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UK Renal Registry 20th Annual Report: Chapter 5 Survival and Cause of Death in UK Adult Patients on Renal Replacement Therapy in 2016: National and Centre-specific Analyses

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Keywords

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

Summary

- Short-term (90 day) age adjusted survival of incident RRT patients in the 2015 cohort was similar to the 2014 cohort (96.5% versus 96.8%).
- One year after 90 day age adjusted survival for incident RRT patients in the 2015 cohort fell slightly to 90.0% compared with the previous year (90.2%).
- There was a difference in one year after 90 day incident survival by age group and diagnosis of diabetes: patients with diabetes aged <65 years had worse one year after 90 day survival than patients without diabetes, but for older patients with diabetes (⩾65 years) survival was similar compared to those patients without diabetes.
- One year age adjusted survival for prevalent dialysis patients was similar at 88.0% in the 2015 cohort, compared with 88.3% in the 2014 cohort. Age adjusted one year survival for prevalent dialysis patients with diabetic primary renal disease has been declining slightly from 2012 onwards.
- Centre and UK country variability was evident in incident and prevalent patient survival after adjusting to age 60. Further adjustment for comorbidity was not possible due to missing data.
- The relative one year risk of death for prevalent RRT patients compared with the general population was approximately 21 for age group 35–39 years compared with 1.5 at age 85+ years, but the relative risk of death for younger patients has improved over time.
- In the prevalent RRT population, cardiovascular disease was the most common cause of death and accounted for 24% of deaths, with infection accounting for 20%. Treatment withdrawal accounted for 17% of deaths and has increased in recent years from historical levels.

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Introduction

The analyses presented in this chapter examine a) survival from the start of renal replacement therapy (RRT) of adult patients; b) survival amongst prevalent adult dialysis patients alive on 31 December 2015; c) the death rate in the UK compared to the general population; d) the cause of death for incident and prevalent adult patients. They encompass the outcomes of the total incident adult UK RRT population (2015) reported to the UK Renal Registry (UKRR), including the 19% who started on peritoneal dialysis (PD) and the 8% who received a pre-emptive renal transplant. These results are therefore a true reflection of the outcomes in the whole UK adult incident RRT population. Analyses of survival within the first year of starting RRT include patients who were recorded as having started RRT for established renal failure (as opposed to acute kidney injury) but who had died within the first 90 days of starting RRT, a group excluded from most other countries' registry data. As is common in other countries, survival analyses are also presented for the first year after 90 days.

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

Since 2006, the UKRR has openly reported and published centre attributable RRT survival data. These are raw data that must be interpreted with caution. The UKRR adjusts for the different age distributions of patients in different centres, but lacks sufficient data from many participating centres to allow adjustment for primary renal diagnosis, other comorbidities at start of RRT (comorbidity, especially diabetes, is a major factor associated with survival [1–3]) and ethnic origin, which have been shown to have an impact on outcome (for instance, better survival is expected in centres with a higher proportion of Black and South Asian patients) [4]. This lack of data on the centre level case-mix makes interpretation of any apparent difference in survival between centres and UK countries difficult. Despite the uncertainty about apparent differences in outcome, any centre which appears to be an outlier will be subject to the UKRR clinical governance procedures as set out in chapter 2 of the 2009 UKRR Annual Report [5].

Methods

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

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

To allow for comparisons between centres with differing age distributions, survival analyses were adjusted for age and reported as survival adjusted to age 60. This gives an estimate of what the survival would have been if all patients in that centre had been aged 60 at the start of RRT. This age was chosen because it was approximately the average age of patients starting RRT 17 years ago at the start of the UKRR's data collection. The average age of patients commencing RRT in the UK has recently stabilised around an age of 62 years, but the UKRR has maintained age adjustment to 60 years for comparability with all previous years' analyses. Diabetic patients were included in all analyses unless stated otherwise and for some analyses, diabetic and non-diabetic patients were analysed separately and compared. Non-diabetic patients were defined as all patients excluding those patients with diabetes as the primary renal disease.

Centre variability for incident and prevalent patient survival was analysed using a funnel plot. For any number of patients in the incident or prevalent cohort (x-axis), one can identify whether any given survival probability (y-axis) falls within, plus or minus two standard deviations (SDs) from the national mean (solid lines, 95% limits) or three SDs (dotted lines, 99.9% limits). All analyses were undertaken using SAS 9.3.

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 analyses in this chapter for 2015 and 2016.

Definition of RRT start date

The incident survival figures quoted in this chapter are from the first day of RRT whether with dialysis or a pre-emptive transplant. In the UKRR all patients starting RRT for ERF are included from the date of the first RRT treatment wherever it took place (a date currently defined by the clinician) if the clinician considered the renal failure irreversible. Should a patient recover renal function within 90 days they were then excluded. These

UK data therefore may include some patients who died within 90 days who had developed acute, potentially reversible renal failure but were recorded by the clinician as being in irreversible ERF.

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

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

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

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

Methodology for incident patient survival

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

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

The incident survival cohort was **NOT** censored at the time of transplantation and therefore included the survival of the 8% who received a pre-emptive transplant. An additional reason for not censoring was to facilitate comparison between centres. Centres with a high proportion of patients of South Asian and Black origin are likely to have a healthier dialysis population, because South Asian and Black patients are less likely to undergo early transplantation [7] and centres with a high pre-emptive transplant rate are likely to have a less healthy dialysis population as transplantation selectively removes fitter patients. However, censoring at transplantation was performed in the 1997–2015 cohort to establish the effect on long term survival by age group and also in the 2012–2015 cohort to investigate the effect on the outlying status of centres.

The one year incident survival is for patients who started RRT from 1 October 2014 until the 30 September 2015 and followed up for one full year (e.g. patients starting RRT on 1 December 2014 were followed through to 30 November 2015). The 2016 incident patients could not be analysed as they had not yet been followed for a sufficient length of time. For analysis of one year after 90 day survival, patients who started RRT from 1 October 2014 until 30 September 2015 were included in the cohort and they were followed up for a full year after the first 90 days of RRT.

Two years incident data (2014–2015) were combined to increase the size of the patient cohort, so that any differences between the four UK countries could be more reliably identified. To help identify any centre differences in survival from the small centres (where confidence intervals are large), an analysis of one year after 90 day survival using a rolling four year combined incident RRT cohort from 2012 to 2015 was also undertaken. A 10 year rolling cohort was used when analysing trends over time and for long term survival, a cohort from 1997 to 2015 was analysed.

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

Adjustment of one year after 90 day survival for the effect of comorbidity was undertaken using a rolling four year combined incident RRT cohort from 2012 to 2015. Twenty-nine centres returned $\geqslant$85% of comorbidity data for patients in the combined cohort. Adjustment was first performed to a mean age of 60 years, then to the average distribution of primary diagnoses for the 29 centres. The individual centre data were then further adjusted for average distribution of comorbidity present at these centres.

Methodology for prevalent dialysis patient survival

The prevalent dialysis patient group was defined as all patients over 18 years old, alive and receiving dialysis on 31 December 2015 who had been on dialysis for at least 90 days at one of the UK adult renal centres. Prevalent dialysis patients on 31 December 2015 were followed-up in 2016 and were censored at transplantation. When a patient is censored at transplantation, this means that the patient is considered as alive up to the point of transplantation, but the patient's status post-transplant is not considered.

As discussed in previous reports, comparison of survival of prevalent dialysis patients between centres is complex. Survival of prevalent dialysis patients can be studied with or without censoring at transplantation and it is common practice in some registries to censor at transplantation. Censoring could cause apparent differences in survival between those renal centres with a high transplant rate and those with a low transplant rate, especially in younger patients where the transplant rate is highest. Censoring at transplantation systematically removes younger fitter patients from the survival data. The differences are likely to be small due to the relatively small proportion of patients being transplanted in a given year compared to the whole dialysis population (about 14% of the dialysis population aged under 65 and about 2% of the population aged 65 years and over). To allow comparisons with other registries the survival results for prevalent dialysis patients **CENSORED** for transplantation have been quoted. To

understand survival of patients, including survival following transplantation, the incident patient analyses should be viewed. The effect of not censoring at transplantation was performed in the 2015 cohort to investigate the effect on the outlying status of centres.

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

Data on the UK population in mid-2016 and the number of deaths in each age group in 2016 were obtained from the Office of National Statistics [8]. The age specific UK death rate was calculated as the number of deaths in the UK per thousand people in the population. The age specific expected number of deaths in the RRT population was calculated by applying the UK age specific death rate to the total of years exposed for RRT patients in that age group. This is expressed as deaths per 1,000 patient years. The age specific number of RRT deaths is the actual number of deaths observed in 2016 in RRT patients. The RRT observed death rate was calculated as number of deaths observed in 2016 per 1,000 patient years exposed. Relative risk of death was calculated as the ratio of the observed and expected death rates for RRT patients. The death rate was calculated for the UK general population by age group and compared with the same age group for prevalent patients on RRT on 31 December 2015.

Methodology of cause of death

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

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

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

Adult patients aged 18 years and over from England, Wales, Scotland and Northern Ireland were included in the analyses of cause of death. The incident patient analysis included all patients starting RRT in the years 2000–2015. Analysis of prevalent patients included all those aged over 18 years and receiving RRT on 31 December 2015 and followed-up for one year in 2016.

Results

Incident (new RRT) patient survival

Overall survival

The 2015 incident RRT cohort included 7,626 patients who started RRT. Survival at 90 days (adjusted to age 60) for the 2015 cohort was 96.5% and was similar compared to the previous year (96.8%) (table 5.1). One year after 90 days survival for incident patients starting RRT in 2015, (adjusted to age 60) fell slightly compared to the previous year: 90.0% compared to 90.2% in the 2014 cohort (table 5.1).

Survival by UK country

Survival at 90 days was highest in Northern Ireland and Scotland compared with the other nations (table 5.2), while one year after 90 day survival differed between the UK countries, with Northern Ireland having the highest survival (table 5.2). However, there are two important caveats for the interpretation of these data; the data have not been adjusted for differences in primary renal diagnosis, ethnicity, socio-economic status or comorbidity, which may differ by country. Secondly, there are known regional differences in the life expectancy of the general population within the UK (which may be explained by some of the factors outlined above). These general population differences are likely

Table 5.1. Survival of incident RRT patients, 2015 cohort

Interval	Unadjusted survival (%)	Adjusted survival (%)	*95% CI*	*N*
Survival at 90 days	95.0	96.5	*96.0–97.0*	7,626
Survival one year after 90 days	87.3	90.0	*89.2–90.8*	7,204

Table 5.2. Incident RRT survival across the UK countries, combined two year cohort (2014–2015), adjusted to age 60

Interval	England	N Ireland	Scotland	Wales	UK
Survival at 90 days (%)	96.5	97.8	97.8	96.5	**96.6**
95% CI	*96.1–96.8*	*96.6–99.1*	*97.0–98.6*	*95.4–97.6*	***96.3–97.0***
Survival 1 year after 90 days (%)	90.2	91.5	89.4	88.8	**90.1**
95% CI	*89.6–90.8*	*89.0–94.0*	*87.7–91.2*	*86.9–90.9*	***89.6–90.7***

Table 5.3. Life expectancy in years in the UK countries, 2014–2016 (source ONS [8])

	At birth		At age 65	
Country	Male	Female	Male	Female
England	79.5	83.1	18.8	21.1
Northern Ireland	78.5	82.3	18.3	20.6
Scotland	77.1	81.2	17.4	19.7
Wales	78.4	82.3	18.2	20.6
UK	**79.2**	**82.9**	**18.6**	**21.0**

to contribute to the variation in survival between renal centres and UK countries. To illustrate this, table 5.3 shows general population life expectancy of the UK countries for the period 2014–2015.

Survival by modality

It is not possible to make truly valid comparisons of survival of cohorts of patients starting different RRT modalities, as modality selection is not random. In the UK, the cohort of patients starting PD was younger and received a transplant more quickly than those starting HD. The age adjusted one year after 90 days survival estimates for incident patients starting RRT on HD and PD in 2015 were 88.3% and 92.5% respectively, with both HD and PD patient survival falling slightly from the previous year (figure 5.1). This is the second year that the one year after 90 days survival on HD and PD has declined (figure 5.1).

Survival by age

Tables 5.4 and 5.5 show survival for the 2015 incident RRT cohort divided by age (⩾65 years and <65 years). Short term survival (at 90 days) was similar to the previous year for the younger age group, while it decreased for those ⩾65 years compared with the 2014 cohort (97.8% to 97.7% for those aged 18–64 years and 93.2% to 92.2% for those ⩾65 years respectively). There was a small decline in one year after 90 day survival for younger patients (<65 years) and an increase in survival for patients aged ⩾65 years compared to the 2014 cohort (80.6% to 81.3%). There was a steep decline in survival with advancing age (figure 5.2).

Table 5.4. Unadjusted 90 day survival of incident RRT patients, 2015 cohort, by age

Age group	Survival (%)	*95% CI*	*N*
18–64	97.7	*97.2–98.1*	3,884
⩾65	92.2	*91.3–93.0*	3,742
All ages	**95.0**	***94.5–95.5***	**7,626**

Table 5.5. Unadjusted one year after day 90 survival of incident RRT patients, 2015 cohort, by age

Age group	Survival (%)	*95% CI*	*N*
18–64	92.9	*92.0–93.7*	3,765
⩾65	81.3	*79.9–82.5*	3,439
All ages	**87.3**	***86.5–88.1***	**7,204**

There was a curvilinear increase in the death rate per 1,000 patient years with increasing age for the one year period from 90 days after RRT start (figure 5.3). The overall death rate in Wales was higher than in the other UK countries, mostly due to a higher death rate in Wales for patients ⩾55 years old (figure 5.3) and a higher overall median age compared to the other UK countries. A similar finding is reported in table 5.12, where there was evidence that the one year death rate in prevalent dialysis patients (2015 cohort) was higher in Wales compared to England and Northern Ireland. This is also

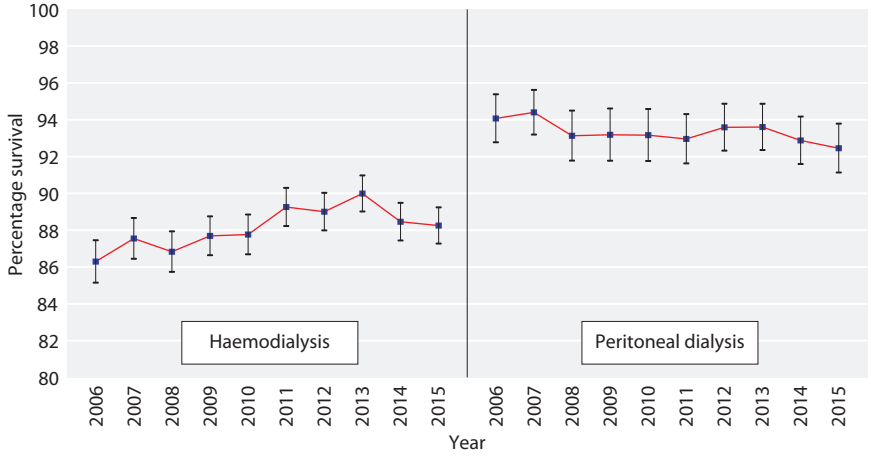

Fig. 5.1. Trend in one year after 90 day incident patient survival by first modality, 2006–2015 cohorts (adjusted to age 60, excluding patients whose first modality was transplantation)

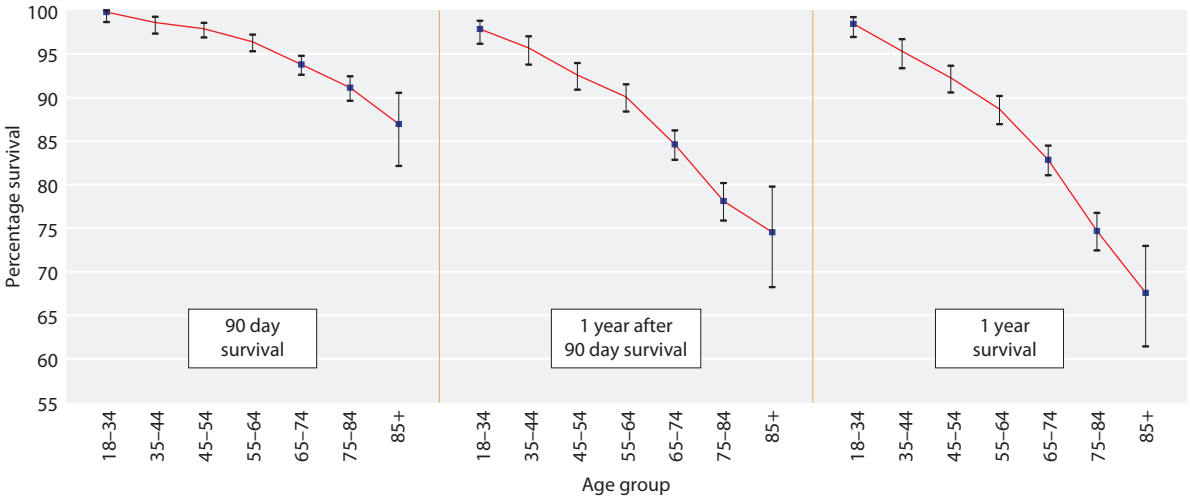

Fig. 5.2. Unadjusted survival of incident RRT patients by age group, 2015 cohort

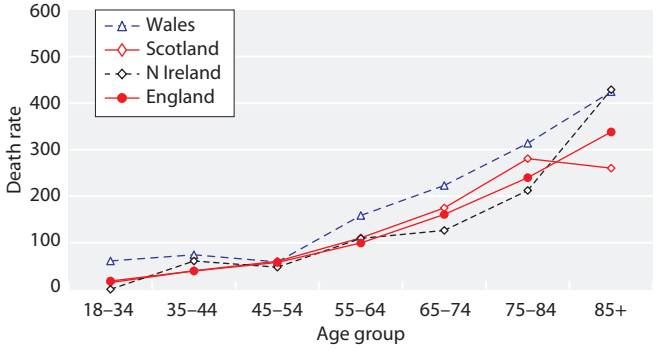

Fig. 5.3. One year after 90 days death rate per 1,000 patient years by UK country and age group for incident RRT patients, 2012–2015 cohort

consistent with the survival figures reported in table 5.2. In patients over 85 years of age, the death rate was again lower in Scotland as was seen in the previous year, although the number of patients in this age group was relatively small ($N = 31$).

Figure 5.4 shows the long-term survival of incident patients from start of RRT (day 0), according to age at RRT start. More than 50% of patients who were aged between 45–54 years when starting RRT survived for over ten years. Median survival for those aged between 55–64 years at RRT start was around six years and median survival for those aged between 65–74 years was approximately 3.5 years.

Figure 5.5 illustrates the survival of incident patients, excluding those who died within the first 90 days and shows that the median survival of patients aged between 55–64 years was approximately 6.5 years and the median survival of patients aged between 65–74 years was approximately four years. These survival results are slightly better than survival from day 0 for the same age groups, as would be expected due to the higher mortality observed in the first 90 days of treatment.

Censoring at transplantation removes the fittest patients from the survival cohort and affects the appearance of the longer-term outcomes of the younger patients

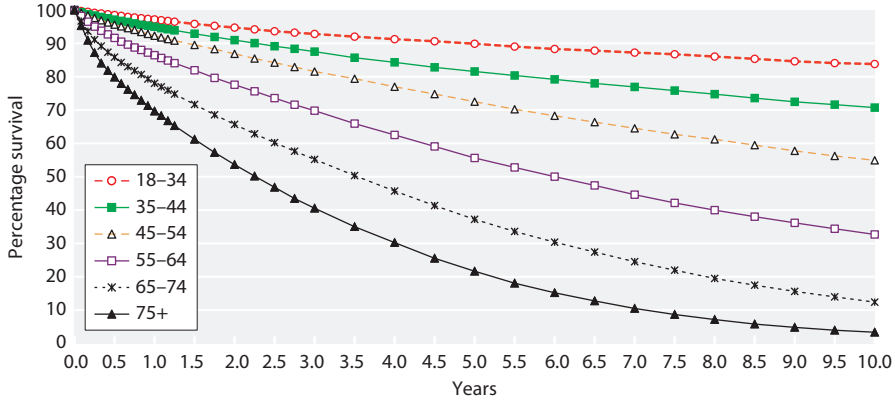

Fig. 5.4. Survival of incident RRT patients (unadjusted), 1997–2015 cohort (from day 0)

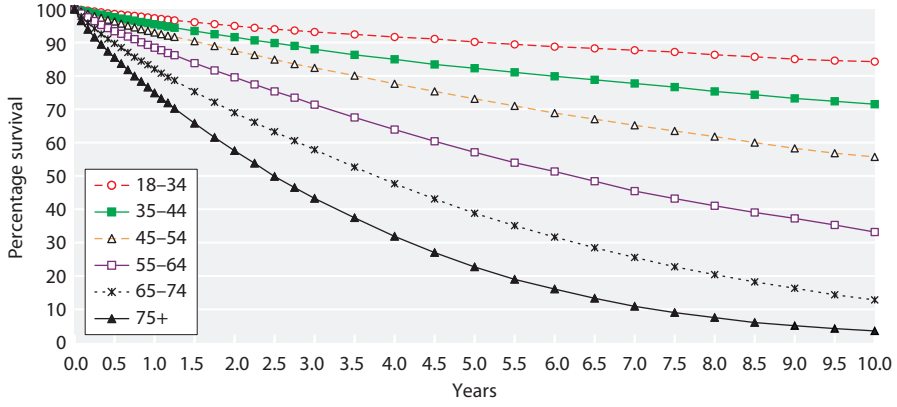

Fig. 5.5. Survival of incident RRT patients (unadjusted), 1997–2015 cohort (from day 90)

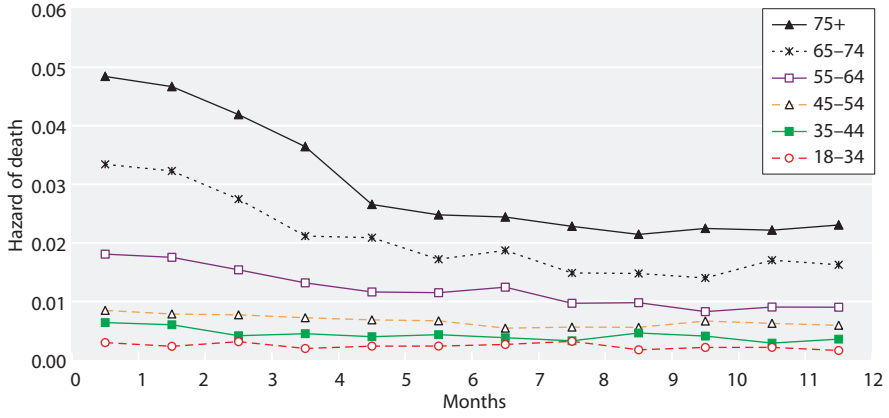

Fig. 5.6. First year monthly hazard of death, by age group, 1997–2015 combined incident RRT cohort

(who are most likely to have undergone transplantation). Without censoring, the ten year survival for patients aged 18–34 years was 83.8% (figure 5.4), however if survival is censored at transplantation this falls dramatically to 56.6% (data not shown). The ten year survival without and with censoring at transplantation were 70.7% and 43.9% for age group 35–44 years and 54.9% and 30.0% for age group 45–54 years respectively. This difference in survival becomes less pronounced with increasing age, especially for patients aged 65+. This was previously examined in more detail in the 2008 Annual Report [9].

Age and the hazard of death

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

The hazard of death at 90 days per ten year increase in patient age increased from 1.61 (2014 cohort) to 1.64 (2015 cohort) while the hazard in the first year after 90 days slightly decreased (1.59 in the 2014 cohort compared to 1.54 in the 2015 cohort) (table 5.6).

Survival by gender

There was no survival difference between genders in the incident RRT cohort of patients starting RRT from 2004 to 2013 and followed up for a minimum of three years until 2016 (figure 5.7). There was also no evidence of a survival difference between genders in the first 90 days and one year after the first 90 days (data not shown).

Survival in the 2006–2015 cohort

The death rate per 1,000 patient years in the first year of starting RRT from 2006 to 2015 is shown in figure 5.8. Death rates were gradually increasing from 2013 onwards after a declining trend in the death rate over the past decade. It is important to note that these death rates

Table 5.6. Increase in proportional hazard of death for each 10 year increase in age, 2015 incident RRT cohort

Interval	Hazard of death for 10 year age increase	*95% CI*
First 90 days	1.64	*1.51–1.78*
1 year after first 90 days	1.54	*1.46–1.62*

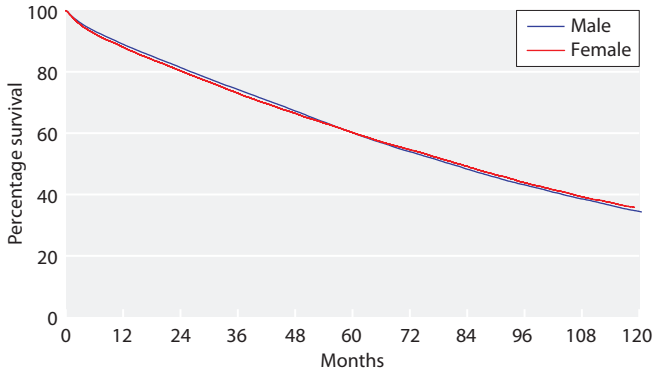

Fig. 5.7. Long term survival of incident RRT patients by gender, 2004–2013 combined cohort, adjusted to age 60, followed-up for a minimum of three years

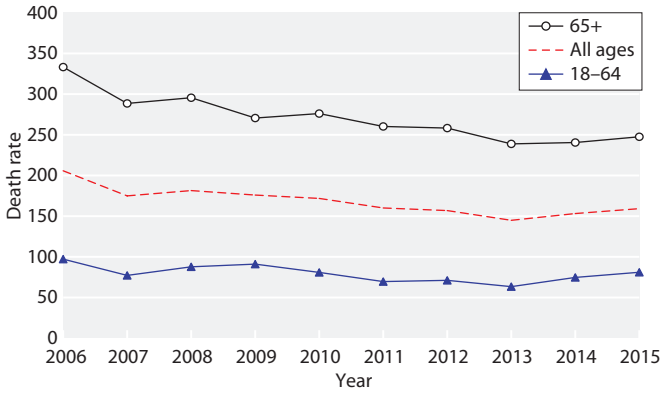

Fig. 5.8. One year incident RRT death rate per 1,000 patient years by age group, 2006–2015 cohort

may not be directly comparable with those produced by other registries (for instance the USRDS) if the first 90 day period, when death rates are higher than subsequent time periods, are excluded.

The time trend changes in one year after 90 days incident survival over the period 2006–2015 are shown in figure 5.9. The percentage of patients surviving one year after 90 days fell slightly in 2015 compared with the preceding year (from 90.3% to 90.0% for all renal centres).

One year after 90 days incident RRT patient survival in the 2006–2015 cohort by centre, UK country and overall, can be found in appendix 1: Survival tables, table 5.22.

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

The unadjusted survival analyses (tables 5.7, 5.8, figures 5.10, 5.11) show an overall improvement in longer term survival between 1998 and 2015 for both those aged <65 years and those aged ⩾65 years. For example, five year survival amongst patients aged <65 years at start of RRT has improved from 64.3% in the 1998 cohort to 74.5% in the 2011 cohort. For those aged ⩾65 years at RRT initiation during the same period, five year survival improved from 19.5% (1998) to 32.5% (2011).

Although survival improved overall between the 1998 and 2015 cohorts, the improvement was more pronounced in patients aged ⩾65. There has been a 15.5% absolute improvement in one year survival from the 1998 to 2015 cohorts (table 5.8) versus 4.8% in those aged <65 years during the same period. It is not possible to ascertain the specific reasons for this reduction in risk of death.

Survival by RRT vintage

Figure 5.12 shows the six monthly hazard of death for incident patients, by age group. There is little evidence of a worsening prognosis with increasing time on RRT (vintage) for the majority of incident RRT patients in the UK, except in incident patients aged 65 years and over where an increased hazard over time is evident. When the analysis is repeated with censoring for transplantation an apparent vintage effect is evident (data

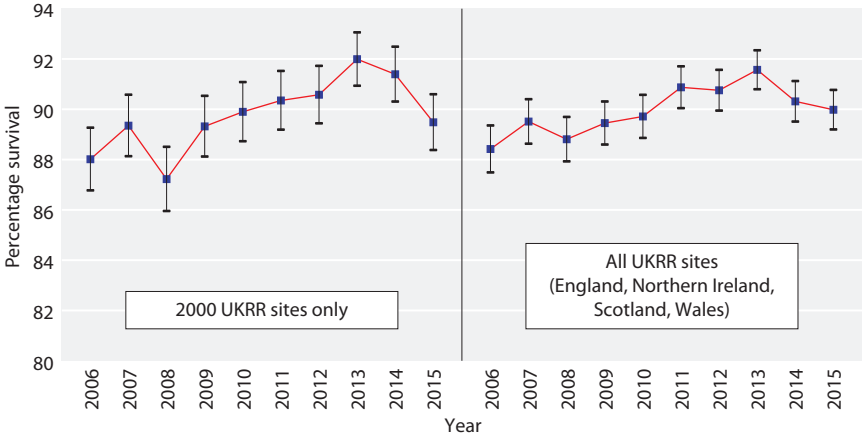

Fig. 5.9. Change in one year after 90 day survival, 2006–2015 incident RRT cohort (adjusted to age 60)
Showing 95% confidence intervals

Table 5.7. Unadjusted percentage survival of incident RRT patients, 1998–2015 cohort for patients aged 18–64 years

Cohort	1 year	2 year	3 year	4 year	5 year	6 year	7 year	8 year	9 year	10 year	*95% CI for latest year*	*N*
2015	**92.2**										***91.3–93.0***	**3,884**
2014	92.8	86.8									*85.7–87.9*	3,671
2013	93.9	88.3	83.1								*81.8–84.3*	3,577
2012	93.2	87.5	82.0	76.9							*75.5–78.3*	3,534
2011	93.3	88.6	83.6	79.0	74.5						*73.0–76.0*	3,348
2010	92.3	86.6	81.7	77.3	72.8	69.6					*68.0–71.1*	3,367
2009	91.3	85.1	80.5	76.4	71.2	67.1	63.8				*62.2–65.4*	3,385
2008	91.6	86.1	81.2	76.9	73.2	69.6	65.6	62.3			*60.7–63.9*	3,441
2007	92.6	87.0	81.8	76.8	73.1	69.3	65.9	62.6	59.2		*57.5–60.9*	3,327
2006	90.8	85.2	80.2	75.8	72.1	68.3	64.1	61.2	58.2	55.5	*53.7–57.2*	3,158
2005	89.8	83.8	78.7	74.0	69.3	65.7	62.7	59.6	56.6	54.1	*52.2–55.9*	2,828
2004	89.7	83.4	78.0	72.5	67.8	64.1	60.9	57.0	54.6	53.0	*51.0–54.9*	2,554
2003	89.6	82.9	77.4	72.5	67.4	63.2	59.5	56.7	54.1	51.6	*49.5–53.7*	2,254
2002	88.9	80.9	75.0	69.4	65.3	61.4	57.9	54.8	51.8	49.7	*47.5–51.9*	2,013
2001	88.1	81.0	75.5	70.1	65.2	60.4	56.5	52.9	50.0	47.7	*45.3–50.1*	1,729
2000	89.3	81.3	74.4	69.3	63.8	59.0	55.5	52.3	49.9	47.1	*44.5–49.6*	1,520
1999	87.2	81.0	73.4	67.9	62.3	58.3	54.0	51.0	48.6	47.0	*44.3–49.7*	1,344
1998	87.5	80.2	74.0	69.6	64.3	59.2	55.1	53.0	50.0	47.5	*44.5–50.3*	1,163

Table 5.8. Unadjusted percentage survival of incident RRT patients, 1998–2015 cohort for patients aged ⩾65 years

Cohort	1 year	2 year	3 year	4 year	5 year	6 year	7 year	8 year	9 year	10 year	*95% CI for latest year*	*N*
2015	**78.4**										***77.0–79.7***	**3,742**
2014	78.8	64.4									*62.8–66.0*	3,581
2013	79.0	65.0	53.5								*51.8–55.2*	3,422
2012	77.6	65.5	54.5	44.3							*42.6–46.0*	3,318
2011	77.4	62.9	51.5	41.3	32.5						*30.9–34.1*	3,351
2010	76.3	63.3	51.4	42.0	32.4	25.6					*24.1–27.1*	3,271
2009	76.7	63.3	52.6	41.6	33.0	26.2	20.1				*18.7–21.4*	3,362
2008	74.9	61.3	49.9	40.5	32.2	25.7	20.6	16.2			*14.9–17.5*	3,166
2007	75.3	61.4	49.8	40.5	32.0	25.4	20.2	15.5	11.9		*10.8–13.0*	3,201
2006	72.4	58.5	47.2	37.5	29.1	23.2	17.6	13.5	10.7	8.5	*7.6–9.6*	3,097
2005	71.5	57.6	45.7	36.4	28.0	21.3	16.7	12.5	10.0	7.8	*6.8–8.8*	2,924
2004	69.3	54.2	42.6	34.1	26.9	21.0	16.3	12.9	9.8	7.5	*6.5–8.6*	2,609
2003	68.6	53.8	41.8	31.8	24.3	18.1	14.1	10.9	8.2	6.5	*5.6–7.6*	2,306
2002	66.6	51.2	40.7	32.1	24.0	18.3	13.7	10.9	8.2	6.3	*5.3–7.5*	2,066
2001	66.8	52.0	38.4	28.9	21.6	15.8	11.8	8.8	7.0	5.4	*4.4–6.6*	1,692
2000	66.3	52.3	39.5	28.6	22.2	16.9	12.8	9.3	7.2	5.4	*4.3–6.6*	1,482
1999	68.6	52.0	39.3	30.0	22.3	16.1	11.5	8.2	6.0	4.7	*3.6–6.0*	1,204
1998	62.8	45.3	35.7	26.4	19.5	13.7	10.2	7.3	5.4	4.4	*3.2–5.8*	1,008

not shown) and this is, at least in part, because younger and healthier patients are only included in the survival calculation up to the date of transplantation. In the oldest age group, the number of patients surviving beyond seven years was small, accounting for the variability seen. Figures 5.13 and 5.14 show the same analysis for patients without diabetes and with diabetes respectively. An increased hazard of death over time is evident for patients with diabetes predominantly over ⩾65 years of age.

Centre variability in one year after 90 days survival

Due to small numbers of incident patients in any given year in each centre and resultant wide confidence intervals, variability by renal centre was assessed in a larger cohort across several years. Similar to previous years, sustained performance was assessed in a rolling four year cohort from 2012 to 2015. These data are presented as a funnel plot in figure 5.15. Table 5.9 allows centres to be identified on this graph by finding the number of

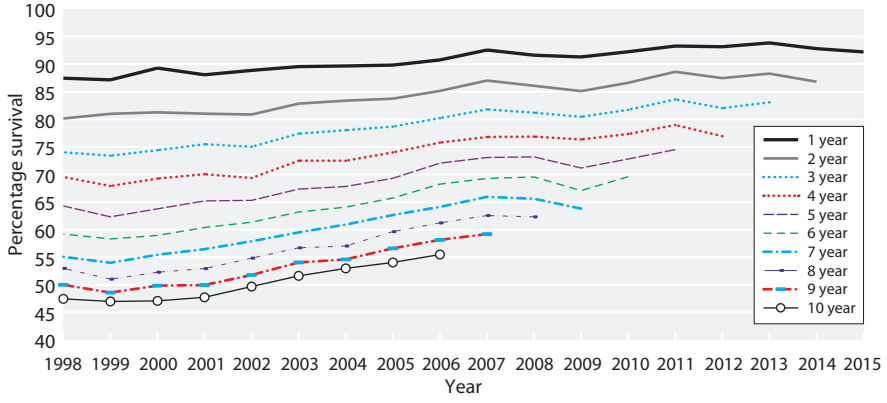

Fig. 5.10. Change in long term survival by year of starting RRT (1998–2015), for incident RRT patients aged 18–64 years

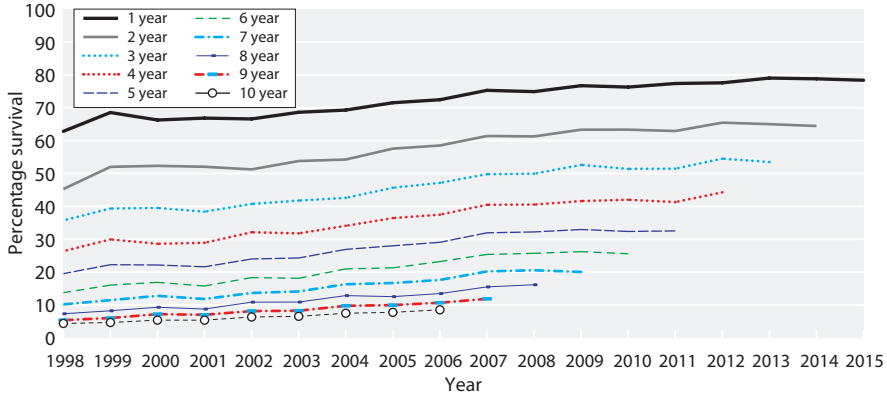

Fig. 5.11. Change in long term survival by year of starting RRT (1998–2015), for incident RRT patients aged ⩾65 years

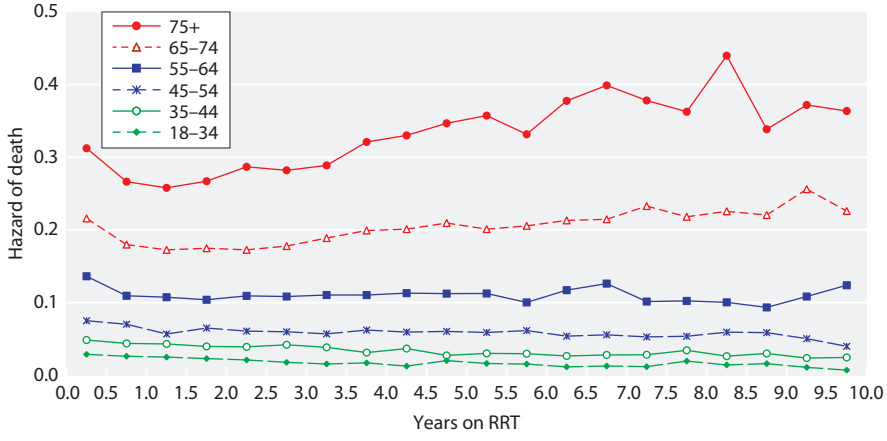

Fig. 5.12. Six monthly hazard of death, by vintage and age group, 1997–2015 incident RRT cohort after day 90

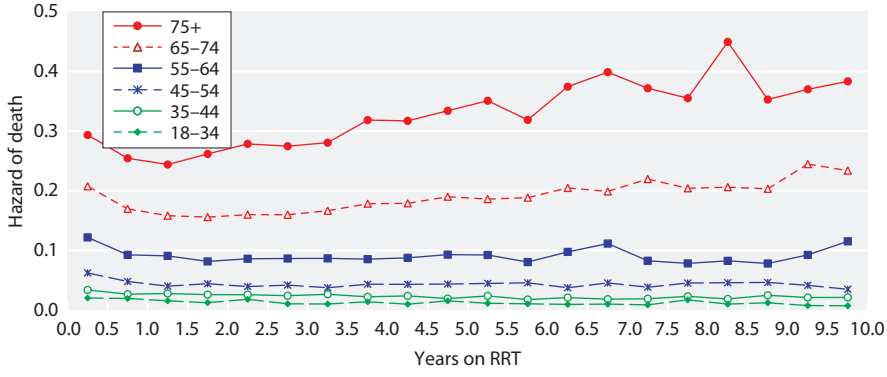

Fig. 5.13. Six monthly hazard of death, by vintage and age group, 1997–2015 incident RRT cohort without diabetes after day 90

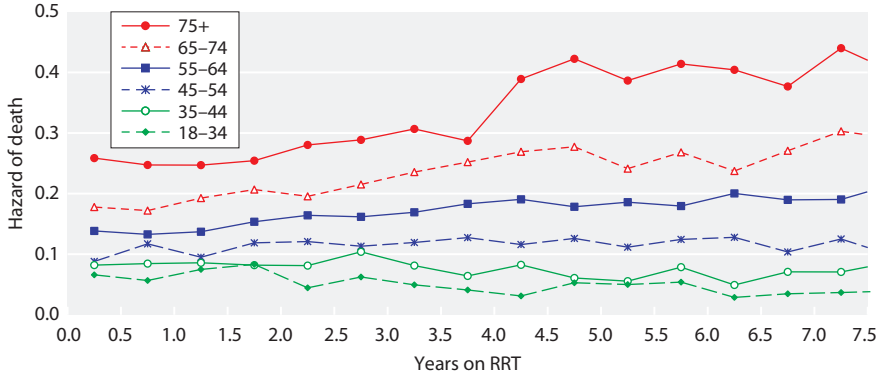

Fig. 5.14. Six monthly hazard of death, by vintage and age group, 1997–2015 incident RRT cohort with diabetes after day 90

patients treated by the centre and then looking up the corresponding number on the x-axis. Four centres (Wolverhampton, Cardiff, Swansea, Glasgow) had survival below the 95% lower limit whilst three centres (Gloucester, Reading, West Northern Ireland) had survival above the 95% upper limit and one centre (London West) above the 99% upper limit. This is compared with last year when three centres were survival outliers below the 95% lower limit and two centres above the 95% upper limit. With 71 centres included in the analysis it would be expected that three centres would be outside these limits by chance. It is important to highlight that these data have only been adjusted for age (i.e. no other patient factors such as comorbidity, primary renal disease or ethnicity) and have not been censored at transplantation. Therefore the effect of differing rates of transplantation by centre was not taken into account. Please see the following section for the effects of adjustment for primary renal disease and comorbidity.

Appendix 1 of this chapter contains additional tables related to these survival analyses; table 5.22 and 5.23 show unadjusted and adjusted survival together with 95% confidence intervals for incident patient survival one year after 90 days and at 90 days for the 2015 single year cohort. Table 5.24 in appendix 1 shows the one year after 90 day incident survival by centre for incident RRT cohort years 2006–2015, adjusted to age 60. One to five year survival after the first 90 days of RRT adjusted to age 60 is included in appendix 1, table 5.25 for incident RRT cohorts 2011–2015.

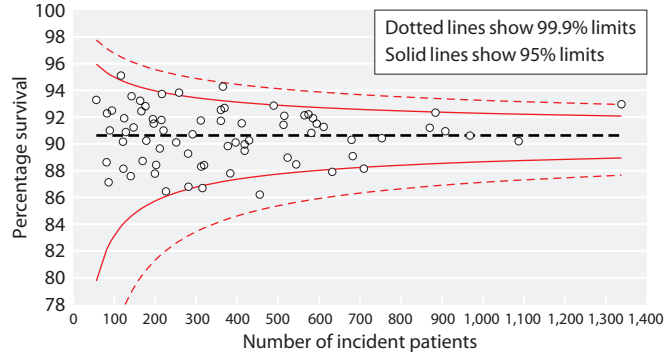

Fig. 5.15. Funnel plot for age adjusted one year after 90 days survival, 2012–2015 incident RRT cohort

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

Although comorbidity returns to the UKRR have remained poor, some centres have consistently returned ⩾85% comorbidity data for incident patients. The analyses in this section use a combined incident RRT cohort from 2012–2015 for the 29 centres who consistently returned comorbidity data for ⩾85% of patients during this period and demonstrate the impact of sequential adjustment for age, primary renal diagnosis and comorbidity (table 5.10).

It can be seen that adjustment for age has the largest effect, most notably in those centres with the lower unadjusted survival figures. Survival improved for all centres after adjustment for age, as the average age of incident patients was over 60 years. There were only minor changes in survival for most centres after adjustment for primary renal diagnosis, but survival did increase by ⩾0.8% for three centres (Shrewsbury, Swansea, York). In five centres (Newcastle, Swansea, Cardiff, Bradford, Clwyd) adjustment for comorbidity had a noticeable effect (⩾1% increase) on adjusted survival (table 5.10, figure 5.16). After adjustment for age, primary renal diagnosis and comorbidity, Swansea, Antrim, Bangor and Clwyd had the largest improvement in survival of 8.3%, 8.0%, 6.5% and 6.1% respectively.

One of the largest survival improvements, as a result of adjustment for comorbidity was seen in Swansea. Adjustment for comorbidity may have an important differential effect for renal centres that have a higher comorbid burden in their RRT population. This could affect the

Table 5.9. Age adjusted (to age 60) one year after 90 day survival, 2012–2015 incident RRT cohort

	1 year after 90 days			
			Limits for funnel plot	
Centre	*N*	Adjusted survival %	*Lower 95% limit*	*Upper 95% limit*
D&Gall	56	93.3	79.7	96.0
Bangor	81	88.6	82.1	95.3
Inverns	82	92.3	82.2	95.3
Clwyd	86	87.1	82.4	95.2
Newry	89	91.0	82.6	95.2
Ulster	94	92.5	82.9	95.1
West NI	116	95.1	83.8	94.8
Colchr	121	90.2	84.0	94.7
Antrim	122	88.1	84.0	94.7
Sthend	124	91.9	84.1	94.7
Krkcldy	128	90.9	84.2	94.6
Klmarnk	140	87.6	84.6	94.5
Carlis	142	93.6	84.6	94.4
Wrexm	147	91.2	84.7	94.4
Ipswi	163	93.2	85.1	94.2
Dundee	166	92.4	85.2	94.2
Basldn	169	88.7	85.2	94.2
Truro	176	92.8	85.3	94.1
Donc	178	90.2	85.4	94.1
Chelms	194	91.9	85.6	94.0
Dudley	196	91.5	85.7	94.0
York	199	87.8	85.7	94.0
Wirral	202	88.4	85.8	93.9
Liv Ain	211	89.7	85.9	93.9
Plymth	215	91.8	85.9	93.9
Abrdn	216	93.7	86.0	93.9
Airdrie	220	91.0	86.0	93.8
Shrew	226	86.4	86.1	93.8
Sund	251	90.1	86.4	93.7
Glouc	258	93.8	86.4	93.6
Derby	280	89.3	86.6	93.5
Bradfd	281	86.8	86.6	93.5
Dorset	291	90.7	86.7	93.5
Belfast	311	91.7	86.9	93.4
Edinb	312	88.3	86.9	93.4
Wolve	315	86.7	86.9	93.4
Norwch	319	88.4	86.9	93.4
Hull	360	91.7	87.2	93.2
L St.G	360	92.5	87.2	93.2
Redng	365	94.3	87.2	93.2
Camb	369	92.7	87.2	93.2
Stoke	377	89.8	87.2	93.2
Newc	383	87.8	87.3	93.2
B Heart	396	90.1	87.3	93.1
Nottm	411	91.5	87.4	93.1
Covnt	418	90.0	87.4	93.1
Liv Roy	418	89.5	87.4	93.1
Middlbr	429	90.3	87.5	93.0
Swanse	455	86.2	87.6	93.0
Exeter	489	92.9	87.7	92.9
Kent	513	91.4	87.8	92.9
Stevng	515	92.1	87.8	92.9
Brightn	523	89.0	87.8	92.8
Salford	544	88.5	87.9	92.8
Sheff	564	92.1	87.9	92.8
L Guys	574	92.2	88.0	92.8
Bristol	581	90.8	88.0	92.7
Prestn	585	91.9	88.0	92.7
L Kings	594	91.5	88.0	92.7
Leeds	611	91.3	88.1	92.7
Cardff	632	87.9	88.1	92.7
Oxford	679	90.3	88.2	92.6
M RI	682	89.1	88.2	92.6
Glasgw	709	88.1	88.3	92.6
Ports	753	90.4	88.3	92.5
B QEH	870	91.2	88.5	92.4
L Rfree	884	92.3	88.5	92.4
Carsh	908	90.9	88.6	92.4
Leic	968	90.6	88.6	92.3
L Barts	1,087	90.2	88.7	92.2
L West	1,338	93.0	88.9	92.1

*Cambridge included for 2012–2014 as no patient level data was received for 2015 and 2016

status of centres as a survival outlier as shown in figure 5.15, such as Swansea, Cardiff, Wolverhampton and Glasgow. However due to poor comorbidity returns for many renal centres, comorbidity adjustment for the entire incident RRT population is not yet possible. Data completeness and data quality both have significant implications for the accuracy of analyses such as these. Case-mix adjustment performed in a cohort of incident patients starting RRT in England from 2002 to 2006 which was linked to the Hospital Episodes Statistics (HES) data, found that three of the four survival outliers at that time were no longer outliers after adjustment for HES-derived case-mix. Case-mix adjusted survival for Wolverhampton was shown to increase substantially in this research. Swansea, Cardiff and Glasgow could not be evaluated in this research as this HES research only included English hospitals, but the study results highlight that observed variability in survival between centres is affected by case-mix [10]. High levels of deprivation such as in parts of Glasgow, Wales and some other

Table 5.10. The effect of adjustment for age, primary renal diagnosis and comorbidity on survival, 2012–2015 incident RRT cohort, percentage survival one year after 90 days

Centre*	Unadjusted	Age adjusted	Age, PRD adjusted	Age, PRD and comorbidity adjusted
Swanse	79.6	86.1	86.9	88.0
Bangor	80.8	87.0	87.0	87.3
Antrim	81.1	87.6	88.2	89.0
Shrew	82.0	86.7	88.3	87.9
Cardff	83.9	87.6	88.0	89.0
Bradfd	85.2	86.8	87.3	88.3
Clwyd	85.2	89.8	90.2	91.4
York	85.4	88.9	89.7	90.1
Dorset	85.8	90.6	90.7	91.2
Basldn	86.2	89.8	89.6	89.8
Newc	86.6	89.0	89.6	90.9
Wrexm	86.6	90.9	91.2	91.5
B Heart	86.9	90.4	91.0	91.0
Middlbr	87.2	89.8	90.4	91.0
Kent	87.8	91.2	91.6	90.9
Sund	88.2	90.8	91.0	91.0
Bristol	88.2	91.3	91.6	92.1
Newry	88.3	90.6	91.3	91.5
Ulster	88.3	92.2	92.6	92.5
Oxford	88.3	90.4	90.6	91.2
Nottm	88.3	91.2	91.7	91.5
L Kings	89.3	91.3	91.2	91.5
Exeter	89.6	93.4	93.7	93.7
Hull	90.0	92.0	92.1	92.1
B QEH	90.3	92.3	92.9	92.1
Leeds	90.5	91.5	91.5	91.9
Derby	90.8	92.0	92.6	92.5
Redng	91.7	94.1	94.5	95.2
L Guys	94.4	94.9	95.1	94.8
All 29 centres	**87.7**	**90.6**	**91.0**	**91.3**

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

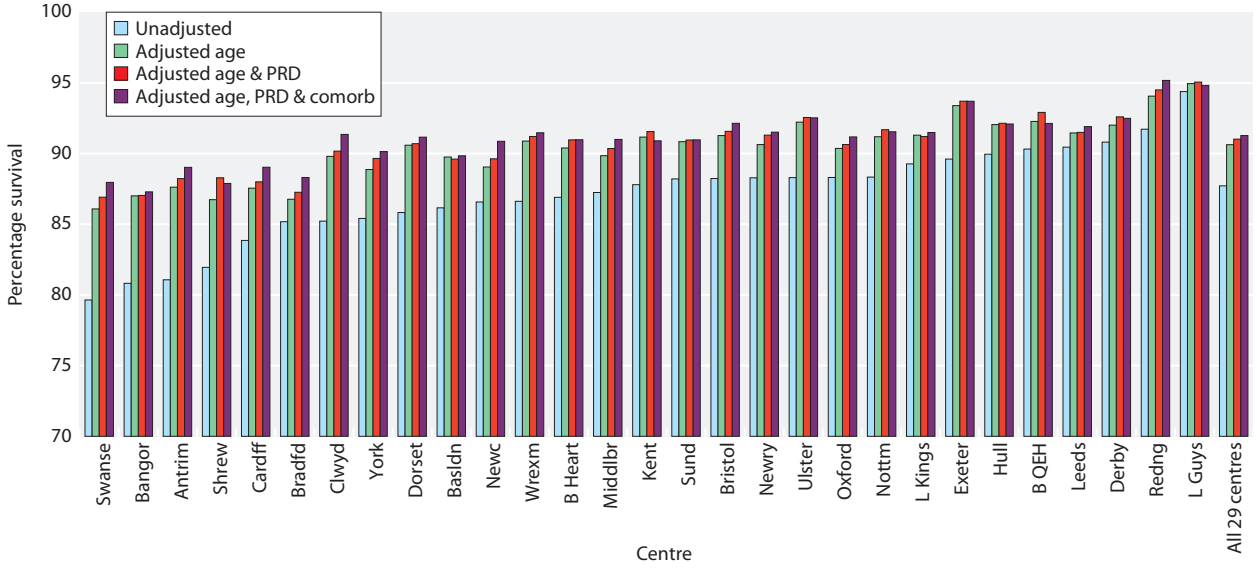

Fig. 5.16. The effect on one year after 90 day survival after sequential adjustment for age, primary renal diagnosis and comorbidity, 2012–2015 incident RRT cohort

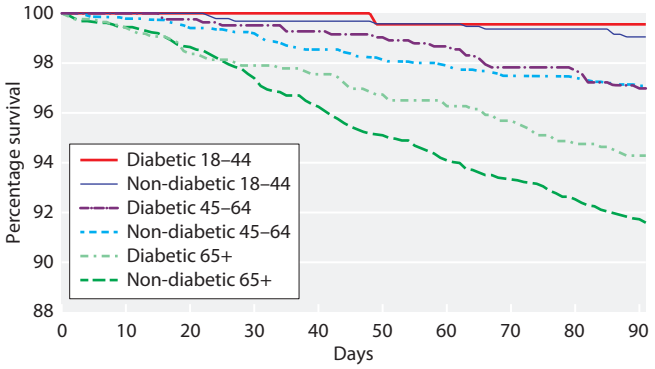

Fig. 5.17. Survival at 90 days for incident RRT patients with and without diabetes by age group, 2015 cohort

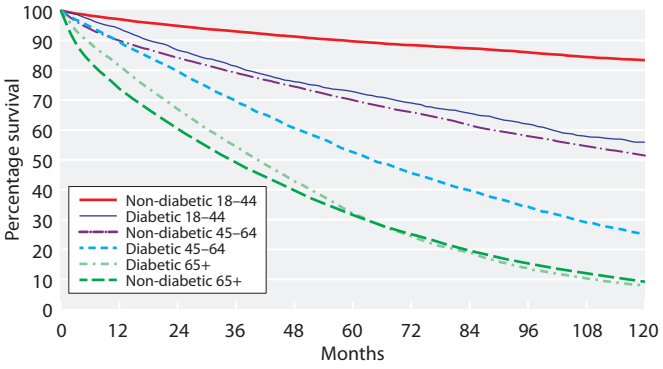

Fig. 5.19. Long term survival for incident RRT patients with and without diabetes by age group, 2004–2013 cohort, followed up for a minimum of three years

areas have not been adjusted for and may impact on the mortality rate in these areas.

Survival in patients with diabetes

Patients with diabetes have been shown to have worse long term survival compared to patients without diabetes [3]. In the following analyses, 90 day survival, 1 year after 90 day survival and long term survival are presented according to the presence or absence of a diagnosis of diabetes as the primary renal disease.

In the UK in 2015, 90 day survival for incident patients with diabetes was better than those without diabetes across the age categories of 18–44 years, 45–64 years and 65 years and over (figure 5.17). For one year survival after 90 days in the 2015 cohort, young patients (18–44 years) without diabetes had better survival than their counterparts with diabetes, whereas for the 45–64 years group and those 65 years and over, the survival was more similar (figure 5.18).

Long term survival for patients with diabetes and patients without diabetes is presented for the incident RRT cohort of patients starting RRT from 2004 to 2013 with a minimum of three years follow up (figure 5.19). These data show large differences between survival for those with diabetes and those without diabetes in the age groups 18–44 years and 45–64 years. In the age group 18–44 years, 89.7% of patients without diabetes were alive five years after start of RRT compared to 72.8% for patients with diabetes. In the age group 45–64 years, 69.9% of patients without diabetes were alive five years after start of RRT compared to 52.5% for patients with diabetes (figure 5.19). The initial survival difference where incident RRT patients without diabetes in the older age group (⩾65 years) had poorer survival than incident patients with diabetes in the same age group, diminished over the years until there was very little difference in five year survival between these groups.

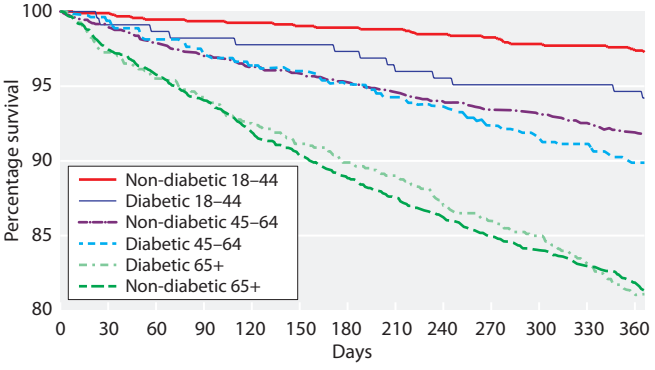

Fig. 5.18. Survival at one year after 90 days for incident RRT patients with and without diabetes by age group, 2015 cohort

Survival in prevalent dialysis patients

Overall survival

Table 5.11 shows the one and two year survival for prevalent patients on dialysis. One year age adjusted survival for prevalent dialysis patients was essentially stable at 88.0% in the 2015 cohort compared to 88.3% in the 2014 cohort. Two year survival dropped slightly from 71.1% in the 2014 cohort to 69.9% in the 2015 cohort.

Survival by UK country

The one year death rate for prevalent dialysis patients in 2015 for each UK country is shown in table 5.12. The death rate rose in every UK nation compared to the 2014 cohort, except in Northern Ireland; the median age of prevalent dialysis patients remained similar in England and Wales, decreased slightly in Scotland and increased in Northern Ireland. The one year unadjusted death rate in Wales was significantly higher than in England and Northern Ireland. However, the higher median age in Wales and

Table 5.11. One and two year survival of prevalent dialysis patients

Patient group	Patients *N*	Deaths *N*	Survival %	*95% CI*
1 year survival – 2015 cohort				
Unadjusted	26,582	4,092	83.9	*83.5–84.4*
Adjusted to age 60	26,582	4,092	88.0	*87.5–88.4*
2 year survival – 2014 cohort				
Unadjusted	26,331	7,328	69.9	*69.4–70.5*

2015 cohort: all dialysis patients alive on 31/12/2015
2014 cohort: all dialysis patients alive on 31/12/2014

Table 5.12. One year death rate per 1,000 prevalent dialysis patient years in the 2015 cohort and median age of prevalent dialysis patients by UK country

	England	N Ireland	Scotland	Wales
Death rate	172	157	190	234
95% CI	*166–177*	*127–191*	*169–211*	*206–264*
Median age	67.0	71.5	65.0	69.0

socio-economic factors such as general population life expectancy and area deprivation, may contribute to the death rate in Wales. These results are unadjusted for age, primary renal diagnosis or comorbidity.

One year survival of prevalent dialysis patients by centre

The age adjusted (adjusted to age 60) one year survival of dialysis patients by centre is illustrated in a funnel plot (figure 5.20). As there are 70 centres included in the analyses, it would be expected that three centres would fall outside the 95% (1 in 20) confidence limits, entirely by chance. The survival for patients attending Salford was below the 95% confidence limit and there were no centres below the 99% confidence limit. Comparing data over a number of years, there was no centre that had consistently been below the 95% confidence limit. Five centres (Newry, Birmingham Queen Elizabeth Hospital, Aberdeen, London St Bartholomew's, London West) were above the 95% confidence limit and one centre (London St George's) was above the 99% confidence limit. A sensitivity analysis was performed without censoring at transplantation and the results for outlying centres were unchanged. These observed differences may have occurred by chance, may be true differences or may reflect differences in the case-mix of the renal centres. Transplantation listing practice (percentage of patients wait-listed within two years of RRT start, median time to wait-listing) and pre-emptive transplant rates in renal centres may have an impact on the survival results for prevalent dialysis patients.

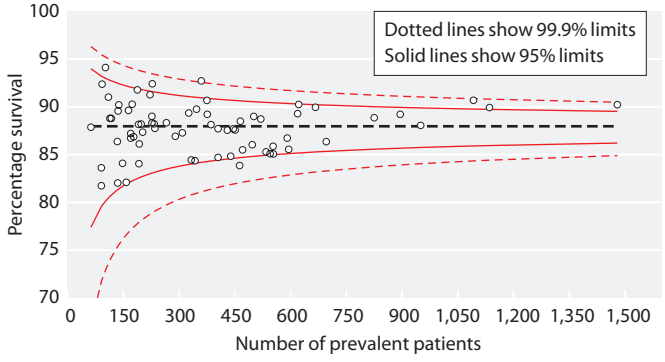

Fig. 5.20. One year survival funnel plot of prevalent dialysis patients by centre adjusted to age 60, 2015 cohort

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

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

Survival by age group

Figure 5.23 shows the one year survival of prevalent dialysis patients who were alive and receiving dialysis on 31 December 2015, stratified by age group. This demonstrates a curvilinear decrease in survival with increasing age.

One year death rate in prevalent dialysis patients by age group, 2015 cohort

The death rates for prevalent patients on dialysis by age group are shown in figure 5.24. The younger patients included in this analysis are a selected higher risk group, as they remained on dialysis rather than undergoing transplantation. The increase in the death rate with age was not linear; in those aged <45 years, a ten year

Table 5.13. One year survival of prevalent dialysis patients in each centre (adjusted to age 60), 2015 cohort

Centre*	N	Adjusted one year survival	Limits for funnel plot		Centre*	N	Adjusted one year survival	Limits for funnel plot	
			Lower 95% limit	*Upper 95% limit*				*Lower 95% limit*	*Upper 95% limit*
D&Gall	63	87.9	*77.4*	*94.0*	Newc	333	84.4	*84.0*	*91.1*
Clwyd	91	83.6	*79.5*	*93.2*	Middlbr	343	84.4	*84.1*	*91.0*
Bangor	91	81.7	*79.5*	*93.2*	Redng	347	89.8	*84.1*	*91.0*
Inverns	93	92.4	*79.7*	*93.2*	L St.G	360	92.7	*84.2*	*90.9*
Newry	102	94.1	*80.1*	*93.0*	Norwch	375	90.7	*84.3*	*90.9*
Ulster	110	91.0	*80.5*	*92.9*	Wolve	376	89.2	*84.3*	*90.9*
Carlis	114	88.8	*80.6*	*92.8*	Stoke	386	88.1	*84.3*	*90.9*
Colchr	118	88.8	*80.8*	*92.7*	Hull	405	87.7	*84.4*	*90.8*
Antrim	134	86.4	*81.3*	*92.5*	Swanse	405	84.7	*84.4*	*90.8*
Sthend	135	82.0	*81.3*	*92.5*	Covnt	430	87.6	*84.5*	*90.7*
Wrexm	136	89.6	*81.3*	*92.5*	Liv Roy	439	84.8	*84.6*	*90.7*
West NI	138	90.2	*81.4*	*92.4*	B Heart	446	87.7	*84.6*	*90.7*
Krkcldy	148	84.1	*81.7*	*92.3*	Nottm	451	87.6	*84.6*	*90.7*
Klmarnk	158	82.1	*81.9*	*92.2*	Salford	463	83.9	*84.7*	*90.6*
Truro	164	89.6	*82.0*	*92.1*	Brightn	465	88.5	*84.7*	*90.6*
York	170	87.2	*82.2*	*92.1*	Kent	471	85.5	*84.7*	*90.6*
Plymth	170	86.7	*82.2*	*92.1*	Oxford	497	86.0	*84.8*	*90.5*
Ipswi	174	90.3	*82.2*	*92.0*	Exeter	501	89.0	*84.8*	*90.5*
Chelms	178	86.9	*82.3*	*92.0*	Stevng	520	88.7	*84.9*	*90.5*
Liv Ain	188	91.8	*82.5*	*91.9*	Leeds	534	85.3	*84.9*	*90.5*
Donc	191	88.2	*82.5*	*91.9*	Cardff	545	85.1	*85.0*	*90.4*
Airdrie	192	84.1	*82.6*	*91.9*	Bristol	553	85.9	*85.0*	*90.4*
Dundee	193	86.1	*82.6*	*91.9*	M RI	554	85.1	*85.0*	*90.4*
Basldn	198	88.2	*82.7*	*91.8*	Prestn	591	86.7	*85.1*	*90.4*
Wirral	202	87.4	*82.7*	*91.8*	Glasgw	595	85.6	*85.1*	*90.3*
Belfast	222	91.3	*83.0*	*91.6*	L Kings	619	89.3	*85.2*	*90.3*
Sund	227	88.3	*83.1*	*91.6*	Sheff	622	90.3	*85.2*	*90.3*
Shrew	227	89.0	*83.1*	*91.6*	L Guys	667	90.0	*85.3*	*90.2*
Abrdn	228	92.4	*83.1*	*91.6*	Ports	696	86.4	*85.3*	*90.2*
Dudley	233	88.2	*83.1*	*91.6*	L Rfree	825	88.9	*85.6*	*90.0*
Bradfd	235	87.8	*83.2*	*91.5*	Carsh	895	89.2	*85.7*	*89.9*
Glouc	266	88.3	*83.5*	*91.4*	Leic	950	88.1	*85.7*	*89.9*
Edinb	290	86.9	*83.7*	*91.2*	B QEH	1,092	90.7	*85.9*	*89.8*
Derby	309	87.3	*83.8*	*91.2*	L Barts	1,135	89.9	*85.9*	*89.7*
Dorset	326	89.4	*84.0*	*91.1*	L West	1,479	90.2	*86.2*	*89.5*

*Cambridge not included in the 2015 cohort as no patient level data was received for 2015 and 2016

increase in age was associated with a rise in the death rate of approximately 25 deaths per 1,000 patient years compared with those ⩾75 years where a ten year increase in age was associated with a rise of about 80 deaths per 1,000 patient years.

Time trends in survival, 2006 to 2015

Figure 5.25 illustrates that one year survival for prevalent dialysis patients in England gradually improved from 2006 to 2011 with a gradual decrease thereafter. The numbers of patients were smaller in Scotland, Northern Ireland and Wales which resulted in variability and wide confidence intervals, so no firm conclusions can be drawn, but survival in Scotland and Wales is also showing a gradual decrease from around 2010. The change in prevalent survival by centre from 2006 to 2015 is included in appendix 1: Survival tables, table 5.26.

Survival in prevalent dialysis patients with diabetes

In patients aged <65 years, one year survival for prevalent dialysis patients with diabetes was approximately 8.0% lower compared to the same age group without diabetes. In contrast, for prevalent dialysis patients aged 65+ years, the survival difference was smaller between those with and without diabetes (2.5% lower, table 5.14).

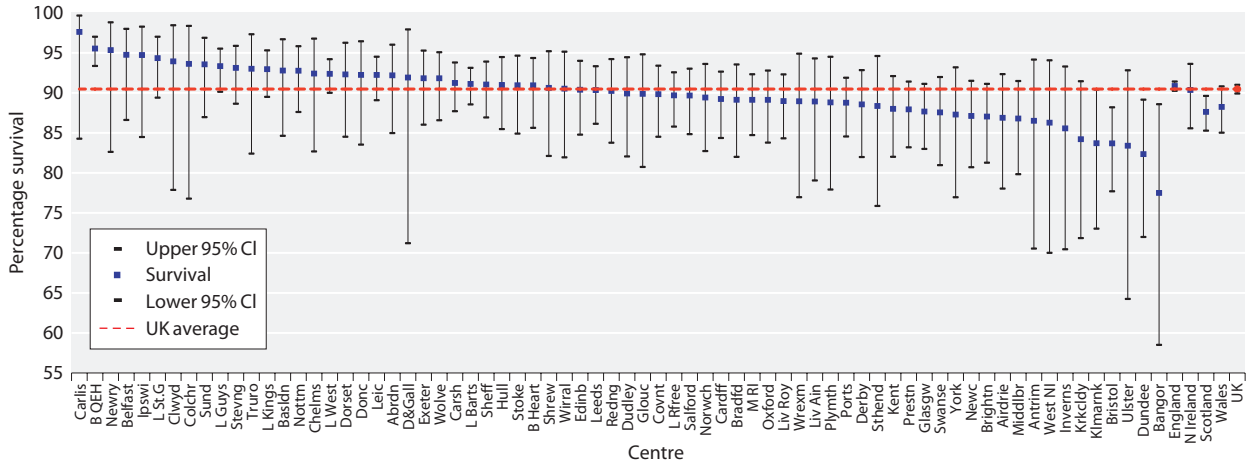

Fig. 5.21. One year survival of prevalent dialysis patients aged less than 65 years by centre, 2015 cohort

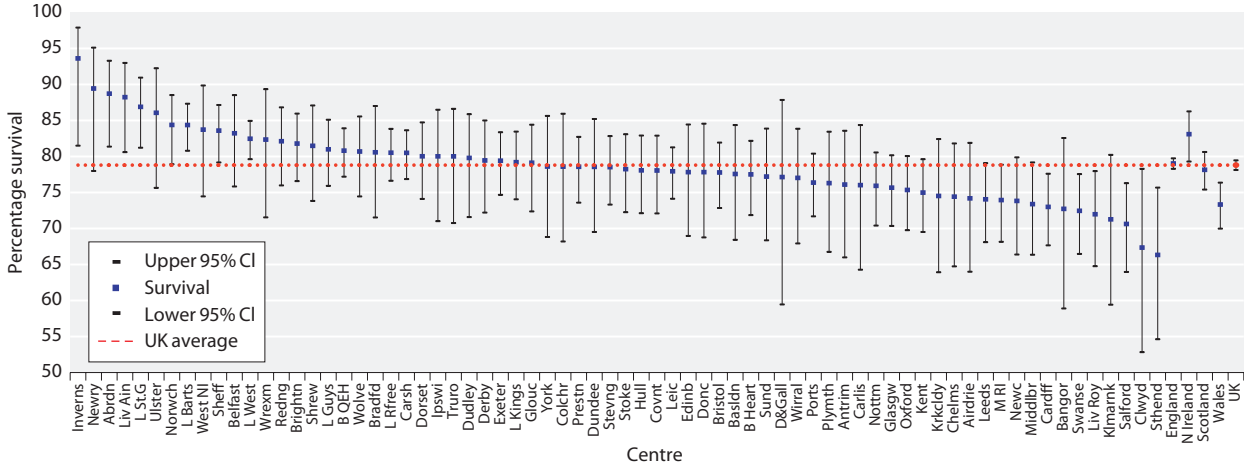

Fig. 5.22. One year survival of prevalent dialysis patients aged 65 years and over by centre, 2015 cohort

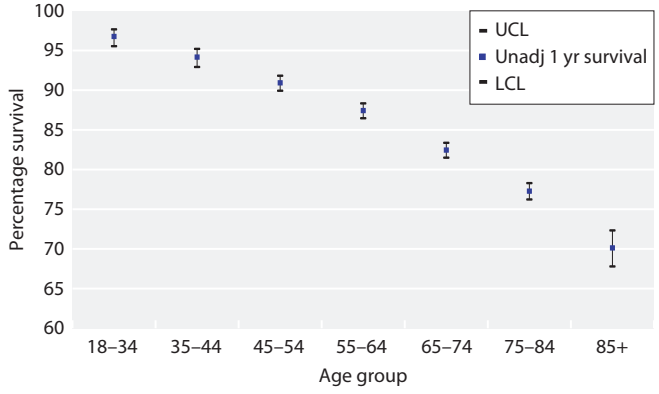

Fig. 5.23. One year survival of prevalent dialysis patients by age group, 2015 cohort

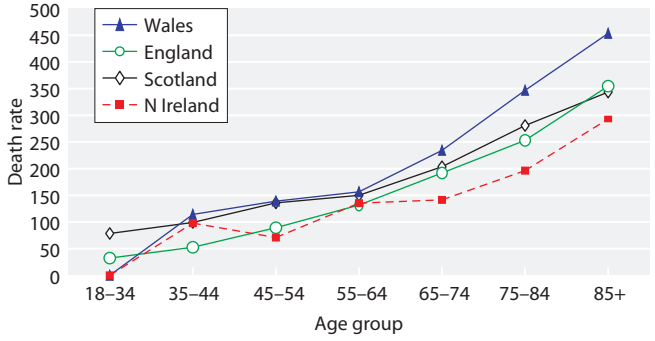

Fig. 5.24. One year death rate per 1,000 patient years by UK country and age group for prevalent dialysis patients, 2015 cohort

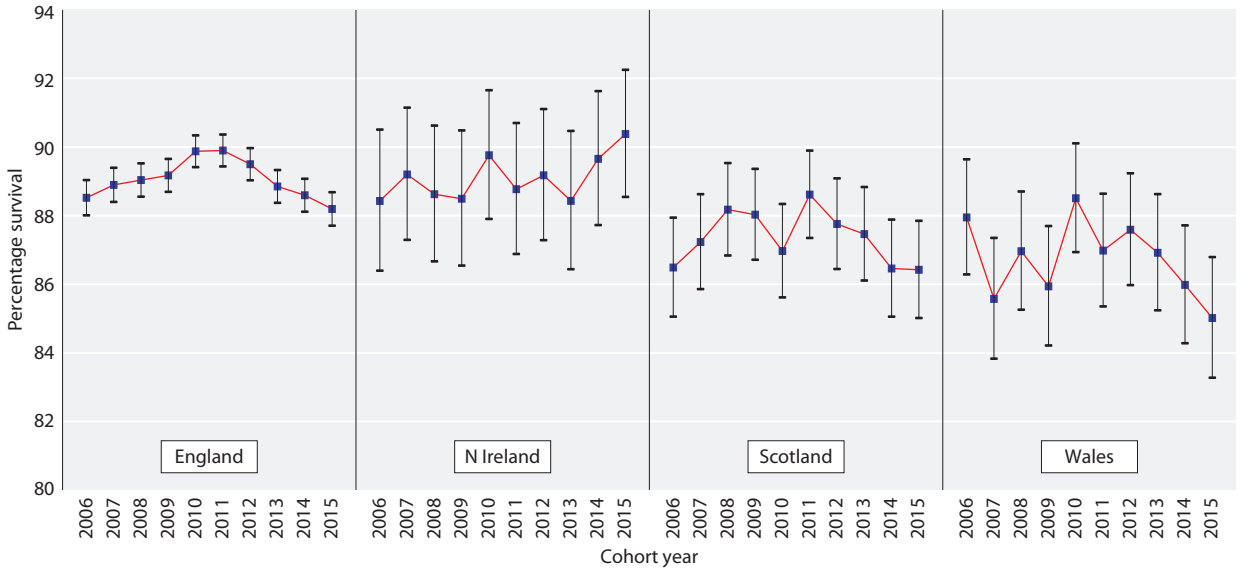

Fig. 5.25. Serial one year survival for prevalent dialysis patients by UK country, 2006 to 2015 cohort years, adjusted to age 60

Time trends in patients with a primary diagnosis of diabetes

The age adjusted one year survival for prevalent dialysis patients with a reported primary renal disease of diabetic nephropathy are shown in table 5.15.

Death rate on RRT compared with the UK general population

The death rate of patients on all RRT modalities compared to the general population is shown in table 5.16.

Table 5.14. One year survival of prevalent dialysis patients in the UK by age group and diagnosis of diabetes, 2015 cohort

Patient group	Patients *N*	Deaths *N*	Survival %	*95% CI*
Dialysis patients 2015 cohort				
All age <65	12,101	1,064	90.5	*89.9–91.0*
Non-diabetic <65	9,266	648	92.4	*91.8–92.9*
Diabetic <65	2,835	416	84.6	*83.1–85.9*
All age 65+	14,481	3,028	78.8	*78.1–79.5*
Non-diabetic 65+	11,088	2,252	79.4	*78.6–80.1*
Diabetic 65+	3,393	776	76.9	*75.5–78.3*

The relative risk of death on RRT decreased with age from a peak of approximately 25 times that of the general population at age 20–24 years to 1.5 times the general population at age 85 and over. Figure 5.26 shows that the relative risk of death has decreased substantially for the younger age groups (<50 years) in recent years, whereas the relative risk of death in patients aged over 50 has not changed greatly in the 2015 cohort compared to the 1998–2001 cohort. The overall relative risk of death was 5.6 in the 2015 cohort and was slightly lower compared to the previous year (relative risk of death 6.1).

Cause of death

Data completeness

Overall completeness of data for cause of death in the UK was similar to the previous year: 63.5% in 2015 and 63.2% in 2016. Cause of death data completeness declined in England and Northern Ireland by −1.7% and −0.8% respectively but increased by 9.4% and 5.3% in Scotland and Wales respectively (appendix 1: Survival tables, table 5.27). There was substantial variability in the completeness of cause of death data between centres, with

Table 5.15. Serial one year survival of prevalent dialysis patients with a primary diagnosis of diabetes, 2006–2015 cohort years

	Year									
Survival	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
1 year survival (%)	85.0	83.6	84.0	83.4	85.0	85.2	84.7	83.4	83.2	83.1
Number of patients	3,955	4,361	4,706	5,048	5,214	5,443	5,637	5,833	5,995	6,228

Table 5.16. Death rate by age group for prevalent RRT patients, 2015 cohort, compared with the general population and with previous analyses in the 1998–2001 cohort

Age group	UK population mid 2016 (thousands)	UK deaths in 2016	Death rate per 1,000 population	Expected number of deaths in UKRR population	UKRR deaths in 2016	UKRR death rate per 1,000 prevalent RRT patients	Relative risk of death in 2016	Relative risk of death 1998–2001 cohort
20–24	4,254	1,636	0.4	0	9	10	24.7	41.1
25–29	4,511	2,176	0.5	1	17	11	23.0	41.8
30–34	4,408	3,004	0.7	2	32	14	21.0	31.2
35–39	4,180	3,861	0.9	3	57	20	21.2	26.0
40–44	4,174	6,248	1.5	6	97	25	16.6	22.6
45–49	4,619	9,981	2.2	12	191	34	15.8	19.0
50–54	4,632	14,801	3.2	22	273	41	12.7	12.8
55–59	4,067	20,356	5.0	33	382	57	11.4	10.1
60–64	3,534	27,993	7.9	49	476	77	9.7	10.4
65–69	3,637	44,527	12.2	78	690	109	8.9	7.9
70–74	2,852	56,421	19.8	102	799	155	7.8	7.2
75–79	2,155	73,524	34.1	149	884	203	5.9	5.3
80–84	1,607	96,298	59.9	165	804	293	4.9	4.0
85+	993	231,386	233.0	315	481	356	1.5	3.0
Total	**49,623**	**592,212**	**11.9**	**935**	**5,192**	**92**	**5.6**	**7.7**

some returning no data whilst others achieved 100% completeness. Several centres have shown substantial improvement in data returns (appendix 1, table 5.27).

Cause of death in incident RRT patients

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

Cause of death within the first 90 days

In the first 90 days after start of RRT, cardiac disease was the most common cause of death in both age groups. Infection and treatment withdrawal as a cause of death were more common in older patients (aged 65+), whereas malignancy was more common in younger patients (<65 years old) (table 5.17).

Cause of death within one year after 90 days

In the year after the first 90 days, treatment withdrawal as a cause of death was more common in older patients (aged 65+), whereas cardiac disease was more common in younger patients (<65 years old) (table 5.18). Although cardiac disease remained the leading cause of death in both older and younger age groups at one year after the first 90 days, it has decreased over time.

Cause of death in prevalent RRT patients in the 2015 cohort

Table 5.19 shows the comparison of cause of death for prevalent dialysis and transplant patients in the 2015 cohort. Cardiac disease as a cause of death was less common in patients with a transplant who were a highly selected group of patients. Malignancy was responsible for a far greater percentage of deaths in prevalent patients

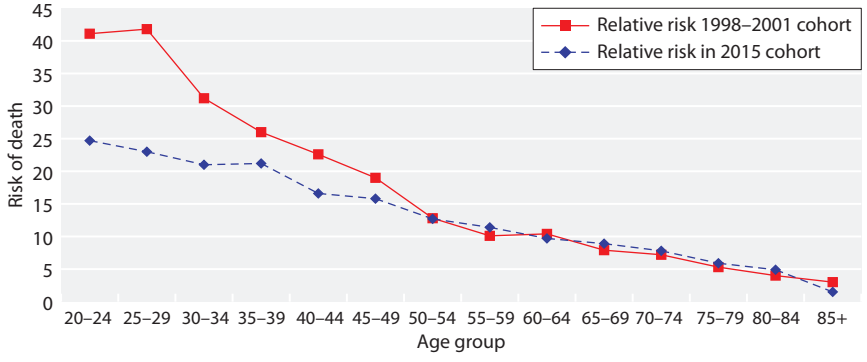

Fig. 5.26. Relative risk of death in prevalent RRT patients in the 2015 cohort compared to the 1998–2001 cohort

Table 5.17. Cause of death in the first 90 days for incident RRT patients by age group, 2000–2015 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	847	26	195	27	652	25
Cerebrovascular disease	146	4	30	4	116	4
Infection	597	18	112	15	485	19
Malignancy	313	9	100	14	213	8
Treatment withdrawal	538	16	77	11	461	18
Other	727	22	181	25	546	21
Uncertain	140	4	29	4	111	4
Total	**3,308**		**724**		**2,584**	
Missing data	2,873	46	642	47	2,231	46

Table 5.18. Cause of death one year after 90 days for incident RRT patients by age group, 2000–2015 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	1,460	22	472	25	988	20
Cerebrovascular disease	319	5	99	5	220	5
Infection	1,273	19	343	18	930	19
Malignancy	777	12	244	13	533	11
Treatment withdrawal	1,135	17	175	9	960	20
Other	1,397	21	439	23	958	20
Uncertain	374	6	108	6	266	5
Total	**6,735**		**1,880**		**4,855**	
Missing data	5,453	45	1,528	45	3,925	45

Table 5.19. Cause of death in prevalent RRT patients by modality, 2015 cohort

	All modalities		Dialysis		Transplant	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	807	24	698	24	109	19
Cerebrovascular disease	159	5	129	5	30	5
Infection	696	20	570	20	126	22
Malignancy	351	10	218	8	133	23
Treatment withdrawal	565	17	544	19	21	4
Other	659	19	548	19	111	20
Uncertain	181	5	145	5	36	6
Total	**3,418**		**2,852**		**566**	
Missing data	1,775	34	1,464	34	311	35

with a transplant than in those receiving dialysis; infection was also more common. Treatment withdrawal was a more common cause of death in the prevalent dialysis population.

Table 5.20 shows the cause of death for prevalent dialysis patients in the 2015 cohort, divided into subgroups according to age. Again, cardiac disease was the leading cause of death overall. Cardiac disease represented a higher proportion of all deaths (amongst those where cause of death was known) in younger (<65 years) dialysis patients, although the absolute number of cardiac deaths were higher amongst those

Table 5.20. Cause of death in prevalent dialysis patients by age group, 2015 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	698	24	251	34	447	21
Cerebrovascular disease	129	5	35	5	94	4
Infection	570	20	148	20	422	20
Malignancy	218	8	57	8	161	8
Treatment withdrawal	544	19	71	10	473	22
Other	548	19	139	19	409	19
Uncertain	145	5	43	6	102	5
Total	**2,852**		**744**		**2,108**	
No cause of death data	1,464	34	395	35	1,069	34

Table 5.21. Cause of death in prevalent transplant patients by age group, 2015 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	109	19	59	23	50	16
Cerebrovascular disease	30	5	15	6	15	5
Infection	126	22	43	17	83	27
Malignancy	133	23	61	24	72	23
Treatment withdrawal	21	4	7	3	14	5
Other	111	20	54	21	57	18
Uncertain	36	6	17	7	19	6
Total	**566**		**256**		**310**	
No cause of death data	311	35	140	35	171	36

aged ⩾65 years (34% versus 21%). Prevalent dialysis patients aged ⩾65 years were substantially more likely to withdraw from treatment than younger patients (22% and 10% respectively).

Table 5.21 shows the cause of death for prevalent transplant patients in the 2015 cohort, divided into subgroups according to age. It shows that cardiac disease was more common in the younger age group (similar to that seen for dialysis patients, table 5.20), whereas infection was much more common in older transplant patients. The proportions of other causes of death were relatively similar between older and younger patients.

Figure 5.27 shows cause of death for prevalent RRT patients over time (2000 to 2015). Cardiovascular mortality decreased from year 2000 to 2005 and has remained static since, whilst treatment withdrawal as a cause of death has increased since 2009 onwards. Infection and malignancy as cause of death have remained static over the period (figure 5.27).

Discussion

Survival of incident patients on RRT at 90 days (adjusted to age 60) was slightly lower compared to the preceding year. When analysed according to age group, 90 day survival declined for those ⩾65 years whilst it was similar for the younger patients. Incident one year after 90 days survival (adjusted to age 60) declined slightly in the 2015 cohort compared to 2014, due to decreased survival in patients aged <65 years of age. There was no difference in survival by gender. Long term survival of incident patients on RRT continued to improve gradually over time.

There were differences in short term incident survival (90 days and one year after 90 days) by combined age group and diagnosis of diabetes; 90 day survival was better for those with diabetes across all age groups. For survival one year after 90 days, in the younger age group (<65 years) survival was much better for those patients without diabetes, however, this association was

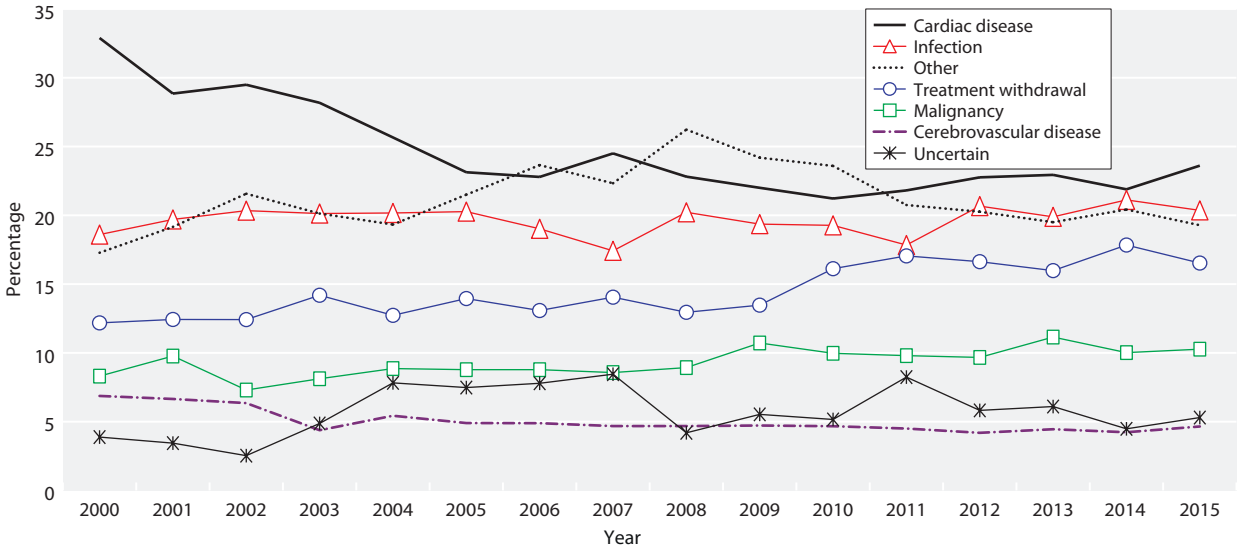

Fig. 5.27. Cause of death in prevalent RRT patients by cohort year (2000–2015)

not seen in the older age group (⩾65 years), where survival was more similar between patients with and without diabetes. Long-term survival showed a similar picture, where younger (<65 years) patients without diabetes survived much better than similar aged patients with diabetes. Survival was similar for older patients (⩾65 years) with and without diabetes.

One year age adjusted survival for prevalent dialysis patients was approximately the same in 2015 compared to 2014 (88.0% and 88.3% respectively). Prevalent dialysis patient survival in the UK seems to have peaked in 2011 and has been slightly lower in more recent years. The age adjusted one year survival for prevalent dialysis patients with diabetic primary renal disease in the UK has decreased slightly from 2011 onwards. The relative one year risk of death on RRT at age 20–24 years is 25 times that of the same age group in the general population, but has improved markedly over time (compared with a relative risk of 41 in the 1998–2001 cohort of the same age). For older patients (70–74 years) the relative risk is lower at 7.8 compared with the general population of a similar age, but this relative risk has not improved over time.

In the prevalent dialysis population for whom data regarding cause of death were available, cardiovascular disease was the most common cause of death accounting for 24% of deaths. Infection accounted for 20% of deaths and treatment withdrawal for 19% of deaths, with differences seen according to age group. In contrast, malignancy was the most common cause of death in prevalent transplant patients (23%), whilst infection accounted for 22% and cardiac disease 19% of all deaths. Trends in cause of death over time (2000–2015) show a decrease in cardiovascular disease, an increase in treatment withdrawal from 2009 onwards and a plateauing of deaths related to infection.

Variability in survival between centres was still evident, with some centres appearing as outliers in the data (below the lower 95% and above the upper 95% confidence limits) in incident RRT and prevalent dialysis patient survival. The survival analyses in this chapter have not been adjusted for any case-mix factors except for age. Differences in proportions of primary renal diagnosis, ethnicity and comorbidity have not been considered due to missing data from some renal centres. Although research has suggested that adjustment for comorbidity only explains a modest part of the variance in ERF patient outcomes [11], the prevalence of comorbidities could vary substantially between renal centres and it would be expected that adjustment for comorbidity may explain a proportion of the variance in survival. The UK Renal Registry regularly evaluates the effect of adjusting for primary renal diagnosis and comorbidity in addition to age in those centres returning ⩾85% of comorbidity data and repeatedly shows that, at centre level, there is clear benefit for some centres in adjusting for these case-mix factors. Research using comorbid conditions identified from Hospital Episode Statistics (HES) data for RRT patients in England during 2002–2006 showed that adjustment for HES-derived case-mix, including comorbid conditions, affected the position on the funnel plot and outlying status of some renal centres

for incident patients and reduced outlying centres from four to one [10].

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

There was also considerable centre level variability in the early hazard of death (e.g. first six months) from start of RRT. The proportion of deaths in the first 90 days of starting RRT varied at centre level and in some centres the proportion was very low or even zero (data not shown). This may be due to unreported deaths in patients that die within the first 90 days of starting RRT for ERF. Alternatively, it may be due to those patients being described as having acute kidney injury (AKI) and therefore not included in the historical UKRR data collection. From January 2015, the UKRR began collecting data for patients receiving RRT for acute dialysis in renal centres in England and some Welsh centres, therefore future survival analyses will be able to take account of these discrepancies.

There is recognised variability in how conservative care is delivered and this is likely to contribute to centre differences in the population who start dialysis, particularly amongst older patients [12]. Historically, the UKRR has been unable to collect data on patients opting for conservative care rather than RRT for their chronic kidney disease. From January 2016 the UKRR began collecting data for patients with chronic kidney disease (CKD) stage 4 and 5 seen in renal centres in England, Wales and Northern Ireland. This will further improve understanding of case-mix differences between centres as well as understanding centre differences in the transition from CKD to RRT or conservative care and how this may impact on survival. In the future, patient frailty data, which has been shown to be independently associated with the timing of RRT start as well as outcomes may further augment the analysis [13].

Conflicts of interest: the authors declare no conflicts of interest

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Appendix 1: Survival tables

Table 5.22. One year after 90 day incident RRT survival percentage by centre, 2015 cohort, unadjusted and adjusted to age 60

Centre	Unadjusted one year after 90 days survival	Adjusted one year after 90 days survival	*Adjusted one year after 90 days 95% CI*
England			
B Heart	80.9	86.2	*80.6–92.2*
B QEH	88.2	90.9	*87.7–94.3*
Basldn	81.9	86.5	*78.8–95.0*
Bradfd	82.3	85.4	*78.6–92.7*
Brightn	82.8	87.2	*82.3–92.4*
Bristol	87.3	89.9	*85.5–94.4*
Carlis	95.9	97.1	*93.3–100.0*
Carsh	85.3	88.9	*85.4–92.6*
Chelms	96.3	97.2	*93.6–100.0*
Colchr	83.6	90.8	*82.8–99.6*
Covnt	82.7	86.4	*80.9–92.3*
Derby	80.2	82.0	*73.6–91.3*
Donc	82.4	86.6	*77.4–96.9*
Dorset	87.0	90.9	*85.4–96.7*
Dudley	88.9	90.6	*83.1–98.7*
Exeter	87.4	91.6	*87.9–95.6*
Glouc	92.6	95.1	*91.1–99.4*
Hull	89.2	92.1	*87.7–96.7*
Ipswi	86.7	92.0	*86.4–97.8*
Kent	83.9	88.3	*83.6–93.3*
L Barts	91.0	91.4	*88.2–94.6*
L Guys	86.3	87.9	*83.3–92.6*
L Kings	90.0	92.1	*88.5–95.8*
L Rfree	89.5	92.1	*89.0–95.2*
L St.G	90.8	92.6	*88.4–97.1*
L West	93.4	94.8	*92.7–96.9*
Leeds	91.2	91.9	*87.8–96.2*
Leic	88.7	90.6	*87.3–94.1*
Liv Ain	81.6	86.4	*78.5–95.0*
Liv Roy	86.7	88.5	*83.3–93.9*
M RI	88.5	90.5	*86.6–94.6*
Middlbr	84.8	86.9	*81.5–92.7*
Newc	78.0	81.9	*75.5–88.9*
Norwch	85.7	88.5	*82.8–94.5*
Nottm	86.5	90.3	*85.7–95.1*
Oxford	86.2	88.5	*84.4–92.7*
Plymth	92.2	93.7	*88.0–99.8*
Ports	87.8	90.5	*87.0–94.1*
Prestn	83.3	87.2	*82.8–91.9*
Redng	90.9	92.3	*87.4–97.5*
Salford	84.7	86.2	*81.3–91.4*
Sheff	92.5	94.0	*90.6–97.5*
Shrew	83.3	88.3	*82.1–95.0*
Stevng	94.4	95.4	*92.2–98.8*
Sthend	83.9	89.0	*80.4–98.4*
Stoke	81.9	87.2	*82.1–92.7*
Sund	88.4	91.5	*85.8–97.7*
Truro	89.8	92.5	*87.0–98.4*
Wirral	78.7	84.6	*76.9–93.0*
Wolve	81.7	85.4	*78.9–92.5*
York	78.0	84.2	*76.7–92.4*
N Ireland			
Antrim	88.9	92.2	*85.4–99.7*
Belfast	90.3	92.7	*88.0–97.7*
Newry	96.4	97.2	*91.9–100.0*
Ulster	92.6	94.8	*88.2–100.0*
West NI	94.4	96.4	*91.7–100.0*
Scotland			
Abrdn	90.9	92.2	*86.5–98.3*
Airdrie	86.0	87.9	*80.0–96.6*
D&Gall	92.9	92.3	*79.5–100.0*
Dundee	91.0	93.6	*87.8–99.8*
Edinb	85.7	86.5	*79.7–93.8*
Glasgw	85.7	86.0	*81.2–91.1*
Inverns	89.3	90.3	*80.7–100.0*
Klmarnk	81.8	86.8	*77.7–97.0*
Krkcldy	90.0	92.3	*84.6–100.0*
Wales			
Bangor	87.0	90.3	*80.8–100.0*
Cardff	86.8	89.9	*85.8–94.2*
Clwyd	77.8	86.1	*74.7–99.2*
Swanse	79.1	85.3	*80.1–90.9*
Wrexm	94.0	95.5	*90.6–100.0*
England	**87.3**	**90.0**	***91.5–96.9***
N Ireland	**91.9**	**94.1**	***86.1–91.3***
Scotland	**87.2**	**88.7**	***86.1–91.8***
Wales	**84.8**	**88.9**	***89.2–90.8***
UK	**87.3**	**90.0**	***89.2–90.8***

Cambridge excluded for 2015 as no patient level data was received

Table 5.23. Ninety day incident RRT survival percentage by centre, 2015 cohort, unadjusted and adjusted to age 60

Centre	Unadjusted 90 day survival	Adjusted 90 day survival	*Adjusted 90 day 95% CI*
England			
B Heart	98.0	98.8	*97.2–100.0*
B QEH	97.9	98.5	*97.2–99.8*
Basldn	92.6	95.3	*90.9–99.9*
Bradfd	92.2	94.1	*89.9–98.4*
Brightn	92.3	94.9	*92.0–97.9*
Bristol	92.4	94.6	*91.6–97.6*
Carsh	90.8	93.8	*91.4–96.3*
Colchr	86.7	93.2	*87.1–99.8*
Covnt	92.6	95.1	*91.9–98.3*
Derby	97.2	97.7	*94.5–100.0*
Dorset	98.6	99.1	*97.5–100.0*
Dudley	95.7	96.6	*92.2–100.0*
Exeter	95.8	97.6	*95.6–99.5*
Glouc	97.1	98.3	*96.0–100.0*
Hull	97.3	98.1	*96.1–100.0*
Ipswi	96.4	98.1	*95.6–100.0*
Kent	93.3	95.8	*93.1–98.5*
L Barts	93.9	94.6	*92.2–97.0*
L Guys	96.6	97.3	*95.2–99.5*
L Kings	98.3	98.8	*97.4–100.0*
L Rfree	95.8	97.3	*95.6–99.0*
L St.G	97.3	98.1	*96.0–100.0*
L West	96.2	97.3	*95.8–98.7*
Leeds	92.6	93.7	*90.3–97.2*
Leic	95.3	96.5	*94.5–98.5*
Liv Ain	90.7	93.9	*88.9–99.2*
Liv Roy	94.1	95.3	*92.1–98.5*
M RI	90.2	92.9	*89.8–96.1*
Middlbr	95.2	96.3	*93.4–99.3*
Newc	93.8	95.6	*92.4–98.8*
Norwch	93.8	95.6	*92.3–99.1*
Nottm	95.7	97.2	*94.9–99.7*
Oxford	97.9	98.4	*96.9–100.0*
Plymth	94.4	95.9	*91.4–100.0*
Ports	99.0	99.3	*98.4–100.0*
Prestn	94.3	96.1	*93.8–98.5*
Redng	93.8	95.2	*91.5–99.0*
Salford	93.3	94.7	*91.8–97.7*
Sheff	97.4	98.1	*96.3–100.0*
Shrew	95.7	97.4	*94.5–100.0*
Stevng	90.8	93.2	*89.6–96.9*
Sthend	88.6	93.2	*87.1–99.8*
Stoke	94.9	97.0	*94.6–99.4*
Truro	89.4	93.0	*88.2–98.2*
Wirral	81.4	88.3	*82.4–94.6*
Wolve	93.2	95.3	*91.7–99.0*
N Ireland			
Belfast	96.6	97.7	*95.2–100.0*
Newry	96.6	97.4	*92.7–100.0*
Ulster	96.4	97.8	*93.6–100.0*
West NI	97.3	98.5	*95.6–100.0*
Scotland			
Abrdn	97.1	97.7	*94.6–100.0*
Airdrie	96.2	97.0	*93.1–100.0*
D&Gall	93.3	93.3	*82.3–100.0*
Dundee	91.8	94.8	*90.0–99.9*
Edinb	97.7	98.0	*95.2–100.0*
Glasgw	96.8	97.1	*94.9–99.4*
Klmarnk	97.1	98.2	*94.8–100.0*
Krkcldy	96.8	97.8	*93.7–100.0*
Wales			
Bangor	95.8	97.3	*92.4–100.0*
Cardff	96.2	97.5	*95.5–99.5*
Clwyd	90.0	94.8	*88.1–100.0*
Swanse	93.2	95.8	*93.1–98.6*
Wrexm	92.6	94.8	*90.1–99.9*
England	**94.8**	**96.4**	***95.8–96.9***
N Ireland	**97.3**	**98.2**	***96.8–99.7***
Scotland	**96.6**	**97.2**	***96.0–98.5***
Wales	**94.3**	**96.3**	***94.8–97.9***
UK	**95.0**	**96.5**	***96.0–97.0***

Centres excluded: Carlisle, Chelmsford, Doncaster, Sunderland, York, Antrim and Inverness due to no deaths recorded in the first 90 days
Cambridge excluded for 2015 as no patient level data was received

Table 5.24. One year after 90 day incident RRT survival percentage by centre for incident RRT cohort years 2006–2015, adjusted to age 60

	Cohort year									
Centre	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
England										
B Heart	89.4	94.1	93.7	83.7	92.0	94.4	86.8	93.5	93.6	86.2
B QEH	86.4	92.7	90.2	91.5	89.0	94.1	92.1	92.0	89.9	90.9
Basldn	90.8	89.7	89.3	87.5	85.9	91.7	89.5	90.8	88.0	86.5
Bradfd	81.4	84.0	85.4	91.6	89.2	89.0	85.6	95.5	81.4	85.4
Brightn	87.1	94.7	90.4	84.9	88.5	91.1	91.0	86.8	91.2	87.2
Bristol	92.0	91.4	84.5	89.7	89.1	95.1	88.4	91.3	93.7	89.9
Camb	90.7	93.3	90.5	87.9	90.3	91.9	91.8	94.6	92.0	
Carlis	89.9	96.5	81.4	71.5	86.4	91.6	89.7	95.7	88.3	97.1
Carsh	88.2	87.2	85.9	88.0	88.9	94.1	89.1	94.6	91.3	88.9
Chelms	94.3	86.4	90.9	94.1	85.8	81.0	89.7	92.2	88.1	97.2
Colchr			85.0	86.4	93.9	84.3	82.4	97.9	90.0	90.8
Covnt	88.5	90.4	87.0	94.2	89.1	90.7	88.4	90.8	93.5	86.4
Derby	92.0	96.3	89.8	88.1	87.5	90.6	88.3	91.2	95.9	82.0
Donc			89.9	87.8	91.5	87.6	88.8	92.3	91.7	86.6
Dorset	86.2	91.3	92.6	92.4	87.6	88.3	88.6	93.3	90.7	90.9
Dudley	92.6	88.9	69.8	85.2	87.9	93.8	89.8	94.0	91.5	90.6
Exeter	89.4	86.2	86.6	88.6	95.8	89.2	92.9	94.9	92.4	91.6
Glouc	89.6	86.1	96.1	89.3	92.4	89.9	90.9	96.7	92.4	95.1
Hull	95.2	89.5	84.5	90.3	88.7	93.1	90.2	91.9	92.3	92.1
Ipswi	93.7	95.9	95.7	94.0	93.2	95.4	93.1	86.7	98.6	92.0
Kent		91.7	90.4	89.0	91.1	87.7	94.7	91.9	91.4	88.3
L Barts	93.9	86.3	92.5	91.2	91.8	94.1	91.0	91.3	87.4	91.4
L Guys	92.9	91.9	90.5	94.1	92.1	94.1	94.8	94.3	93.0	87.9
L Kings	84.5	87.4	90.2	84.8	89.8	90.4	89.7	90.6	93.3	92.1
L Rfree	89.7	94.3	94.8	90.1	90.8	91.0	93.5	91.6	92.3	92.1
L St.G		92.0	93.1	92.8	94.6	96.7	93.5	92.4	91.6	92.6
L West	93.0	92.4	93.9	92.5	88.6	90.7	92.4	94.2	90.5	94.8
Leeds	83.5	88.2	88.8	90.4	91.4	88.3	92.4	91.3	89.6	91.9
Leic	88.7	90.0	90.5	90.1	90.6	91.0	90.2	90.8	91.0	90.6
Liv Ain	91.2	82.6	83.6	82.8	89.0	87.6	95.0	85.9	89.3	86.4
Liv Roy	86.3	84.3	94.1	93.9	87.4	89.1	89.9	92.8	88.2	88.5
M RI		89.4	87.7	86.8	90.1	92.5	89.8	90.2	85.4	90.5
Middlbr	90.7	88.7	82.4	87.7	88.8	88.1	89.5	91.9	93.0	86.9
Newc	86.2	85.7	91.4	85.7	88.9	86.1	85.6	92.8	91.2	81.9
Norwch	85.8	90.9	88.2	88.7	92.4	89.9	88.2	88.9	88.5	88.5
Nottm	91.9	89.8	90.3	88.8	93.5	93.4	89.3	93.6	92.6	90.3
Oxford	89.3	88.6	87.2	91.6	90.6	89.0	92.7	94.1	86.6	88.5
Plymth	82.1	90.0	87.9	89.1	93.9	91.4	91.9	94.6	86.3	93.7
Ports	87.5	88.4	88.8	90.6	88.2	91.3	90.9	91.0	89.6	90.5
Prestn	83.0	91.3	82.2	87.6	87.6	91.2	93.3	94.4	93.5	87.2
Redng	91.3	90.0	93.5	89.0	92.1	93.1	96.7	93.2	95.0	92.3
Salford	90.6	86.3	85.7	88.6	86.5	92.0	88.9	88.6	90.5	86.2
Sheff	87.5	90.7	92.2	94.2	92.2	87.9	92.9	91.4	90.6	94.0
Shrew	87.7	91.7	93.0	84.8	87.0	91.8	85.9	88.0	83.5	88.3
Stevng	85.8	90.6	89.5	96.8	93.7	91.2	93.0	90.7	90.4	95.4
Sthend	94.8	91.7	88.8	91.5	82.2	94.4		91.5	89.2	89.0
Stoke		87.0	89.7	85.9	87.2	93.1	93.0	88.2	91.5	87.2
Sund	83.5	88.6	83.6	83.0	81.3	88.7	92.9	87.6	87.9	91.5
Truro	89.5	90.1	89.2	94.2	92.1	93.4	94.6	97.0	85.4	92.5
Wirral	85.9	88.8	90.4	84.8	94.5	86.1	86.2	93.4	87.9	84.6
Wolve	89.3	89.4	90.3	88.6	88.7	89.7	84.3	89.0	87.7	85.4
York	82.7	95.0	88.2	94.2	80.4	93.6	93.9	87.6	85.7	84.2

Table 5.24. Continued

	Cohort year									
Centre	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
N Ireland										
Antrim	93.9	85.0	88.7	97.5	85.9	89.1	86.5	92.5	81.8	92.2
Belfast	90.9	90.7	88.1	91.4	88.5	91.4	92.2	92.3	89.0	92.7
Newry	77.6	91.4	90.0	83.4	92.1	85.5	89.6	84.8	90.1	97.2
Ulster		89.1	66.8		93.7	86.5	93.8	89.9	92.8	94.8
West NI	90.1	97.3	93.1	97.6	89.1	97.8		94.1	88.3	96.4
Scotland										
Abrdn	85.1	85.9	87.0	88.8	85.4	94.4	91.4	97.2	94.1	92.2
Airdrie	80.7	79.7	90.3	94.2	83.3	84.0	91.9	95.0	88.1	87.9
D&Gall	88.2	87.4	84.9	84.1	90.3	92.7	90.6		97.1	92.3
Dundee	89.2	81.0	84.3	86.8	90.3	90.7	93.3	92.4	90.6	93.6
Edinb	88.5	90.1	83.1	85.0	86.5	89.7	92.9	82.0	89.9	86.5
Glasgw	83.6	87.7	83.1	87.2	86.9	89.2	90.5	89.8	86.3	86.0
Inverns	84.0	87.6	90.0	74.6	93.7	96.5	89.8	95.0	95.0	90.3
Klmarnk	79.2	86.5	90.1	84.1	88.5	85.6	90.8	85.1	87.6	86.8
Krkcldy	80.1	87.3	86.7	87.7	93.6	92.5	91.6	80.2		92.3
Wales										
Bangor	81.5	89.9	86.0	87.3	91.6	94.4	84.3	91.0	86.5	90.3
Cardff	87.0	84.5	82.9	89.7	90.0	88.5	86.1	89.1	87.2	89.9
Clwyd	96.9	85.4	75.3	92.4		87.1	81.8	89.6	89.8	86.1
Swanse	85.0	89.5	84.7	81.2	87.3	84.4	84.3	84.5	89.9	85.3
Wrexm	88.4	89.8	89.3	91.5	82.2	89.0	83.9	88.0	94.6	95.5
England	**88.9**	**90.0**	**89.4**	**89.7**	**89.9**	**91.2**	**91.0**	**92.0**	**90.5**	**90.0**
N Ireland	**90.3**	**90.0**	**87.9**	**92.5**	**89.3**	**90.3**	**92.3**	**91.3**	**87.5**	**94.1**
Scotland	**84.4**	**86.3**	**85.5**	**86.6**	**87.9**	**90.2**	**91.4**	**89.7**	**90.2**	**88.7**
Wales	**86.6**	**86.8**	**83.9**	**87.3**	**89.2**	**87.6**	**85.0**	**87.6**	**88.9**	**88.9**
UK	**88.4**	**89.5**	**88.8**	**89.5**	**89.7**	**90.9**	**90.8**	**91.6**	**90.3**	**90.0**

Blank cells: centres with either less than 10 patients, no deaths or no data contribution to the UKRR for that year

Table 5.25. Incident RRT survival percentage after 90 days from start of RRT by centre for incident RRT cohort years 2011–2015, adjusted to age 60

Centre	5 year survival 2011 cohort	4 year survival 2012 cohort	3 year survival 2013 cohort	2 year survival 2014 cohort	1 year survival 2015 cohort
England					
B Heart	61.5	63.9	79.7	84.3	86.2
B QEH	70.7	70.3	77.6	86.1	90.9
Basldn	66.4	65.7	73.0	79.3	86.5
Bradfd	48.4	71.0	72.0	77.8	85.4
Brightn	57.0	71.8	72.3	80.5	87.2
Bristol	69.9	64.6	77.2	84.8	89.9
Camb	65.6	67.3	80.2	81.5	
Carlis	66.7	79.7	80.8	81.5	97.1
Carsh	66.5	70.7	80.0	80.9	88.9
Chelms	63.6	64.0	79.1	84.4	97.2
Colchr	53.8	60.7	88.3	82.2	90.8
Covnt	57.9	65.2	66.6	83.4	86.4
Derby	61.0	62.7	73.8	89.7	82.0
Donc	67.2	66.5	85.3	76.1	86.6
Dorset	63.5	66.4	79.9	80.5	90.9
Dudley	69.0	65.0	72.7	78.6	90.6
Exeter	56.2	70.9	77.6	85.3	91.6
Glouc	61.9	67.1	86.1	83.5	95.1
Hull	66.9	70.6	79.7	86.1	92.1
Ipswi	69.1	70.4	66.1	93.8	92.0
Kent	56.1	67.8	75.8	80.8	88.3
L Barts	64.6	72.4	77.4	80.2	91.4
L Guys	71.2	74.6	78.6	84.5	87.9
L Kings	64.5	67.5	71.1	85.1	92.1
L Rfree	69.5	77.4	77.4	79.7	92.1
L St.G	67.0	74.9	82.8	80.8	92.6
L West	65.9	73.1	79.3	82.5	94.8
Leeds	61.3	70.0	74.6	82.1	91.9
Leic	62.1	68.7	72.7	83.2	90.6
Liv Ain	62.4	62.9	64.3	82.2	86.4
Liv Roy	46.0	62.7	79.8	81.8	88.5
M RI	63.2	61.6	75.3	77.2	90.5
Middlbr	59.8	66.4	77.1	83.9	86.9
Newc	58.5	66.7	74.0	80.0	81.9
Norwch	67.1	72.1	71.5	81.6	88.5
Nottm	68.7	63.7	79.4	85.6	90.3
Oxford	63.2	70.9	73.3	77.2	88.5
Plymth	65.8	68.4	72.5	79.6	93.7
Ports	60.0	67.2	74.5	77.8	90.5
Prestn	65.6	71.7	78.6	85.7	87.2
Redng	63.3	76.2	83.1	86.7	92.3
Salford	62.7	60.8	74.8	77.0	86.2
Sheff	62.7	67.9	75.6	82.8	94.0
Shrew	53.8	59.9	72.1	72.3	88.3
Stevng	64.2	80.4	79.6	85.5	95.4
Sthend	63.2	82.6	71.9	79.8	89.0
Stoke	57.7	57.0	73.6	84.4	87.2
Sund	42.1	72.1	76.1	75.9	91.5
Truro	72.0	67.1	79.5	75.8	92.5
Wirral	51.7	58.8	72.7	73.5	84.6
Wolve	55.9	69.9	67.9	77.8	85.4
York	70.9	69.8	70.5	81.1	84.2

Table 5.25. Continued

Centre	5 year survival 2011 cohort	4 year survival 2012 cohort	3 year survival 2013 cohort	2 year survival 2014 cohort	1 year survival 2015 cohort
N Ireland					
Antrim	73.1	60.7	78.0	73.2	92.2
Belfast	59.5	68.8	81.5	82.4	92.7
Newry	56.3	69.3	84.6	89.9	97.2
Ulster	58.3	66.3	77.1	88.9	94.8
West NI	72.3	76.4	77.8	81.6	96.4
Scotland					
Abrdn	52.8	76.4	76.9	85.7	92.2
Airdrie	47.0	64.1	69.3	81.6	87.9
D&Gall	42.1	75.0		87.2	92.3
Dundee	59.4	74.3	73.5	80.0	93.6
Edinb	65.7	68.4	66.7	79.8	86.5
Glasgw	52.9	67.6	76.1	75.6	86.0
Inverns	64.2	72.4	79.2	89.9	90.3
Klmarnk	39.8	63.6	61.6	76.3	86.8
Krkcldy	47.6	52.8	61.8	82.9	92.3
Wales					
Bangor	49.1	72.1	74.9	74.0	90.3
Cardff	60.0	62.7	70.1	79.3	89.9
Clwyd	52.6	47.3	64.0	78.0	86.1
Swanse	61.7	64.1	65.9	79.2	85.3
Wrexm	51.2	55.7	75.7	88.4	95.5
England	**63.2**	**69.1**	**76.4**	**81.8**	**90.0**
N Ireland	**62.8**	**68.6**	**80.0**	**81.7**	**94.1**
Scotland	**54.4**	**68.1**	**71.9**	**79.9**	**88.7**
Wales	**58.7**	**62.3**	**69.6**	**79.8**	**88.9**
UK	**62.3**	**68.7**	**75.8**	**81.6**	**90.0**

Blank cells: centres with either less than 10 patients, no deaths or no data contribution to the UKRR for that year

Table 5.26. One year prevalent dialysis patient survival percentage by centre for prevalent cohort years 2006–2015, adjusted to age 60

	Cohort year									
Centre	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
England										
B Heart	87.9	90.5	91.0	87.5	89.6	88.6	89.2	87.6	89.6	87.9
B QEH	88.0	88.4	90.0	89.4	91.1	91.6	91.9	89.7	91.4	88.0
Basldn	90.3	92.7	91.6	88.7	91.0	88.2	92.8	86.8	88.7	90.3
Bradfd	84.3	87.7	84.6	89.3	88.1	87.7	85.2	87.6	87.6	84.3
Brightn	87.3	88.8	87.5	90.0	88.4	89.6	88.3	87.4	87.7	87.3
Bristol	89.2	87.4	85.1	85.9	89.7	90.7	89.9	89.3	88.1	89.2
Camb	88.0	92.6	90.0	91.4	93.1	89.2	92.8	87.8	89.6	
Carlis	85.9	87.1	80.6	80.8	93.3	89.0	83.1	88.4	91.0	85.9
Carsh	88.3	89.7	88.7	89.2	89.6	91.0	90.4	89.6	87.9	88.3
Chelms	87.6	85.2	86.2	89.7	84.4	91.3	90.3	90.1	90.6	87.6
Colchr			91.2	86.7	89.1	89.3	86.1	88.4	90.5	
Covnt	86.9	87.2	90.9	90.2	91.0	91.9	90.6	86.2	85.8	86.9
Derby	87.0	90.3	90.5	90.0	89.5	89.4	88.1	89.5	90.9	87.0
Donc		88.8	84.1	88.9	91.9	91.2	83.1	90.5	89.6	
Dorset	87.6	90.0	90.2	93.1	90.1	90.6	91.9	92.2	89.8	87.6
Dudley	86.9	88.9	88.9	90.8	87.8	91.5	86.9	87.7	90.9	86.9
Exeter	87.2	85.4	85.4	86.6	88.4	88.2	91.6	90.0	89.1	87.2
Glouc	88.3	86.4	91.7	92.2	89.7	90.8	89.8	92.1	89.1	88.3
Hull	90.0	86.8	87.9	87.6	89.9	91.0	88.5	87.7	88.8	90.0
Ipswi	86.1	93.0	84.4	87.5	91.8	90.3	88.0	89.6	89.2	86.1
Kent		86.4	88.0	90.5	89.9	89.3	87.7	87.9	86.5	
L Barts	89.3	88.7	90.8	92.9	91.7	89.9	91.2	90.2	88.2	89.3
L Guys	90.7	90.3	91.4	91.0	94.0	91.2	90.9	90.6	89.9	90.7
L Kings	84.6	87.6	87.7	88.7	89.7	89.5	89.0	90.5	90.6	84.6
L Rfree	90.4	91.3	89.7	90.2	91.5	90.3	90.8	90.0	90.1	90.4
L St.G		94.3	89.3	90.8	92.0	88.5	91.7	92.2	88.4	
L West	91.5	90.1	91.8	90.5	90.5	91.7	90.1	89.9	91.1	91.5
Leeds	88.3	87.3	88.9	90.8	88.8	86.8	88.4	88.8	87.5	88.3
Leic	89.7	89.4	88.6	90.4	89.8	90.4	89.0	89.4	86.4	89.7
Liv Ain	90.5	88.4	92.0	89.8	89.8	84.0	84.4	87.7	86.8	90.5
Liv Roy	84.5	86.5	89.1	89.0	90.5	88.6	87.9	87.0	88.0	84.5
M RI		86.5	87.6	87.0	88.6	90.8	86.2	86.5	85.2	
Middlbr	87.2	86.9	86.5	83.6	93.0	88.6	88.8	85.3	88.6	87.2
Newc	86.1	86.4	87.2	86.3	85.3	89.3	84.6	86.5	89.0	86.1
Norwch	87.7	90.7	89.5	90.1	91.4	91.4	88.7	88.9	91.0	87.7
Nottm	89.6	88.4	88.0	89.6	90.0	89.0	90.7	88.8	90.4	89.6
Oxford	86.8	88.0	88.4	87.2	88.0	88.3	89.6	87.5	83.5	86.8
Plymth	82.9	88.0	86.0	85.3	90.0	84.8	89.9	87.1	85.5	82.9
Ports	89.9	88.5	89.3	88.5	88.2	90.0	90.2	85.7	89.6	89.9
Prestn	90.8	90.2	89.8	90.2	88.3	90.9	89.2	88.8	87.8	90.8
Redng	90.4	89.0	92.5	89.1	89.6	91.0	91.0	89.6	90.9	90.4
Salford	87.5	86.1	87.5	84.7	87.1	88.5	87.6	88.6	85.5	87.5
Sheff	88.9	88.9	89.8	89.7	88.9	89.1	91.5	88.3	89.2	88.9
Shrew	89.1	89.0	87.9	85.8	87.5	90.0	84.0	86.6	88.5	89.1
Stevng	88.0	91.5	89.0	88.5	91.2	90.7	87.2	90.7	89.7	88.0
Sthend	86.5	90.3	91.1	92.0	90.4	87.9	91.9	90.4	87.1	86.5
Stoke		87.5	88.6	87.0	90.7	90.6	91.9	88.9	87.1	
Sund	83.9	87.7	85.4	85.0	84.0	86.7	85.1	88.2	85.6	83.9
Truro	89.4	89.6	89.1	90.8	89.3	89.8	89.0	90.3	85.5	89.4
Wirral	88.2	89.3	90.3	88.6	90.8	90.1	90.8	84.5	83.5	88.2
Wolve	88.0	92.6	89.6	87.5	89.5	89.0	89.4	90.1	88.3	88.0
York	88.6	87.9	88.9	90.1	84.5	88.9	91.6	88.3	88.6	88.6

Table 5.26. Continued

	Cohort year									
Centre	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
N Ireland										
Antrim	85.4	87.9	89.6	88.2	91.7	90.1	90.7	85.7	88.4	85.4
Belfast	89.5	87.8	87.0	87.1	87.6	87.7	85.3	89.2	88.5	89.5
Newry	87.4	89.1	91.7	86.8	91.2	81.8	90.2	90.7	92.9	87.4
Ulster	89.5	89.7	87.5	90.0	89.1	91.1	90.9	91.3	86.5	89.5
West NI	90.3	93.2	89.4	91.1	90.9	91.6	91.9	86.1	93.9	90.3
Scotland										
Abrdn	87.3	90.0	89.6	89.5	89.2	91.5	88.1	83.9	86.3	87.3
Airdrie	79.1	86.2	85.6	89.5	88.1	86.5	86.0	85.9	88.6	79.1
D&Gall	90.0	83.8	86.5	87.7	91.0	87.0	90.0	86.7	87.3	90.0
Dundee	82.0	82.0	93.3	86.4	86.8	90.9	88.3	91.5	89.2	82.0
Edinb	87.0	87.7	85.8	88.2	81.4	89.4	89.1	87.9	85.4	87.0
Glasgw	87.4	87.4	88.1	88.0	87.1	87.6	87.1	87.5	85.4	87.4
Inverns	93.5	88.0	91.8	88.5	86.1	87.2	86.5	88.9	90.5	93.5
Klmarnk	86.9	88.5	88.0	88.6	88.9	89.6	87.1	91.8	85.7	86.9
Krkcldy	87.0	90.3	84.8	86.1	88.9	86.8	90.4	84.1	85.3	87.0
Wales										
Bangor	81.7	88.8	85.2	85.7	87.0	90.0	84.7	85.7	86.4	81.7
Cardff	88.7	82.5	86.4	85.8	88.2	86.4	87.6	86.6	85.6	88.7
Clwyd	90.6	87.3	88.9	78.6	93.1	90.1	86.4	88.9	84.3	90.6
Swanse	88.1	89.4	87.4	87.5	89.1	86.3	88.3	87.2	87.2	88.1
Wrexm	88.2	85.2	89.1	86.8	85.9	87.4	89.3	87.4	85.1	88.2
England	**88.5**	**88.9**	**89.0**	**89.2**	**89.9**	**89.9**	**89.5**	**88.9**	**88.6**	**88.5**
N Ireland	**88.4**	**89.2**	**88.6**	**88.5**	**89.8**	**88.8**	**89.2**	**88.4**	**89.7**	**88.4**
Scotland	**86.5**	**87.2**	**88.2**	**88.0**	**87.0**	**88.6**	**87.8**	**87.5**	**86.5**	**86.5**
Wales	**87.9**	**85.6**	**87.0**	**85.9**	**88.5**	**87.0**	**87.6**	**86.9**	**86.0**	**87.9**
UK	**88.3**	**88.6**	**88.8**	**88.9**	**89.6**	**89.6**	**89.3**	**88.6**	**88.3**	**88.3**

Blank cells: centres with either less than 10 patients or no data contribution to the UKRR for that year

Table 5.27. Percentage completeness of EDTA cause of death for prevalent patients by centre and year of death, 2007 to 2016

	Year of death									
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
England										
B Heart	84.5	93.9	100.0	96.6	96.1	96.6	95.0	65.6	93.8	93.3
B QEH	7.0	5.8	0.7	1.7	2.0	2.1	61.9	91.0	53.4	4.2
Basldn	45.5	47.6	76.2	66.7	84.6	88.9	90.9	90.0	86.7	91.4
Bradfd	86.5	92.5	82.2	97.0	97.5	97.7	97.9	98.0	92.2	95.8
Brightn	11.9	0.0	1.1	2.4	1.1	1.1	0.0	0.9	7.0	91.9
Bristol	60.3	66.4	70.7	89.4	96.1	82.2	82.0	94.5	61.2	65.3
Camb	1.1	1.6	5.1	10.4	62.0	94.1	80.5	42.3		
Carlis	73.9	47.6	80.6	100.0	92.9	94.7	92.3	92.0	82.4	85.3
Carsh	0.8	1.5	0.8	6.7	25.0	40.8	17.4	16.3	25.0	10.8
Chelms	76.5	71.4	86.7	86.7	87.0	100.0	92.3	85.7	96.2	92.7
Colchr		33.3	66.7	85.2	82.6	100.0	91.7	77.3	90.0	78.3
Covnt	0.0	1.2	1.8	0.0	1.4	33.3	70.5	6.7	4.7	1.9
Derby	83.3	97.8	73.5	91.2	88.5	86.9	88.7	78.9	86.7	93.4
Donc		100.0	94.3	90.9	91.7	92.6	100.0	96.8	91.7	81.8
Dorset	87.2	88.9	85.2	95.7	95.0	89.1	98.3	90.6	90.2	93.2
Dudley	6.1	5.3	0.0	94.4	88.1	91.2	94.0	97.7	94.3	90.5
Exeter	4.7	3.1	3.0	89.5	84.6	95.1	98.6	96.5	85.3	89.1
Glouc	77.8	70.8	68.4	97.2	93.6	91.5	100.0	88.1	94.2	78.6
Hull	76.5	52.7	18.7	92.0	93.5	96.9	86.8	91.7	97.3	60.0
Ipswi	35.5	13.6	18.8	73.3	77.8	77.4	78.8	83.3	25.0	5.9
Kent		61.7	92.8	89.0	96.2	94.9	81.4	86.6	95.3	100.0
L Barts	74.6	77.0	69.5	73.9	82.6	79.9	82.9	83.3	49.5	42.4
L Guys	3.5	0.0	0.0	67.6	84.2	58.2	1.1	0.0	93.2	90.1
L Kings	75.6	86.2	67.1	94.8	97.6	100.0	98.9	98.7	96.7	98.1
L Rfree	0.0	0.0	0.9	1.7	0.0	7.1	5.7	16.1	16.1	16.0
L St.G	16.7	17.9	19.6	77.6	49.0	42.4	62.5	57.1	32.8	26.8
L West	18.9	6.3	2.2	2.2	95.0	97.3	96.4	94.6	96.7	98.9
Leeds	29.6	30.1	33.9	100.0	99.1	97.7	98.3	99.2	97.3	88.8
Leic	65.5	69.5	69.8	74.5	61.7	94.1	79.6	55.7	57.7	50.0
Liv Ain	73.3	66.7	100.0	89.5	95.7	0.0	0.0	0.0	12.5	10.0
Liv Roy	76.8	75.8	81.8	71.6	76.4	2.8	33.7	19.0	11.1	4.5
M RI	4.0	0.9	1.0	4.7	3.1	10.0	0.8	1.4	2.0	1.4
Middlbr	57.5	26.0	52.0	89.2	97.5	94.9	81.3	95.1	93.4	83.0
Newc	48.7	35.7	40.8	14.0	45.0	16.9	23.6	51.8	74.1	92.5
Norwch	18.2	20.9	44.4	75.8	70.3	76.5	91.0	74.0	48.6	61.2
Nottm	87.0	98.8	97.1	98.8	100.0	100.0	97.6	98.9	95.7	96.1
Oxford	0.0	1.0	0.0	84.6	97.4	93.5	96.5	98.3	97.5	75.4
Plymth	56.7	70.7	47.5	80.9	43.6	41.2	100.0	32.7	74.0	92.0
Ports	21.4	6.9	44.5	68.7	23.3	19.8	40.7	38.8	34.1	24.0
Prestn	47.8	38.1	17.9	95.7	98.9	97.6	99.0	96.2	80.3	83.2
Redng	97.8	89.6	83.0	100.0	96.7	91.2	91.9	79.7	76.7	95.9
Salford	1.3	0.0	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.9
Sheff	12.9	0.9	1.9	3.0	0.8	0.8	1.9	0.9	0.8	0.0
Shrew	89.3	62.5	20.5	46.0	0.0	7.9	17.7	0.0	34.9	8.3
Stevng	54.3	66.1	74.3	86.3	85.2	67.7	69.8	9.3	62.1	7.9
Sthend	3.2	57.7	75.0	92.3	90.0	100.0	100.0	95.7	97.0	86.0
Stoke	16.1	21.0	28.6	54.7	57.9	89.6	55.9	53.5	75.0	91.8
Sund	60.5	50.0	78.9	93.5	95.1	97.4	82.6	97.4	98.0	91.5
Truro	0.0	18.4	28.9	93.3	94.9	78.8	100.0	97.1	98.0	100.0
Wirral	84.6	96.9	84.8	86.5	0.0	2.6	25.8	68.5	69.0	59.5
Wolve	51.5	65.8	76.4	98.4	94.1	92.2	85.1	85.2	62.5	62.0
York	38.5	62.1	67.9	96.7	97.3	100.0	100.0	97.4	94.6	95.2

Table 5.27. Continued

	Year of death									
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
N Ireland										
Antrim	8.6	3.4	26.9	96.8	95.2	100.0	93.1	100.0	93.9	100.0
Belfast	36.0	20.0	25.4	80.3	77.2	77.0	41.7	51.1	50.0	43.2
Newry	15.0	11.8	68.4	95.2	94.4	96.7	100.0	93.3	100.0	80.0
Ulster	92.9	69.2	75.0	95.0	90.9	100.0	95.7	90.0	96.0	100.0
West NI	35.0	22.2	45.8	92.3	80.0	96.6	96.2	93.9	100.0	100.0
Scotland										
Abrdn	2.1	100.0	100.0	100.0	100.0	97.1	91.1	68.3	46.7	81.8
Airdrie	100.0	100.0	100.0	100.0	97.1	93.9	100.0	97.6	97.5	92.2
D&Gall	100.0	93.3	94.4	100.0	100.0	87.5	100.0	100.0	69.2	69.2
Dundee	8.9	100.0	100.0	100.0	100.0	100.0	100.0	57.6	66.7	98.0
Edinb	48.3	100.0	97.5	100.0	98.8	100.0	96.4	96.2	92.9	100.0
Glasgw	59.1	100.0	98.5	97.8	99.3	100.0	99.3	100.0	91.4	92.2
Inverns	0.0	100.0	94.7	100.0	100.0	100.0	100.0	100.0	100.0	85.7
Klmarnk	15.6	100.0	96.7	100.0	100.0	100.0	100.0	100.0	97.4	100.0
Krkcldy	61.5	100.0	96.6	96.6	100.0	96.9	100.0	94.7	54.8	80.5
Wales										
Bangor	86.2	52.4	76.9	73.9	90.0	100.0	95.8	95.0	90.0	100.0
Cardff	4.9	0.0	2.4	6.7	7.9	0.6	73.5	96.7	80.9	93.5
Clwyd	45.5	84.2	83.3	100.0	85.7	89.5	83.3	90.0	100.0	92.3
Swanse	97.3	94.8	89.8	98.0	87.5	98.1	95.7	82.6	94.9	93.9
Wrexm	22.7	69.2	100.0	95.7	92.6	100.0	95.7	87.0	97.4	100.0
England	**37.8**	**36.9**	**38.9**	**58.8**	**63.4**	**64.5**	**64.7**	**60.5**	**59.6**	**57.9**
N Ireland	**31.7**	**20.4**	**40.8**	**89.3**	**84.6**	**90.7**	**75.2**	**81.5**	**80.0**	**79.2**
Scotland	**44.8**	**99.8**	**98.1**	**99.0**	**99.3**	**98.5**	**98.4**	**90.6**	**82.4**	**91.9**
Wales	**43.8**	**36.3**	**47.6**	**53.3**	**48.6**	**50.6**	**84.8**	**91.2**	**89.2**	**94.5**
UK	**38.6**	**42.2**	**44.9**	**62.9**	**66.6**	**67.1**	**69.1**	**65.3**	**63.6**	**63.2**

Blank cells: centres with either less than 10 patients or no data contribution to the UKRR for that year