UK Renal Registry 16th Annual Report: Chapter 8 Survival and Cause of Death of UK Adult Patients on Renal Replacement Therapy in 2012: National and Centre-specific Analyses

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

Summary

- Unadjusted 1 year after 90 day survival for patients starting renal replacement therapy (RRT) in 2011 increased to 87.5% from 87.3% for those starting in 2010.
- In incident patients aged ⩾65 years, unadjusted 1 year after 90 day survival increased from 63.9% in 1997 to 80.6% in the 2011 cohort. An increase in survival was also observed between the 2010 and 2011 cohorts.
- In incident patients aged ⩾65 years the one year survival of diabetic patients was better than that of non-diabetic patients, and three year survival was similar.
- One year age adjusted survival for prevalent dialysis patients remained relatively unchanged at 89.7% in the 2011 cohort compared to 89.8% in the 2010 cohort.
- One year survival for prevalent diabetic patients increased from 81.6% in the 2002 cohort to 84.9% in the 2011 cohort. An increase in survival was also observed between the 2010 and 2011 cohorts.
- RRT patients aged 35–39 had a mortality rate 16.6 times higher than the age matched general population, whereas RRT patients aged 85+ had a mortality rate only 2.7 times higher. The overall relative risk of death improved across most age groups in the 2011 cohort.
- In the prevalent RRT dialysis population, cardiovascular disease accounted for 22% of deaths and treatment withdrawal 19%, whilst 21% were recorded as other cause of death.
- The median life years remaining for an incident patient aged 25–29 years was 18.5 years and approximately 2.4 years for a 75+ year old.

Introduction

The analyses presented in this chapter examine: a) survival from the start of renal replacement therapy (RRT) of adults; b) survival amongst all prevalent adult dialysis patients alive on 31st December 2011; c) the cause of death for incident and prevalent adult patients and d) the projected life years remaining for adult patients starting RRT. They encompass the outcomes from the total incident adult UK dialysis population reported to the UK Renal Registry (UKRR), including the 19.5% 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 adult 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.

The prevalent dialysis patient group was defined as all patients over 18 years old, alive and receiving dialysis on 31st December 2011 who had been on dialysis 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 sub-groups 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 recently 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 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 died within 90 days who had developed acute potentially reversible renal failure but were recorded by the clinician as being in irreversible established renal failure.

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

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

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

In addition to these problems of defining day 0 within one country, there is international variability 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], and centres with a high pre-emptive transplant rate are likely to have a less healthy dialysis population as transplantation selectively removes fit patients only.

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 from 1st October 2010 until the 30th September 2011 and followed up for one full year (e.g. patients starting RRT on 1st December 2010 were followed through to 30th November 2011). The 2012 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 from 1st October 2010 until 30th September 2011 were included in the cohort and they were followed up for a full one year after 90 days.

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 four year combined incident cohort from 2008 to 2011 was also undertaken. For those centres which had joined the UKRR after 2008, 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 five year combined incident cohort from 2007 to 2011. Twenty-one 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 21 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 2011 were included in these analyses. Prevalent dialysis patients on 31st December 2011 were followed up in 2012 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 22% of the dialysis population aged under 65 and 3% 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

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 all prevalent patients on RRT that died in a specific year with cause of death data completed for that year.

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 2000–2011. Analysis of prevalent patients included all those aged over 18 years and receiving RRT on 31st December 2011. 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 2011.

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 2000–2009, with at least three years follow-up from 2010 to 2012. 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-2012 and the number of deaths in each age group in 2012 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 2012 in RRT patients. The RRT observed death rate was calculated as number of deaths observed in 2012 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 2011 incident cohort included 6,750 patients who started RRT, without any period of renal function recovery lasting more than 90 days. The unadjusted 1 year after 90 day survival for incident patients starting RRT in 2011 (table 8.1) has increased to 87.5% compared to 87.3% in the 2010 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 8.2). 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 Wales compared to England. It has been postulated that a greater prevalence of cardiovascular disease in Wales 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 8.3 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.

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 89.3% and 92.9% respectively, both showing a slight increase from the previous year (figure 8.1, table 8.4). Over the last six years the one

Table 8.1. Unadjusted survival of incident patients, 2011 cohort

Interval	Survival (%)	*95% CI*	*N*
Survival at 90 day	94.5	93.9–95.0	6,750
Survival 1 year after 90 days	87.5	86.7–88.3	6,359

Table 8.2. Incident patient survival across the UK countries, combined 2 year cohort (2010–2011), adjusted to age 60

Interval	England	N Ireland	Scotland	Wales	UK
Survival at 90 day (%)	96.2	96.0	95.8	96.6	96.2
95% CI	*95.8–96.6*	*94.4–97.7*	*94.7–96.8*	*95.6–97.7*	*95.8–96.5*
Survival 1 year after 90 days (%)	90.5	90.4	88.9	88.2	90.3
95% CI	*89.9–91.1*	*87.7–93.1*	*87.1–90.7*	*86.1–90.3*	*89.7–90.9*

Table 8.3. 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 for Northern Ireland

Table 8.4. One year after 90 day incident patient survival by first established modality 2005–2011 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
2011	89.3	92.9
	88.3–90.3	*91.6–94.3*
2010	87.7	93.3
	86.6–88.8	*91.9–94.7*
2009	87.6	93.1
	86.5–88.7	*91.6–94.6*
2008	87.1	93.1
	86.0–88.2	*91.7–94.4*
2007	87.8	94.5
	86.7–88.9	*93.3–95.7*
2006	86.5	94.1
	85.4–87.7	*92.8–95.4*
2005	85.3	92.5
	84.0–86.5	*91.1–94.0*

year after 90 days survival has progressively improved in HD patients, but remained static in PD patients (table 8.4).

Age

Tables 8.5 to 8.10 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 94.5% (94.2% for patients starting RRT in 2010) (table 8.5). 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 8.6). Longer term survival of patients on RRT continued to improve (tables 8.8, 8.9, 8.10). There is a steep decline in survival with advancing age (figures 8.2 and 8.3).

There was a curvilinear increase in death rate per 1,000 patient years with age, shown in figure 8.3 for the period one year after 90 days. There were differences between the overall death rates across all age groups with the

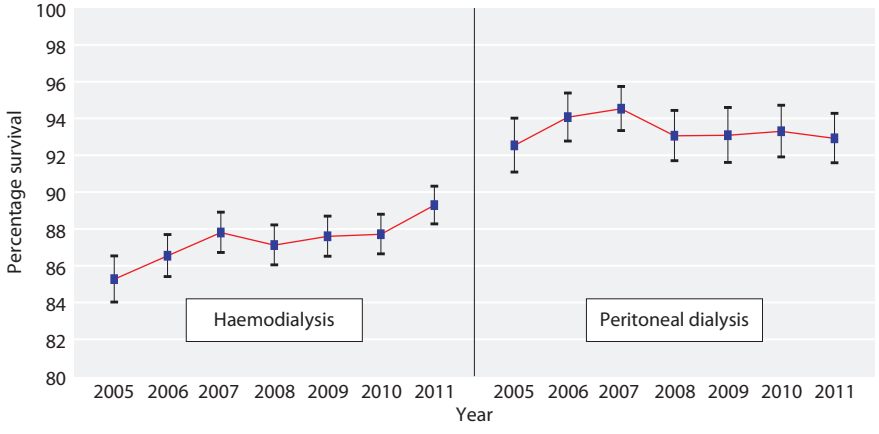

Fig. 8.1. Trend in 1 year after 90 day incident patient survival by first modality, 2005–2011 cohort (adjusted to age 60) (excluding patients whose first modality was transplantation)

Table 8.5. Unadjusted 90 day survival of incident patients, 2011 cohort, by age

Age	Survival (%)	*95% CI*	*N*
18–64	97.8	*97.2–98.2*	3,370
⩾65	91.2	*90.2–92.1*	3,380
All ages	94.5	*93.9–95.0*	6,750

Table 8.6. Unadjusted 1 year after day 90 survival of incident patients, 2011 cohort, by age

Age	Survival (%)	*95% CI*	*N*
18–64	94.1	*93.2–94.8*	3,284
⩾65	80.6	*79.1–82.0*	3,075
All ages	87.5	*86.7–88.3*	6,359

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

Table 8.7. Increase in proportional hazard of death for each 10 year increase in age, 2011 incident cohort

Interval	Hazard of death for 10 year age increase	*95% CI*
First 90 days	1.70	*1.56–1.85*
1 year after first 90 days	1.64	*1.55–1.73*

Table 8.8. Unadjusted survival of incident patients, 1997–2011 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*
2011	**93.4**										***92.5–94.2***	**3,370**
2010	92.2	86.6									*85.4–87.7*	3,375
2009	91.3	85.4	80.8								*79.4–82.2*	3,160
2008	91.6	86.2	81.4	77.3							*75.8–78.6*	3,481
2007	92.7	87.2	82.0	77.1	73.4						*71.8–74.8*	3,347
2006	90.8	85.2	80.3	76.0	72.4	68.5					*66.8–70.1*	3,182
2005	89.7	83.6	78.6	73.8	69.3	65.7	62.6				*60.8–64.4*	2,828
2004	89.7	83.6	78.2	72.8	68.2	64.5	61.5	57.7			*55.7–59.6*	2,571
2003	89.5	82.8	77.5	72.6	67.6	63.5	59.8	57.0	54.4		*52.3–56.5*	2,271
2002	88.7	80.9	74.9	69.4	65.3	61.4	58.0	55.1	52.0	49.9	*47.7–52.1*	2,034
2001	88.3	81.3	75.5	70.5	65.3	60.6	56.5	53.0	50.2	48.2	*45.7–50.7*	1,611
2000	89.2	81.4	74.6	69.3	64.0	59.4	55.9	52.7	50.3	47.6	*45.0–50.1*	1,533
1999	87.0	81.1	73.4	67.6	62.2	58.1	54.0	51.1	48.7	47.1	*44.4–49.8*	1,349
1998	87.6	80.3	74.5	69.6	64.2	59.2	55.4	53.4	50.2	47.9	*45.0–50.8*	1,172
1997	85.3	77.5	69.6	63.7	58.8	54.5	51.5	49.1	47.9	44.1	*40.0–48.1*	589

Table 8.9. Unadjusted survival of incident patients, 1997–2011 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*
2011	**77.5**										***76.1–78.9***	**3,380**
2010	76.4	63.6									*61.9–65.2*	3,287
2009	76.9	63.8	52.8								*51.1–54.6*	3,147
2008	74.8	61.5	50.3	40.9							*39.2–42.6*	3,184
2007	75.3	61.5	50.2	41.0	32.5						*30.9–34.1*	3,221
2006	72.1	58.6	47.4	37.8	29.6	23.8					*22.3–25.3*	3,139
2005	71.3	57.4	45.5	36.4	28.2	21.5	16.9				*15.6–18.3*	2,946
2004	69.3	54.4	43.0	34.6	27.4	21.6	17.0	13.5			*12.2–14.9*	2,633
2003	68.4	53.9	42.1	32.2	24.7	18.5	14.6	11.5	8.9		*7.8–10.1*	2,317
2002	66.1	50.9	40.6	32.2	24.3	18.7	14.1	11.3	8.7	6.9	*5.9–8.1*	2,090
2001	66.6	52.0	38.1	28.9	21.7	16.3	12.2	9.6	8.1	6.2	*5.1–7.6*	1,557
2000	66.0	52.4	39.6	28.6	22.3	17.4	13.4	10.0	7.8	6.0	*4.8–7.2*	1,497
1999	68.4	51.7	39.3	30.1	22.5	16.6	12.0	9.0	6.9	5.5	*4.3–6.9*	1,218
1998	62.7	45.6	36.3	26.6	20.2	14.1	10.7	7.7	5.7	4.6	*3.5–6.1*	1,017
1997	63.3	46.5	31.7	22.8	14.6	9.9	5.9	4.5	2.7	2.0	*0.9–3.7*	412

Table 8.10. Unadjusted survival of incident patients, 1997–2011 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*
2011	**85.5**										***84.6–86.3***	**6,750**
2010	84.4	75.2									*74.2–76.3*	6,662
2009	84.1	74.6	66.9								*65.7–68.0*	6,307
2008	83.6	74.4	66.5	59.9							*58.7–61.0*	6,665
2007	84.1	74.6	66.4	59.3	53.3						*52.0–54.5*	6,568
2006	81.5	72.0	64.0	57.1	51.2	46.3					*45.1–47.6*	6,321
2005	80.3	70.3	61.7	54.8	48.3	43.2	39.3				*38.1–40.6*	5,774
2004	79.4	68.8	60.4	53.5	47.6	42.9	39.0	35.4			*34.1–36.7*	5,204
2003	78.8	68.2	59.7	52.3	46.1	40.9	37.1	34.2	31.6		*30.2–33.0*	4,588
2002	77.2	65.7	57.5	50.6	44.6	39.8	35.8	32.9	30.0	28.2	*26.8–29.6*	4,124
2001	77.7	66.9	57.2	50.1	44.0	38.9	34.9	31.8	29.6	27.7	*26.1–29.3*	3,168
2000	77.7	67.1	57.3	49.3	43.5	38.7	35.0	31.7	29.4	27.1	*25.5–28.7*	3,030
1999	78.2	67.2	57.2	49.8	43.4	38.5	34.1	31.2	28.9	27.4	*25.7–29.2*	2,567
1998	76.0	64.3	56.8	49.7	43.8	38.3	34.7	32.2	29.6	27.9	*26.0–29.8*	2,189
1997	76.3	64.8	54.0	46.9	40.7	36.2	32.9	30.8	29.4	26.8	*24.1–29.6*	1,001

figure 8.4, it can be seen that 50% of patients starting RRT aged between 45–54 survived for over 10 years, 50% of patients starting RRT aged between 55–64 survived for 5.75 years and 50% of patients starting RRT aged between 65–74 survived for 3.3 years.

Figure 8.5 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 3.6 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

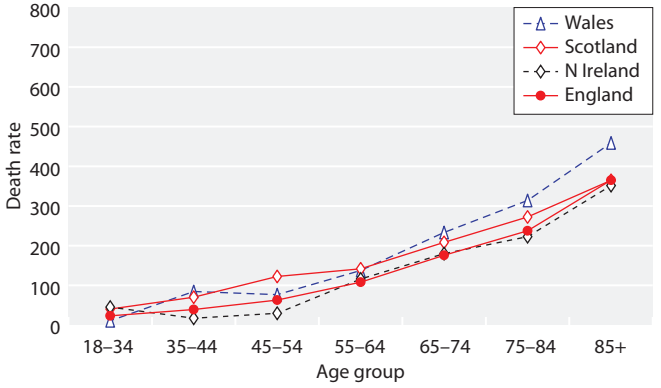

Fig. 8.3. One year after 90 days death rate per 1,000 patient years by UK country and age group for incident patients, 2008–2011 cohort

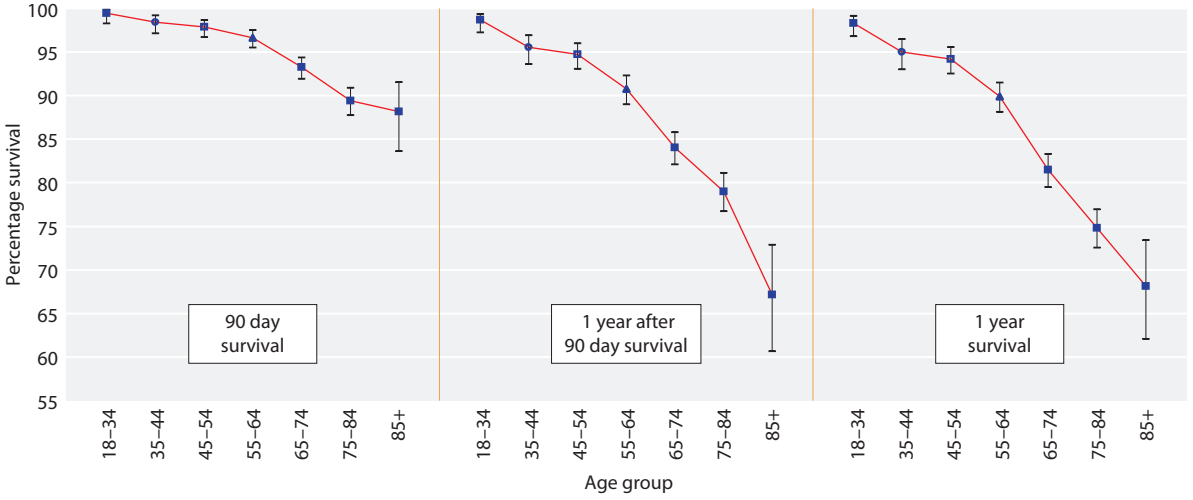

Fig. 8.2. Unadjusted survival of incident patients by age group, 2011 cohort

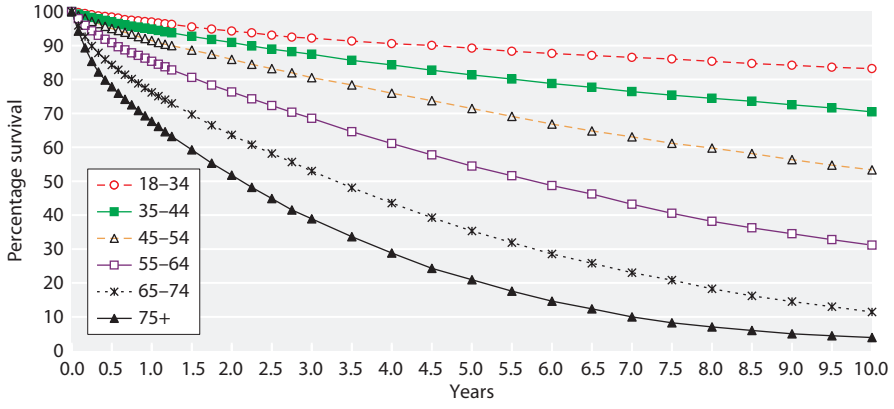

Fig. 8.4. Survival of incident patients (unadjusted), 1997–2011 cohort (from day 0), without censoring at transplantation

survival for patients aged 18–34 years was 83.6% (figure 8.4), which contrasts with a 57.5% 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 8.6 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 1.70 times increased risk of death within 90 days and a 1.64 times increased risk of death within 1 year after 90 days (table 8.7).

Changes in survival in the 2000–2011 cohort

The death rate per 1,000 patient years in the first year of starting RRT from 2000 to 2011 is shown in figure 8.7. There was a declining trend in the overall death rate, although this appears to have levelled off during the last four years. There has been a steeper rate of decline in the older age group (aged 65 years and older).

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 8.8, 8.9, 8.10, figures 8.8, 8.9) and annual death rates (figure 8.7) show a large improvement in 1 to 10 year survival across the years for both those aged under and those over 65 years. One year survival amongst patients aged less than 65 years at start of RRT has improved from 85.3% in the 1997 cohort to 93.4% in the 2011 cohort.

Similarly, for patients aged 65 years and over there has been a 14.2% absolute improvement in one year survival from the 1997 to 2011 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 in an incident cohort of patients starting RRT from 2000 to 2009 and followed up for a minimum of three years until 2012 (figure 8.10). Gender differences were investigated

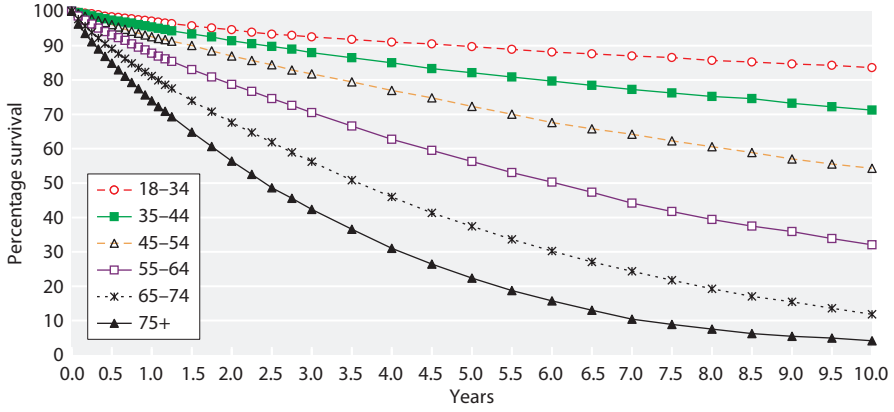

Fig. 8.5. Survival of incident patients (unadjusted), 1997–2011 cohort (from day 90), without censoring at transplantation

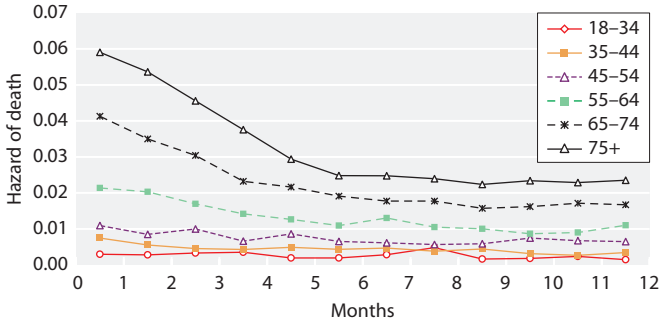

Fig. 8.6. First year monthly hazard of death, by age group 1997–2011 combined incident cohort

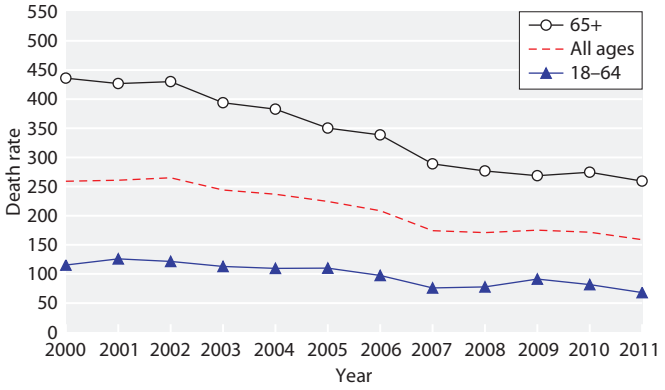

Fig. 8.7. One-year incident death rate per 1,000 patient years by age group, 2000–2011 cohort

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

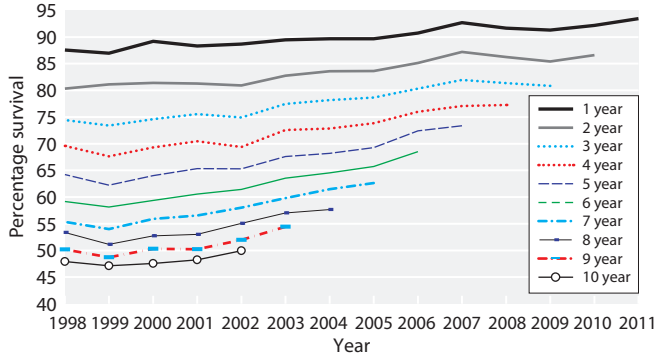

Fig. 8.8. Change in long term survival by year of starting RRT, for incident patients aged 18–64 years

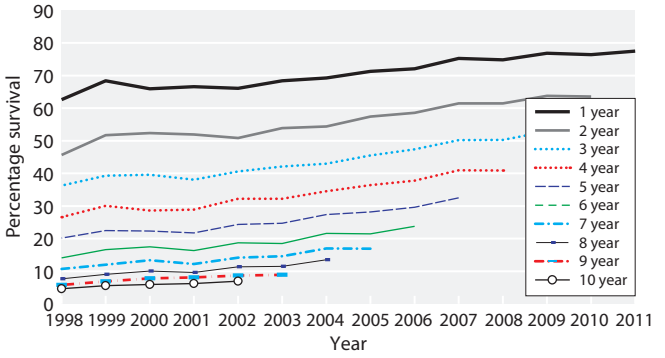

Fig. 8.9. Change in long term survival by year of starting RRT, for incident patients aged ⩾65 years

RRT (vintage) when comparing survival without censoring for transplantation. Figure 8.11 shows the instantaneous hazard of death by age group. The apparent vintage effect when censoring for transplantation (data not shown) is at least in part because these younger and healthier patients are only included in the survival calculation up to the date of transplantation. In the older age groups there were decreasing numbers remaining alive beyond seven years accounting for the increased variability seen. Figures 8.12 and 8.13 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 the primary renal disease.

Time trend changes in incident patient survival, 2000–2011 cohort

The time trend changes are shown in figure 8.14. The left hand plot, which includes only those centres that have been sending data continuously since 2000, shows a similar improvement in survival to the plot in which data from all renal centres are analysed.

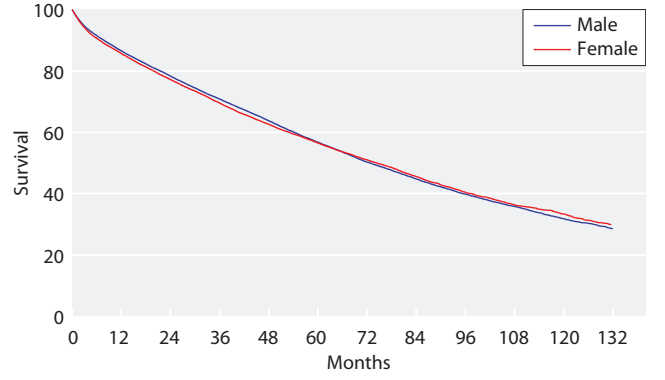

Fig. 8.10. Long term survival of incident patients by gender, 2000–2009 combined cohort, adjusted to age 60

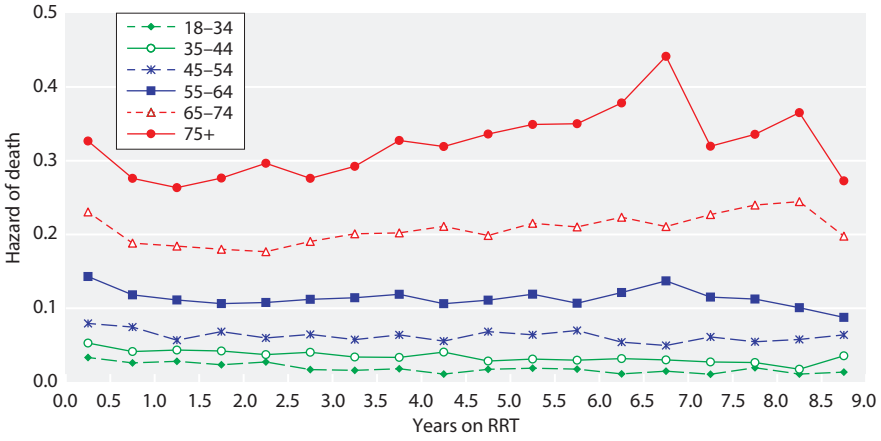

Fig. 8.11. Six monthly hazard of death, by vintage and age group, 1997–2011 incident cohort after day 90 (not censored at transplantation)

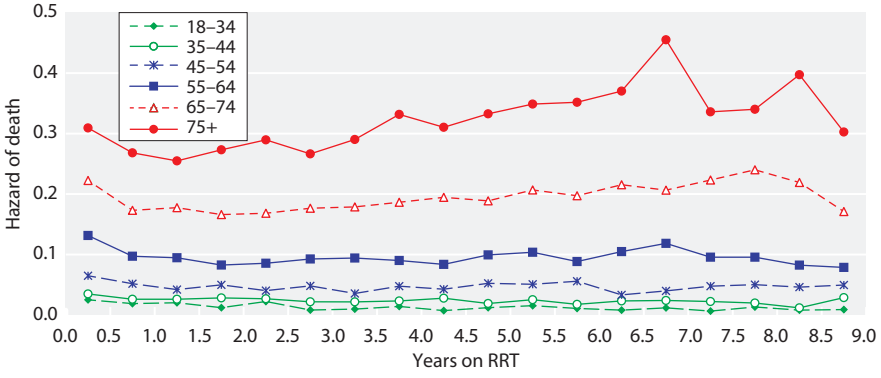

Fig. 8.12. Six monthly hazard of death, by vintage and age group, 1997–2011 non-diabetic incident cohort after day 90 (not censored at transplantation)

Analysis of centre variability in 1 year after 90 days survival

The one year after 90 day survival for the 2011 incident cohort is shown in figure 8.15 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 8.25 and 8.26). The age adjusted individual centre survival for each of the last nine years can also be found in appendix 1, table 8.27. 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 2011 (Clwyd, Dumfries & Galloway, Inverness) are not shown in figure 8.15, although they were included in the national and UK survival calculations.

In the analysis of 2011 incident cohort survival data, some of the smaller centres had wide confidence intervals (figure 8.15) due to small numbers of patients. This was

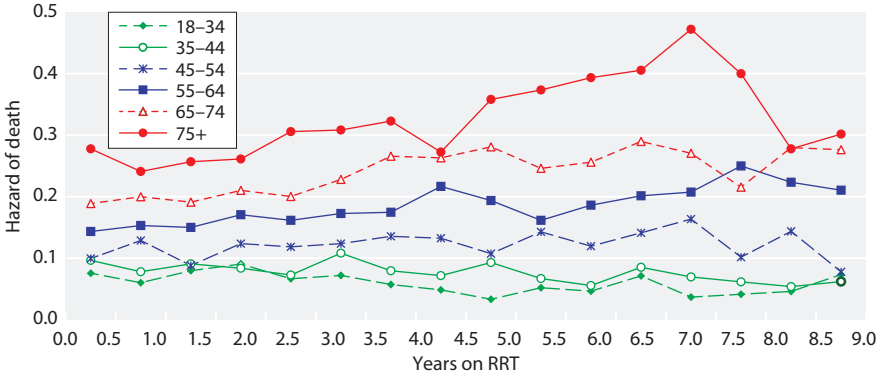

Fig. 8.13. Six monthly hazard of death, by vintage and age group, 1997–2011 diabetic incident cohort after day 90 (not censored at transplantation)

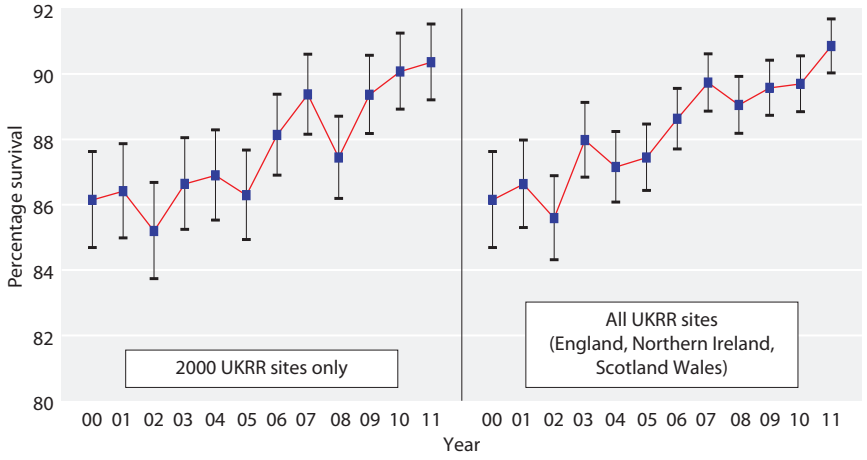

Fig. 8.14. Change in one-year after 90 day survival, 2000–2011 incident cohort (adjusted to age 60)
Showing 95% confidence intervals

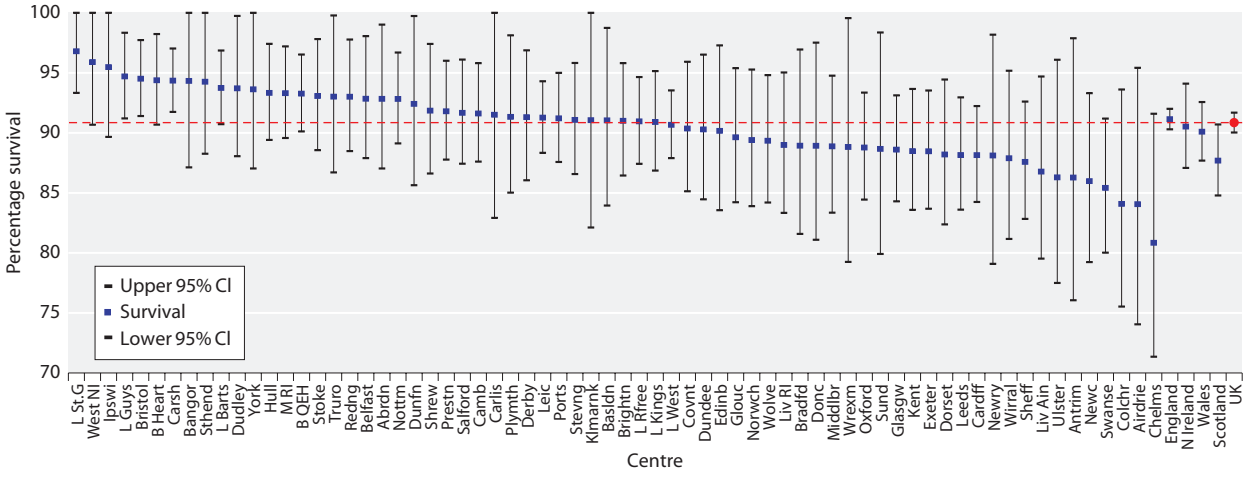

Fig. 8.15. Survival one-year after 90 days, adjusted to age 60, 2011 incident cohort

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 2008 to 2011. These data are presented as a funnel plot in figure 8.16. 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 8.11 allows centres to be identified on this graph by finding the number of patients treated by the centre and then looking up this number on the x-axis. Two centres (Swansea, Glasgow) had survival below the 95% lower limit whilst seven centres (Ipswich, London St. George's, Stevenage, London Guys, London Barts, London West, Western Trust Northern Ireland) had survival above the 95% upper limit. Amongst these, St George's was above the 99% upper limit having consistently had survival above the 95% upper limit for the last few years. With 71 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

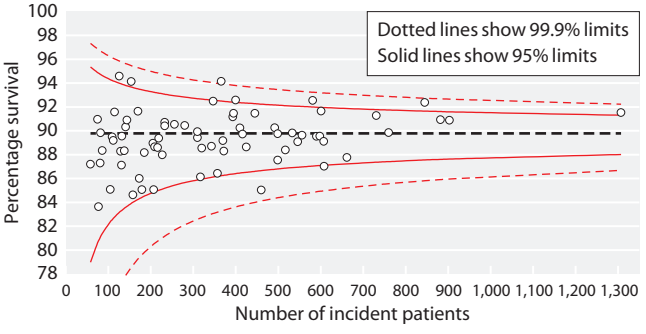

Fig. 8.16. Funnel plot for age adjusted 1 year after 90 days survival, 2008–2011 incident cohort

Table 8.11. Age adjusted (to age 60) 1 year after 90 day survival, 2008–2011 incident cohort

Centre	*N*	1 year after 90 day survival %	Centre	*N*	1 year after 90 day survival %
D & Gall	58	87.2	Redng	347	92.5
Clwyd	75	91.0	Middlbr	357	86.4
Ulster	77	83.6	L St.G	366	94.1
Wrexm	81	87.3	Hull	370	89.2
Inverns	82	89.8	Newc	372	88.3
Newry	86	88.3	B Heart	393	91.2
Carlis	105	85.1	Liv RI	395	91.5
Bangor	109	89.5	Stevng	400	92.6
Sthend	112	89.2	Covnt	410	90.2
Antrim	115	91.6	Camb	416	89.7
West NI	126	94.6	Brightn	425	88.6
Basldn	129	88.3	Nottm	445	91.5
Colchr	131	87.1	Swanse	460	85.0
Donc	132	89.5	Exeter	492	90.2
Klmarnk	138	88.3	Prestn	499	87.5
York	141	90.3	Kent	499	89.7
Dunfn	144	90.9	Salford	517	88.4
Ipswi	154	94.1	Leeds	533	89.8
Liv Ain	158	84.6	L Kings	546	89.1
Truro	170	91.6	M RI	556	89.6
Airdrie	173	86.0	L Guys	581	92.5
Dudley	179	85.1	Oxford	590	89.5
Chelms	185	88.2	Ports	598	89.6
Wirral	205	88.9	Sheff	601	91.7
Sund	207	85.1	Bristol	607	89.1
Abrdn	209	88.6	Glasgw	608	87.0
Dundee	216	88.6	Cardff	662	87.8
Shrew	219	89.4	L Rfree	731	91.3
Bradfd	227	88.0	Carsh	760	89.8
Glouc	233	90.7	L Barts	845	92.4
Plymth	233	90.4	B QEH	882	90.9
Belfast	256	90.5	Leic	903	90.9
Dorset	280	90.4	L West	1,307	91.5
Derby	310	89.4	**England**	**21,226**	**90.1**
Norwch	310	89.9	**N Ireland**	**660**	**90.4**
Edinb	317	86.1	**Scotland**	**1,945**	**87.8**
Wolve	320	88.6	**Wales**	**1,387**	**87.2**
Stoke	343	88.7	**UK**	**25,218**	**89.8**

except age (i.e. not comorbidity, primary renal disease or ethnicity) and have not been censored at transplantation, so the effect of differing centre rates of transplantation was not taken into account. 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 some centres. In addition, another possible reason why several of the best performing centres are London based could be that they serve large ethnic minority populations which are known to have better survival on dialysis [4].

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 2011. Using the combined incident cohort from 2007–2011, it was found that 21 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 21 centres. Further adjustment was

Table 8.12. The effect of adjustment for age, PRD and comorbidity on survival, 2007–2011 incident cohort, % survival 1 year after 90 days

Centre*	Unadjusted	Age adjusted	Age, PRD adjusted	Age, PRD and comorbidity adjusted
Ulster	78.9	85.2	86.7	87.3
Swanse	80.9	86.8	88.4	90.0
Sund	84.6	86.6	87.4	88.2
Bradfd	84.8	86.9	87.6	88.9
Basldn	84.9	89.6	90.4	91.3
Middlbr	85.5	88.7	89.4	90.2
Dorset	85.9	90.7	90.8	91.2
Wolve	85.9	89.0	89.8	90.0
Derby	86.4	90.3	91.2	91.4
Wrexm	86.5	90.1	90.9	90.5
Leeds	86.6	89.4	90.2	91.0
L Kings	86.6	88.8	89.9	90.0
Hull	86.9	90.0	90.5	91.0
Bristol	87.8	90.8	91.3	91.7
Oxford	88.3	90.5	90.9	90.9
Shrew	89.2	92.3	92.8	90.8
Nottm	89.2	91.7	92.4	92.8
Truro	90.4	93.2	93.7	93.3
Kent	90.8	93.0	93.3	93.0
York	91.8	93.9	94.3	93.9
Stevng	93.8	94.8	95.4	94.9
All 21 centres	87.3	90.3	91.0	91.3

*Centre included if >85% comorbidity data available

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, Bradford, Basildon, Middlesbrough) adjustment for comorbidity had a noticeable effect on adjusted survival (table 8.12, figure 8.17) helping explain the lower survival noted in figure 8.15.

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 (2011 cohort) (figure 8.18) and in the subsequent year (figure 8.19); 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 2009 with a minimum of three years follow-up until 2012. 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 was very little difference in three year survival between diabetics and non-diabetics in the older age group. In the age group 18–44, 89% of non-diabetic patients were alive five years after start of RRT compared to 70% for diabetic patients. In the age group 45–64, 66% of non-diabetic patients were alive 5 years after start of RRT compared to 49% for diabetic patients (figure 8.20).

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.

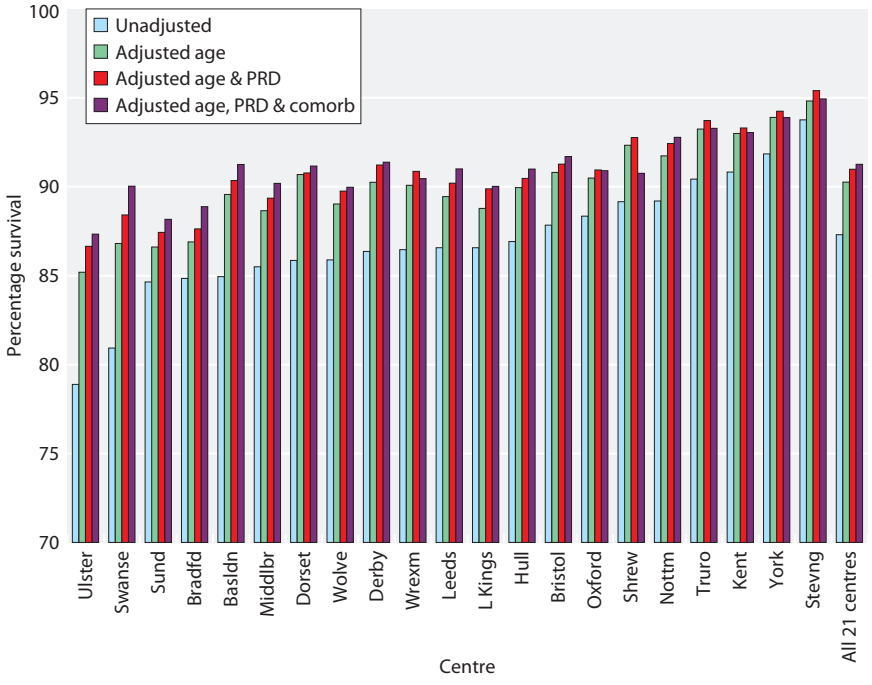

Fig. 8.17. The effect on survival after sequential adjustment for age, PRD and comorbidity, 2007–2011 incident cohort

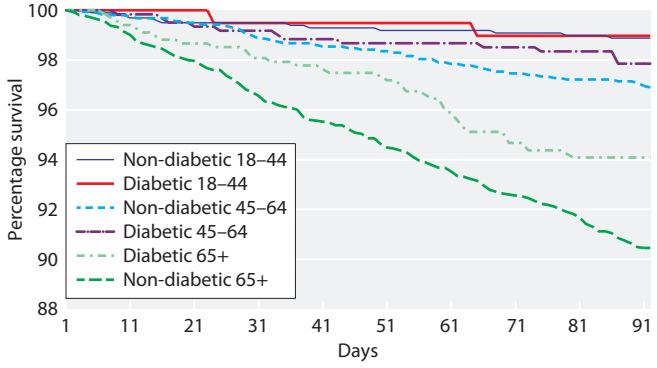

Fig. 8.18. Survival at 90 days for incident diabetic and non-diabetic patients by age group for patients starting RRT, 2011 cohort

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 the 2011 cohort in younger age groups (aged 18–54) and followed up for a maximum of one year is shown in table 8.13. For a longer term comparison, the 2002 cohort is also included (table 8.13).

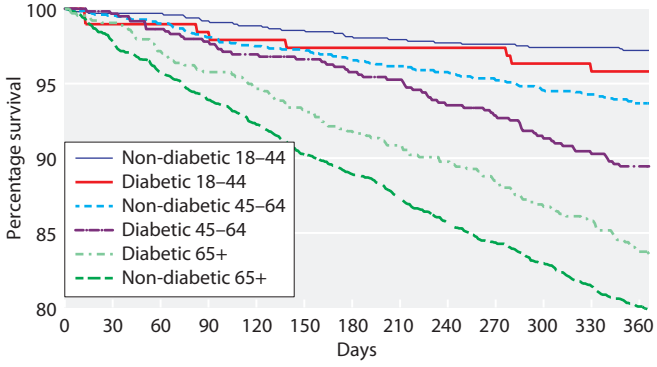

Fig. 8.19. Survival at 1 year after 90 days for incident diabetic and non-diabetic patients by age group for patients starting RRT, 2011 cohort

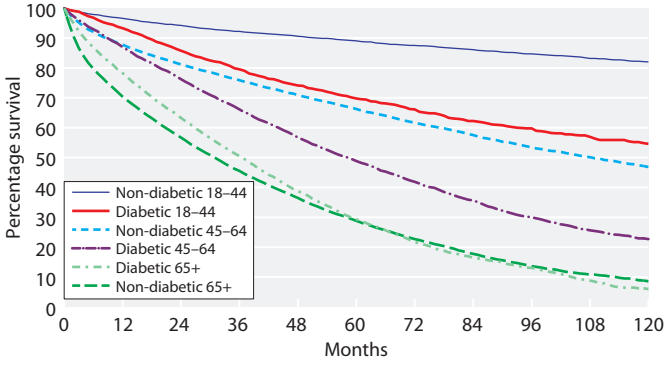

Fig. 8.20. Long term survival for incident diabetic and non-diabetic patients by age group, 2000–2009 cohort, followed up for a minimum of 3 years

Table 8.13. One-year incident dialysis patient survival (from day 0–365), patients aged 18–54, 2011 and 2002 cohort (excludes patients whose first modality was transplantation)

	2011 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 %	97.1	95.3	95.4	93.9
95% CI	*95.8–98.0*	*94.0–96.3*	*93.7–97.1*	*92.2–95.5*
HD %	96.5	94.3	93.4	91.6
95% CI	*94.7–97.7*	*92.7–95.6*	*90.7–96.0*	*89.2–94.0*
PD %	98.3	97.4	98.6	97.9
95% CI	*96.0–99.3*	*95.4–98.6*	*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

Results of prevalent patient survival analyses

Tables 8.14 and 8.16 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 remained relatively unchanged at 89.7% in the 2011 cohort compared to 89.8% in the 2010 cohort.

Table 8.15 gives the 2011 cohort one year death rate for prevalent dialysis patients in each UK country. The one-year death rate in Wales was significantly higher than in the three other UK countries: the higher median age in Wales together with socio-economic reasons probably explains this.

Figure 8.21 shows the one year survival of dialysis patients who were alive and receiving dialysis on 31st December 2011, 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 8.14 and is illustrated in figures 8.22 and 8.23; the data for those patients aged <65 years and those aged 65 years and over are separated. Figure 8.24 shows the age adjusted (adjusted to age 60) data and in figure 8.25 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 two centres (Leeds, Cardiff) was below the 95% confidence limits and for two centres (London West, Birmingham QEH) was above the 95% confidence limits. The funnel plot analysis shows an improvement in prevalent dialysis patient survival compared to the 2010 cohort when three centres were outliers below the 95% lower limits compared to two centres in this most recent analysis. The number of centres that were outliers above the 95% upper limit decreased from five in the 2010 cohort to two in this most recent analysis.

The effect of censoring at transplantation on survival was investigated in the 2011 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 8.14 allows centres in figure 8.25 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 2011 cohort by age group

The death rates for prevalent patients on dialysis by age group are shown in figure 8.26. The younger patients included in this analysis are a selected higher risk group, as the similar aged transplanted patients have been excluded. The increase in the death rate was not linear with age; with a 10 year increase in age in the younger patients, the death rate increased by about 10 deaths per 1,000 patient years compared with an increase of 160 deaths per 1,000 patient years in the older age groups. The apparent differences between the countries were not statistically significant except for Wales where the death rate was significantly higher compared to England.

One year survival of prevalent dialysis patients by UK country, 2000 to 2011 cohort

One year survival for prevalent patients seemed to be improving in most of the UK countries (figure 8.27). In Northern Ireland and Wales numbers were much

Table 8.14. One year survival of prevalent dialysis patients in each centre (adjusted to age 60), 2011 cohort

Centre	*N*	Adjusted 1 year survival	Lower 95% CI	Upper 95% CI
England				
B Heart	466	88.3	85.8	91.0
B QEH	1,037	91.7	90.1	93.2
Basldn	181	88.4	84.5	92.5
Bradfd	218	87.7	83.7	91.8
Brightn	415	89.4	86.9	92.0
Bristol	524	90.6	88.5	92.8
Camb	460	88.9	86.5	91.3
Carlis	82	88.8	83.0	95.0
Carsh	809	91.2	89.6	92.9
Chelms	148	90.7	86.8	94.7
Colchr	106	89.1	84.3	94.2
Covnt	424	91.7	89.4	94.0
Derby	327	90.1	87.3	93.0
Donc	180	91.1	87.6	94.7
Dorset	293	90.4	87.7	93.2
Dudley	202	91.4	88.1	94.9
Exeter	426	88.0	85.5	90.6
Glouc	227	90.6	87.6	93.7
Hull	399	91.1	88.8	93.6
Ipswi	157	90.4	86.5	94.5
Kent	441	89.3	86.8	91.8
L Barts	994	90.0	88.2	91.8
L Guys	634	91.1	89.1	93.1
L Kings	563	89.9	87.6	92.2
L Rfree	740	90.2	88.3	92.1
L St.G	340	88.5	85.6	91.5
L West	1,383	91.5	90.2	92.8
Leeds	569	86.7	84.3	89.2
Leic	954	90.2	88.6	91.9
Liv Ain	153	83.8	78.7	89.2
Liv RI	499	89.0	86.5	91.6
M RI	537	90.5	88.2	92.8
Middlbr	304	89.0	86.0	92.0
Newc	304	89.4	86.2	92.7
Norwch	350	91.3	88.9	93.7
Nottm	477	88.9	86.5	91.4
Oxford	498	88.1	85.6	90.6
Plymth	167	84.2	79.5	89.2
Ports	564	89.9	87.7	92.1
Prestn	555	90.6	88.4	92.8
Redng	318	90.8	88.0	93.7
Salford	469	88.9	86.2	91.6
Sheff	632	88.8	86.7	91.0
Shrew	212	89.9	86.5	93.4
Stevng	505	91.9	89.9	94.0
Sthend	135	87.8	83.3	92.5
Stoke	379	90.6	88.1	93.2
Sund	179	86.4	81.8	91.2
Truro	166	89.6	85.8	93.5
Wirral	236	90.4	87.1	93.8
Wolve	367	88.6	85.8	91.5
York	146	88.6	84.2	93.2
N Ireland				
Antrim	160	91.5	88.1	95.1
Belfast	288	89.8	86.8	92.9
Newry	125	84.1	78.7	90.0
Ulster	116	91.6	87.7	95.6
West NI	181	92.3	89.0	95.7
Scotland				
Abrdn	230	90.9	87.6	94.3
Airdrie	168	86.4	81.6	91.4
D & Gall	65	87.4	80.9	94.3
Dundee	214	92.0	89.1	95.0
Dunfn	180	88.2	84.3	92.4
Edinb	313	90.7	87.8	93.8
Glasgw	657	88.5	86.4	90.7
Inverns	98	88.0	82.9	93.4
Klmarnk	185	89.8	86.0	93.7
Wales				
Bangor	107	89.8	84.9	95.0
Cardff	574	86.3	83.9	88.8
Clwyd	95	90.8	86.0	95.9
Swanse	404	86.6	83.8	89.5
Wrexm	107	88.1	83.0	93.4
England	**21,851**	**89.9**	**89.4**	**90.3**
N Ireland	**870**	**90.1**	**88.4**	**91.9**
Scotland	**2,110**	**89.3**	**88.1**	**90.5**
Wales	**1,287**	**87.1**	**85.5**	**88.8**
UK	**26,118**	**89.7**	**89.3**	**90.1**

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 2002 to 2011 is shown in this chapter, appendix 1, table 8.28.

Table 8.15. One-year death rate per 1,000 prevalent dialysis patient years in the 2011 cohort and median age of prevalent patients by country

	England	N Ireland	Scotland	Wales
Death rate	149	155	156	207
95% CI	144–155	129–185	139–175	181–235
Median age	66.1	68.6	66.1	68.1

One year survival of prevalent dialysis patients with a primary diagnosis of diabetes, 2002 to 2011 cohort years

The age-adjusted survival for patients with diabetic renal disease in the UK has increased slightly in the 2011 cohort year to 84.9% (table 8.17).

Table 8.16. One-year survival of prevalent RRT patients in the UK (unadjusted unless indicated otherwise)

Patient group	Patients	Deaths	Survival	*95% CI*
Dialysis patients 2011 cohort				
All	26,118	3,555	85.8	*85.4–86.2*
All – adjusted to age 60	26,118	3,555	89.7	*89.3–90.1*
2 year survival – dialysis patients				
All patients alive on 31/12/2010	25,567	6,171	73.9	*73.3–74.5*
Dialysis patients 2011 cohort				
All age <65	12,293	897	92.2	*91.6–92.6*
All age 65+	13,825	2,658	80.5	*79.8–81.2*
Non-diabetic <55	6,095	246	95.6	*95.1–96.1*
Non-diabetic 55–64	3,673	315	90.9	*89.9–91.8*
Non-diabetic 65–74	4,757	650	86.0	*84.9–86.9*
Non-diabetic 75+	6,265	1,454	76.7	*75.6–77.7*
Non-diabetic <65	9,768	561	93.8	*93.3–94.3*
Diabetic <65	2,525	336	85.9	*84.4–87.2*
Non-Diabetic 65+	11,022	2,104	80.6	*79.9–81.4*
Diabetic 65+	2,803	554	80.0	*78.5–81.4*

Cohorts of patients alive on 31/12/2011 unless indicated otherwise

Death rate on RRT compared with the UK general population

The death rate compared to the general population is shown in table 8.18. Figure 8.28 shows that the relative risk of death on RRT decreased with age from 16.6 times that of the general population at age 35–39 years to 2.7 times the general population at age 85 and over. Figure 8.28 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 was unchanged at 6.1, in the 2011 cohort as it was in the 2010 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 2011 cohort).

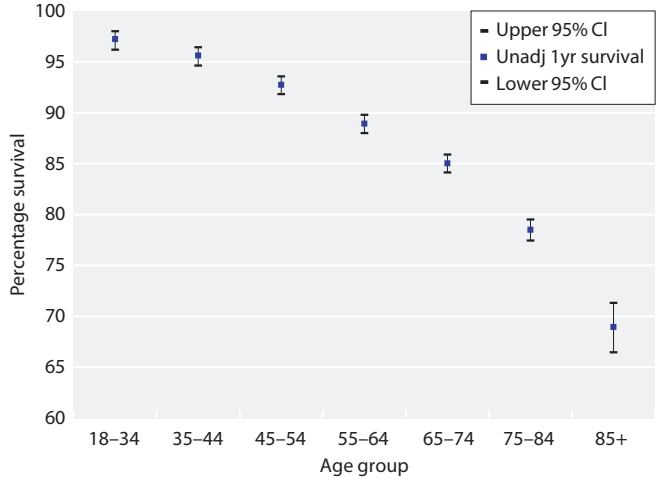

Fig. 8.21. One year survival of prevalent dialysis patients by age group, 2011 cohort

Results of analyses on causes of death

Data completeness

Having increased significantly in recent years, data completeness for cause of death data in the UK showed only a marginal rise of 0.2% (table 8.19) with both Northern Ireland and Scotland recording more than 85% of cause of death data. Northern Ireland centres overall had the highest rate of data return for cause of death (92.3%) and their cause of death completeness improved by about 3% compared with the previous year. Patterns of cause of death must be cautiously interpreted, as there are significant differences between the cause of death for centres with a high proportion of non-returns when compared to centres with good returns (⩾70%). 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

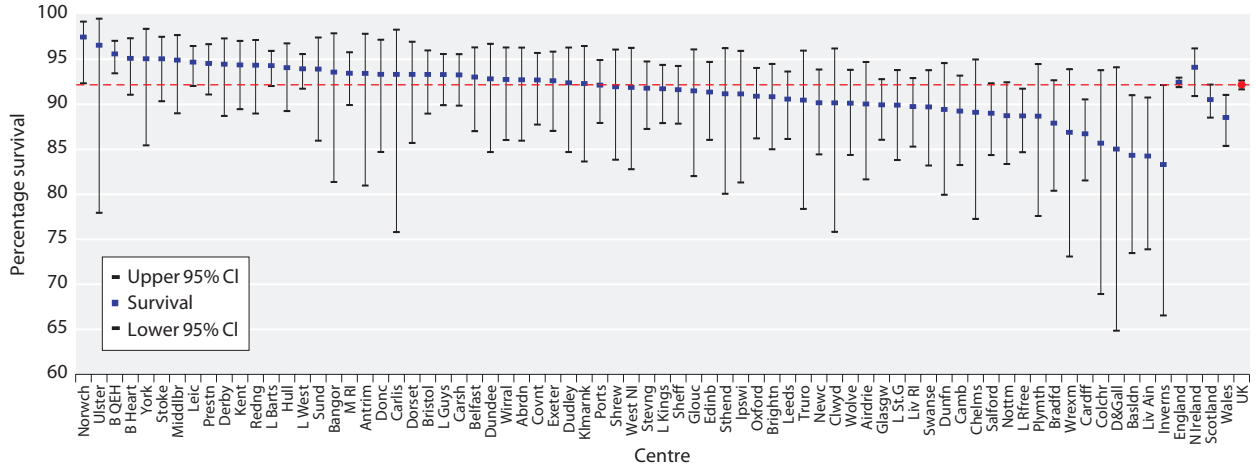

Fig. 8.22. One year survival of prevalent dialysis patients aged under 65 by centre, 2011 cohort

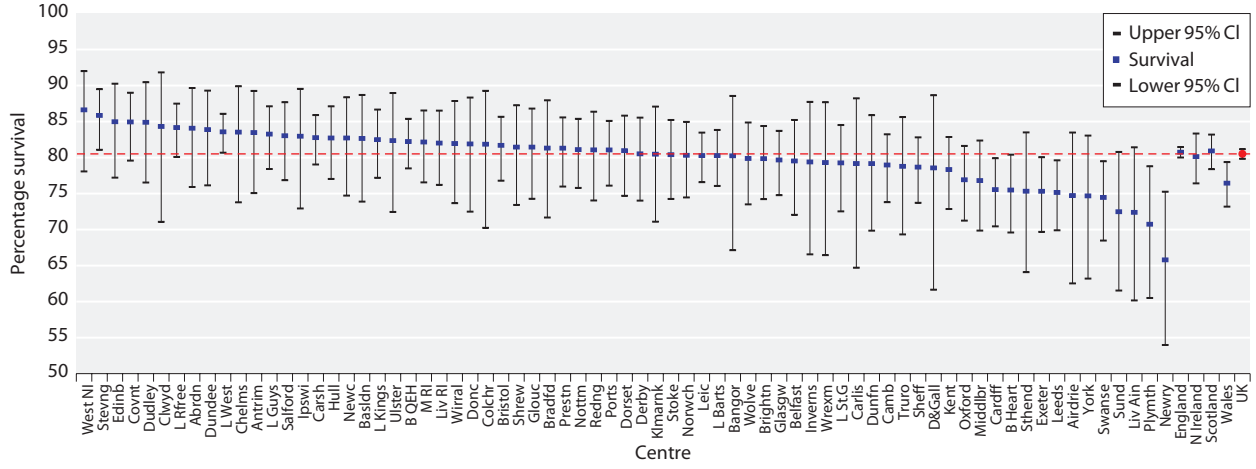

Fig. 8.23. One year survival of prevalent dialysis patients aged 65 years and over by centre, 2011 cohort

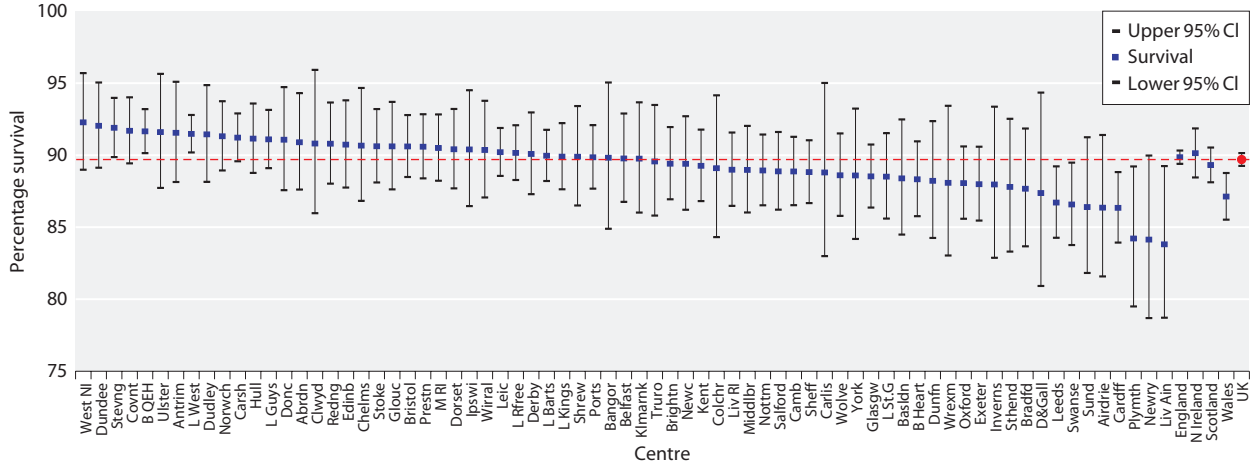

Fig. 8.24. One year survival of prevalent dialysis patients by centre adjusted to age 60, 2011 cohort

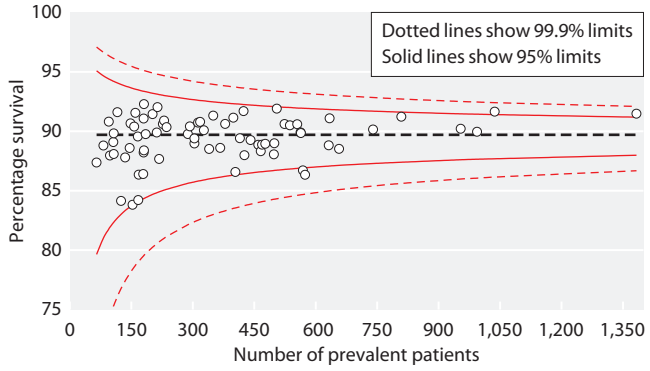

Fig. 8.25. One year survival funnel plot of prevalent dialysis patients by centre adjusted to age 60, 2011 cohort

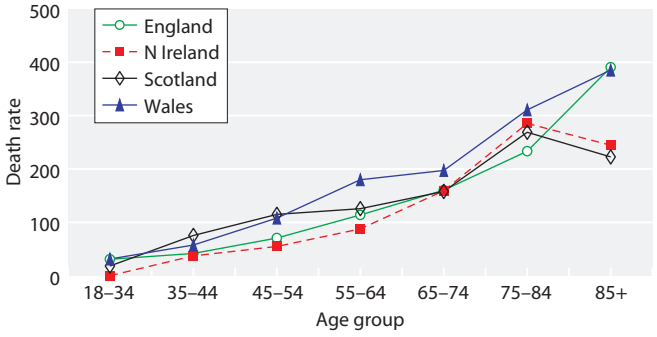

Fig. 8.26. One year death rate per 1,000 patient years by UK country and age group for prevalent dialysis patients, 2011 cohort

cause of death with some centres returning no data and other centres having 100% completeness (table 8.19).

Causes of death in incident RRT patients

Causes of death within the first 90 days

See table 8.20.

Cause of death within one year after 90 days

Treatment withdrawal as a cause of death (tables 8.20, 8.21) 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. Cardiac disease remained the leading cause of death both in the first 90 days and one year after 90 days.

Cause of death in prevalent RRT patients in the 2011 cohort

Table 8.22, figures 8.29 and 8.30 show the cause of death for both prevalent dialysis and transplant patients in the 2011 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 8.23 shows that malignancy and infection were slightly more common in younger (<65 years) prevalent transplanted patients as the cause of death than in older (⩾65 years old) transplanted patients.

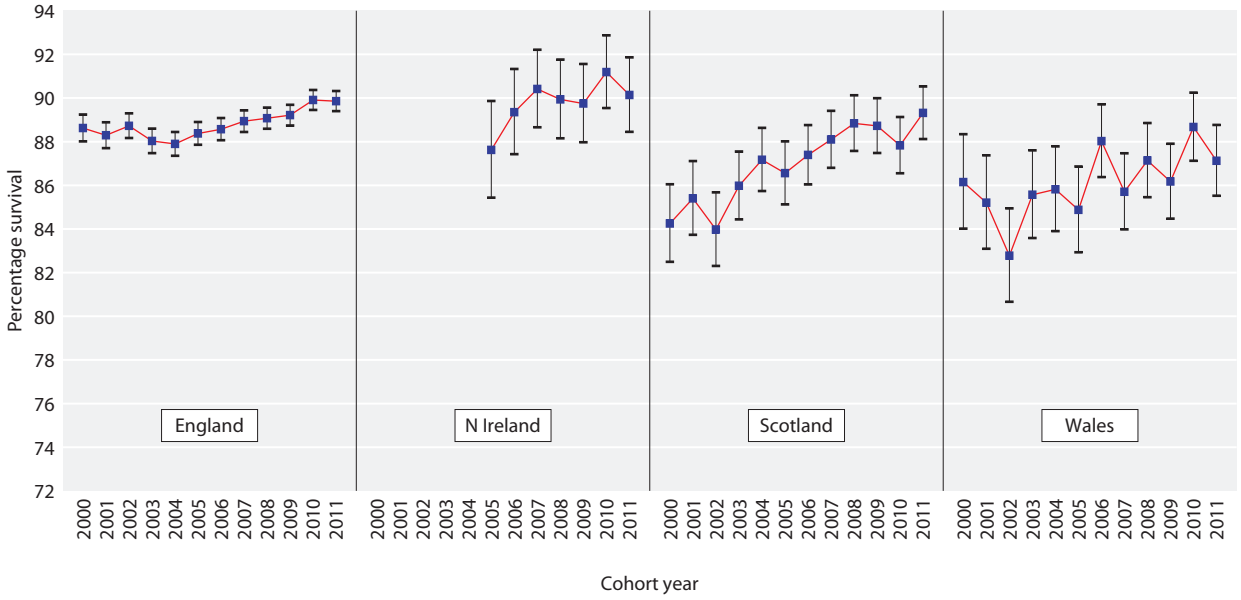

Fig. 8.27. Serial 1 year survival for prevalent dialysis patients by UK country, 2000 to 2011 cohort years, adjusted to age 60

Table 8.17. Serial 1 year survival of prevalent dialysis patients with a primary diagnosis of diabetes, 2002–2011 cohort years

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1 year survival %	81.6	81.7	82.8	82.4	84.7	83.5	83.9	83.3	84.8	84.9

Table 8.18. Death rate by age group for all prevalent RRT patients, 2011 cohort, compared with the general population and with previous analyses in the 1998–2001 cohort

Age group	UK population mid 2012 (thousands)	UK deaths in 2012	Death rate per 1,000 population	Expected number of deaths in UKRR population	UKRR deaths in 2012	UKRR death rate per 1,000 prevalent RRT patients	Relative risk of death in 2012	Relative risk of death 1998–2001 cohort
20–24	4,332	1,550	0.4	0	10	10	28.8	41.1
25–29	4,318	1,982	0.5	1	18	12	25.1	41.8
30–34	4,240	2,661	0.6	1	18	9	13.7	31.2
35–39	4,036	3,690	0.9	3	43	15	16.6	26.0
40–44	4,567	6,315	1.4	6	89	21	15.5	22.6
45–49	4,686	9,690	2.1	11	141	27	13.0	19.0
50–54	4,236	13,384	3.2	17	226	41	13.0	12.8
55–59	3,684	18,736	5.1	27	284	53	10.4	10.1
60–64	3,624	29,012	8.0	44	437	79	9.8	10.4
65–69	3,345	41,101	12.3	64	553	107	8.7	7.9
70–74	2,476	51,932	21.0	96	682	149	7.1	7.2
75–79	2,047	71,835	35.1	132	792	211	6.0	5.3
80–84	1,534	96,291	62.8	149	652	275	4.4	4.0
85+	1,439	215,351	149.7	166	452	408	2.7	3.0
Total	**48,564**	**563,530**	**11.6**	**717**	**4,397**	**87**	**6.1**	**7.7**

Table 8.24 shows the cause of death for prevalent dialysis patients in the 2011 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) dialysis patients. Figure 8.31 shows cause of death for prevalent patients in the 2000 to 2011 cohort. Over time, cardiac disease as cause of death has decreased markedly and there has been a gradual decline in cerebrovascular disease as a cause of death. The proportion of patients coded with 'other' cause of death has increased, as has treatment withdrawal (19% in 2011 cohort). Infection as cause of death remained at a similar level to the 2000 cohort (figure 8.31).

Median life expectancy on RRT

The statistical methodology for this analysis is described in the methodology section at the start of this

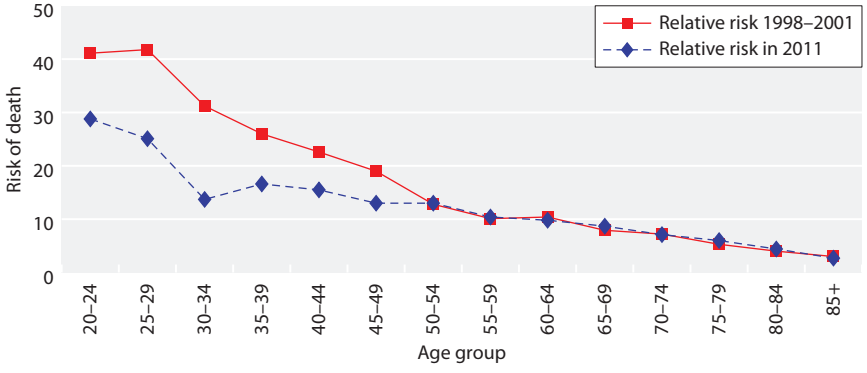

Fig. 8.28. Relative risk of death in all prevalent RRT patients in the 2011 cohort compared with the UK general population

Table 8.19. Percentage completeness of EDTA cause of death for prevalent patients by centre and year

Centre	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
England										
B Heart	76.3	76.4	68.1	85.7	84.5	93.9	100.0	96.6	96.1	96.6
B QEH		0.0	60.2	4.8	5.1	3.5	0.7	1.2	2.0	2.1
Basldn	92.3	84.0	45.0	22.7	45.5	47.6	80.0	68.8	84.6	88.9
Bradfd	88.1	83.3	87.8	90.0	88.2	92.5	79.5	97.0	97.6	97.7
Brightn		0.0	0.0	0.0	12.0	0.0	1.1	2.4	1.1	1.1
Bristol	85.0	89.9	76.7	60.2	58.7	65.8	70.0	89.4	95.2	82.2
Camb	0.0	1.6	1.5	1.3	0.0	0.0	5.0	10.3	62.0	94.1
Carlis	60.0	77.3	87.0	91.3	73.9	47.6	80.6	100.0	92.9	94.7
Carsh	0.0	0.0	0.0	0.0	0.8	0.8	0.8	6.7	25.0	40.8
Chelms		35.0	69.7	64.0	76.5	71.4	86.7	86.7	87.0	100.0
Colchr						0.0	50.0	77.3	82.6	100.0
Covnt	3.0	1.7	0.0	0.0	0.0	1.2	0.0	0.0	1.4	33.3
Derby	11.1	69.0	77.6	75.6	83.3	97.8	73.5	91.2	88.5	85.2
Donc						100.0	94.3	90.9	91.7	92.6
Dorset	0.0	30.6	61.5	66.7	87.2	88.9	85.2	95.7	94.9	88.9
Dudley	3.4	31.7	14.3	5.9	6.3	5.3	0.0	94.3	88.1	90.9
Exeter	35.1	40.8	34.7	17.5	4.7	2.1	3.0	89.5	84.6	95.1
Glouc	63.0	43.2	51.6	44.4	55.6	60.4	65.8	97.2	93.6	91.5
Hull	38.9	83.6	81.5	76.0	76.5	51.6	17.3	90.8	93.5	96.9
Ipswi	47.1	30.4	10.3	21.9	35.5	13.6	18.8	70.0	77.8	77.4
Kent						56.8	89.2	89.0	96.2	94.9
L Barts		86.5	83.3	87.4	74.6	77.0	70.1	74.6	82.6	79.9
L Guys	1.2	0.0	0.0	0.0	3.5	0.0	0.0	69.5	84.2	58.8
L Kings	31.5	66.7	85.7	90.6	75.6	88.2	67.1	96.1	97.6	100.0
L Rfree				0.0	0.0	0.0	0.9	1.7	0.0	7.0
L St.G					16.7	17.9	21.4	77.6	47.9	42.4
L West	79.1	67.5	79.8	31.3	18.9	5.8	2.2	2.2	95.0	96.8
Leeds	58.6	73.8	67.2	66.7	29.6	27.9	33.6	99.0	99.1	97.7
Leic	77.0	88.2	71.5	77.0	65.5	69.5	69.3	74.5	60.9	94.1
Liv Ain	100.0	66.7	50.0	81.3	73.3	66.7	100.0	85.0	95.7	0.0
Liv RI	74.1	69.9	39.8	65.5	76.8	75.6	79.2	71.6	76.4	2.8
M RI					4.0	0.9	1.0	4.7	3.1	9.9
Middlbr	66.7	42.0	77.6	63.5	54.8	23.4	46.7	88.2	97.5	94.9
Newc	29.9	27.1	19.4	29.8	48.7	35.7	40.8	14.0	45.0	16.9
Norwch		30.8	21.0	21.4	18.2	21.2	44.4	75.8	70.3	76.1
Nottm	90.6	94.4	97.0	87.5	87.0	98.8	97.1	98.8	100.0	99.0
Oxford	8.7	1.9	2.8	0.0	0.0	1.0	0.0	84.6	97.4	92.7
Plymth	52.8	46.9	43.2	39.6	56.7	70.7	47.5	78.7	43.6	41.2
Ports	32.7	55.1	21.5	7.3	17.5	5.9	43.6	67.0	23.3	19.8
Prestn	73.8	75.9	50.0	55.4	47.8	38.1	17.9	95.7	98.9	97.6
Redng	86.0	77.1	81.5	77.1	97.8	89.6	83.0	100.0	96.7	91.2
Salford	1.7	1.3	0.0	0.0	1.3	0.0	1.3	0.0	0.0	0.0
Sheff	98.8	19.6	3.1	5.5	8.1	0.9	1.9	3.0	0.8	0.8
Shrew		25.0	66.7	53.1	85.7	62.5	20.5	46.0	0.0	7.9
Stevng	71.0	66.2	75.0	57.5	52.2	60.3	70.0	86.3	86.8	67.7
Sthend	66.7	25.0	41.2	9.4	3.2	57.7	75.0	92.3	90.0	100.0
Stoke					16.1	21.0	28.6	53.9	57.9	89.6
Sund	53.1	54.8	56.3	60.0	60.5	50.0	78.9	93.5	95.1	97.4
Truro	80.6	57.1	2.3	6.9	0.0	18.4	26.3	93.3	94.9	78.8
Wirral	85.7	64.5	31.3	88.2	68.4	87.5	24.2	62.2	0.0	2.7
Wolve	98.5	96.6	92.2	48.5	52.3	65.8	76.4	96.9	94.1	90.9
York	82.5	67.6	41.4	83.3	38.5	62.1	64.3	96.6	97.3	100.0
N Ireland										
Antrim			4.3	10.0	8.8	3.8	26.9	100.0	100.0	100.0
Belfast			17.2	33.8	38.3	20.0	26.2	81.4	80.0	79.7
Newry			0.0	42.9	16.7	15.4	85.7	95.2	100.0	96.7
Ulster			100.0	85.7	92.9	90.0	75.0	95.0	95.2	100.0
West NI			46.2	57.7	38.9	25.0	45.8	100.0	87.0	100.0

Table 8.19. Continued

Centre	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Scotland										
Abrdn	47.7	31.7	2.8	0.0	0.0	82.9	97.6	92.1	97.6	65.7
Airdrie	26.7	10.3	40.0	26.3	26.8	79.3	100.0	96.8	97.0	93.9
D & Gall	69.2	76.9	80.0	76.9	100.0	93.3	94.1	100.0	100.0	81.3
Dundee	92.1	92.1	86.1	2.8	0.0	50.0	90.6	85.7	59.5	62.2
Dunfn	80.0	66.7	81.3	50.0	53.8	61.9	89.3	78.6	90.0	87.5
Edinb	60.4	44.2	50.9	29.3	45.0	85.9	96.2	98.3	95.1	100.0
Glasgw	49.6	41.9	40.2	53.2	55.3	75.4	88.0	66.9	98.5	96.0
Inverns	0.0	0.0	0.0	0.0	0.0	65.2	90.0	91.7	100.0	95.7
Klmarnk	4.0	10.0	0.0	11.1	9.4	95.8	93.3	93.9	94.4	96.8
Wales	34.1	30.7	28.6	30.0	43.4	36.4	47.2	53.0	48.6	50.3
Bangor	39.1	42.1	66.7	35.0	86.2	52.4	76.9	73.9	90.0	100.0
Cardff	3.5	2.6	3.5	2.2	4.1	0.0	1.6	6.0	7.9	0.6
Clwyd	22.2	0.0	0.0	11.1	45.5	84.2	83.3	100.0	85.7	89.5
Swanse	92.0	89.2	85.7	92.4	97.3	94.8	89.8	98.0	87.5	97.1
Wrexm	10.7	3.7	3.7	0.0	22.7	69.2	100.0	95.7	92.6	100.0
England	**52.3**	**51.8**	**46.8**	**40.8**	**36.8**	**36.0**	**37.8**	**58.3**	**63.4**	**64.3**
N Ireland			**20.4**	**38.7**	**33.6**	**22.4**	**42.1**	**91.5**	**89.0**	**92.3**
Scotland	**50.5**	**42.5**	**40.3**	**32.3**	**33.5**	**75.2**	**92.5**	**83.8**	**93.1**	**89.1**
Wales	**34.1**	**30.7**	**28.6**	**30.0**	**43.4**	**36.4**	**47.2**	**53.0**	**48.6**	**50.3**
UK	**50.5**	**49.2**	**44.2**	**39.2**	**36.8**	**39.3**	**43.4**	**61.2**	**66.1**	**66.3**

Blank cells denote data not available for that year

Table 8.20. Cause of death in the first 90 days for incident patients by age group, 2000–2011 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	644	27	152	29	492	26
Cerebrovascular disease	120	5	25	5	95	5
Infection	416	17	76	14	340	18
Malignancy	216	9	65	12	151	8
Treatment withdrawal	367	15	53	10	314	17
Other	554	23	138	26	416	22
Uncertain	95	4	16	3	79	4
Total	**2,412**		**525**		**1,887**	
No cause of death data	2,537	51	555	51	1,982	51

Table 8.21. Cause of death in 1 year after 90 days for incident patients by age group, 2000–2011 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	1,000	23	316	26	684	22
Cerebrovascular disease	228	5	60	5	168	5
Infection	804	18	226	18	578	18
Malignancy	460	10	155	13	305	10
Treatment withdrawal	732	17	104	8	628	20
Other	934	21	291	24	643	20
Uncertain	232	5	73	6	159	5
Total	**4,390**		**1,225**		**3,165**	
No cause of death data	4,430	50.2	1,255	50.6	3,175	50.1

Table 8.22. Cause of death in prevalent RRT patients by modality, 2011 cohort

	All modalities		Dialysis		Transplant	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	647	22	575	22	72	18
Cerebrovascular disease	135	5	118	5	17	4
Infection	532	18	437	17	95	23
Malignancy	292	10	208	8	84	20
Treatment withdrawal	511	17	498	19	13	3
Other	624	21	528	21	96	23
Uncertain	245	8	212	8	33	8
Total	**2,986**		**2,576**		**410**	
No cause of death data	1,414	32	1,160	31	254	38

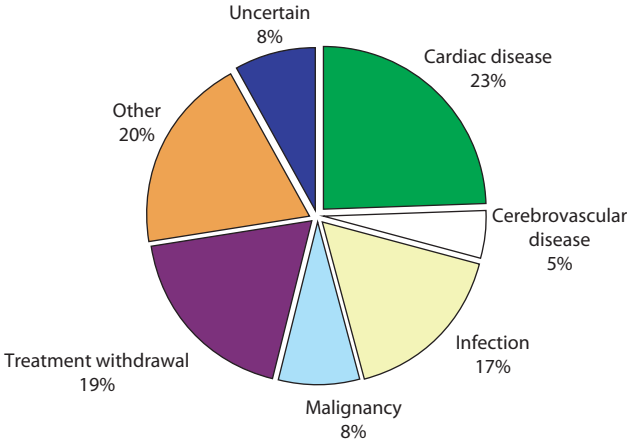

Fig. 8.29. Percentage contribution to cause of death for prevalent dialysis patients, 2011 cohort

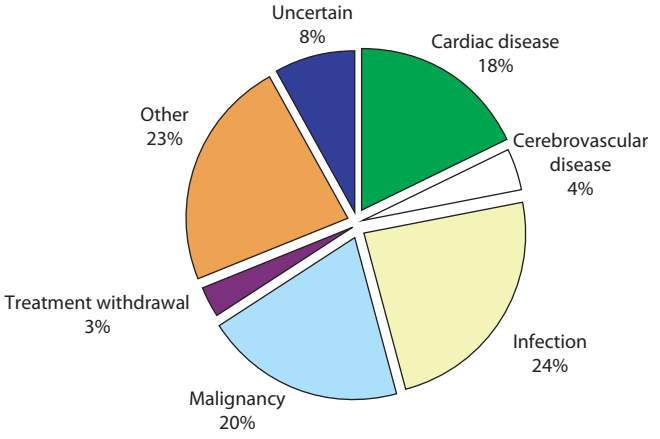

Fig. 8.30. Percentage contribution to cause of death for prevalent transplant patients, 2011 cohort

chapter. Figure 8.32 shows median life expectancy on RRT after 90 days by age group. All incident patients starting RRT from 2000 to 2009 have been included in this analysis and patients were followed up for a minimum of three years. 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 8.33) were

Table 8.23. Cause of death in prevalent transplanted patients by age group, 2011 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	72	18	36	18	36	17
Cerebrovascular disease	17	4	8	4	9	4
Infection	95	23	48	24	47	22
Malignancy	84	20	42	21	42	20
Treatment withdrawal	13	3	5	3	8	4
Other	96	23	43	22	53	25
Uncertain	33	8	16	8	17	8
Total	**410**		**198**		**212**	
No cause of death data	254	38	126	39	128	38

Table 8.24. Cause of death in prevalent dialysis patients by age group, 2011 cohort

	All age groups		<65 years		⩾65 years	
Cause of death	*N*	%	*N*	%	*N*	%
Cardiac disease	575	22	172	28	403	21
Cerebrovascular disease	118	5	32	5	86	4
Infection	437	17	105	17	332	17
Malignancy	208	8	45	7	163	8
Treatment withdrawal	498	19	59	10	439	22
Other	528	21	143	23	385	20
Uncertain	212	8	58	9	154	8
Total	**2,576**		**614**		**1,962**	
No cause of death data	1,160	31	331	35	829	30

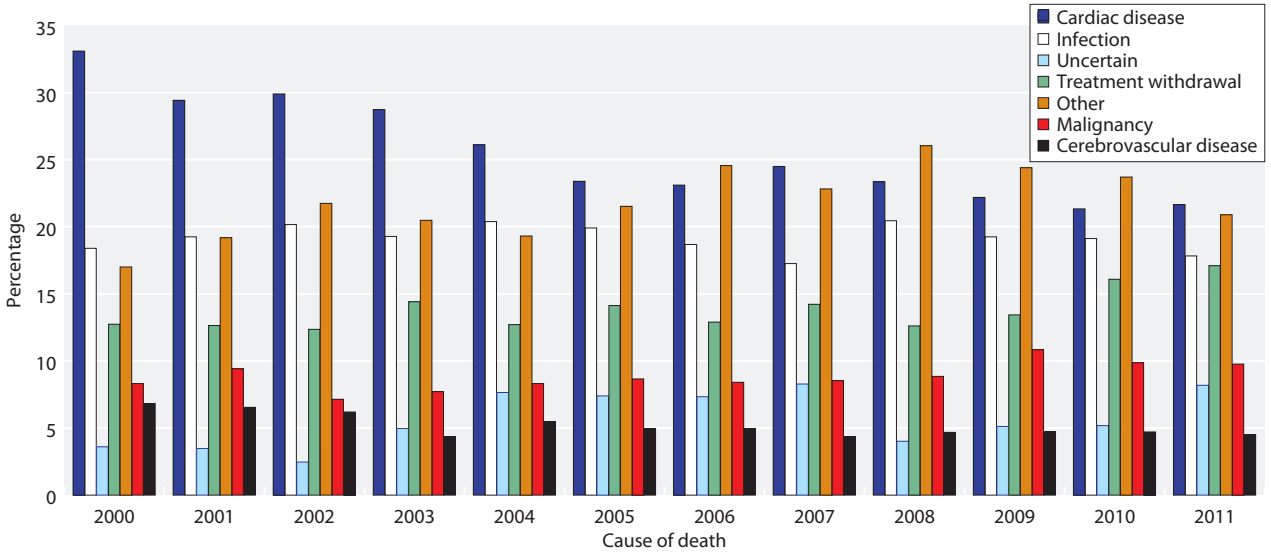

Fig. 8.31. Cause of death in prevalent RRT patients by cohort year

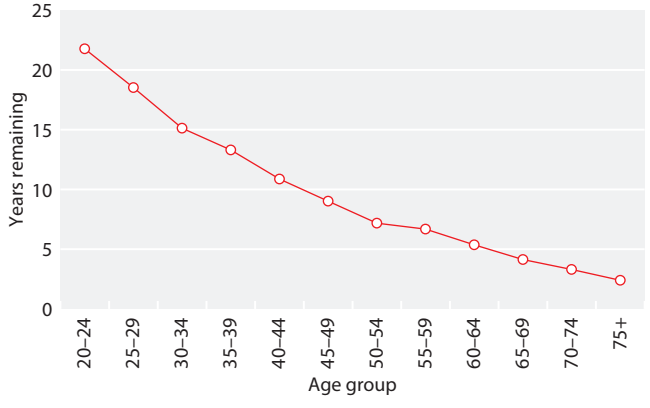

Fig. 8.32. Median life expectancy on RRT after 90 days, by age group, incident patients starting RRT from 2000–2009

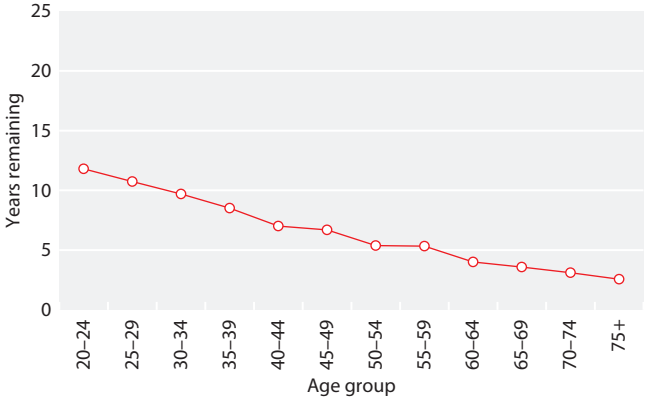

Fig. 8.33. Median life expectancy on RRT after 90 days by age group, incident diabetic patients starting RRT from 2000–2009

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 8.25. One-year after 90–day incident survival percentage by centre, 2011 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	92.0	94.4	*90.7–98.2*
B QEH	91.2	93.3	*90.1–96.5*
Basldn	85.7	91.0	*83.9–98.7*
Bradfd	87.0	88.9	*81.6–96.9*
Brightn	86.7	91.0	*86.4–95.8*
Bristol	92.0	94.5	*91.4–97.7*
Camb	86.4	91.6	*87.6–95.8*
Carlis	88.5	91.5	*82.9–100.0*
Carsh	90.8	94.3	*91.7–97.0*
Chelms	75.6	80.8	*71.4–91.6*
Colchr	72.5	84.1	*75.5–93.6*
Covnt	88.4	90.4	*85.1–95.9*
Derby	87.8	91.3	*86.1–96.9*
Donc	83.8	88.9	*81.1–97.5*
Dorset	82.4	88.2	*82.4–94.4*
Dudley	90.0	93.7	*88.1–99.7*
Exeter	82.9	88.5	*83.7–93.5*
Glouc	80.6	89.6	*84.2–95.4*
Hull	89.7	93.3	*89.4–97.4*
Ipswi	94.6	95.5	*89.7–100.0*
Kent	84.3	88.5	*83.6–93.7*
L Barts	92.9	93.7	*90.7–96.9*
L Guys	93.2	94.7	*91.2–98.3*
L Kings	88.0	90.9	*86.9–95.1*
L Rfree	89.1	91.0	*87.4–94.6*
L St.G	95.9	96.8	*93.3–100.0*
L West	88.5	90.7	*87.9–93.5*
Leeds	85.0	88.2	*83.6–93.0*
Leic	88.1	91.3	*88.3–94.3*
Liv Ain	81.8	86.8	*79.5–94.7*
Liv RI	87.8	89.0	*83.3–95.0*
M RI	92.1	93.3	*89.6–97.2*
Middlbr	84.6	88.9	*83.4–94.8*
Newc	84.0	86.0	*79.2–93.3*
Norwch	84.0	89.4	*83.9–95.3*
Nottm	87.9	92.8	*89.1–96.7*
Oxford	85.9	88.8	*84.4–93.3*
Plymth	88.2	91.3	*85.0–98.1*
Ports	87.7	91.2	*87.6–95.0*
Prestn	89.9	91.8	*87.8–96.0*
Redng	90.4	93.0	*88.5–97.8*
Salford	90.1	91.7	*87.4–96.1*
Sheff	83.8	87.6	*82.8–92.6*
Shrew	86.7	91.9	*86.6–97.4*
Stevng	88.5	91.1	*86.6–95.8*
Sthend	89.3	94.3	*88.3–100.0*
Stoke	88.9	93.1	*88.6–97.8*
Sund	88.2	88.7	*79.9–98.4*
Truro	89.9	93.0	*86.7–99.8*
Wirral	83.5	87.9	*81.2–95.2*
Wolve	83.7	89.3	*84.2–94.8*
York	92.5	93.6	*87.0–100.0*
N Ireland			
Antrim	78.3	86.3	*76.1–97.9*
Belfast	89.9	92.8	*87.9–98.1*
Newry	83.3	88.1	*79.1–98.2*
Ulster	79.4	86.3	*77.5–96.1*
West NI	94.3	95.9	*90.7–100.0*
Scotland			
Abrdn	89.8	92.8	*87.0–99.0*
Airdrie	81.3	84.1	*74.1–95.4*
Dundee	83.8	90.3	*84.5–96.5*
Dunfn	90.2	92.4	*85.6–99.7*
Edinb	89.3	90.2	*83.6–97.3*
Glasgw	85.1	88.6	*84.3–93.1*
Klmarnk	88.0	91.1	*82.1–100.0*
Wales			
Bangor	92.1	94.3	*87.1–100.0*
Cardff	83.3	88.1	*84.2–92.2*
Swanse	79.2	85.4	*80.0–91.2*
Wrexm	83.3	88.8	*79.3–99.6*
England	**88.0**	**91.1**	***90.3–92.0***
N Ireland	**86.4**	**90.5**	***87.1–94.1***
Scotland	**86.8**	**90.1**	***87.7–92.6***
Wales	**82.6**	**87.7**	***84.8–90.7***
UK	**87.5**	**90.9**	***90.0–91.7***

Excluded: centres with less than 20 patients (Clwyd, Dumfries & Galloway, Inverness)

Table 8.26. Ninety day incident survival percentage by centre, 2011 cohort, unadjusted and adjusted to age 60

Centre	Unadjusted 90 day survival	Adjusted 90 day survival	*Adjusted 90 day 95% CI*
England			
B Heart	97.1	98.2	*96.1–100.0*
B QEH	95.9	97.0	*95.0–99.1*
Basldn	97.2	98.4	*95.4–100.0*
Bradfd	93.2	94.5	*89.4–99.9*
Brightn	89.2	93.4	*89.8–97.1*
Bristol	96.5	97.8	*95.8–99.7*
Camb	96.0	97.7	*95.6–99.7*
Carlis	96.4	97.5	*92.8–100.0*
Carsh	93.6	96.3	*94.4–98.4*
Chelms	90.0	93.6	*88.3–99.1*
Colchr	97.4	98.7	*96.2–100.0*
Covnt	88.9	91.9	*87.5–96.4*
Derby	89.2	92.8	*88.3–97.5*
Donc	92.5	95.5	*90.8–100.0*
Dorset	93.7	96.2	*93.0–99.5*
Dudley	93.0	96.2	*92.0–100.0*
Exeter	94.9	96.9	*94.5–99.4*
Glouc	95.4	97.8	*95.4–100.0*
Hull	92.4	95.4	*92.3–98.6*
Kent	94.3	96.1	*93.3–99.0*
L Barts	97.7	98.1	*96.5–99.8*
L Guys	97.6	98.2	*96.3–100.0*
L Kings	97.3	98.1	*96.2–100.0*
L Rfree	96.2	97.2	*95.3–99.1*
L St.G	96.1	97.0	*93.8–100.0*
L West	96.6	97.5	*96.1–98.9*
Leeds	93.6	95.4	*92.6–98.2*
Leic	94.6	96.3	*94.5–98.2*
Liv Ain	87.5	92.3	*87.3–97.6*
Liv RI	91.7	93.3	*89.2–97.6*
M RI	94.6	95.8	*93.0–98.7*
Middlbr	93.4	95.8	*92.5–99.1*
Newc	90.2	92.2	*87.4–97.2*
Norwch	89.4	93.6	*89.6–97.8*
Nottm	90.2	94.5	*91.4–97.6*
Oxford	94.6	96.1	*93.6–98.6*
Plymth	96.2	97.4	*94.0–100.0*
Ports	95.4	97.0	*94.9–99.1*
Prestn	97.9	98.4	*96.7–100.0*
Redng	91.3	94.2	*90.4–98.2*
Salford	94.3	95.5	*92.6–98.6*
Sheff	93.8	95.8	*93.1–98.5*
Shrew	90.9	95.0	*91.1–99.0*
Stevng	99.1	99.4	*98.1–100.0*
Sthend	96.6	98.3	*95.0–100.0*
Stoke	92.3	95.5	*92.1–99.1*
Sund	95.7	96.0	*90.9–100.0*
Truro	91.1	94.3	*89.2–99.8*
Wirral	91.0	94.0	*89.4–98.8*
Wolve	93.5	96.1	*93.2–99.2*
York	95.2	96.3	*91.4–100.0*
N Ireland			
Antrim	92.0	95.4	*89.6–100.0*
Belfast	98.6	99.1	*97.4–100.0*
Newry	96.8	98.0	*94.4–100.0*
Ulster	94.4	96.6	*92.1–100.0*
West NI	97.2	98.2	*94.8–100.0*
Scotland			
Abrdn	94.2	96.2	*92.0–100.0*
Airdrie	97.6	98.0	*94.4–100.0*
Dundee	93.3	96.3	*92.8–99.9*
Dunfn	89.1	91.9	*85.5–98.9*
Edinb	95.7	96.4	*92.4–100.0*
Glasgw	93.4	95.3	*92.7–98.1*
Klmarnk	78.1	85.5	*76.3–95.9*
Wales			
Cardff	96.9	98.0	*96.4–99.6*
Swanse	94.2	96.6	*94.1–99.1*
Wrexm	92.3	95.1	*88.7–100.0*
England	**94.4**	**96.3**	***95.7–96.8***
N Ireland	**96.5**	**97.8**	***96.2–99.4***
Scotland	**93.1**	**95.3**	***93.7–96.9***
Wales	**95.8**	**97.4**	***96.1–98.7***
UK	**94.5**	**96.3**	***95.8–96.8***

Excluded: centres with less than 20 patients (Clwyd, Dumfries & Galloway, Inverness) and centres with no deaths recorded in the first 90 days of RRT (Ipswich and Bangor)

Table 8.27. One year after 90-day incident survival by centre for incident cohort years 2003–2011 adjusted to age 60

Centre	2003	2004	2005	2006	2007	2008	2009	2010	2011
England									
B Heart	88.2	86.4	83.6	88.5	93.5	93.6	84.3	92.0	94.4
B QEH		88.0	90.4	86.9	92.9	89.8	92.2	88.3	93.3
Basldn	92.6	92.3	92.8	90.9	89.9	89.3	88.5	84.8	91.0
Bradfd	88.3	80.9	86.1	80.8	84.2	84.4	92.4	87.6	88.9
Brightn		90.6	84.3	87.2	94.2	89.3	84.7	88.3	91.0
Bristol	85.7	88.0	82.8	92.6	91.4	84.0	88.7	88.9	94.5
Camb	89.4	86.9	89.8	90.9	93.4	91.2	87.7	89.5	91.6
Carlis	82.5	86.9	79.5	89.9	96.5	87.8	71.5	86.3	91.5
Carsh	89.4	85.8	90.2	88.7	87.2	86.6	88.0	89.8	94.3
Chelms		82.2	82.8	94.3	86.6	90.8	93.4	85.6	80.8
Colchr						86.6	84.6	96.8	84.1
Covnt	81.8	87.6	82.5	88.6	90.4	86.9	94.2	89.0	90.4
Derby	86.5	83.7	87.9	93.1	96.6	90.5	87.6	87.4	91.3
Donc						89.8	84.6	91.5	88.9
Dorset	85.9	91.3	82.5	86.3	90.4	93.5	92.7	87.4	88.2
Dudley	90.5	81.3	97.3	92.7	85.6	70.3	84.6	87.8	93.7
Exeter	82.3	88.5	86.1	88.9	86.4	87.0	88.5	95.3	88.5
Glouc	82.9	83.4	95.1	89.7	87.0	94.3	90.1	92.3	89.6
Hull	89.3	88.8	85.7	93.6	89.8	85.4	88.9	88.0	93.3
Ipswi	93.2	97.4	84.4	93.9	96.0	95.8	91.3	93.2	95.5
Kent					91.8	90.0	89.3	90.6	88.5
L Barts		87.1	91.0	94.0	86.5	93.1	90.1	91.9	93.7
L Guys	94.8	91.6	90.4	92.9	92.0	90.5	95.0	91.4	94.7
L Kings	88.0	86.9	91.8	86.5	87.9	89.7	86.3	89.7	90.9
L Rfree			93.3	89.8	94.4	95.2	88.6	90.3	91.0
L St.G					92.1	94.0	92.2	93.7	96.8
L West	95.9	92.4	94.4	92.8	92.9	94.5	93.8	88.8	90.7
Leeds	87.1	89.6	89.9	85.7	87.4	88.7	89.9	92.7	88.2
Leic	89.0	87.5	84.6	87.9	89.8	90.5	90.2	91.6	91.3
Liv Ain				87.0	82.9	78.6	82.5	89.1	86.8
Liv RI	90.2	80.9	90.1	86.7	86.2	94.1	94.4	88.5	89.0
M RI					90.2	87.8	87.6	89.5	93.3
Middlbr	82.4	85.3	83.3	91.5	87.8	82.3	87.9	88.1	88.9
Newc	87.2	85.4	82.1	86.3	85.8	91.5	84.5	88.8	86.0
Norwch		84.0	90.7	86.4	91.1	89.0	92.0	92.1	89.4
Nottm	85.9	85.6	86.9	92.0	90.0	91.1	88.6	93.5	92.8
Oxford	89.4	87.8	87.8	90.2	89.3	87.1	91.0	90.6	88.8
Plymth	84.0	77.7	84.5	81.2	90.1	87.8	89.9	93.8	91.3
Ports	89.8	88.4	82.4	87.6	88.7	88.8	88.9	88.1	91.2
Prestn	85.2	87.2	88.5	83.7	91.4	82.1	86.8	87.6	91.8
Redng	92.1	90.7	90.5	91.3	90.7	95.2	89.5	92.9	93.0
Salford	88.4	85.1	89.0	90.6	89.2	86.0	88.3	86.7	91.7
Sheff	87.5	91.7	90.6	88.7	90.9	92.5	93.7	92.2	87.6
Shrew		87.4	86.2	87.8	91.8	93.0	83.6	86.9	91.9
Stevng	93.8	93.3	76.7	85.4	90.7	90.2	96.3	93.8	91.1
Sthend	91.8	90.4	91.1	94.9	91.8	86.5	91.2	83.0	94.3
Stoke					87.4	89.9	85.5	87.0	93.1
Sund	80.6	86.7	80.5	83.6	88.7	85.3	79.9	84.1	88.7
Truro	86.9	92.7	90.6	89.6	90.2	89.2	93.9	90.8	93.0
Wirral	96.6	85.5	86.9	86.0	88.9	90.4	83.9	93.0	87.9
Wolve	83.6	88.0	84.1	89.3	89.5	89.1	90.3	87.5	89.3
York	76.1	91.2	83.9	82.5	95.1	86.2	93.9	86.3	93.6

Table 8.27. Continued

Centre	2003	2004	2005	2006	2007	2008	2009	2010	2011
N Ireland									
Antrim			87.3	94.0	86.9	92.2	97.2	90.1	86.3
Belfast			86.8	93.2	91.0	88.4	90.4	89.3	92.8
Newry			90.1					92.0	88.1
Ulster								90.9	86.3
West NI				90.2	97.3	93.1	97.5	91.3	95.9
Scotland									
Abrdn	86.0	88.7	84.1	82.7	86.0	86.4	89.2	85.4	92.8
Airdrie	74.6	86.3	75.1	80.7	76.7	88.3	94.0	81.9	84.1
D & Gall	84.5				87.5				
Dundee	86.9	85.7	84.8	89.5	82.0	86.2	87.4	90.2	90.3
Dunfn	88.2	89.8	78.2	80.3	87.4	87.0	89.9	93.5	92.4
Edinb	86.7	79.4	83.2	88.8	90.0	84.2	84.2	86.3	90.2
Glasgw	87.4	80.9	86.2	83.4	88.0	84.2	87.8	86.8	88.6
Inverns	87.6	89.2	84.2	83.9	90.6	87.2		96.7	
Klmarnk	83.7	87.4	96.3	82.8	87.6	90.1	82.9	88.3	91.1
Wales									
Bangor	91.1	80.8	82.2	81.5	92.3	87.6	87.1	89.1	94.3
Cardff	87.2	85.6	87.2	87.5	84.5	83.6	89.6	89.7	88.1
Clwyd			75.3	96.9			92.1		
Swanse	84.6	78.0	83.0	84.3	89.0	85.2	83.5	86.9	85.4
Wrexm	93.4	79.7	97.7	85.6	89.9			82.0	88.8
England	**88.4**	**87.8**	**87.9**	**89.1**	**90.3**	**89.6**	**89.6**	**89.9**	**91.1**
N Ireland			**88.9**	**91.7**	**90.9**	**88.9**	**92.0**	**90.3**	**90.5**
Scotland	**86.0**	**84.7**	**84.5**	**84.6**	**86.6**	**86.0**	**86.7**	**87.8**	**90.1**
Wales	**87.0**	**82.8**	**86.0**	**86.4**	**86.8**	**84.6**	**87.9**	**88.7**	**87.7**
UK	**88.0**	**87.2**	**87.4**	**88.6**	**89.7**	**89.0**	**89.4**	**89.7**	**90.9**

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

Table 8.28. One year prevalent patient survival by centre for prevalent cohort years 2002–2011, adjusted to age 60

Centre	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
England										
B Heart	87.9	86.8	88.1	86.5	87.1	90.1	90.7	87.4	89.4	88.3
B QEH	99.7	89.1	89.1	88.4	88.5	88.4	90.2	89.5	91.2	91.7
Basldn	84.6	87.9	90.4	90.2	90.5	92.7	91.8	88.8	91.1	88.4
Bradfd	83.2	88.2	86.3	82.8	84.2	87.8	84.6	89.3	88.0	87.7
Brightn	99.7	87.1	84.3	87.6	87.4	89.0	87.5	90.1	88.4	89.4
Bristol	89.0	86.8	87.4	87.6	89.1	87.3	84.9	85.7	89.6	90.6
Camb	87.3	88.1	87.4	89.4	88.0	92.6	90.0	91.4	93.1	88.9
Carlis	83.4	82.9	83.7	83.8	85.7	86.9	80.2	80.4	93.2	88.8
Carsh	84.6	87.4	86.3	89.4	88.7	90.1	89.0	89.5	89.8	91.2
Chelms	98.4	86.4	82.9	85.6	87.5	85.0	86.0	89.5	84.1	90.7
Colchr							91.0	86.5	88.9	89.1
Covnt	87.0	89.0	89.1	85.1	87.0	87.1	90.8	90.0	90.9	91.7
Derby	86.7	88.7	87.9	88.8	87.2	90.7	90.8	90.3	90.2	90.1
Donc						88.7	83.8	88.8	91.8	91.1
Dorset	90.3	88.3	89.4	87.0	87.7	89.8	90.0	93.0	89.9	90.4
Dudley	85.0	86.4	85.9	87.2	87.2	88.7	88.6	90.7	87.6	91.4
Exeter	86.9	86.2	83.7	90.9	87.1	85.3	85.3	86.5	88.2	88.0
Glouc	83.5	88.8	88.1	91.1	88.2	86.1	91.7	92.1	89.5	90.6
Hull	86.0	86.2	84.6	85.9	90.0	86.9	88.0	87.5	90.0	91.1
Ipswi	84.8	90.2	86.0	84.5	86.5	92.7	84.8	87.8	92.0	90.4
Kent						86.2	87.9	90.5	89.8	89.3
L Barts		83.8	85.7	88.3	89.2	88.8	90.9	92.9	91.7	90.0
L Guys	88.8	88.5	89.3	87.4	90.5	90.3	91.3	91.0	93.9	91.1
L Kings	77.7	81.1	86.7	89.2	84.9	88.0	88.0	89.4	90.1	89.9
L Rfree			90.2	90.4	90.3	91.3	89.8	90.3	91.6	90.2
L St.G					95.8	94.3	89.2	90.8	91.9	88.5
L West	91.3	91.0	91.1	91.1	91.4	90.1	91.9	90.3	90.4	91.5
Leeds	86.3	85.9	89.1	88.7	88.3	87.4	88.9	90.9	88.8	86.7
Leic	83.8	85.2	86.7	84.4	89.7	89.6	88.6	90.4	89.8	90.2
Liv Ain	91.5	88.0	97.2	87.2	90.7	88.5	92.0	89.9	89.7	83.8
Liv RI	84.4	85.7	84.2	88.0	85.0	86.9	89.5	89.3	90.8	89.0
M RI					86.3	86.4	87.5	86.8	88.4	90.5
Middlbr	84.6	83.6	86.2	85.4	87.4	87.0	86.6	83.7	93.1	89.0
Newc	81.0	81.0	86.1	83.9	86.1	86.4	87.2	86.3	85.2	89.4
Norwch		87.3	88.3	90.2	87.5	91.0	89.4	89.8	91.2	91.3
Nottm	85.3	86.7	84.7	83.4	89.5	88.4	87.9	89.7	90.1	88.9
Oxford	87.0	88.3	87.3	87.2	86.8	87.8	88.6	87.4	88.0	88.1
Plymth	84.7	85.7	87.6	83.5	82.5	87.8	85.6	85.0	89.7	84.2
Ports	82.1	89.1	85.9	85.2	89.8	88.4	89.2	88.3	88.2	89.9
Prestn	84.8	85.6	85.8	86.3	90.7	90.1	89.7	90.1	88.1	90.6
Redng	82.7	89.2	86.2	89.0	90.6	88.8	92.3	88.8	89.3	90.8
Salford	84.4	81.8	83.6	85.9	88.0	86.5	87.9	85.2	87.7	88.9
Sheff	91.1	87.8	87.0	89.2	88.8	88.8	89.7	89.6	88.7	88.8
Shrew	94.5	84.7	86.3	86.6	89.1	88.9	87.9	85.9	87.4	89.9
Stevng	88.6	89.5	88.7	89.5	89.7	92.4	90.4	89.9	92.7	91.9
Sthend	87.3	88.5	87.0	83.4	86.3	90.2	91.0	92.4	90.3	87.8
Stoke					84.5	87.3	88.5	86.8	90.9	90.6
Sund	75.5	81.8	86.4	79.4	83.7	87.5	85.2	84.7	83.7	86.4
Truro	90.3	89.9	85.1	91.8	89.3	89.4	89.0	90.7	89.0	89.6
Wirral	83.5	87.4	89.4	88.5	88.1	89.6	90.2	88.6	90.7	90.4
Wolve	85.0	87.6	86.8	89.3	87.8	92.8	89.4	87.4	89.3	88.6
York	81.1	83.0	89.4	84.0	88.5	87.9	88.8	90.0	84.1	88.6

Table 8.28. Continued

Centre	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
N Ireland										
Antrim			83.5	92.2	86.0	89.5	90.7	89.8	92.8	91.5
Belfast			85.8	86.4	90.9	88.9	88.8	88.8	89.9	89.8
Newry			87.2	87.5	87.4	90.9	94.3	88.2	92.1	84.1
Ulster			86.1	91.6	89.4	92.6	88.2	90.6	90.5	91.6
West NI			88.9	83.7	91.5	93.0	89.7	91.8	91.5	92.3
Scotland										
Abrdn	80.1	85.4	87.8	86.3	87.3	89.6	89.4	89.4	89.0	90.9
Airdrie	84.5	84.2	83.0	79.9	79.5	86.1	85.6	89.4	88.5	86.4
D & Gall	85.1	83.1	92.1	82.1	90.6	84.6	88.4	87.3	91.3	87.4
Dundee	83.5	86.0	87.4	87.6	84.1	84.2	93.8	87.9	88.4	92.0
Dunfn	84.2	88.9	91.0	88.7	88.8	91.0	87.9	88.0	90.2	88.2
Edinb	83.2	86.4	86.4	87.4	88.5	88.9	86.8	89.6	83.3	90.7
Glasgw	84.1	85.6	87.5	86.4	88.1	88.3	88.5	88.7	88.1	88.5
Inverns	87.6	86.9	87.2	86.5	93.8	89.2	92.2	89.0	86.8	88.0
Klmarnk	82.8	87.6	85.2	92.2	87.3	89.3	88.4	88.4	89.1	89.8
Wales										
Bangor	81.2	89.8	86.6	88.5	81.4	88.7	85.0	85.4	86.8	89.8
Cardff	80.7	84.7	84.2	84.0	88.8	82.6	86.6	86.0	88.4	86.3
Clwyd	90.0	76.5	83.6	79.2	91.3	88.0	89.6	80.0	93.7	90.8
Swanse	82.0	87.2	89.2	85.9	88.2	89.5	87.4	87.7	89.2	86.6
Wrexm	86.0	85.9	83.6	85.8	88.2	85.9	89.6	87.5	86.1	88.1
England	**88.7**	**88.0**	**87.9**	**88.4**	**88.6**	**88.9**	**89.1**	**89.2**	**89.9**	**89.9**
N Ireland			**86.1**	**87.6**	**89.4**	**90.4**	**89.9**	**89.7**	**91.2**	**90.1**
Scotland	**84.0**	**86.0**	**87.2**	**86.6**	**87.4**	**88.1**	**88.8**	**88.7**	**87.8**	**89.3**
Wales	**82.8**	**85.6**	**85.8**	**84.9**	**88.0**	**85.7**	**87.1**	**86.2**	**88.7**	**87.1**
UK	**88.2**	**88.0**	**87.7**	**88.0**	**88.5**	**88.7**	**89.0**	**89.0**	**89.7**	**89.7**

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