age group. Median life years remaining for non-diabetic and diabetic patients (figure 5.33) were also calculated and show that median life expectancy for patients younger than 45 was on average nine years more for non-diabetic patients (data not shown) compared with age matched diabetic patients. In the older age group ($\geqslant$65 years) the median life years remaining were similar between diabetic and non-diabetic patients.

Conflicts of interest: none

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Appendix 1: Survival tables

Table 5.25. One-year after 90-day incident survival percentage by centre, 2010 cohort, unadjusted and adjusted to age 60

Centre	Unadjusted 1 year after 90 days survival	Adjusted 1 year after 90 days survival	Adjusted 1 year after 90 days 95% CI
England			
B Heart	89.3	92.0	*87.3–96.9*
B QEH	87.0	90.0	*86.3–93.9*
Basldn	88.1	92.4	*84.6–100.0*
Bradfd	87.5	88.6	*81.1–96.9*
Brightn	84.0	88.7	*83.4–94.3*
Bristol	87.1	90.3	*86.1–94.6*
Camb	87.3	91.7	*87.3–96.4*
Carlis	85.7	87.5	*75.5–100.0*
Carsh	86.7	90.6	*87.2–94.1*
Chelms	73.3	79.9	*70.0–91.1*
Colchr	93.0	95.2	*89.2–100.0*
Covnt	87.3	89.6	*84.4–95.1*
Derby	84.1	89.4	*83.6–95.6*
Donc	92.7	95.2	*90.1–100.0*
Dorset	86.2	90.9	*85.4–96.8*
Dudley	82.8	87.2	*78.0–97.5*
Exeter	88.6	93.3	*89.9–96.8*
Glouc	85.9	90.7	*84.8–97.0*
Hull	80.0	85.6	*79.0–92.6*
Ipswi	92.9	93.9	*86.2–100.0*
Kent	86.9	90.8	*86.5–95.4*
L Barts	92.2	91.9	*88.0–95.9*
L Guys	90.3	90.8	*85.9–95.9*
L Kings	87.4	90.2	*85.8–94.7*
L Rfree	90.8	92.8	*89.6–96.1*
L St.G	94.0	95.4	*91.6–99.4*
L West	86.7	89.0	*86.0–92.2*
Leeds	85.5	88.2	*82.9–93.9*
Leic	89.1	91.8	*88.6–95.0*
Liv Ain	85.7	89.7	*82.3–97.8*
Liv RI	86.5	88.2	*82.1–94.7*
M RI	88.4	90.3	*85.9–94.8*
Middlbr	87.3	90.7	*85.7–96.1*
Newc	86.4	88.3	*82.0–95.0*
Norwch	85.1	89.9	*84.4–95.8*
Nottm	92.6	94.4	*90.7–98.3*
Oxford	89.8	91.7	*87.8–95.8*
Plymth	90.3	93.1	*87.5–99.1*
Ports	84.3	87.9	*83.1–92.9*
Prestn	89.4	91.5	*87.0–96.2*
Redng	90.5	92.9	*88.3–97.7*
Salford	89.5	90.1	*85.5–95.0*
Sheff	89.5	91.2	*86.8–95.7*
Shrew	84.3	89.5	*82.9–96.7*
Stevng	93.9	94.8	*90.8–98.9*
Sthend	81.7	88.3	*79.2–98.4*
Stoke	86.9	91.0	*86.2–96.0*
Sund	84.8	86.3	*78.0–95.5*
Truro	81.0	86.7	*78.6–95.6*
Wirral	88.0	91.4	*85.0–98.3*
Wolve	82.9	86.5	*80.6–93.0*
York	84.0	87.8	*78.4–98.3*
N Ireland			
Antrim	85.8	88.8	*80.1–98.4*
Belfast	84.0	88.5	*82.1–95.5*
Newry	84.6	89.0	*78.1–100.0*
West NI	87.5	92.9	*85.7–100.0*
Scotland			
Abrdn	87.5	88.1	*79.7–97.4*
Airdrie	78.5	83.0	*74.4–92.7*
Dundee	82.6	88.2	*80.8–96.2*
Dunfn	89.9	93.5	*87.7–99.8*
Edinb	80.7	82.2	*73.5–91.8*
Glasgw	84.7	88.3	*83.7–93.2*
Inverns	96.3	97.3	*92.4–100.0*
Klmarnk	84.2	88.4	*80.2–97.4*
Wales			
Bangor	80.6	86.1	*75.7–97.9*
Cardff	87.5	90.9	*87.2–94.7*
Swanse	84.1	89.6	*85.2–94.2*
Wrexm	75.0	82.9	*71.5–96.0*
England	**87.7**	**90.5**	***89.6–91.4***
N Ireland	**86.2**	**90.4**	***86.6–94.4***
Scotland	**84.5**	**88.1**	***85.4–90.8***
Wales	**85.0**	**89.5**	***86.7–92.3***
UK	**87.3**	**90.2**	***89.4–91.1***

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

Table 5.26. Ninety day incident survival percentage by centre, 2010 cohort, unadjusted and adjusted to age 60

Centre	Unadjusted 90 day survival	Adjusted 90 day survival	Adjusted 90 day 95% CI
England			
B Heart	98.9	99.3	*97.8–100.0*
B QEH	97.5	98.2	*96.6–99.8*
Basldn	81.3	89.0	*81.1–97.7*
Bradfd	89.5	91.4	*85.5–97.6*
Brightn	93.3	95.7	*92.6–98.9*
Bristol	94.0	95.9	*93.4–98.5*
Camb	97.1	98.3	*96.4–100.0*
Carlis	95.7	96.4	*89.8–100.0*
Carsh	94.1	96.2	*94.1–98.3*
Chelms	93.3	95.7	*91.2–100.0*
Colchr	93.8	96.2	*91.3–100.0*
Covnt	92.1	94.1	*90.4–97.9*
Derby	91.1	94.6	*90.8–98.6*
Donc	93.2	95.7	*91.1–100.0*
Dorset	94.4	96.6	*93.5–99.9*
Dudley	95.3	97.2	*93.5–100.0*
Exeter	95.0	97.3	*95.4–99.3*
Glouc	95.1	97.2	*94.1–100.0*
Hull	88.5	92.4	*87.9–97.1*
Kent	91.0	94.3	*91.2–97.5*
L Barts	96.6	96.7	*94.3–99.1*
L Guys	95.5	95.9	*92.8–99.2*
L Kings	96.5	97.5	*95.3–99.7*
L Rfree	96.6	97.5	*95.7–99.3*
L St.G	96.5	97.5	*94.8–100.0*
L West	95.0	96.3	*94.6–98.0*
Leeds	92.8	94.7	*91.4–98.2*
Leic	92.2	94.6	*92.2–97.1*
Liv Ain	90.2	93.7	*88.4–99.2*
Liv RI	90.9	92.5	*88.0–97.3*
M RI	96.3	97.2	*94.9–99.4*
Middlbr	91.8	94.5	*90.9–98.3*
Newc	91.3	93.2	*88.8–97.9*
Norwch	90.7	94.0	*90.0–98.1*
Nottm	96.6	97.6	*95.2–100.0*
Oxford	90.3	92.7	*89.3–96.3*
Plymth	96.4	97.6	*94.5–100.0*
Ports	92.6	94.8	*91.8–97.9*
Prestn	94.4	95.9	*92.9–98.9*
Redng	95.5	97.0	*94.1–99.9*
Salford	97.3	97.7	*95.5–99.9*
Sheff	95.8	96.8	*94.3–99.3*
Shrew	93.1	95.9	*92.1–99.9*
Stevng	97.2	97.7	*95.2–100.0*
Stoke	96.8	98.0	*95.8–100.0*
Sund	96.4	97.0	*93.0–100.0*
Truro	91.3	94.6	*89.6–99.8*
Wirral	91.8	94.7	*90.2–99.3*
Wolve	92.4	94.7	*91.2–98.4*
York	94.7	96.3	*91.4–100.0*
N Ireland			
Antrim	87.8	91.6	*84.9–98.8*
Belfast	91.7	94.5	*90.3–98.9*
Ulster	95.0	97.2	*92.1–100.0*
West NI	92.3	96.1	*91.0–100.0*
Scotland			
Abrdn	94.1	94.7	*89.1–100.0*
Airdrie	94.6	96.1	*91.9–100.0*
Dundee	94.0	96.3	*92.2–100.0*
Dunfn	95.6	97.2	*93.6–100.0*
Edinb	95.6	96.3	*92.2–100.0*
Glasgw	94.8	96.3	*93.8–98.9*
Klmarnk	88.4	92.3	*86.0–99.0*
Wales	93.8	96.1	*94.5–97.7*
Cardff	93.5	95.7	*93.2–98.1*
Swanse	92.7	95.7	*93.1–98.4*
Wrexm	96.0	97.7	*93.5–100.0*
England	**94.3**	**96.0**	***95.4–96.6***
N Ireland	**92.2**	**95.2**	***92.7–97.7***
Scotland	**94.6**	**96.2**	***94.8–97.7***
Wales	**93.8**	**96.1**	***94.5–97.7***
UK	**94.2**	**96.0**	***95.4–96.5***

Excluded: centres with less than 20 patients (Clwyd, D & Gall) and centres with no deaths recorded in the first 90 days of RRT (Newry, Sthend, Ipswi, Bangor, Inverns)

Table 5.27. One year after 90-day incident survival by centre for incident cohort years 2002–2010, adjusted to age 60

	One year after 90 days survival								
Centre	2002	2003	2004	2005	2006	2007	2008	2009	2010
England									
B Heart	88.0	86.3	88.1	85.5	89.9	91.0	93.2	85.1	92.0
B QEH			88.4	90.7	87.7	93.3	89.2	91.0	90.0
Basldn		92.0	95.1	91.4	91.0	88.0	92.4	77.5	92.4
Bradfd	86.3	84.3	84.5	85.5	76.8	86.9	85.1	89.3	88.6
Brightn			88.0	83.2	90.4	94.4	86.9	88.5	88.7
Bristol	87.9	87.3	87.8	83.4	93.2	91.0	83.5	90.0	90.3
Camb	82.4	89.0	87.6	90.7	92.4	91.6	92.3	84.6	91.7
Carlis	87.8	78.5	87.0	82.8	91.1	92.8	85.5	74.8	87.5
Carsh	84.8	90.8	86.6	91.7	85.4	89.3	86.4	88.9	90.6
Chelms			81.4	86.5	87.4	90.4	94.5	93.2	79.9
Colchr							86.6	89.8	95.2
Covnt	90.5	82.6	84.7	87.2	84.9	92.8	87.4	94.1	89.6
Derby		83.7	87.2	89.2	92.7	95.4	91.8	86.1	89.4
Donc						96.9	93.0	83.5	95.2
Dorset		86.5	91.2	82.7	90.0	86.2	92.5	92.3	90.9
Dudley	89.4	88.9	85.8	96.7	90.1	85.0	65.4	87.9	87.2
Exeter	87.1	85.4	86.7	86.2	87.6	86.9	87.2	92.5	93.3
Glouc	82.4	84.9	86.7	93.4	89.8	86.3	98.1	88.5	90.7
Hull	85.6	87.8	86.2	89.4	92.0	86.6	87.4	91.6	85.6
Ipswi	98.3	93.8	91.2	85.6	96.1	94.3	97.5	91.4	93.9
Kent						92.4	88.3	91.5	90.8
L Barts			87.6	93.1	91.6	88.1	93.8	90.4	91.9
L Guys	86.1	96.8	87.9	92.7	90.6	93.1	90.3	94.1	90.8
L Kings	87.9	86.0	88.7	88.8	89.0	88.2	89.1	85.2	90.2
L Rfree				91.6	92.3	93.4	95.3	86.8	92.8
L St.G						92.2	92.8	93.1	95.4
L West	92.9	95.9	92.0	93.9	94.0	92.7	94.0	92.0	89.0
Leeds	85.6	88.8	89.7	89.8	84.7	87.2	91.1	92.5	88.2
Leic	88.0	91.1	85.4	85.8	87.5	88.8	91.5	91.5	91.8
Liv Ain				85.5	86.1	82.0	84.5	83.4	89.7
Liv RI	84.9	83.5	84.7	91.1	84.2	89.6	95.5	93.6	88.2
M RI						88.1	91.0	88.5	90.3
Middlbr	78.5	82.6	85.5	83.2	89.5	87.5	85.8	83.4	90.7
Newc	87.1	87.0	83.9	83.8	87.0	87.3	92.0	84.0	88.3
Norwch			86.1	90.2	88.8	89.1	91.0	89.3	89.9
Nottm	87.6	87.0	84.7	86.7	94.5	88.6	90.3	90.3	94.4
Oxford	88.8	87.8	90.0	86.2	90.7	89.0	91.2	89.2	91.7
Plymth	81.9	81.6	81.1	81.9	83.8	89.6	91.6	88.3	93.1
Ports	86.1	88.0	89.3	83.4	86.2	90.0	87.7	91.1	87.9
Prestn	87.3	85.8	83.9	91.8	84.6	89.2	80.7	87.2	91.5
Redng	92.1	91.1	93.5	89.2	90.0	91.0	94.4	90.5	92.9
Salford		88.7	82.5	92.0	92.2	85.3	87.0	85.8	90.1
Sheff	84.4	90.3	89.9	92.1	89.6	87.2	95.9	93.4	91.2
Shrew			86.5	89.5	89.8	89.6	92.2	85.1	89.5
Stevng	87.6	94.2	88.7	78.9	88.3	88.7	91.9	94.2	94.8
Sthend	87.5	90.8	88.8	92.3	96.4	92.1	84.4	92.5	88.3
Stoke						85.6	90.6	84.6	91.0
Sund	68.9	81.4	87.5	82.8	82.4	87.7	86.2	84.1	86.3
Truro	83.5	88.6	92.3	88.1	92.8	86.8	92.3	94.9	86.7
Wirral	78.1	95.0	82.5	88.3	90.8	86.8	87.1	89.3	91.4
Wolve	88.0	82.8	88.0	86.1	89.9	90.9	89.3	85.7	86.5
York	82.2	78.2	89.6	85.4	83.8	94.5	86.9	93.6	87.8

Table 5.27. Continued

	One year after 90 days survival								
Centre	2002	2003	2004	2005	2006	2007	2008	2009	2010
N Ireland									
Antrim				86.2	94.4	85.1	94.9	96.7	88.8
Belfast				90.4	92.4	90.4	88.3	92.0	88.5
Newry				86.6			88.4		89.0
Ulster									
West NI					91.1	92.0	97.7	92.8	92.9
Scotland									
Abrdn	88.0	83.0	89.6	79.5	82.7	85.2	94.0	85.1	88.1
Airdrie	79.5	78.9	85.6	72.3	74.8	84.0	90.9	86.3	83.0
D & Gall	78.2								
Dundee	84.0	89.7	84.1	86.4	89.6	79.6	89.0	90.3	88.2
Dunfn	86.1	85.8	87.9	77.1	83.1	85.4	93.0	88.9	93.5
Edinb	82.6	83.3	79.6	86.0	87.9	92.4	83.4	86.8	82.2
Glasgw	83.7	85.5	81.3	84.8	84.4	88.1	86.5	87.7	88.3
Inverns	83.7	88.1	83.5	85.4	90.8	80.1	90.9		97.3
Klmarnk	87.4	85.4	84.0	94.0	84.0	90.5	91.4	82.9	88.4
Wales									
Bangor	83.1	89.0	84.1	81.4	81.5	92.8	88.6	90.0	86.1
Cardff	83.0	89.4	86.2	88.4	85.9	82.3	86.7	88.3	90.9
Clwyd				80.1		82.3			
Swanse	83.4	82.4	82.1	84.3	83.4	89.7	85.2	80.5	89.6
Wrexm	93.2	83.8	91.8	92.4	90.8	90.8			82.9
England	**86.5**	**88.3**	**87.6**	**88.5**	**89.4**	**89.8**	**90.1**	**89.6**	**90.5**
N Ireland				**89.8**	**91.8**	**89.8**	**90.7**	**91.0**	**90.4**
Scotland	**83.8**	**85.4**	**83.7**	**84.2**	**84.8**	**86.6**	**88.5**	**86.8**	**88.1**
Wales	**84.5**	**86.0**	**85.6**	**86.4**	**85.6**	**86.0**	**86.2**	**85.9**	**89.5**
UK	**86.0**	**87.8**	**87.1**	**88.0**	**88.8**	**89.3**	**89.8**	**89.2**	**90.2**

Blank cells: centres with less than 20 patients for that year or centres with no data available for that year

Table 5.28. One year prevalent patient survival by centre for prevalent cohort years 2001–2010, adjusted to age 60

	One-year prevalent survival									
Centre	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
England										
B Heart	88.2	87.9	86.5	88.1	86.5	87.1	90.1	90.7	87.3	89.3
B QEH		99.7	89.0	89.1	88.4	88.5	88.4	90.1	89.6	91.1
Basldn	97.3	85.3	88.0	91.2	90.9	90.7	92.9	92.0	89.0	91.3
Bradfd	87.7	82.7	88.1	86.2	82.6	84.3	87.9	84.7	89.4	88.1
Brightn		99.7	87.0	84.3	87.6	87.3	89.1	87.5	90.1	88.4
Bristol	88.1	89.0	86.7	87.4	87.6	89.1	87.3	84.9	85.7	89.6
Camb	86.5	87.3	88.1	87.3	89.4	88.0	92.6	90.0	91.4	93.0
Carlis	81.4	83.4	82.9	83.8	84.0	85.8	87.0	80.3	80.6	93.3
Carsh	82.3	84.8	87.7	86.5	89.7	88.8	90.2	89.1	89.7	90.0
Chelms		98.4	86.1	82.7	85.6	87.5	85.0	86.0	89.5	84.1
Colchr								91.0	86.5	88.9
Covnt	85.9	87.2	88.8	89.5	85.5	87.4	87.3	91.1	90.3	90.9
Derby	93.4	86.7	88.7	87.9	88.8	87.2	90.7	90.8	90.4	90.2
Donc							88.7	83.8	88.8	91.7
Dorset	99.3	90.3	88.3	89.4	87.0	87.7	89.8	90.0	93.0	89.9
Dudley	83.5	85.0	86.4	85.9	87.2	87.1	88.7	88.6	90.7	87.6
Exeter	87.3	86.9	86.2	83.7	90.9	87.1	85.3	85.2	86.5	88.1
Glouc	84.8	83.5	88.8	88.1	91.1	88.1	86.1	91.6	92.1	89.5
Hull	87.5	86.0	86.0	84.7	86.0	90.1	87.0	88.0	87.7	89.9
Ipswi	82.0	84.8	90.2	86.0	84.5	86.5	92.7	84.7	87.8	92.0
Kent							86.2	87.9	90.5	89.9
L Barts			84.0	85.7	88.3	89.2	88.8	91.0	92.9	91.7
L Guys	86.2	88.8	88.5	89.3	87.5	90.5	90.2	91.3	90.9	93.8
L Kings	80.8	78.0	81.0	86.7	89.2	84.9	88.1	88.0	89.5	90.1
L Rfree				90.2	90.4	90.3	91.3	89.9	90.4	91.7
L St.G						95.8	94.7	89.2	90.8	91.9
L West	89.9	91.5	91.3	91.7	91.6	92.0	90.5	92.2	90.8	90.8
Leeds	87.3	86.3	85.9	89.1	88.7	88.3	87.4	88.9	90.9	88.8
Leic	84.1	83.8	85.1	86.7	84.4	89.7	89.5	88.6	90.5	89.8
Liv Ain	90.8	90.9	87.2	97.0	86.8	90.4	88.4	92.0	89.4	89.2
Liv RI	82.4	84.5	85.8	84.2	88.1	85.0	87.0	89.5	89.5	91.0
M RI						86.2	86.3	87.4	86.8	88.3
Middlbr	84.3	84.6	83.6	86.2	85.4	87.4	87.1	86.7	83.8	93.2
Newc	82.7	81.0	80.9	86.0	83.8	86.0	86.4	87.2	86.3	85.3
Norwch			87.3	88.3	90.2	87.5	91.0	89.4	89.8	91.1
Nottm	83.0	85.3	86.6	84.7	83.4	89.5	88.4	87.9	89.6	90.0
Oxford	85.8	87.0	88.3	87.2	87.2	86.8	87.7	88.6	87.3	88.0
Plymth	77.0	84.7	85.7	87.6	83.5	82.7	88.0	85.8	85.6	89.9
Ports	81.7	82.1	89.1	85.9	85.1	89.7	88.4	89.1	88.3	88.1
Prestn	86.4	84.8	85.6	85.8	86.3	90.8	90.1	89.7	90.1	88.2
Redng	86.2	82.8	89.2	86.3	89.0	90.7	89.0	92.5	89.1	89.7
Salford	80.5	84.4	81.6	83.6	85.9	88.0	86.4	87.9	85.2	87.6
Sheff	90.5	91.1	87.8	87.0	89.3	88.9	88.8	89.7	89.6	88.8
Shrew		94.5	85.3	86.4	86.7	89.2	89.0	88.1	86.2	87.7
Stevng	86.4	88.7	89.6	88.8	89.5	89.8	92.6	90.5	90.2	92.6
Sthend	89.7	87.3	88.5	87.0	83.4	86.3	90.2	91.0	92.5	90.5
Stoke						84.4	87.3	88.4	86.9	90.9
Sund	78.7	75.4	82.0	86.5	79.6	83.8	87.6	85.3	84.7	83.8
Truro	82.5	90.3	89.9	85.1	91.8	89.2	89.4	88.9	90.7	89.0
Wirral	93.1	83.5	87.4	89.4	88.5	88.1	89.5	90.2	88.5	90.6
Wolve	85.6	85.0	87.5	86.8	89.3	87.8	92.7	89.4	87.4	89.2
York	85.1	81.1	83.0	89.4	84.0	88.5	87.8	88.8	90.0	84.0

Table 5.28. Continued

	One-year prevalent survival									
Centre	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
N Ireland										
Antrim				83.5	92.1	86.0	89.5	90.6	89.8	92.8
Belfast				86.1	86.8	91.3	89.0	88.9	89.0	90.2
Newry				87.0	87.3	87.2	90.7	94.2	88.0	92.0
Ulster				86.1	91.6	89.4	92.6	88.1	90.6	90.4
West NI				88.9	83.6	91.5	93.0	89.7	91.8	91.4
Scotland										
Abrdn	87.2	80.4	85.6	87.9	86.4	87.4	89.7	89.5	89.9	89.2
Airdrie	82.2	84.5	84.1	83.0	79.9	79.5	86.1	85.6	89.4	88.5
D & Gall	84.1	85.1	83.1	92.1	82.1	90.5	84.5	88.4	87.3	91.2
Dundee	85.5	83.5	85.9	87.9	87.7	84.2	84.4	93.8	88.0	88.4
Dunfn	82.5	84.2	88.9	91.0	88.7	88.8	91.0	87.9	88.0	90.1
Edinb	84.3	83.2	86.4	86.3	87.4	88.5	88.9	86.7	89.6	83.3
Glasgw	85.9	84.1	85.6	87.5	86.3	88.1	88.3	88.5	88.7	88.1
Inverns	87.6	87.6	86.9	87.2	86.5	93.8	89.2	92.2	89.0	86.8
Klmarnk	83.8	82.8	87.6	85.1	92.2	87.2	89.3	88.3	88.4	89.0
Wales										
Bangor	86.3	81.2	89.8	86.6	88.5	81.3	88.6	84.9	85.5	86.8
Cardff	86.0	80.8	84.6	84.2	84.0	88.7	82.6	86.7	85.9	88.4
Clwyd	86.8	90.0	76.3	83.5	79.0	91.2	87.9	89.5	78.0	92.3
Swanse	81.0	82.3	87.4	89.3	86.0	88.3	89.6	87.5	88.0	89.4
Wrexm	87.3	86.1	86.2	84.5	86.2	88.5	86.3	90.0	88.0	87.3
England	**88.3**	**88.8**	**88.0**	**88.0**	**88.4**	**88.6**	**89.0**	**89.1**	**89.3**	**89.9**
N Ireland				**86.2**	**87.7**	**89.4**	**90.4**	**89.9**	**89.8**	**91.2**
Scotland	**85.4**	**84.0**	**86.0**	**87.2**	**86.6**	**87.4**	**88.1**	**88.8**	**88.8**	**87.8**
Wales	**85.3**	**82.8**	**85.6**	**85.9**	**84.9**	**88.1**	**85.8**	**87.2**	**86.2**	**88.7**
UK	**88.1**	**88.2**	**88.0**	**87.7**	**88.1**	**88.5**	**88.8**	**89.0**	**89.1**	**89.8**

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

UK Renal Registry 15th Annual Report: Chapter 6 Haemoglobin, Ferritin and Erythropoietin amongst UK Adult Dialysis Patients in 2011: 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 2011, the median Hb of patients at the time of starting dialysis in the UK was 10 g/dl with 51% of patients having a Hb $\geqslant$10.0 g/dl.
- The UK median Hb in patients starting HD was 9.7 g/dl (IQR 8.8–10.7) and in patients starting PD was 10.9 g/dl (IQR 9.9–11.9).
- In 2011, at start of dialysis in the UK, 55% of patients presenting early had Hb $\geqslant$10.0 g/dl whilst 37% of patients presenting late had Hb $\geqslant$10.0 g/dl.
- The median Hb of prevalent patients on HD in the UK was 11.2 g/dl with an IQR of 10.3–12.1 g/dl.
- The median Hb of prevalent patients on PD in the UK was 11.4 g/dl with an IQR of 10.5–12.3 g/dl.
- In 2011, 82% of HD and 85% of PD UK patients had Hb $\geqslant$10 g/dl.
- In 2011, 56% of HD patients and 53% of PD UK patients had Hb $\geqslant$10 and $\leqslant$12 g/dl.
- In the UK, the median ferritin in HD patients was 436 µg/L (IQR 292–625) and 96% of HD patients had a ferritin $\geqslant$100 µg/L.
- In England, Wales and Northern Ireland the median ferritin in PD patients was 273 µg/L (IQR 153–446) with 86% of PD patients having a ferritin $\geqslant$100 µg/L.
- In 2011, the mean erythropoietin stimulating agent (ESA) dose was higher for HD than PD patients (8,740 vs. 6,624 IU/week) in England, Wales and Northern Ireland.

Introduction

This chapter describes the UK Renal Registry (UKRR) data relating to the management of anaemia in dialysis patients during 2011. The chapter reports outcomes of submitted variables and analyses of these variables in the context of the UK Renal Association – Anaemia in CKD guidelines and recommendations.

In this report haemoglobin levels are given in g/dl as the majority of UK laboratories were using these units in 2011. It is intended to switch to reporting haemoglobin levels in g/L in the 16th annual report.

Anaemia in adults with CKD is diagnosed when the Hb concentration is $<$13.0 g/dl in males and $<$12.0 g/dl in females [1]. The degree of renal impairment affects the likelihood of any patient developing anaemia. Although current treatment with ESAs is not recommended unless Hb falls consistently below 11.0 g/dl, other causes of anaemia should be excluded in patients with Hb below normal range.

The renal National Service Framework (NSF) part one [2] and the RA minimum standards document 3rd edition [3] state that individuals with chronic kidney disease (CKD) should achieve a haemoglobin (Hb) of at least 10 g/dl within six months of being seen by a nephrologist, unless there is a specific reason why it was unachievable. At present the UKRR does not collect Hb measurements specifically from patients six months after meeting a nephrologist. However, an indication of the attainment of this standard is given by the Hb of the incident patient population at the start of dialysis. The achievement of these standards is mainly through the use of iron therapy (oral and intravenous) and erythropoietin stimulating agents (ESAs).

The European Best Practice Guidelines (EBPG) [4] set a minimum target of 11 g/dl but suggest not to go higher than 12 g/dl in severe cardiovascular disease. The United States Kidney Disease Outcomes Quality Initiative (KDOQI) [5] guidelines set a target Hb range of 11–12 g/dl with a recommendation that the Hb target should not be greater than 13.0 g/dl. The NICE guidelines published in 2006 [6] and the 4th edition of the RA Clinical Practice Guidelines 2006 [7] recommended an outcome Hb of between 10.5 and 12.5 g/dl (with ESA dose changes considered at 11 and 12 g/dl) to allow for the difficulty in consistently narrowing the distribution to between 11 and 12 g/dl. In 2009, a new target Hb range for haemodialysis (HD) patients was recommended by the 5th edition of the Renal Association Guidelines for Haemodialysis patients [8]. This guidance specified that pre-HD Hb concentration should be maintained between 10 and 12 g/dl. The 5th edition of the UK Renal Association's Anaemia in CKD guideline was published at the end of 2010 and attempted to unify targets with those published in the 2010 update NICE guideline on anaemia management in CKD [9]. The target outcome Hb for RRT patients on ESA treatment in these guidelines is between 10 and 12 g/dl. The rationale behind choosing a wide target Hb range (10–12 g/dl) is that when the target Hb level is narrow (e.g. 1 g/dl), variability in achieved Hb levels around the target is high, the fraction of prevalent patients with achieved Hb levels within the target range is low and ESA dose titration is required frequently during maintenance therapy. Therefore, as this chapter analyses 2011 data, this revised target has been used for both HD and PD patients. There are also some analyses showing attainment of the minimum standard of Hb $\geqslant$10.0 g/dl. The KDIGO website [10] is a useful resource for comparison of international anaemia guidelines.

In patients on peritoneal dialysis (PD), the timing of the blood sample draw is not critical because plasma volume in these patients remains relatively constant. In haemodialysis (HD) patients, interdialytic weight gain contributes to a decrease in Hb level, whereas intradialytic ultrafiltration leads to an increase in Hb level. Thus, a predialysis sample underestimates the euvolaemic Hb level, whereas a postdialysis sample overestimates the euvolaemic Hb. Given the relationship between Hb level and the dialysis related weight change, midweek pre-dialysis sampling should be optimal for regular Hb monitoring [11].

The national and international recommendations for target iron status in CKD used in this chapter remain unchanged from the 2006 UKRR Annual Report. The 2007 Renal Association (RA) Clinical Practice Guidelines document, revised European Best Practice Guidelines (EBPGII), Dialysis Outcomes Quality Initiative (DOQI) guidelines and UK NICE anaemia guidelines all recommend a target serum ferritin greater than 100 µg/L and percentage transferrin saturation (TSAT) of more than 20% in patients with CKD. RA guidelines and EBPGII recommend hypochromic red cells (HRC) less than 10%. In addition, EBPGII recommends target reticulocyte Hb content (CHr) of greater than 29 pg/cell. KDOQI recommends a serum ferritin $>$200 µg/L for HD patients. The NICE guidelines suggest that a hypochromic red cell value $>$6% indicates ongoing iron deficiency.

To achieve adequate iron status across a patient population, RA guidelines advocate population target medians for ferritin of 200–500 µg/L in HD patients

and 100–500 μg/L for PD patients, for TSAT of 30–40%, for hypochromic red cells of <2.5% and CHr of 35 pg/cell. EBPGII comments that a serum ferritin target for the treatment population of 200–500 μg/L ensures that 85–90% of patients attain a serum ferritin of 100 μg/L.

All guidelines advise that serum ferritin levels should not exceed 800 μg/L since the potential risk of toxicity increases without conferring additional benefit. The KDOQI and NICE guidelines advise against intravenous iron administration to patients with a ferritin >500 μg/L.

Serum ferritin has some disadvantages as an index of iron status. It measures storage iron rather than available iron, behaves as an acute phase reactant and is therefore increased in inflammatory states, malignancy and liver disease and may not accurately reflect iron stores if measured within a week of the administration of intravenous iron. Serum ferritin level is less reliable in the evaluation of iron stores in HD patients, because ferritin level is affected by other factors in addition to iron storage status. In relatively healthy HD patients, before widespread use of IV iron therapy, the finding of a ferritin level less than 50 ng/mL was not uncommon and was associated with absent bone marrow iron in approximately 80% of patients. However, in HD patients with several comorbidities, absent iron stores may still be found at ferritin levels approaching or even exceeding 200 ng/mL [12].

Of the alternative measures of iron status available, HRC and CHr are generally considered superior to TSAT. Both however require specialised analysers to which not all UK renal centres have easy access. Since TSAT is measured infrequently in many centres and most UK centres continue to use serum ferritin for routine iron management, ferritin remains the chosen index of iron status for this report.

Treatment of renal anaemia with ESAs has offered a major way to improve quality of life for dialysis patients. These agents are relatively expensive and thus approaches to achieving normal haemoglobin levels with the lowest possible doses are desirable. The health economics of anaemia therapy using ESAs has been subject to a NICE systematic review which concludes that treating to a target Hb 11–12 g/dl is cost effective in HD patients.

The risks associated with low (<10 g/dl) and high (>13 g/dl) Hb are not necessarily equivalent. Two important studies of patients not yet on dialysis – CHOIR [13] and CREATE [14] showed an increased risk among the patients assigned to the higher Hb targets and adverse cardiovascular events. In the TREAT study [15] although there was no difference between the two arms in the primary outcome of death, cardiovascular event or end stage renal disease, there was an increase in fatal or nonfatal stroke in the treatment arm.

Methods

The incident and prevalent RRT cohorts for 2011 were analysed. The UKRR extracted quarterly data electronically from renal centres in England, Wales and Northern Ireland; data from Scotland were provided by the Scottish Renal Registry.

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 could be from 0 to 90 days later. The haemoglobin values the registry receives from the renal systems should be the closest available measurement to the end of the quarter. 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 more or less than 90 days respectively).

For the analyses of prevalent patients, those patients receiving dialysis on 31st December 2011 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 for Hb and from the last three quarters for ferritin was used. Scotland was excluded from the analysis for ferritin for PD patients as this data was not available.

The completeness of data items was 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 performance. Centres providing relevant data from less than 20 patients (10 patients for the analyses of incident patients) were also excluded from the plots. The number preceding the centre name in the caterpiller plots indicates the percentage of data that was missing for that centre.

The data were analysed to calculate summary statistics including maximum, minimum and average (mean and median) values. Standard deviations and inter-quartile ranges (IQR) were also calculated. These are shown using caterpillar plots giving median values and the inter-quartile ranges.

The percentages achieving RA and other standards were calculated for Hb and ferritin. 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 various targets and also whether any of the centres are significantly different from the average.

Longitudinal analysis was performed to show overall changes in achievement of standards from 1998 to 2011.

Erythropoietin data from the last quarter of 2011 were used to define which patients were receiving ESAs. Scotland was excluded from this analysis as data regarding ESA 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 70% of HD patients or fewer than 50% 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 is 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.

Previous reports have only used the dose from the final quarter of the year. This year, 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 (provided the patient was on the same treatment and receiving the same drug in those quarters) were used. 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 dose 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.

Patients for conservative care of established renal failure were by definition excluded from the dataset. Patients were similarly excluded if they received a pre-emptive transplant.

The percentage of data returned and outcome Hb are listed in table 6.1. Six centres were not included in this analysis due to either being small centres who submitted data on fewer than 10 patients and/or because data completeness was less than 50%.

The median Hb of patients at the time of starting dialysis in the UK was 10.0 g/dl. The percentage of patients having a Hb $\geqslant$10.0 g/dl has fallen over the last couple of years to 51% (53.6% and 55% for 2010 and 2009 cohorts respectively). The variation between centres remained high (25–74%). Using only centres with presentation time data, the median Hb in the late presenters was 9.4 g/dl with only 37% of patients having a Hb $\geqslant$10.0 g/dl compared to a median Hb of 10.1 g/dl and 55% of the patients having a Hb $\geqslant$10.0 g/dl in the early presenters group. In the late presenters group there was a large variation between centres in percentage of patients having a Hb $\geqslant$10.0 g/dl (0%–73%). The lower median Hb in late presenters may reflect inadequate pre-dialysis care with limited anaemia management, but alternatively, those presenting late may be more likely to have anaemia of multisystem disease or inter-current illness.

Median Hb of patients at dialysis start was also examined by modality and was 9.7 g/dl (IQR 8.8–10.7 g/dl) and 10.9 g/dl (IQR 9.9–11.9 g/dl) for HD and PD patients respectively. When initiating dialysis, 44.5% of HD patients had a Hb $\geqslant$10.0 g/dl, compared with 74.0% of PD patients.

The median starting Hb by centre is shown in figure 6.1 and the percentage starting with a Hb $\geqslant$10.0 g/dl by centre is given in figure 6.2.

Incident dialysis patients from 2010 were followed for one year and the median haemoglobin (and percentage with a Hb $\geqslant$10.0 g/dl) of survivors on the same treatment at the same centre after a year was calculated for each quarter. This was sub-analysed by modality and length of pre-RRT care (figures 6.3 and 6.4). Hb was higher in the second quarter on dialysis than the quarter of start reflecting the treatment administered. Over 80% of incident patients surviving to a year had Hb $\geqslant$10 g/dl regardless of the modality or the length of pre-RRT care.

The annual distribution of Hb in incident dialysis patients is shown in figure 6.5. Since 2006, the proportion of incident patients with Hb $\geqslant$12 g/dl has fallen from 17% to 10% and the proportion of patients with Hb $<$10.0 g/dl has increased from 40% to 49%.

ESA by time on dialysis in early vs. late presenters

Figure 6.6 shows that there was a relatively small difference betweeen early and late presenters in the percentage of patients receiving an ESA in the first quarter for both HD and PD patients. The differences disappear within six months of starting dialysis.

Anaemia management in prevalent dialysis patients

Compliance with data returns for haemoglobin and serum ferritin and percentages on ESA are shown for the 71 renal centres in the UK in tables 6.2 for both HD and PD patients. Completeness of data returns was generally good for Hb and ferritin. The percentages on ESA are shown as they appear in the data received by the registry. For some centres the ESA data is completely missing and for others it appears to be partially complete

Table 6.1. Haemoglobin data for incident patients starting haemodialysis or peritoneal dialysis during 2011, both overall and by presentation time

	All incident patients				Early presenters only (⩾3 months)		Late presenters only (<3 months)	
Centre	% data return	N with data	Median Hb g/dl	% Hb ⩾10 g/dl	Median Hb g/dl	% Hb ⩾10 g/dl	Median Hb g/dl	% Hb ⩾10 g/dl
England								
B Heart	100	102	9.9	49	10.0	51		
B QEH	94	182	9.9	49	10.2	56	9.3	27
Basldn	100	41	9.3	32	9.6	40	8.8	10
Bradfd	98	46	9.8	43	9.8	44		
Brightn	97	99	10.3	62				
Bristol	100	112	9.9	47	10.1	54	8.9	17
Camb	99	94	9.8	48	10.3	54	9.4	33
Carlis	100	23	10.6	57	10.6	58		
Carsh	98	182	10.3	60	10.3	62	10.2	55
Chelms	97	31	10.2	68	10.6	74		
Colchr	41	18						
Covnt	96	78	9.9	50				
Derby	97	68	10.4	65	10.4	63	10.4	73
Donc	98	41	9.6	41	10.4	54	8.9	9
Dorset	92	58	10.3	64	10.6	73	9.3	33
Dudley	100	25	9.6	44	10.1	55		
Exeter	100	103	9.8	45	9.8	44	9.4	40
Glouc	100	49	10.1	51	10.2	52		
Hull	98	93	10.4	62				
Ipswi	93	25	10.1	52	10.3	60		
Kent	97	102	9.9	47	10.0	52	9.3	26
L Barts	97	227	9.5	39				
L Guys	51	49	9.6	37	9.5	34		
L Kings	100	130	9.3	25	9.5	30	8.9	0
L Rfree	68	104	10.7	65				
L St.G	95	58	9.6	34				
L West	72	222	10.6	70	10.8	71	10.5	70
Leeds	100	119	9.5	35	9.6	40	8.9	20
Leic	97	218	10.0	52	10.1	55	9.6	40
Liv Ain	87	53	10.4	60				
Liv RI	92	78	11.0	71				
M RI	98	123	10.1	54				
Middlbr	96	79	9.6	42	9.8	44	8.4	33
Newc	99	75	9.9	48	10.2	57	8.6	17
Norwch	99	75	10.3	60	10.5	64	10.0	50
Nottm	99	86	10.0	50	10.0	53	9.7	36
Oxford	99	136	10.2	59	10.4	64	9.4	25
Plymth	49	23						
Ports	100	173	10.1	58	10.3	65	9.4	32
Prestn	98	125	9.6	38	9.8	42	8.9	26
Redng	97	90	9.7	43				
Salford	100	110	9.9	48				
Sheff	100	113	9.9	47	10.0	52	8.9	26
Shrew	98	55	10.5	71	10.6	71		
Stevng	100	101	9.7	42	9.8	46	9.3	23
Sthend	100	27	10.4	63	10.0	62		
Stoke	100	87	10.5	66	10.4	64	10.8	70
Sund	98	49	10.6	69	11.0	77		
Truro	97	28	10.4	61	10.4	63		
Wirral	85	47	10.0	51				

Table 6.1. Continued

Centre	All incident patients				Early presenters only (⩾3 months)		Late presenters only (<3 months)	
	% data return	N with data	Median Hb g/dl	% Hb ⩾10 g/dl	Median Hb g/dl	% Hb ⩾10 g/dl	Median Hb g/dl	% Hb ⩾10 g/dl
Wolve	97	65	9.8	48	9.8	47	10.0	50
York	100	38	9.6	34	9.6	41		
N Ireland								
Antrim	95	21	9.8	43	10.0	50		
Belfast	89	47	9.9	47	9.6	42		
Newry	97	37	10.2	54	10.3	62		
Ulster	100	34	10.0	50	10.0	50		
West NI	97	30	10.3	57	10.5	57		
Scotland								
Abrdn	83	39	9.5	41				
Airdrie	79	37	9.5	32				
D & Gall	40	4						
Dundee	96	52	10.2	56				
Dunfn	58	23	10.3	65				
Edinb	80	49	10.4	59				
Glasgw	49	72						
Inverns	31	4						
Klmarnk	50	15	9.2	47				
Wales								
Bangor	100	19	10.7	74	10.9	82		
Cardff	99	160	10.1	56	10.1	57	9.9	42
Clwyd	100	6						
Swanse	97	101	10.1	51	10.1	56	9.3	32
Wrexm	100	21	10.5	67	10.5	67		
England	**93**	**4,535**	**10.0**	**51**	**10.1**	**55**	**9.4**	**37**
N Ireland	**95**	**169**	**10.0**	**50**	**10.0**	**51**	**9.6**	**44**
Scotland	**66**	**295**	**9.9**	**49**				
Wales	**99**	**307**	**10.1**	**56**	**10.2**	**59**	**9.6**	**37**
UK	**91**	**5,306**	**10.0**	**51**	**10.1**	**55**	**9.4**	**37**

Blank cells – centres excluded from analyses due to poor data completeness or low patient numbers or because presentation time data not available

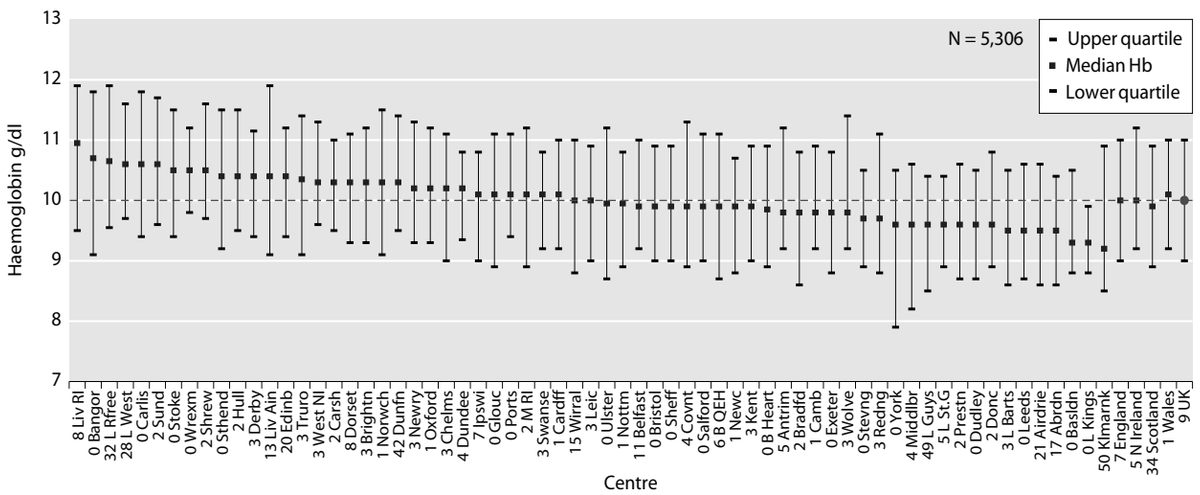

Fig. 6.1. Median haemoglobin for incident dialysis patients at start of dialysis treatment in 2011

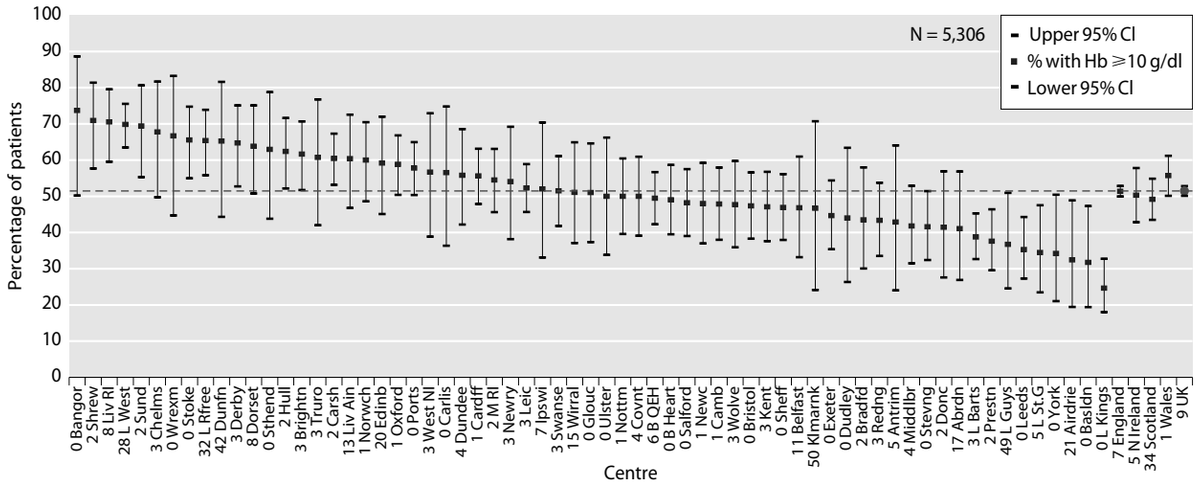

Fig. 6.2. Percentage of incident dialysis patients with Hb ⩾10 g/dl at start of dialysis treatment in 2011

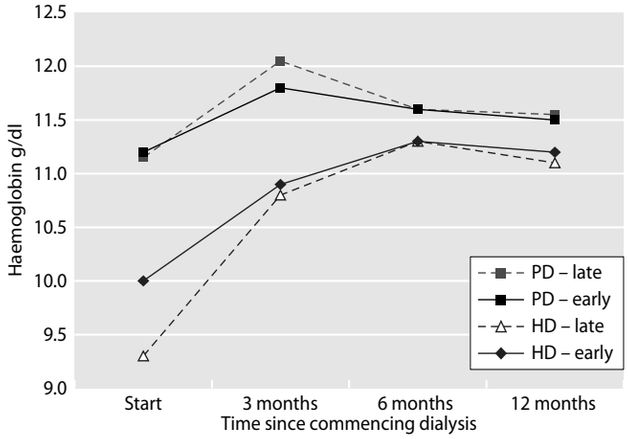

Fig. 6.3. Median haemoglobin, by time on dialysis and length of pre-RRT care, for incident dialysis patients in 2010

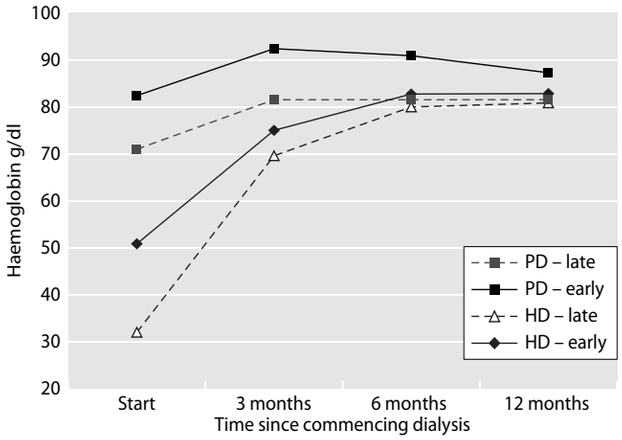

Fig. 6.4. Percentage of incident dialysis patients in 2010 with Hb ⩾10 g/dl, by time on dialysis and by length of pre-RRT care

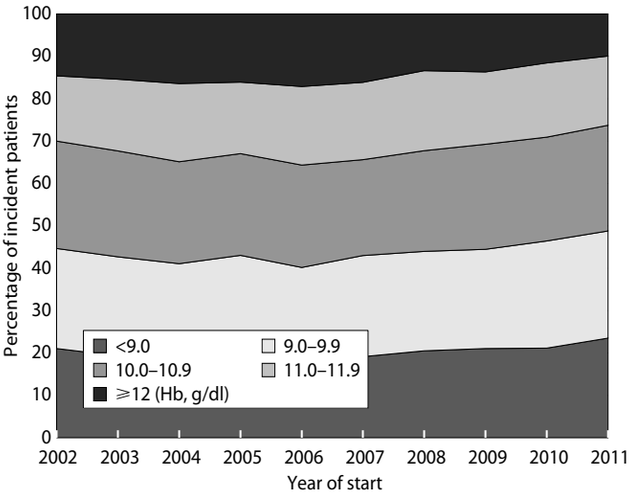

Fig. 6.5. Distribution of haemoglobin in incident dialysis patients by year of start

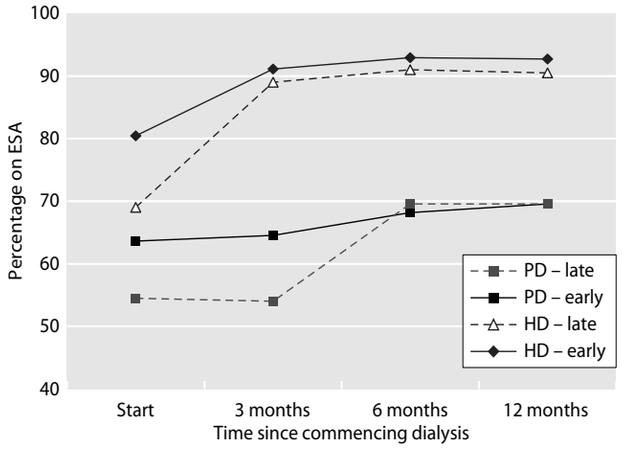

Fig. 6.6. Percentage of incident dialysis patients in 2010 on ESA, by time on dialysis and by length of pre-RRT care

Table 6.2. Percentage compliance for data returns for haemoglobin and serum ferritin and percentages on ESA for prevalent HD and PD patients in 2011

	HD				PD			
		% completeness				% completeness		
Centre	N	Hb	Ferritin	% on ESA	N	Hb	Ferritin	% on ESA
England								
B Heart	413	100	99	76	38	100	100	61
B QEH	831	99	98	85	147	99	99	65
Basldn	138	98	98	86	25	100	96	60
Bradfd	181	99	97	95	28	96	96	79
Brightn	313	99	93	0	66	98	88	0
Bristol	445	100	100	93	60	100	98	70
Camb	334	99	87	15	32	100	100	72
Carlis	60	100	93	60	17	100	100	59
Carsh	704	93	91	0	94	95	98	0
Chelms	113	100	100	98	22	100	100	86
Colchr	105	96	94	23				
Covnt	334	99	99	93	79	97	89	70
Derby	193	99	99	0	101	100	100	0
Donc	153	100	97	92	21	100	100	76
Dorset	222	100	98	3	45	100	98	9
Dudley	137	100	99	4	50	98	84	8
Exeter	340	100	99	96	63	100	100	76
Glouc	183	100	96	94	34	94	91	62
Hull	308	99	98	0	78	96	92	0
Ipswi	119	100	67	86	30	100	93	87
Kent	353	100	98	90	61	100	100	3
L Barts	818	99	98	0	152	98	97	0
L Guys	578	84	77	21	28	100	100	11
L Kings	431	100	99	0	77	99	99	0
L Rfree	659	72	79	0	81	80	100	0
L St.G	275	98	96	0	53	96	96	0
L West	1317	98	98	0	32	94	100	0
Leeds	468	100	100	92	81	100	100	86
Leic	784	99	99	98	139	99	99	85
Liv Ain	160	94	93	46	13	100	100	23
Liv RI	362	99	99	88	59	98	98	80
M RI	453	87	85	0	71	100	97	0
Middlbr	285	98	98	81	14	93	93	64
Newc	239	100	100	76	41	100	100	2
Norwch	291	100	98	92	48	100	100	58
Nottm	385	100	100	90	74	100	100	68
Oxford	374	100	99	91	82	100	100	82
Plymth	124	44	97	29	40	83	93	70
Ports	468	100	99	11	83	99	95	17
Prestn	486	99	99	87	54	100	100	59
Redng	245	100	100	96	74	99	99	3
Salford	337	90	21	95	97	100	1	93
Sheff	560	100	100	89	54	100	100	59
Shrew	176	100	99	95	27	96	89	67
Stevng	387	100	99	0	26	100	96	0
Sthend	116	100	100	92	16	100	100	44
Stoke	292	100	99	1	69	100	100	0
Sund	162	100	96	96	13	100	92	69
Truro	139	100	100	1	22	100	95	0
Wirral	181	75	70	2	36	75	53	0

Table 6.2. Continued

	HD				PD			
		% completeness				% completeness		
Centre	N	Hb	Ferritin	% on ESA	N	Hb	Ferritin	% on ESA
Wolve	295	99	99	86	63	100	100	68
York	123	100	98	85	19	95	100	89
N Ireland								
Antrim	123	100	99	93	12	100	100	92
Belfast	209	98	98	89	28	100	96	79
Newry	100	99	65	98	9	100	100	67
Ulster	101	100	100	95	3	100	100	100
West NI	137	100	66	91	17	100	94	71
Scotland								
Abrdn	202	100	95		22	100		
Airdrie	158	100	94		8	100		
D & Gall	49	86	98		13	46		
Dundee	175	99	97		18	94		
Dunfn	137	100	99		26	100		
Edinb	240	99	95		35	100		
Glasgw	571	96	83		42	57		
Inverns	78	95	50		18	83		
Klmarnk	141	94	89		39	77		
Wales								
Bangor	85	100	100	86	20	100	100	60
Cardff	458	99	97	65	94	99	97	13
Clwyd	59	100	100	46	8	100	88	63
Swanse	328	100	100	44	49	100	100	45
Wrexm	81	100	44	93	15	93	27	53
England	**17,949**	**96**	**94**	**90**	**2,829**	**98**	**94**	**74**
N Ireland	**670**	**99**	**87**	**92**	**69**	**100**	**97**	**78**
Scotland	**1,751**	**97**	**89**		**221**	**83**		
Wales	**1,011**	**100**	**94**	**89**	**186**	**99**	**92**	**58**
UK	**21,381**	**97**	**94**	**90***	**3,305**	**97**	**94***	**73***

*The overall averages given are for E,W & NI (not UK)
Blank cells – centres with no PD patients or because data not available
Percentages on ESA are shown, but it is believed that there were data problems for those centres with apparently less than 70% of HD patients or 50% of PD patients on ESA
The country level averages for the % on ESA are based only on those centres whose % was above the limits mentioned above

with, for example, only 10 or 20% of patients appearing to be on ESAs. It is believed that there were problems with data entry and/or data transfer in those centres with apparently less than 70% of HD patients or 50% of PD patients on ESA. These centres have been excluded from further analyses of ESA use.

Summary statistics for haemoglobin, serum ferritin and ESA are shown for the 71 renal centres in the UK in tables 6.3 for HD and 6.4 for PD patients respectively.

Haemoglobin in prevalent haemodialysis patients

The median Hb of patients on HD in the UK was 11.2 g/dl with an IQR of 10.3–12.1 g/dl and 82% of HD patients had a Hb $\geqslant$10.0 g/dl (table 6.3). The median Hb by centre is shown in figure 6.7. The UK median dropped from 11.5 g/dl to 11.2 g/dl between 2010 and 2011. Compliance with the target range of Hb $\geqslant$10 and $\leqslant$12 g/dl increased from 52.7% in 2010 to 56.1% in 2011 (figure 6.8). The percentages of HD patients with Hb below 10 g/dl and above 12 g/dl, as well as the percentages meeting the target, are shown by centre in figure 6.9.

Funnel plots are shown for the minimum (Hb $\geqslant$10.0 g/dl) and target range (Hb $\geqslant$10 and $\leqslant$12 g/dl) in figures 6.10 and 6.11 respectively. Many centres complied well with respect to both the minimum and

Table 6.3. Summary statistics for haemoglobin, serum ferritin and ESA for prevalent HD patients in 2011

Centre	N with Hb data	Median Hb g/dl	% Hb ⩾10 g/dl	% Hb 10–12 g/dl	Median ferritin µg/L	% ferritin ⩾100 µg/L	% ferritin >200 and ⩽500 µg/L	% on ESA	Median ESA dose (IU/week)	% with Hb ⩾10 g/dl and not on ESA
England										
B Heart	413	11.1	78	53	336	93	60	76	8,800	22
B QEH	821	11.0	78	58	390	97	68	85	6,000	14
Basldn	135	11.0	80	63	341	96	80	86	6,000	11
Bradfd	179	11.3	75	47	523	99	40	95	6,708	4
Brightn	309	11.1	81	57	474	98	50			
Bristol	445	11.3	82	56	599	97	29	93	7,500	7
Camb	332	11.2	79	56	320	88	53			
Carlis	60	11.6	88	53	482	100	54			
Carsh	657	11.0	79	60	368	94	60			
Chelms	113	11.1	77	54	449	100	57	98	10,000	1
Colchr	101	11.3	88	64	653	99	20			
Covnt	332	10.8	73	58	303	92	71	93	11,050	7
Derby	192	11.6	91	57	406	97	51			
Donc	153	11.4	81	54	497	99	45	92	7,000	8
Dorset	222	11.4	85	54	495	98	46			
Dudley	137	11.3	82	53	321	86	57			
Exeter	340	11.1	81	56	278	96	71	96	7,789	4
Glouc	183	11.4	90	66	384	95	49	94		6
Hull	305	11.5	90	58	411	99	65			
Ipswi	119	11.4	86	55	624	98	26	86	7,625	12
Kent	352	11.1	85	66	468	94	40	90	8,250	8
L Barts	809	10.8	75	60	461	96	51			
L Guys	485	10.9	77	59	554	98	34			
L Kings	430	10.5	70	61	567	98	33			
L Rfree	474	11.6	85	46	499	96	34			
L St.G	269	10.8	74	57	434	97	50			
L West	1,291	11.4	88	56	491	98	48			
Leeds	468	11.3	84	57	512	95	37	92	4,000	7
Leic	778	11.4	82	54	353	95	60	98	6,250	1
Liv Ain	150	11.6	91	59	572	96	31			
Liv RI	359	11.9	89	45	459	94	34	88	8,000	11
M RI	394	11.6	86	49	394	95	62			
Middlbr	280	11.3	78	43	679	94	21	81	5,750	16
Newc	239	11.3	84	56	430	92	41	76	9,225	22
Norwch	290	11.4	89	59	489	96	37	92	8,000	7
Nottm	384	11.2	84	61	561	99	32	90	8,250	9
Oxford	374	11.1	79	54	286	91	55	91	8,000	9
Plymth	55				734	98	25			
Ports	468	11.5	86	49	313	94	59			
Prestn	482	11.1	82	57	593	92	26	87		12
Redng	245	11.2	82	56	509	98	42	96		4
Salford	302	10.9	78	53				95	6,000	3
Sheff	560	11.2	81	52	491	97	45	89	7,500	10
Shrew	176	11.5	91	59	394	95	58	95	7,500	5
Stevng	387	11.3	83	58	432	97	49			
Sthend	116	10.8	78	61	316	97	70	92	9,000	8
Stoke	292	11.4	86	55	540	99	38			
Sund	162	11.5	90	56	598	98	31	96	8,788	3
Truro	139	11.0	81	65	507	99	47			
Wirral	135	11.0	73	52	513	99	40			
Wolve	293	11.4	87	55	466	97	52	86	6,000	13
York	123	10.8	80	63	414	93	66	85	4,000	13

Table 6.3. Summary statistics for haemoglobin, serum ferritin and ESA for prevalent HD patients in 2011

Centre	N with Hb data	Median Hb g/dl	% Hb ⩾10 g/dl	% Hb 10–12 g/dl	Median ferritin µg/L	% ferritin ⩾100 µg/L	% ferritin >200 and ⩽500 µg/L	% on ESA	Median ESA dose (IU/week)	% with Hb ⩾10 g/dl and not on ESA
N Ireland										
Antrim	123	11.2	86	66	401	98	52	93	6,500	6
Belfast	205	11.3	81	55	419	96	43	89	8,000	10
Newry	99	11.7	94	58	501	95	40	98	6,000	2
Ulster	101	11.0	84	67	552	99	35	95	5,417	5
West NI	137	11.5	89	61	613	88	20	91	9,000	9
Scotland										
Abrdn	201	11.1	80	60	554	98	36			
Airdrie	158	11.4	87	58	768	99	22			
D & Gall	42	11.3	90	81	589	94	23			
Dundee	174	11.4	87	60	445	90	35			
Dunfn	137	11.5	83	47	521	91	32			
Edinb	238	11.8	91	48	407	88	44			
Glasgw	549	11.2	80	55	439	92	38			
Inverns	74	12.0	92	45	248	97	56			
Klmarnk	132	11.5	77	48	333	94	50			
Wales										
Bangor	85	11.3	92	59	435	99	58	86	9,000	13
Cardff	455	11.4	85	55	323	96	64			
Clwyd	59	11.6	90	58	336	97	63			
Swanse	328	11.2	83	67	354	91	50			
Wrexm	81	11.7	89	49				93	7,000	7
England	**17,309**	**11.2**	**82**	**56**	**440**	**96**	**48**	**90**	**7,500**	**9**
N Ireland	**665**	**11.3**	**86**	**60**	**477**	**95**	**40**	**92**	**7,000**	**7**
Scotland	**1,705**	**11.4**	**83**	**54**	**465**	**93**	**37**			
Wales	**1,008**	**11.3**	**86**	**59**	**344**	**95**	**59**	**89**	**7,583**	**10**
UK	**20,687**	**11.2**	**82**	**56**	**436**	**96**	**47**	**90**	**7,450**	**9**

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 70% or more
For ESA the overall averages given are for E,W & NI not UK

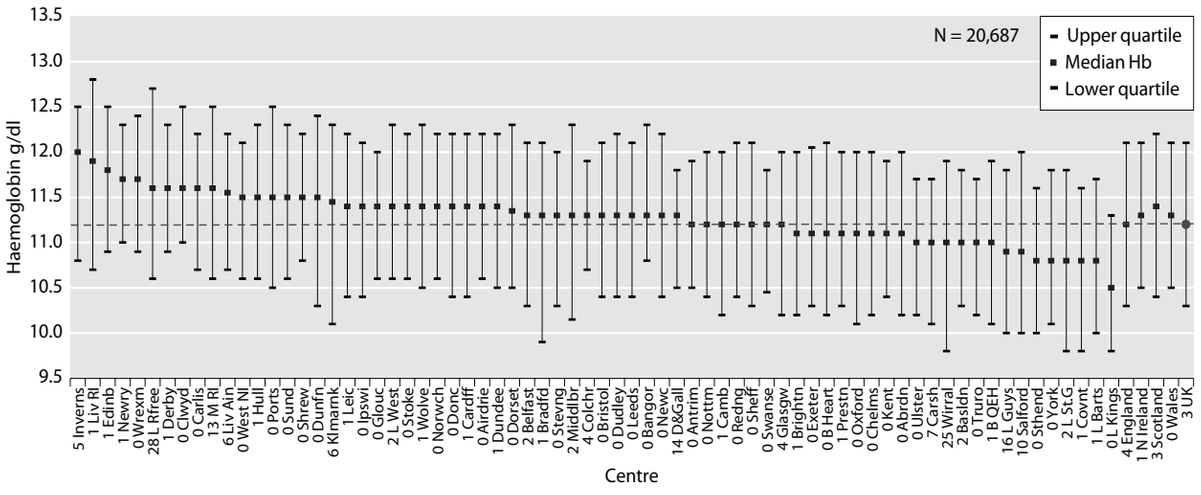

Fig. 6.7. Median haemoglobin in patients treated with HD by centre in 2011

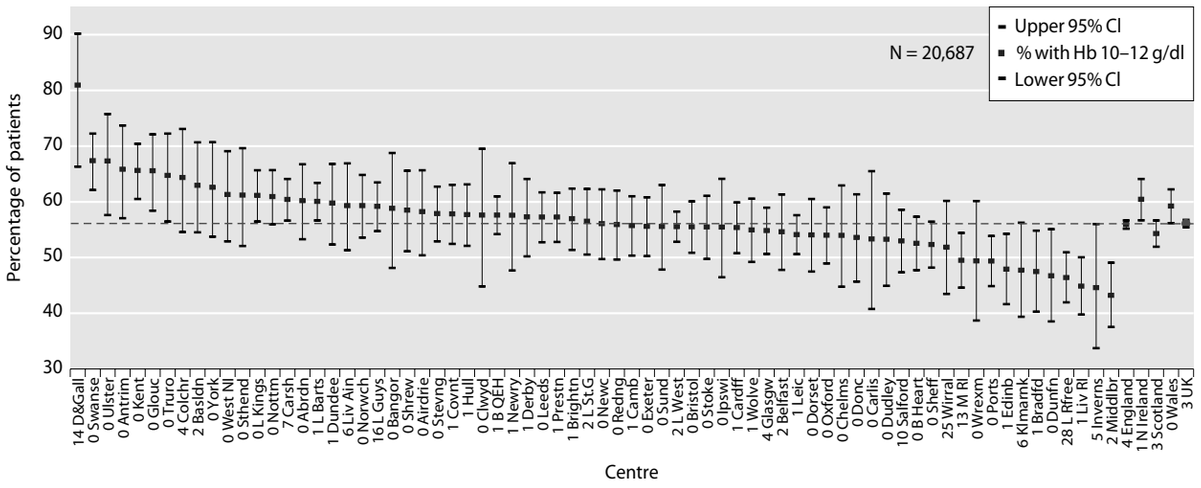

Fig. 6.8. Percentage of HD patients with Hb $\geqslant$10 and $\leqslant$12 g/dl by centre in 2011

target range Hb standards. Some centres fell within 3 SDs of the mean in the funnel plot for the percentage of patients with Hb $\geqslant$10 and $\leqslant$12 g/dl (figure 6.11) and yet had a poor compliance with the percentage with Hb $\geqslant$10.0 g/dl (figure 6.10) (for example Coventry, London Barts and London Kings). On the contrary some centres complied well with the percentage with Hb $\geqslant$10.0 g/dl but had a poor compliance with percentage of patients with Hb $\geqslant$10 and $\leqslant$12 g/dl (for example London Royal Free and Liverpool Royal had 31–44% of their patients with Hb >12.0 g/dl). This demonstrates that compliance with one standard can be achieved without compliance with another standard. Table 6.3 can be used in conjunction with figures 6.10 and 6.11 to identify centres.

Haemoglobin in prevalent peritoneal dialysis patients

Overall, 85% of patients on PD had a Hb $\geqslant$10.0 g/dl (table 6.4). The median Hb of patients on PD in the UK in 2011 was 11.4 g/dl with an IQR of 10.5–12.3 g/dl which compares with 11.6 g/dl in 2010. The median Hb by centre is shown in figure 6.12. The compliance with Hb $\geqslant$10.0 and $\leqslant$12.0 g/dl is shown in figure 6.13. In 2011, 53% of prevalent PD patients had a Hb within the target range. The distribution of Hb in PD patients by centre is shown in figure 6.14. The funnel plots for percentage with Hb $\geqslant$10.0 g/dl and for the percentage of patients with Hb $\geqslant$10 and $\leqslant$12 g/dl are shown in figures 6.15 and 6.16 respectively. Table 6.4 can be used in conjunction with figures 6.15 and 6.16 to identify centres in the funnel plot.

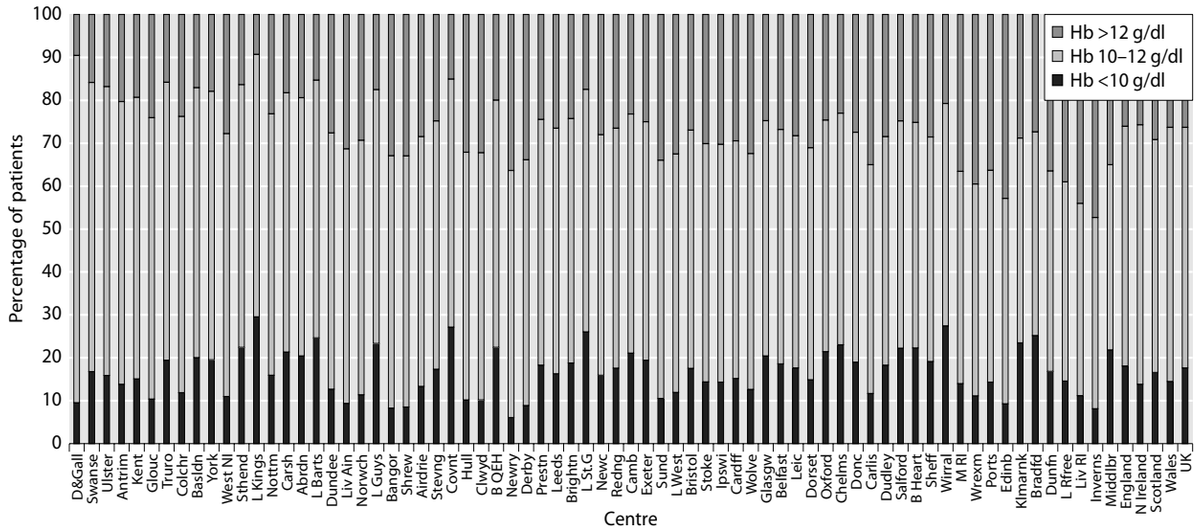

Fig. 6.9. Distribution of haemoglobin in patients treated with HD by centre in 2011

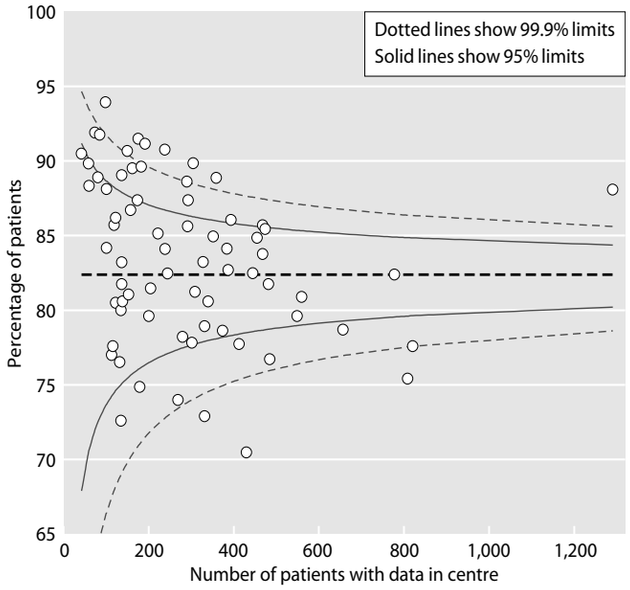

Fig. 6.10. Funnel plot of percentage of HD patients with Hb ⩾10 g/dl by centre in 2011

Relationship between Hb in incident and prevalent dialysis patients in 2011

The relationship between the percentage of incident and prevalent dialysis (HD and PD) patients with a Hb ⩾10.0 g/dl is shown in figure 6.17. As expected, all centres had a higher percentage of prevalent patients achieving a Hb ⩾10.0 g/dl than that for incident patients. Overall in the UK, 83% of prevalent patients, compared with 51% of incident patients, had a Hb ⩾10.0 g/dl in 2011. Compliance with 'current' minimum standards by year (1998–2011) for incident and prevalent patients (all dialysis patients) is shown in figure 6.18. Since 2006 there has been a decline in achieving this standard for incident and prevalent patients.

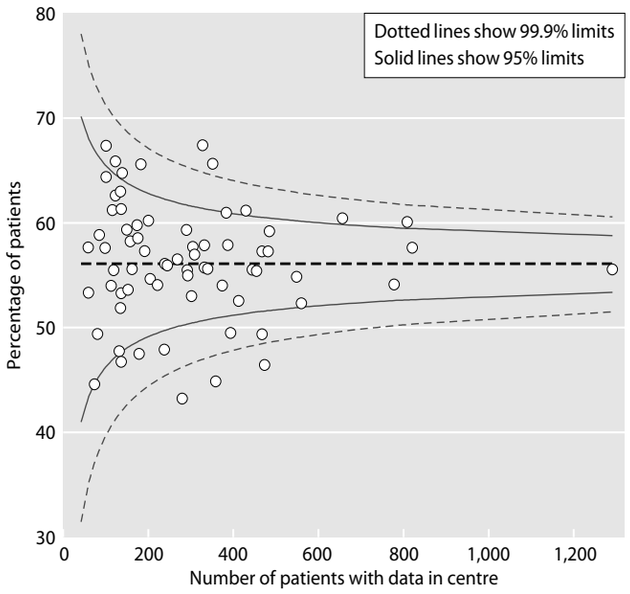

Fig. 6.11. Funnel plot of percentage of HD patients with Hb ⩾10 and ⩽12 g/dl by centre in 2011

Ferritin in prevalent haemodialysis patients

The median and IQR for serum ferritin for patients treated with HD are shown in figure 6.19. The percentages with serum ferritin ⩾100 µg/L, >200 µg/L and ⩽500 µg/L, and ⩾800 µg/L are shown in figures 6.20, 6.21 and 6.22 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 436 µg/L, IQR 292–625. Twenty-one of the 69 units who had returns for ferritin had greater than 20% (21–43%) of their patients with ferritin ⩾800 µg/L (figure 6.22). The serum ferritin correlated poorly with median Hb achieved and ESA dose demonstrating that serum ferritin is a poor index of iron status.

Ferritin in prevalent peritoneal dialysis patients

The median and IQR for serum ferritin for patients treated with PD are shown in figure 6.23. The percentages with serum ferritin ⩾100 µg/L, >100 µg/L and ⩽500 µg/L, and ⩾800 µg/L are shown in figures 6.24, 6.25 and 6.26 respectively. The PD population had a lower median ferritin value at 273 µg/L, IQR 153–446. In 2011, 27 centres reported less than 90% of PD patients compliant with serum ferritin ⩾100 µg/L, although this had little bearing on their achieved median Hb or median ESA dose when compared with other centres.

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 7,450 IU/week and varied from 4,000 IU/week (Leeds) to 11,050 IU/week (Coventry). These results have been consistent over the last two years with a median Hb of 11.3 g/dl and 10.8 g/dl for Leeds and Coventry respectively (table 6.3).

Erythropoietin stimulating agents in prevalent peritoneal dialysis patients

In 2011, the median dose was substantially lower in prevalent PD patients at 4,750 (range 1,500–12,000) IU/week (table 6.4) compared to HD patients.

Table 6.4. Summary statistics for haemoglobin, serum ferritin and ESA for prevalent PD patients in 2011

Centre	N with Hb data	Median Hb g/dl	% Hb ⩾10 g/dl	% Hb 10–12 g/dl	Median ferritin µg/L	% ferritin ⩾100 µg/L	% ferritin >100 and ⩽500 µg/L	% on ESA	Median ESA dose (IU/week)	% with Hb ⩾10 g/dl and not on ESA
England										
B Heart	38	11.7	95	53	235	89	84	61	4,000	37
B QEH	146	11.4	81	53	247	77	57	65	5,000	33
Basldn	25	10.9	64	28	140	71	71	60	3,000	40
Bradfd	27	11.6	85	59	195	93	63	79	3,750	19
Brightn	65	11.4	78	48	295	91	72			
Bristol	60	11.4	92	58	343	88	59	70	3,292	30
Camb	32	11.7	94	53	346	94	75	72	4,000	28
Carlis	17									
Carsh	89	11.1	83	54	197	82	70			
Chelms	22	11.7	91	50	200	91	82	86	4,000	14
Colchr	n/a									
Covnt	77	11.4	81	51	241	87	70	70	8,000	26
Derby	101	11.2	85	57	330	92	63			
Donc	21	11.7	90	52	209	95	86	76	3,000	24
Dorset	45	11.7	89	42	348	93	70			
Dudley	49	12.1	88	37	124	67	62			
Exeter	63	11.7	92	51	198	86	83	76	4,000	22
Glouc	32	11.7	88	53	143	68	61	62		34
Hull	75	11.2	84	56	371	94	68			
Ipswi	30	11.3	87	47	272	86	61	87	3,875	10
Kent	61	11.3	85	51	324	90	72			
L Barts	149	11.0	81	56	285	86	65			
L Guys	28	10.5	75	61	232	86	68			
L Kings	76	10.6	70	54	242	91	83			
L Rfree	65	11.2	82	52	477	93	46			
L St.G	51	11.6	84	47	327	92	78			
L West	30	11.4	87	63	250	91	69			
Leeds	81	11.3	83	63	320	94	75	86	4,000	14
Leic	138	11.4	86	60	409	94	66	85	4,000	14
Liv Ain	13									
Liv RI	58	11.6	91	59	361	88	55	80	8,000	19
M RI	71	11.5	77	41	160	81	75			
Middlbr	13									
Newc	41	11.8	80	44	494	85	37			
Norwch	48	11.9	96	56	172	71	58	58	4,000	40
Nottm	74	10.8	76	54	291	86	62	68		30
Oxford	82	11.2	87	65	219	88	72	82	6,000	18
Plymth	33	11.5	82	45	284	81	57	70	9,000	24
Ports	82	12.0	88	39	317	92	75			
Prestn	54	11.4	87	59	296	81	52	59		35
Redng	73	11.5	89	58	341	92	67			
Salford	97	11.4	86	46				93	12,000	7
Sheff	54	11.4	87	56	449	89	50	59	4,417	37
Shrew	26	12.0	92	46	303	92	71	67	6,000	35
Stevng	26	11.8	100	65	225	80	72			
Sthend	16									
Stoke	69	11.3	88	52	416	90	54			
Sund	13									
Truro	22	11.5	91	59	308	100	95			
Wirral	27	11.4	74	59						
Wolve	63	11.4	83	49	202	75	57	68	4,000	30
York	18									

Table 6.4. Continued

Centre	N with Hb data	Median Hb g/dl	% Hb ⩾10 g/dl	% Hb 10–12 g/dl	Median ferritin µg/L	% ferritin ⩾100 µg/L	% ferritin >100 and ⩽500 µg/L	% on ESA	Median ESA dose (IU/week)	% with Hb ⩾10 g/dl and not on ESA
N Ireland										
Antrim	12									
Belfast	28	10.7	82	57	267	93	70	79	4,000	21
Newry	9									
Ulster	3									
West NI	17									
Scotland										
Abrdn	22	11.6	86	55						
Airdrie	8									
D & Gall	6									
Dundee	17									
Dunfn	26	11.8	92	50						
Edinb	35	10.8	80	57						
Glasgw	24	11.1	92	67						
Inverns	15									
Klmarnk	30	11.2	83	53						
Wales										
Bangor	20	12.4	100	40	148	65	45	60	1,500	40
Cardff	93	11.6	87	47	96	48	46			
Clwyd	8									
Swanse	49	11.3	82	53	243	86	69			
Wrexm	14									
England	**2,766**	**11.4**	**85**	**53**	**284**	**87**	**66**	**74**	**5,000**	**25**
N Ireland	**69**	**11.4**	**90**	**57**	**281**	**90**	**67**	**78**	**3,000**	**22**
Scotland	**183**	**11.5**	**86**	**54**						
Wales	**184**	**11.6**	**87**	**47**	**134**	**64**	**56**	**58**	**4,000**	**40**
UK	**3,202**	**11.4**	**85**	**53**	**273**	**86**	**65**	**73**	**4,750**	**25**

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 50% or more
For ferritin and for ESA the overall avaerages given are for E,W & NI not UK

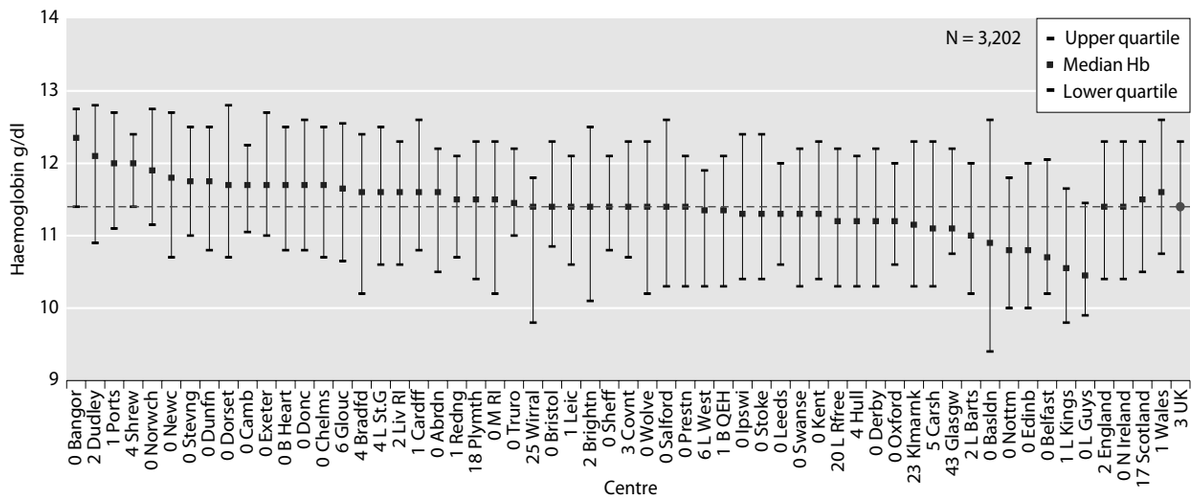

Fig. 6.12. Median haemoglobin in patients treated with PD by centre in 2011

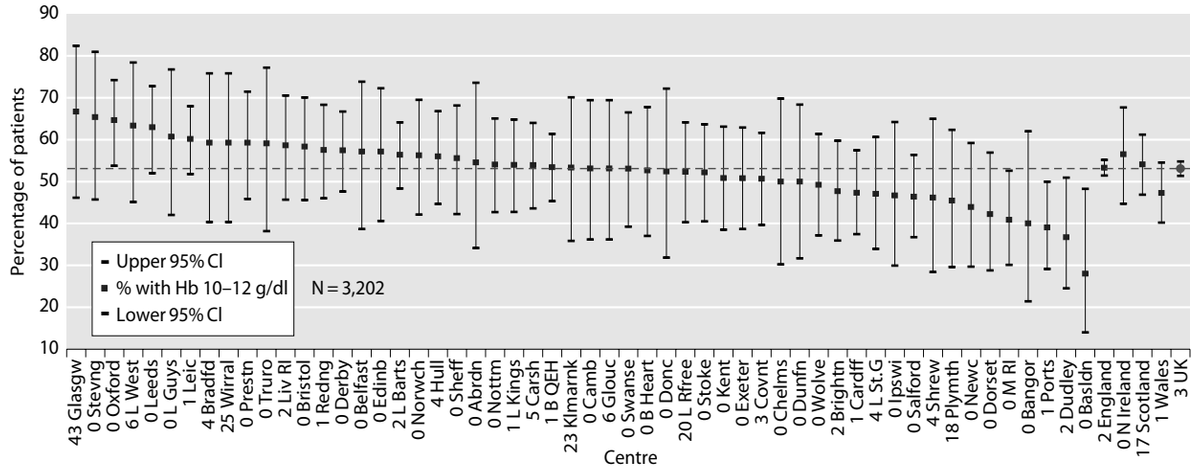

Fig. 6.13. Percentage of PD patients with Hb $\geqslant$10 and $\leqslant$12 g/dl by centre in 2011

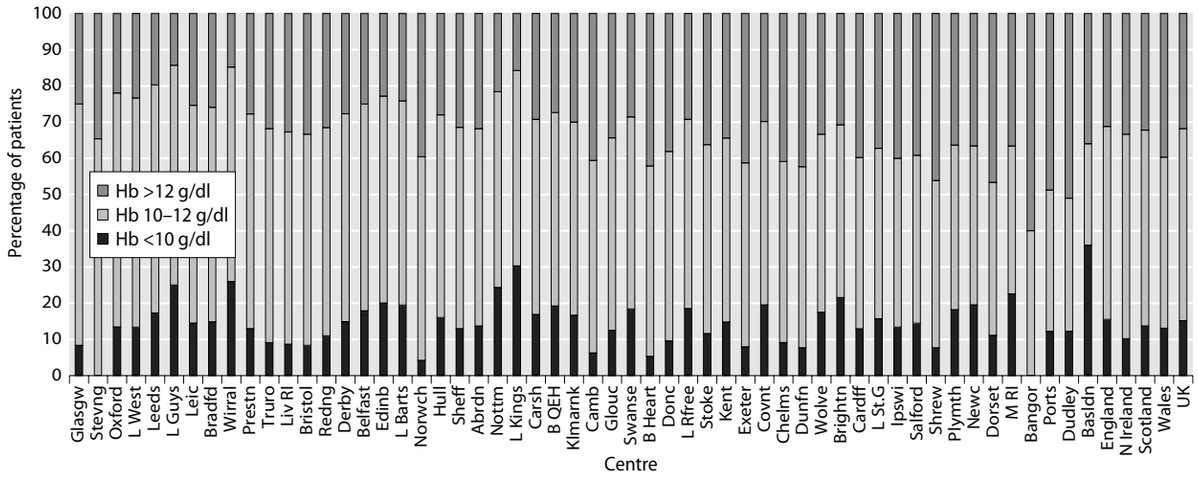

Fig. 6.14. Distribution of haemoglobin in patients treated with PD by centre in 2011

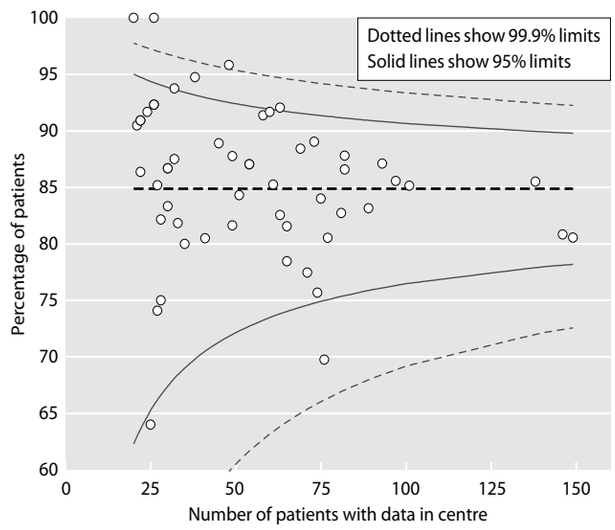

Fig. 6.15. Funnel plot of percentage of PD patients with Hb $\geqslant$10 g/dl by centre in 2011

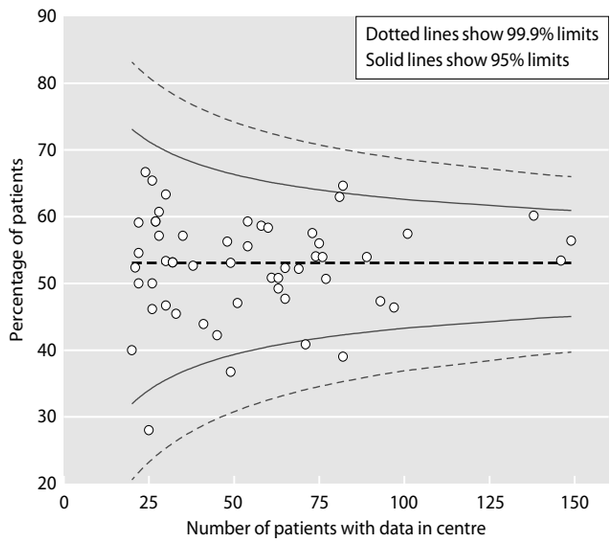

Fig. 6.16. Funnel plot of percentage of PD patients with Hb $\geqslant$10 g/dl and $\leqslant$12 g/dl by centre in 2011

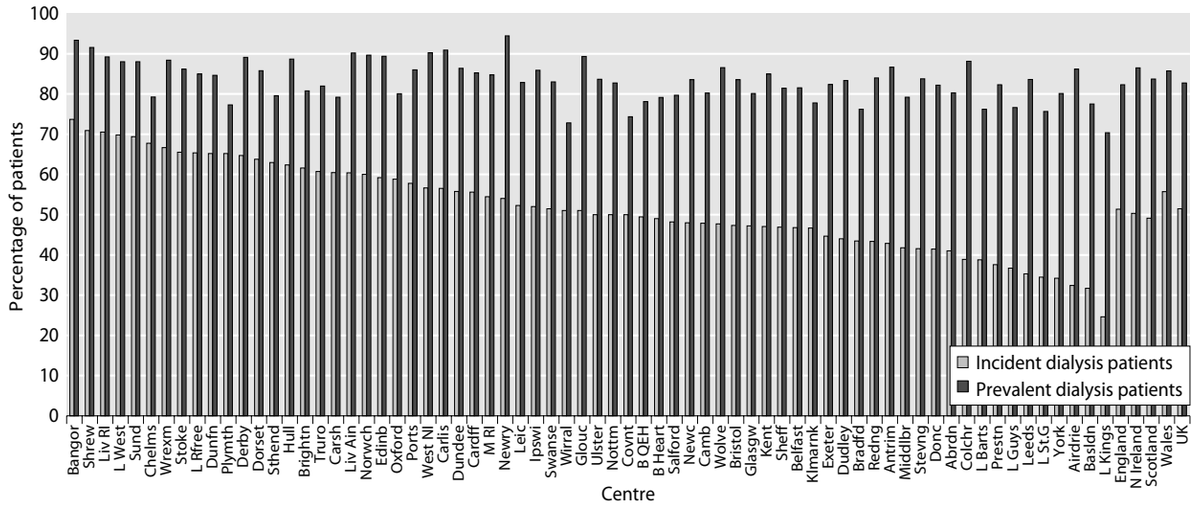

Fig. 6.17. Percentage of incident and prevalent dialysis patients with Hb ⩾10 g/dl by centre in 2011

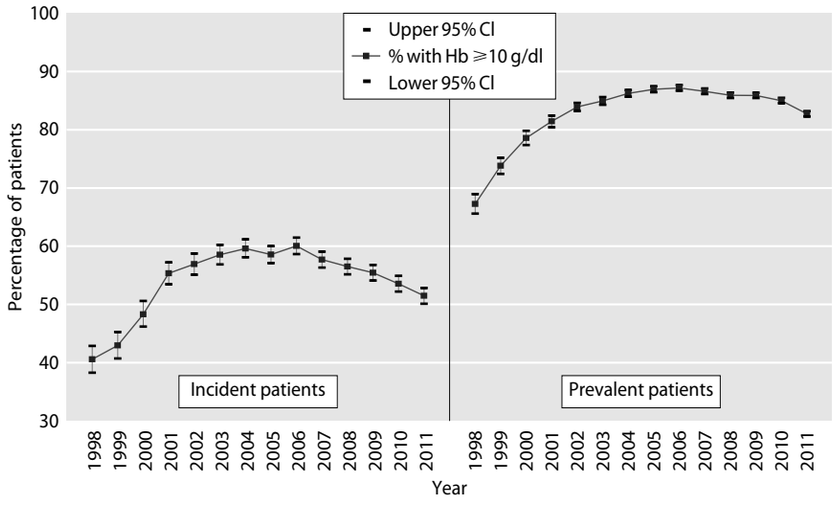

Fig. 6.18. Percentage of incident and prevalent dialysis patients (1998–2011) with Hb ⩾10 g/dl

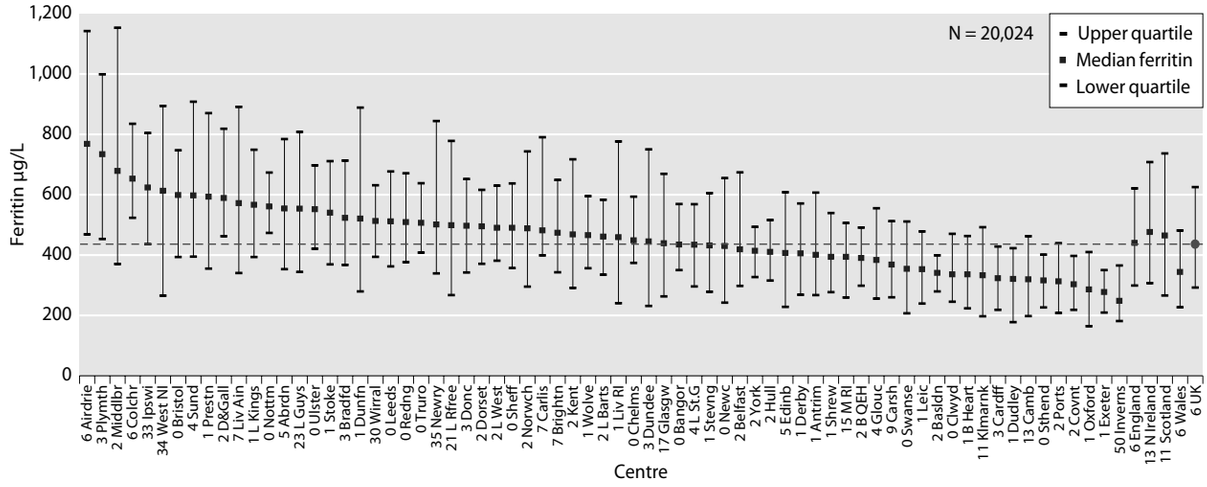

Fig. 6.19. Median ferritin in patients treated with HD by centre in 2011

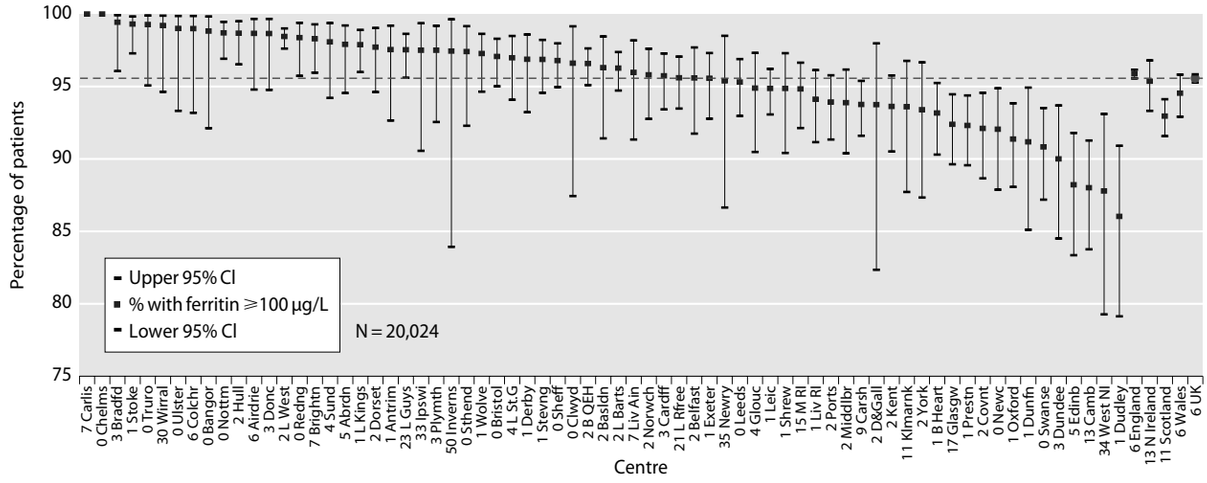

Fig. 6.20. Percentage of HD patients with ferritin ⩾100 µg/L by centre in 2011

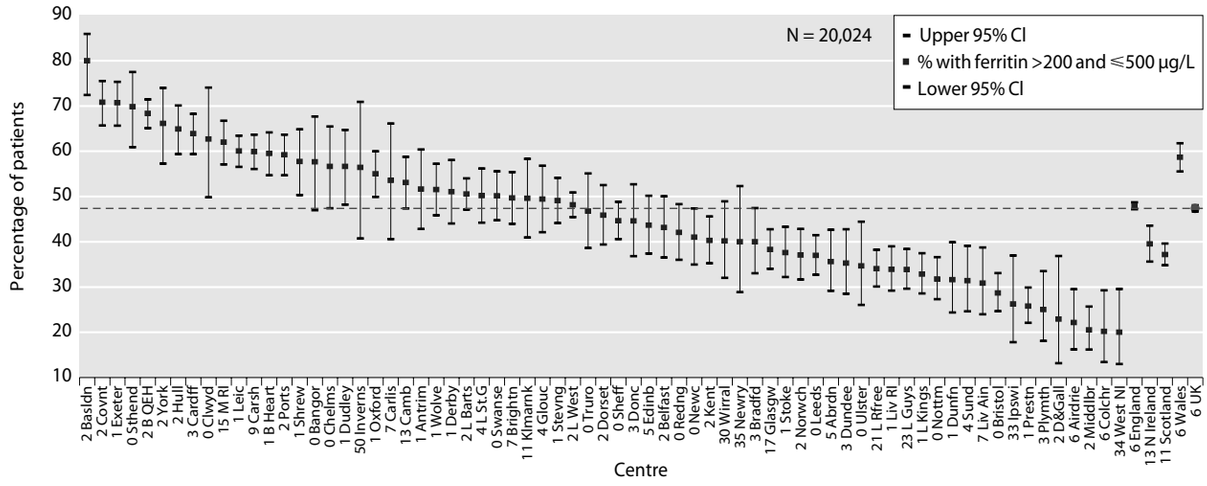

Fig. 6.21. Percentage of HD patients with ferritin >200 µg/L and ⩽500 µg/L by centre in 2011

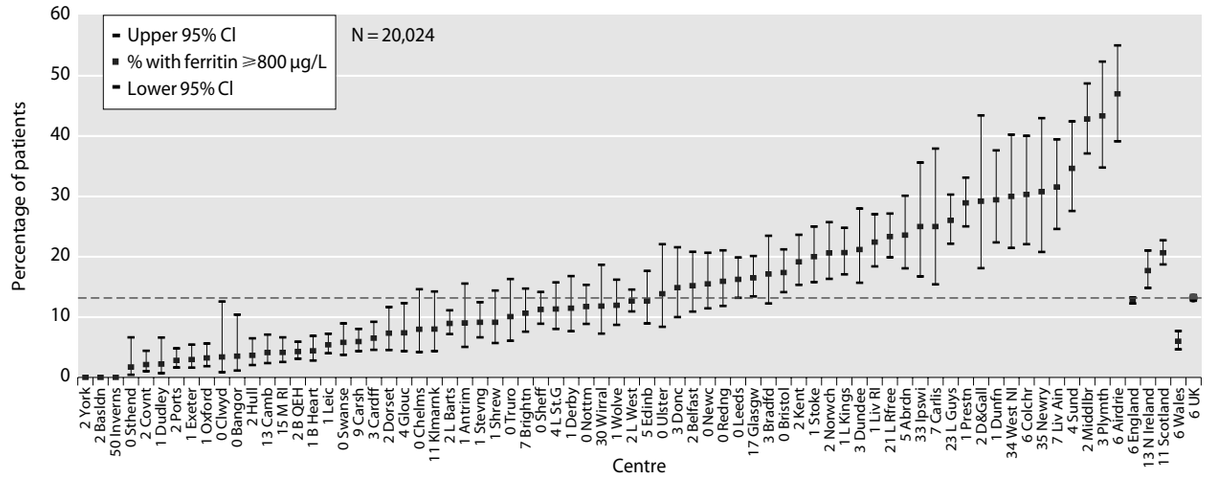

Fig. 6.22. Percentage of HD patients with ferritin ⩾800 µg/L by centre in 2011

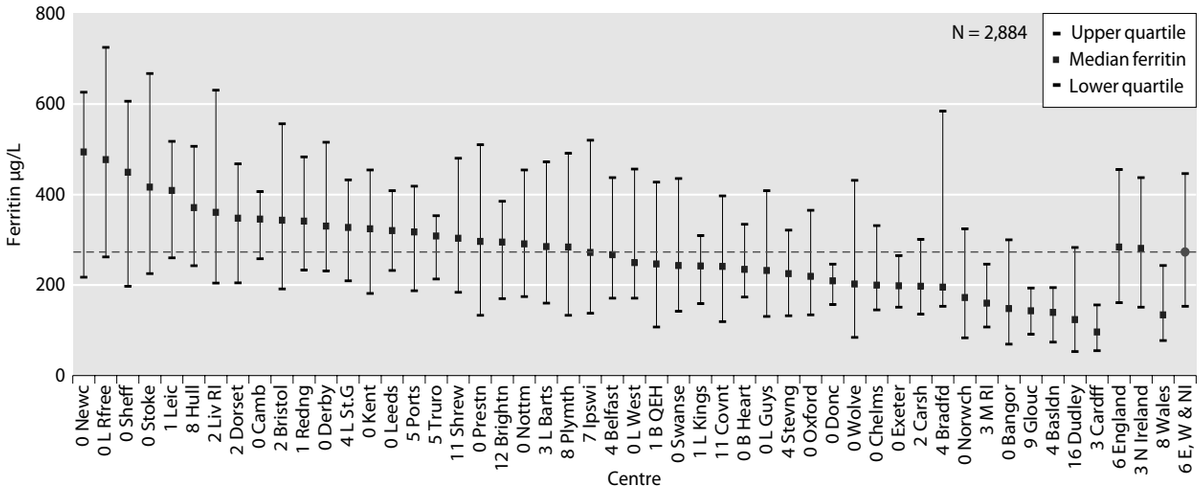

Fig. 6.23. Median ferritin in patients treated with PD by centre in 2011

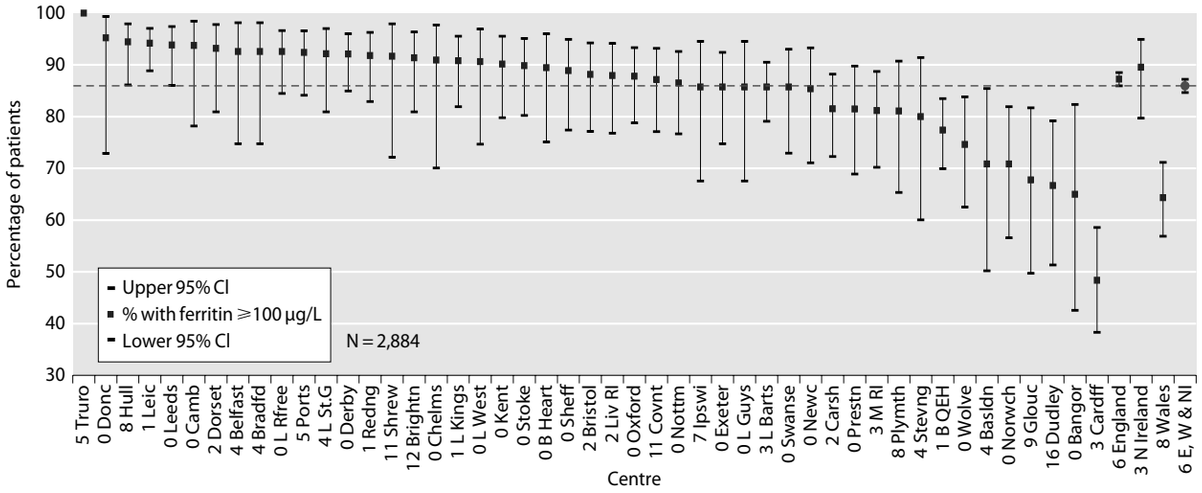

Fig. 6.24. Percentage of PD patients with ferritin ⩾100 µg/L by centre in 2011

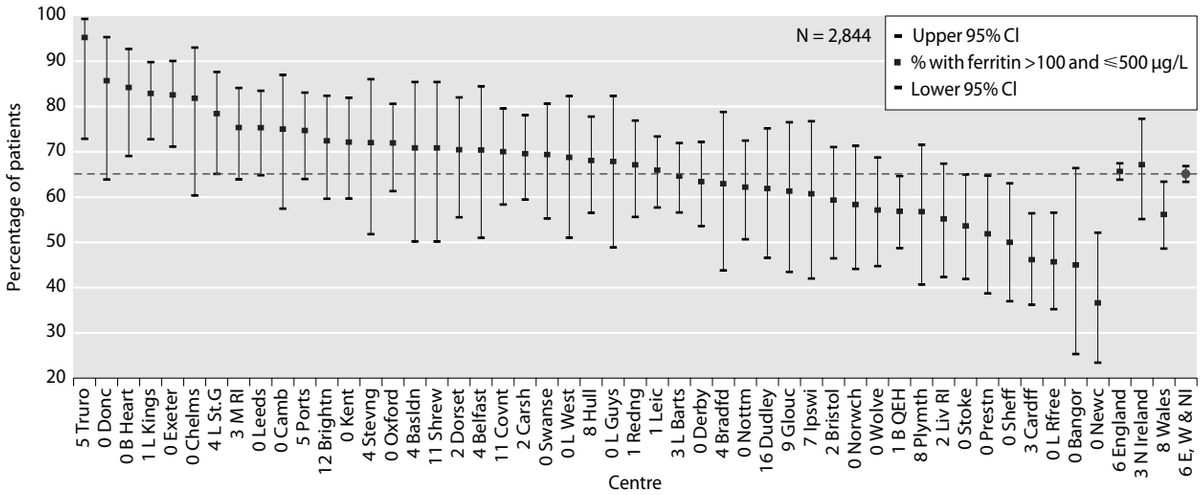

Fig. 6.25. Percentage of PD patients with ferritin >100 µg/L and ⩽500 µg/L by centre in 2011

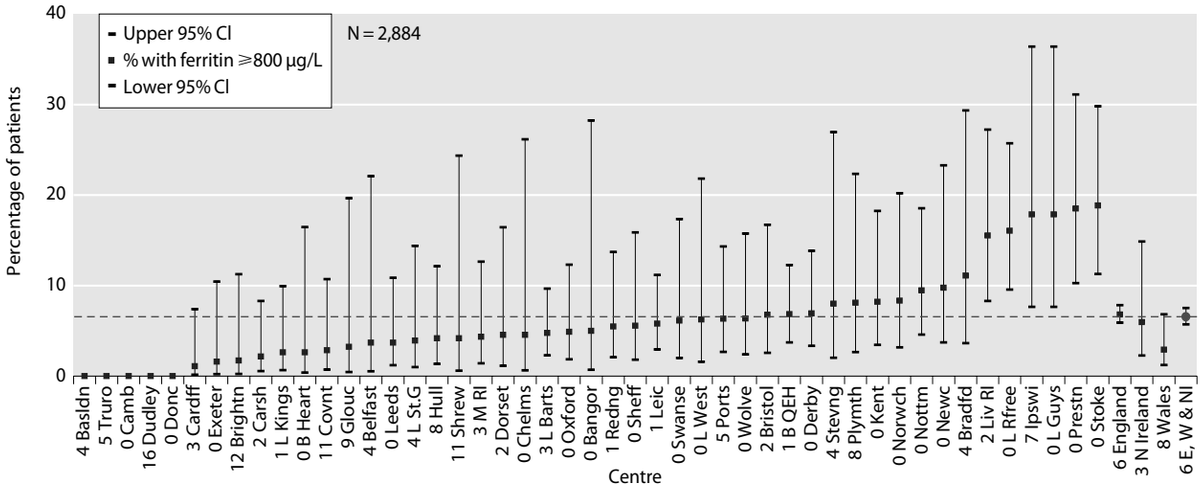

Fig. 6.26. Percentage of PD patients with ferritin ⩾800 µg/L by centre in 2011

ESA prescription: age and modality associations

The proportion of patients on an ESA was higher for HD (90%) than PD (73%) and this difference was present and similar across all age groups (figure 6.27). The percentage of the whole cohort which maintained a Hb ⩾10 g/dl without requiring ESA (by age group and modality) is shown in figure 6.28. This was highest at 12% (6–12%) in the 45–54 age group for HD and highest for PD at 27% (16–27%) in the 75+ age group.

Figure 6.29 shows the percentage of anaemic patients (Hb <10.0 g/dl) receiving an ESA. A minority of patients had a Hb <10 g/dl and appeared to not be receiving ESA therapy. The Renal Association guidelines state that units should audit the ***"Proportion of patients on renal replacement therapy with Hb level <10 who are not prescribed an ESA"***. Across the age groups this was between 3–7% for HD patients and 3–16% for PD patients. There are several potential explanations for this. Treatment with ESA may have been stopped in some patients who were unresponsive or avoided in those with malignancy. Some patients may have recently become anaemic and not yet started therapy. Others may have been on ESA treatment but not had it recorded.

ESAs and time on renal replacement therapy

The percentage of patients on ESA by time on RRT and dialysis modality is shown in figure 6.30. This is a cross-sectional analysis at the final quarter of 2011. Patients who had previously changed RRT modality were still included in this analysis. The proportion of

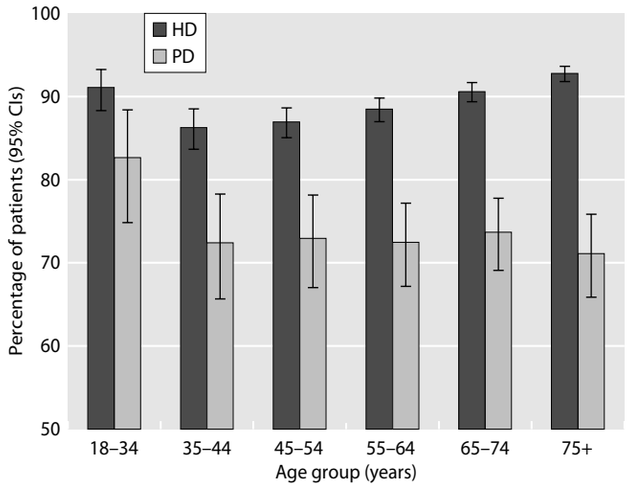

Fig. 6.27. Percentage of dialysis patients on ESA, by age group and treatment modality (2011)

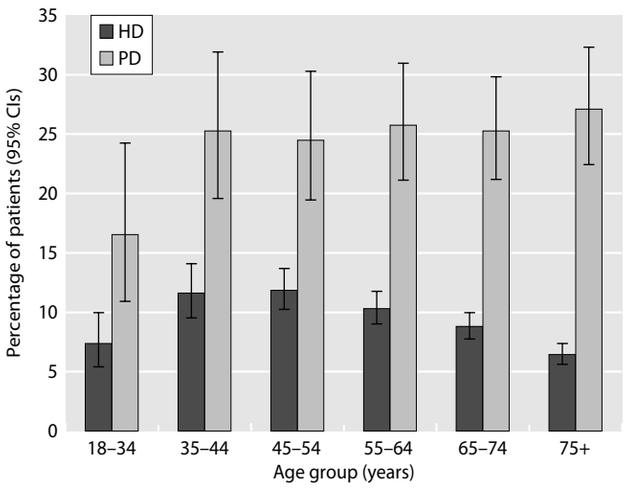

Fig. 6.28. Percentage of whole cohort (2011) who are not on ESA and have Hb ⩾10 g/dl, by age group and treatment modality

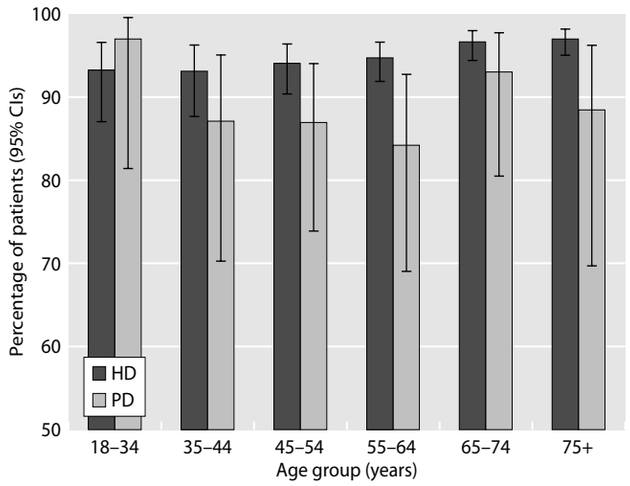

Fig. 6.29. Percentage of patients with Hb <10 g/dl who are on ESA, by age group and treatment modality (2011)

PD patients requiring ESA rises with duration of RRT from 70% after 3–12 months, to 80% after 10 or more years. This almost certainly reflects loss of residual renal function. For at least the first 10 years on RRT, a greater percentage of HD patients are receiving ESA treatment than patients on PD for any given duration on RRT.

Resistance to ESA therapy

Figure 6.31 shows the frequency distribution of weekly ESA dose 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 a 70 kilo patient this equates to approximately 21,000 IU/week for PD and 31,000 IU/week for HD. For those centres with good ESA completeness, the percentage of patients with EPO dose >20,000 IU/week was 5.8% and 7.1% for PD and HD respectively. In order to establish the true prevalence of ESA resistance in the UK, knowledge of patient weight and ESA dose will be needed.

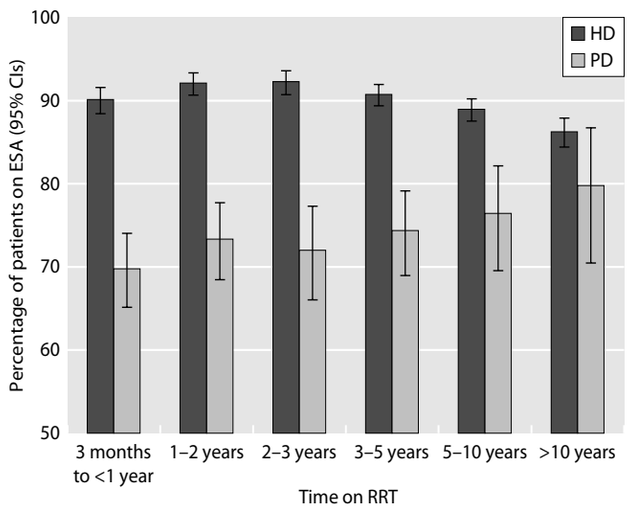

Fig. 6.30. Percentage of patients on ESA by time on RRT (2011)

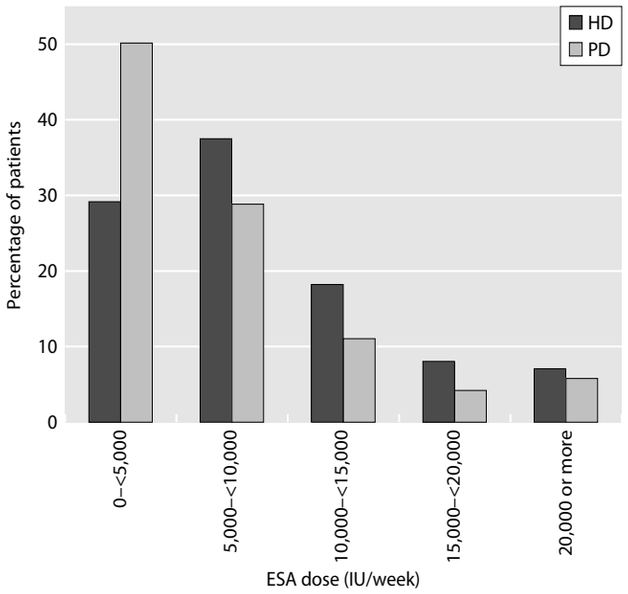

Fig. 6.31. Frequency distribution of mean weekly ESA dose in 2011

Success with guideline compliance

Compliance with current minimum standards by year (1998 to 2011) is shown in figure 6.32 for prevalent patients (by treatment modality).

There is no strong relationship between centres' mean ESA dose and median Hb for HD patients (figure 6.33) or compliance with the RA standards for Hb ⩾10 g/dl and ⩽12 g/dl in HD patients (figure 6.34). This is not surprising as the most anaemic patients and those least responsive to ESAs are those given the biggest doses.

It is known that not all patients treated with dialysis who have a Hb above 12 g/dl 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

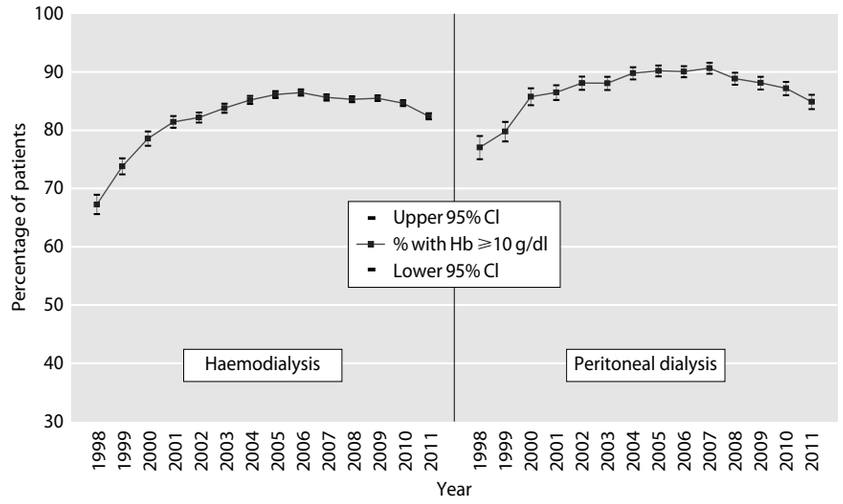

Fig. 6.32. Percentage of prevalent HD and PD patients (1998–2011) with Hb ⩾10 g/dl

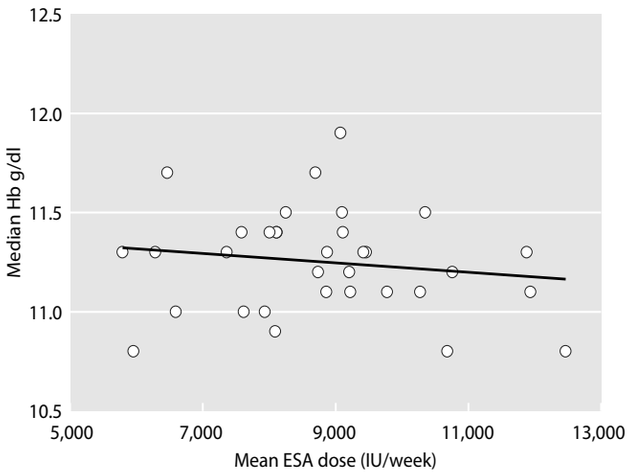

Fig. 6.33. Median Hb versus mean ESA dose in patients treated with HD by centre in 2011

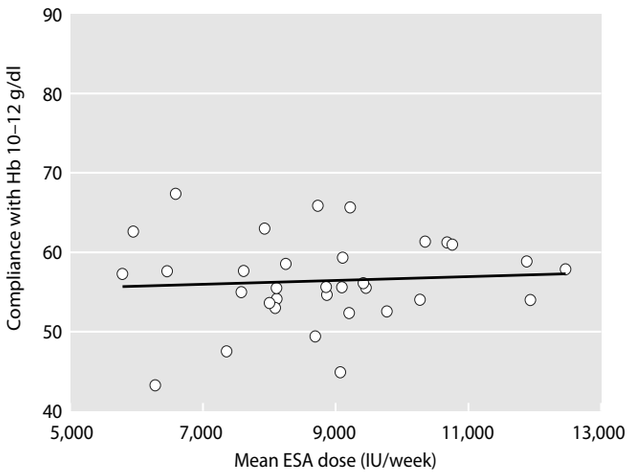

Fig. 6.34. Compliance with Hb 10–12 g/dl versus mean ESA dose in patients treated with HD by centre in 2011

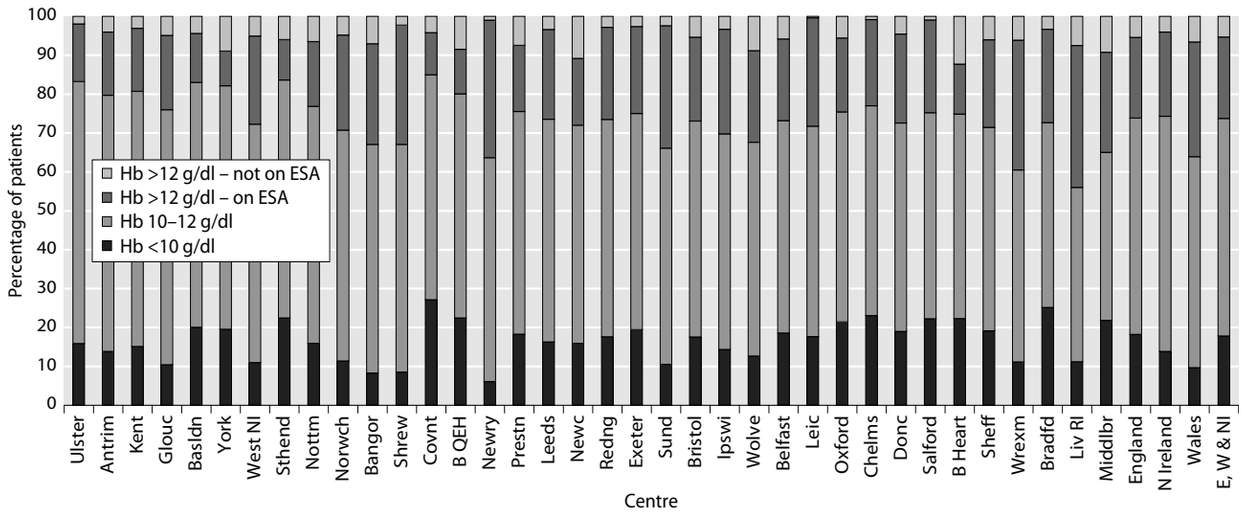

Fig. 6.35. Distribution of haemoglobin in patients treated with HD and the proportion of patients with Hb >12 g/dl receiving ESA by centre in 2011

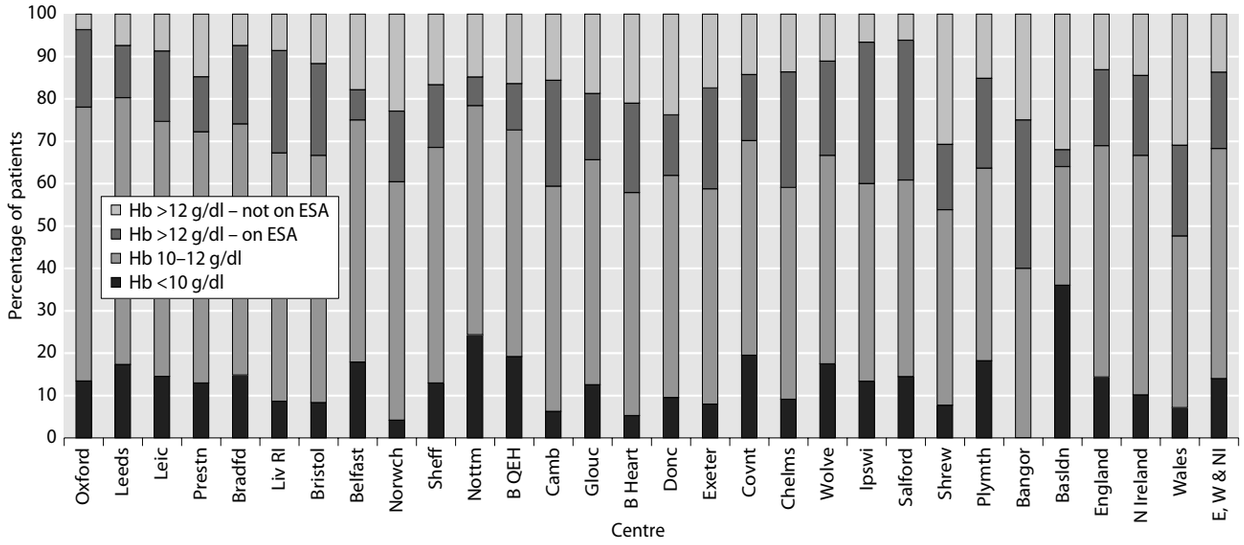

Fig. 6.36. Distribution of haemoglobin in patients treated with PD and the proportion of patients with Hb >12 g/dl receiving ESA by centre in 2011

suggesting that it may be detrimental to achieve a high Hb in renal patients were based only upon patients treated with ESAs [14, 15].

Figures 6.35 and 6.36 show the percentages of HD and PD patients in each centre whose Hb lies above, within or below the RA guidelines of 10–12 g/dl. These charts also show the proportion of patients with a Hb above the upper limit who were receiving, or were not receiving ESAs. These analyses are restricted to the centres with acceptable ESA returns as stipulated above. These figures show that 26% of HD patients had a Hb >12 g/dl. Most of these patients (80%) were on ESAs. Whereas for PD, 32% of patients had a Hb >12.0 g/dl, but only 57% of these were on ESAs.

The Renal Association guideline states that units should audit the ***"Proportion of patients with serum ferritin levels <100 μg/L with an ESA" & "The proportion of patients treated with an ESA with Hb >12 g/dl"***. Table 6.5 shows that the percentage of all patients treated with an ESA and having Hb >12 g/dl ranged between 9–36% for HD and between 4–35% for PD. For HD, there was a small percentage of patients having ferritin levels <100 μg/L and being on an ESA. The percentages were somewhat higher for PD.

Renal Association guidelines state that ***"Each renal unit should audit the type, route and frequency of administration and weekly dose of ESA prescribed"***. Table 6.6 shows the percentage completeness for type, 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.

Discussion

Haemoglobin outcomes for patients on HD and PD in the UK were largely compliant with the RA minimum standard of Hb ⩾10.0 g/dl (82% and 85% respectively). As would be anticipated, a greater proportion of prevalent patients (83%) than incident patients (51%) had a Hb ⩾10.0 g/dl in 2011.

In the UK, the median Hb of patients on HD was 11.2 g/dl with an IQR of 10.3–12.1 g/dl, and the median Hb of patients on PD was 11.4 g/dl with an IQR of 10.5–12.3 g/dl.

Compliance with advice regarding iron stores as reflected by ferritin remained stable in the UK with 96% of HD patients and 86% of PD patients achieving a serum ferritin greater than 100 μg/L.

The analysis of ESA usage was limited by incomplete data returns. From the available data, 90% of HD patients and 73% of PD patients were on ESA treatment in England, Wales and Northern Ireland. The percentage of patients treated with an ESA and having Hb >12 g/dl ranged between centres from 9%–36% for HD and from 4%–35% for PD. There was a small percentage of patients with ferritin levels <100 μg/L and receiving an ESA.

Table 6.5. Percentage of patients with serum ferritin levels <100 µg/L and on ESA and percentage of patients with Hb >12 g/dl and on ESA by modality

	HD		PD	
Centre	% with Hb >12 g/dl and on ESA	% with ferr <100 µg/L and on ESA	% with Hb >12 g/dl and on ESA	% with ferr <100 µg/L and on ESA
England				
B Heart	13	3	21	0
B QEH	11	1	11	8
Basldn	13	4	4	14
Bradfd	24	0	19	8
Bristol	22	2	22	4
Camb			25	3
Chelms	22	0	27	5
Covnt	11	5	16	8
Donc	23	1	14	6
Exeter	22	3	24	3
Glouc	19	4	16	22
Ipswi	27	6	33	7
Kent	16	5		
Leeds	23	3	12	4
Leic	28	5	17	1
Liv RI	36	5	24	4
Middlbr	26	4		
Newc	17	4		
Norwch	24	2	17	11
Nottm	17	0	7	4
Oxford	19	7	18	9
Plymth			21	13
Prestn	17	4	13	12
Redng	24	1		
Salford	24		33	
Sheff	23	1	15	2
Shrew	31	4	15	0
Sthend	10	2		
Sund	31	2		
Wolve	24	1	22	16
York	9	2		
N Ireland				
Antrim	16	0		
Belfast	21	2	7	5
Newry	35	0		
Ulster	15	1		
West NI	23	8		
Wales				
Bangor	26	0	35	11
Wrexm	33			
England	**21**	**3**	**18**	**6**
N Ireland	**22**	**2**	**19**	**5**
Wales	**30**	**0**	**21**	**7**
E, W & NI	**21**	**3**	**18**	**6**

Blank cells denote centres excluded from analyses due to poor completeness or small numbers with data

Table 6.6. Percentage completeness for type, 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	312	100	100	0	0	23	100	100	0	0
B QEH	703	100	100	100	0	96	100	100	100	0
Basldn	119	100	99	100	100	15	100	100	100	100
Bradfd	172	100	100	0	0	22	100	100	0	0
Bristol	414	100	100	0	0	42	100	100	0	0
Camb						23	100	100	0	0
Chelms	111	100	100	100	100	19	100	100	100	100
Covnt	309	100	100	0	0	55	100	96	0	0
Donc	141	100	100	100	99	16	100	100	100	94
Exeter	325	100	99	0	0	48	100	100	0	0
Glouc	172	100	0	0	0	21	100	0	0	0
Ipswi	102	100	100	0	0	26	100	100	0	0
Kent	319	100	100	100	100					
Leeds	432	100	87	0	0	70	100	99	0	0
Leic	769	100	98	0	0	118	100	92	0	0
Liv RI	319	100	100	0	0	47	100	100	0	0
Middlbr	230	100	100	0	0	9	100	100	0	0
Newc	182	100	100	0	0					
Norwch	268	100	100	100	100	28	100	100	100	100
Nottm	347	100	97	0	0	50	100	0	0	0
Oxford	339	100	100	0	0	67	100	100	0	0
Plymth						28	100	96	0	0
Prestn	423	100	6	0	0	32	100	0	0	0
Redng	235	100	0	0	0					
Salford	321	100	95	99	0	90	100	88	99	0
Sheff	501	100	99	0	0	32	100	100	0	0
Shrew	167	100	100	87	95	18	100	100	94	100
Sthend	107	0	100	0	0					
Sund	156	100	99	0	0	9	100	100	0	0
Wolve	254	100	100	0	0	43	100	100	0	0
York	104	100	100	0	0	17	100	88	0	0
N Ireland										
Antrim	114	100	100	100	100	11	100	100	100	100
Belfast	185	100	100	99	100	22	100	100	100	100
Newry	98	100	100	100	100	6	100	100	100	100
Ulster	96	100	100	100	100	3	100	100	100	100
West NI	125	100	99	98	100	12	100	100	100	100
Wales										
Bangor	73	100	59	0	0	12	100	92	0	0
Wrexm	75	100	100	99	100	8	100	100	75	100
England	**8,353**	**99**	**89**	**25**	**13**	**1,074**	**99**	**87**	**26**	**9**
N Ireland	**618**	**100**	**100**	**100**	**100**	**54**	**100**	**100**	**100**	**100**
Wales	**148**	**100**	**80**	**50**	**51**	**20**	**100**	**95**	**30**	**40**
E, W & NI	**9,119**	**99**	**90**	**31**	**20**	**1,148**	**100**	**89**	**29**	**14**

Conflicts of interest: none

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UK Renal Registry 15th Annual Report: Chapter 7 Clinical, Haematological and Biochemical Parameters in Patients receiving Renal Replacement Therapy in Paediatric Centres in the UK in 2011: national and centre-specific analyses

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Key Words
Biochemical variables · Children · Dialysis · ERF · Haemoglobin · Height · Quality improvement · Transplant · Weight

Summary

- Median weight z-score for children on dialysis was −1.0 whereas children with a functioning transplant had normal weights (median z-score 0).
- Median height z-score for children on dialysis was −2.0 and for children with a functioning transplant −1.2.
- 81% of transplant patients, 67% of haemodialysis patients and 66% of peritoneal dialysis patients had a systolic blood pressure within the 90th percentile standard.
- 93% of transplant patients, 64% of HD patients and 72% of PD patients had a haemoglobin within or above the age appropriate standard.
- 38% of HD patients and 62% of PD patients achieved the audit standard for phosphate.

Introduction

This report focuses on the following variables for the prevalent paediatric dialysis and transplantation cohort on 31st December 2011:

1. The completeness of data returns to the renal registry
2. The anthropometric characteristics in children with established renal failure (ERF)
3. Blood pressure control in children with ERF
4. Anaemia control in children with ERF
5. Key biochemical findings in this population.

Analyses of prevalent paediatric patients aged <16 years receiving renal replacement therapy for the year 2011 and for the period 2000 to 2011 inclusive are reported. A single dataset was collected for each patient per year during this time period. Due to low numbers of patients in each cohort, no incident cohort analyses have been undertaken. Centre specific data for each paediatric nephrology centre in the UK has also been provided.

Methods

There were 13 centres providing care for children requiring renal replacement therapy in the UK, ten of which also provided surgical renal transplant services. All 13 centres provided outpatient and inpatient follow up for children who had received kidney transplants. Centres are listed in table 7.1 and appendix K.

Data collection

The data presented in this report relate to the annual census date of 31st December 2011.

Those paediatric centres with access to renal IT systems submitted encrypted electronic data directly to the UKRR. Those centres without access, sent paper or electronic returns in the original BAPN database format which were then entered into the original BAPN database as in previous years. Complete transfer to the UKRR encrypted database is still awaited.

Governance, reporting and standardisation

Information governance, reporting and standardisation were all performed in an identical manner to previous analyses to allow comparison [1]. With the value of many clinical parameters in childhood varying with age and size, data are presented as z-scores.

Anthropometry

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 $(m)^2$.

Table 7.1. Paediatric renal centres, their abbreviations and IT systems

Paediatric centre	Abbreviation	Renal IT system
Belfast*	Blfst_P	Mediqal
Birmingham	Bham_P	Proton
Bristol	Brstl_P	Proton
Cardiff	Cardf_P	Proton
Glasgow	Glasg_P	Filemaker
Leeds	Leeds_P	Proton
Liverpool	Livpl_P	None
London Evelina**	L Eve_P	Proton
London Great Ormond Street**	L GOSH_P	Proton
Manchester	Manch_P	Filemaker
Newcastle*	Newc_P	Clinical Vision
Nottingham	Nottm_P	Proton
Southampton***	Soton_P	Bespoke

*New system installed, although paper submissions received in 2011
**Both London centres have a link to the PROTON system in Bristol but with no lab links
***Recent implementation of a bespoke renal IT system has enabled transmission of a limited dataset from Southampton this year

Height, weight and BMI were all adjusted for age and z-scores were calculated based on the British 1990 reference data for height and weight [2].

Blood pressure (BP)

The reference range for blood pressure 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 (NHBPEP) working group in the United States [3].

Laboratory values

Haemoglobin (Hb), ferritin (Ferr), calcium (Ca) and phosphate (Phos) were analysed using age related laboratory reference ranges as in table 7.2. Data analysis is presented for each centre individually and at a national level for each variable.

Statistical analyses

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 over time were also performed. These were based on a single data point per ERF patient per year collected as described

Table 7.2 Summary of relevant biochemical clinical audit measures

	Age			
Parameter	<1 year	1–5 years	6–12 years	>12 years
Haemoglobin (g/dl), NICE guideline CG 114	Maintain 9.5–11.5 for <2 years	Maintain 10–12 for >2 years	10–12	10–12
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)	1.1–1.95	1.05–1.75	1.05–1.75	1.05–1.75
eGFR ml/min/1.73 m^2 (transplant patients)	Estimated GFR (eGFR) as per Schwartz formula: (height x k)/plasma creatinine. The value for k is that in use at the reporting centre			
Parathyroid hormone (individual centre units)	Within twice the normal range Levels may be maintained within normal range if growing appropriately			

previously. Cautious interpretation of these analyses is required due to changing audit standards over time and variable data returns for previous years. All analyses were done using SAS 9.3.

Standards

Standards are from the treatment of adults and children with renal failure, Renal Association 2002 guidelines [4] unless otherwise stated.

Anthropometry

'Height and weight should be monitored at each clinic visit. Measures of supine length or standing head circumference should be measured during each visit up to two years of age and 6 monthly up to 5 years of age. All measurements should be plotted on European reference growth charts for healthy children.'

Blood pressure

'Blood pressure varies throughout childhood and should be maintained within 2 standard deviations of the mean for normal children of the same height and sex. Systolic blood pressure during PD or post-HD should be maintained at <90th percentile for age, gender and height.'

The analyses of blood pressure in this report present the achievement of blood pressures at or below the 90th percentile.

Anaemia

Guidance on the management of anaemia in adults and children with chronic kidney disease was updated and published by the National Institute for Clinical Excellence (NICE) in February 2011 (Clinical Guideline 114) [5]. The recommendation in this guidance is that in children with chronic kidney disease, treatment should maintain stable haemoglobin levels between 10 and 12 g/dl in children above 2 years of age and between 9.5 and 11.5 g/dl in children below 2 years of age. These NICE standards have been adopted for this report.

Calcium, phosphate and parathyroid hormone (PTH) levels

Phosphate and calcium should be kept within the normal range [4]. For analyses of calcium and phosphate, the age related ranges as described previously have been used [1]. PTH levels should be kept less than twice the upper limit of normal.

Results

Data completeness

Tables 7.3 and 7.4 show the completeness of data returns for transplant and dialysis patients for 2011.

In 2011, overall completeness was good, with virtually all data variables showing a significant rise in completeness compared to 2010 especially within the dialysis population. The exceptions were data returns for ferritin, IV Iron and EPO which showed modest rises, or a slight fall in some cases. This was attributed to some centres being unable to technically submit data, whilst other centres cited they were adopting to monitor transferrin saturations as an alternative to measuring ferritin levels which may have longer term consequences on future analyses. Cholesterol returns continued to remain poor

Table 7.3. Percentage data completeness for transplant patients <16 years old by centre for each variable and total number of patients per centre in 2011

Centre	Transplant patients N	Height	Weight	BMI	Systolic BP	Hb	Creat	Ferr	EPO	IV iron	Chol	HCO_3	PTH	Ca	Phos
Bham_P	58	98.3	98.3	98.3	98.3	98.3	98.3	53.5	0.0	0.0	87.9	98.3	94.8	98.3	98.3
Blfst_P	24	95.8	100.0	95.8	100.0	95.8	100.0	37.5	95.8	83.3	75.0	95.8			
Brstl_P	30	90.0	96.7	90.0	96.7	96.7	100.0	56.7	100.0	100.0	70.0	96.7	73.3	96.7	96.7
Cardf_P	14	28.6	85.7	21.4	92.9	100.0	100.0	14.3	100.0	42.9	14.3	100.0	28.6	100.0	100.0
Glasg_P	27	100.0	100.0	100.0	100.0	96.3	96.3	70.4	96.3	92.6	66.7	92.6	0.0	88.9	88.9
L Eve_P	64	84.4	85.9	84.4	98.4	98.4	100.0	90.6	82.8	81.3	42.2	100.0	95.3	100.0	100.0
L GOSH_P	116	94.8	97.4	94.8	99.1	99.1	99.1	67.2	100.0	100.0	13.2	99.1	99.1	86.2	99.1
Leeds_P	58	94.8	94.8	94.8	94.8	98.3	98.3	41.4	93.1	93.1	98.3	98.3	60.3	98.3	98.3
Livpl_P	25	80.0	80.0	80.0	80.0	80.0	76.0	64.0	12.0	12.0	64.0	76.0		64.0	64.0
Manch_P	29	93.1	100.0	93.1	96.6	96.6	96.6	86.2	93.1	93.1	69.0	96.6	100.0	100.0	100.0
Newc_P	22	100.0	100.0	100.0	100.0	90.9	100.0	36.4	100.0	100.0	36.4	90.9	36.4	90.9	90.9
Nottm_P	56	92.9	96.4	92.9	96.4	96.4	96.4	80.4	100.0	100.0	44.6	96.4	75.0	92.9	98.2
Soton_P	9	100.0	100.0	100.0	77.8	100.0	100.0	0.0	0.0	0.0	22.2	22.2	0.0	22.2	22.2
UK	**532**	**91.5**	**95.1**	**91.4**	**96.6**	**96.8**	**97.6**	**62.4**	**79.7**	**77.3**	**52.6**	**95.3**	**69.7**	**87.2**	**90.6**

Blank cells represent data items that could not be sent by centres due to technical reasons

especially from Cardiff and GOSH although it is hoped that analysis of this data may be feasible in next year's report.

In 2011, Southampton and Newcastle continued to provide a limited dataset due to a combination of technical difficulties and limited resources resulting in their respective low completion percentages.

Height, weight and BMI

Figures 7.1 and 7.4 show that children receiving renal replacement therapy were short for their age; those on dialysis were significantly shorter that those with renal transplants. The overall median z-score was −1.20 in the transplanted group and −2.0 in the dialysis group, $p < 0.0001$.

Children with a functioning kidney transplant had a normal weight (median z-score of 0.0), (figure 7.2), whilst those on dialysis had a significantly lower weight than that of healthy children with a median z-score of −1.0 (figure 7.5), $p < 0.0001$.

Body mass index in children with a functioning transplant in 2011 showed inter-centre variation with a

Table 7.4. Percentage data completeness for dialysis patients <16 years old by centre for each variable and total number of patients per centre in 2011

Centre	Dialysis patients N	Height	Weight	BMI	Systolic BP	Hb	Ferr	EPO	IV iron	Chol	HCO_3	PTH	Ca	Phos
Bham_P	19	94.7	100.0	94.7	100.0	100.0	94.7	0.0	0.0	84.2	100.0	100.0	100.0	100.0
Blfst_P	6	33.3	100.0	33.3	100.0	100.0	100.0	100.0	83.3	50.0	100.0	83.3	100.0	100.0
Brstl_P	12	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Cardf_P	1	0.0	100.0	0.0	100.0	100.0	100.0	0.0	0.0	0.0	100.0	100.0	100.0	100.0
Glasg_P	14	78.6	100.0	78.6	100.0	100.0	100.0	100.0	100.0	35.7	85.7	100.0	100.0	100.0
L Eve_P	14	71.4	78.6	71.4	78.6	100.0	85.7	100.0	100.0	7.1	100.0	92.9	100.0	100.0
L GOSH_P	19	100.0	100.0	100.0	84.2	100.0	36.8	10.5	5.3	72.0	100.0	100.0	36.8	100.0
Leeds_P	6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Livpl_P	2	50.0	100.0	50.0	100.0	100.0	100.0	50.0	50.0	50.0	100.0	50.0	100.0	100.0
Manch_P	22	90.9	95.5	90.9	95.5	100.0	90.9	100.0	100.0	9.1	100.0	100.0	100.0	100.0
Newc_P	8	75.0	87.5	75.0	87.5	37.5	50.0	100.0	100.0	25.0	50.0	37.5	50.0	50.0
Nottm_P	10	90.0	100.0	90.0	90.0	90.0	100.0	100.0	90.0	80.0	100.0	100.0	100.0	100.0
Soton_P	9	100.0	100.0	100.0	44.4	100.0	22.2	11.1	0.0	11.1	11.1	0.0	11.1	22.2
UK	**142**	**86.6**	**96.5**	**86.6**	**90.1**	**95.8**	**80.3**	**67.6**	**64.8**	**50.0**	**90.1**	**88.0**	**83.1**	**92.3**

Blank cells represent data items that could not be sent by centres due to technical reasons

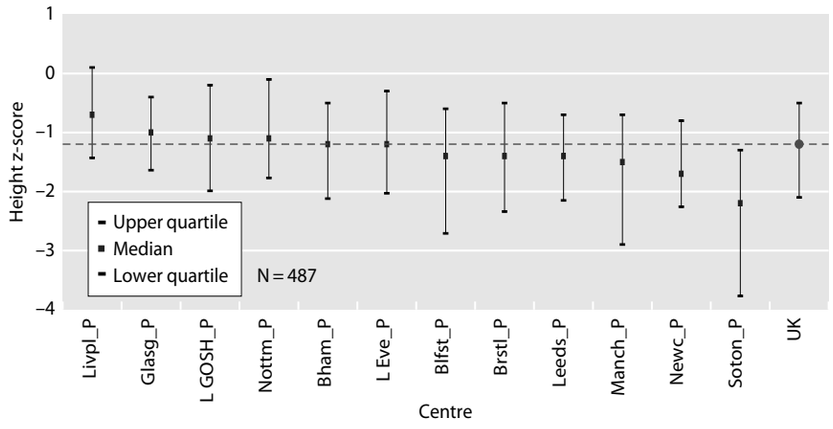

Fig. 7.1. Median height z-scores for transplant patients <16 years in 2011
Centres with less than 50% data completeness were excluded from the centre specific analysis but were included in the UK totals

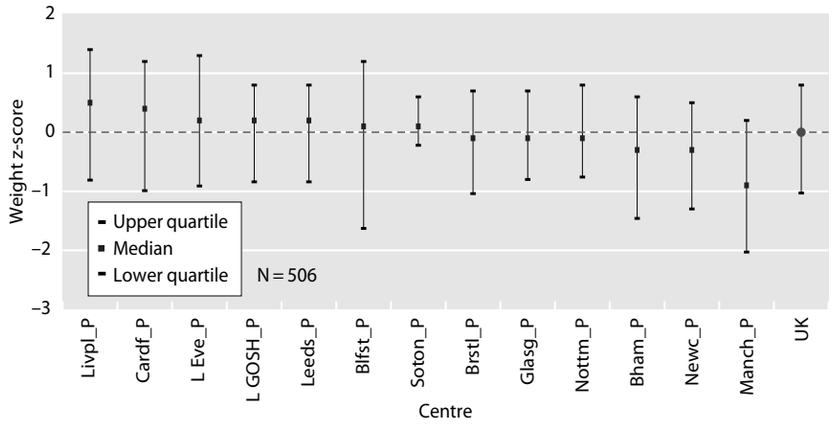

Fig. 7.2. Median weight z-scores for transplant patients <16 years in 2011

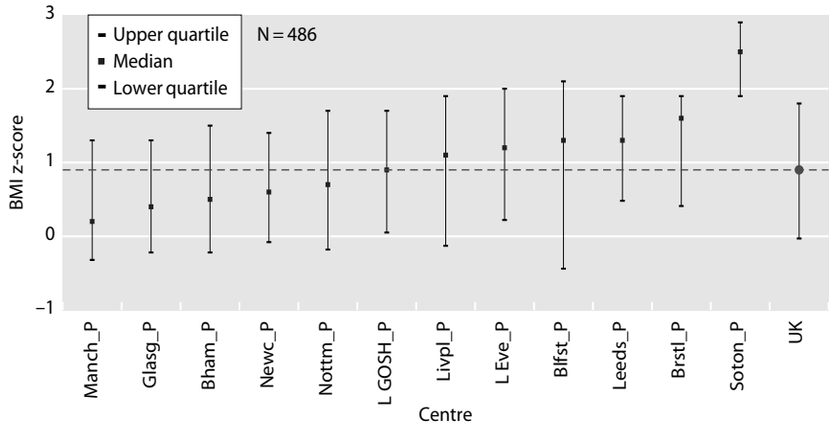

Fig. 7.3. Median BMI z-scores for transplant patients <16 years in 2011
Centres with less than 50% data completeness were excluded from the centre specific analysis but were included in the UK totals

median z-score of 0.90 (figure 7.3) which was significantly higher than the median BMI z-score in those on dialysis which was near normal at 0.20 (figure 7.6), $p = 0.0002$. These data indicate that in the group as a whole, children on dialysis have less excess weight for height with a BMI z-score close to zero, whereas transplanted children have more excess weight for height.

Table 7.5 shows that 28.3% of patients with a functioning transplant had a height <2SD, which was significantly lower than those on haemodialysis

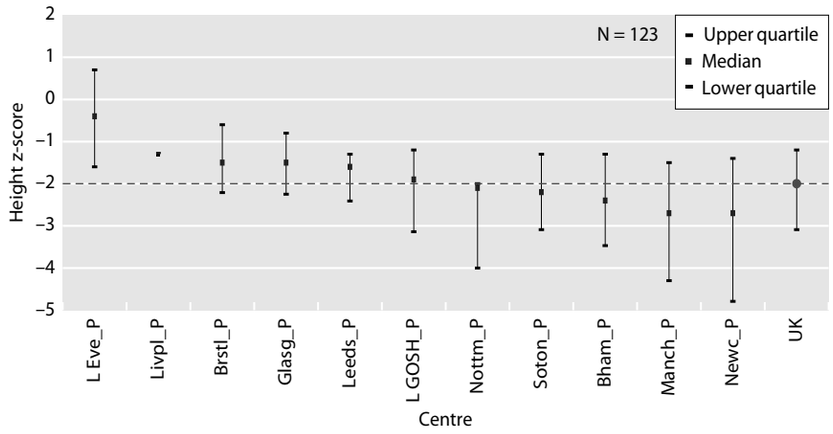

Fig. 7.4. Median height z-scores for dialysis patients <16 years in 2011
Centres with less than 50% data completeness were excluded from the centre specific analysis but were included in the UK totals

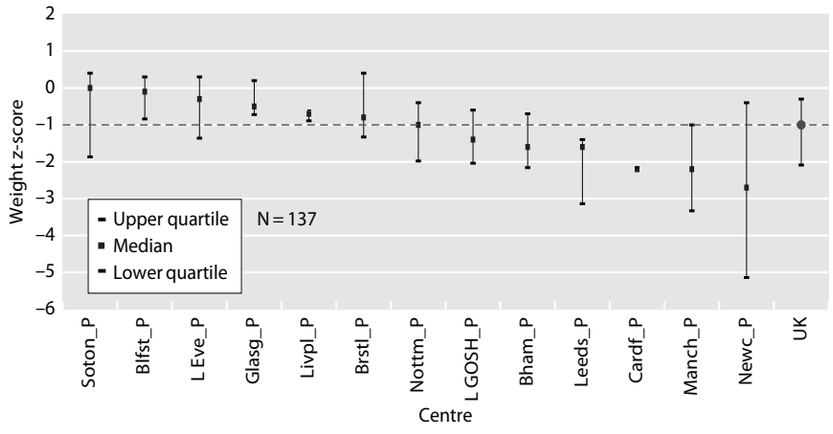

Fig. 7.5. Median weight z-scores for dialysis patients <16 years in 2011

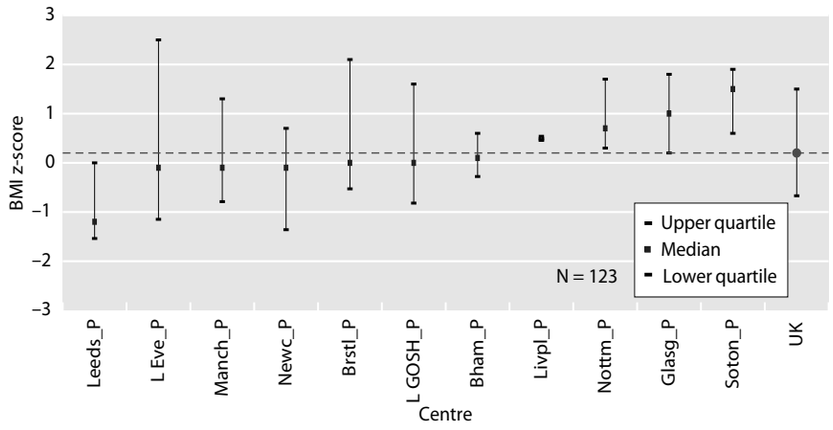

Fig. 7.6. Median BMI z-scores for dialysis patients <16 years in 2011
Centres with less than 50% data completeness were excluded from the centre specific analysis but were included in the UK totals

(54.0%) and those on peritoneal dialysis (48.0%). Analysis by age showed that amongst dialysis patients the greatest proportion of children with a height <2SD was in the 0–4.99 years age group, this was not noted in the transplanted group where age did not appear to make a difference.

Figure 7.7 shows the use of growth hormone in children under 16 years with a height under 2SD in the UK between 2001 and 2011, a significant proportion of these children did not receive growth hormone. Only 31.3% of dialysis patients with a height below the normal range and 10.0% with a functioning

Table 7.5. Percentage of patients <16 years with height under 2SDs in 2011

	Transplant patients		Haemodialysis patients		Peritoneal dialysis patients	
Centre	Patients with data N	% <2SD	Patients with data N	% <2SD	Patients with data N	% <2SD
Bham_P	57	29.8	10	90.0	8	37.5
Blfst_P	23	43.5			2	50.0
Brstl_P	27	37.0	5	20.0	7	42.9
Cardf_P [a]			n/a	n/a		
Glasg_P	27	14.8	2	50.0	9	33.3
L Eve_P	54	25.9	4	0.0	6	33.3
L GOSH_P	110	23.6	10	40.0	9	55.6
Leeds_P	55	29.1	2	0.0	4	50.0
Livpl_P	20	20.0			1	0.0
Manch_P	27	37.0	6	66.7	14	64.3
Newc_P	22	31.8	3	100.0	3	33.3
Nottm_P	52	23.1	4	75.0	5	60.0
Soton_P	9	55.6	4	50.0	5	60.0
UK [b]	**487**	**28.3**	**50**	**54.0**	**73**	**48.0**
Age group						
0–4.99 years	36	27.8	13	84.6	35	54.3
5–11.99 years	222	28.8	16	50.0	20	45.0
12–15.99 years	229	28.0	21	38.1	18	38.9

[a] Cardiff did not have any HD patients under 16 in 2011
[b] If a centre had <50% completeness for a treatment group, that centre has been excluded from centre specific analysis, although included in the UK totals
Blank cells denote categories where data completion was <50%
n/a – not applicable

transplant who were short received growth hormone treatment.

Blood pressure

Analyses of blood pressure management have shown that blood pressure was higher in children receiving renal replacement therapy than in healthy children (figures 7.8, 7.9). There was wide inter-centre variation in systolic blood pressure, particularly in dialysis patients with a UK median z-score of 0.70 for dialysis patients and 0.30 for transplant patients.

For children with a functioning kidney transplant, 81.1% had a systolic BP <90th percentile which was slightly better than last year when 78.6% of such children achieved the target (table 7.6). In comparison, 66.7% of children on haemodialysis had a systolic BP <90th percentile whilst 66.2% of children receiving peritoneal dialysis achieved this (table 7.6). The results for haemodialysis and peritoneal dialysis were slightly worse than those achieved in the previous year (71.7% and 74.2% respectively) although absolute numbers were small. When analysing data by age, blood pressure control

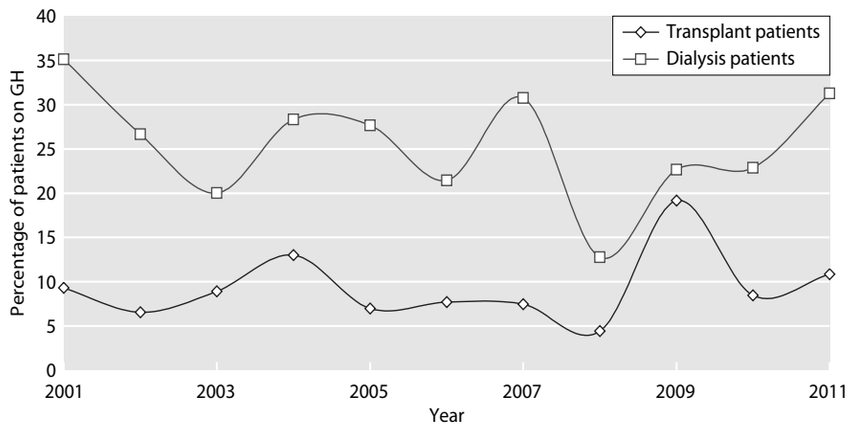

Fig. 7.7. Use of growth hormone in children <16 years with a height under 2SD in the UK between 2001 and 2011

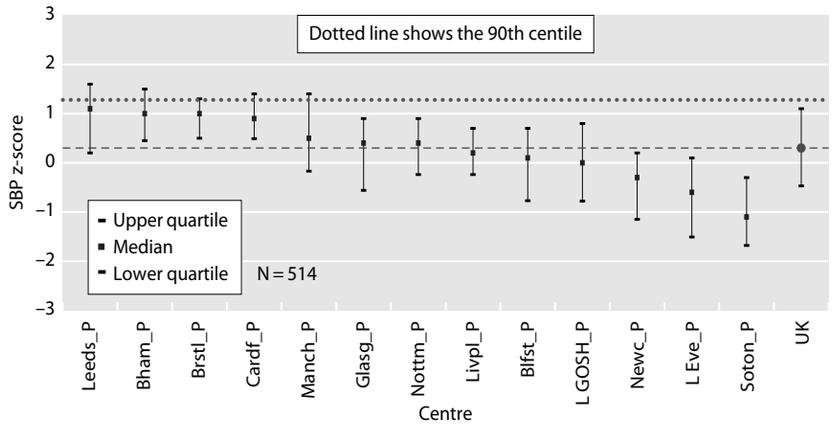

Fig. 7.8. Median systolic blood pressure z-scores for transplant patients <16 years in 2011

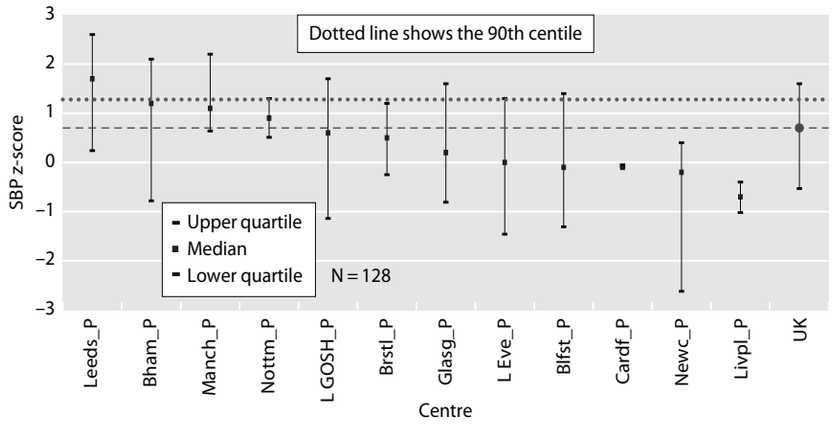

Fig. 7.9. Median systolic blood pressure z-scores for dialysis patients <16 years in 2011

Centres with less than 50% data completeness were excluded from the centres specific analysis but were included in the UK totals

was slightly worse in the 5–11.99 year age group for dialysis patients with little difference noted amongst transplanted age groups.

Haemoglobin

The analyses in this report show that many children receiving dialysis were anaemic, with 36.2% of haemodialysis and 28.2% of peritoneal dialysis patients having a haemoglobin level below the standard (table 7.7). This compared to only 7.4% of patients with a functioning transplant having haemoglobin below the standard. Overall there has been a marked reduction in the proportion of children deemed anaemic compared to previous years which was due to using the updated NICE guidelines CG14 (see methods) for this report, as opposed to the previously published guideline (CG 39) which was used in earlier reports (NB analysis of this year's data using the old standard showed no difference this year compared to the previous year).

Analysis by age showed that the proportion of children with a haemoglobin below the standard was greatest for the under 5 years age group for both transplanted patients and those on haemodialysis. This trend was not statistically significant.

Figure 7.10 shows that the percentage of patients (dialysis and transplanted) achieving or exceeding the treatment standards for haemoglobin has increased over the last decade, more noticeably in dialysis patients. Attainment of ferritin standards (data not shown) during this time shows less of a clear pattern (possibly due to a higher proportion of historical missing data) with a smaller rise noted over time albeit with some fluctuations.

The attainment of the haemoglobin standard in transplant patients was assessed for different levels of graft function (figure 7.11) and with the use of MMF as immunosuppressant therapy (figure 7.12). Figure 7.11 demonstrates that haemoglobin standard attainment was worse for patients with transplant dysfunction with only 80.0% of patients with an eGFR of <45 achieving or exceeding the standard for haemoglobin compared to 95.6% of patients with an eGFR of >60. As for the impact of MMF, figure 7.12 shows that patients using MMF as immunosuppressant therapy were more likely

Table 7.6. Percentage of patients <16 years achieving the standards for systolic blood pressure in 2011

	Transplant patients		Haemodialysis patients		Peritoneal dialysis patients	
Centre	Patients with data N	Below 90th percentile	Patients with data N	Below 90th percentile	Patients with data N	Below 90th percentile
Bham_P	57	63.2	11	45.5	8	62.5
Blfst_P	24	95.8	3	66.7	3	66.7
Brstl_P	29	72.4	5	100.0	7	57.1
Cardf_P *	13	69.2	n/a	n/a	1	100.0
Glasg_P	27	88.9	2	50.0	12	66.7
L Eve_P	63	95.2	4	75.0	7	71.4
L GOSH_P	115	85.2	7	57.1	9	77.8
Leeds_P	55	61.8	2	100.0	4	0.0
Livpl_P	20	85.0	1	100.0	1	100.0
Manch_P	28	67.9	7	42.9	14	64.3
Newc_P	22	95.5	4	100.0	3	100.0
Nottm_P	54	88.9	4	75.0	5	60.0
Soton_P	7	100.0			3	100.0
UK	**514**	**81.1**	**51**	**66.7**	**77**	**66.2**
Age group						
0–4.99 years	37	75.7	14	64.3	36	75.0
5–11.99 years	232	77.6	17	58.8	23	56.5
12–15.99 years	245	85.3	20	75.0	18	61.1

* Cardiff did not have any haemodialysis patients under 16 in 2011
Blank cells denote categories where data completion was <50%
n/a – not applicable

Table 7.7. Percentage of patients <16 years old achieving the haemoglobin standard in 2011

	Transplant patients			Haemodialysis patients			Peritoneal dialysis patients		
Centre	Patients with data N	% achieving or exceeding standard	% lower then standard	Patients with data N	% achieving or exceeding standard	% lower then standard	Patients with data N	% achieving or exceeding standard	% lower then standard
Bham_P	57	89.5	10.5	11	63.6	36.4	8	62.5	37.5
Blfst_P	23	91.3	8.7	3	100.0	0.0	3	66.7	33.3
Brstl_P	29	96.6	3.5	5	40.0	60.0	7	85.7	14.3
Cardf_P [a]	14	100.0	0.0	n/a	n/a	n/a	1	100.0	0.0
Glasg_P	26	92.3	7.7	2	50.0	50.0	12	91.7	8.3
L Eve_P	63	92.1	7.9	7	85.7	14.3	7	57.1	42.9
L GOSH_P	115	96.5	3.5	10	80.0	20.0	9	77.8	22.2
Leeds_P	57	91.2	8.8	2	50.0	50.0	4	50.0	50.0
Livpl_P	20	90.0	10.0	1	0.0	100.0	1	100.0	0.0
Manch_P	28	82.1	17.9	7	42.9	57.1	15	53.3	46.7
Newc_P	20	100.0	0.0				2	100.0	0.0
Nottm_P	54	88.9	11.1	5	40.0	60.0	4	50.0	50.0
Soton_P	9	100.0	0.0	4	75.0	25.0	5	100.0	0.0
UK [b]	**515**	**92.6**	**7.4**	**58**	**63.8**	**36.2**	**78**	**71.8**	**28.2**
Age group									
0–4.99 years	**38**	86.8	13.2	14	50.0	50.0	37	73.0	27.0
5–11.99 years	234	93.6	6.4	21	61.9	38.1	23	73.9	26.1
12–15.99 years	243	92.6	7.4	23	73.9	26.1	18	66.7	33.3

[a] Cardiff did not have any HD patients under 16 in 2011
[b] If a centre had <50% completeness for a treatment group, that centre has been excluded from centre specific analysis, although included in the UK totals
Blank cells denote categories where data completion was <50%
n/a – not applicable

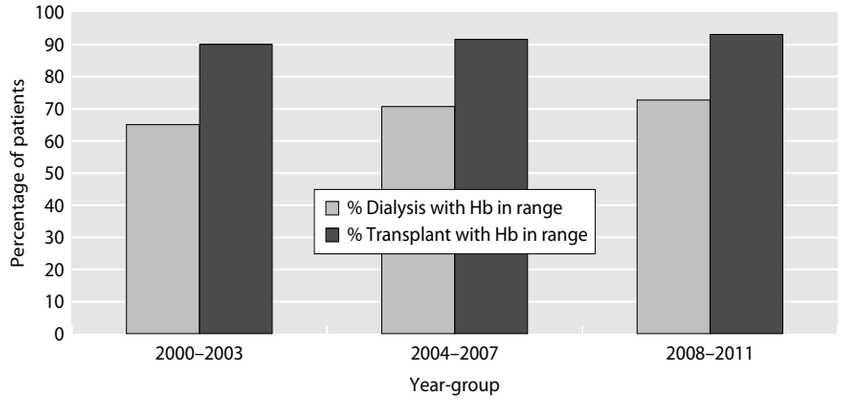

Fig. 7.10. The percentage of patients <16 years achieving the treatment standard for haemoglobin between 2000–2011, by treatment modality

to have haemoglobin concentrations below the standard, which was statistically significant $p < 0.001$. Whilst this was noted between 2000–2007, this was not seen between 2008–2011, although during this time period there was a marked rise in missing data for MMF (57% missing data, compared to 15% during earlier years) making it difficult to draw any significant conclusions.

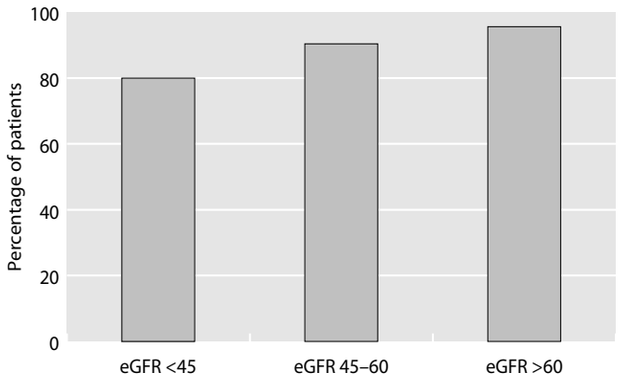

Fig. 7.11. The achievement of haemoglobin treatment standards in paediatric transplant patients <16 years, by the level of graft function
This figures combines all data from 2000–2011.

Regarding the use of erythropoietin (ESA) and IV iron, figure 7.13 shows that there has been little change in the use of these agents in transplanted patients over the last decade, although amongst dialysis patients there has been a rise in prescribing both these agents over the last year, reversing the falls noted in the previous two years. Table 7.8 shows that the majority of patients on dialysis (peritoneal or haemodialysis) were on ESA with little change over time. There is a suggestion that more transplant patients were prescribed ESA over time especially if anaemic, however these results should be interpreted with caution as they may be skewed by the fall in data returns for these variables noted this year.

Phosphate, calcium and PTH

In 2011 in the UK as a whole, 38% of haemodialysis patients and 62% of peritoneal dialysis patients had a phosphate within the target range (table 7.9). The achievement of the standard for calcium was better with 63% of children on haemodialysis and 70% of children on peritoneal dialysis having a calcium level within the target range (table 7.10). As for PTH, 49% of children on HD and 46% on PD had a PTH within

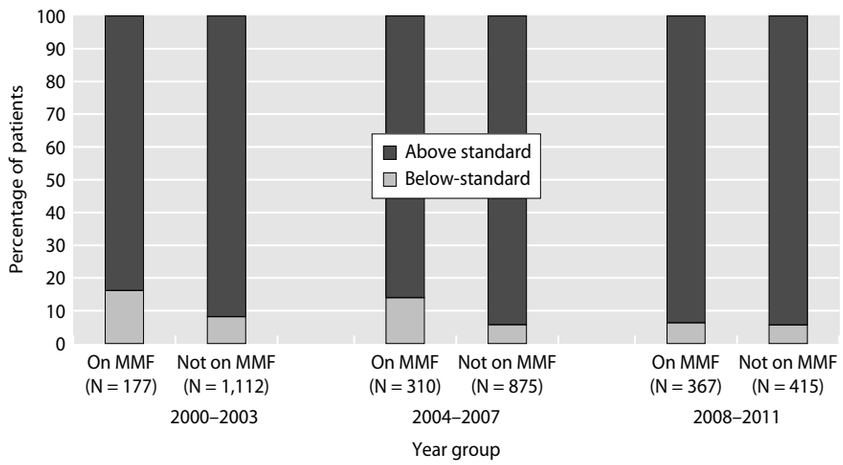

Fig. 7.12. The achievement of haemoglobin treatment standards in paediatric transplant patients <16 years, by use of MMF between 2000–2011

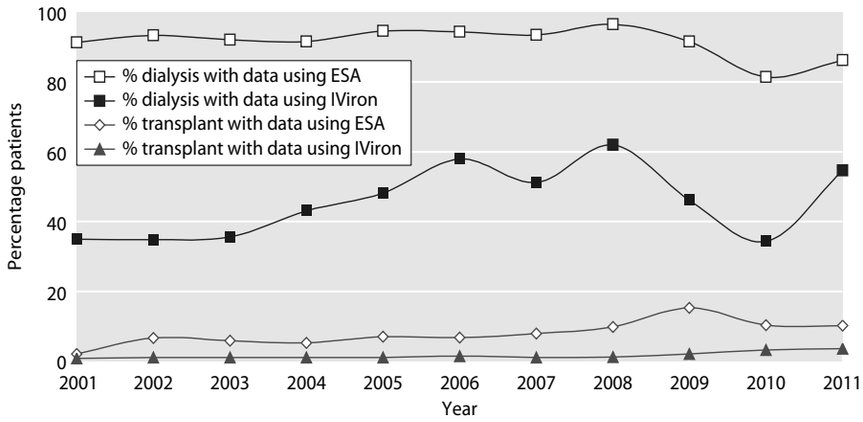

Fig. 7.13. The use of erythropoietin and IV iron in paediatric patients <16 years between 2001 and 2011 by treatment modality

the target range with wide inter-centre variation (table 7.11). In comparison, 79% of patients with a functioning transplant achieved a PTH within the target range. Caution should be exercised in the interpretation of these analyses as these analyses represent measurements performed once per year per patient. Further, there are differences between assays used at different centres which may further complicate interpretation of results. No significant age related differences were observed.

Discussion

There is a continuing move to electronic reporting with many centres now having electronic systems, albeit currently without the facility for automatic data extraction. As this is developed over the coming years, it will allow downloads of data at multiple time points per year for each patient allowing more meaningful analyses. The first step of this process, development of an updated paediatric dataset, is now complete.

Table 7.8. 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		
2000–2003	14.6	3.5
2004–2007	21.7	3.6
2008–2011	25.5	8.1
Dialysis patients		
2000–2003	94.0	91.3
2004–2007	96.6	92.8
2008–2011	90.3	88.3

The data for each section will be discussed below, but often the results throw up as many questions as they answer. There are several areas where more detailed analysis may help to identify obstacles as to why there has been little apparent change in attainment of many standards over the last few years.

Anthropometry

Children on renal replacement therapy are short for their age. The cross-sectional data presented here are little different from previous reports; indeed there appears to have been little change since 1999 which is disappointing [6]. Similarly, there has been little change in weight SDs and BMI SDs since 1999 in both transplanted children and those on dialysis.

There may be a number of reasons for this. Over the last few years, there has been an increase in the number of infants and young children receiving RRT. There are also a number of children who have renal failure as part of a syndrome who are often particularly short and their growth may not pick up following transplantation. Indeed one of the shortcomings of the current analyses is the inclusion of children with syndromes, those born prematurely and those aged <2 years on RRT, although their overall numbers are likely to be small. However, there have also been initiatives to try and improve growth, such as using rhGH, improved nutrition and avoiding the use of steroids post transplant. This low uptake of rhGH within the UK ERF population where overall 32.8% of patients have a height below the normal range, remains disappointing. Further, it may be that many different factors not included here have an influence on growth and that further in depth study is needed to tease out what is happening.

For the first time, the proportion of patients who had a height less that the normal range by treatment modality,

Table 7.9. Achievement of the phosphate standard in dialysis patients <16 years in 2011

	Haemodialysis				Peritoneal dialysis			
Centre	Patients with data N	% within standard	% below standard	% above standard	Patients with data N	% within standard	% below standard	% above standard
Bham_P	11	54.6	0.0	45.5	8	87.5	0.0	12.5
Blfst_P	3	33.3	33.3	33.3	3	100.0	0.0	0.0
Brstl_P	5	40.0	20.0	40.0	7	57.1	42.9	0.0
Cardf_P	n/a	n/a	n/a	n/a	1	0.0	100.0	0.0
Glasg_P	2	50.0	0.0	50.0	12	58.3	8.3	33.3
L Eve_P	7	28.6	14.3	57.1	7	71.4	14.3	14.3
L GOSH_P	10	50.0	0.0	50.0	9	88.9	0.0	11.1
Leeds_P	2	0.0	0.0	100.0	4	25.0	0.0	75.0
Livpl_P	1	0.0	100.0	0.0	1	0.0	0.0	100.0
Manch_P	7	28.6	0.0	71.4	15	46.7	13.3	40.0
Newc_P					3	66.7	0.0	33.3
Nottm_P	5	20.0	20.0	60.0	5	40.0	0.0	60.0
UK	**55**	**38.2**	**9.1**	**52.7**	**76**	**61.8**	**10.5**	**27.6**
Age group								
0–4.99 years	13	30.8	7.7	61.5	35	60.0	14.3	25.7
5–11.99 years	19	36.8	10.5	52.6	23	65.2	8.7	26.1
12–15.99 years	23	43.5	8.7	47.8	18	61.1	5.6	33.3

Blank cells denote categories where data completion is <50% complete, and thus not displayed
n/a not applicable, Cardiff did not have any haemodialysis patients under 16 in 2011
As Southampton had <50% completeness for both groups it has been excluded from centre specific analysis, though included in the UK totals

Table 7.10. Achievement of the adjusted calcium standard in dialysis patients <16 years in 2011

	Haemodialysis patients				Peritoneal dialysis patients			
Centre	Patients with data N	% within standard	% below standard	% above standard	Patients with data N	% within standard	% below standard	% above standard
Bham_P	11	54.6	0.0	45.5	8	50.0	0.0	50.0
Blfst_P	3	66.7	0.0	33.3	3	66.7	0.0	33.3
Brstl_P	5	60.0	20.0	20.0	7	71.4	14.3	14.3
Cardf_P [a]	n/a	n/a	n/a	n/a	1	100.0	0.0	0.0
Glasg_P	2	50.0	50.0	0.0	12	66.7	8.3	25.0
L Eve_P	7	71.4	28.6	0.0	7	100.0	0.0	0.0
L GOSH_P	5	80.0	20.0	0.0	2			
Leeds_P	2	100.0	0.0	0.0	4	100.0	0.0	0.0
Livpl_P	1	0.0	100.0	0.0	1	100.0	0.0	0.0
Manch_P	6	33.3	16.7	50.0	15	46.7	13.3	40.0
Newc_P	1				3	66.7	0.0	33.3
Nottm_P	5	100.0	0.0	0.0	5	100.0	0.0	0.0
UK [b]	**48**	**62.5**	**14.6**	**22.9**	**69**	**69.6**	**7.3**	**23.2**
Age group								
0–4.99 years	11	63.6	18.2	18.2	32	78.1	9.4	12.5
5–11.99 years	18	77.8	5.6	16.7	19	68.4	5.3	26.3
12–15.99 years	19	47.4	21.1	31.6	18	55.6	5.6	38.9

[a] Cardiff did not have any HD patients under 16 in 2011
[b] As Southampton had <50% completeness for both groups it has been excluded from centre specific analysis, though included in the UK totals
Blank cells denote categories where data completion was <50%
n/a – not applicable

Table 7.11. Percentage of patients <16 years achieving the PTH standard in 2011

	Transplant patients			Haemodialysis patients			Peritoneal dialysis patients		
Centre	Patients with data N	% achieving standard	% above standard	Patients with data N	% achieving standard	% above standard	Patients with data N	% achieving standard	% above standard
Bham_P	55	40.0	60.0	11	45.5	54.6	8	25.0	75.0
Blfst_P				2	50.0	50.0	3	33.3	66.7
Brstl_P	22	90.9	9.1	5	20.0	80.0	7	57.1	42.9
Cardf_P[a]							1	0.0	100.0
Glasg_P				2	50.0	50.0	12	41.7	58.3
L Eve_P	61	93.4	6.6	6	50.0	50.0	7	42.9	57.1
L GOSH_P	115	89.6	10.4	10	50.0	50.0	9	100.0	0.0
Leeds_P	35	57.1	42.9	2	100.0	0.0	4	75.0	25.0
Livpl_P							1	0.0	100.0
Manch_P	29	93.1	6.9	7	42.9	57.1	15	20.0	80.0
Newc_P							2	100.0	0.0
Nottm_P	42	76.2	23.8	5	60.0	40.0	5	40.0	60.0
UK[b]	**371**	**79.0**	**21.0**	**51**	**49.0**	**51.0**	**74**	**46.0**	**54.1**
Age group									
0–4.99 years	31	83.9	16.1	13	15.4	84.6	34	41.2	58.8
5–11.99 years	171	78.4	21.6	18	66.7	33.3	23	52.2	47.8
12–15.99 years	169	78.7	21.3	20	55.0	45.0	17	47.1	52.9

[a] Cardiff did not have any HD patients under 16 in 2011
[b] As Southampton had <50% completeness for both groups it has been excluded from centre specific analysis, though included in the UK totals
Blank cells denote categories where data completion was <50%

by centre and by age are presented. Twenty eight percent of transplant patients, 54% of HD patients and 48% of PD patients had a height that was below the normal range. Children aged less than 5 who were on dialysis seem to be worst affected. Only a third of dialysis patients, and 11% of transplant patients, who were short for their age, were on growth hormone treatment. There is therefore scope to increase the use of rhGH in these patients. Whilst the figure on rhGH in the transplant group was low, it is important to remember that these data are cross-sectional and although some children are short, they may be growing at a rate above normal and therefore would not fall into the category for whom rhGH is appropriate. An analysis evaluating final adult height may add to our understanding. The proportion of short transplanted children varied by centre and it would be interesting to see if this relates to the centres' likelihood of using steroids post transplant.

Blood pressure

There is an increasing body of evidence supporting the role of good blood pressure control in the management of CKD [7, 8]. There is also an increasing awareness of the importance of cardiovascular morbidity in paediatric patients with CKD and ERF. Overall, there remains scope for improvement in BP control. As BP changes during childhood, it is important to calculate centiles in the clinic rather than using the absolute measurements alone. The authors hope that it may be possible at some point to include the degree of proteinuria for transplant patients.

There was a wide range of median systolic BP scores in different centres and it might be helpful to reflect on the different strategies in each centre and their effect on outcomes. Once again the authors would highlight that these data reflect single measurements per year often performed using BP instruments that employ different techniques.

Anaemia

A significant proportion of dialysis patients were anaemic; this is little changed from previous reports. The proportion of transplant patients with a haemoglobin within the recommended range however has improved and is due to the change in standard used.

For transplant patients, the chances of a haemoglobin level below the standard were greater with reduced GFR and with the use of MMF. This highlights the importance of calculating GFR for transplant patients, rather than

using creatinine alone. A lower GFR should highlight the need to check that the haemoglobin is within the recommended range. Since 2000, the proportion of patients with a haemoglobin within range who were on MMF has increased, though with the increase in missing data for use of MMF in the last few years, it makes it difficult to draw any firm conclusions.

Whilst there are indicators to help identify those transplant patients at risk of anaemia, it is more difficult to highlight those at risk within the dialysis populations. Patients on HD seem more at risk and the risk of anaemia may be higher for those aged less than five years. Of those with a haemoglobin below range, over 90% of patients were on ESAs, although the proportion on IV iron or with a low ferritin is less clear. Of transplant patients with a low haemoglobin, 25% were now on ESAs compared with 14.6% between 2000–2003.

It is important to highlight here that it is beyond the scope of the registry to be able to report on dose adjustments that would likely improve understanding of these data. It would be helpful to study dialysis patients in more detail to see if there are any factors which help identify those children at highest risk of anaemia. Detailed data on ferritin and IV iron would be needed for this subgroup of patients. The results of the recently completed national audit on anaemia in the UK paediatric ERF population may help to shed some further light on this.

Biochemistry

The numbers of paediatric patients on dialysis were small but phosphate control appears to be worse in patients on haemodialysis than in patients on PD. Results for calcium were little different between the dialysis groups and approximately half in each group had a PTH above the desired range. This compares to 21% of transplanted patients. Data were less complete for PTH in the transplant group which might imply that the complications of reduced GFR might sometimes be overlooked in this group of patients. It would be useful to include vitamin D levels in the parameters studied. Moving to multiple time point reporting of data in future reports will allow better interpretation of biochemistry results.

Summary

In summary, continued efforts are being made to move towards electronic reporting. Whilst this is still not complete, many centres are moving to using electronic systems which incorporate an electronic patient record. These improved electronic platforms have the additional potential to display percentiles and SDs and it may be that these functionalities will help make clinicians aware of patients results and achievement of targeted clinical standards. Automatic calculations of e.g. eGFR in transplant patients may help to point out that some patients have lower GFRs that make them susceptible to anaemia. The likelihood of complete electronic reporting in the near future with plans for quarterly reporting in the format of the recently finalised NEW paediatric dataset will undoubtedly improve quality of data and their reporting, allowing improvements in patient care.

Conflicts of interest: none

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UK Renal Registry 15th Annual Report: Chapter 8 UK Multisite Peritoneal Dialysis Access Catheter Audit for First PD Catheters 2011

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Key Words
Access · Catheter outcome · Deprivation · Peritoneal dialysis · Primary renal disease

Summary

- These data represent the first return of a multisite peritoneal dialysis (PD) access audit within the United Kingdom (UK).
- 43 of 65 UK renal centres in England, Wales and Northern Ireland contributed data on a total of 917 patients who had a first PD catheter placed in 2011.
- The median age of PD patients was 61 years with the largest proportion of patients in the 65–79 year age group. The majority of PD patients (61.5%) were male.
- The proportion of patients initiated on PD in comparison to haemodialysis was lower in patients from socially deprived areas.
- The majority of new PD patients in 2011 had been known to a renal physician for over 1 year (72%). Of all late presenting patients (known for <90 days) starting dialysis in 2011 only 9% started on PD; whereas for those known to renal centres for more than 1 year, 27% started on PD (data from combined PD and vascular access survey).
- PD catheter(s) were still being used 3 months following initiation of therapy for 75% of patients.
- There was a relationship between the timing of nephrology referral and the likelihood of surgical assessment regarding PD catheter placement: patients for whom the time between presentation and starting dialysis was less than 90 days were less likely to be referred to a surgeon for PD catheter insertion and were more likely to receive percutaneous catheter insertion.
- Early peritonitis (less than 2 weeks) and catheter flow problems were more common with percutaneously placed catheters compared with those inserted using a general surgical approach. There was an increase in 3 month catheter failure with percutaneous catheters.
- Diabetic nephropathy was the primary renal disease in 21% of new PD patients in 2011; patients with diabetes did not have higher rates of PD catheter failure or of early peritonitis.
- There was wide variation in the practice of surgical referral for PD catheter insertion. Surgical assessments varied from 0% in 5 of the centres to 100% in Antrim, Birmingham QEH and Bangor. This likely reflects the differing surgical services in renal centres. Throughout the UK, approximately half of all patients where data were returned were assessed by a surgeon before PD catheter insertion. Many centres did not report this data.

Introduction

Peritoneal dialysis (PD) is a key mode of renal replacement therapy (RRT) being used by 18% of United Kingdom (UK) dialysis patients [1]. In order for PD to be both clinically successful and acceptable from the perspective of patient experience, sustained catheter function in the absence of significant complications is essential. Poorly functioning PD catheters prevent patients from getting the best from renal replacement therapy and poor catheter function often leads to the abandonment of the modality completely. Surprisingly, such information has not been routinely collected from UK renal centres until now.

Whilst published guidelines relating to PD catheter functionality and post-insertion complication thresholds exist, (International Society for Peritoneal Dialysis (ISPD) [2] and the Renal Association (RA) [3]) their validity has not been rigorously evaluated. The accurate collection of PD access data remains a challenge due to ambiguity of data terms and the methodology of data collection. This is exacerbated by the presence of untested audit standards [4]. Two important audit standards which have emerged from current RA/ISPD guidance are:

1) Peritonitis rate occurring within 2 weeks of catheter insertion should occur in less than 5% of cases
2) Catheter patency should be more than 80% at 1 year. This report does not capture this length of follow up.

The requirement for timely peritoneal dialysis access is also of paramount importance and is described in the Renal Association Peritoneal Dialysis clinical guideline 2.1[5]:

'Fast track education and urgent PD catheter insertion with acute start PD should be available, and be offered to suitable patients urgently starting on renal replacement therapy who wish to avoid temporary haemodialysis'.

The associated audit measures describe the care pathway for catheter insertion including timeliness and requirement for temporary haemodialysis. Further audit measures describe catheter complications and their resolution. In order to advance this important area of clinical care, funding was received from the Health Quality Improvement Partnership (HQIP) to enable the UK Renal Registry to initiate a process of data acquisition relating to PD functionality and access. This report describes selected observations from the first round of data collection from incident PD patients in 2011.

Methodology

The work supported by HQIP was described in a previous report [6]. All adult renal centres were contacted regarding vascular and peritoneal access in all new patients in 2011. Of 65 centres contacted, data were received from 43 centres. These centres contributed incident peritoneal dialysis access data during 2011 relating to first PD episode (i.e. first PD catheter) in 917 patients (353 females, 563 males) (one patient was excluded as under the age of 16 when PD started). Catheter insertion technique was reported as percutaneous in 240 patients, open surgery in 409, laparoscopic in 111, peritoneoscopic in 33 and missing in 124.

Data fields were refined from existing renal registry tables, adjusted based on audit work conducted in Yorkshire and the Humber during 2010 and meetings of the multisite audit group which included patient representation. Data were collected using Excel spreadsheets circulated by the UK Renal Registry. The records collected by the questionnaires were matched with the UK Renal Registry database allowing identification of unreported deaths within three months of commencing dialysis and patients who had previously received RRT.

Referral time was defined as the time between the date of first being seen by a renal physician and the date of commencing dialysis. A valid referral time was calculated for a patient if they had both dates recorded and if the date of first being seen by a renal physician was no later than the date of commencing dialysis. Two centres had no valid referral times calculated for any of their patients due to poor data completeness. If a patient did not have a date that they were first seen by a renal physician available, then the data field should have been left blank. However, patients from London St Bart's & The London Hospital for whom this data were unavailable had had this date recorded as the date they started dialysis. For this reason, when the data were validated, all 11 patients from London St Bart's & The London Hospital who had matching dates for these two data fields had the date they were first seen by a renal physician set to missing. This might have caused an under estimation of the number of late referrals at London St Bart's & The London Hospital as some of the dates that were changed may have been accurate.

Deprivation quintiles were calculated using the English Indices of Deprivation 2010 which measured relative levels of deprivation in small areas of England called Lower Layer Super Output Areas (English Indices of Deprivation 2010: http://www.communities.gov.uk/publications/corporate/statistics/indices2010). These 32,482 areas were ranked from least deprived to most deprived and then split into equal quintiles. Patient records were matched to an area, and accordingly a deprivation quintile, by postcode. Only patients resident in England with a

valid postcode were included in the analyses involving deprivation quintiles.

Catheter survival at 3 months was censored for death, transplantation, stopping treatment, and switching to haemodialysis (HD) with no catheter failure. It was not possible to compare centres regarding 3 month catheter function as a measure of the success of catheter placement due to the small number of catheters inserted at each centre.

Patients were classified according to the length of time they were known to nephrology services: less than 90 days, 90 days to 1 year and more than 1 year. This audit reports the commonly used PD catheter insertion methods in the UK as described in the RA PD access working party report [7] and summarised as:

- an open surgical approach in which the layers of the abdominal wall are opened under direct vision and the catheter placed at laparotomy
- a percutaneous Seldinger approach
- placement using a peritoneoscope
- placement aided by a laparoscope

Data completeness by centre ranged from 0% to 100% for almost all of the data fields that were collected, including the date the catheter was first used, catheter insertion technique, access at three months, date of catheter failure, BMI and date first seen by renal physician. Statistical analyses were performed using SAS 9.2.

Results

Table 8.1 shows patient demographic data and percentage completeness of the data items collected.

Demography and primary renal disease

The majority of peritoneal dialysis patients in the audit were male (n = 563, 61.5%) compared to females (n = 353, 38.5%). This trend was reflected in all age groups except the youngest (figure 8.1). The peak age range for incident patients was 65 to 79 years for both male and female patients, re-enforcing findings in the recent vascular access report [8].

The median age at first dialysis across all United Kingdom centres was 61 years but varied widely across centres. The lowest median age was 33.8 in Tyrone and increased to a maximum median age of 79.7 in Glan Clwyd (figure 8.2).

The most common underlying primary renal disease (PRD) in incident peritoneal dialysis patients (with first PD catheter inserted in 2011) was diabetes mellitus (21%), with glomerular disease (13%), polycystic kidney disease (9%) and hypertension (7%) representing other

Table 8.1. Demographic data for patients included in the PD access audit

	% complete	Data item	N 916 patients	% of completed records
Gender	100	Male	563	61.5
		Female	353	38.5
Diabetes at time of catheter insertion	77	Yes	224	31.7
		No	483	68.3
First modality	100	PD	867	94.7
		HD	49	5.3
Catheter failure	14	Date recorded	127	100.0
BMI	38	Underweight	10	2.9
		Normal	131	38.0
		Overweight	125	36.2
		Obese	79	22.9
Primary renal disease	100	Diabetes	194	21.2
		Glomerulonephritis	117	12.8
		Hypertension	65	7.1
		Other	88	9.6
		Polycystic kidney	87	9.5
		Pyelonephritis	59	6.4
		Renal vascular disease	34	3.7
		Uncertain aetiology	152	16.6
		Missing	120	13.1
			Mean	**SD**
Age	100	At start of dialysis	58.6	16.7

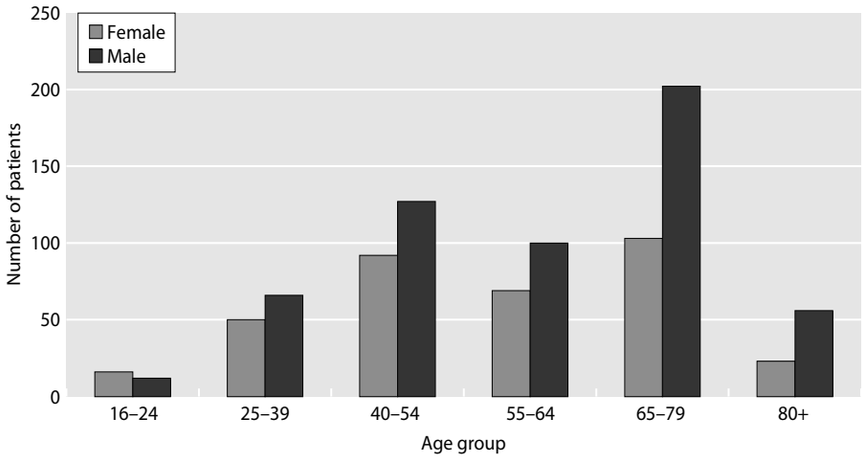

Fig. 8.1. Age and gender of PD patients submitted to audit

notable primary renal diseases; 17% of patients lacked a clear underlying primary renal disease and data were not available for 13% of patients (figure 8.3, table 8.1).

Diabetes mellitus as the primary aetiological renal disease in PD patients was notably over represented in the most deprived quintile (26.7%) when compared to the least deprived (13.3%) quintile. Interestingly, similar trends, either directly or inversely, were not apparent for other primary renal diseases such as hypertension or glomerular diseases (figure 8.4).

Figure 8.5 shows a greater proportion of PD patients in England were derived from the most deprived quintile of the population (16% for the least versus 24% for the most). This was consistent with a greater incidence of end stage kidney disease in the most deprived groups of the UK population [9].

Although absolute dialysis patient numbers increased with increasing deprivation, PD as a modality fell proportionally across deprivation quintiles with the most deprived patient cohort being the least likely to use PD as a renal replacement modality (25% for the least deprived versus 19% for the most deprived quintile) (figure 8.6). Data were stratified by referral time to see if there were confounding factors but for patients who were referred more than 90 days prior to the start of RRT there was still a marked difference between the deprivation quintiles. For late presenters, all quintiles had roughly equal proportions of HD and PD patients (figure 8.7).

Impact of referral interval on PD uptake and catheter placement method

The proportion of PD patients who were late presenters (<90 days between presentation and initiation of therapy), varied markedly between renal networks (figure 8.8). Late presenting patients accounted for 15% of all PD patients in the West Midlands contrasting with other networks such as the South West where only 2% of PD patients were late presenters. Data were not available from some renal networks.

There was no relationship between centre size and the likelihood of late presenting patients commencing PD (figure 8.9). For any number of patients in the cohort (x-axis), one can identify whether the percentage of patients referred within <90 days (y-axis) falls within plus or minus 2 standard deviations (SDs) from the national mean (solid lines, 95% limits) or 3 SDs (dotted lines, 99.9% limits). With 43 centres included in the analysis, it would be expected by chance that two centres would fall outside the 95% (1 in 20) confidence limits. The results have to be cautiously interpreted due to the extent and variation in missing data, small numbers of patients in some centres and non-adjustment for any patient related factors.

Figure 8.10 shows that across centres there was large variation in the proportion of PD patients who were late presenters, with many centres not starting any patients presenting at less than 90 days on PD. In two centres, more than 20% of patients started on PD were late presenters (however one of these centres, Tyrone, only had 3 patients starting PD in 2011).

Figure 8.11 shows first access for centres reporting PD patients in the audit. There was a wide variation between centres in the use of PD as first access. A similar variation is noted in the use of an arteriovenous (AV) fistula as first access. Derby had the highest use of both PD catheter and primary AV fistulas resulting in a less than 20% use of central lines for the first dialysis. Clearly an understanding of the wide variation between centres

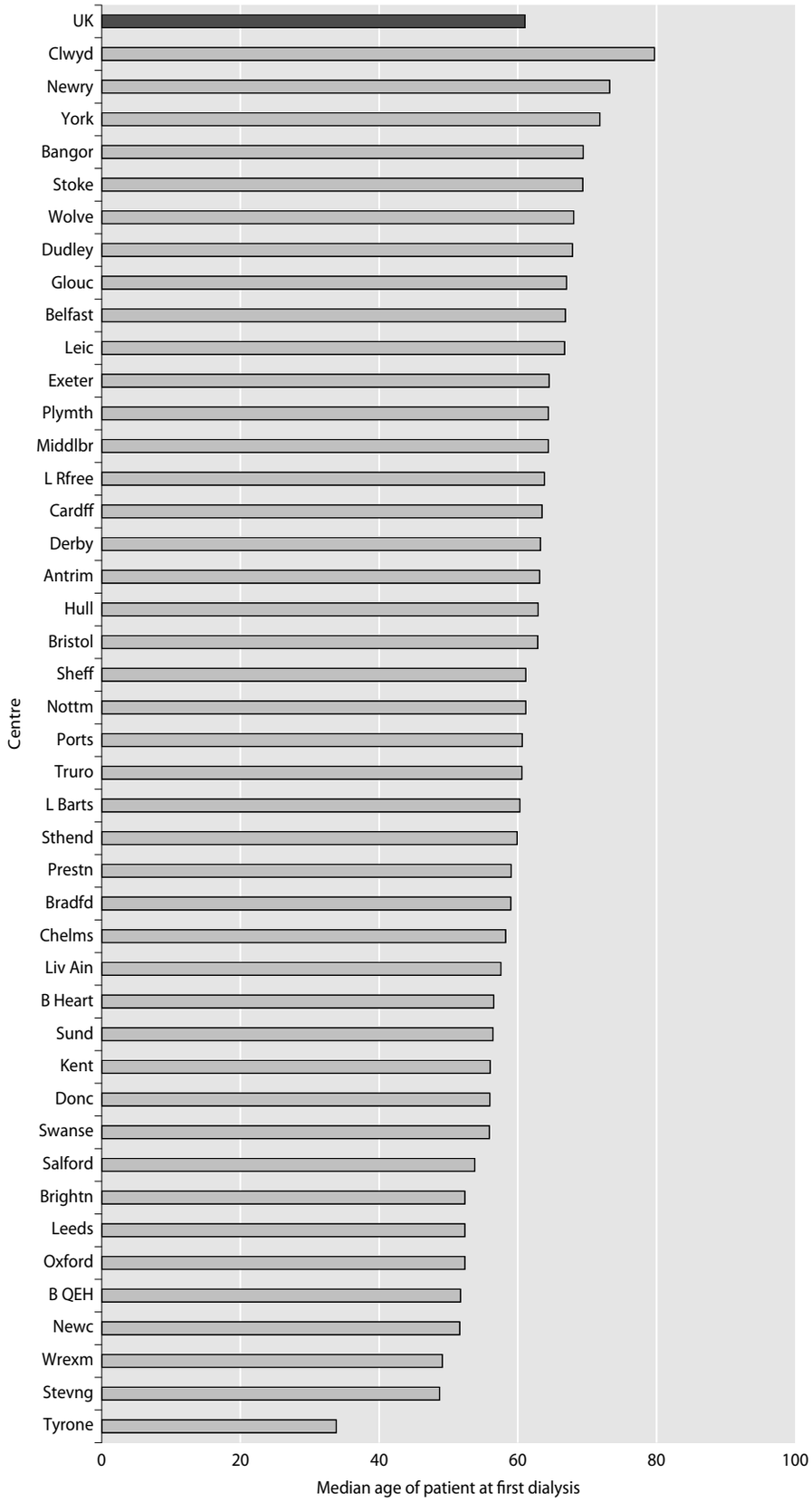

Fig. 8.2. Median age of PD patients at first dialysis by renal centre

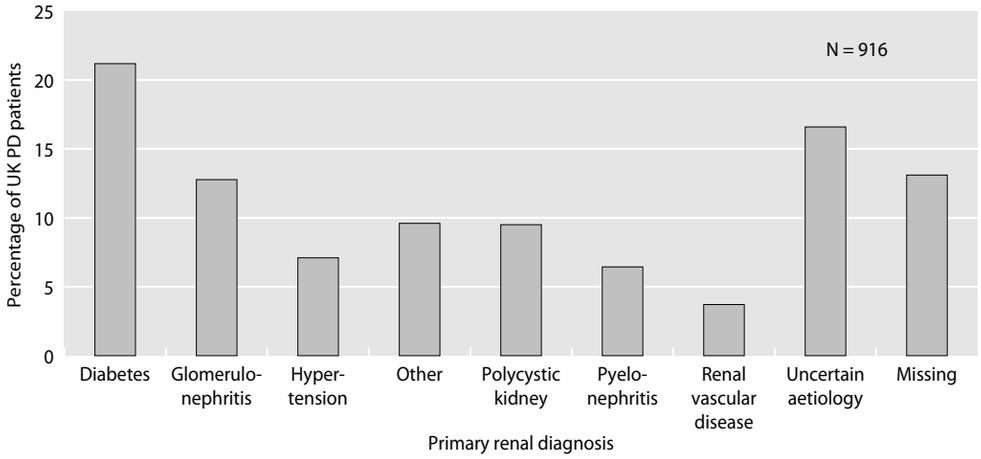

Fig. 8.3. Contributory proportions of primary renal disease in UK PD patients

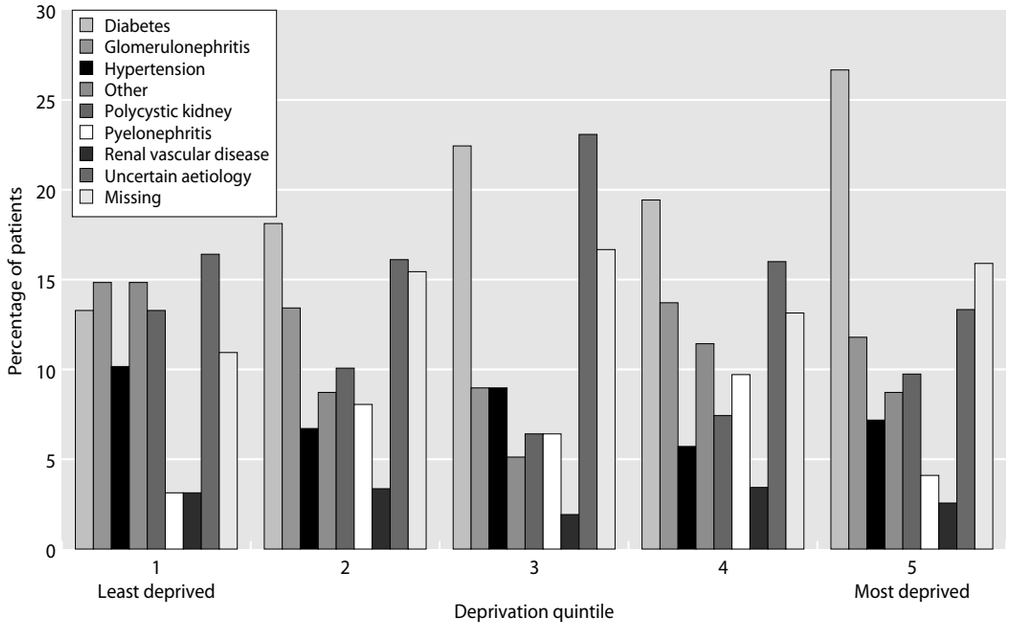

Fig. 8.4. Percentage of patients with each PRD, by deprivation quintile
Based on 803 PD patients with a valid postcode in England (128, 149, 156, 175, 195 patients in the 1–5 quintiles)

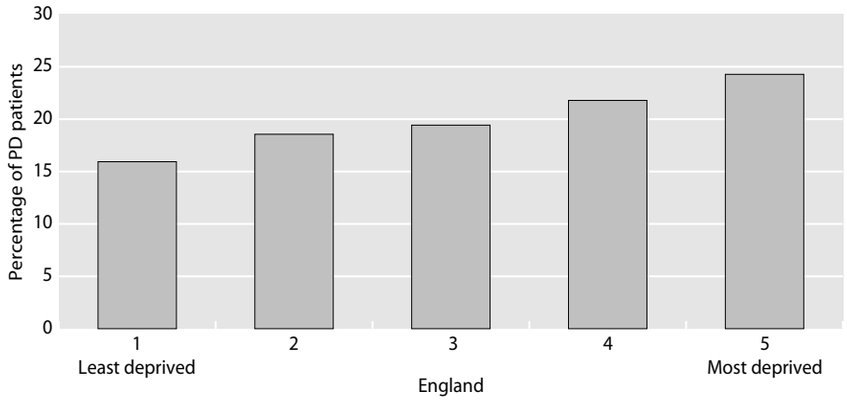

Fig. 8.5. Deprivation quintile profile for PD patients resident in England
Based on 803 PD patients (excludes 113 without valid English postcode)

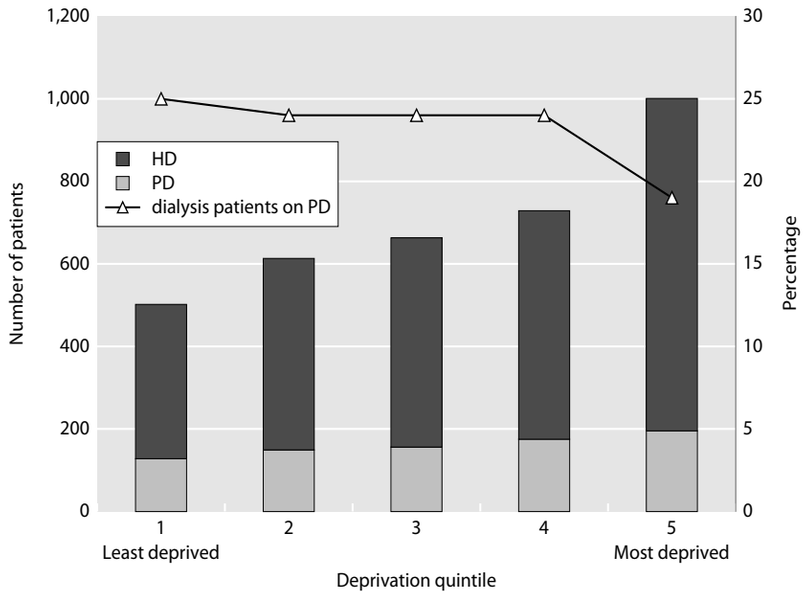

Fig. 8.6. Number and percentage of dialysis patients on PD, by deprivation quintile
Based on 3,508 dialysis patients with valid postcode in England (591 excluded). The bars for HD and PD represent numbers of patients and relate to the left hand axis. The line graph relates to the right hand axis.

is interesting and could lead to potential improvements. There may be reporting differences which need to be explored.

Approximately 50% of all non-tunnelled lines and 33% of tunnelled lines were in late presenting patients. The majority of patients who started dialysis with an AV fistula had been known to a physician for over a year – very few late presenting patients were able to start dialysis with either an AV fistula (2%) or AV graft (6%) (figure 8.12). The pattern for PD catheter use is similar to that of AV fistulas – where the majority are in patients who have been known to centres for more than 1 year. This suggests that the PD catheter insertion pathway was insufficiently responsive at many centres and that PD catheters were being under used for late presenters.

From the available data, 75% of UK renal centre patients who were initiated on PD catheters were documented as PD functioning at three months. Due to small numbers of catheters being inserted at individual centres it is not possible to perform a statistical comparison of three month catheter survival between centres. There was an inverse relationship between lateness of presentation and 3 month retention on PD. Thus 90% of patients starting therapy less than 90 days from first

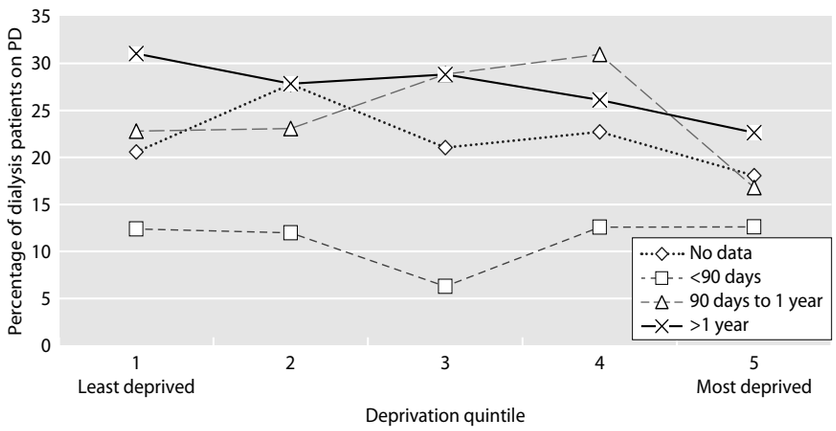

Fig. 8.7. Percentage of dialysis patients on PD by quintile and length of time between first seeing a renal physician and starting dialysis

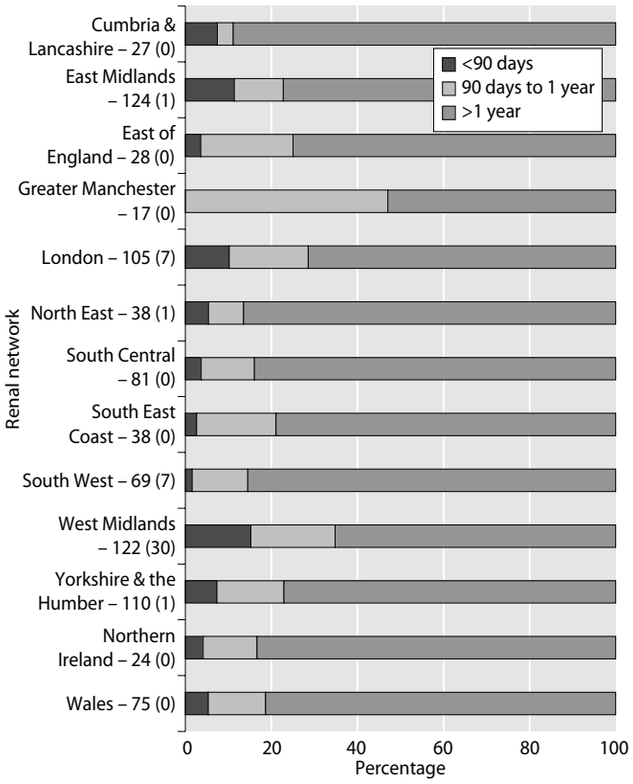

Fig. 8.8. Referral time from first seeing a renal physician to first dialysis for patients starting on PD, by renal network
Based on 867 patients who had PD catheter as first access (number of patients in each network listed on y-axis, includes patients with missing data (number in brackets)). Cheshire & Merseyside excluded because none of their 9 patients had referral time data returned.

physician contact remained on PD at 3 months; for patients starting PD between 90 days and 1 year following first physician contact, PD utilisation at 3 months was 86%; and for those known to a physician for more than 1 year the 3 month utilisation rate was 75% (figure 8.13). For patients in whom referral time was not recorded, only 68% were reported as having a PD catheter as their access at three months. Thus, there was a greater tendency for patients who started PD 'acutely' to be on PD at 3 months when compared to patients known to the team for longer.

The relationship between PD catheter usage for late-presenters and other access modalities is shown in figure 8.14. The variation in centre practice was wide.

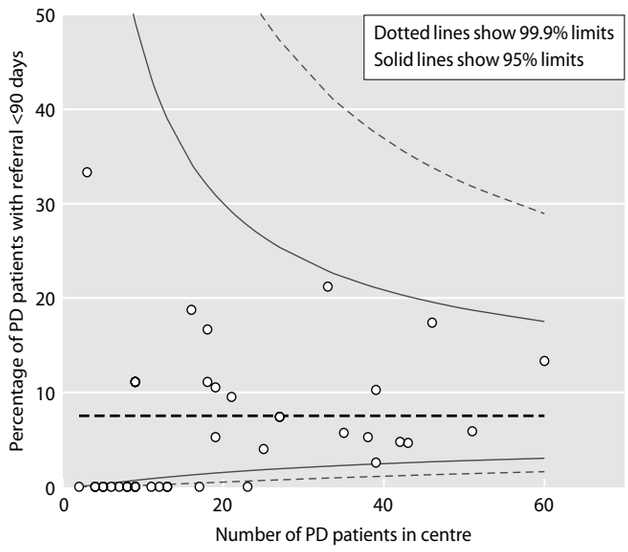

Fig. 8.9. Funnel plot relating number of patients per centre and the percentage of PD patients with referral <90 days

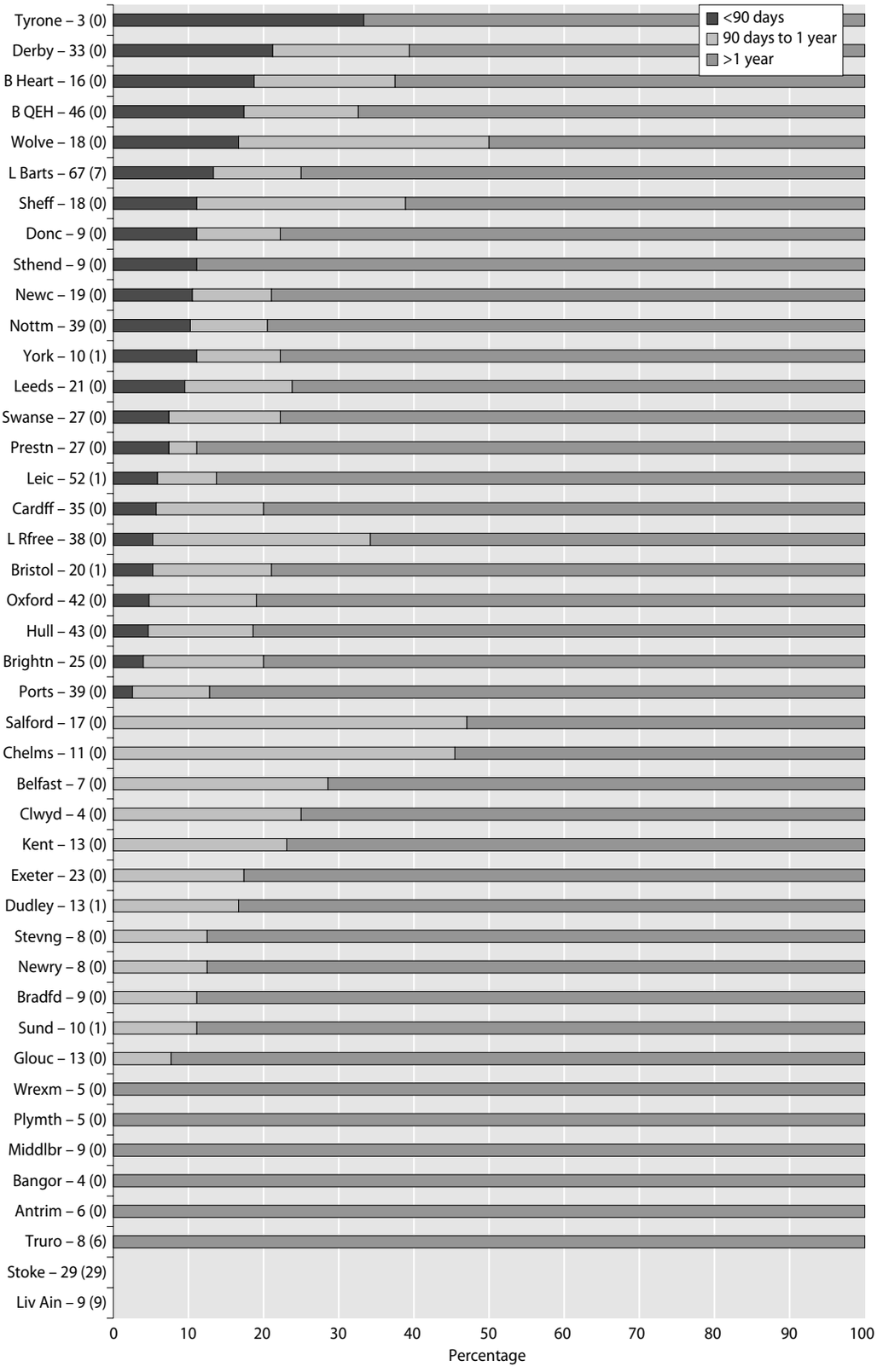

Fig. 8.10. Percentage of PD patients in each referral time category by centre
Based on 867 patients who had PD catheter as first access (number of patients at each centre listed on y-axis), includes patients with missing data (number in brackets)

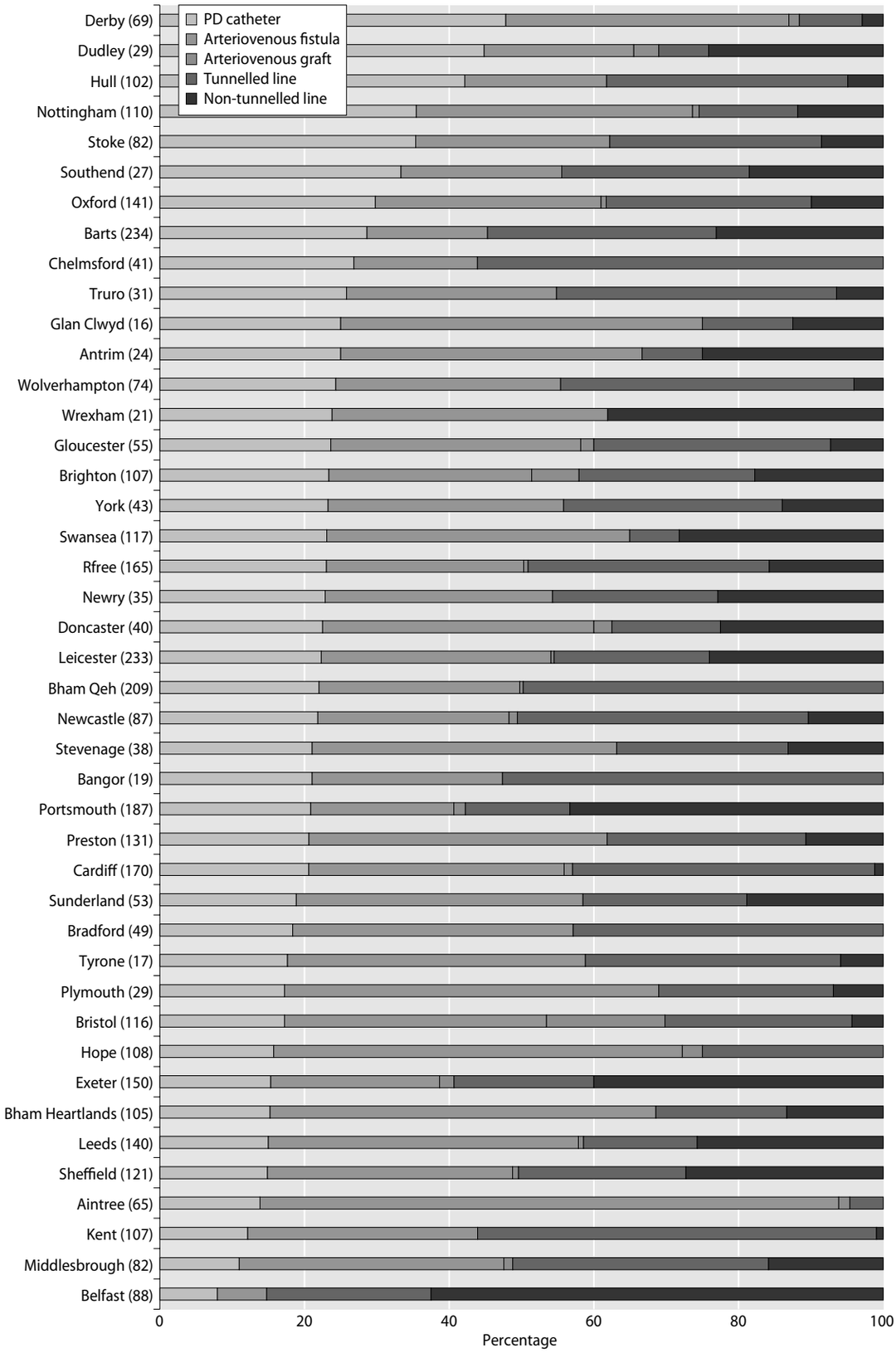

Fig. 8.11. Access at first dialysis for centres reporting PD patients, by renal centre
Based on 3,867 dialysis patients from centres that reported PD patients. Number of patients at each centre in brackets.

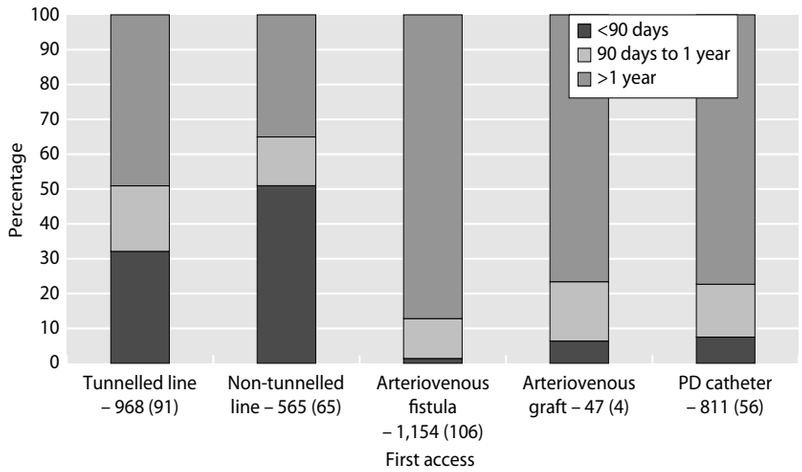

Fig. 8.12. Referral time from first being seen by renal physician to starting dialysis by type of first access
Based on 3,545 patients from centres that reported PD patients, who had data on both referral time and type of first access. Total number of patients contributing data to the chart by access type included in x-axis labels (number with missing data in brackets).

For example, Derby used PD catheters in 58% of late presenting patients with tunnelled lines in 25%, when compared with Chelmsford where all late presenters commenced dialysis via tunnelled catheters. Belfast had 26 and Exeter 43 patients classed as late presenters with the majority of patients commencing dialysis via a non-tunnelled line. Again, differences in reporting practice of first access may be important.

There was wide variation in the practice of surgical assessment for PD catheter insertion (figure 8.15). Surgical assessments varied from 0% in 5 of the centres to 100% in Antrim, Birmingham QEH and Bangor. This likely reflects the differing surgical services in renal centres. Throughout the UK, approximately half of all patients where data were returned were assessed by a surgeon before PD catheter insertion. Many centres did not report this data.

Late presenters initiated on PD were less likely to undergo surgical referral for PD catheter insertion. For late presenters to be established on PD, a responsive pathway is essential, and to this end medical PD catheter insertion allows the nephrologist to have control over the process. Patients who had been known to the services longer were more likely to be referred to a surgeon, although there was considerable missing data (figure 8.16).

Information regarding the use of insertion technique stratified by advanced surgical assessment was compromised by missing data in 375 patients. An association was noted between surgical assessment and open surgical catheter placement, which is unsurprising.

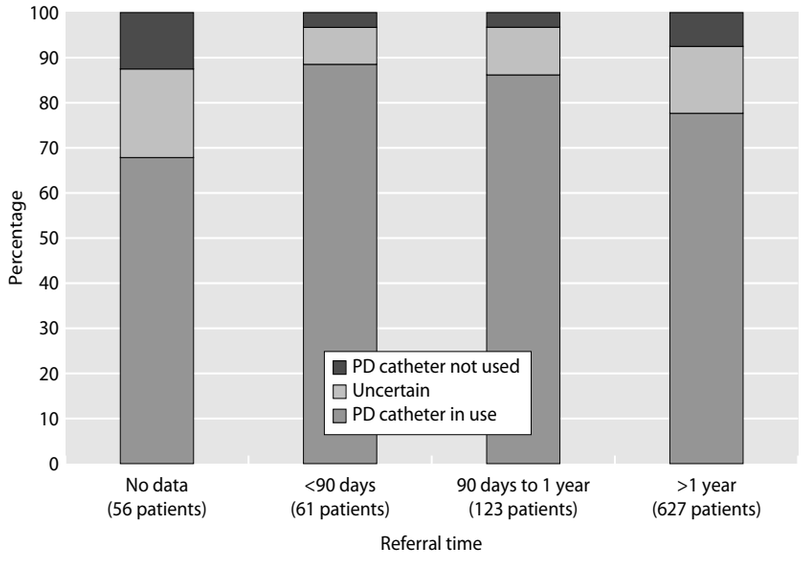

Fig. 8.13. Access at 3 months after starting peritoneal dialysis, by referral time
Based on 867 patients who had PD as their first access

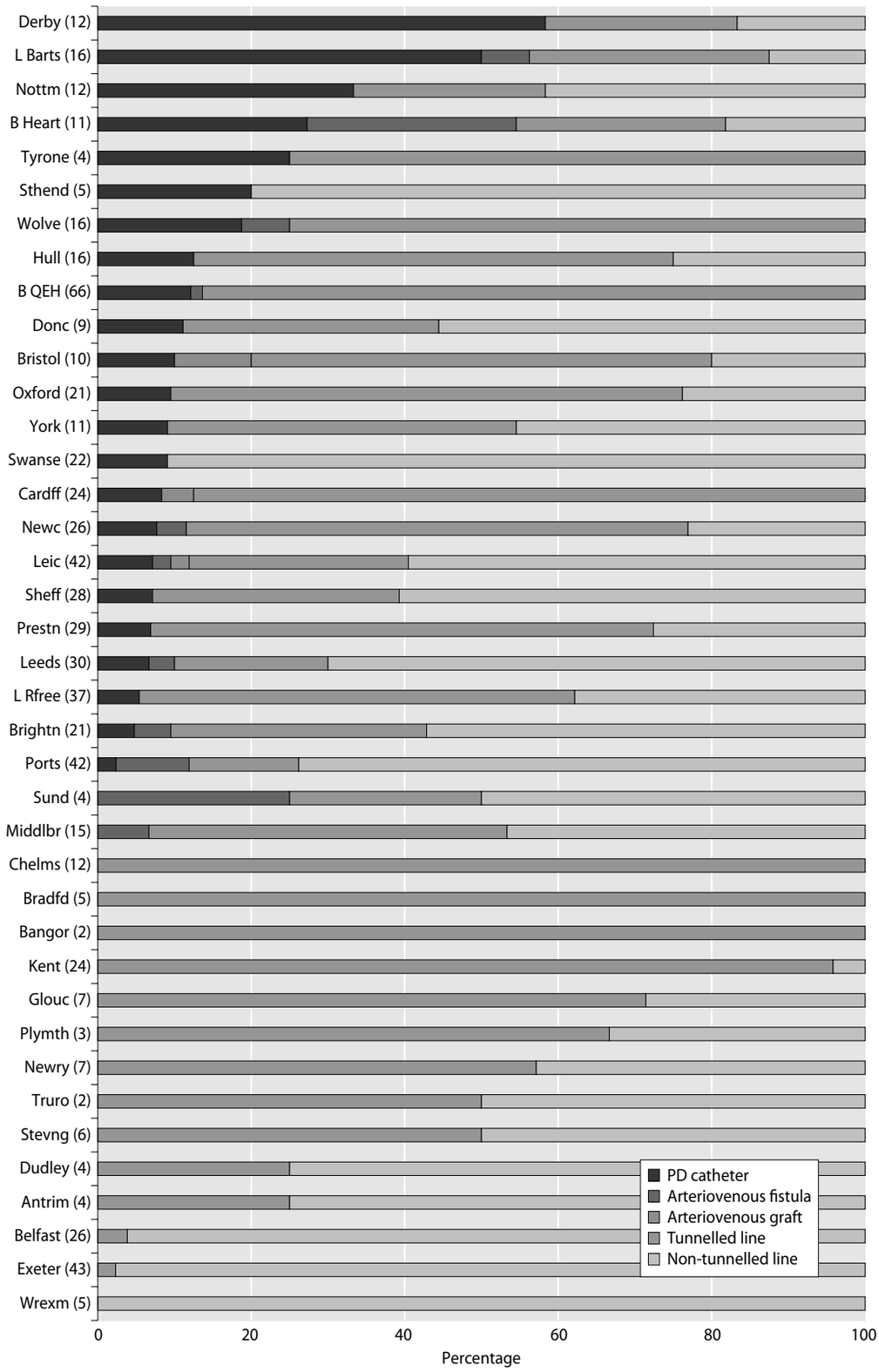

Fig. 8.14. Type of first access for late presenting patients (referral time of <90 days) by centre

Based on 750 patients who had less than 90 days between when they were first seen by a physician and starting dialysis (individual centre totals in brackets). 4 centres do not appear on the chart. Aintree and Stoke returned no data for referral time. Salford and Glan Clwyd had no patients who had a referral time of less than 90 days.

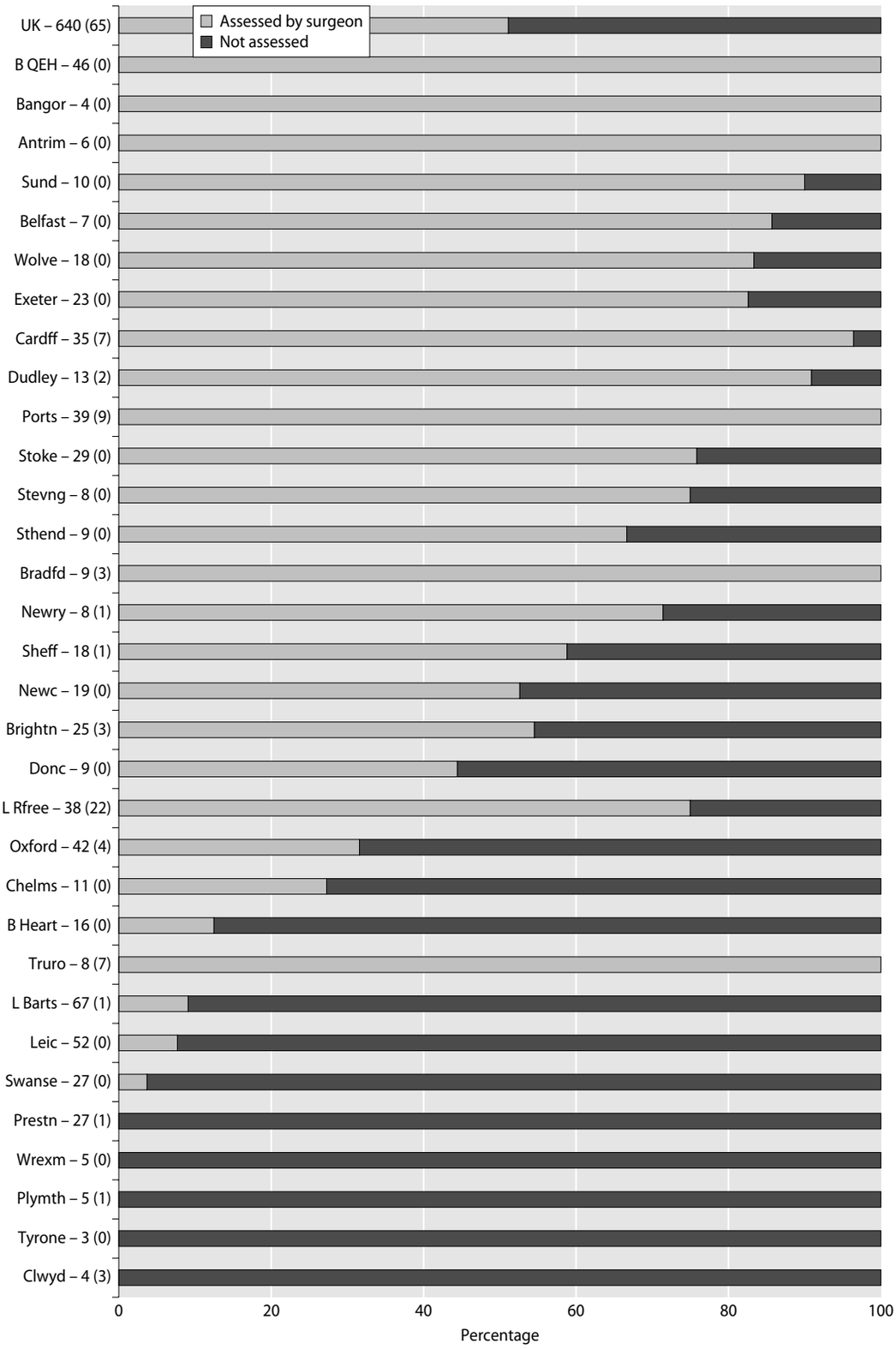

Fig. 8.15. Assessed by surgeon, by renal network for patients with first access as PD catheter
Based on 640 patients who had PD as their first modality. Total number of patients listed after centre name (number of patients with missing data in brackets). The following centres are not displayed as they did not return any data: York, Nottingham, Middlesbrough, Leeds, Kent & Canterbury, Hull, Manchester, Gloucester, Derby, Bristol and Liverpool Aintree. A total of 227 patients were excluded from these centres.

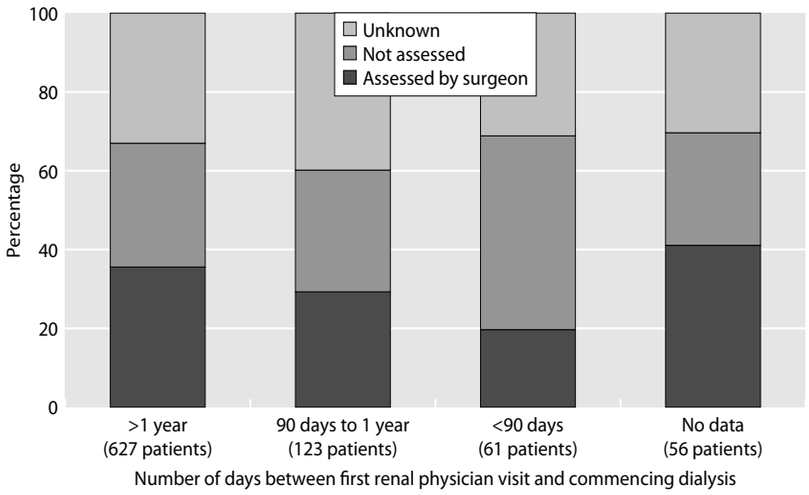

Fig. 8.16. Assessed by surgeon, by referral period for patients with PD as first access

The practice of surgical assessment three months in advance of PD catheter insertion varied between centres with 294 patients in the UK who received a PD catheter being seen by a surgeon and 281 reported as not being seen (figure 8.17).

PD catheter insertion technique varied in accordance with the time to PD initiation from first physician contact (figure 8.18). There was greater representation of percutaneous insertion in so-called 'late presenters'. Of late presenting patients, 40% had the PD catheter inserted by the percutaneous method, this figure fell to 30% in patients presenting between 90 days and 1 year prior to dialysis start and 28% in patients known to the service for more than 1 year.

PD catheter outcomes

The number of patients with sufficient data to be included in this analysis was low (121 patients), however there appeared to be more catheter flow problems with percutaneous catheters (20 out of 38) compared with 23 out of 62 catheters placed by the open surgical technique (figure 8.19). Outcomes were reported in only 17 laparoscopic cases and 4 peritoneoscopic cases and therefore no conclusions can be drawn for these

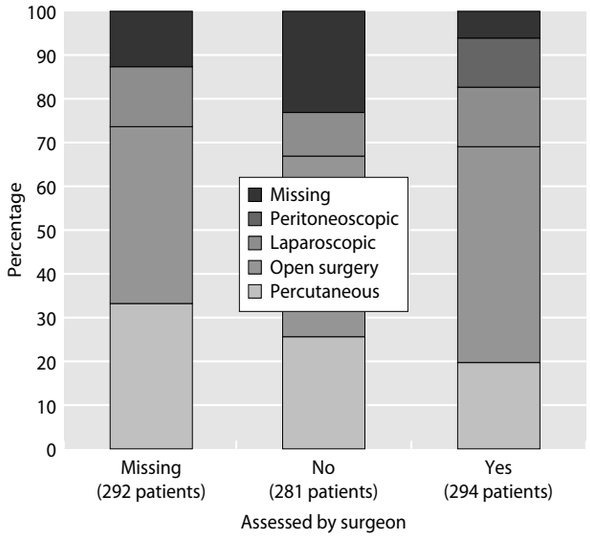

Fig. 8.17. PD catheter insertion technique by surgical assessment

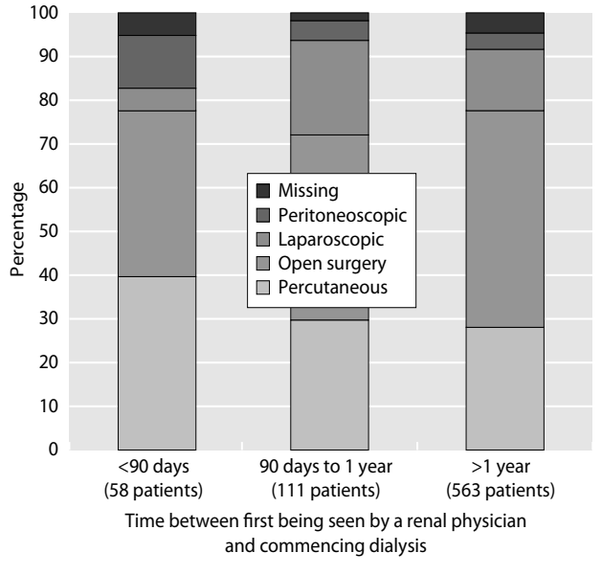

Fig. 8.18. PD catheter insertion technique by referral time

Based on 732 patients who had PD catheter as their first access and a valid referral time. Six centres were excluded, two due to returning no data about referral time and four due to returning no data about insertion technique.

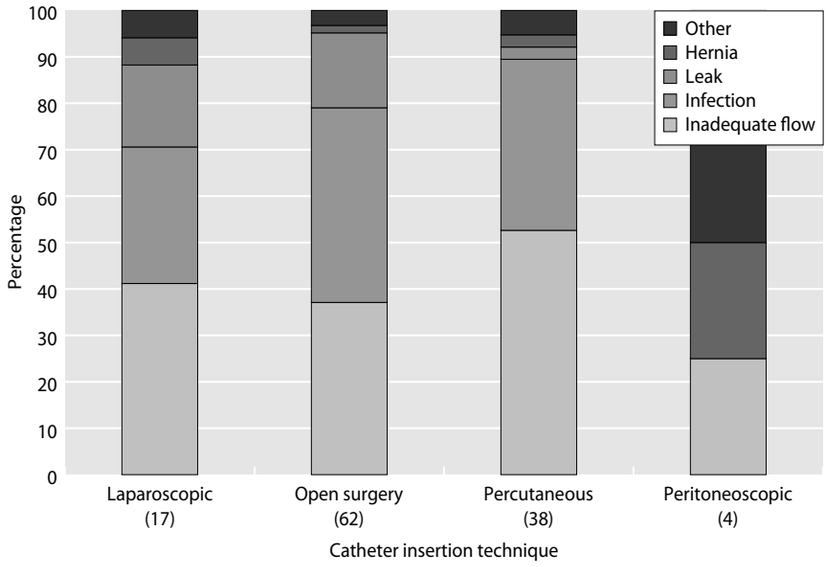

Fig. 8.19. Catheter failure reason by insertion technique
Based on 121 patients. Number of failures by insertion technique in brackets. Inadequate flow covers inflow and outflow.

techniques.

Figure 8.20 describes catheter complications according to whether the patient was described as having diabetes (type 1 & 2) at the time of catheter insertion (as distinct from diabetes as the primary renal disease). Of the 916 patients, 224 were recorded as diabetic, 483 as not diabetic and 209 had missing data. Patients with diabetes may be anticipated to have higher rates of infection and thus catheter failure at 3 and 12 months. Although the numbers of patients with diabetes included in this analysis were small (112 patients had complete data) there was no excess of complications in these patients compared to those without diabetes. There was no association between diabetes and the likelihood of early peritonitis (less than 2 weeks) however a number of patients (283) were excluded due to poor data completeness (figure 8.21).

The Renal Association Guidelines suggest exit site infection within 2 weeks of catheter insertion should occur in less than 5% of patients and also that peritonitis within 2 weeks of catheter insertion should be similarly rare. There was a significant difference ($p = 0.016$) in the percentage of catheters recorded as experiencing an

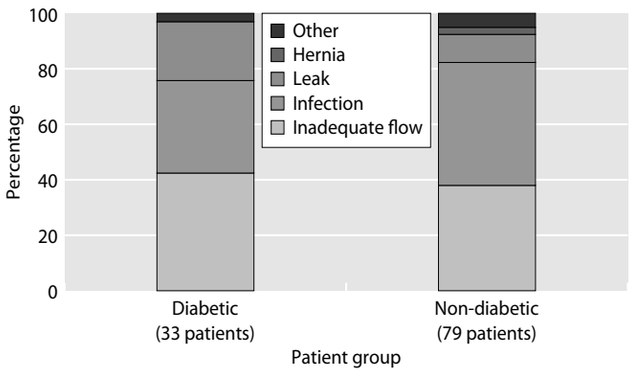

Fig. 8.20. Reason for catheter failure, diabetic vs. non-diabetic
Seven centres (206 patients) excluded due to poor data completeness (<50% of patient records returned with data on diabetes status at time of catheter insertion). No catheter failure recorded for 580 patients. No failure reason recorded for 16 patients who had a failure date recorded. Two patients with no data returned about diabetes status have a failure reason recorded as inadequate flow–inflow and outflow

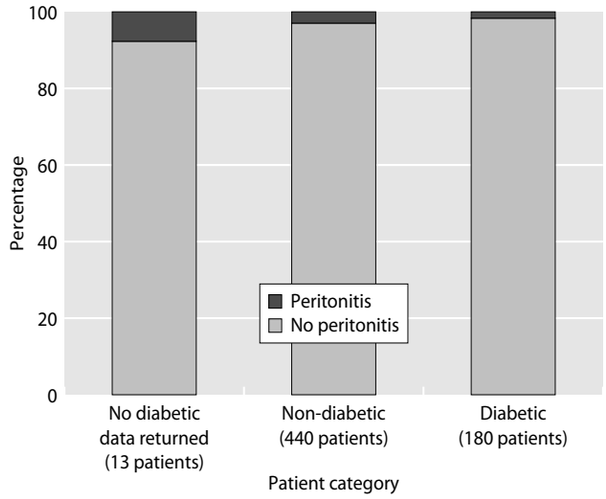

Fig. 8.21. Percentage of patients who experienced a peritonitis episode within 2 weeks of catheter insertion
Ten centres had all their patients (270) excluded due to poor data completeness (<50% completeness for either the diabetes or peritonitis fields). 13 additional patients excluded from chart as no data returned regarding peritonitis.

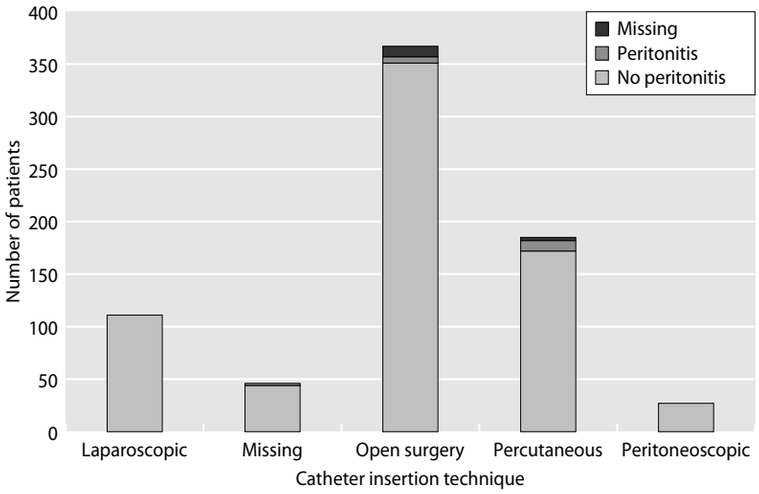

Fig. 8.22. Number of patients who experienced a peritonitis episode within 2 weeks of catheter insertion, by catheter insertion technique
180 patients excluded due to poor data completeness at their centre (<50% with peritonitis field completed)

early peritonitis episode (at less than 2 weeks post catheter insertion) for each insertion technique. The highest percentage of early peritonitis episodes for a technique was 5.4% for percutaneous catheter insertions which was at the level of the audit standard (5%) (figure 8.22). The majority of patients underwent open surgical PD catheter insertion.

Catheter failure by 3 months was most common amongst patients with percutaneous catheters, 31 failures of 202 inserted (15.3%). The other insertion techniques reported on were open surgery, 33 failures of 380 inserted (8.7%); laparoscopic, 8 failures of 111 inserted (7.2%); and peritoneoscopic, 2 failures of 33 inserted (6.1%) (figure 8.23). A log-rank test found some evidence ($p = 0.039$) of a difference between the catheter survival distributions for the four insertion techniques.

Conclusions

This is the first multisite PD catheter audit in the UK. It highlights a number of important points including:

- Peritoneal dialysis is less likely to be used compared with haemodialysis for those from geographical areas with higher deprivation scores.
- There was wide variation between centres of PD catheter use for late presenting patients (known to centres for less than 90 days).
- The percutaneous PD catheter insertion technique was more commonly used than the open surgical technique for late presenting patients.
- Overall, patients are more likely to get a PD catheter if they had been known to the service for more than 1 year.

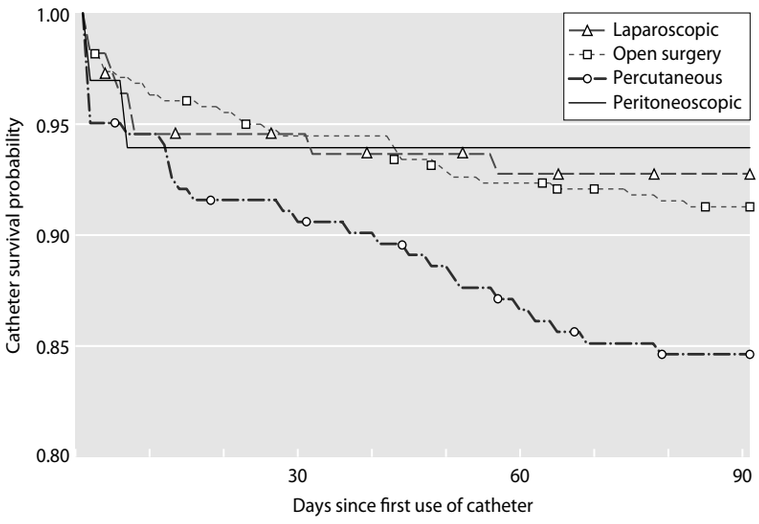

Fig. 8.23. Catheter survival by insertion technique

- The percutaneous insertion technique was associated with a higher early (less than 2 week) peritonitis rate and more catheter flow problems.
- Patients with diabetes did not have an increased complication rate following PD catheter insertion.

Recommendations

1. The prospective collection of information relating to dialysis is central to understanding quality of care in this area and should be supported to continue and develop.
2. Centres need clear systems to report PD catheter access to the UK Renal Registry. At present too few of the Electronic Patient Record systems in use in renal centres lend themselves to the easy capture of this data. Clinical Directors need to discuss the support of these and related tools to allow national audit more seamlessly than currently happens.
3. Attention should be given to the pathway of catheter placement. The evidence from this audit that patients are more likely to get onto PD if known more than 1 year to the service indicates that the processes around PD initiation are too slow at most centres and represent a missed opportunity. However some centres have demonstrated that with the appropriate structures, this process can be speeded up and late presenting dialysis patients can be started on PD. Many of the patients who do not get PD catheters end up with tunnelled or non-tunnelled haemodialysis lines with which there is evidence of poorer outcomes [10].
4. Centres should employ quality assurance measures to ensure that the success of PD catheter placement is monitored locally [11].

Acknowledgements

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Conflicts of interest: none

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UK Renal Registry 15th Annual Report: Chapter 9 Centre Variation in Access to Renal Transplantation in the UK (2006–2008)

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Key Words

Centre variation · Comorbidity · Donor after brainstem death · Donor after cardiac death · Equity of access · Living kidney donor · Outcomes · Patient factors · Quality improvement · Renal transplantation · Transplant waiting list

Summary

- A patient starting dialysis in a non-transplanting renal centre was less likely to be registered for transplantation (OR (odds ratio) 0.80, 95% CI 0.74–0.87) compared with a patient treated in a transplanting renal centre.
- A patient starting dialysis in a non-transplanting renal centre was less likely to receive a transplant from a donor after cardiac death or a living kidney donor (OR 0.69, 95% CI 0.61–0.77) compared with a patient treated in a transplanting renal centre.
- Once registered for kidney transplantation, patients in both transplanting and non-transplanting renal centres had an equal chance of receiving a transplant from a donor after brainstem death (OR 0.92, 95% CI 0.79 to 1.08).
- After adjustment for case mix, this analysis identified significant centre differences for the probability of being activated on the kidney transplant waiting list ($p < 0.0001$) and the probability of receiving a renal transplant from a donor after brainstem death ($p = 0.015$) or a donor after cardiac death/living kidney donor ($p < 0.0001$).

Introduction

In an era where demand is increasingly outstripping supply, ensuring equity in access and allocation of a scarce resource that is a renal transplant poses many ethical and pragmatic dilemmas. For 'suitable' patients with established renal failure, renal transplantation confers both better quality of life and life expectancy than dialysis [1–3] and is the preferred modality of renal replacement therapy. Defining 'suitable' is a complex concept for which a series of national and international guidelines exist but most such guidelines do not have a robust evidence base for their recommendations. Therefore the fitness for transplantation assessment process ultimately revolves around conducting an individualised assessment of the risks of transplantation as well as the likely benefit. Centre practices and policies play an integral role in influencing this, although other patient specific factors are also known to influence access including age, gender, ethnicity, comorbidity and social deprivation [4–9].

In addition to influencing access to transplantation, centre practices and policies may also influence the likelihood of a patient receiving a living kidney donor or donor after cardiac death particularly during the time period this study covers, when the retrieving centre had the major influence on the distribution of such organs. Once a patient was on the waiting list, the probability of receiving a transplant from a donor after brainstem death however, was predominantly under the influence of the national organ allocation algorithm.

Achieving prompt and timely activation on the waiting list is important not least because increasing length of time on dialysis adversely affects graft and patient survival, but also because the current organ allocation algorithm introduced in April 2006 takes time spent on the waiting list into account when allocating deceased donor kidneys in the UK [10]. Thus, centres that achieve earlier listing for transplantation provide an advantage for their patients compared with centres that take longer.

This analysis aims to evaluate whether equity of access to the renal transplant list exists for patients with end stage renal disease across the UK, whether centres differ in the time taken to activate suitable patients on the waiting list and whether equity exists in the receipt of a renal transplant once the patient is on the transplant list (that is, the conversion efficiency from being on the waiting list to receiving a transplant). Patient specific and independent variables that influenced access to the waiting list or transplantation were analysed.

Methods

Study population

All adult patients starting renal replacement therapy (n = 19,780) between 1st January 2006 and 31st December 2008 in renal centres (n = 72) returning data to the UK Renal Registry (UKRR) were considered for inclusion. For the analysis of the proportion of a centre's patients included on the waiting list, patients aged 65 years or above (n = 9,636), patients with inappropriate activation and early suspension as described below (n = 146) and patients listed for multi-organ transplants other than pancreas (n = 37) were excluded, resulting in a final cohort of 9,961 patients. These patients were followed to 31st December 2010 or until they were put on the waiting list for kidney transplant alone, kidney plus pancreas transplant, or death, whichever was earliest. For the analysis of the proportion transplanted, all patients from the incident cohort who were activated on the waiting list before 31st December 2009 (n = 5,755) were followed until 31st December 2011, to estimate the proportion transplanted with a kidney alone or kidney plus pancreas within two years of inclusion on the waiting list.

Exclusions

Patients listed for multi-organ transplants other than pancreas were excluded as were those who were suspended for more than 30 days within 90 days of first activation. The latter avoided any potential bias from centres that may activate patients on the transplant list and then immediately suspend them before more permanent activation at a later date after more formal medical assessment of the patient's fitness.

Data analysed

Information on start date of renal replacement therapy and relevant patient level data including age (grouped as 18–29, 30–39, 40–49, 50–59, 60–64), gender, ethnicity (white, non-White, missing) and PRD (primary renal diagnosis classified as: patient with diabetes, patient without diabetes, missing) came from the UKRR. The date of activation on the kidney transplant waiting list, date of transplantation, or both came from the UK Transplant Registry held by the Organ Donation and Transplantation Directorate of NHS Blood and Transplant.

Statistical methods

A logistic regression model was developed to identify the influence of patient specific variables including age, gender, ethnicity and primary renal diagnosis, on the probability of access to the transplant list and receipt of a transplant once on the waiting list. After adjusting for patient specific variables, the percentage of patients activated on the transplant list and the percentage of patients on the waiting list who achieved a transplant in each centre were determined. The overall effect of the centre associated with each analysis was assessed by including renal centre as a random effect in the risk-adjusted logistic regression model. The extent of variation between centres was determined by using a log likelihood ratio test that provided the change in the value of −2 LogL on inclusion of the random centre effect. SAS 9.3 was used for analyses; a p value of less than 5% was considered significant.

To analyse access to the transplant list, the proportion of incident patients with end stage renal disease in each centre

who were subsequently activated on the waiting list within two years of starting renal replacement therapy was identified. All patients who achieved live donor transplantation without prior activation on the national transplant waiting list were assumed to have been activated for the purposes of this analysis. Time to activation on the waiting list was defined as the interval between the start of RRT and the date of activation on the waiting list. Patients achieving pre-emptive deceased donor transplantation were considered to have been activated on the same day as starting RRT i.e. a time to activation of 0 days. Patients achieving pre-emptive live donor transplantation without prior activation on the national transplant list were considered to have been 'active' on the list for an arbitrary time of six months. This was to take into account an average of six months required by most centres to complete live donor fitness evaluation and hence the likelihood that the intended recipient was considered fit for transplantation (and by inference suitable to be active on the waiting list) for that duration. This was done to account for different centre practices with regard to listing patients on the deceased donor list prior to receiving a living donor transplant.

The median time to activation was estimated from the Kaplan-Meier plot for patients at each renal centre, with the event as the date of activation and censoring at death or on 31st December 2010, whichever was earlier. Data from patients who did not achieve activation were included in the calculation of median times using this method, thus providing a meaningful estimate of the true time to activation. Including only those patients activated would produce a biased estimate. The overall centre effect associated with time to activation was calculated by including renal centre as a variable in a risk- adjusted Cox regression model.

To analyse the differences between centres in achieving a renal transplant, the percentage of patients activated on the waiting list who received a renal transplant within two years of being activated was estimated (conversion efficiency). The conversion efficiency for receiving a transplant from a donor after brainstem death or a donor after cardiac death/living kidney donor were analysed separately. Receipt of a kidney from a donor after brainstem death was predominantly influenced by national allocation policy, whereas receipt from a donor after cardiac death/live donor kidney was much more dependent on local transplant centre practices. For the cohort under consideration, donor after cardiac death transplantation was predominantly a locally managed service.

Funnel plots are used to present the results for each outcome of interest, providing a visual comparison of each centre's performance compared with its peers. Where relevant, the funnel plots are adjusted for patient specific variables influencing that outcome. The solid black straight line in each funnel plot shows the overall average together with the 95% and 99.8% confidence intervals, which correspond to two and three standard deviations from the mean. Each point on the plot represents one renal centre. With 72 centres included, for each outcome of interest, three centres would be predicted to fall between the 95% and 99.8% confidence intervals and no centre should fall outside the 99.8% confidence interval. Centres ($n = 3$) with fewer than 10 patients activated on the waiting list are not included in the funnel plots.

The analysis methodology described above is identical to a previous independent peer reviewed publication [11].

Results

The results of the logistic regression model analysis of patient characteristics influencing access to the waiting list are presented in table 9.1. Ethnicity data were missing for 17.1% of patients and PRD for 5.3% of patients.

Tables 9.2 and 9.3 show the results of the logistic regression analysis of factors influencing the likelihood of receiving a transplant from a donor after brainstem death and the analysis of factors influencing receipt of a transplant from a donor after cardiac death or a

Table 9.1. Patient factors influencing activation on the national kidney transplant waiting list within two years of RRT start

Factor	Category (at baseline)	Patients N (%)	Odds ratio	95% CI	P value
Age	(18–29)	898 (9.0)	1.00	ref	n/a
	30–39	1,442 (14.5)	0.78	0.63–0.96	0.02
	40–49	2,378 (23.9)	0.51	0.42–0.62	<0.0001
	50–59	3,171 (31.8)	0.26	0.21–0.31	<0.0001
	60–64	2,072 (20.8)	0.13	0.11–0.16	<0.0001
Ethnicity	(White)	6,301 (63.3)	1.00	ref	n/a
	Non-White	1,956 (19.6)	0.90	0.80–1.01	0.06
	Missing	1,704 (17.1)	0.54	0.48–0.61	<0.0001
Gender	(Male)	6,057 (60.8)	1.00	ref	n/a
	Female	3,904 (39.2)	0.92	0.84–1.00	0.05
PRD	(Non-diabetic)	7,096 (71.2)	1.00	ref	n/a
	Diabetic	2,335 (23.4)	0.43	0.39–0.48	<0.0001
	Missing	530 (5.3)	0.65	0.54–0.79	<0.0001

ref – reference category, n/a – not applicable

Table 9.2. Patient factors affecting the probability of receiving a transplant from a donor after brainstem death within two years of registration on the national kidney transplant waiting list

Factor	Category (at baseline)	Patients N (%)	Odds ratio	95% CI	P value
Age	(18–29)	731 (12.7)	1.00	ref	n/a
	30–39	1,089 (18.9)	1.20	0.94–1.53	0.14
	40–49	1,603 (27.9)	0.76	0.60–0.96	0.02
	50–59	1,599 (27.8)	0.35	0.27–0.45	<0.0001
	60–64	733 (12.7)	0.17	0.12–0.25	<0.0001
Ethnicity	(White)	3,829 (66.5)	1.00	ref	n/a
	Non-White	1,145 (19.9)	0.50	0.41–0.63	<0.0001
	Missing	781 (13.6)	0.84	0.67–1.06	0.14
Gender	(Male)	3,528 (61.3)	1.00	ref	n/a
	Female	2,227 (38.7)	0.93	0.80–1.09	0.38
PRD	(Non-diabetic)	4,501 (78.2)	1.00	ref	n/a
	Diabetic	971 (16.9)	5.03	4.24–5.96	<0.0001
	Missing	283 (4.9)	1.17	0.81–1.69	0.4

ref – reference category, n/a – not applicable

living kidney donor. Ethnicity data were missing for 13.6% of patients and PRD for 4.9% of patients.

A patient starting dialysis in a non-transplanting renal centre was less likely to be registered for transplantation (OR 0.80, 95% CI 0.74–0.87) or receive a transplant from a donor after cardiac death or a living kidney donor (OR 0.69, 95% CI 0.61–0.77) compared with patients managed in transplanting renal centres. Once registered for kidney transplantation, patients in both transplanting and non-transplanting renal centres had an equal chance of receiving a transplant from a donor after brainstem death (OR 0.92, 95% CI 0.79–1.08).

After adjusting for patient specific variables that were shown to influence outcome (age, ethnicity, gender, PRD), significant centre effects were identified for the probability of being activated on the waiting list (figure 9.1 and table 9.4) (change in $-2\,\mathrm{LogL} = 264.4$, df (degrees of freedom) $= 1$, $p < 0.0001$).

Table 9.3. Patient factors affecting the probability of receiving a transplant from a donor after cardiac death or living kidney donor within two years of registration on the national kidney transplant waiting list

Factor	Category (at baseline)	Patients N (%)	Odds ratio	95% CI	P value
Age	(18–29)	731 (12.7)	1.00	ref	n/a
	30–39	1,089 (18.9)	0.63	0.52–0.77	<0.0001
	40–49	1,603 (27.9)	0.59	0.49–0.71	<0.0001
	50–59	1,599 (27.8)	0.40	0.34–0.49	<0.0001
	60–64	733 (12.7)	0.41	0.33–0.52	<0.0001
Ethnicity	(White)	3,829 (66.5)	1.00	ref	n/a
	Non-White	1,145 (19.9)	0.48	0.41–0.56	<0.0001
	Missing	781 (13.6)	0.63	0.53–0.75	<0.0001
Gender	(Male)	3,528 (61.3)	1.00	ref	n/a
	Female	2,227 (38.7)	0.91	0.81–1.02	0.11
PRD	(Non-diabetic)	4,501 (78.2)	1.00	ref	n/a
	Diabetic	971 (16.9)	0.33	0.28–0.40	<0.0001
	Missing	283 (4.9)	1.09	0.85–1.40	0.5

ref – reference category, n/a – not applicable

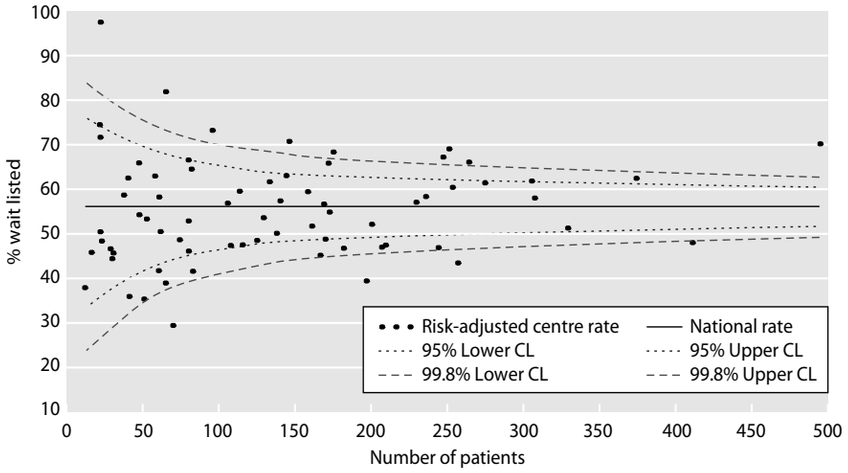

Fig. 9.1. The percentage of patients wait listed for a kidney transplant by renal centre, prior to or within two years of starting dialysis (centres with <10 patients excluded)

Table 9.4. The percentage of patients wait listed for a kidney transplant by renal centre, prior to or within two years of starting dialysis

	RRT	Registrations	% wait listed			RRT	Registrations	% wait listed	
Centre	N	N	Unadjusted	Risk-adjusted	Centre	N	N	Unadjusted	Risk-adjusted
Abrdn	88	51	58.0	71.1	L Barts	411	200	48.7	48.2
Airdrie	80	39	48.8	53.0	L Guys	307	193	62.9	61.8
Antrim	30	12	40.0	44.2	L Kings	208	100	48.1	46.9
B Heart	138	70	50.7	50.2	L Rfree	308	187	60.7	58.2
B QEH	330	176	53.3	51.1	L St.G	106	63	59.4	56.8
Bangor	41	14	34.1	36.1	L West	496	348	70.2	70.3
Basldn	61	26	42.6	41.4	Leeds	237	144	60.8	58.3
Belfast	129	73	56.6	53.7	Leic	375	244	65.1	62.6
Bradfd	115	56	48.7	47.4	Liv Ain	51	16	31.4	34.3
Brightn	144	88	61.1	63.0	Liv RI	201	110	54.7	52.3
Bristol	254	157	61.8	60.6	M RI	169	101	59.8	56.6
Camb	197	84	42.6	39.6	Middlbr	134	86	64.2	62.1
Cardff	276	171	62.0	61.7	Newc	173	98	56.6	55.1
Carlis	40	27	67.5	62.6	Newry	22	11	50.0	50.6
Carsh	258	110	42.6	43.2	Norwch	125	58	46.4	48.5
Chelms	53	26	49.1	53.2	Nottm	183	88	48.1	46.8
Clwyd	23	9	39.1	48.1	Oxford	247	171	69.2	67.3
Colchr	22	12	54.5	71.8	Plymth	95	69	72.6	73.5
Covnt	170	86	50.6	48.6	Ports	252	181	71.8	69.0
D & Gall	22	16	72.7	97.7	Prestn	210	100	47.6	47.5
Derby	113	65	57.5	59.5	Redng	147	108	73.5	70.7
Derry	12	4	33.3	38.0	Salford	230	137	59.6	56.9
Donc	22	16	72.7	74.7	Sheff	245	118	48.2	46.8
Dorset	80	55	68.8	66.5	Shrew	83	36	43.4	41.4
Dudley	70	21	30.0	29.4	Stevng	167	76	45.5	43.9
Dundee	61	29	47.5	58.3	Sthend	58	34	58.6	63.1
Dunfn	48	26	54.2	65.9	Stoke	75	37	49.3	48.6
Edinb	172	95	55.2	65.9	Sund	79	38	48.1	46.0
Exeter	141	77	54.6	57.3	Swanse	161	82	50.9	51.8
Glasgw	265	147	55.5	65.7	Truro	65	46	70.8	81.9
Glouc	82	52	63.4	64.7	Tyrone	29	15	51.7	46.8
Hull	175	99	56.6	68.4	Ulster	16	6	37.5	45.9
Inverns	37	19	51.4	58.8	Wirral	77	32	41.6	39.5
Ipswi	61	33	54.1	50.4	Wolve	108	52	48.1	47.4
Kent	158	99	62.7	59.5	Wrexm	30	16	53.3	45.8
Klmarnk	65	19	29.2	38.9	York	48	28	58.3	54.2

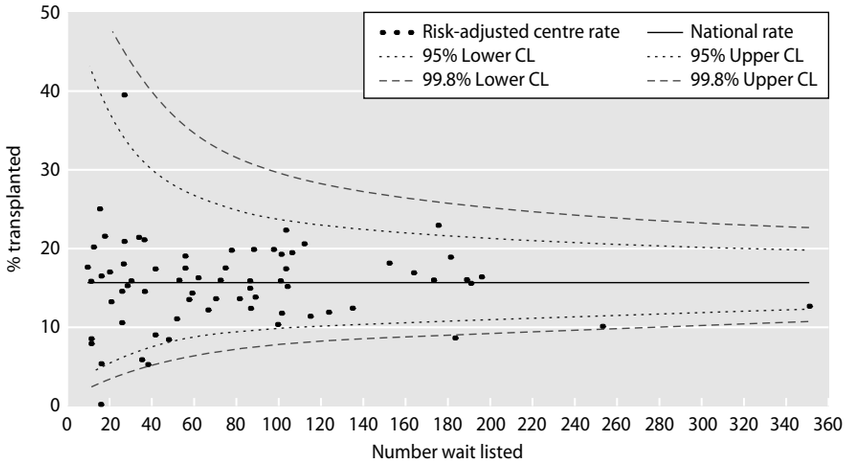

Fig. 9.2. The percentage of patients receiving a transplant from a donor after brainstem death by renal centre, within two years of transplant waiting list registration (centres with <10 patients excluded)

After adjustment for patient variables, significant centre differences were seen in the probability of receiving a renal transplant from a donor after brainstem death (figure 9.2 and table 9.5) (change in $-2\,\text{LogL} = 6.0$, $\text{df} = 1$, $p = 0.015$) or a donor after cardiac death/living kidney donor (figure 9.3 and table 9.5) (change in $-2\,\text{LogL} = 172.9$, $\text{df} = 1$, $p < 0.0001$). As shown, several centres fall outside the 95% and 99.8% confidence intervals.

Figure 9.4 and table 9.6 show the unadjusted median time taken to activate patients on the transplant list for each renal centre.

The funnel plot is based on the assumption of an exponential distribution for time to activation. Although this assumption is broadly consistent with the data, the model based estimate of the national median was greater than that observed. This leads to an unusually large number of centres falling outside the lower 99.8% confidence limit for this national rate and perhaps too few occurring outside the upper limit. However, the plot highlights those centres that have significantly longer time to activation but small numbers of patients on the waiting list. The Cox model giving a risk-adjusted analysis of time to activation identified a significant effect of centre variation (change in $-2\,\text{LogL} = 458.0$, $\text{df} = 71$, $p < 0.0001$). In general, centres with the longest unadjusted waiting times also had the longest risk-adjusted waiting times. The four centres lying outside the upper 99.8% confidence limit all had hazard ratios that indicated a significant delay in the chance of wait listing compared with a baseline centre that had a median time comparable to the national median.

Discussion

Patient level factors affecting access

The observation that increasing age was seen to be negatively associated with access to transplantation was not unexpected as the risk-benefit ratio of receiving a renal transplant alters with age. Increased comorbidity burden in older patients may require more intensive time consuming investigations prior to listing and may also deem them unsuitable in some cases. Interestingly, whilst previous reports [12] have cited female gender to be associated with a reduced likelihood to receive a kidney after brainstem death, this was not noted in this study.

Ethnicity has sometimes been cited as being a cause of inequity in accessing transplantation, although it was reassuring to see that in this study it was not seen to impact a patients' probability of being listed (consistent with earlier work undertaken by Udayaraj and colleagues) [13]. It was however seen to be negatively associated with receiving a kidney once listed from a living kidney donor, donor after brainstem death or donor after cardiac death. A likely cause for this may be the widely acknowledged lack of donors from ethnic minorities contributing to the donor pool, as well as the importance given to HLA matching in the national allocation protocol which may have favoured a predominantly white donor pool being matched with white recipients. Although the allocation protocol changed in April 2006 (during the study period) the lack of an observed impact may be due to the fact that all patients in this study irrespective of ethnicity were likely to have been on the waiting list for a similar duration of time,

Table 9.5. The percentage of patients receiving a transplant, by donor type and renal centre, within two years of transplant waiting list registration

		Organ from donor after brainstem death			Organ from living kidney donor/donor after cardiac death		
			Transplant rate (%)			Transplant rate (%)	
Centre	Listed N	Transplanted N	Unadjusted	Risk-adjusted	Transplanted N	Unadjusted	Risk-adjusted
Abrdn	52	5	9.6	10.9	6	11.5	13.6
Airdrie	42	11	26.2	17.3	7	16.7	16.9
Antrim	12	1	8.3	7.9	1	8.3	8.0
B Heart	73	10	13.7	15.7	16	21.9	23.9
B QEH	184	14	7.6	8.5	50	27.2	28.7
Bangor	13	4	30.8	20.0	2	15.4	13.4
Basldn	27	6	22.2	18.0	12	44.4	40.1
Belfast	75	13	17.3	17.4	14	18.7	15.6
Bradfd	56	9	16.1	17.4	15	26.8	26.5
Brightn	89	14	15.7	13.8	35	39.3	37.5
Bristol	164	29	17.7	16.7	59	36.0	34.5
Camb	87	14	16.1	15.6	46	52.9	48.0
Cardff	174	32	18.4	15.8	64	36.8	35.1
Carlis	27	9	33.3	39.4	9	33.3	28.6
Carsh	115	12	10.4	11.2	37	32.2	32.9
Chelms	26	2	7.7	10.4	8	30.8	28.9
Clwyd	10	2	20.0	17.4	3	30.0	27.9
Colchr	12	1	8.3	8.5	6	50.0	54.7
Covnt	87	13	14.9	14.9	40	46.0	42.6
D & Gall	16	2	12.5	16.3	7	43.8	54.2
Derby	67	8	11.9	12.1	6	9.0	8.9
Derry	4	1	25.0	47.3	0	0.0	0.0
Donc	16	1	6.3	5.0	1	6.3	6.0
Dorset	56	12	21.4	18.9	13	23.2	22.5
Dudley	26	4	15.4	14.6	3	11.5	10.5
Dundee	30	4	13.3	15.8	8	26.7	31.6
Dunfn	28	5	17.9	15.3	1	3.6	4.5
Edinb	98	18	18.4	19.7	34	34.7	40.1
Exeter	78	16	20.5	19.6	36	46.2	42.9
Glasgw	153	26	17.0	17.8	41	26.8	30.5
Glouc	53	8	15.1	15.7	11	20.8	19.6
Hull	101	15	14.9	15.7	32	31.7	33.6
Inverns	20	4	20.0	16.9	3	15.0	17.3
Ipswi	34	7	20.6	21.3	15	44.1	38.1
Kent	100	10	10.0	10.2	44	44.0	39.8
Klmarnk	21	3	14.3	13.2	3	14.3	17.6
L Barts	197	27	13.7	16.2	72	36.5	41.4
L Guys	192	33	17.2	15.5	105	54.7	58.5
L Kings	102	10	9.8	11.6	23	22.5	25.5
L Rfree	190	26	13.7	16.0	59	31.1	32.1
L St.G	62	8	12.9	16.2	34	54.8	53.5
L West	351	37	10.5	12.6	156	44.4	54.7
Leeds	153	25	16.3	18.0	64	41.8	39.6
Leic	254	23	9.1	9.9	88	34.6	33.8
Liv Ain	15	3	20.0	24.9	4	26.7	24.5
Liv RI	113	24	21.2	20.4	40	35.4	32.2
M RI	104	25	24.0	22.2	28	26.9	26.1
Middlbr	88	21	23.9	19.8	35	39.8	39.5
Newc	102	21	20.6	19.1	44	43.1	41.2
Newry	12	2	16.7	15.6	0	0.0	0.0
Norwch	59	9	15.3	14.1	21	35.6	34.1

Table 9.5. Continued

		Organ from donor after brainstem death			Organ from living kidney donor/donor after cardiac death		
			Transplant rate (%)			Transplant rate (%)	
Centre	Listed N	Transplanted N	Unadjusted	Risk-adjusted	Transplanted N	Unadjusted	Risk-adjusted
Nottm	104	20	19.2	17.4	29	27.9	26.8
Oxford	176	50	28.4	22.8	52	29.5	30.1
Plymth	71	9	12.7	13.5	41	57.7	53.9
Ports	182	38	20.9	18.8	59	32.4	31.5
Prestn	105	14	13.3	15.1	30	28.6	26.7
Redng	107	21	19.6	19.3	38	35.5	37.2
Salford	135	15	11.1	12.3	38	28.1	26.2
Sheff	124	14	11.3	11.9	43	34.7	30.8
Shrew	38	2	5.3	5.1	11	28.9	25.0
Stevng	87	12	13.8	12.3	32	36.8	36.7
Sthend	36	9	25.0	21.1	6	16.7	18.1
Stoke	36	2	5.6	5.6	13	36.1	31.5
Sund	42	4	9.5	8.8	19	45.2	41.2
Swanse	82	12	14.6	13.4	25	30.5	29.4
Truro	48	4	8.3	8.3	30	62.5	65.2
Tyrone	16	0	0.0	0.0	1	6.3	5.6
Ulster	6	0	0.0	0.0	0	0.0	0.0
Wirral	37	5	13.5	14.3	11	29.7	25.5
Wolve	58	8	13.8	13.3	20	34.5	34.0
Wrexm	18	6	33.3	21.4	6	33.3	29.9
York	27	7	25.9	20.7	5	18.5	16.5

whereas the new allocation policy would primarily have improved access for those listed well before 2006 (not included in this study).

Diabetes was also seen to affect wait listing adversely although this is not surprising as many would be subject to additional diabetic complications and increased cardiovascular risk that would need to be managed. The higher proportion of patients with diabetes receiving a transplant corresponds to an increase in the number of simultaneous kidney-pancreas transplants during the study period, as the allocation algorithm prioritised dual organ recipients.

When interpreting the analyses in this chapter it is important to consider the potential impact of missing data on the results. Missing data occurs as a result of either a renal centre failing to complete relevant fields

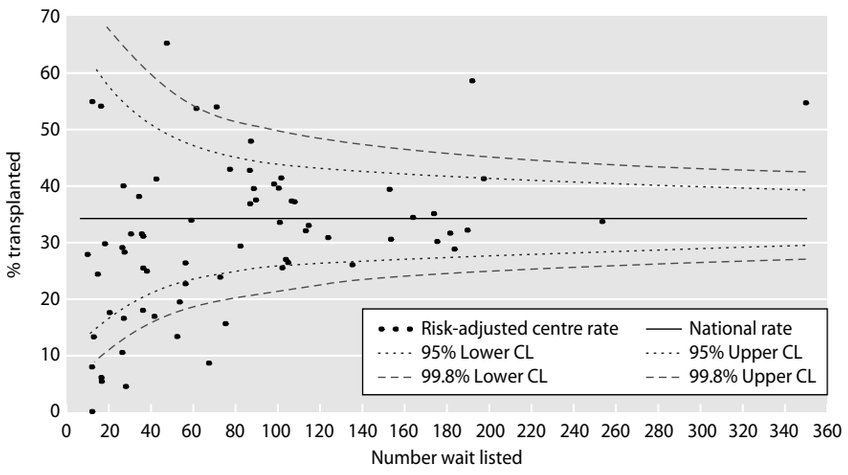

Fig. 9.3. The percentage of patients receiving a transplant from a living kidney donor/donor after cardiac death by renal centre, within two years of transplant waiting list registration (centres with <10 patients excluded)

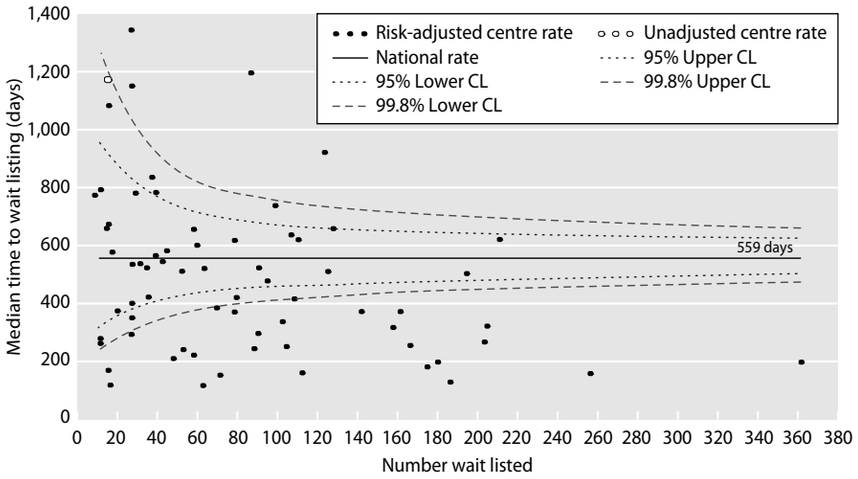

Fig. 9.4. Median time to wait listing for a kidney transplant, by renal centre (centres with <10 patients excluded)
The centre represented by an unfilled symbol has its final event time as the plotting position as the median time could not be estimated

Table 9.6. Median time to wait listing for a kidney transplant, by renal centre (censoring at the earliest of death or 31st December 2010)

Centre	RRT N	Registrations N	Median time to listing (days)	Centre	RRT N	Registrations N	Median time to listing (days)
Abrdn	88	53	511	L Barts	411	212	623
Airdrie	80	45	580	L Guys	307	204	269
Antrim	30	13	794	L Kings	208	108	635
B Heart	138	79	620	L Rfree	308	205	322
B QEH	330	195	501	L St.G	106	64	120
Bangor	41	16	1089	L West	496	362	202
Basldn	61	30	786	Leeds	237	159	320
Belfast	129	79	369	Leic	375	257	153
Bradfd	115	60	603	Liv Ain	51	17	***1181****
Brightn	144	91	296	Liv RI	201	126	512
Bristol	254	167	255	M RI	169	109	418
Camb	197	88	1197	Middlbr	134	89	245
Cardff	276	176	180	Newc	173	103	341
Carlis	40	27	293	Newry	22	12	262
Carsh	258	124	926	Norwch	125	64	526
Chelms	53	28	534	Nottm	183	111	623
Clwyd	23	10	778	Oxford	247	181	197
Colchr	22	12	280	Plymth	95	72	156
Covnt	170	95	482	Ports	252	187	129
D & Gall	22	16	174	Prestn	210	111	622
Derby	113	70	384	Redng	147	113	159
Derry	12	5	881	Salford	230	142	376
Donc	22	17	120	Sheff	245	129	663
Dorset	80	59	223	Shrew	83	40	786
Dudley	70	28	1155	Stevng	167	99	742
Dundee	61	32	540	Sthend	58	36	420
Dunfn	48	28	356	Stoke	75	40	567
Edinb	172	102	338	Sund	79	43	549
Exeter	141	80	419	Swanse	161	91	523
Glasgw	265	162	373	Truro	65	49	213
Glouc	82	54	242	Tyrone	29	16	667
Hull	175	104	333	Ulster	16	7	786
Inverns	37	21	371	Wirral	77	39	838
Ipswi	61	35	519	Wolve	108	59	656
Kent	158	105	252	Wrexm	30	18	579
Klmarnk	65	28	1347	York	48	28	400

* Results in ***bold italics*** are final event times as median times could not be estimated

on their renal IT system or a failure to extract this data. Missing data may not be at random; sicker patients may die more quickly, allowing inadequate time for their physician to enter relevant comorbidity data. The very process of working up and listing a patient makes it less likely that data will be missing. It is therefore perhaps not surprising that patients activated on the national kidney transplant waiting list are more likely to have ethnicity and PRD data reported ($p < 0.0001$) (table 9.1).

Centre variation

The analyses performed within this report highlight significant centre effect in relation to the proportion of patients wait listed with nearly 20% of centres lying outside the lower 95% confidence interval, and three centres outside the lower 99.8% confidence interval, despite adjusting for a range of patient characteristics. Inter-centre differences are also noted in access to transplants from donors after cardiac death/living kidney donors with nine centres lying outside the lower 99.8% confidence interval.

Whilst both these outcomes are subject to individual centre practices and policies (which thus could be deemed a cause of the observed variation), one needs to interpret these results with caution as this study is limited by the lack comprehensive comorbidity data on all patients. Centres with higher prevalence rates of comorbidities would be expected to list proportionally fewer patients to reflect the fact that fewer patients are fit for transplantation. Additionally, it may take longer to activate patients in these centres due to the need for more intensive investigation and medical optimisation prior to transplantation. Indeed lack of comorbidity data limits definitive adjustment for case mix. Other patient level factors which this study too fails to adjust for include social deprivation which has been associated with reduced access to transplantation of a range of organs, as well as the impact of primary renal diagnoses (other than diabetes), health literacy and HLA sensitisation. Also, this study has not analysed the interplay between factors such as social deprivation and ethnicity and whether the observed differences based on ethnicity are likely to persist after adjustment for social deprivation and varying comorbidity burden in different ethnic groups. In essence, the available dataset does not permit definitive adjustment for case mix.

The observation that a patient starting dialysis in a non-transplanting renal centre was less likely to be registered for transplantation or receive a transplant from a donor after cardiac death (or a living kidney donor) compared with patients managed in transplanting renal centres, is interesting as this raises the question of whether patients are being disadvantaged by their address, and if indeed a 'post-code lottery' does exist. Drawing conclusions on this having not fully adjusted for the aforementioned potential confounders is again difficult, although it does add weight to the argument to conduct a more detailed study. Once registered for kidney transplantation, patients in both transplanting and non-transplanting renal centres had an equal chance of receiving a transplant from a donor after brainstem death. This is reassuring as organ allocation is subject to the national allocation algorithm which one would expect to allocate organs equitably.

The UKRR is collaborating with other researchers in the National Institute for Health Research (NIHR) funded Access to Transplant and Transplant Outcome Measures (ATTOM) research project to study access to kidney transplantation in greater detail. ATTOM is a non-interventional, prospective, cohort study that aims to recruit all patients aged 18–75 years starting dialysis, receiving a transplant and a similar number of matched patients active on the transplant waiting list, from all dialysis and transplant centres in the UK over a one year period. It is hoped that this study will provide greater insight into the barriers in access to transplantation, and that accurate comprehensive comorbidity data collected as part of this study will allow for more accurate adjustment for case mix for future analyses, and will hopefully more accurately demonstrate whether true inter-centre variation exists. This study will also allow practices identified in the better performing centres to be disseminated to other centres, thereby facilitating equity of access to transplantation across the UK.

Conclusions

This study highlights the persistence of significant centre variation in access to transplantation with respect to the proportion of patients listed and the time taken to activate suitable patients, even after correction for available relevant patient related variables. Significant differences exist between transplanting and non-transplanting centres, with increasing age and diabetes showing a negative association in terms of accessing the transplant wait list. Ethnicity was not seen to affect access to the wait list though did affect the probability of receiving a transplant once listed.

Conflicts of interest: none

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Appendix A: The UK Renal Registry Statement of Purpose

This appendix is available on the web only and can be found at www.renalreg.com

Appendix B: Definitions and Analysis Criteria

This appendix is available on the web only and can be found at www.renalreg.com

Appendix C: Renal Services Described for Non-physicians

This appendix is available on the web only and can be found at www.renalreg.com

Appendix D: Methodology used for Analyses of PCT/HB Incidence and Prevalence Rates and of Standardised Ratios

This appendix is available on the web only and can be found at www.renalreg.com

Appendix E: Methodology for Estimating Catchment Populations of Renal Centres in England for Dialysis Patients

This appendix is available on the web only and can be found at www.renalreg.com

Appendix F: Additional data tables for 2011 incident and prevalent patients

This appendix is available on the web only and can be found at www.renalreg.com

Appendix G: UK Renal Registry Dataset Specification

This appendix is available on the web only and can be found at www.renalreg.com

Appendix H: Coding: Ethnicity, EDTA Primary Renal Diagnoses, EDTA Causes of Death

This appendix is available on the web only and can be found at www.renalreg.com

UK Renal Registry 15th Annual Report: Appendix I Acronyms and Abbreviations used in the Report

ACE (inhibitor)	Angiotensin converting enzyme (inhibitor)
ANZDATA	Australia and New Zealand Dialysis and Transplant Registry
APD	Automated peritoneal dialysis
ADPKD	Autosomal dominant polycystic kidney disease
APKD	Adult polycystic kidney disease
AV	Arteriovenous
AVF	Arteriovenous fistula
AVG	Arteriovenous graft
BAPN	British Association of Paediatric Nephrology
BCG	Bromocresol green
BCP	Bromocresol purple
BMI	Body mass index
BP	Blood pressure
BTS	British Transplant Society
CAB	Clinical Affairs Board (Renal Association)
CABG	Coronary artery bypass grafting
CAPD	Continuous ambulatory peritoneal dialysis
CCL	Clinical Computing Limited
CCPD	Cycling peritoneal dialysis
CHr	Target reticulocyte Hb content
CI	Confidence interval
CK	Creatine kinase
CKD	Chronic kidney disease
CK-MB	Creatine kinase isoenzyme MB
COPD	Chronic obstructive pulmonary disease
CRF	Chronic renal failure
CRP	C-reactive protein
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
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
EDTA	European Dialysis and Transplant Association
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
FEV1	Forced expiratory volume in 1 second
FVC	Forced vital capacity
GFR	Glomerular filtration rate
GN	Glomerulonephritis
HA	Health Authority
Hb	Haemoglobin
HbA1c	Glycated Haemoglobin
HBeAg	Hepatitis B e antigen
HCAI-DCS	Healthcare-associated infection data collection system
HD	Haemodialysis
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
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
IPD	Intermittent peritoneal dialysis
IQR	Inter-quartile range
ISPD	International Society for Peritoneal Dialysis
IT	Information technology
IU	International units
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
M:F	Male:Female
MAP	Mean arterial blood pressure
MDRD	Modification of diet in renal disease
MI	Myocardial infarction
MRSA	Methicillin resistant Staphylococcal aureus
N	Number
NI	Northern Ireland
N Ireland	Northern Ireland
NE	North East
NEQAS	UK National External Quality Assessment Scheme
NHS	National Health Service
NHS BT	National Health Service Blood and Transplant
NI	Northern Ireland
NICE	National Institute for Health and Clinical Excellence
NMO	Non-mixed origin
NSF	National service framework

NTC	Non-tunnelled dialysis catheter
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 of National Statistics
PAS	Patient Administration System
PCT	Primary Care Trust
PD	Peritoneal dialysis
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
RI	Royal Infirmary
RNSF	Renal National Service Framework (or NSF)
RR	Relative risk
RRDSS	Renal Registry data set specification
RRT	Renal replacement therapy
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
SPR	Standardised prevalence ratio (=O/E)
SR	Standardised ratio (used to cover either SAR or SPR)
SUS	Secondary uses service
SW	South West
TC	Tunnelled dialysis catheter
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

UK Renal Registry 15th 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
Haemoglobin	Hct = g/dl × 3.11 (*NB this factor is variable*)
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

UK Renal Registry 15th 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	Addenbrookes Hospital	Camb
Carlisle	Cumberland Infirmary	Carlis
Carshalton	St Helier Hospital	Carsh
Chelmsford	Broomfield Hospital	Chelms
Colchester	Colchester General Hospital	Colchr
Coventry	Walsgrave Hospital	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	Gloucester 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	University Hospital Aintree	Liv Ain
Liverpool	Royal Liverpool University Hospital	Liv RI
London	St Barts and The London Hospital	L Barts
London	St George's Hospital	L St. G
London	Guy's & St Thomas' Hospital	L Guys
London	Hammersmith, Charing Cross, St Marys' and Paddington Hospitals	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	James Cook University Hospital	Middlbr
Newcastle	Freeman Hospital and Royal Victoria Infirmary	Newc

City	Hospital	Abbreviation
Norwich	Norfolk and Norwich University Hospital	Norwch
Nottingham	Nottingham City Hospital	Nottm
Oxford	Oxford Radcliffe 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	University Hospital of North Staffordshire	Stoke
Sunderland	Sunderland Royal Hospital	Sund
Truro	Royal Cornwall Hospital	Truro
Wirral	Arrowe Park Hospital	Wirral
Wolverhampton	New Cross Hospital	Wolve
York	York District General Hospital	York
Wales		
Bangor	Ysbyty Gwynedd	Bangor
Cardiff	University Hospital of Wales	Cardff
Clwyd	Ysbyty Glan Clwyd	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
Dunfermline	Queen Margaret Hospital	Dunfn
Edinburgh	Edinburgh Royal Infirmary	Edinb
Glasgow	Glasgow Western Infirmary, Royal Infirmary and Stobhill Hospitals	Glasgw
Inverness	Raigmore Hospital	Inverns
Kilmarnock	Crosshouse Hospital	Klmarnk
Northern Ireland		
Antrim	Antrim 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 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 Sick Children	Glasg_P	Scotland
Leeds	St James's University Hospital – Paediatric	Leeds_P	England
Liverpool	Royal Liverpool 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	Royal Victoria Infirmary – Paediatric	Newc_P	England
Nottingham	Nottingham City Hospital – Paediatric	Nottm_P	England
Southampton	Southampton General Hospital – Paediatric	Soton_P	England