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

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Key Words

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

Summary

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

Introduction

The analyses presented in this chapter examine a) the survival from the start of renal replacement therapy (RRT); b) the survival amongst all prevalent RRT patients alive on 31st December 2010; c) the cause of death for incident and prevalent patients and d) the projected life years remaining for patients starting RRT. They encompass the outcomes from the total incident UK dialysis population reported to the UK Renal Registry (UKRR), including the 18% who started on peritoneal dialysis and the 7% who received a pre-emptive renal transplant. These results are therefore a true reflection of the outcomes in the whole UK RRT population. Analyses of survival within the 1st year of starting RRT include patients who were recorded as having started RRT for established renal failure (as opposed to acute kidney injury) but who had died within the first 90 days of starting RRT, a group excluded from most other countries' registry data. As is common in other countries, survival analyses are also presented for the first year after 90 days.

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

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

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

Methods

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

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

To allow comparisons between centres with differing age distributions, survival analyses were statistically adjusted for age and reported as survival adjusted to age 60. This gives an estimate of what the survival would have been if all patients in that centre had been aged 60 at the start of RRT. This age was chosen because it was approximately the average age of patients starting RRT 15 years ago at the start of the UKRR's data collection. The average age of patients commencing RRT in the UK has been stable around an age of 65 years, but the UKRR has maintained age adjustment to 60 years for comparability with all previous years' analyses. Diabetic patients were included in all analyses unless stated otherwise and in many analyses diabetic patients were also analysed separately and compared to non-diabetic patients. All analyses were undertaken using SAS 9.3.

Definition of renal replacement therapy start date

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

Previously, the UKRR asked clinicians to re-enter a code for established renal failure in patients initially coded as having acute renal failure once it had become clear that there was no

recovery of kidney function. However, adherence to this requirement was very variable, with some clinicians entering a code for established renal failure only once a decision had been made to plan for long-term RRT [6]. All UK nephrologists have now been asked to record the date of the first haemodialysis session and to record whether the patient was considered to have acute kidney injury (acute renal failure) or to be in ERF at the time. For patients initially categorised as 'acute', but who were subsequently categorised as ERF, the UKRR assigns the date of this first 'acute' session as the date of start of RRT.

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

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

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

Methodology for incident patient survival

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

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

The incident survival cohort was **NOT** censored at the time of transplantation and therefore included the survival of the 7% who received a pre-emptive transplant. An additional reason for not censoring was to facilitate comparison between centres. Centres with a high proportion of patients of South Asian and Black origin are likely to have a healthier dialysis population, because South Asian and Black patients are less likely to undergo early transplantation [7].

The incident ('take-on') population in any specific year excludes those who recovered within 90 days from the start of RRT, but includes patients who recovered from ERF after 90 days. For survival analyses, patients newly transferred into a centre who were already on RRT were excluded from the incident population for that centre and were counted at the centre at which they started RRT.

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

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

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

The death rate per 1,000 patient years was calculated by dividing the number of deaths by the person years exposed. Person years exposed are the total days at risk for each patient (until death, recovery or lost to follow-up) expressed as years. All patients, even those who died within the first 90 days of RRT, were included in the death rate calculation.

Adjustment of 1 year after 90 day survival for the effect of comorbidity was undertaken using a rolling 5 year combined incident cohort from 2006 to 2010. Sixteen centres returned >85% of comorbidity data for patients in the combined cohort. Adjustment was first performed to a mean age of 60 years, then to the average distribution of primary diagnoses for all sixteen centres. The individual centre data were then further adjusted for average distribution of comorbidity present at these centres. The survival hazard function was calculated as the probability of dying in a short time interval considering survival to that interval.

Methodology for prevalent dialysis patient survival

For prevalent dialysis patients, all patients who had been established on dialysis for at least 90 days on 31st December 2010 were included in these analyses. Prevalent dialysis patients on 31st December 2010 were followed up in 2011 and were censored at transplantation. When a patient is censored at transplantation, this means that the patient is considered as alive up to the point of transplantation, but the patient's status post-transplant is not considered.

As discussed in previous reports, comparison of survival of prevalent dialysis patients between centres is complex. Survival of prevalent dialysis patients can be studied with or without censoring at transplantation and it is common practice in some registries to censor at transplantation. Censoring could cause apparent differences in survival between those renal centres with a high transplant rate and those with a low transplant rate, especially in younger patients where the transplant rate is highest. Censoring at transplantation systematically removes younger fitter patients from the survival data. The differences are likely to be small due to the relatively small proportion of patients being transplanted in a given year compared to the whole dialysis population (about 12% of the dialysis population aged under 65 and 2% of the population aged 65 years and over). To allow comparisons with other registries the survival results for prevalent dialysis patients **CENSORED** for transplantation have been quoted. To understand survival of patients, including survival following transplantation, the incident patient analyses should be viewed.

Methodology of cause of death

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

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

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

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

Adult patients aged 18 years and over from England, Wales, Scotland and Northern Ireland were included in the analyses of cause of death. The incident patient analysis included all patients starting RRT in the years 2000–2010. Previously, data analysis was limited to centres with a high rate of return for cause of death. When this was compared with an analysis of all the cause of death data reported to the UKRR, the percentages in the cause of death categories remained largely unchanged so the latter data were therefore included.

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

Methodology of median life expectancy (life table calculations)

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

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

Data on the UK population in mid-2011 and the number of deaths in each age group in 2011 were obtained from the Office of National Statistics. The age specific UK death rate was calculated as the number of deaths in the UK per thousand people in the population. The age specific expected number of deaths in the RRT population was calculated by applying the UK age specific death rate to the total of years exposed for RRT patients in that age group. This is expressed as deaths per 1,000 patient years. The age specific number of RRT deaths is the actual number of deaths observed in 2011 in RRT patients. The RRT observed death rate was calculated as number of deaths observed in 2011 per 1,000 patient years exposed. Relative risk of death was calculated as the ratio of the observed and expected death rates for RRT patients.

Results of incident (new RRT) patient survival

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

Comparison of survival between UK countries

Two years incident data have been combined to increase the size of the patient cohort, so that any differences between the four UK countries are more likely to be reliably identified (table 5.2). These data have not been adjusted for differences in primary renal diagnosis, ethnicity, socio-economic status or comorbidity, nor for differences in life expectancy in the general populations of the four UK countries. There was no significant difference in the 90 day survival between the UK countries. One year after 90 day survival was significantly lower in Scotland compared to England. It has been postulated that a greater prevalence of cardiovascular disease in Scotland compared to England may account for the difference.

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

Table 5.1. Unadjusted survival of incident patients, 2010 cohort

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

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

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

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

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

* provisional data from ONS

Modality

It is impossible to obtain truly valid comparisons of survival of patients starting RRT on different treatment modalities, as modality selection is not random. In the UK, patients starting peritoneal dialysis as a group were younger and fitter than those starting haemodialysis and were transplanted more quickly. The age adjusted 1 year survival estimates for incident patients starting RRT on HD and PD were 88.6% and 92.7% respectively, with 1 year survival increasing for HD patients from the previous year and remaining constant for PD patients (figure 5.1, table 5.4). The inclusion of Northern Ireland from 2005 did not significantly affect the survival for the UK in that year (table 5.4).

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

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

* Excludes Northern Ireland

Age

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

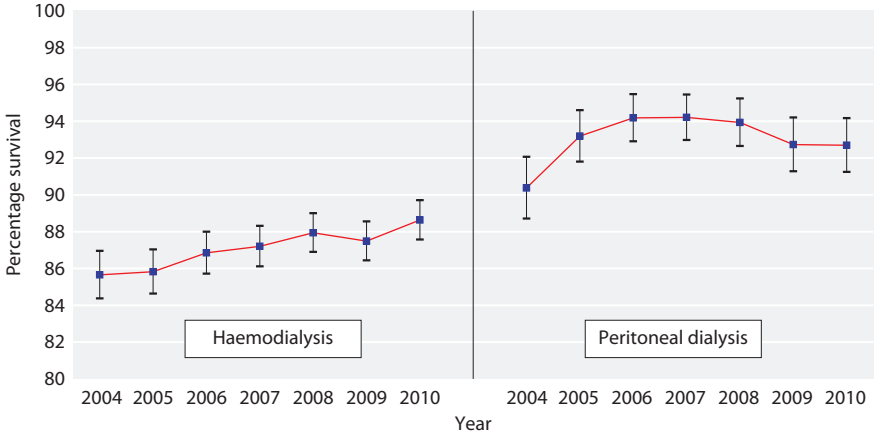

Fig. 5.1. Trend in 1 year after 90 day incident patient survival by first modality, 2004–2010 cohort (adjusted to age 60) (excluding patients whose first modality was transplantation)

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

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

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

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

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

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

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

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

Cohort	1 year	2 year	3 year	4 year	5 year	6 year	7 year	8 year	9 year	10 year	*95% CI for latest year*	N
2010	**92.6**										***91.6–93.4***	**3,334**
2009	91.2	85.5									*84.2–86.6*	3,401
2008	91.9	86.5	81.8								*80.5–83.1*	3,472
2007	92.5	86.8	81.4	76.9							*75.5–78.3*	3,461
2006	91.4	85.7	80.9	76.3	72.8						*71.2–74.3*	3,158
2005	89.7	83.9	79.3	75.0	70.7	67.4					*65.6–69.0*	2,976
2004	89.9	84.0	77.9	72.3	67.8	63.8	60.6				*58.7–62.5*	2,638
2003	89.6	82.8	77.7	72.5	67.5	63.5	60.0	56.8			*54.7–58.8*	2,365
2002	88.6	81.7	76.3	71.2	66.5	62.8	59.2	56.5	53.9		*51.7–56.1*	2,078
2001	87.5	79.9	74.2	68.7	64.1	59.6	56.4	53.1	49.5	47.4	*45.1–49.7*	1,840
2000	89.4	81.9	75.3	70.4	65.1	60.3	56.2	53.0	50.7	48.1	*45.6–50.6*	1,586
1999	87.8	81.7	74.3	68.4	63.5	59.6	55.6	52.7	50.1	47.8	*45.1–50.4*	1,369
1998	86.9	79.7	72.9	67.7	61.8	56.9	53.0	50.7	47.9	46.6	*43.8–49.3*	1,271
1997	86.0	78.5	71.4	65.9	60.9	56.2	52.9	50.7	48.8	44.7	*41.2–48.1*	794

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

Cohort	1 year	2 year	3 year	4 year	5 year	6 year	7 year	8 year	9 year	10 year	*95% CI for latest year*	N
2010	**77.0**										***75.5–78.4***	**3,316**
2009	76.2	62.9									*61.2–64.5*	3,381
2008	75.8	62.9	52.2								*50.5–53.9*	3,234
2007	75.0	61.2	49.5	40.6							*38.9–42.3*	3,187
2006	72.5	59.4	48.4	38.4	30.8						*29.1–32.4*	3,154
2005	72.9	58.6	46.5	37.7	29.2	22.5					*21.1–24.0*	3,071
2004	68.6	54.7	43.3	34.3	26.8	20.7	16.1				*14.8–17.6*	2,713
2003	69.2	53.8	42.4	32.5	24.9	19.5	15.4	12.3			*11.0–13.7*	2,362
2002	65.9	51.3	40.8	32.7	25.3	19.0	14.6	11.8	9.2		*8.0–10.5*	2,168
2001	67.2	52.1	39.5	30.4	23.0	17.2	13.2	10.1	8.0	6.2	*5.2–7.4*	1,850
2000	66.4	53.1	40.2	29.3	23.0	18.3	14.2	10.3	8.1	6.0	*4.9–7.3*	1,505
1999	66.2	50.7	38.6	29.0	21.7	15.5	11.3	8.9	7.1	5.8	*4.6–7.2*	1,265
1998	64.0	47.0	36.7	27.8	20.8	15.0	10.9	7.5	5.4	4.1	*3.1–5.4*	1,139
1997	63.9	46.0	33.2	23.7	16.2	11.4	7.7	6.1	4.4	3.7	*2.4–5.5*	794

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

Cohort	1 year	2 year	3 year	4 year	5 year	6 year	7 year	8 year	9 year	10 year	*95% CI for latest year*	N
2010	**84.8**										***83.9–85.6***	**6,650**
2009	83.8	74.2									*73.1–75.2*	6,782
2008	84.1	75.1	67.5								*66.4–68.7*	6,706
2007	84.1	74.5	66.1	59.5							*58.3–60.7*	6,648
2006	82.0	72.5	64.7	57.4	51.8						*50.5–53.0*	6,312
2005	81.2	71.1	62.7	56.1	49.6	44.6					*43.3–45.9*	6,047
2004	79.1	69.2	60.3	53.1	47.1	42.0	38.1				36.8–39.4	5,351
2003	79.4	68.4	60.1	52.6	46.3	41.6	37.8	34.7			*33.3–36.1*	4,727
2002	77.0	66.2	58.2	51.6	45.5	40.5	36.5	33.7	31.2		*29.8–32.6*	4,246
2001	77.4	66.0	56.9	49.6	43.6	38.4	34.8	31.7	28.9	26.9	*25.4–28.3*	3,690
2000	78.2	67.9	58.3	50.5	44.7	39.9	35.9	32.3	30.0	27.7	*26.1–29.3*	3,091
1999	77.4	66.8	57.2	49.5	43.4	38.4	34.3	31.7	29.4	27.6	*25.9–29.3*	2,634
1998	76.1	64.3	55.9	48.9	42.5	37.2	33.2	30.4	27.9	26.7	*24.9–28.4*	2,410
1997	76.7	64.8	55.3	48.1	42.1	37.4	33.9	32.0	30.1	27.4	*25.1–29.8*	1,375

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

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

The current method for calculating survival for incident patients does not censor at transplantation. From figure 5.4, it can be seen that 50% of patients starting RRT aged between 45–54 survived for over 10 years, 50% of patients starting RRT aged between 55–64

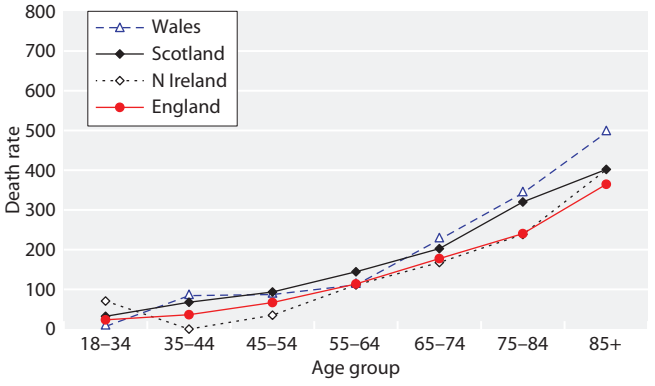

Fig. 5.3. One year after 90 days death rate per 1,000 patients years by UK country and age group for incident patients, 2007–2010 cohort

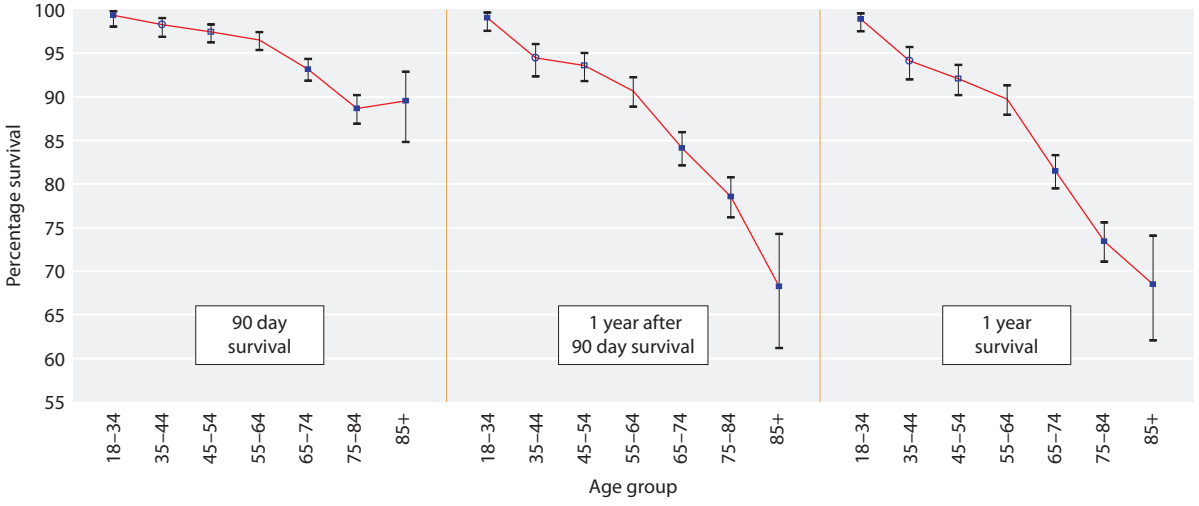

Fig. 5.2. Unadjusted survival of incident patients by age group, 2010 cohort

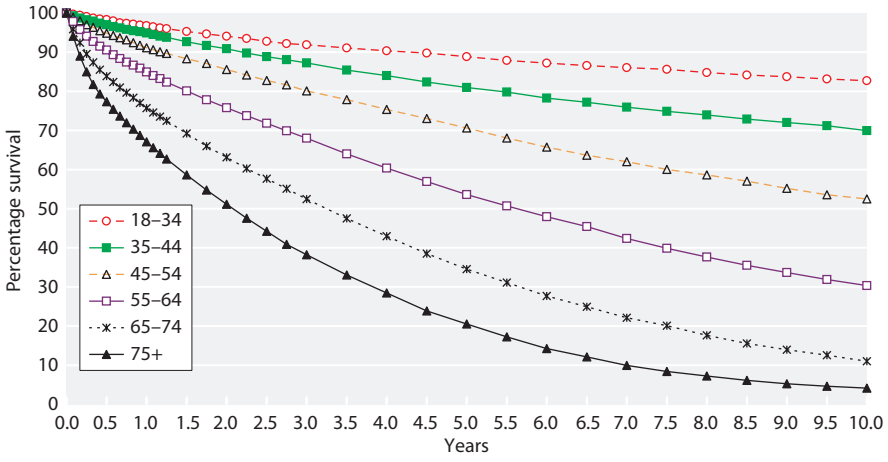

Fig. 5.4. Survival of incident patients (unadjusted), 1997–2010 cohort (from day 0), without censoring at transplantation

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

Figure 5.5 shows the survival of incident patients, excluding those who died within the first 90 days and shows that 50% of patients aged between 55–64 years survived for 6 years and 50% of patients aged between 65–74 years survived for 3.5 years.

Censoring at transplantation would make the longer term outcomes of younger patients (who were more likely to have undergone transplantation) appear worse than they actually were. Without censoring, the 10 year survival for patients aged 18–34 years was 82.7% (figure 5.4), which contrasts with a 59.1% survival if censoring at the time of transplantation (data not shown). For more detailed information on this effect, refer to the 2008 Report [9].

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

Figure 5.6 shows the monthly hazard of death from the first day of starting RRT by age group, which falls sharply during the first 4–5 months, particularly for older patients.

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

Changes in survival from 1997–2010 cohort

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

It is important to note that these death rates are not directly comparable with those produced by the USRDS Registry, as the UK data include the first 90 day period when death rates are higher than subsequent time periods.

The unadjusted survival analyses (tables 5.8, 5.9, 5.10, figures 5.7, 5.8, 5.9) and annual death rates show a large

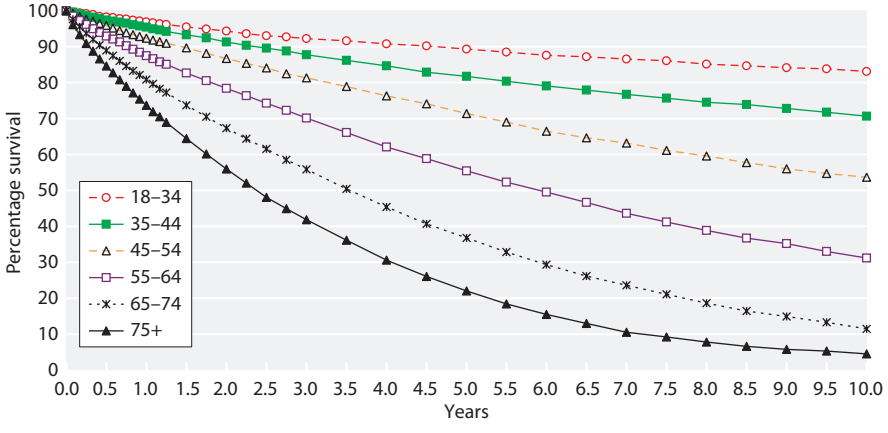

Fig. 5.5. Survival of incident patients (unadjusted), 1997–2010 cohort (from day 90), without censoring at transplantation

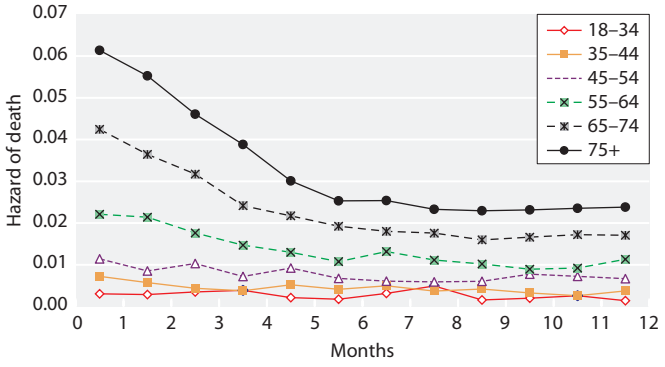

Fig. 5.6. First year monthly hazard of death, by age group 1997–2010 combined incident cohort

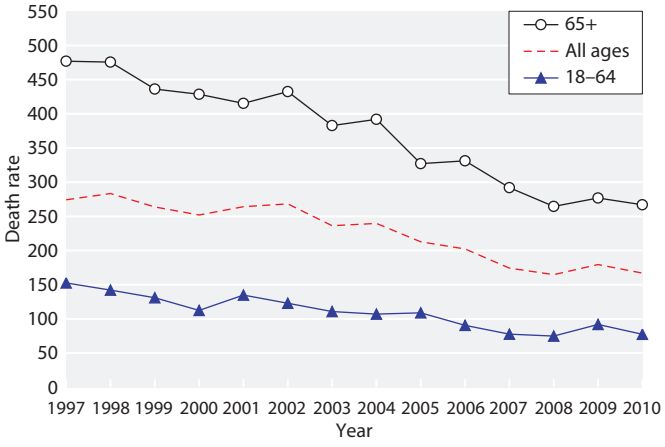

Fig. 5.7. One-year incident death rate per 1,000 patient years by age group, 1997–2010 cohort

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

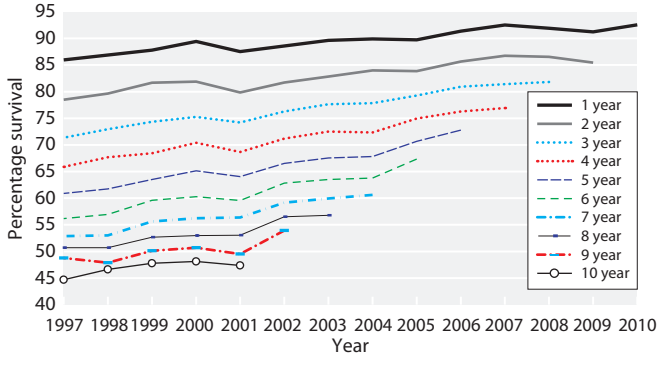

Fig. 5.8. Change in long term survival by year of starting RRT, for incident patients aged 18–64 years

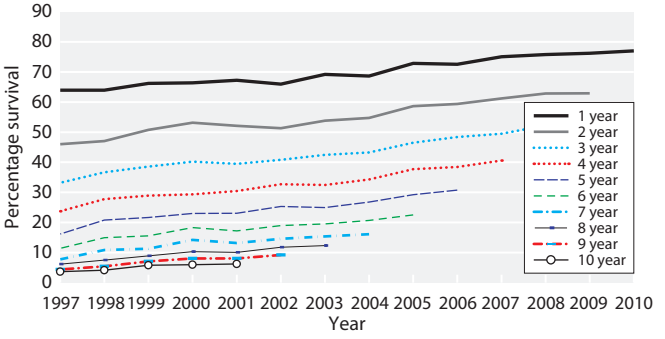

Fig. 5.9. Change in long term survival by year of starting RRT, for incident patients aged >65 years

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

Gender

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

Change in survival on renal replacement therapy by vintage

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

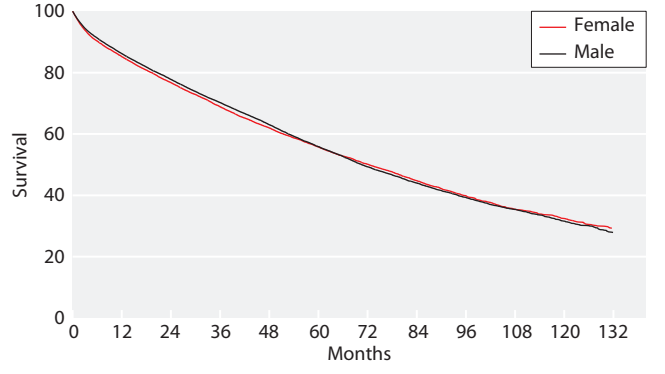

Fig. 5.10. Long term survival of incident patients by gender, 2000–2008 combined cohort, adjusted to age 60

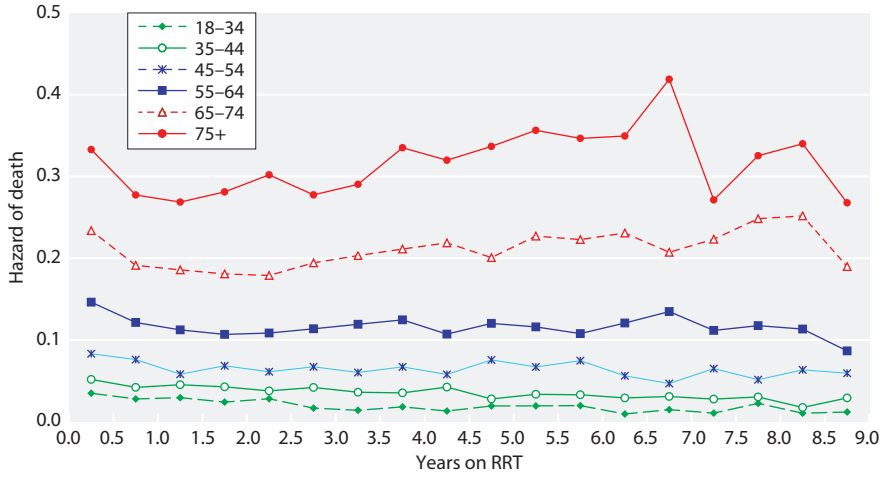

Fig. 5.11. Six monthly hazard of death, by vintage and age group, 1997–2010 incident cohort after day 90 (not censored at transplantation)

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

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

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

Analysis of centre variability in 1 year after 90 days survival

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

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

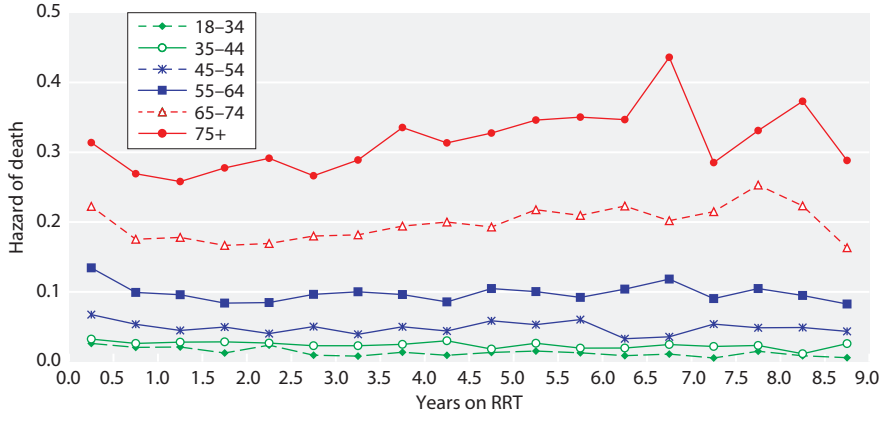

Fig. 5.12. Six monthly hazard of death, by vintage and age group, 1997–2010 non-diabetic incident cohort after day 90 (not censored at transplantation)

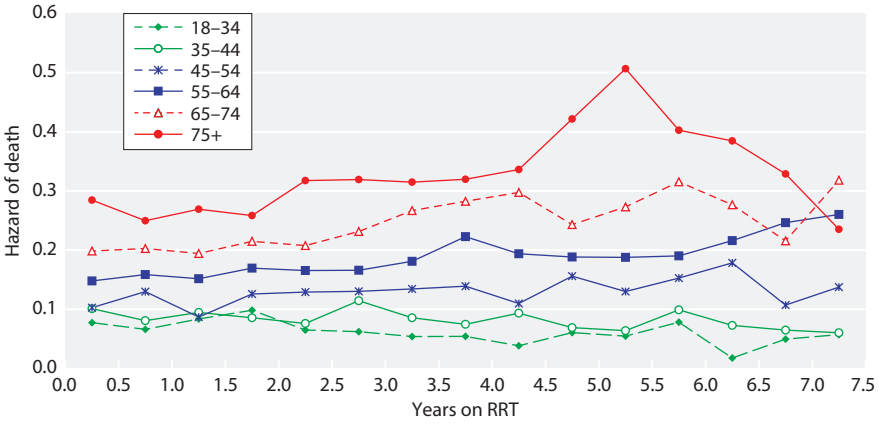

Fig. 5.13. Six monthly hazard of death, by vintage and age group, 1997–2010 diabetic incident cohort after day 90 (not censored at transplantation)

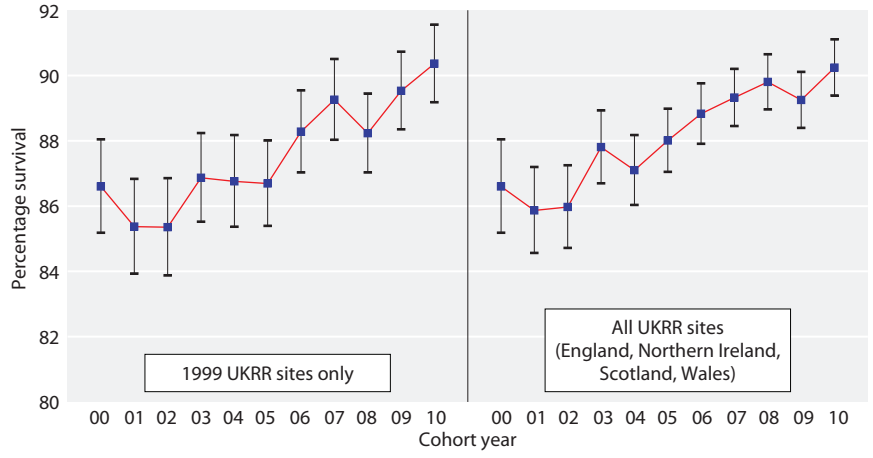

Fig. 5.14. Change in one-year after 90 day survival, 2000–2010 incident cohort (adjusted to age 60)
Showing 95% confidence intervals

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

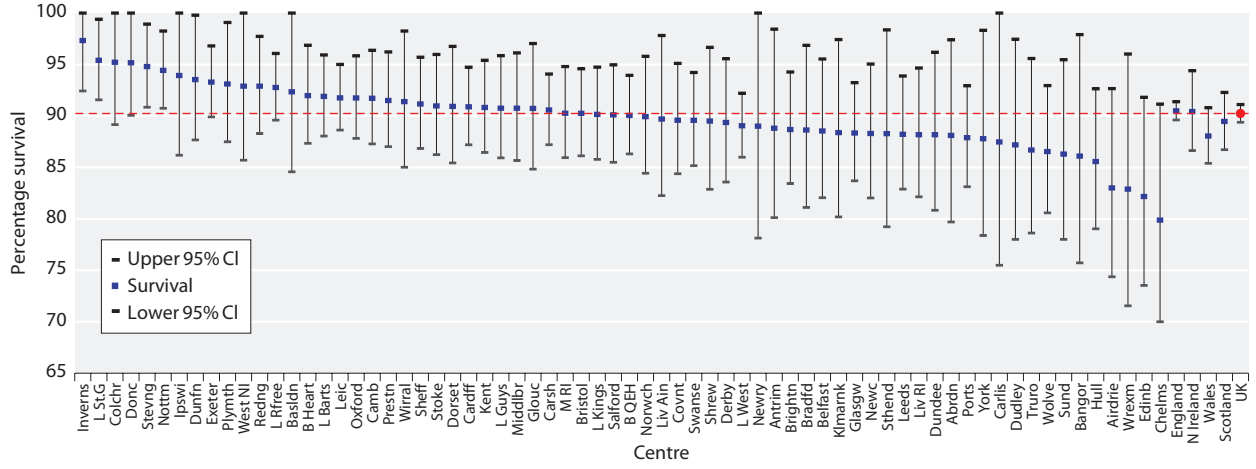

Fig. 5.15. Survival one-year after 90 days, adjusted to age 60, 2010 incident cohort

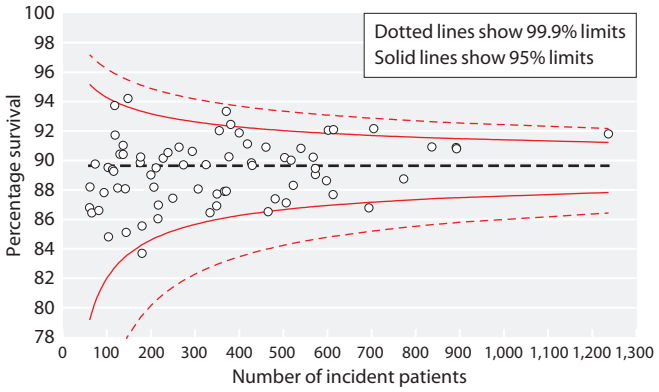

Fig. 5.16. Funnel plot for age adjusted 1 year after 90 days survival, 2007–2010 incident cohort

centres to be identified on this graph by finding the number of patients treated by the centre and then looking up this number on the x-axis. Two centres (Dudley and Cardiff) had survival below the 95% lower limit; this may be due to past performance as both were near average for the 2010 cohort. Seven centres (Ipswich, London St. George's, Stevenage, Sheffield, London Guys, London Royal Free and London West) had survival above the 95% upper limit. With 72 centres it would be expected that only three centres would be outside these limits by chance. It is important to acknowledge that these data have not been adjusted for any patient related factor except age (i.e. not comorbidity, primary renal disease or ethnicity) and have not

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

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

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

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

* Centre included if >85% comorbidity data available

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

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

Although comorbidity returns to the UKRR have remained poor, there was an increase in the number of centres returning more than 85% of comorbidity data to the UKRR for patients starting RRT in 2010. Using the combined incident cohort from 2006–2010, it was found that 16 centres had returned comorbidity data for more than 85% of patients and these centres were included in this analysis. Adjustment was first performed to age 60, then to the average distribution of primary diagnoses for all 16 centres. Further adjustment was then made to the average distribution of comorbidities present at those centres.

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

Survival in patients with diabetes

Although it has previously been shown that diabetic patients have worse long term survival compared to non-diabetic patients [3], non-diabetic patient survival in the older age group (65 years and older) was worse compared to diabetic patients in the same age group during the first 90 days of starting RRT in 2010 (figure 5.18) and in the subsequent year (figure 5.19); this might be due to patient selection.

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

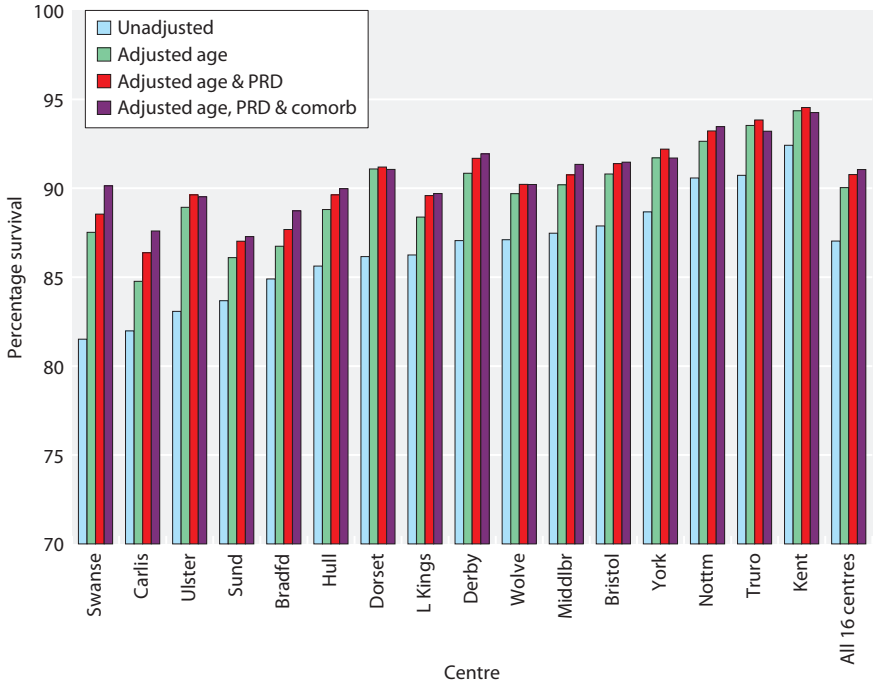

Fig. 5.17. The effect on survival after sequential adjustment for age, PRD and comorbidity, 2006–2010 incident cohort

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

Standard primary renal disease and survival

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

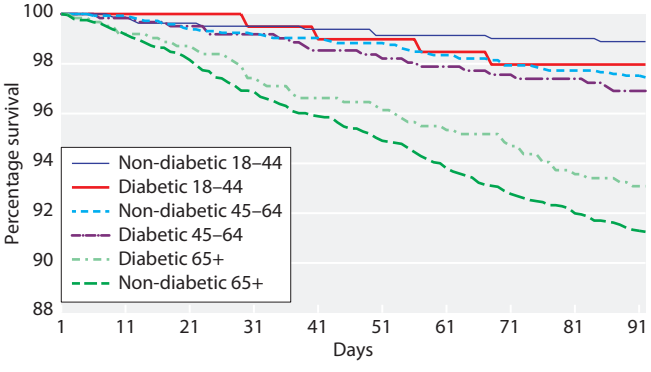

Fig. 5.18. Survival at 90 days for incident diabetic and non-diabetic patients by age group for patients starting RRT in 2010

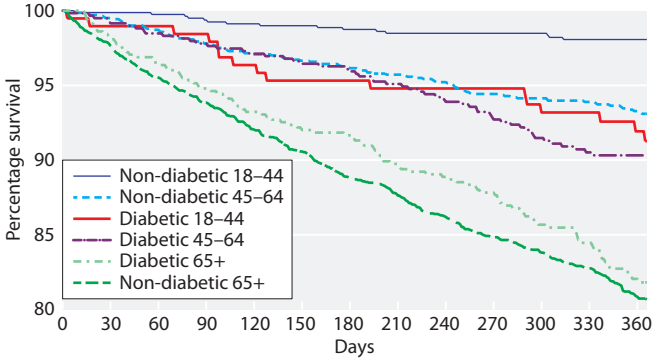

Fig. 5.19. Survival at 1 year after 90 days for incident diabetic and non-diabetic patients by age group for patients starting RRT in 2010

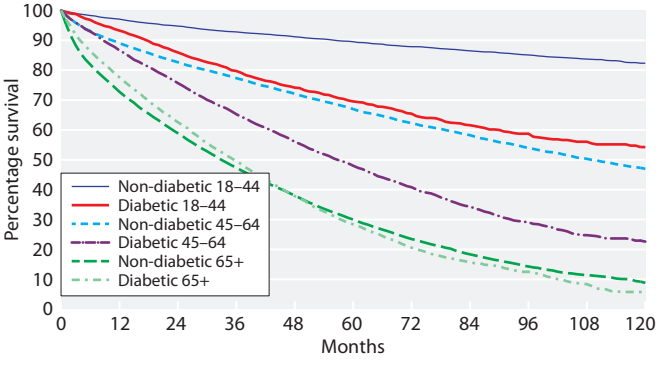

Fig. 5.20. Long term survival for incident diabetic and non-diabetic patients by age group, cohort 2000–2008, followed up for a minimum of 3 years

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

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

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

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

Results of prevalent patient survival analyses

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

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

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

One year survival of prevalent dialysis patients by centre

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

The effect of censoring at transplantation on survival was investigated in the 2010 prevalent dialysis cohort. Results show that this had a minimal effect on prevalent dialysis patient 1 year survival and outlier status (data not shown). Table 5.14 allows centres in figure 5.25 to be identified by finding the number of patients treated by the centre and the corresponding survival and then looking this up on the axes of the funnel plot.

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

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

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

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

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

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

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

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

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

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

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

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

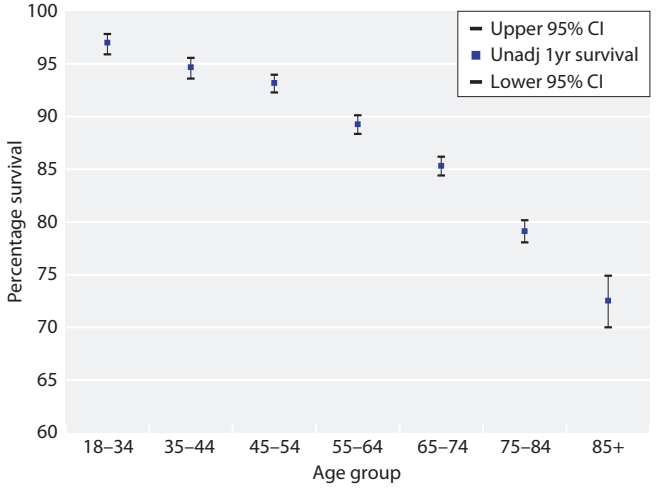

Fig. 5.21. One year survival of prevalent dialysis patients by age group, 2010 cohort

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

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

Death rate on RRT compared with the UK general population

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

Results of analyses on causes of death

Data completeness

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

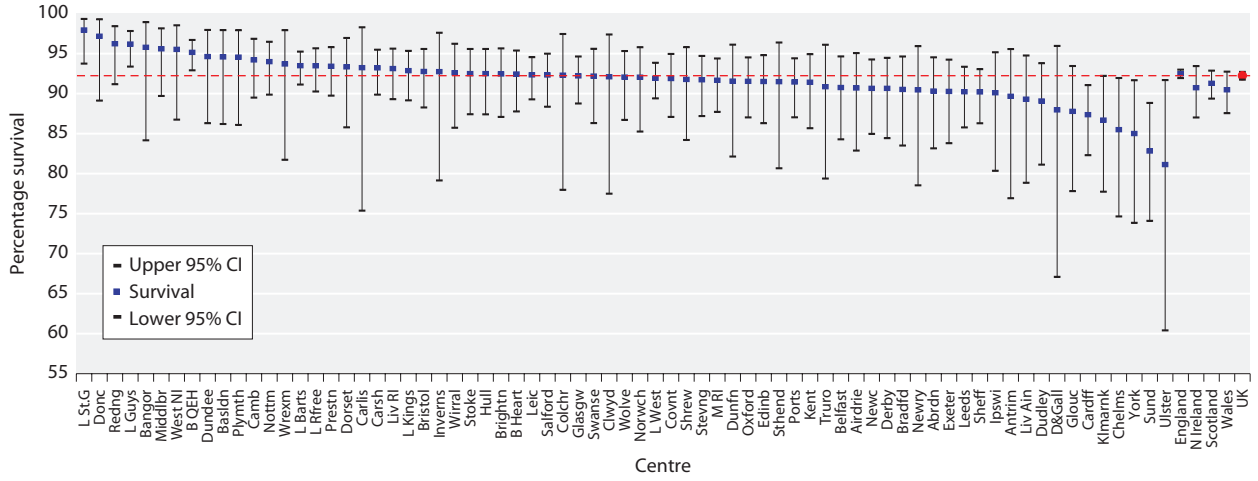

Fig. 5.22. One year survival of prevalent dialysis patients aged under 65 by centre, 2010 cohort

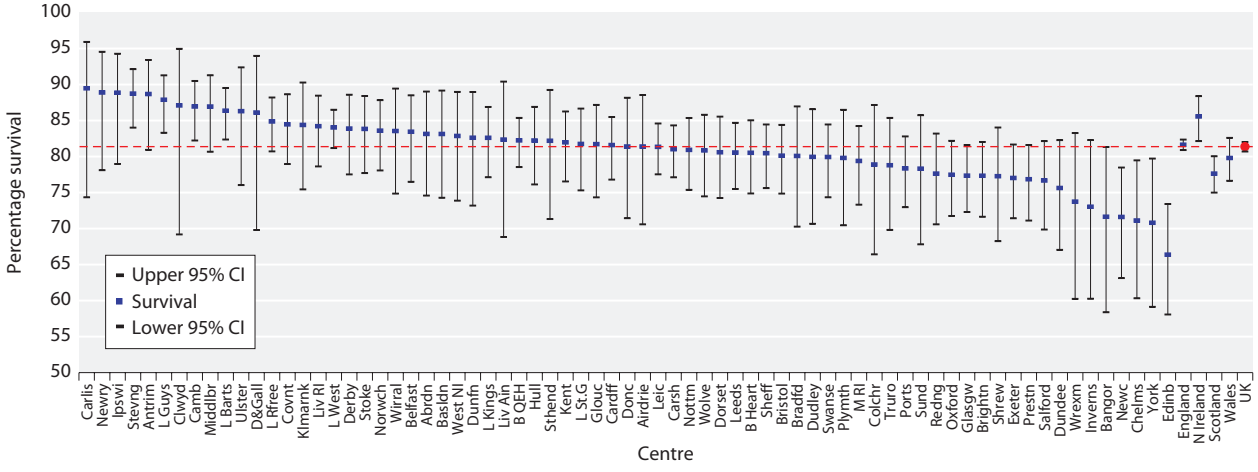

Fig. 5.23. One year survival of prevalent dialysis patients aged 65 years and over by centre, 2010 cohort

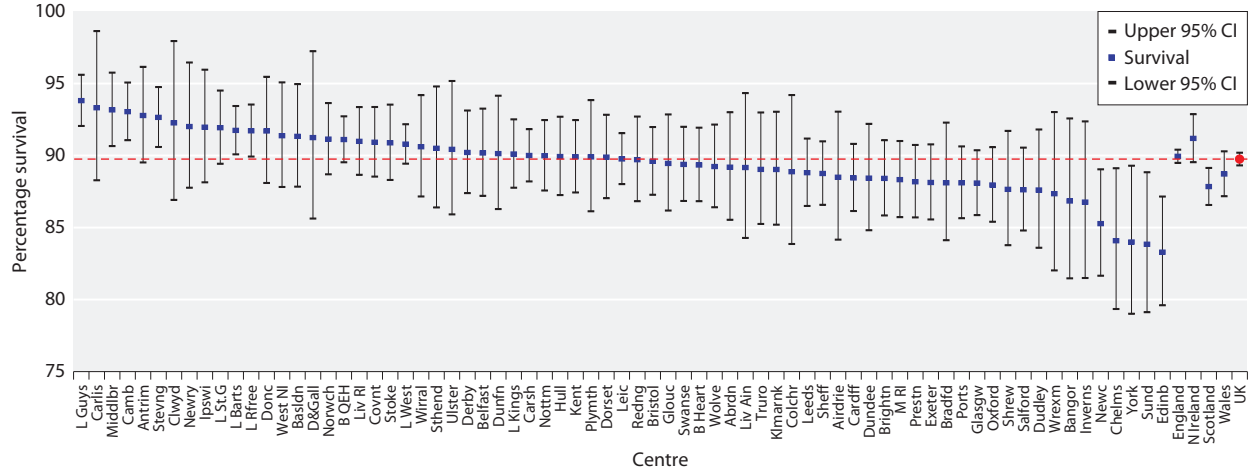

Fig. 5.24. One year survival of prevalent dialysis patients by centre adjusted to age 60, 2010 cohort

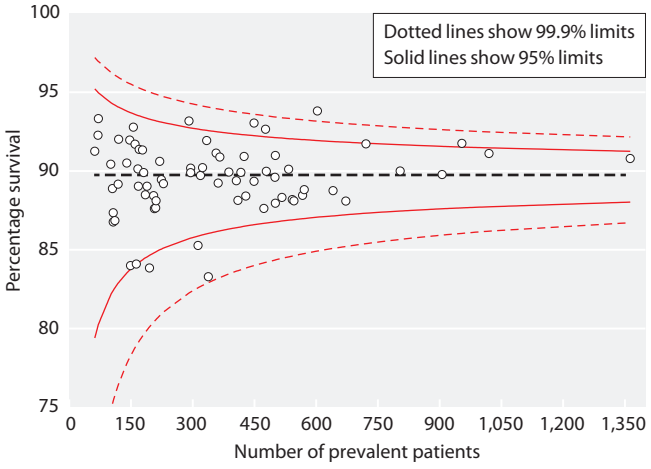

Fig. 5.25. One year survival funnel plot of prevalent dialysis patients by centre adjusted to age 60, 2010 cohort

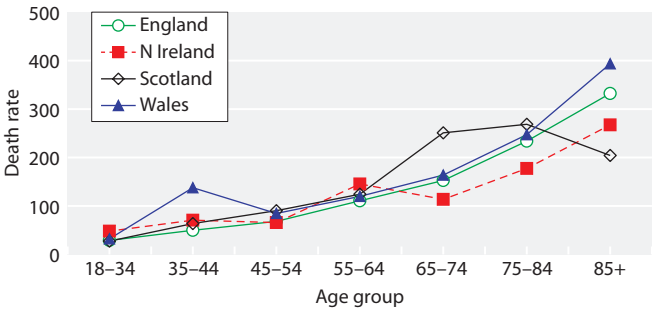

Fig. 5.26. One year death rate per 1,000 patient years by UK country and age group for prevalent dialysis patients, 2010 cohort

cohort (table 5.19) with both Northern Ireland and Scotland recording more than 85% of cause of death data. Scottish centres overall had the highest rate of data return for cause of death (93.5%) and their cause of death completeness improved by about 11% compared with the 2009 cohort. Patterns of cause of death must be cautiously interpreted, as there are significant differences between the causes of death for centres with a high proportion of non returns when compared to centres with good returns (⩾70% causes of death returned). Some centres consistently achieve a very high rate of data return for cause of death because a process is in place to ensure that these data were entered. Several centres have shown significant improvement in data returns, but unfortunately some centres that were reporting these data in previous years have stopped reporting cause of death data. There is still much variability between the centres regarding the completeness of cause of death with some centres returning no data and other centres having 100% completeness (table 5.19).

Causes of death in incident RRT patients

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

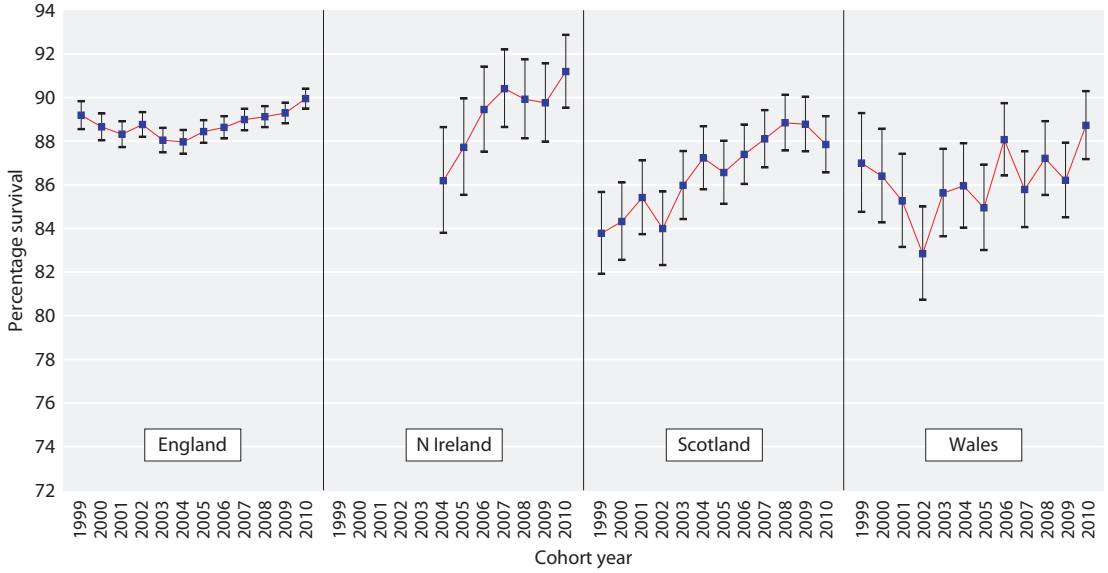

Fig. 5.27. Serial 1 year survival for prevalent dialysis patients by UK country, 1999 to 2010 cohort years, adjusted to age 60

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

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

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

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

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

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

Causes of death within the first 90 days

See table 5.20.

Causes of death within one year after 90 days

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

Causes of death in prevalent RRT patients in the 2010 cohort

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

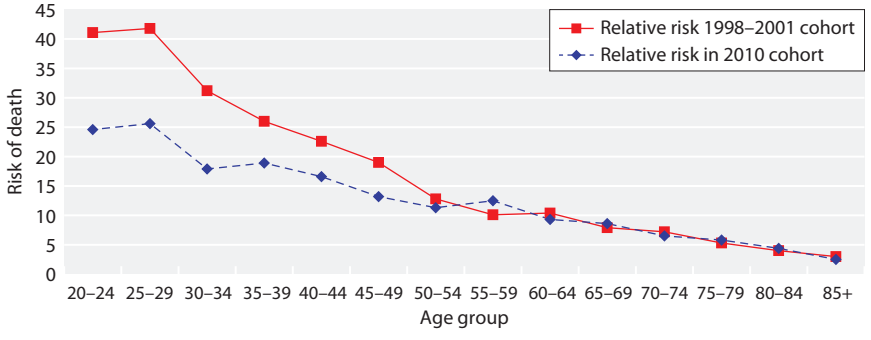

Fig. 5.28. Relative risk of death in all prevalent RRT patients in the 2010 cohort compared with the UK general population

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

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

Table 5.19. Continued

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

Blank cells, data not available for that year

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

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

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

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

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

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

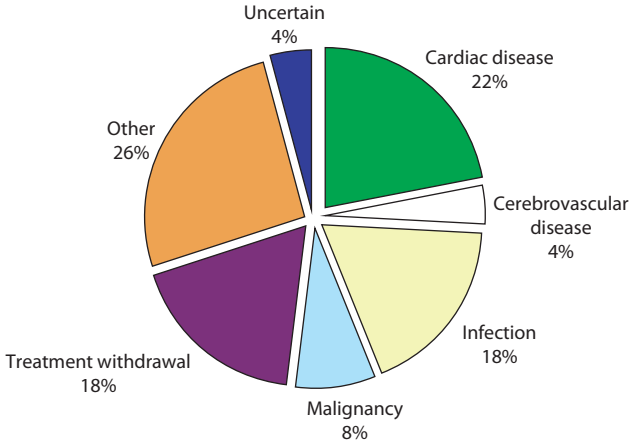

Fig. 5.29. Percentage contribution to cause of death for prevalent dialysis patients, 2010 cohort

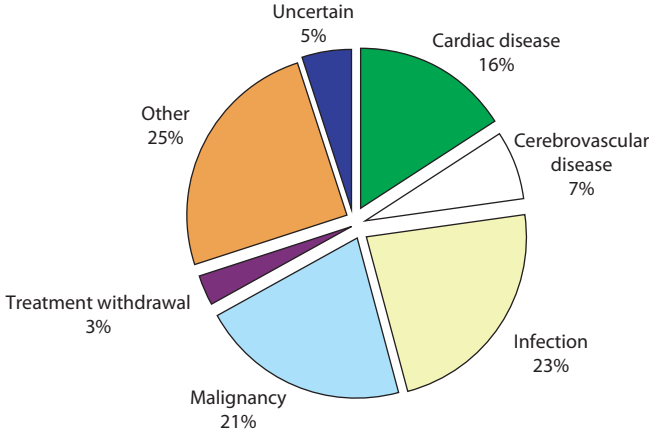

Fig. 5.30. Percentage contribution to cause of death for prevalent transplant patients, 2010 cohort

in the 2010 cohort. These data are neither age adjusted nor adjusted for differences in the comorbidity between the two groups. Cardiac disease as a cause of death was less common in transplanted patients as these were a pre-selected low risk group of patients. Malignancy and infection were both responsible for a greater percentage of deaths in prevalent transplanted patients, with treatment withdrawal a common cause of death in the prevalent dialysis population.

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

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

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

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

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

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

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

Median life expectancy on RRT

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

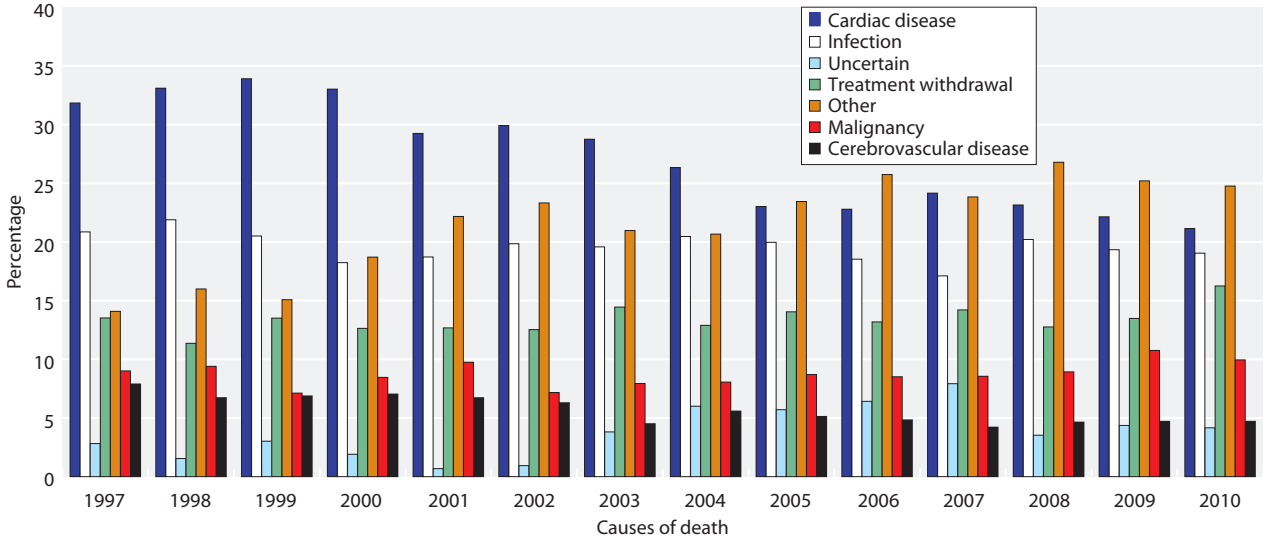

Fig. 5.31. Cause of death in prevalent RRT patients by cohort year

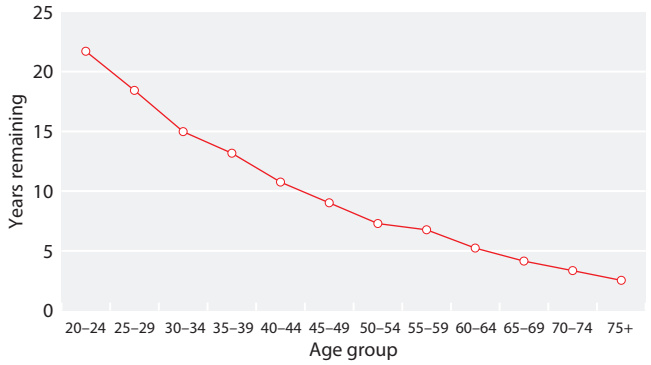

Fig. 5.32. Median life expectancy on RRT by age group, incident patients starting RRT from 2000–2008 cohort

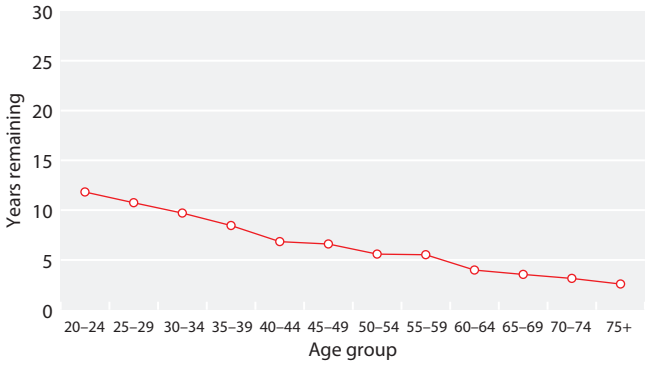

Fig. 5.33. Median life expectancy on RRT by age group, incident diabetic patients starting RRT from 2000–2008 cohort

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

Conflicts of interest: none

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Appendix 1: Survival tables

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

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

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

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

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

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

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

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

Table 5.27. Continued

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

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

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

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

Table 5.28. Continued

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

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