nephron
Clinical Practice

Nephron 2018;139(suppl1):13–46
DOI: 10.1159/000490959

Published online: July 11, 2018

UK Renal Registry 20th Annual Report: Chapter 1 UK Renal Replacement Therapy Adult Incidence in 2016: National and Centre-specific Analyses

Barnaby Hole[ab], Julie Gilg[a], Anna Casula[a], Shona Methven[c], Clare Castledine[d]

[a]UK Renal Registry, Bristol, UK; [b]The University of Bristol, Bristol, UK; [c]Aberdeen Royal Infirmary, Foresterhill, Aberdeen, UK; [d]Brighton and Sussex Medical School, Brighton, UK

Keywords

Incidence rates · Comorbidity · Diabetes · Dialysis · End stage renal disease · End stage renal failure · Established renal failure · Glomerulonephritis · Haemodialysis · Incidence · Peritoneal dialysis · Registries · Renal replacement therapy · Transplantation · Treatment modality · Acute haemodialysis

Summary

- The incidence rate in the UK decreased from 120 per million population (pmp) in 2015 to 118 pmp in 2016 reflecting renal replacement therapy (RRT) initiation for 7,759 new patients.
- The median age of all incident patients was 64.3 years, but this was highly dependent on ethnicity (66.2 years for White incident patients, 58.7 years for non-White patients).
- Diabetic renal disease remained the single most common cause of renal failure treated by RRT (28.6%).
- By 90 days, 66.6% of patients were on haemodialysis (HD), 19.6% on peritoneal dialysis (PD), 9.3% had a functioning transplant (Tx) and 4.6% had died or stopped treatment.
- The percentage of RRT patients at 90 days who had a functioning transplant varied between centres from 0% to 31% (between 2% and 31% for transplanting centres and between 0% and 19% for non-transplanting centres).
- The mean eGFR at the start of RRT was 7.4 ml/min/1.73 m^2 by the CKD-EPI method and 8.5 ml/min/1.73 m^2 by the MDRD method, similar to the previous five years.
- Late presentation continued to fall from 23.9% in 2006 to 15.6% in 2016.
- Timeline codes indicated that 6,891 first-ever HD sessions were delivered in 2016 across 62 centres in England, Wales and Northern Ireland. Of these, 2,581 (37.5%) were classified as acute HD and the remaining 4,310 (62.5%) as HD for established renal failure (ERF). Data relating to the first HD session were available for 5,373 (78.0%) HD starts.
- After centre exclusions, 4,191 (79.7%) of 5,257 timeline and sessional HD start dates were on the same day and 97.2% were within two weeks of each other. These low levels of discordance are unlikely to meaningfully influence overall survival data for HD recipients.
- Of the 2,581 individuals who received acute HD, 790 (30.6%) developed ERF and 1,791 (69.4%) died, stopped RRT or recovered renal function.

KARGER

Fax +41 61 306 12 34
E-Mail karger@karger.com
www.karger.com/nef

Barnaby Hole
UK Renal Registry, Southmead Hospital, Southmead Road, Bristol, BS10 5NB, UK
Email: renalregistry@renalregistry.nhs.uk

- It is vital that coding is consistent between centres. The UK Renal Registry (UKRR) asks clinicians to use the timeline to record the date of first dialysis and separately, the date on which the patient is deemed to have reached ERF. This allows patients who have an acute start to be distinguished from those whose start on RRT was planned.

Introduction

This chapter contains analyses of UK adults who started renal replacement therapy (RRT) in 2016. The methodology and results for these analyses are in four sections: geographical variations in incidence rates; the demographic and clinical characteristics of patients starting RRT; analyses of late presentation and delayed referral; and analyses of acute haemodialysis sessions. The data were analysed using SAS 9.3.

Definitions

The first three sections of this chapter consider individuals who received RRT as a treatment for established renal failure (ERF). These individuals are considered 'incident to RRT' throughout this report. The term ERF is used synonymously with the terms end stage renal failure/disease (ESRF/ESRD). Since the 19th Annual Report, data have also been published for individuals who received acute haemodialysis (HD), as coded by their reporting centre. Previously, such individuals were only reported if their dialysis was subsequently recoded as being for ERF, when they failed to recover native renal function. Recoding is automatically applied at 90 days for individuals still on RRT, but can also be applied at any point between days 0 and 90 by the reporting centre. Individuals who commenced HD for acute kidney injury (AKI) and subsequently recovered renal function, or died within the first 90 days of treatment without receiving an ERF code are reported in the fourth section of this chapter. These individuals do not feature elsewhere in the UKRR report. Figure 1.1 illustrates the terms used to categorise dialysis as being acute or for ERF. See appendix B: Definitions and Analysis Criteria (www.renalreg.org) for further details. Note that individuals with a failed renal transplant who returned to dialysis are not included.

NHS England now mandates the collection of data regarding acute HD sessions. These data will help to provide a more complete picture of dialysis use in the UK than has ever before been possible. Sessional HD data carry no information about whether the dialysis was for AKI or ERF. Distinguishing between these two indications depends entirely upon the accuracy of timeline data provided by centres.

Differences in incidence data may be seen in the 2011 to 2015 numbers now quoted when compared with previous publications because of retrospective updating of data in collaboration with renal centres. In addition, patients with acute kidney injury requiring dialysis may be coded in the subsequent year as having developed ERF, allowing the UKRR to backdate the start date of RRT.

Where applicable, pre-emptive transplant patients were allocated to their work-up centre, rather than their transplant centre. This was not possible for all patients as some centres did not supply the 'transfer out for pre-emptive transplant' timeline codes. Consequently, some patients remain allocated to their transplanting centre.

UK Renal Registry coverage

The UKRR received individual patient level data from 70 adult renal centres in the UK (five in Wales, five in Northern Ireland, nine in Scotland, 51 in England).

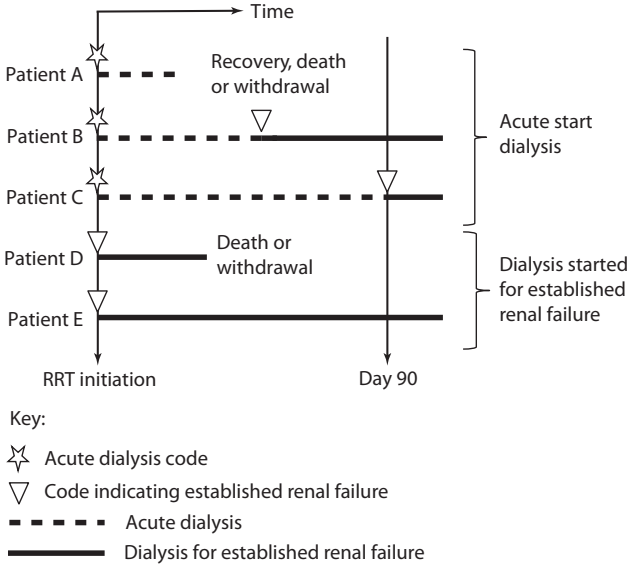

Fig. 1.1. Example histories for patients starting RRT, illustrating the use of timeline codes to define dialysis as being 'acute' or for established renal failure

Patients that follow patterns B–E receive RRT for ERF and are counted as 'incident to RRT' throughout this report. Patients that follow pattern A are not counted as 'incident to RRT' and feature only in section four of this chapter

Cambridge renal centre (Addenbrooke's) was unable to submit 2015 or 2016 data at patient level prior to the UKRR closing the database and only provided summary numbers of patients starting RRT by treatment modality. This centre is therefore excluded from most analyses in this chapter. 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 2016.

Renal Association Guidelines

Table 1.1 lists the relevant items from the Renal Association Guidelines on the Planning, Initiating and Withdrawal of Renal Replacement Therapy [1]. Many of the audit measures are not currently reported by the UKRR; mainly due to a high proportion of incomplete data or because the relevant data are not included in the UKRR dataset. The UKRR is working with the renal community to improve reporting across all of these measures.

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

RA audit measure	Reported	Reason for non-inclusion/comment
Percentage of patients commencing RRT referred <3 months and <12 months before date of starting RRT	Yes	UKRR dataset allows reporting on time elapsed between date first seen and start of RRT
Percentage of incident RRT patients followed up for >3 months in dedicated pre-dialysis or low clearance clinic	No	Not in UKRR dataset
Proportion of incident patients on UK transplant waiting list at RRT initiation	Yes	See chapter 9
Proportion of incident RRT patients transplanted pre-emptively from living donors and cadaveric donors	Yes	
Mean eGFR at time of pre-emptive transplantation	No	Numbers with data were small, the UKRR will consider doing a combined years analysis in future reports
Proportion of incident patients commencing peritoneal or home haemodialysis	Partly	See appendix F for proportion starting on PD and see tables 1.12a and 1.12b for proportion on PD at 90 days. Not reported for home HD due to small numbers
Proportion of patients who have undergone a formal education programme prior to initiation of RRT	No	Not in UKRR dataset
Proportion of haemodialysis patients who report that they have been offered a choice of RRT modality	No	Not in UKRR dataset
Proportion of patients who have initiated dialysis in an unplanned fashion who have undergone formal education by 3 months	No	Not in UKRR dataset
Evidence of formal continuing education programme for patients on dialysis	No	Not in UKRR dataset
Proportion of incident patients known to nephrology services for 3 months or more prior to initiation (planned initiation)	Yes	
Proportion of planned initiations with established access or pre-emptive transplantation	Yes	See appendix F for proportion of incident patients having pre–emptive transplantation, and see chapter 10 for dialysis access
Inpatient/outpatient status of planned initiations	No	Not in UKRR dataset
Mean eGFR at start of renal replacement therapy	Partly	Reported but not at centre level due to poor data completeness

1. Geographical variation in incidence rates

Introduction

Incidence rates vary widely between renal centres. Equity of access to RRT is hard to assess, many variables (including medical, social and demographic factors) influence rates of ERF. Thus, comparisons of crude incidence rates by geographical area are misleading. To enhance comparisons, age and sex standardised rates for each clinical commissioning group/health board (CCG/HBs) are presented along with crude rates. Population ethnicity rates are presented but adjustment for ethnicity or comorbidity was not made due to incomplete data.

Methods

See appendix D: Methodology used for Analyses and appendix E: Methodology for Estimating Catchment Populations (www.renalreg.org) for a detailed description of methods used to calculate crude and age/sex standardised incidence ratios and to estimate catchment populations.

Only one centre (Cambridge) was unable to provide patient-level data. Aggregated data enabled estimation of incident numbers for 2015 and 2016. These estimates are presented in tables 1.2 and 1.4, but do not feature elsewhere in this chapter. The 2011 to 2014 data were used to decide which CCG/HBs should be excluded from the calculation of age and sex standardised rates due to missing patient-level data. Those CCG/HBs where greater than 15% of the incident RRT population from 2011 to 2014 were incident patients of the Cambridge renal centre were not included in the analysis for 2015 or 2016. These CCG/HBs are included for 2011–2014. CCG/HBs where less than 15% of the 2011–2014 data were from Cambridge were included in the analyses, and where the percentage was between 5% and 15% are flagged in table 1.3 as their results are likely to be underestimated.

Results

Overall

In 2016, the number of adult patients starting RRT in the UK was 7,759 equating to an incidence rate of 118 pmp (table 1.2), compared with 120 pmp in 2015. Scotland's rate was notably lower than the rest of the UK (figure 1.2). There continued to be very marked sex differences in incidence rates which were 151 pmp (95% CI 147–155) in males and 86 pmp (95% CI 83–90) in females.

The denominators used for these rates were the entire population i.e. they include under 18-year olds. When incident patients aged under 18 were included in the numerator the UK rate was 120 pmp.

Incidence rates at CCG/HB level

Table 1.3 shows incidence rates and standardised incidence ratios for CCG/HBs. There were wide variations

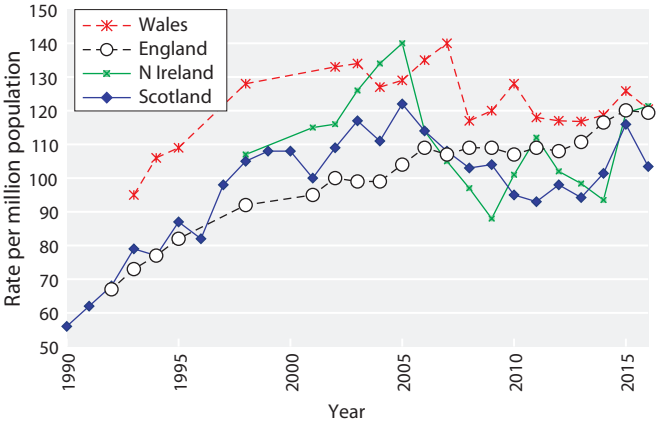

Fig. 1.2. RRT incidence rates in the countries of the UK 1990–2016

Table 1.2. Number of new adult patients starting RRT in the UK in 2016

	England[b]	N Ireland	Scotland[c]	Wales	**UK[b]**
Number starting RRT	6,599	226	559	375	**7,759**
Total estimated population mid-2016 (millions)[a]	55.3	1.9	5.4	3.1	**65.6**
Incidence rate (pmp)	119	121	103	120	**118**
(95% CI)	(117–122)	(106–137)	(95–112)	(108–133)	**(116–121)**

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

[b]Cambridge was unable to submit patient level data for 2015 or 2016 but provided the UKRR with information allowing their incident numbers for 2015 and 2016 to be estimated. These numbers have been used here and in table 1.4 but not elsewhere in this chapter

[c]The number starting RRT, and hence the RRT incidence rate, published in the Scottish Renal Registry report for the same period is slightly higher at 573 (106 pmp). This is explained by their inclusion of under 18 year olds and other differences in the definition of incident RRT patients between the two registries

Table 1.3. Crude adult incidence rates (pmp) and age/sex standardised incidence ratios 2011–2016

CCG/HB – CCG in England, Health and Social Care Areas in Northern Ireland, Local Health Boards in Wales and Health Boards in Scotland
O/E – standardised incidence ratio
LCL – lower 95% confidence limit
UCL – upper 95% confidence limit
pmp – per million population
Areas with notably low incidence ratios over six years are italicised in lighter greyed areas, those with notably high incidence ratios over six years are bold in darker greyed areas – for the full methodology see appendix D
Confidence intervals are not given for the crude rates per million population but figures D1 and D2 in appendix D can be used to determine if a CCG/HB falls within the 95% confidence interval around the national average rate
Mid-2016 population data from the Office for National Statistics, National Records of Scotland and the Northern Ireland Statistics and Research Agency – based on the 2011 census
% non-White – percentage of the CCG/HB population that is non-White, from 2011 census

UK area	CCG/HB	Total population (2016)	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2016 O/E	2016 Crude rate pmp	2011–2016 O/E	2011–2016 LCL	2011–2016 UCL	2011–2016 Crude rate pmp[a]	% non-White
Cheshire, Warrington and Wirral	*NHS Eastern Cheshire*	*196,900*	*0.75*	*0.71*	*0.65*	*0.72*	*0.91*	*0.51*	*71*	*0.71*	*0.59*	*0.85*	*92*	*3.7*
	NHS South Cheshire	179,800	0.74	0.58	1.14	1.07	0.85	0.69	89	0.85	0.70	1.02	103	2.9
	NHS Vale Royal	*103,700*	*0.87*	*0.78*	*1.26*	*0.24*	*0.45*	*0.31*	*39*	*0.64*	*0.48*	*0.85*	*76*	*2.1*
	NHS Warrington	*208,800*	*0.45*	*0.85*	*0.70*	*0.99*	*0.75*	*0.64*	*77*	*0.73*	*0.60*	*0.89*	*83*	*4.1*
	NHS West Cheshire	232,000	1.05	0.86	0.98	0.82	0.78	0.99	129	0.91	0.78	1.07	112	2.8
	NHS Wirral	321,200	0.91	0.63	0.99	0.68	1.08	0.94	121	0.88	0.76	1.00	106	3.0
Durham, Darlington and Tees	NHS Darlington	105,600	0.86	1.29	0.83	0.55	1.13	0.61	76	0.87	0.69	1.11	103	3.8
	NHS Durham Dales, Easington and Sedgefield	274,600	1.12	0.85	1.01	0.93	1.00	0.95	124	0.98	0.85	1.12	120	1.2
	NHS Hartlepool and Stockton-on-Tees	288,500	0.93	1.05	0.87	0.97	0.72	0.73	87	0.87	0.75	1.01	98	4.4
	NHS North Durham	*247,500*	*0.55*	*1.25*	*0.64*	*0.54*	*0.71*	*0.88*	*109*	*0.76*	*0.64*	*0.90*	*89*	*2.5*
	NHS South Tees	275,800	0.96	0.99	1.23	0.81	1.58	0.99	120	1.10	0.96	1.26	124	6.7
Greater Manchester	NHS Bolton	283,100	0.96	0.91	0.92	0.68	1.08	1.15	131	0.95	0.82	1.11	102	18.1
	NHS Bury	188,700	0.72	1.38	0.79	1.17	1.21	1.13	133	1.07	0.90	1.27	118	10.8
	NHS Heywood, Middleton & Rochdale	**216,200**	**1.23**	**1.27**	**1.24**	**1.39**	**1.03**	**1.37**	**153**	**1.25**	**1.08**	**1.46**	**131**	**18.3**
	NHS Manchester	**541,300**	**1.26**	**1.45**	**1.63**	**1.50**	**1.77**	**1.62**	**133**	**1.54**	**1.40**	**1.71**	**119**	**33.5**
	NHS Oldham	232,700	1.04	0.72	0.96	1.28	1.10	1.43	155	1.10	0.94	1.28	112	22.5
	NHS Salford	248,700	0.74	0.87	1.10	0.84	0.84	1.23	129	0.94	0.80	1.11	92	9.9
	NHS Stockport	*290,600*	*0.88*	*0.66*	*0.52*	*0.89*	*0.82*	*1.02*	*127*	*0.80*	*0.69*	*0.94*	*94*	*7.9*
	NHS Tameside and Glossop	256,400	0.98	0.60	1.09	0.82	1.01	1.22	144	0.96	0.82	1.12	107	8.2
	NHS Trafford	234,700	0.50	1.17	1.14	0.84	0.88	1.03	119	0.93	0.79	1.10	101	14.5
	NHS Wigan Borough	323,100	1.01	0.77	0.75	0.92	0.93	1.04	127	0.90	0.79	1.04	104	2.7
Lancashire	NHS Blackburn with Darwen	147,000	1.41	1.25	0.93	0.81	1.62	0.98	102	1.17	0.96	1.42	114	30.8
	NHS Blackpool	139,200	0.90	1.53	1.18	1.17	0.89	0.56	72	1.03	0.85	1.25	123	3.3
	NHS Chorley and South Ribble	174,300	0.95	0.73	1.27	0.86	1.10	0.65	80	0.93	0.77	1.11	108	2.9
	NHS East Lancashire	*375,800*	*0.93*	*0.55*	*0.87*	*1.07*	*0.65*	*0.86*	*104*	*0.82*	*0.72*	*0.94*	*94*	*11.9*
	NHS Fylde & Wyre	*169,000*	*0.55*	*0.77*	*0.79*	*0.96*	*0.87*	*0.84*	*124*	*0.80*	*0.67*	*0.96*	*111*	*2.1*
	NHS Greater Preston	203,500	0.53	1.02	0.85	0.93	1.02	0.69	79	0.84	0.70	1.01	91	14.7
	NHS Morecombe Bay	*348,500*	*0.70*	*0.82*	*0.70*	*0.64*	*0.55*	*0.49*	*66*	*0.64*	*0.55*	*0.75*	*82*	*4.0*
	NHS West Lancashire	113,400	0.85	0.77	0.67	0.63	1.21	0.61	79	0.79	0.62	1.01	97	1.9
Merseyside	NHS Halton	126,900	1.53	0.98	0.95	1.04	1.32	1.00	118	1.14	0.93	1.39	126	2.2
	NHS Knowsley	147,900	1.13	1.32	0.64	1.70	0.87	0.82	95	1.08	0.89	1.30	117	2.8
	NHS Liverpool	484,600	1.11	1.22	1.01	1.20	1.16	0.90	95	1.10	0.98	1.23	109	11.1
	NHS South Sefton	**158,900**	**1.41**	**1.06**	**1.31**	**1.28**	**1.03**	**1.23**	**157**	**1.22**	**1.03**	**1.44**	**146**	**2.2**
	NHS Southport and Formby	115,400	0.95	0.75	1.39	0.81	0.54	0.72	104	0.85	0.68	1.06	116	3.1
	NHS St Helens	178,500	0.76	0.90	0.58	0.96	0.96	0.97	123	0.86	0.71	1.04	103	2.0

Table 1.3. Continued

UK area	CCG/HB	Total population (2016)	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2016		2011–2016				% non-White
								O/E	Crude rate pmp	O/E	LCL	UCL	Crude rate pmp[a]	
Cumbria, Northumberland, Tyne and Wear	*NHS Cumbria North*	*318,200*	*0.65*	*0.44*	*1.01*	*0.88*	*1.04*	*0.89*	*123*	*0.83*	*0.72*	*0.95*	*107*	*1.5*
	NHS Newcastle Gateshead	*498,100*	*0.82*	*0.85*	*0.62*	*0.85*	*1.05*	*0.93*	*102*	*0.86*	*0.76*	*0.97*	*89*	*10.1*
	NHS North Tyneside	*203,300*	*0.67*	*0.89*	*0.95*	*0.65*	*0.78*	*0.98*	*123*	*0.82*	*0.69*	*0.98*	*97*	*3.4*
	NHS Northumberland	*316,000*	*0.82*	*0.76*	*0.62*	*0.94*	*0.63*	*0.86*	*120*	*0.77*	*0.67*	*0.89*	*102*	*1.6*
	NHS South Tyneside	149,400	1.09	0.54	0.76	0.61	0.95	1.43	181	0.90	0.74	1.10	107	4.1
	NHS Sunderland	278,000	0.77	0.89	0.61	0.91	0.99	1.26	155	0.91	0.79	1.06	106	4.1
North Yorkshire and Humber	*NHS East Riding of Yorkshire*	*315,900*	*0.73*	*0.70*	*0.46*	*0.73*	*0.81*	*0.73*	*104*	*0.69*	*0.60*	*0.80*	*94*	*1.9*
	NHS Hambleton, Richmondshire and Whitby	*153,200*	*0.69*	*1.21*	*0.87*	*0.82*	*0.60*	*0.65*	*91*	*0.80*	*0.65*	*0.97*	*106*	*2.7*
	NHS Harrogate and Rural District	156,300	0.97	0.96	0.52	1.07	1.07	1.08	147	0.95	0.79	1.14	122	3.7
	NHS Hull	260,200	0.78	0.78	0.95	1.02	1.33	0.98	104	0.98	0.84	1.15	98	5.9
	NHS North East Lincolnshire	159,100	1.33	0.69	0.83	1.00	1.00	0.56	69	0.90	0.74	1.09	105	2.6
	NHS North Lincolnshire	170,800	1.51	1.14	1.00	0.47	1.00	0.82	105	0.98	0.82	1.17	118	4.0
	NHS Scarborough and Ryedale	*111,400*	*0.57*	*0.92*	*0.69*	*0.78*	*0.62*	*0.82*	*117*	*0.74*	*0.58*	*0.94*	*99*	*2.5*
	NHS Vale of York	*357,900*	*1.08*	*0.92*	*0.77*	*0.82*	*0.63*	*0.90*	*112*	*0.85*	*0.74*	*0.97*	*99*	*4.0*
South Yorkshire and Bassetlaw	NHS Barnsley	241,200	0.80	1.02	1.03	1.39	0.80	1.21	149	1.05	0.90	1.21	122	2.1
	NHS Bassetlaw	114,800	0.82	1.04	1.30	0.89	0.52	0.79	104	0.88	0.71	1.11	110	2.6
	NHS Doncaster	306,400	1.07	0.82	1.15	1.37	0.83	1.18	144	1.07	0.94	1.22	122	4.7
	NHS Rotherham	*261,900*	*0.67*	*0.84*	*0.75*	*0.90*	*1.04*	*0.77*	*95*	*0.83*	*0.71*	*0.98*	*97*	*6.4*
	NHS Sheffield	575,400	1.00	1.24	0.96	1.02	0.93	0.93	101	1.01	0.91	1.12	103	16.3
West Yorkshire	*NHS Airedale, Wharfedale and Craven*	*160,000*	*0.49*	*0.65*	*0.84*	*1.14*	*0.90*	*0.62*	*81*	*0.78*	*0.64*	*0.96*	*96*	*11.1*
	NHS Bradford City	**84,900**	**1.86**	**2.61**	**2.55**	**3.12**	**2.31**	**2.67**	**188**	**2.53**	**2.04**	**3.12**	**169**	**72.2**
	NHS Bradford Districts	**339,700**	**1.10**	**1.40**	**1.06**	**1.15**	**1.57**	**1.58**	**165**	**1.32**	**1.17**	**1.49**	**129**	**28.7**
	NHS Calderdale	*209,800*	*0.59*	*0.77*	*1.05*	*0.62*	*0.71*	*0.92*	*110*	*0.78*	*0.64*	*0.94*	*87*	*10.3*
	NHS Greater Huddersfield	245,000	0.91	1.10	0.92	1.01	0.76	0.63	73	0.88	0.75	1.04	97	17.4
	NHS Leeds North	201,200	0.84	0.79	0.86	0.90	0.65	0.99	119	0.84	0.70	1.01	95	17.4
	NHS Leeds South and East	253,700	0.93	0.75	0.95	0.98	0.62	0.94	95	0.86	0.72	1.03	81	18.3
	NHS Leeds West	*326,900*	*0.59*	*0.73*	*1.14*	*0.70*	*0.88*	*0.64*	*64*	*0.78*	*0.66*	*0.92*	*73*	*10.8*
	NHS North Kirklees	192,000	1.24	0.48	1.46	0.84	0.80	1.00	109	0.97	0.80	1.16	100	25.3
	NHS Wakefield	336,800	0.91	1.07	0.85	0.98	0.60	0.87	107	0.88	0.76	1.00	101	4.6
Arden, Herefordshire and Worcestershire	**NHS Coventry and Rugby**	**456,700**	**1.44**	**1.75**	**1.27**	**1.13**	**1.04**	**1.47**	**153**	**1.34**	**1.21**	**1.49**	**132**	**22.2**
	NHS Herefordshire	189,300	0.82	0.90	0.80	0.91	1.24	0.99	137	0.95	0.81	1.12	124	1.8
	NHS Redditch and Bromsgrove	181,700	0.80	1.18	0.72	0.82	0.78	0.70	88	0.83	0.69	1.00	98	6.0
	NHS South Warwickshire	*262,700*	*0.99*	*0.66*	*0.58*	*0.85*	*0.81*	*0.87*	*114*	*0.80*	*0.68*	*0.93*	*98*	*7.0*
	NHS South Worcestershire	*301,400*	*0.71*	*0.78*	*0.76*	*0.95*	*0.71*	*0.64*	*86*	*0.76*	*0.65*	*0.88*	*96*	*3.7*
	NHS Warwickshire North	190,200	1.10	0.80	0.74	1.56	1.08	1.25	158	1.10	0.93	1.29	130	6.5
	NHS Wyre Forest	99,900	1.07	0.81	0.64	1.35	0.43	0.87	120	0.86	0.67	1.09	112	2.8
Birmingham and the Black Country	**NHS Birmingham CrossCity**	**748,300**	**1.63**	**1.49**	**1.46**	**1.53**	**1.62**	**1.72**	**170**	**1.58**	**1.46**	**1.70**	**146**	**35.2**
	NHS Birmingham South and Central	**204,000**	**1.87**	**1.53**	**1.66**	**1.78**	**1.39**	**1.82**	**172**	**1.67**	**1.45**	**1.93**	**149**	**40.4**
	NHS Dudley	317,600	0.86	1.22	1.25	0.91	0.85	0.88	110	0.99	0.87	1.13	116	10.0
	NHS Sandwell and West Birmingham	**495,100**	**1.69**	**1.47**	**1.55**	**1.70**	**1.85**	**1.95**	**190**	**1.71**	**1.56**	**1.87**	**157**	**45.3**
	NHS Solihull	211,800	0.68	1.01	0.90	0.89	1.11	1.08	137	0.95	0.81	1.12	113	10.9
	NHS Walsall	**278,700**	**1.24**	**1.41**	**1.61**	**0.97**	**1.27**	**0.87**	**100**	**1.22**	**1.07**	**1.39**	**132**	**21.1**
	NHS Wolverhampton	**256,600**	**1.23**	**1.54**	**1.15**	**1.38**	**1.24**	**1.05**	**117**	**1.26**	**1.10**	**1.44**	**132**	**32.0**

Table 1.3. Continued

UK area	CCG/HB	Total population (2016)	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2016		2011–2016				% non-White
								O/E	Crude rate pmp	O/E	LCL	UCL	Crude rate pmp[a]	
Derbyshire and Notting-hamshire	NHS Erewash	96,700	1.15	1.33	1.30	0.61	1.08	0.92	114	1.06	0.84	1.34	122	3.2
	NHS Hardwick	*111,400*	*0.70*	*0.85*	*0.76*	*0.85*	*0.82*	*0.55*	*72*	*0.75*	*0.59*	*0.97*	*93*	*1.8*
	NHS Mansfield & Ashfield	*197,900*	*0.75*	*0.83*	*0.81*	*1.02*	*0.81*	*0.65*	*81*	*0.81*	*0.68*	*0.98*	*94*	*2.5*
	NHS Newark & Sherwood	119,700	1.29	0.93	0.49	0.72	0.62	0.76	100	0.79	0.63	1.00	99	2.4
	NHS North Derbyshire	*273,200*	*0.94*	*0.78*	*0.76*	*0.66*	*0.61*	*0.75*	*102*	*0.75*	*0.64*	*0.87*	*96*	*2.5*
	NHS Nottingham City	**325,300**	**1.11**	**1.24**	**1.36**	**1.32**	**1.63**	**1.41**	**126**	**1.35**	**1.18**	**1.54**	**114**	**28.5**
	NHS Nottingham North & East	*150,300*	*0.85*	*0.72*	*0.70*	*0.55*	*0.79*	*0.95*	*120*	*0.76*	*0.61*	*0.95*	*90*	*6.2*
	NHS Nottingham West	112,700	0.55	1.10	1.30	0.87	0.83	0.90	115	0.92	0.74	1.16	111	7.3
	NHS Rushcliffe	*115,200*	*1.16*	*0.38*	*1.04*	*0.42*	*0.20*	*0.81*	*104*	*0.66*	*0.51*	*0.86*	*80*	*6.9*
	NHS Southern Derbyshire	527,400	1.03	1.13	0.87	0.99	0.79	1.05	125	0.97	0.88	1.08	109	11.0
East Anglia	*NHS Cambridgeshire and Peterborough*[c]	*884,600*	*0.90*	*0.66*	*1.05*	*0.78*				*0.85*	*0.76*	*0.95*	*89*	*9.5*
	NHS Great Yarmouth & Waveney	215,700	1.17	0.97	0.95	0.79	1.18	1.06	148	1.02	0.88	1.18	134	2.7
	NHS Ipswich and East Suffolk[b]	*401,000*	*0.62*	*0.89*	*0.91*	*0.72*	*1.06*	*0.77*	*102*	*0.83*	*0.74*	*0.94*	*104*	*5.6*
	NHS North Norfolk[b]	*171,900*	*0.55*	*0.76*	*0.82*	*0.89*	*0.96*	*0.75*	*116*	*0.79*	*0.66*	*0.95*	*116*	*1.5*
	NHS Norwich[b]	216,800	1.09	0.96	0.80	0.84	0.92	0.69	78	0.88	0.74	1.05	95	7.3
	NHS South Norfolk[c]	229,900	1.00	0.75	0.97	0.62				0.83	0.68	1.02	104	2.6
	NHS West Norfolk[c]	*175,100*	*0.63*	*0.67*	*0.61*	*0.86*				*0.70*	*0.55*	*0.89*	*91*	*2.6*
	NHS West Suffolk[c]	*227,800*	*0.70*	*0.89*	*0.82*	*0.60*				*0.75*	*0.60*	*0.93*	*88*	*4.6*
Essex	NHS Basildon and Brentwood	259,800	1.04	1.26	0.94	0.99	1.07	1.11	131	1.07	0.92	1.23	118	7.1
	NHS Castle Point, Rayleigh and Rochford	175,400	0.75	0.70	1.18	0.73	0.90	0.87	120	0.86	0.71	1.03	111	3.0
	NHS Mid Essex[b]	*388,400*	*0.98*	*0.81*	*0.72*	*0.87*	*0.69*	*0.73*	*93*	*0.80*	*0.70*	*0.91*	*94*	*4.4*
	NHS North East Essex[b]	329,200	1.24	0.95	0.85	1.11	0.74	0.79	103	0.94	0.83	1.07	115	5.5
	NHS Southend	179,800	0.84	0.94	1.07	0.72	1.01	1.29	156	0.98	0.82	1.17	111	8.4
	NHS Thurrock	167,000	1.19	0.78	0.96	1.15	1.09	0.64	66	0.97	0.79	1.18	94	14.1
	NHS West Essex[b]	302,500	0.73	1.19	1.04	1.10	0.94	0.89	106	0.98	0.85	1.12	110	8.2
Hertfordshire and the South Midlands	NHS Bedfordshire	447,700	0.72	0.95	0.98	0.93	0.81	1.03	121	0.90	0.80	1.02	100	11.2
	NHS Corby	68,200	1.11	0.78	0.61	1.01	1.64	1.38	147	1.10	0.82	1.48	110	4.5
	NHS East and North Hertfordshire	565,700	1.04	0.70	1.09	1.03	1.04	0.97	111	0.98	0.88	1.09	105	10.4
	NHS Herts Valleys	591,800	0.78	0.88	0.91	1.11	0.83	1.00	113	0.92	0.83	1.02	98	14.6
	NHS Luton	**216,800**	**1.38**	**1.21**	**1.98**	**1.52**	**1.30**	**1.85**	**175**	**1.54**	**1.33**	**1.79**	**138**	**45.3**
	NHS Milton Keynes	270,500	0.91	1.10	0.87	1.16	1.21	1.33	137	1.11	0.95	1.28	107	19.6
	NHS Nene	*648,600*	*0.88*	*1.06*	*0.96*	*0.90*	*0.80*	*0.84*	*99*	*0.90*	*0.82*	*1.00*	*100*	*9.1*
Leicestershire and Lincolnshire	*NHS East Leicestershire and Rutland*	*328,600*	*0.72*	*0.97*	*0.90*	*0.77*	*0.90*	*0.77*	*100*	*0.84*	*0.73*	*0.96*	*103*	*9.8*
	NHS Leicester City	**348,300**	**1.80**	**1.62**	**1.68**	**1.20**	**1.49**	**2.13**	**195**	**1.65**	**1.48**	**1.85**	**143**	**49.5**
	NHS Lincolnshire East	*233,400*	*0.89*	*0.75*	*1.09*	*0.57*	*0.75*	*0.84*	*124*	*0.81*	*0.69*	*0.95*	*113*	*2.0*
	NHS Lincolnshire West	*236,900*	*0.73*	*0.42*	*0.79*	*0.60*	*0.64*	*0.58*	*72*	*0.63*	*0.52*	*0.76*	*73*	*3.0*
	NHS South Lincolnshire[b]	147,800	0.96	0.90	0.66	0.67	0.89	0.85	115	0.82	0.67	1.00	105	2.3
	NHS South West Lincolnshire	*125,200*	*0.95*	*0.67*	*0.85*	*0.49*	*0.53*	*0.48*	*64*	*0.65*	*0.51*	*0.84*	*83*	*2.3*
	NHS West Leicestershire	*393,000*	*0.89*	*0.51*	*0.80*	*0.97*	*0.61*	*0.85*	*104*	*0.77*	*0.68*	*0.88*	*89*	*6.9*
Shropshire and Staffordshire	NHS Cannock Chase	135,100	1.15	0.80	1.17	0.80	0.88	1.07	133	0.98	0.80	1.20	115	2.4
	NHS East Staffordshire	*126,400*	*0.88*	*0.73*	*1.13*	*0.87*	*0.57*	*0.58*	*71*	*0.79*	*0.62*	*0.99*	*91*	*9.0*
	NHS North Staffordshire	218,300	1.11	0.59	0.96	1.01	1.03	1.11	147	0.97	0.83	1.14	121	3.5
	NHS Shropshire	313,400	0.97	0.75	1.03	0.90	0.86	0.80	112	0.88	0.77	1.01	116	2.0
	NHS South East Staffs and Seisdon and Peninsular	*225,200*	*0.99*	*0.72*	*0.63*	*0.76*	*0.73*	*0.84*	*111*	*0.78*	*0.65*	*0.92*	*97*	*3.6*
	NHS Stafford and Surrounds	154,000	0.82	0.92	0.84	0.84	1.28	1.15	156	0.98	0.82	1.18	126	4.7
	NHS Stoke on Trent	261,400	1.06	0.87	1.10	1.45	1.12	1.13	130	1.13	0.98	1.30	122	11.0
	NHS Telford & Wrekin	173,000	1.09	1.20	1.22	1.26	1.35	0.96	110	1.18	1.00	1.40	127	7.3

Table 1.3. Continued

UK area	CCG/HB	Total population (2016)	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2016 O/E	2016 Crude rate pmp	2011–2016 O/E	2011–2016 LCL	2011–2016 UCL	2011–2016 Crude rate pmp[a]	% non-White
London	**NHS Barking & Dagenham**	**206,500**	**1.65**	**2.03**	**1.60**	**1.94**	**1.91**	**1.69**	**140**	**1.80**	**1.56**	**2.09**	**141**	**41.7**
	NHS Barnet	**386,100**	**1.41**	**1.46**	**1.23**	**1.29**	**1.41**	**1.27**	**130**	**1.34**	**1.20**	**1.50**	**129**	**35.9**
	NHS Camden	246,200	1.11	1.06	1.32	1.16	1.28	0.99	93	1.15	0.98	1.35	103	33.7
	NHS City and Hackney	**282,900**	**1.68**	**2.02**	**1.83**	**2.11**	**1.13**	**1.84**	**148**	**1.76**	**1.55**	**2.01**	**134**	**44.6**
	NHS Enfield	**331,400**	**1.98**	**1.59**	**1.58**	**1.53**	**1.55**	**1.59**	**157**	**1.63**	**1.46**	**1.83**	**151**	**39.0**
	NHS Haringey	**278,500**	**1.69**	**2.27**	**2.21**	**1.64**	**1.56**	**1.94**	**172**	**1.88**	**1.66**	**2.12**	**157**	**39.5**
	NHS Havering	252,800	1.20	1.04	0.83	0.92	1.08	0.78	91	0.97	0.83	1.13	106	12.3
	NHS Islington	**232,900**	**1.53**	**2.05**	**1.44**	**1.11**	**1.60**	**1.06**	**90**	**1.46**	**1.25**	**1.70**	**117**	**31.8**
	NHS Newham	**341,000**	**2.12**	**1.86**	**2.14**	**2.24**	**2.31**	**2.44**	**191**	**2.19**	**1.97**	**2.44**	**161**	**71.0**
	NHS Redbridge	**299,200**	**1.38**	**2.15**	**1.98**	**1.45**	**1.45**	**1.73**	**167**	**1.68**	**1.50**	**1.90**	**153**	**57.5**
	NHS Tower Hamlets	**304,900**	**1.61**	**1.82**	**2.02**	**2.26**	**2.33**	**1.84**	**134**	**1.99**	**1.76**	**2.25**	**137**	**54.8**
	NHS Waltham Forest	**275,800**	**1.81**	**1.26**	**1.62**	**2.08**	**1.70**	**1.51**	**138**	**1.66**	**1.47**	**1.89**	**143**	**47.8**
	NHS Brent	**328,300**	**2.08**	**2.43**	**1.95**	**2.51**	**2.23**	**2.02**	**195**	**2.20**	**1.99**	**2.43**	**200**	**63.7**
	NHS Central London (Westminster)	178,400	1.29	1.17	1.37	1.08	0.97	1.09	112	1.16	0.97	1.38	112	36.2
	NHS Ealing	**343,200**	**1.91**	**2.26**	**1.68**	**1.78**	**2.25**	**1.77**	**175**	**1.94**	**1.76**	**2.15**	**181**	**51.0**
	NHS Hammersmith and Fulham	**179,700**	**1.43**	**1.49**	**0.99**	**1.44**	**1.13**	**1.80**	**167**	**1.38**	**1.16**	**1.64**	**121**	**31.9**
	NHS Harrow	**248,800**	**2.23**	**1.59**	**1.06**	**1.54**	**1.43**	**1.70**	**185**	**1.59**	**1.40**	**1.80**	**162**	**57.8**
	NHS Hillingdon	**302,500**	**1.46**	**1.50**	**1.42**	**1.00**	**1.08**	**1.16**	**116**	**1.26**	**1.10**	**1.44**	**118**	**39.4**
	NHS Hounslow	**271,100**	**1.83**	**1.73**	**2.02**	**1.28**	**1.29**	**1.65**	**159**	**1.62**	**1.43**	**1.84**	**147**	**48.6**
	NHS West London (Kensington and Chelsea, Queen's Park and Paddington)	226,000	1.20	0.91	0.98	1.50	0.67	1.23	128	1.08	0.92	1.27	106	33.4
	NHS Bexley	**244,800**	**1.17**	**0.87**	**1.01**	**1.11**	**1.24**	**1.65**	**184**	**1.19**	**1.03**	**1.37**	**124**	**18.1**
	NHS Bromley	326,900	0.69	0.72	0.85	0.99	1.50	0.82	95	0.94	0.82	1.08	102	15.7
	NHS Croydon	**382,300**	**1.26**	**2.00**	**1.95**	**1.79**	**1.93**	**1.64**	**167**	**1.76**	**1.60**	**1.95**	**169**	**44.9**
	NHS Greenwich	**279,800**	**1.03**	**1.15**	**2.38**	**1.23**	**1.68**	**1.62**	**147**	**1.52**	**1.33**	**1.74**	**130**	**37.5**
	NHS Kingston	176,100	0.96	1.08	1.11	1.11	0.78	0.96	97	1.00	0.82	1.21	95	25.5
	NHS Lambeth	**327,900**	**1.76**	**1.68**	**1.39**	**1.87**	**1.95**	**1.38**	**116**	**1.67**	**1.48**	**1.89**	**132**	**42.9**
	NHS Lewisham	**301,900**	**1.78**	**1.85**	**1.47**	**1.52**	**1.48**	**1.31**	**116**	**1.56**	**1.37**	**1.77**	**130**	**46.5**
	NHS Merton	**205,000**	**1.57**	**1.78**	**1.30**	**1.44**	**1.61**	**1.73**	**171**	**1.57**	**1.36**	**1.82**	**146**	**35.1**
	NHS Richmond	*195,800*	*0.69*	*0.79*	*0.98*	*0.78*	*0.60*	*0.65*	*71*	*0.74*	*0.61*	*0.92*	*77*	*14.0*
	NHS Southwark	**313,200**	**1.96**	**1.74**	**2.23**	**1.82**	**1.83**	**1.69**	**144**	**1.88**	**1.67**	**2.11**	**150**	**45.8**
	NHS Sutton	**202,200**	**1.30**	**1.54**	**0.80**	**1.66**	**1.40**	**1.41**	**153**	**1.36**	**1.17**	**1.58**	**138**	**21.4**
	NHS Wandsworth	**316,100**	**1.23**	**1.39**	**0.96**	**1.56**	**1.77**	**1.38**	**120**	**1.39**	**1.22**	**1.59**	**114**	**28.6**
Bath, Gloucestershire, Swindon and Wiltshire	*NHS Bath and North East Somerset*	*187,800*	*0.56*	*0.92*	*0.95*	*0.66*	*0.59*	*0.73*	*85*	*0.73*	*0.60*	*0.90*	*81*	*5.4*
	NHS Gloucestershire	*623,100*	*0.88*	*1.17*	*0.70*	*0.92*	*0.87*	*0.86*	*111*	*0.90*	*0.81*	*0.99*	*109*	*4.6*
	NHS Swindon	223,600	1.14	1.22	0.92	1.16	1.15	1.08	121	1.11	0.95	1.30	117	10.0
	NHS Wiltshire	*488,400*	*0.64*	*0.47*	*0.77*	*0.81*	*0.69*	*0.83*	*106*	*0.71*	*0.62*	*0.80*	*85*	*3.4*
Bristol, North Somerset, Somerset and South Gloucestershire	**NHS Bristol**	**454,200**	**1.44**	**1.26**	**1.38**	**1.16**	**1.20**	**1.30**	**125**	**1.29**	**1.15**	**1.44**	**117**	**16.0**
	NHS North Somerset	211,700	0.87	1.02	1.04	1.01	0.79	0.77	104	0.91	0.78	1.07	117	2.7
	NHS Somerset	*549,400*	*0.84*	*0.67*	*0.55*	*0.88*	*0.66*	*0.86*	*118*	*0.75*	*0.67*	*0.83*	*96*	*2.0*
	NHS South Gloucestershire	*277,600*	*0.61*	*0.81*	*1.15*	*0.68*	*0.74*	*0.81*	*97*	*0.80*	*0.68*	*0.94*	*91*	*5.0*
Devon, Cornwall and Isles of Scilly	*NHS Kernow*	*556,000*	*0.81*	*0.95*	*0.88*	*0.79*	*1.01*	*0.90*	*126*	*0.89*	*0.81*	*0.99*	*117*	*1.8*
	NHS North, East, West Devon	*898,000*	*0.92*	*1.00*	*0.84*	*0.92*	*0.90*	*0.87*	*115*	*0.91*	*0.84*	*0.98*	*112*	*3.0*
	NHS South Devon and Torbay	279,900	0.90	1.08	1.00	0.87	0.88	0.98	143	0.95	0.83	1.08	130	2.1

Table 1.3. Continued

UK area	CCG/HB	Total population (2016)	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2016 O/E	2016 Crude rate pmp	2011–2016 O/E	2011–2016 LCL	2011–2016 UCL	2011–2016 Crude rate pmp[a]	% non-White
Kent and Medway	NHS Ashford	126,200	0.83	1.26	1.09	0.96	0.85	0.99	119	0.99	0.80	1.23	112	6.3
	NHS Canterbury and Coastal	210,500	0.83	0.57	0.94	1.16	0.88	1.00	124	0.90	0.76	1.07	105	5.9
	NHS Dartford, Gravesham and Swanley	260,600	0.87	0.98	1.47	0.93	0.96	1.13	130	1.06	0.91	1.22	114	13.0
	NHS Medway	278,500	0.90	0.81	1.08	0.92	1.17	0.59	65	0.91	0.78	1.07	94	10.4
	NHS South Kent Coast	207,600	1.01	0.56	0.74	1.00	0.88	1.07	145	0.88	0.75	1.04	112	4.5
	NHS Swale	114,800	0.59	1.33	0.81	1.15	0.88	1.18	139	0.99	0.79	1.24	110	3.8
	NHS Thanet	140,700	0.86	1.04	1.55	1.01	0.70	0.86	114	1.00	0.82	1.21	123	4.5
	NHS West Kent	*481,600*	*0.82*	*0.62*	*0.70*	*0.91*	*0.80*	*0.80*	*98*	*0.78*	*0.69*	*0.88*	*89*	*4.9*
Surrey and Sussex	NHS Brighton & Hove	289,200	0.92	1.16	0.79	1.06	1.05	1.40	142	1.07	0.92	1.24	102	10.9
	NHS Coastal West Sussex	*498,900*	*0.64*	*0.80*	*0.78*	*1.02*	*0.88*	*0.96*	*136*	*0.85*	*0.77*	*0.95*	*114*	*3.8*
	NHS Crawley	111,400	0.50	0.80	1.07	1.29	0.70	1.59	162	1.00	0.79	1.28	96	20.1
	NHS East Surrey	183,700	0.74	1.25	0.91	0.82	1.46	0.83	98	1.01	0.84	1.20	112	8.3
	NHS Eastbourne, Hailsham and Seaford	189,500	0.84	1.04	1.18	0.73	1.06	0.85	121	0.95	0.81	1.12	128	4.4
	NHS Guildford and Waverley	*207,800*	*0.74*	*1.16*	*0.54*	*0.77*	*0.94*	*0.58*	*67*	*0.79*	*0.65*	*0.95*	*87*	*7.2*
	NHS Hastings & Rother	185,800	0.96	0.73	1.22	0.63	0.99	0.72	102	0.87	0.73	1.04	116	4.6
	NHS High Weald Lewes Havens	*172,600*	*0.68*	*0.91*	*0.61*	*0.97*	*0.84*	*0.89*	*122*	*0.82*	*0.68*	*0.99*	*105*	*3.1*
	NHS Horsham and Mid Sussex	*233,500*	*0.78*	*0.51*	*0.76*	*0.82*	*0.51*	*0.76*	*94*	*0.69*	*0.57*	*0.83*	*81*	*4.9*
	NHS North West Surrey	344,600	1.31	0.91	0.94	1.22	0.87	1.20	142	1.08	0.95	1.22	120	12.5
	NHS Surrey Downs	288,200	0.97	0.90	1.02	0.94	0.84	0.82	104	0.91	0.79	1.05	109	9.1
	NHS Surrey Heath	*96,700*	*0.77*	*0.76*	*0.46*	*0.44*	*0.92*	*0.50*	*62*	*0.64*	*0.47*	*0.86*	*74*	*9.3*
Thames Valley	NHS Aylesbury Vale	211,400	1.01	0.73	0.67	0.80	0.72	1.21	142	0.86	0.72	1.03	95	9.7
	NHS Bracknell and Ascot	137,700	0.76	0.37	1.24	0.96	0.79	0.99	109	0.86	0.68	1.08	88	9.5
	NHS Chiltern	*325,900*	*0.69*	*0.74*	*1.00*	*0.78*	*0.77*	*0.73*	*89*	*0.78*	*0.68*	*0.91*	*90*	*15.8*
	NHS Newbury and District	107,100	0.62	0.62	1.03	0.89	0.70	1.01	121	0.82	0.63	1.05	92	4.4
	NHS North & West Reading	100,300	0.95	0.94	0.64	0.95	0.90	0.91	110	0.88	0.68	1.13	100	10.4
	NHS Oxfordshire	*668,700*	*1.01*	*0.98*	*0.88*	*0.83*	*0.81*	*0.75*	*87*	*0.87*	*0.79*	*0.96*	*95*	*9.3*
	NHS Slough	**147,200**	**2.20**	**1.74**	**1.78**	**1.69**	**1.91**	**1.62**	**143**	**1.82**	**1.54**	**2.16**	**151**	**54.3**
	NHS South Reading	**112,000**	**1.16**	**1.17**	**2.38**	**1.51**	**0.72**	**1.34**	**116**	**1.37**	**1.09**	**1.72**	**112**	**30.5**
	NHS Windsor, Ascot and Maidenhead	142,900	1.24	0.62	1.33	1.20	0.66	0.97	112	1.00	0.82	1.22	108	14.7
	NHS Wokingham	*161,900*	*1.31*	*0.47*	*0.81*	*0.76*	*0.57*	*0.73*	*86*	*0.77*	*0.62*	*0.95*	*85*	*11.6*
Wessex	*NHS Dorset*	*771,900*	*0.73*	*0.71*	*0.73*	*0.71*	*0.61*	*0.57*	*79*	*0.67*	*0.61*	*0.74*	*87*	*4.0*
	NHS Fareham and Gosport	200,800	0.78	0.78	0.97	1.07	0.87	0.88	115	0.90	0.76	1.06	110	3.4
	NHS Isle of Wight	139,800	0.77	0.87	1.22	0.85	0.67	0.58	86	0.82	0.67	1.00	114	2.7
	NHS North East Hampshire and Farnham	210,500	0.84	1.16	1.17	0.85	0.97	0.86	100	0.97	0.82	1.15	106	9.7
	NHS North Hampshire	*221,900*	*0.69*	*0.47*	*0.71*	*1.02*	*0.75*	*0.53*	*63*	*0.70*	*0.57*	*0.84*	*78*	*6.4*
	NHS Portsmouth	214,800	1.31	1.10	1.12	0.96	1.06	1.07	107	1.10	0.93	1.30	104	11.6
	NHS South Eastern Hampshire	*212,300*	*0.76*	*0.63*	*0.96*	*1.09*	*0.69*	*0.63*	*85*	*0.79*	*0.67*	*0.94*	*100*	*3.1*
	NHS Southampton	254,300	1.15	0.88	0.63	0.98	0.93	0.94	90	0.92	0.77	1.09	83	14.1
	NHS West Hampshire	*558,300*	*0.67*	*0.62*	*0.66*	*0.76*	*0.57*	*0.55*	*73*	*0.64*	*0.57*	*0.72*	*80*	*3.9*
Wales	Betsi Cadwaladr University	695,800	0.84	1.01	0.88	1.08	1.06	0.98	131	0.98	0.90	1.07	122	2.5
	Powys Teaching	132,200	1.28	1.27	0.73	0.58	0.96	0.92	136	0.95	0.79	1.15	132	1.6
	Hywel Dda	383,700	1.25	0.92	1.08	1.18	1.05	0.78	107	1.04	0.93	1.16	135	2.2
	Abertawe Bro Morgannwg University	**529,300**	**1.18**	**1.45**	**1.04**	**0.94**	**1.20**	**1.16**	**144**	**1.16**	**1.05**	**1.27**	**135**	**3.9**
	Cwm Taf	298,100	1.46	0.91	1.13	1.13	0.97	0.98	117	1.09	0.96	1.24	124	2.6
	Aneurin Bevan	584,100	1.21	1.18	1.05	1.16	0.97	0.91	113	1.07	0.98	1.18	126	3.9
	Cardiff and Vale University	489,900	1.01	0.99	1.11	0.93	0.93	1.15	122	1.02	0.91	1.14	103	12.2

Table 1.3. Continued

UK area	CCG/HB	Total population (2016)	2011 O/E	2012 O/E	2013 O/E	2014 O/E	2015 O/E	2016 O/E	2016 Crude rate pmp	2011–2016 O/E	2011–2016 LCL	2011–2016 UCL	2011–2016 Crude rate pmp[a]	% non-White
Scotland	Ayrshire and Arran	370,600	0.83	0.96	1.00	0.80	0.90	1.21	162	0.95	0.85	1.07	120	1.2
	Borders	*114,500*	*0.56*	*0.56*	*0.47*	*0.57*	*0.67*	*0.31*	*44*	*0.52*	*0.39*	*0.69*	*70*	*1.3*
	Dumfries and Galloway	*149,500*	*0.58*	*1.05*	*0.41*	*1.20*	*0.64*	*0.51*	*74*	*0.73*	*0.59*	*0.90*	*99*	*1.2*
	Fife	370,300	1.17	0.87	1.01	0.91	1.04	0.71	89	0.95	0.84	1.07	113	2.4
	Forth Valley	304,500	0.82	0.88	1.00	0.92	1.01	0.61	76	0.87	0.75	1.01	101	2.2
	Grampian	*588,100*	*0.83*	*0.86*	*0.91*	*0.76*	*0.88*	*0.80*	*95*	*0.84*	*0.75*	*0.94*	*94*	*4.0*
	Greater Glasgow and Clyde	1,161,400	1.11	1.13	0.93	0.90	1.14	1.09	124	1.05	0.98	1.12	113	7.3
	Highland	*321,900*	*0.52*	*0.62*	*0.68*	*0.52*	*0.93*	*0.59*	*81*	*0.65*	*0.55*	*0.75*	*83*	*1.3*
	Lanarkshire	656,500	0.84	1.08	0.93	0.89	0.94	0.97	117	0.94	0.86	1.04	107	2.0
	Lothian	*880,000*	*0.71*	*0.74*	*0.60*	*0.75*	*0.70*	*0.72*	*81*	*0.70*	*0.64*	*0.78*	*74*	*5.6*
	Orkney	21,900	0.00	1.85	0.72	0.00	1.62	0.00	0	0.69	0.39	1.22	92	0.7
	Shetland	23,200	0.78	0.00	0.75	1.06	1.02	0.68	86	0.73	0.41	1.28	86	1.5
	Tayside	415,500	1.20	0.68	0.87	0.96	0.95	0.86	111	0.92	0.82	1.03	111	3.2
	Western Isles	26,900	0.00	0.00	0.85	1.60	1.79	1.03	149	0.91	0.59	1.42	124	0.9
Northern Ireland	**Belfast**	**354,700**	**1.08**	**1.71**	**1.17**	**0.88**	**1.24**	**1.46**	**155**	**1.25**	**1.11**	**1.41**	**125**	**3.2**
	Northern	473,100	1.24	1.12	1.03	1.01	0.93	1.09	125	1.07	0.96	1.19	115	1.2
	Southern	377,200	1.27	0.86	0.83	0.76	0.88	0.78	82	0.89	0.78	1.02	88	1.2
	South Eastern	356,700	0.92	0.80	0.91	0.76	1.27	1.02	121	0.95	0.84	1.09	106	1.3
	Western	300,400	0.97	0.59	0.97	1.05	1.15	1.10	120	0.98	0.85	1.13	100	1.0

[a] – per year
[b]CCGs where between 5% and 15% of the incident RRT population from 2011 to 2014 were incident patients of the Cambridge renal centre. In these CCGs the rates/ratios for 2015 and 2016 and for the combined years 2011–2016 are likely to be underestimated
[c]CCGs where >15% of the incident RRT population from 2011 to 2014 were incident patients of the Cambridge renal centre. These have not been included in the analysis for 2015 or 2016 but are included for 2011–2014 (and the combined years analysis for these areas uses only four years (2011–2014))

between areas, with ratios ranging from 0.52 to 2.53 (IQR 0.82, 1.09). From the analysis using all six years (where available), out of a total of 233 areas, 44 areas had notably high ratios and 67 notably low. The crude rates ranged from 70 pmp to 200 pmp (IQR 96 pmp, 121 pmp). These rates and ratios are not adjusted for population ethnicity, which correlates strongly with incidence at CCG/HB level (figure 1.3).

Centre level

The number of new patients starting RRT at each renal centre from 2011 to 2016 is shown in table 1.4. The table also shows centre level incidence rates (per million population) for 2016. For most centres there was a lot of variability in the numbers of incident patients from one year to the next, making it hard to see any underlying trend. Variation incorporates chance fluctuation, the introduction of new centres, changes in catchment populations and completeness of reporting. Trends reflect changes in incidence of ERF (underlying disease prevalence, recognition and survival from comorbidity), and practice changes such as an emphasis

Fig. 1.3. Age/sex standardised incidence ratio (2011–2016) by percentage non-White

Table 1.4. Number of patients starting RRT by renal centre 2011–2016

Centre	Year						Estimated catchment population (millions)[a]	2016 crude rate pmp[b]	(95% CI)
	2011	2012	2013	2014	2015	2016			
England									
B Heart	113	101	100	100	123	135	0.74	183	(152–214)
B QEH	213	208	200	249	245	238	1.70	140	(122–158)
Basldn	44	53	34	45	48	40	0.42	96	(67–126)
Bradfd	60	71	63	83	91	86	0.65	132	(104–160)
Brightn	119	132	139	148	144	150	1.30	116	(97–134)
Bristol	141	149	174	149	146	155	1.44	108	(91–125)
Camb[c]	122	123	136	126	175[c]	120[c]	1.16	104	(85–122)
Carlis	27	19	42	37	46	35	0.32	109	(73–145)
Carsh	207	244	229	265	260	246	1.91	129	(113–145)
Chelms	47	46	47	55	51	53	0.51	104	(76–132)
Colchr	44	29	29	38	28	30	0.30	100	(64–136)
Covnt	110	114	90	126	111	128	0.89	143	(119–168)
Derby	74	80	74	77	64	86	0.70	122	(97–148)
Donc	43	40	61	54	39	62	0.41	151	(114–189)
Dorset	79	73	73	78	75	70	0.86	81	(62–100)
Dudley	43	56	52	42	51	53	0.44	120	(88–152)
Exeter	112	134	100	143	137	143	1.09	131	(110–153)
Glouc	58	75	53	74	72	66	0.59	112	(85–140)
Hull	108	94	90	98	121	93	1.02	91	(73–110)
Ipswi	29	44	40	34	67	42	0.40	105	(73–137)
Kent	120	114	143	148	143	141	1.22	115	(96–134)
L Barts	250	264	283	302	311	297	1.83	162	(144–181)
L Guys	121	130	134	159	179	169	1.08	156	(133–180)
L Kings	137	123	166	148	180	152	1.17	130	(109–150)
L Rfree	220	232	224	230	239	238	1.52	157	(137–177)
L St.G	72	95	85	92	114	94	0.80	118	(94–142)
L West	364	354	303	355	337	385	2.40	160	(144–177)
Leeds	153	151	183	169	147	166	1.67	99	(84–115)
Leic	266	235	288	251	270	324	2.44	133	(119–147)
Liv Ain	58	63	65	65	61	53	0.48	110	(80–139)
Liv Roy	111	104	93	136	141	111	1.00	111	(90–132)
M RI	154	161	198	164	198	219	1.53	143	(124–162)
Middlbr	100	119	110	102	134	101	1.00	101	(81–120)
Newc	98	102	92	109	125	135	1.12	120	(100–141)
Norwch	88	75	78	77	112	97	0.79	123	(99–148)
Nottm	115	100	116	111	120	120	1.09	110	(91–130)
Oxford	176	170	164	188	195	218	1.69	129	(112–146)
Plymth	60	54	65	54	53	63	0.47	134	(101–167)
Ports	187	159	193	230	200	191	2.02	94	(81–108)
Prestn	138	146	154	164	163	133	1.49	89	(74–104)
Redng	103	72	117	104	87	96	0.91	105	(84–127)
Salford	131	134	116	161	173	188	1.49	126	(108–144)
Sheff	134	156	136	164	146	151	1.37	110	(93–128)
Shrew	61	58	60	65	62	58	0.50	116	(86–146)
Stevng	110	109	156	150	136	165	1.20	137	(116–158)
Sthend	29	26	42	30	35	47	0.32	148	(106–191)
Stoke	91	74	103	117	116	107	0.89	120	(97–143)
Sund	57	71	51	63	63	94	0.62	152	(121–183)
Truro	39	49	47	40	70	50	0.41	121	(87–155)
Wirral	58	46	65	55	64	69	0.57	121	(92–149)
Wolve	78	88	93	74	85	64	0.67	96	(72–119)
York	53	55	37	64	61	72	0.49	146	(112–180)

Table 1.4. Continued

Centre	Year						Estimated catchment population (millions)[a]	2016 crude rate pmp[b]	(95% CI)
	2011	2012	2013	2014	2015	2016			
N Ireland									
Antrim	29	25	29	35	36	41	0.29	139	(97–182)
Belfast	68	97	72	65	94	95	0.64	149	(119–179)
Newry	36	17	23	20	28	25	0.26	96	(58–133)
Ulster	36	28	30	23	33	30	0.27	113	(72–153)
West NI	35	22	30	35	39	35	0.35	99	(67–132)
Scotland									
Abrdn	50	53	58	53	66	52	0.60	87	(63–110)
Airdrie	48	60	51	50	64	62	0.55	112	(84–140)
D & Gall	10	18	8	22	12	11	0.15	74	(30–118)
Dundee	59	38	42	50	46	45	0.46	97	(69–126)
Edinb	76	82	72	90	97	87	0.96	90	(71–109)
Glasgw	177	184	174	173	221	198	1.62	122	(105–139)
Inverns	12	16	21	22	35	19	0.27	70	(39–102)
Klmarnk	33	40	40	34	39	53	0.36	147	(107–186)
Krkcldy	43	30	38	36	44	32	0.32	101	(66–136)
Wales									
Bangor	20	21	24	22	29	25	0.22	115	(70–160)
Cardff	186	169	171	168	160	161	1.42	113	(96–131)
Clwyd	17	22	17	32	28	16	0.19	84	(43–126)
Swanse	118	118	109	120	136	124	0.89	140	(115–165)
Wrexm	26	34	35	42	45	49	0.24	204	(147–261)
							% increase since 2011		
England	**5,725**	**5,774**	**5,986**	**6,362**	**6,614**	**6,599**	**15.3**		
N Ireland	**204**	**189**	**184**	**178**	**230**	**226**	**10.8**		
Scotland	**508**	**521**	**504**	**530**	**624**	**559**	**10.0**		
Wales	**367**	**364**	**356**	**384**	**398**	**375**	**2.2**		
UK	**6,804**	**6,848**	**7,030**	**7,454**	**7,866**	**7,759**	**14.0**		

[a]See appendix E for details of estimation of catchment populations
[b]pmp – per million population
[c]Cambridge was unable to submit patient level data for 2015 or 2016 but provided the UKRR with information allowing their incident numbers for 2015 and 2016 to be estimated. These numbers have been used here and in table 1.2 but not elsewhere in this chapter

on pre-emptive transplantation or the introduction of conservative care programmes. Analysis of data from patients with chronic kidney disease (CKD) stage 5 who are not receiving RRT is required to explore these underlying mechanisms.

The number of people starting RRT in the UK increased between 2011 and 2016, with an overall rise of 14.0% over these six years.

2. Demographics and clinical characteristics of patients starting RRT

Methods

Age, sex, primary renal disease, ethnic origin and treatment modality were examined for patients starting RRT.

Crude CCG/HB incidence rates were calculated for the over 75 year age group. These are per million age related population (pmarp), i.e. the number of incident patients over 75 years old divided by the population over 75 years old.

A mixture of old and new (2012) ERA-EDTA codes for primary diagnoses [2] were received from centres. For those people without an old code, new codes (where available) were converted to old codes using the mapping available on the ERA-EDTA website. As recommended in the notes for users in the ERA-EDTA's primary renal diagnosis (PRD) code list document, this mapping is provided for guidance only and has not been validated. These codes were grouped into the same eight categories as in previous reports, the details are given in appendix H: Ethnicity and ERA-EDTA Coding (www.renalreg.org).

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 was based on self-reported ethnicity. For the

remaining centres, ethnicity coding was performed by clinical staff and recorded directly into the renal IT system (using a variety of coding systems). Data on ethnic origin were grouped into White, South Asian, Black, Chinese or Other. The details of regrouping of the PAS codes into the above ethnic categories are provided in appendix H: Ethnicity and ERA-EDTA Coding (www.renalreg.org). Chi-squared, Fisher's exact, ANOVA and Kruskal Wallis tests were used as appropriate.

Data were withheld from some tables due to small numbers of patients in a category that increase the possibility of identifying patients. Primary suppression is the withholding of information from risky cells for publication, which means that their value is not shown in the table but replaced by a symbol such as '×' to indicate the suppression. According to the definition of a risky cell, in frequency count tables all cells containing small counts and in tables of magnitudes all cells containing small counts or presenting a case of dominance have to be primary suppressed. To reach the desired protection for risky cells, it is necessary to suppress additional non-risky cells, which is called complementary (secondary) suppression. The pattern of complementary suppressed cells has to be carefully chosen to provide the desired level of ambiguity for the risky cells with the least amount of suppressed information.

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 CKD-EPI equation [3]. The abbreviated four variable MDRD study equation was also used to allow comparison with values published in previous years. For the purpose of the eGFR calculation, patients who had missing ethnicity but a valid serum creatinine measurement were classed as White. The eGFR values were log transformed due to their skewed distribution and geometric means calculated.

Results

Incidence rates appear to have plateaued in the over 65 age group, but continued to rise amongst individuals between 45 and 64 years of age (figure 1.4). Figure 1.5 shows RRT incidence rates for 2016 by age group and sex. The peak rate was in the 80–84 age group for men and 75–79 for women. Figure 1.6 shows the numbers of people starting HD and PD by age group. The age group with the highest number of HD and PD starters was 65–74. Haemodialysis was used proportionately more, with increasing age above the age of 35.

Age

In 2016, the median age of patients starting RRT was 64.3 years (table 1.5) and this has changed little over recent years. Per modality, the median age at start was 66.8 years for patients starting on HD, 60.5 for patients starting on PD and 50.5 for those having a pre-emptive transplant (table 1.6). The median age at start, of non-White patients, was 58.7, considerably lower than that for White patients (66.2 years) reflecting differences in CKD frequency and progression and the younger age distribution of ethnic minority populations in general, compared with the White population (in the 2011 census data for England and Wales, 5.3% of ethnic minorities

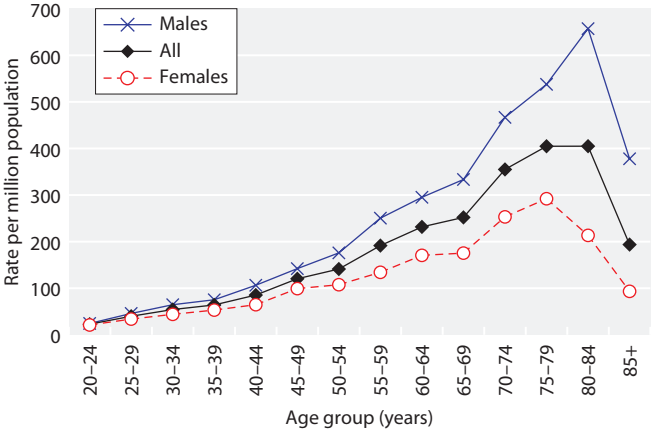

Fig. 1.5. RRT incidence rates in 2016 by age and sex

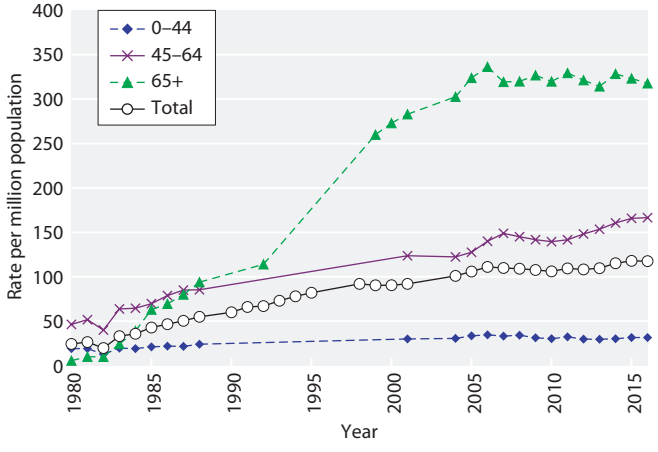

Fig. 1.4. RRT incidence rates between 1980 and 2016

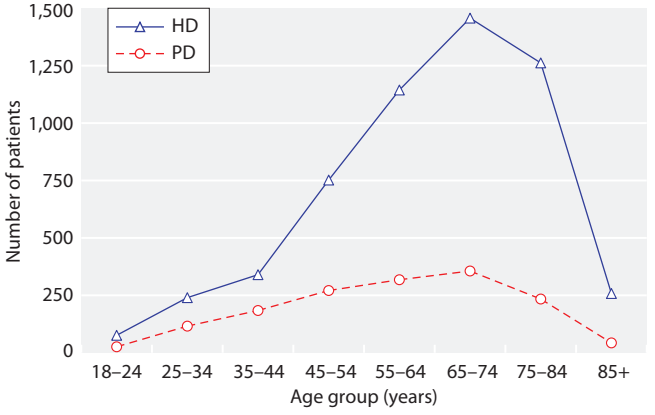

Fig. 1.6. Number of incident dialysis patients in 2016, by age group and initial dialysis modality

were over 65 years old compared to 18.3% of Whites) [4]. The median age of new patients with diabetes was similar to the overall median and has not varied greatly over recent years.

There were large differences between centres in the median age of incident patients (figure 1.7). This is likely to reflect differences in the age and ethnic structure of the catchment populations (for which these data were not adjusted) along with chance, particularly in centres with small numbers of incident patients. Nevertheless, true practice variation may exist. The median age of patients starting treatment at transplant centres was 62.8 years (IQR 50.3, 73.3) and at non-transplanting centres 66.0 years (IQR 52.7, 75.5).

Averaged over 2011–2016, crude CCG/HB incidence rates in the over 75 year age group varied from 57 per million age related population (pmarp) in Borders to 1,048 pmarp in NHS Brent (IQR 259 pmarp, 400 pmarp, data not shown). The variation between CCG/HBs seen in the over 75 year age group was much greater than the variation seen in the overall analysis. Some of this difference is likely to be due to the smaller numbers included in the over 75 analysis.

Table 1.5. Median, inter-quartile range and 90% range of the age of patients starting renal replacement therapy in 2016 by country

Country	Median	IQR	90% range
England	64.3	(51.5–74.5)	(31.4–84.1)
N Ireland	66.0	(51.3–74.2)	(34.5–82.9)
Scotland	62.4	(49.9–72.9)	(32.4–81.9)
Wales	66.3	(55.4–76.5)	(34.3–85.8)
UK	**64.3**	**(51.6–74.5)**	**(31.9–84.0)**

IQR – interquartile range

Table 1.6. Median, inter-quartile range and 90% range of the age of patients starting renal replacement therapy in 2016 by initial treatment modality

Treatment	Median	IQR	90% range
HD	66.8	(54.7–76.0)	(34.0–84.7)
PD	60.5	(47.3–72.0)	(30.2–82.5)
Transplant	50.5	(41.1–60.3)	(26.6–70.5)

IQR – interquartile range

Sex

More men than women started RRT in every age group and this sex effect appeared to increase with age (figure 1.8). The overall breakdown was 62.9% male, 37.1% female.

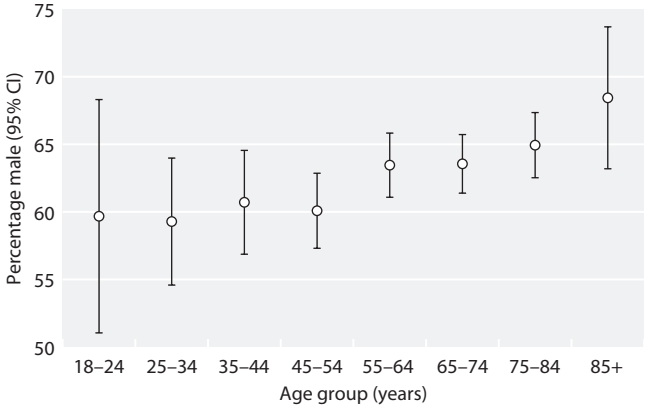

Fig. 1.8. Percentage of patients starting RRT in 2016 who were male, by age group

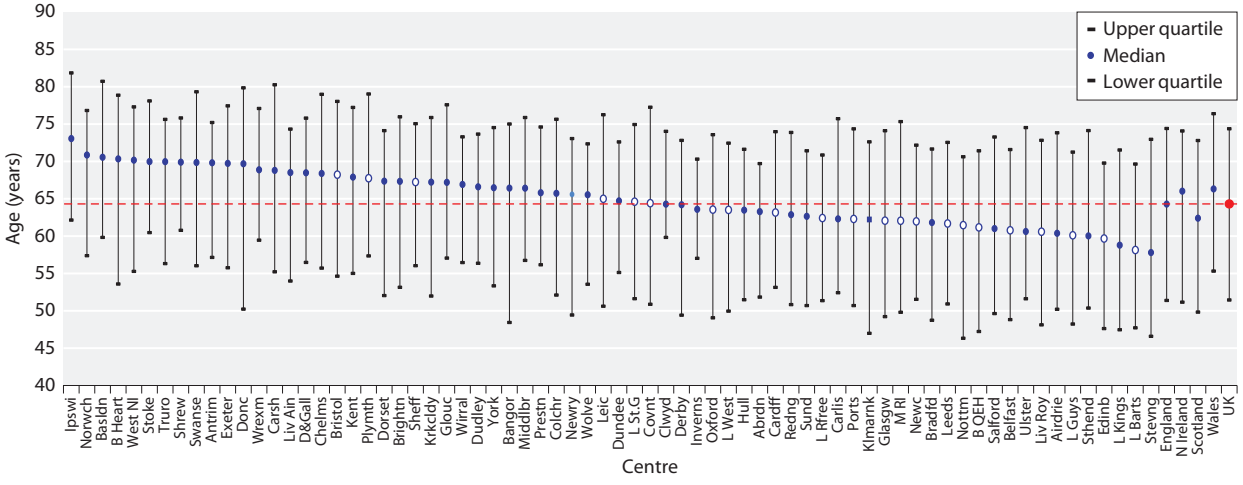

Fig. 1.7. Median age of incident RRT patients by centre in 2016
White points indicate transplant centres

Ethnicity

As in previous reports, Scotland is not included in this section as completeness of ethnicity data was low. Across centres in England, Wales and Northern Ireland the average completeness was 94.9% for 2016 incident patients, similar to the 95.8% seen last year and the 94.8% the year before. Data completeness and the percentage in minority ethnic groups are shown by centre in table 1.7a. Table 1.7b shows the overall detailed ethnicity breakdown for England, Wales and Northern Ireland.

Table 1.7a. Percentage of incident patients (2016) in minority ethnic groups (South Asian, Black, Chinese or Other) by centre

Centre	Percentage with data not available	*N* with data	Percentage non-White
England			
B Heart	0.0	135	34
B QEH	3.8	229	40
Basldn	5.0	38	18
Bradfd	1.2	85	40
Brightn	10.7	134	*
Bristol	19.4	125	12
Carlis	2.9	34	*
Carsh	8.9	224	29
Chelms	0.0	53	*
Colchr	3.3	29	*
Covnt	3.1	124	19
Derby	1.2	85	11
Donc	0.0	62	*
Dorset	1.4	69	*
Dudley	0.0	53	25
Exeter	1.4	141	*
Glouc	1.5	65	*
Hull	2.2	91	*
Ipswi	7.1	39	26
Kent	2.1	138	*
L Barts	0.3	296	69
L Guys	5.3	160	43
L Kings	0.0	152	48
L Rfree	5.0	226	53
L St.G	14.9	80	54
L West	0.0	385	59
Leeds	0.6	165	25
Leic	9.0	295	23
Liv Ain	1.9	52	*
Liv Roy	2.7	108	11
M RI	4.1	210	30
Middlbr	2.0	99	*
Newc	0.0	135	*
Norwch	2.1	95	*
Nottm	0.8	119	19
Oxford	20.2	174	20
Plymth	1.6	62	*
Ports	15.7	161	*
Prestn	0.0	133	16
Redng	15.6	81	23
Salford	3.2	182	21
Sheff	2.6	147	*
Shrew	3.4	56	*
Stevng	14.5	141	26
Sthend	0.0	47	19
Stoke	9.3	97	*
Sund	0.0	94	*
Truro	0.0	50	*
Wirral	2.9	67	*
Wolve	0.0	64	30
York	6.9	67	*
N Ireland			
Antrim	0.0	41	*
Belfast	17.9	78	*
Newry	0.0	25	*
Ulster	0.0	30	*
West NI	2.9	34	*
Wales			
Bangor	12.0	22	*
Cardff	3.7	155	*
Clwyd	18.8	13	*
Swanse	0.0	124	*
Wrexm	6.1	46	*
England	**5.0**	**6,153**	**25**
N Ireland	**8.0**	**208**	*
Wales	**4.0**	**360**	*
E, W & NI	**5.1**	**6,721**	**23**

*<10% in minority ethnic group

Table 1.7b. Percentage of incident RRT patients (2016) in different ethnic groups (England, Wales and Northern Ireland)

Country	% data not available	*N* with data	Percentage in each ethnic group				
			White	South Asian	Black	Chinese	Other
E, W & NI	**5.1**	**6,721**	**76.8**	**12.1**	**7.4**	**0.5**	**3.2**

E, W & NI – England, Wales, Northern Ireland

Table 1.8a. Distribution of primary renal diagnosis by country in the 2012–2016 incident RRT cohort

Centre	Percentage with data not available	*N* with data	Percentage							
			Uncertain aetiology	Diabetes	Glomerulo-nephritis	Hyper-tension	Other	Polycystic kidney	Pyelo-nephritis	Renal vascular disease
England										
B Heart	2	546	16	37	10	9	14	4	7	3
B QEH	0	1,137	16	24	13	6	21	6	5	9
Basldn	3	213	6	30	18	7	12	4	8	15
Bradfd	0	394	18	29	15	8	15	5	5	5
Brightn	1	709	22	22	14	4	19	8	6	6
Bristol	5	733	13	24	14	5	20	10	8	7
Carlis	7	167	*	20	17	17	*	12	8	11
Carsh	58	521								
Chelms	2	246	17	27	15	5	20	5	7	4
Colchr	2	56	32	34	*	*	*	*	*	*
Covnt	7	530	14	23	15	12	14	5	7	10
Derby	1	377	11	32	18	2	17	6	7	6
Donc	1	254	21	20	14	10	20	5	6	5
Dorset	0	369	11	26	13	10	15	11	8	6
Dudley	1	252	25	21	11	7	25	6	*	*
Exeter	1	651	10	23	14	9	18	7	7	13
Glouc	0	339	30	22	14	3	12	8	6	5
Hull	1	493	20	21	17	6	15	11	7	4
Ipswi	50	21								
Kent	1	683	23	23	15	5	17	5	8	4
L Barts	8	1,342	13	36	11	10	15	5	8	3
L Guys	25	459								
L Kings	0	769	10	36	10	18	13	4	5	3
L Rfree	3	1,123	11	32	12	9	23	4	4	6
L St.G	31	331								
L West	0	1,734	11	40	13	3	17	6	5	5
Leeds	0	814	12	23	14	9	19	9	9	4
Leic	19	1,108	22	22	13	6	15	9	8	5
Liv Ain	0	307	15	22	15	10	15	5	8	11
Liv Roy	29	413								
M RI	7	870	10	30	13	13	20	6	6	3
Middlbr	1	563	16	26	13	6	16	8	7	7
Newc	0	561	13	23	15	4	22	8	6	9
Norwch	2	429	26	20	16	4	17	7	6	5
Nottm	0	566	22	22	12	5	20	7	7	5
Oxford	3	905	13	28	16	6	17	9	6	5
Plymth	11	258	7	20	18	7	16	8	6	18
Ports	20	782	9	25	15	9	18	10	8	7
Prestn	1	756	13	25	15	11	16	6	8	6
Redng	1	470	18	30	13	3	18	6	6	6
Salford	27	564								
Sheff	2	737	18	25	19	5	12	7	7	8
Shrew	3	293	22	24	10	4	22	5	6	6
Stevng	9	653	20	24	11	2	29	7	3	4
Sthend	1	178	19	19	15	6	19	10	7	6
Stoke	9	468	7	28	12	8	22	8	5	10
Sund	1	338	5	23	11	19	17	8	9	8
Truro	1	253	9	26	20	8	17	6	7	7
Wirral	11	266	7	32	9	14	25	5	3	5
Wolve	1	398	26	20	12	3	28	4	5	4
York	1	287	8	20	18	10	22	8	7	6

Table 1.8a. Continued

Centre	Percentage with 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	166	33	27	10	*	17	3	7	*
Belfast	8	390	15	20	15	3	21	12	11	3
Newry	0	113	17	26	11	*	21	7	5	*
Ulster	0	144	12	27	10	12	16	4	7	13
West NI	0	161	6	25	12	11	19	5	13	9
Scotland										
Abrdn	0	282	10	31	17	7	18	8	6	4
Airdrie	0	287	18	29	16	3	14	8	7	5
D & Gall	0	71	*	42	14	14	14	*	*	*
Dundee	0	221	12	22	14	9	24	9	5	5
Edinb	0	428	13	26	17	4	20	10	5	5
Glasgw	0	950	11	30	17	2	17	9	6	9
Inverns	1	112	20	19	14	*	25	10	6	*
Klmarnk	0	206	4	30	13	5	17	8	10	14
Krkcldy	7	168	16	24	14	*	17	5	6	*
Wales										
Bangor	2	118	16	27	10	8	15	6	4	13
Cardff	0	828	22	26	18	2	12	9	5	6
Clwyd	11	102	17	27	12	11	21	*	*	*
Swanse	1	601	7	29	17	2	17	4	7	16
Wrexm	1	202	13	23	16	4	15	9	9	9
England	**8**	**27,686**	**15**	**27**	**14**	**8**	**18**	**7**	**7**	**6**
N Ireland	**3**	**974**	**16**	**24**	**12**	**6**	**19**	**7**	**9**	**6**
Scotland	**0**	**2,725**	**12**	**28**	**16**	**4**	**18**	**8**	**6**	**8**
Wales	**1**	**1,851**	**16**	**27**	**17**	**3**	**15**	**7**	**6**	**10**
UK	**7**	**33,236**	**15**	**27**	**14**	**7**	**18**	**7**	**7**	**6**

*values suppressed due to small numbers (primary or secondary suppression – see methods)
The percentage in each category has been calculated after excluding those patients with data not available
Blank cells – centres with >25% missing primary diagnoses, the percentages in the other diagnostic categories have not been calculated
For those centres judged to have high % uncertain aetiology for a year (arbitrarily defined as >45%), their data has not been used for that year

Primary renal diagnosis

The breakdown of PRD by centre is shown for a 2012–2016 incident cohort in table 1.8a. The breakdown by country is shown for 2016 incident patients in table 1.8b. For completeness data for 2016 by centre see the Introduction chapter of this report. Fifty-four centres provided data on over 90% of incident patients and 31 of these centres had 100% completeness. There was only a small amount of missing data for Northern Ireland, Scotland and Wales, whilst England had 12.5% missing. The overall percentage missing was 11.1% and this was similar in the under 65–year olds and those aged 65 and over (10.8% and 11.3% respectively). Eight centres had missing PRD for more than 25% of incident patients.

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 patients with uncertain aetiology. The proportion of these patients will vary between clinicians and centres in part because the diagnostic criteria of conditions such as hypertensive renal disease permit subjectivity. Many of the new ERA-

Table 1.8b. Distribution of primary renal diagnosis by country in the 2016 incident RRT cohort

Country	% data not available	*N* with data	Percentage							
			Uncertain aetiology	Diabetes	Glomerulo-nephritis	Hyper-tension	Other	Polycystic kidney	Pyelo-nephritis	Renal vascular disease
England	12.5	5,669	14.9	28.7	13.0	7.0	17.0	6.9	6.4	6.1
N Ireland	4.0	217	16.6	25.4	12.0	2.3	22.1	6.5	6.9	8.3
Scotland	2.2	547	10.2	30.5	17.0	3.8	17.4	7.3	5.3	8.4
Wales	3.2	363	14.9	26.5	16.5	3.0	16.5	7.2	6.6	8.8
UK	**11.1**	**6,796**	**14.6**	**28.6**	**13.5**	**6.3**	**17.2**	**7.0**	**6.4**	**6.5**

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

EDTA codes allow clinicians to indicate the basis for the diagnosis of the PRD (e.g. biopsy-proven, or not). Adoption of these codes should reduce 'uncertain' PRD coding. There was wide variation in all PRD codes between centres.

The UK age distribution of PRDs is shown in table 1.9. Diabetic nephropathy was the most common renal diagnosis overall and in all age groups except the under 35s and those over 85. Glomerulonephritis and autosomal dominant polycystic kidney disease (ADPKD) made up much higher proportions of the younger than the older incident cohorts, whilst patients with renal vascular disease comprised a much higher percentage of the older rather than the younger patients. Aetiological uncertainty increased with age.

Table 1.10 shows the incidence rates for each PRD per million population for the 2016 cohort. As there were some missing data, the rates for at least some of the diagnoses will be underestimates.

First established treatment modality

In 2016, the first treatment recorded, irrespective of any later change, was haemodialysis in 72.4% of patients, peritoneal dialysis in 20.3% and pre-emptive transplant in 7.4% (table 1.11). The percentage having a pre-emptive transplant fell in 2015, however, about half of the apparent drop was due to Cambridge (a transplant centre) not being included in the data for 2015 or 2016. Table F.1.3 in appendix F: Additional Data Tables for 2016 new and existing patients gives the treatment breakdown at start of RRT by centre.

Many patients undergo a period of HD before switches to other modalities are, or can be, considered. The modality in use at 90 days may be more representative of the first elective modality and is adopted for the remainder of this section. For these analyses, the incident cohort from 1 October 2015 to 30 September 2016 was used so that follow up to 90 days was possible for all patients. By 90 days, 4.0% of incident patients had died

Table 1.9. Percentage distribution of primary renal diagnosis by age in the 2016 incident RRT cohort

Diagnosis	Percentage with diagnosis								Percentage male
	Age group							All	
	18–<35	35–<45	45–<55	55–<65	65–<75	75–<85	85+		
Diabetes	17.3	26.1	30.7	37.6	30.3	23.1	12.9	28.6	65
Glomerulonephritis	27.0	19.8	17.0	13.5	11.1	7.5	4.7	13.5	69
Pyelonephritis	8.5	6.7	4.2	4.4	7.0	7.6	9.4	6.4	60
Hypertension	3.9	5.4	6.9	5.1	6.3	8.2	8.6	6.3	69
Polycystic kidney	2.2	11.0	13.8	8.8	5.2	2.7	2.0	7.0	51
Renal vascular disease	0.6	1.1	1.5	3.5	8.1	13.0	21.1	6.5	67
Other	25.4	16.8	15.5	16.4	17.1	17.2	14.1	17.2	58
Uncertain aetiology	15.0	13.2	10.4	10.6	14.8	20.7	27.3	14.6	61

Percentages calculated after excluding those patients with data not available

Table 1.10. Primary renal diagnosis RRT incidence rates (2016) per million population (unadjusted)

Diagnosis	England	N Ireland	Scotland	Wales	UK
Diabetes	30.0	29.5	30.9	30.8	30.1
Glomerulonephritis	13.6	14.0	17.2	19.3	14.2
Pyelonephritis	6.7	8.1	5.4	7.7	6.7
Hypertension	7.3	2.7	3.9	3.5	6.7
Polycystic kidney	7.3	7.5	7.4	8.4	7.3
Renal vascular disease	6.4	9.7	8.5	10.3	6.8
Other	17.9	25.8	17.6	19.3	18.1
Uncertain aetiology	15.7	19.3	10.4	17.3	15.4
Data not available	15.0	4.8	2.2	3.9	13.1
All	**120**	**121**	**103**	**120**	**119**

The overall rates per country may be slightly different to those in table 1.2 as Cambridge (due to missing data) and Colchester (due to high percentage with uncertain aetiology) have been excluded from both the numerator and the denominator here

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

Start	HD (%)	PD (%)	Transplant (%)
Day 0 treatment			
2011	72.7	20.4	6.9
2012	72.8	19.5	7.7
2013	71.9	19.3	8.8
2014	71.9	19.9	8.3
2015	73.0	19.3	7.7
2016	72.4	20.3	7.4
Day 90 treatment			
Oct 2010 to end Sept 2011	70.9	20.5	8.6
Oct 2011 to end Sept 2012	70.9	20.1	9.0
Oct 2012 to end Sept 2013	70.0	19.9	10.2
Oct 2013 to end Sept 2014	69.7	20.1	10.2
Oct 2014 to end Sept 2015	71.3	19.4	9.3
Oct 2015 to end Sept 2016	69.8	20.5	9.7

and a further 0.6% had stopped treatment, leaving 95.4% of the original cohort still on RRT. Table 1.12a shows the percentages on each treatment modality at 90 days both as percentages of all of those starting RRT and then of those still on treatment at 90 days. Expressed as percentages of the whole incident cohort, 66.5% were on HD at 90 days, 19.6% were on PD and 9.3% had received a transplant. Expressed as percentages of those still receiving RRT at 90 days, 69.8% were on HD, 20.5% on PD and 9.7% had received a transplant.

Figure 1.9 shows the modality breakdown with the HD patients further subdivided. Of those still on RRT at 90 days, 41% were treated with hospital HD, 28% with satellite HD, and only 0.4% were receiving home HD at this early stage, equating to 32 patients (across 15 centres).

Table 1.12b shows the treatment breakdown at 90 days by centre for a five year cohort (1 October 2011 to 30 September 2016). Using just 2016 incident patients, the percentage of patients receiving RRT at 90 days with a functioning transplant varied between centres from 0% to 31% (between 2% and 31% for transplanting centres and between 0% and 19% for non-transplanting centres). The mean percentage of the incident cohort with a functioning transplant at 90 days was greater in transplanting compared to non-transplanting centres (12.1% vs 6.7%).

Table 1.12a. RRT modality at 90 days by country (incident cohort 1/10/2015 to 30/09/2016)

		Status at 90 days of all patients who started RRT (%)					Status at 90 days of only those patients still on RRT (%)		
Centre	*N*	HD	PD	Tx	Recovered/ discontinued	Died	HD	PD	Tx
England	6,414	65.8	20.1	9.3	0.6	4.1	69.1	21.1	9.8
N Ireland	245	65.3	15.9	14.7	2.0	2.0	68.1	16.6	15.3
Scotland	603	72.4	14.9	8.8	0.0	3.8	75.3	15.5	9.1
Wales	387	70.0	19.6	5.7	*	*	73.4	20.6	6.0
UK	**7,649**	**66.6**	**19.6**	**9.3**	**0.6**	**4.0**	**69.8**	**20.5**	**9.7**

*Values suppressed due to small numbers (primary or secondary suppression)

Table 1.12b. RRT modality at 90 days by centre (incident cohort 1/10/2011 to 30/09/2016)

Centre	*N*	Percentage who had died by 90 days	Percentage of patients still on RRT at 90 days, by modality		
			HD	PD	Tx
England					
B Heart	560	5	74	23	3
B QEH	1,147	2	73	18	9
Basldn	218	4	*	25	*
Bradfd	399	4	77	13	10
Brightn	703	6	70	23	7
Bristol	765	5	71	18	11
Camb	418	3	64	10	26
Carlis	179	*	54	40	6
Carsh	1,237	6	74	20	7
Chelms	244	*	*	20	*
Colchr	157	7	*	*	*
Covnt	574	8	62	28	10
Derby	383	3	56	41	2
Donc	258	4	73	24	2
Dorset	374	1	68	27	4
Dudley	256	2	*	34	*
Exeter	657	3	74	20	6
Glouc	339	2	71	26	3
Hull	492	4	60	32	8
Ipswi	219	3	64	29	7
Kent	676	5	72	18	11
L Barts	1,459	4	64	29	7
L Guys	763	2	73	10	17
L Kings	764	2	71	25	4
L Rfree	1,142	4	61	27	11
L St.G	462	5	76	14	10
L West	1,736	2	82	7	10
Leeds	815	5	66	15	19
Leic	1,335	5	71	17	13
Liv Ain	306	10	69	28	3
Liv Roy	590	8	57	25	18
M RI	939	5	62	19	19
Middlbr	573	5	79	8	13
Newc	551	6	69	20	10
Norwch	437	5	79	18	4
Nottm	560	5	55	30	15
Oxford	913	4	59	23	17
Plymth	280	6	64	22	14
Ports	975	3	71	17	12
Prestn	760	4	72	16	12
Redng	486	5	60	32	8
Salford	754	4	63	25	11
Sheff	739	4	78	14	8
Shrew	296	6	69	28	3
Stevng	699	6	79	12	9
Sthend	181	6	69	26	5
Stoke	519	6	71	26	3
Sund	335	2	83	11	6
Truro	252	8	74	18	9
Wirral	296	14	74	21	5
Wolve	403	6	61	37	2
York	293	3	62	24	14

Table 1.12b. Continued

Centre	*N*	Percentage who had died by 90 days	Percentage of patients still on RRT at 90 days, by modality		
			HD	PD	Tx
N Ireland					
Antrim	169	4	80	16	4
Belfast	427	2	58	13	29
Newry	117	5	*	32	*
Ulster	144	8	*	13	*
West NI	162	3	77	17	5
Scotland					
Abrdn	277	4	*	20	*
Airdrie	292	*	*	16	*
D & Gall	70	*	60	40	0
Dundee	218	2	*	17	*
Edinb	422	4	70	11	19
Glasgw	940	3	76	11	13
Inverns	108	*	71	24	5
Klmarnk	202	6	*	22	*
Krkcldy	180	3	*	16	*
Wales					
Bangor	114	4	*	21	*
Cardff	844	5	72	17	11
Clwyd	114	6	74	22	5
Swanse	611	5	75	20	5
Wrexm	197	4	66	27	6
England	**30,868**	**4**	**70**	**21**	**10**
N Ireland	**1,019**	**4**	**69**	**16**	**14**
Scotland	**2,709**	**3**	**76**	**15**	**8**
Wales	**1,880**	**5**	**73**	**20**	**8**
UK	**36,476**	**4**	**70**	**20**	**10**

*Values suppressed due to small numbers (primary or secondary suppression)

Table 1.13 gives the HD/PD breakdown by age group for patients receiving dialysis at 90 days (incident cohort 1/10/2013 to 30/09/2016). The percentage on PD at 90 days was about 50% higher in patients aged under 65 years than in older patients (27% vs 18%). In both age groups there was a lot of variability between centres in the percentage on PD. There were a small number of centres where the percentage of patients treated with PD was the same as, or higher in the over 65s than the under 65s. Not all of these were centres with a high use of PD.

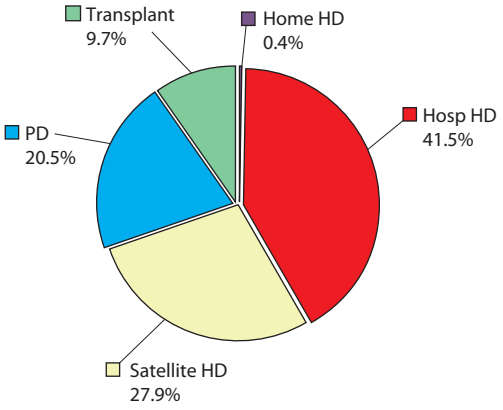

Fig. 1.9. RRT modality at 90 days (incident cohort 1/10/2015 to 30/09/2016)

Modality change over time

Table 1.14 gives the breakdown of status/treatment modality at four subsequent time points by initial treatment type for patients starting RRT in 2011. Fifty-three percent of patients who started on HD had died within five years of starting. This compared to 35% and 5% for those starting on PD or transplant respectively. Of the patients starting on PD, 91% were on PD at 90 days but this percentage dropped sharply at the later time

Table 1.13. Modality split of patients on dialysis at 90 days (incident cohort 1/10/2013 to 30/09/2016)

	Age <65 (%)		Age ⩾65 (%)	
Centre	HD	PD	HD	PD
England				
B Heart	65	35	80	20
B QEH	74	26	86	14
Basldn	69	31	76	24
Bradfd	84	16	93	8
Brightn	76	24	79	21
Bristol	74	26	84	17
Carlis	60	40	54	46
Carsh	72	28	85	16
Chelms	75	25	78	22
Colchr	100	0	100	0
Covnt	65	36	73	27
Derby	49	51	69	32
Donc	74	26	78	22
Dorset	71	29	75	25
Dudley	54	46	72	28
Exeter	68	32	82	18
Glouc	61	39	78	22
Hull	56	44	74	26
Ipswi	67	33	67	33
Kent	74	26	86	14
L Barts	67	33	74	26
L Guys	89	11	90	10
L Kings	70	30	78	22
L Rfree	61	39	70	30
L St.G	88	12	83	18
L West	90	10	91	9
Leeds	75	25	88	12
Leic	80	20	85	15
Liv Ain	58	42	79	21
Liv Roy	68	32	76	24
M RI	74	26	83	17
Middlbr	85	15	93	7
Newc	74	26	76	24
Norwch	75	26	88	12
Nottm	56	44	79	21
Oxford	62	38	79	21
Plymth	72	28	76	24
Ports	76	24	86	14
Prestn	80	20	83	17
Redng	56	44	72	28
Salford	67	33	74	26
Sheff	84	16	88	12
Shrew	52	48	81	19
Stevng	84	16	94	6
Sthend	69	31	67	33
Stoke	63	37	80	21
Sund	86	14	94	7
Truro	76	24	89	11
Wirral	71	29	87	13
Wolve	59	41	74	26
York	61	39	80	20
N Ireland				
Antrim	72	28	91	9
Belfast	75	25	84	16
Newry	78	22	65	36
Ulster	80	20	87	13
West NI	85	15	85	15
Scotland				
Abrdn	71	29	96	4
Airdrie	84	17	84	16
D & Gall	57	44	59	41
Dundee	81	19	83	17
Edinb	86	14	85	15
Glasgw	85	15	90	10
Inverns	72	28	84	16
Klmarnk	76	24	79	21
Krkcldy	73	27	88	12
Wales				
Bangor	74	26	77	23
Cardff	74	26	87	13
Clwyd	63	38	86	14
Swanse	69	31	90	10
Wrexm	51	49	85	16
England	**73**	**27**	**82**	**18**
N Ireland	**78**	**22**	**85**	**16**
Scotland	**80**	**20**	**86**	**14**
Wales	**69**	**31**	**87**	**13**
UK	**73**	**27**	**82**	**18**

points. In contrast, 90% of patients starting with a transplant were also transplant patients at the five year time point.

Renal function at the time of starting RRT

The mean eGFR at initiation of RRT in 2016 was 7.4 ml/min/1.73 m^2. This was markedly lower than the 8.5 ml/min/1.73 m^2 reported last year. This difference is due to the use of the CKD-EPI rather than the MDRD formula. By the MDRD method the mean eGFR was 8.5 ml/min/1.73 m^2 in 2016. The mean eGFR at initiation of RRT is shown by age group in figure 1.10.

Figure 1.11 shows serial data from centres reporting to the UKRR every year since 2007. There has been a tendency for patients to start PD at higher eGFRs than HD recipients, seen again in 2016 (7.5 vs 7.1 ml/min/1.73 m^2).

Some caution should be applied to the analysis of eGFR at the start of RRT as data were only available for less than half of the incident patients (approximately

Table 1.14. Initial and subsequent modalities for patients starting RRT in 2011*

First treatment	*N*	Later modality	Percentage			
			90 days	1 year	3 years	5 years
HD	4,864	HD	90	73	47	28
		PD	2	4	1	1
		Transplant	1	5	13	17
		Recovered/discontinued	0	1	2	1
		Died	6	18	37	53
PD	1,370	HD	6	15	20	17
		PD	91	67	28	10
		Transplant	1	10	30	37
		Recovered/discontinued	0	0	1	1
		Died	2	7	22	35
Transplant	448	HD	0	1	4	5
		PD	1	0		
		Transplant	98	97	92	90
		Died	1	1	4	5

*Cambridge excluded as five year follow up not available
Light grey shading indicates proportion of individuals maintained on their initial modality

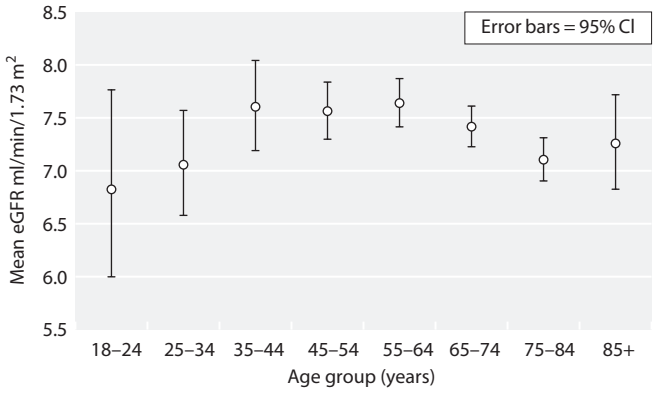

Fig. 1.10. Mean eGFR at start of RRT (2016) by age group
Note, for this report the CKD-EPI method was used for the first time rather than the MDRD method
CKD-EPI estimated mean GFR at start approximately 1 ml/min/1.73 m^2 lower than MDRD

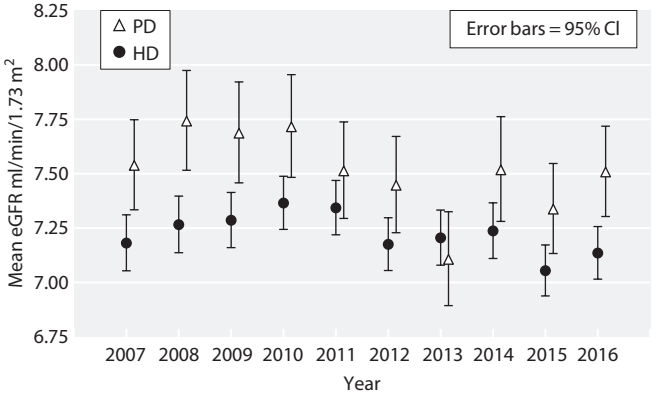

Fig. 1.11. eGFR on starting RRT 2007 to 2016, PD and HD (restricted to centres reporting since 2007)
Note, for this report the CKD-EPI method was used for the first time rather than the MDRD method
CKD-EPI estimated mean GFR at start approximately 1 ml/min/1.73 m^2 lower than MDRD

3,100 for 2016) and almost half of these came from only ten centres. Three-quarters of the values came from 20 centres. Further caution should be applied as some patients may have an incorrect date of starting RRT allocated and thus, the eGFR used for analysis may have been taken whilst they were already receiving RRT. This analysis is presented despite these deficiencies for comparision with historical data. Completeness of eGFR data and accuracy of start date are anticipated to improve with the introduction of realtime data downloads and more complete collection of HD sessional data.

3. Late presentation and delayed referral of incident patients

Introduction

Late presentation to a nephrologist is regarded as a negative aspect in renal care. It can be defined in a number of ways as it has a range of possible causes. There are many patients with CKD who are regularly monitored in primary or secondary care and whose referral to nephrology services is delayed (delayed or

late referral). Other patients present late to medical services with either such slowly progressive disease as to have remained asymptomatic for many years or with rapidly progressive kidney disease. 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 for ERF as 'late presentation'. One analysis attempts to capture 'late referrals': it shows the percentage presenting within 90 days of starting RRT after excluding conditions that are likely to present with rapid decline in renal function.

Methods

Date first seen by a nephrologist has not been collected from the Scottish Renal Registry and so Scottish centres were excluded from these analyses. Data were included for incident patients in English, Welsh or Northern Irish centres in the years 2015 to 2016. This two year cohort was used for most of the analyses in order to make the late presentation percentages more reliably estimated and to allow these to be shown for subgroups of patients. The date first seen in a renal centre and the date of starting RRT were used to define the late presenting cohort. A small amount of data was excluded because of actual or potential inconsistencies. Only data from those centres with 75% or more completeness for the relevant year were used. Data were excluded if more than 10% of 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 10,966 patients were available for analysis. Presentation times of 90 days or more before start were defined as early presentation and times of less than 90 days were defined as late presentation.

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

A mixture of old and new (2012) EDTA codes for primary diagnoses were received from centres. For those people without an old code, new codes (where available) were mapped back to old codes. These codes were grouped into the same eight categories as in previous reports, the details are given in appendix H: Ethnicity and ERA-EDTA Coding (www.renalreg.org).

People with the following conditions were allocated to an 'acute' group in some analyses: crescentic (extracapillary) glomerulonephritis (type I, II, III), nephropathy (interstitial) due to cisplatinum, renal vascular disease due to malignant hypertension, renal vascular disease due to polyarteritis, Wegener's granulomatosis, cryoglobulinemic glomerulonephritis, myelomatosis/light chain deposit disease, Goodpasture's syndrome, systemic sclerosis (scleroderma), haemolytic ureaemic syndrome, multi-system disease – other, tubular necrosis (irreversible) or cortical necrosis, Balkan nephropathy, kidney tumour(s), and traumatic or surgical loss of kidney(s).

Results

Data completeness

Table 1.15 shows the percentage completeness of data for 2015 and 2016.

Late presentation by centre

Figure 1.12 shows that late presentation varied between centres from 5% to 34% in patients starting RRT in 2015 to 2016. The overall rate of late presentation was 15.9% and reduced to 11.2% once those people with diseases likely to present acutely were excluded. Table 1.16 shows the overall percentage presenting late for the combined 2015/2016 incident cohort, the percentages presenting late amongst those patients defined as

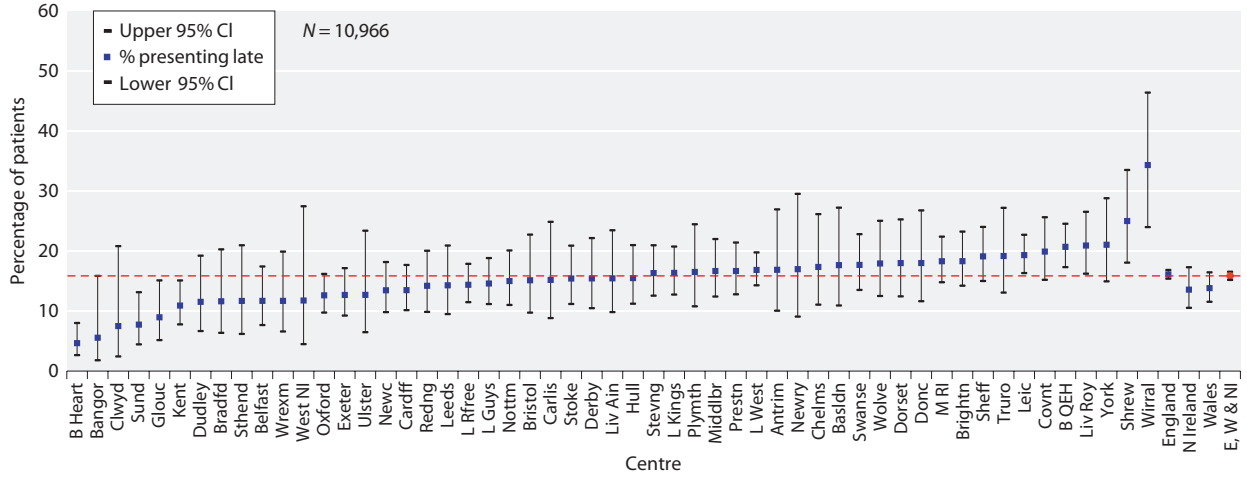

Fig. 1.12. Percentage presenting late (2015/2016)

Table 1.15. Percentage completeness of time of presentation data (2015 and 2016 incident RRT patients) by centre

	N		Percentage completeness	
Centre	2015	2016	2015	2016
England				
B Heart	123	135	100.0	100.0
B QEH	245	238	100.0	100.0
Basldn	48	40	97.9	95.0
Bradfd	91	86	100.0 *	100.0
Brightn	144	150	95.1	98.0
Bristol	146	155	81.5	73.6
Carlis	46	35	100.0	94.3
Carsh	260	246	46.9	41.5
Chelms	51	53	98.0	90.6
Colchr	28	30	67.9	46.7
Covnt	111	128	92.8	96.1
Derby	64	86	98.4	100.0
Donc	39	62	100.0	98.4
Dorset	75	70	94.7	97.1
Dudley	51	53	100.0	100.0
Exeter	137	143	100.0	97.2
Glouc	72	66	100.0	93.9
Hull	121	93	99.2	100.0
Ipswi	67	42	16.4	23.8
Kent	143	141	100.0	100.0
L Barts	311	297	1.9*	1.4
L Guys	179	169	94.4	94.7
L Kings	180	152	99.4	99.3
L Rfree	239	238	98.7	96.6
L St.G	114	94	69.3	16.0
L West	337	385	99.4	99.5
Leeds	147	166	100.0	100.0*
Leic	270	324	100.0	98.8
Liv Ain	61	53	95.1	98.1
Liv Roy	141	111	91.5	99.1
M RI	198	219	97.0	94.5
Middlbr	134	101	99.3	100.0
Newc	125	135	100.0	100.0
Norwch	112	97	100.0*	96.9*
Nottm	120	120	100.0	100.0
Oxford	195	218	100.0	99.5
Plymth	53	63	98.1	100.0
Ports	200	191	70.5	41.4
Prestn	163	133	97.6	97.0
Redng	87	96	100.0	100.0
Salford	173	188	11.6*	5.9
Sheff	146	151	98.0	99.3
Shrew	62	58	100.0	100.0
Stevng	136	165	100.0	99.4
Sthend	35	47	91.4	95.7
Stoke	116	107	94.0	98.1
Sund	63	94	98.4	98.9
Truro	70	50	100.0	100.0
Wirral	64	69	98.4*	97.1
Wolve	85	64	98.8	95.3
York	61	72	100.0	100.0
N Ireland				
Antrim	36	41	100.0	100.0
Belfast	94	95	93.6	87.4
Newry	28	25	100.0	100.0
Ulster	33	30	100.0	100.0
West NI	39	35	100.0*	97.1
Wales				
Bangor	29	25	100.0	100.0
Cardff	160	161	99.4	99.4
Clwyd	28	16	96.4	81.3
Swanse	136	124	100.0	100.0
Wrexm	45	49	100.0	100.0
England	**6,439**	**6,479**	**82.0**	**80.6**
N Ireland	**230**	**226**	**80.4**	**94.2**
Wales	**398**	**375**	**99.5**	**98.9**
E, W & NI	**7,067**	**7,080**	**83.0**	**82.0**

*Completeness data shown but data not used as >10% of patients with data reported as starting RRT on same date as first presentation

not having an 'acute diagnosis' and the percentages amongst non-diabetics (as PRD).

Considerable differences exist between centres in late presentation rates. One centre (Birmingham Heartlands) attained a late presentation rate of just under 5%. Two centres (Wirral, York) reported that over 40% of their incident patients were referred late. These differences have implications for their regions and referral pathways.

Late presentation in 2016 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. In 2016, 72.1% of incident patients presented to nephrology services over a year before they started RRT. The remaining patients presented within a year of start, with 7.8% of patients presenting within the 6–12 month window before RRT, 4.5% within 3–6 months and 15.6% within three months of RRT start. Figure 1.13 shows this breakdown by year for those 37 centres supplying data over 75% complete for each of the last six years. The figure shows an increase over time in the percentage of patients presenting a year or more before starting RRT. As shown in previous reports this increase was even more marked in the years before those shown in the figure. In 2005,

Table 1.16. Percentage of patients presenting to a nephrologist less than 90 days before RRT initiation and percentage presenting less than a year before initiation (2015/2016 incident patients) by centre

Centre	*N* with data	Percentage presenting <90 days before start				Percentage presenting <1 year before start[b]	
		Overall	(95% CI)	Non-acute[a]	Non-diab PRD		(95% CI)
England							
B Heart	258	4.7	(2.7–8.0)	3.9	6.2	13.2	(9.6–17.9)
B QEH	483	20.7	(17.3–24.6)	15.7	23.3	34.6	(30.5–38.9)
Basldn	85	17.7	(10.9–27.2)	14.1	23.7	31.8	(22.8–42.4)
Bradfd	86	11.6	(6.4–20.3)	10.7	16.0	16.3	(9.9–25.6)
Brightn	284	18.3	(14.2–23.2)	11.9	21.5	35.2	(29.9–40.9)
Bristol	119	15.1	(9.7–22.7)	9.6	18.4	22.7	(16.0–31.1)
Carlis	79	15.2	(8.8–24.9)	9.8	16.7	24.1	(15.9–34.7)
Chelms	98	17.4	(11.1–26.2)	15.7	19.2	38.8	(29.7–48.7)
Covnt	226	19.9	(15.2–25.6)	14.4	22.9	33.6	(27.8–40.0)
Derby	149	15.4	(10.5–22.2)	9.0	21.9	25.5	(19.2–33.1)
Donc	100	18.0	(11.6–26.8)	10.5	23.1	30.0	(21.8–39.7)
Dorset	139	18.0	(12.5–25.3)	11.7	21.2	32.4	(25.1–40.6)
Dudley	104	11.5	(6.7–19.2)	8.2	13.9	24.0	(16.8–33.2)
Exeter	276	12.7	(9.3–17.2)	8.5	14.3	23.2	(18.6–28.5)
Glouc	134	9.0	(5.2–15.1)	6.5	12.0	16.4	(11.1–23.7)
Hull	213	15.5	(11.2–21.0)	13.4	17.5	35.7	(29.5–42.3)
Kent	284	10.9	(7.8–15.1)	7.4	12.2	16.9	(13.0–21.7)
L Guys	329	14.6	(11.2–18.8)	10.6	18.3	27.1	(22.5–32.1)
L Kings	330	16.4	(12.8–20.8)	12.9	21.2	29.1	(24.4–34.2)
L Rfree	466	14.4	(11.5–17.9)	11.4	16.2	26.0	(22.2–30.1)
L West	718	16.9	(14.3–19.8)	13.8	21.0	31.3	(28.1–34.8)
Leeds	147	14.3	(9.5–20.9)	9.1	15.9	27.9	(21.2–35.7)
Leic	590	19.3	(16.3–22.7)	10.5	22.4	32.0	(28.4–35.9)
Liv Ain	110	15.5	(9.8–23.5)	9.3	20.2	21.8	(15.1–30.5)
Liv Roy	239	20.9	(16.2–26.5)			28.5	(23.1–34.5)
M RI	399	18.3	(14.8–22.4)	10.1	23.9	34.3	(29.8–39.1)
Middlbr	234	16.7	(12.4–22.0)	13.0	20.5	29.5	(24.0–35.6)
Newc	260	13.5	(9.8–18.2)	9.9	15.9	26.5	(21.5–32.2)
Nottm	240	15.0	(11.0–20.1)	9.1	18.1	23.8	(18.8–29.5)
Oxford	412	12.6	(9.8–16.2)	7.4	15.8	23.8	(19.9–28.1)
Plymth	115	16.5	(10.8–24.5)	12.9	19.1	29.6	(22.0–38.5)
Prestn	288	16.7	(12.8–21.4)	11.3	20.9	28.1	(23.2–33.6)
Redng	183	14.2	(9.9–20.1)	9.8	19.1	26.8	(20.9–33.7)
Sheff	293	19.1	(15.0–24.0)	13.2	23.6	30.4	(25.4–35.9)
Shrew	120	25.0	(18.1–33.5)	21.9	28.9	34.2	(26.3–43.1)
Stevng	300	16.3	(12.6–21.0)	9.5	21.1	22.3	(18.0–27.4)
Sthend	77	11.7	(6.2–21.0)	8.6	12.7	27.3	(18.5–38.2)
Stoke	214	15.4	(11.2–20.9)	8.1	17.8	35.1	(29.0–41.7)
Sund	155	7.7	(4.5–13.1)	5.3	9.2	25.2	(19.0–32.6)
Truro	120	19.2	(13.1–27.2)	16.8	24.4	32.5	(24.7–41.4)
Wirral	67	34.3	(24.0–46.4)	32.8	42.5	58.2	(46.2–69.4)
Wolve	145	17.9	(12.5–25.0)	15.4	22.2	32.4	(25.3–40.4)
York	133	21.1	(15.0–28.8)	19.1	22.4	42.1	(34.0–50.6)
N Ireland							
Antrim	77	16.9	(10.1–26.9)	11.8	22.6	22.1	(14.2–32.7)
Belfast	171	11.7	(7.7–17.4)	6.2	13.6	20.5	(15.1–27.2)
Newry	53	17.0	(9.1–29.5)	15.2	21.4	26.4	(16.3–39.8)
Ulster	63	12.7	(6.5–23.4)	9.1	15.6	22.2	(13.6–34.1)
West NI	34	11.8	(4.5–27.5)	9.4	16.0	14.7	(6.3–30.8)

Table 1.16. Continued

Centre	*N* with data	Percentage presenting <90 days before start				Percentage presenting <1 year before start[b]	
		Overall	(95% CI)	Non-acute[a]	Non-diab PRD		(95% CI)
Wales							
Bangor	54	5.6	(1.8–15.9)	5.8	7.0	11.1	(5.1–22.6)
Cardff	319	13.5	(10.2–17.7)	10.5	16.3	23.5	(19.2–28.5)
Clwyd	40	7.5	(2.4–20.8)	[c]	0.0	10.0	(3.8–23.8)
Swanse	260	17.7	(13.5–22.8)	12.1	23.2	28.9	(23.7–34.7)
Wrexm	94	11.7	(6.6–19.9)	7.1	13.9	21.3	(14.2–30.7)
England	**9,801**	**16.1**	**(15.4–16.9)**	**11.4**	**19.3**	**28.7**	**(27.8–29.6)**
N Ireland	**398**	**13.6**	**(10.5–17.3)**	**9.4**	**16.7**	**21.4**	**(17.6–25.7)**
Wales	**767**	**13.8**	**(11.6–16.5)**	**10.2**	**17.0**	**23.5**	**(20.6–26.6)**
E, W & NI	**10,966**	**15.9**	**(15.2–16.6)**	**11.2**	**19.0**	**28.0**	**(27.2–28.9)**
Min		**4.7**		**3.9**	**0.0**	**10.0**	
Quartile 1		**12.7**		**9.0**	**15.9**	**22.7**	
Quartile 3		**17.9**		**13.1**	**22.3**	**32.0**	
Max		**34.3**		**32.8**	**42.5**	**58.2**	

Blank cells – data for PRD not used due to high % with missing data or high % with uncertain aetiology
[a]Non-acute group excludes those diagnoses defined as acute (see methods)
[b]The remaining patients starting RRT therefore presented over 1 year beforehand
[c]Value suppressed due to small numbers

only 52.6% of incident patients presented over a year before they started RRT.

Characteristics of patients presenting late versus those presenting early

In the combined 2015/2016 incident cohort, the median age was a little lower in those presenting late than those presenting early (table 1.17). The percentage who were male was higher in the group presenting late than those presenting early. There were large differences in the percentages starting on PD and in haemoglobin and eGFR at start with all three of these being lower in late presenters than in early presenters. More detailed analyses of haemoglobin at start of RRT and late presentation can be found in chapter 7: Haemoglobin, Ferritin and Erythropoietin in UK Adult Dialysis Patients in 2016. The finding of lower average eGFR in those presenting late is in contrast to some of the studies in the literature but many of those studies pre-date the era of routine use of eGFR [5, 6]. A Cochrane review [7] showed that eGFR was lower in RRT patients referred

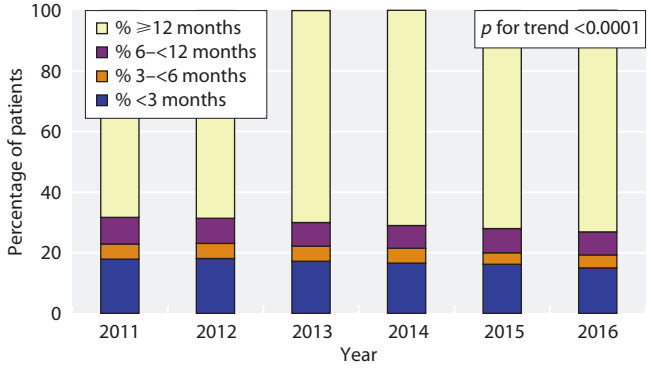

Fig. 1.13. Late presentation rate by year (2011–2016)
Restricted to centres reporting continuous data for 2011–2016

Table 1.17. Patient characteristics amongst patients presenting late (<90 days) compared with those presenting early (⩾90 days) (2015/2016 incident patients)

	<90 days	⩾90 days	*p*-value
Median age	63.8	64.9	0.01
Percentage male	65.8	62.3	0.01
Percentage starting on PD	9.7	22.4	>0.0001
Percentage on PD at 90 days	12.0	22.2	>0.0001
Mean haemoglobin at RRT start (g/L)[a]	91	100	>0.0001
Mean eGFR at RRT start (ml/min/1.73 m^2)[ab]	6.7	7.5	>0.0001

[a]Data only available for about 50% of patients
[b]Note, for this report the CKD-EPI method was used for the first time rather than the MDRD method
CKD-EPI estimated mean GFR at start approximately 1 ml/min/1.73 m^2 lower than MDRD

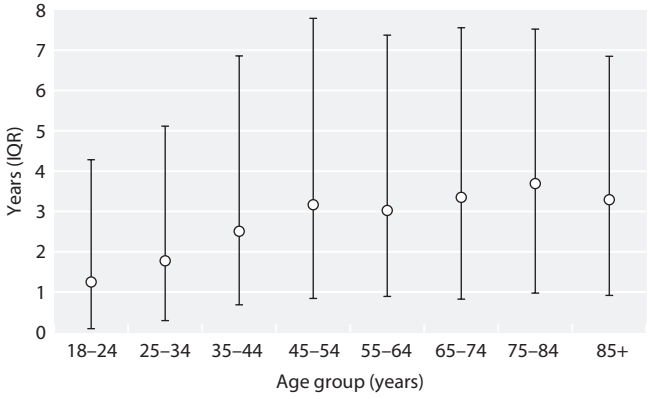

Fig. 1.14. Median duration of pre-RRT care by age group (incident patients 2015/2016)

late (mean difference of 0.42 ml/min/1.73 m^2) compared to those presenting early (definition: more than six months before starting RRT) consistent with UKRR data.

In the 2015/2016 cohort, the percentage of non-White patients presenting late (<90 days) was lower than in Whites (13.8% vs 16.3%: $p = 0.005$). The high incidence of diabetes in non-Whites (patients with diabetes tended to present earlier) explains some of the difference in presentation time between the groups. When patients with diabetes were excluded, the percentages presenting late (<90 days) became 18.3% in non-White patients vs 19.5% in Whites ($p = 0.3$). Above age 45, the median duration of pre-RRT care did not vary greatly with age group (figure 1.14).

Primary renal disease and late presentation

In the 2015/2016 cohort, there were large differences in late presentation rates between PRDs (Chi-squared test $p < 0.0001$) (table 1.18). Patients with conditions likely to present with rapid decline in renal function or without available data had high rates of late presentation, as anticipated. Those with diabetes and adult polycystic kidney disease or pyelonephritis had low rates, in keeping with the natural histories of these conditions.

Comorbidity and late presentation

In the 2015/2016 cohort, the percentage of patients with no recorded comorbidity was similar amongst early and late presenters (50.2% vs 51.8%: $p = 0.4$). However, cardiovascular disease was less common and liver disease and malignancy more common in patients who presented late, compared with those who presented early (table 1.19). This is in keeping with findings from other studies [5–6, 8].

International comparisons

Figure 1.15 shows the crude RRT incidence rates (including children) for 2015 for various countries. The non-UK data are from the USRDS [9]; 2015 was the latest year available at the time of writing. The UK incidence rate was comparable with other Northern European countries, Australia and New Zealand, but remained markedly lower than other countries, most notably Greece, Japan and the USA. There are numerous reasons for these differences which have been documented and explored in other ecological studies and summarised by this review [10].

Survival of incident patients

See chapter 5: Survival and Causes of Death of UK Adult Patients on Renal Replacement Therapy in 2016.

Table 1.18. Late presentation by primary renal diagnosis (2015/2016 incident patients)

		Late presentation	
Diagnosis	*N*	*N*	%
Uncertain aetiology	1,514	273	18.0
Diabetes	2,811	194	6.9
Glomerulonephritis	1,390	184	13.2
Other identified category	921	163	17.7
Polycystic kidney or pyelonephritis	1,353	100	7.4
Renal vascular disease	1,227	121	9.9
Acute group	968	524	54.1
Data not available	361	105	29.1

Unlike elsewhere in the report: (i) the RVD group includes hypertension, and (ii) polycystic kidney and pyelonephritis are grouped together
For definition of acute group see methods

Table 1.19. Percentage prevalence of specific comorbidities amongst patients presenting late (<90 days) compared with those presenting early (⩾90 days) (2015/2016 incident patients)

Comorbidity	<90 days	⩾90 days	*p*-value
Ischaemic heart disease	13.0	20.6	<0.0001
Cerebrovascular disease	5.9	10.4	<0.0001
Peripheral vascular disease	8.3	11.5	0.003
Diabetes (not a cause of ERF)	10.6	10.7	0.9
Liver disease	5.6	3.4	0.001
Malignancy	19.3	12.4	<0.0001
COPD	8.4	7.9	0.6
Smoking	10.7	13.0	0.05

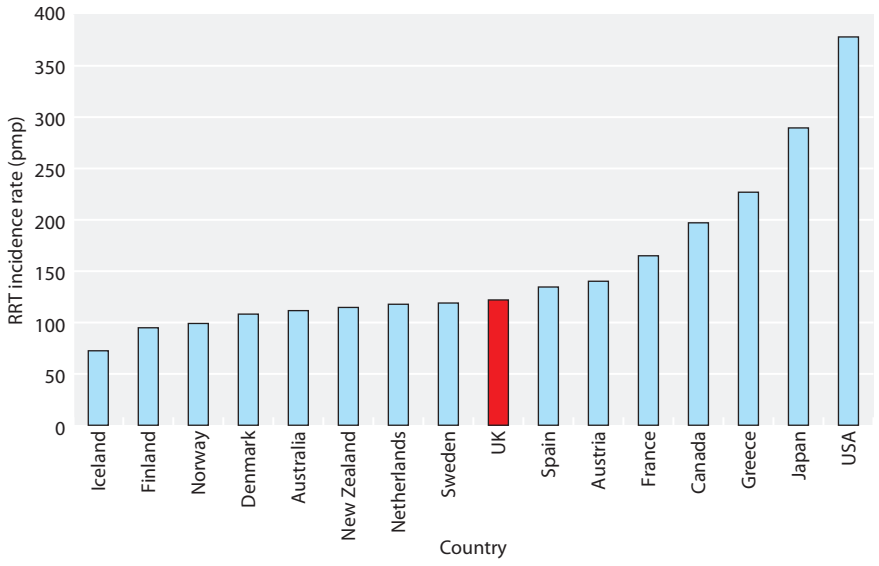

Fig. 1.15. International comparison of RRT incidence rates in 2015
Non-UK data from USRDS [9]

4. Acute haemodialysis

Methods

This section utilises sessional HD data alongside treatment timeline codes. HD sessional data were submitted to the UKRR by renal centres in England, as mandated by NHS England. Centres in Northern Ireland and Wales provided data voluntarily. Centres in Scotland did not provide HD sessional data. Centres were asked to report details related to each HD session, including vascular access used and blood pressure before and after the session (data not shown).

The approach used to define HD as acute or for ERF was based purely on timeline codes (figure 1.16). Sessional HD data were used to check for individuals who received HD without a timeline entry and to check start dates. Where timeline and sessional dates were inconsistent, it was not possible to determine whether this was due to a missing acute HD code or an inaccurate first timeline entry. As such, neither the dates nor content of timelines were corrected using sessional HD data.

Results

Timeline data from 2016 show 6,891 people received their first-ever HD session across 61 centres in England, Wales and Northern Ireland. Of these HD starts, 2,581 (37.5%) were coded as acute and 4,310 (62.5%) as being for ERF (figure 1.16).

Forty-one of the 52 (78.8%) adult renal centres in England submitted HD sessional data. Of these, four submitted only acute HD sessions and one submitted data for only 16.8% of patients. Five centres in Northern Ireland and five in Wales also submitted data, of which two centres did not submit acute HD sessions. A table of completeness of the HD sessional data is available in appendix F: Additional Data Tables for 2016 new and existing patients.

Of the 2,581 individuals who started acute HD, sessional data were available for 2,332 (90.4%). Fifty-three

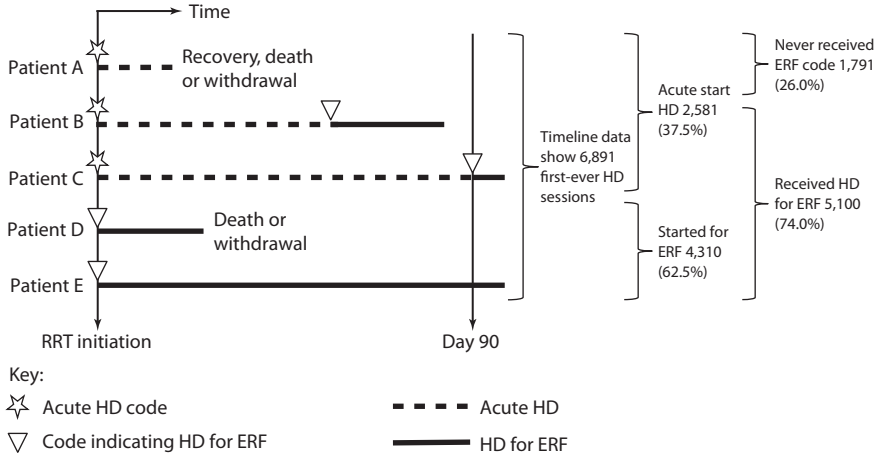

Fig. 1.16. Timeline codes and renal outcomes for all 6,891 people who received their first-ever HD session in England, Northern Ireland and Wales in 2016

Table 1.20. Centre-level acute and chronic haemodialysis initiation

Centre	% of incident patients who started HD acutely	% of HD recipients with ERF who started on acute HD	% of acute HD recipients who developed ERF	Percentage of each category for which sessional HD data were available			
				AHD	ACHD	CHD	Total
Antrim	27.3	5.9	16.7	90.0	100.0	100.0	97.7
B Heart	25.6	24.7	95.5	0.0	100.0	100.0	98.8
B QEH	48.1	44.6	86.7	100.0	98.7	100.0	99.5
Bangor	26.3	12.5	40.0	66.7	100.0	100.0	94.7
Basldn	49.0	16.7	20.8	84.2	100.0	100.0	93.9
Belfast	34.8	27.1	69.6	85.7	100.0	100.0	98.5
Bradfd	47.4	24.2	35.6	86.2	68.8	0.0	37.9
Brightn	46.7	29.2	47.1	94.6	100.0	100.0	98.7
Bristol	43.9	20.0	32.0	98.0	95.8	100.0	98.8
Carlis	67.5	35.0	25.9	75.0	100.0	100.0	87.5
Carsh	48.9	23.8	32.6	100.0	100.0	99.3	99.6
Chelms	43.1	25.6	45.5	100.0	100.0	100.0	100.0
Colchr	25.0	10.0	33.3	100.0	100.0	100.0	100.0
Covnt	37.9	10.3	18.9	90.7	100.0	97.7	95.7
Derby	57.0	21.6	20.8	92.9	100.0	100.0	96.8
Donc	22.4	13.6	54.5	60.0	100.0	100.0	95.9
Dorset	40.0	16.7	30.0	100.0	100.0	100.0	100.0
Dudley	70.8	31.6	19.0	98.0	100.0	96.2	97.8
Exeter	53.4	19.8	21.6	95.0	100.0	98.9	97.4
Glouc	48.7	9.3	10.8	100.0	100.0	100.0	100.0
Hull	56.5	11.3	9.8	98.2	100.0	0.0	55.6
Ipswi	30.3	14.8	40.0	100.0	100.0	100.0	100.0
Kent	33.9	29.6	82.1	100.0	100.0	98.7	99.1
L Barts	1.6	0.5	33.3	0.0	0.0	0.0	0.0
L Guys	3.7	0.8	20.0	100.0	100.0	99.2	99.3
L Kings	39.4	19.6	37.5	94.3	100.0	100.0	98.6
L Rfree	48.0	37.2	64.0	96.8	100.0	98.9	98.9
L St.G	25.8	5.5	16.7	0.0	0.0	0.0	0.0
L West	1.6	1.0	60.0	100.0	100.0	99.0	99.0
Leeds	62.1	30.3	26.5	97.0	94.4	0.0	59.8
Leic	38.4	11.4	20.6	97.1	100.0	99.0	98.5
Liv Ain	15.7	2.3	12.5	0.0	0.0	0.0	0.0
Liv Roy	25.8	8.3	26.1	0.0	0.0	0.0	0.0
M RI	27.9	8.4	23.6	0.0	15.4	21.8	16.8
Middlbr	44.1	12.0	17.3	95.3	100.0	100.0	98.3
Newc	52.6	7.8	7.6	91.8	100.0	100.0	96.0
Newry	36.0	15.8	33.3	83.3	100.0	100.0	96.0
Norwch	10.8	10.8	100.0	0.0	0.0	0.0	0.0
Nottm	66.4	32.4	24.2	96.0	100.0	98.0	97.3
Oxford	18.1	5.4	25.9	60.0	100.0	95.1	90.6
Plymth	47.1	12.2	15.6	100.0	80.0	100.0	98.5
Ports	35.9	15.9	33.8	100.0	100.0	100.0	100.0
Prestn	7.6	3.0	37.5	0.0	0.0	0.0	0.0
Redng	43.6	22.8	38.2	100.0	100.0	100.0	100.0
Salford	36.5	10.8	21.1	100.0	100.0	99.0	99.4
Sheff	3.0	0.0	0.0	0.0	0.0	0.0	0.0
Shrew	67.9	27.0	17.5	95.7	100.0	100.0	97.6
Stevng	52.8	23.9	28.1	100.0	100.0	98.0	99.1
Sthend	36.2	3.2	5.9	100.0	100.0	100.0	100.0
Stoke	16.7	10.3	57.1	0.0	0.0	0.0	0.0
Swanse	75.8	49.5	31.3	95.5	100.0	100.0	97.6
Truro	37.1	4.9	8.7	81.0	100.0	100.0	93.5
Ulster	55.0	14.3	13.6	73.7	100.0	100.0	87.5

Table 1.20. Continued

Centre	% of incident patients who started HD acutely	% of HD recipients with ERF who started on acute HD	% of acute HD recipients who developed ERF	Percentage of each category for which sessional HD data were available			
				AHD	ACHD	CHD	Total
West NI	18.2	12.9	66.7	50.0	100.0	100.0	97.0
Wirral	12.1	0.0	0.0	0.0	0.0	0.0	0.0
Wolve	61.2	16.7	12.7	94.5	100.0	100.0	97.1
Wrexm	29.8	5.7	14.3	83.3	100.0	100.0	95.7
York	54.1	23.5	26.1	100.0	100.0	0.0	54.1
Total	**37.5**	**15.5**	**30.6**	**89.0**	**93.4**	**69.8**	**77.5**

Ten centres supplied no HD sessional data and four supplied acute sessional data only. Three centres do not use acute timeline codes and are not included in this table
HD – haemodialysis; ERF – established renal failure; AHD – started acute HD but never coded as ERF; ACHD – started acute HD and recoded as ERF; CHD – started HD with ERF

acute HD recipients (2.3%) had one or more HD sessions preceding their timeline date of dialysis initiation. A further 47 (2.0%) had sessional data available by at least two weeks after the date of reaching ERF.

Of the 4,310 individuals who started HD for ERF, sessional data were available for 3,010 (69.8%). One hundred and forty-five individuals starting HD for ERF (4.8%) had one or more HD sessions preceding the timeline date of dialysis initiation. Only seven individuals were identified who had sessional HD data, but no timeline entry for acute or chronic HD. These seven individuals were excluded from all analyses. It is not possible to further quantify how many individuals received RRT in 2016 without a timeline code to indicate this.

Acute and chronic HD starts and progression to ERF

Of the 6,891 people who received their first-ever HD session in England, Northern Ireland and Wales in 2016, 5,100 (74.0%) received an ERF code. Of these, 4,310 (84.5%) started HD for ERF, whilst 790 (15.5%) started HD acutely and were subsequently recoded as having ERF. HD sessional data were available for 3,748 (73.5%). A further 1,791 individuals (26.0%) commenced acute HD, but did not develop ERF. Sessional data were available for 1,594 (89.0%) of these individuals. Data relating to death and recovery will be presented in a future report.

Excluding centres that contributed very incomplete or no HD sessional data, 4,191 (79.7%) of 5,257 timeline and sessional HD start dates were identical and 97.2% were within two weeks of each other. Only 31 (0.6%) of the timeline start dates were preceded by two or more weeks of HD sessions.

Table 1.20 presents data for all HD starters at centre level. There was large variation in acute HD use reported by centres, with the percentage of HD starters who received acute HD ranging between 1.6% and 75.8%. The proportion of patients who developed ERF after starting acute HD ranged between 0.0% and 49.5%.

Demography and clinical details of individuals who received only acute HD

Table 1.21 presents demographic and clinical data for the 1,791 individuals who commenced acute HD, but did not progress to ERF. Overall, 62.5% were male and the median age was 70.1 years. Forty-six percent had no cause for AKI coded and a further 16.9% had the cause of their AKI coded non-specifically as 'acute kidney injury'. Seventy-one percent were white and 6.1% were of minority ethnic background. Centres are anonymised in table 1.21 due to the small numbers of patients in some sub-categories and the potential risk of identification.

Discussion

The UK RRT incidence rate for 2016 was 118 pmp, reflecting RRT initiation for 7,759 new patients with ERF. This rate was lower than in 2015 (120 pmp), with significantly lower incidence in Scotland compared with England. Diabetic renal disease remained the single most common cause of renal failure treated by RRT (28.6%), despite late presentation with this condition being the lowest of all PRDs. More men than women

Table 1.21. Demographic and clinical data for individuals who commenced acute haemodialysis, sorted by number of patients

			Cause of acute kidney injury (%)								Ethnicity (%)			
Centre	*N*	% male	AKI	Hypvol	Circ. fail	Sepsis	Rhabdo	Toxicity	Other	Missing	Non-White	White	Missing	Median age
1	10	60	10	0	10	10	0	10	60	0	0	100	0	64
2	12	42	8	0	0	8	0	0	17	67	17	83	0	70
3	12	75	8	0	0	0	0	0	0	92	8	67	25	68
4	12	67	0	17	0	33	0	0	17	33	0	67	33	74
5	16	63	38	0	0	6	0	6	19	31	13	88	0	71
6	17	59	0	0	0	0	0	0	0	100	6	94	0	57
7	19	47	5	0	5	16	0	11	21	42	5	68	26	71
8	19	58	16	0	21	16	0	11	37	0	0	100	0	76
9	20	55	5	0	5	10	0	0	15	65	0	100	0	68
10	20	80	0	0	0	0	0	0	5	95	20	60	20	62
11	20	65	0	0	0	10	10	5	0	75	10	80	10	68
12	21	76	38	5	0	0	0	0	57	0	0	91	10	74
13	21	52	5	0	0	10	5	5	29	48	14	67	19	72
14	21	67	81	0	0	0	0	0	5	14	0	100	0	65
15	27	63	7	4	4	15	0	0	33	37	0	100	0	70
16	29	59	0	0	0	0	0	0	3	97	3	0	97	65
17	31	58	7	0	0	0	3	0	45	45	23	61	16	72
18	33	58	21	3	0	21	0	0	39	15	6	91	3	73
19	34	59	0	0	0	0	0	0	0	100	0	0	100	69
20	35	71	0	3	3	3	0	0	23	69	14	54	31	67
21	37	76	35	0	0	8	11	11	27	8	3	81	16	70
22	42	69	12	2	2	2	2	0	36	43	10	74	17	68
23	42	45	60	0	2	7	7	0	10	14	19	76	5	61
24	43	51	0	0	0	0	0	0	21	79	9	84	7	73
25	43	70	0	0	0	0	0	0	5	95	0	100	0	64
26	43	58	0	0	0	0	0	0	12	88	2	77	21	75
27	45	71	56	0	0	22	9	4	9	0	7	93	0	68
28	47	79	62	0	2	2	4	0	6	23	4	94	2	76
29	51	65	0	0	0	2	0	0	28	71	6	78	16	74
30	51	57	31	2	0	14	4	0	24	26	4	88	8	74
31	55	62	2	0	0	0	0	0	0	98	0	4	96	72
32	55	66	16	6	9	20	2	2	42	4	6	89	6	68
33	75	64	63	0	0	4	0	1	29	3	13	83	4	69
34	80	58	15	13	3	19	4	11	21	15	0	71	29	72
35	82	61	16	6	1	12	5	5	26	29	10	74	16	71
36	85	65	17	8	8	20	7	9	28	2	2	94	4	67
37	91	57	0	0	0	0	0	0	2	98	9	71	20	73
38	100	58	0	0	0	0	0	1	2	97	0	3	97	69
39	104	67	3	0	0	3	1	0	21	72	10	79	12	72
40	110	64	30	2	4	15	6	2	42	1	1	76	23	72
Total	**1,791**	**63**	**17**	**2**	**2**	**8**	**3**	**2**	**21**	**46**	**6**	**71**	**23**	**70**

Centres where $N < 10$ are not shown and centres are anonymised due do the small numbers of patients in some sub-categories and the potential risk of identification

N – number of individuals starting acute haemodialysis at centre; Hypvol. – hypovolaemia; Circ. fail – circulatory failure; Rhabdo.- rhabdomyolysis; Toxicity – nephrotoxicity; AKI – acute kidney injury

The category 'Other' for cause of AKI, groups all of the following answers: pyelonephritis, diabetic kidney disease, renovascular disease, glomerulonephritis, hypertension, uncertain or 'other'

started RRT in every age group (overall 62.9% male, 37.1% female). Incidence amongst the over-65s, which more than tripled between 1990 and 2005, appears to have plateaued at approximately 320 pmp for the past decade. Incidence amongst those aged under 45 has also been stable. Meanwhile, incidence amongst 45 to 64-year olds continued to rise, albeit marginally between 2015 and 2016.

Whilst overall incidence has stabilised, both incidence rates and the total number of new starters was highest in older people. With ongoing population growth and ageing, the incident RRT population is likely to expand and age over the coming decades. The median age of all incident patients in 2016 was 64.3 years, but this was highly dependent on ethnicity (66.2 years for White incident patients; 58.7 years for non-White patients). There was marked variation between CCG/HBs in the rates of older people (>75) starting RRT. This may signify true practice variation, reflective of uncertainty within the renal community about the benefits of dialysis for the oldest patients. However, these data are not adjusted for factors such as rates of comorbid illness or ethnicity that differ between CCG/HBs, or the life-expectancy of the general population, which varies across the UK. A proportion of individuals who developed ERF received comprehensive conservative care in place of renal replacement therapy. Inclusion of CKD data will allow estimation of this population in the near future and will enhance the interpretation of RRT incidence rates.

The percentage of RRT patients at 90 days who had a functioning transplant varied between centres from 0% to 31% (between 2% and 31% for transplanting centres and between 0% and 19% for non-transplanting centres). These data might be seen to represent that transplantation was more likely for an individual who was primarily looked after at a transplant centre. An alternative explanation is that some patients transplanted preemptively were attributed to the incident cohort of their transplanting centre, rather than that from which they were referred.

Although large numbers of patients continued to present late to renal centres, this proportion has dropped substantially in the last decade, from 23.9% in 2006 to 15.6% in 2016. This may be a consequence of CKD guidelines published by NICE [11], 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. Late presentation continued to fall and some centres reported rates of <10%. The proportion of late presenting individuals who have acute or undetected disease is unknown. Correspondingly, the amount of truly avoidable late presentation is unquantified. The Health Foundation has funded an initiative that flags people with declining kidney function to their GP, to ensure they have considered referral to a nephrologist (ASSIST-CKD [12]). This initiative is being managed through Kidney Research UK and the UKRR is leading the evaluation to establish effectiveness.

In 2016, 1,791 individuals in England, Northern Ireland and Wales commenced acute HD, but did not develop ERF. These individuals made up 26% of those

Table 1.22. Instructions for reporting centres regarding use of timeline codes to indicate dialysis initiation

1) Coding must be consistent between centres

2) The timeline should be used to record the date of first dialysis or haemofiltration:

Acute dialysis codes:		**Example dialysis codes indicating ERF (not an exhaustive list)***	
81	Acute HD	1	HD
82	Acute haemofiltration	3	Haemodiafiltration
83	Acute PD	11	CAPD
		12	APD

3) For those who start with an acute code, a separate code must subsequently indicate:

ARF recovered – code 84
ARF stopped dialysis (without recovery of function) – code 85
Development of ERF (codes as listed above plus transplantation)
This code must not be backdated

*For a full list of treatment modality codes see: https://www.renalreg.org/datasets/the-uk-renal-registry-dataset/
CAPD – continuous ambulatory peritoneal dialysis; APD – automated peritoneal dialysis; ARF – acute renal failure

who received HD for the first time during this period. This summary statistic masks striking variation in the reported use of and outcomes from acute HD between centres. Clinical explanations for variation include case mix, case selection and thresholds for initiating dialysis, and the proportion of individuals treated with acute PD or haemofiltration in intensive care units. It seems likely, however, that inconsistent use of timeline codes contributes substantially to inter-centre variation.

Whether an individual is receiving dialysis for AKI or ERF leaves considerable room for clinical interpretation, especially amongst those with advanced CKD. It may be that even a uniform approach to timeline coding cannot adequately distinguish between these groups. Significant input from all contributing renal centres is necessary to ensure data of adequate quality are returned to permit accurate and meaningful conclusions. Since 2009, the UKRR has asked clinicians to use the timeline field on their renal IT system to record the date of first dialysis or haemofiltration and separately, the date on which the patient was deemed to have reached ERF. This allows the distinction between patients who have an acute start and those whose start on RRT was planned. If the patient recovers renal function, an entry should be made in the timeline (table 1.22). Centres should not backdate ERF codes to the date of dialysis initiation, as this negatively influences the quality of survival analyses.

Reassuringly, sessional HD data suggested that start dates are precise for 79.7% and within two weeks for 97.2% of incident HD recipients. These low levels of discordance are unlikely to meaningfully influence overall survival analyses for all HD recipients, although the effect on other analyses (such as eGFR at start) may be greater. The UKRR hopes to improve such analyses with the introduction of realtime data downloads for individuals with advanced CKD and more complete collection of HD sessional data.

Acknowledgement

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

Conflicts of interest: the authors declare no conflicts of interest

References

1 https://renal.org/guidelines/
2 Venkat- Raman G, Tomson CR, Gao Y et al. New primary renal diagnosis codes for the ERA-EDTA. Nephrol Dial Transpl 2012; 27:4414–4419
3 http://www.renal.org/information-resources/the-uk-eckd-guide/about-egfr#sthash.K4QM6ZJB.dpbs
4 http://www.nomisweb.co.uk/census/2011/LC2101EW/view/2092957703?rows=c_ethpuk11&cols=c_age
5 Kazmi WH, et al. Late nephrology referral and mortality among patients with end-stage renal disease: a propensity score analysis. Nephrology Dialysis Transplantation 2004;19(7):1808–1814
6 Roubicek C, et al. Timing of nephrology referral: Influence on mortality and morbidity. American journal of kidney diseases: the official journal of the National Kidney Foundation 2000;36(1):35–41
7 Cochrane Database Syst Rev. Early referral to specialist nephrology services for preventing the progression to end-stage kidney disease. 2014 Jun 18;6:CD007333. doi: 10.1002/14651858.CD007333.pub2
8 Winkelmayer WC, et al. A Propensity Analysis of Late Versus Early Nephrologist Referral and Mortality on Dialysis. Journal of the American Society of Nephrology 2003;14(2):486–492
9 United States Renal Data System. 2017 USRDS annual data report: Epidemiology of kidney disease in the United States. National Institutes of Health, National Institute of Diabetes and Digestive and Kidney Diseases, Bethesda, MD, 2017
10 Caskey FJ, Jager KJ. A population approach to renal replacement therapy epidemiology: lessons from the EVEREST study. Nephrol Dial Transplant. 2014 Aug;29(8):1494–9. doi: 10.1093/ndt/gft390. Epub 2013 Oct 28
11 https://www.nice.org.uk/guidance/cg182
12 Gallagher et al. A programme to spread eGFR graph surveillance for the early identification, support and treatment of people with progressive chronic kidney disease (ASSIST-CKD): protocol for the stepped wedge implementation and evaluation of an intervention to reduce late presentation for renal replacement therapy. BMC Nephrology (2017) 18:131 DOI 10.1186/s12882–017–0522–9