Chapter 6: Survival of Incident and Prevalent Patients

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Summary

- The age adjusted survival of incident patients starting RRT continued to improve. There was an improvement for patients starting on HD and PD. The one year after 90 day survival was 87.3% (95% CI 86.7–88.1).

- There has been a survival improvement for both the under and over 65 year age groups. The last 8 years have shown an annual 3% relative improvement in survival in both the under and over 65 year age group.

- The 'vintage effect' of increasing hazard of death with length of time on RRT, prominent in data from the US, was not seen in the UK within the 9 year incident cohort follow up period.

- From the date of first RRT, the 1 year survival of all patients (unadjusted for age) was 81%. From the 90th day of RRT (to allow comparison with other countries' 1 year survival), the 1 year survival was 86%. The age adjusted (60 years) survival for the 1 year after 90 day period was 85%. There was a high death rate in the first 90 days on RRT (6% of all patients starting RRT), a period not included in reports by many registries and other studies.

- The 5 year survival rates (including deaths within the first 90 days) were 87%, 78%, 67%, 48%, 29% and 18% respectively for patients aged 18–34, 35–44, 45–54, 55–64, 65–74 and >75 years (last years published data was incorrect).

- It was possible to compare co-morbidity adjusted survival (in addition to age and primary renal diagnosis) for nine centres.

- Eight centres had a figure for the 1 year after 90 day survival which was outside 2 standard deviations from the mean for the UK. In 5 centres this was better survival and in 3 centres poorer survival than expected. Poor reporting by renal centres of patient co-morbidity makes interpretation of these apparent differences in patient survival between centres difficult and a relationship to clinical performance cannot yet be inferred.

- Analysis of prevalent dialysis patient survival showed 6 centres outside 2 standard deviations, (4 below and 2 above).

Introduction

The analyses presented in this chapter examine survival from the start of renal replacement therapy (RRT). They encompass the outcomes from the total incident UK dialysis population reported to the Registry, including the 21% who started on peritoneal dialysis and the 5% who received a pre-emptive transplant and were not censored for transplantation. The results therefore show a true reflection of the whole UK RRT population. The incident survival figures reported here are better than those reported for the UK by the iDOPPS study (which only included a haemodialysis cohort). Additionally, 1st year UK survival data included patients that had died within the first 90 days of starting RRT, a period excluded from most other countries' registry data.

For the first time, the dataset this year included patients from all the UK countries (Northern Ireland data were not available in previous Reports). Patients returning to dialysis after a failed transplant were not included in the incident cohort as their survival was calculated from the date of their first RRT.

The incident survival figures quoted in this chapter are from the first day of renal replacement therapy. In many instances survival from day 90 onwards is also presented, as this allows comparison with many other registries, including the US, which mainly record data from day 90 onwards. This distinction is important, as there is a high death rate in the first 90 days which would distort international comparisons. In many other countries, patients are not reported to their national registry or considered to have established renal failure until they have completed 90 days on RRT, whereas in the UK all patients starting RRT are included from the date of the first RRT treatment unless they recover renal function within 90 days. The UK data therefore include some patients who develop acute irreversible renal failure in the context of an acute illness for instance and were recorded by the clinician as being irreversible established renal failure.

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 age was chosen because it was approximately the average age of patients starting RRT 10 years ago at the start of the Registry's data collection. The average age of patients commencing RRT in the UK in 2005 was approximately 65 years, but the Registry has maintained age adjustment to 60 years for comparability with previous years' analyses.

Survival rates in different centres contributing to the UK Renal Registry are reported here. In the 2006 Report, with the agreement of all UK clinical directors, centre anonymity was removed for the first time. Similarly to last year, it is stressed that these are raw data that require very cautious interpretation. The Registry 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 co-morbidity and ethnic origin, which have been demonstrated to have a major impact on outcome. With this lack of information on case mix, it was difficult to interpret any apparent difference in survival between centres. Using data only from those centres with greater than 85% complete data returns on co-morbidity, an analysis has been undertaken to highlight the impact of changes in estimates of survival rates by centre after adjusting for age, primary renal diagnosis and co-morbidity. It is hoped this will encourage all centres to allocate the resources to return the co-morbidity data.

Despite the uncertainty about any apparent differences in outcome for centres which appear to be outliers, the Registry will follow the clinical governance procedures as set out in Chapter 2[1].

The survival of prevalent patients, in previous Reports included within the prevalent chapter, has now been incorporated within this chapter.

Methods

Methodology for incident patient survival

The take-on population in a year included patients who recover from ERF after 90 days from the start of RRT, but excluded those that recover within 90 days. Patients newly transferred into a centre who were already on RRT were excluded from the take-on population for that centre. Patients re-starting dialysis after a failed transplant were also excluded (unless they started RRT in that current year).

Patients who started treatment at a centre and then transferred out after starting RRT treatment were counted at the original centre.

For patients who recovered renal function for >90 days and then went back into ERF, the length of time on RRT was calculated from the day on which the patient re-started 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.

Patients who transferred out of their initial treatment centre to one of the five UK centres not returning individual patient data to the Registry, were censored on the day they transferred out.

The one year incident survival for patients in 2005 were for those who had all been followed for 1 full year through 2006. The 2006 incident patients were excluded from this year's incident survival analysis as they had not 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 2005, were not included in the cohort, as 2007 data on these patients were not yet available. The analyses prior to the 2006 Registry Report have used the previous year's patient cohort to calculate the 1 year after 90 day survival (eg this year the alternative would have been to use the 2004 rather than 2005 cohort) starting in October. A comparison of these two methods has shown no difference between them for any but the smallest centres (who will have wide 95% confidence intervals), so for simplicity of understanding the cohort and using a common cohort across analyses, the Registry will now use the previous year's data (2005 cohort).

Adjustment of 1 year after 90 day survival for the effect of co-morbidity, was undertaken using a combined incident cohort from 2001 to 2005. Nine centres had returned >85% of co-morbidity data for patients. Adjustment was first performed to a mean age of 60 years, then to the average primary diagnosis mix for all the nine centres. The individual centre data were then further adjusted for average co-morbidity mix present at these centres.

Methodology for prevalent patient survival

All patients who had been established on RRT for at least 90 days on 1 January 2006 were included in this analysis. The patients in the transplant cohort had all been established with a transplant for at least 6 months.

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 transplant. When a patient is censored at transplantation, the patient is considered as alive up to the point of transplantation, but the patient's status post-transplant is not considered. Therefore a death following transplantation is not taken into account in calculating the survival figure. This 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. The differences are likely to be small due to the low post-transplantation mortality rate and the relatively small proportion of patients being transplanted in a given year compared to the whole dialysis population (usually less than 7% of the total dialysis population). To estimate the potential differences, the results for individual renal centres were compared with and without censoring at transplant. The results are shown in Table 6.13. Overall there is a 0.5% increase in survival using the censored data. With such small differences only the censored results have been quoted throughout the prevalent analyses.

Another potential source of error in comparing survival of dialysis patients in different renal centres, especially younger patients, is the differing transplant rates between centres. Those with a high transplant rate have removed more of the fitter patients from dialysis and are left with a higher risk population on dialysis.

Centre exclusion from survival analysis

The survival analysis for the London West centre (2005 Hammersmith & Charing Cross data) revealed that this centre was an outlier with an apparent survival of better than 3 s.ds above average. Due to this finding, these data were investigated further. Investigation showed that there were no deaths reported (to the UKRR) from this centre for the first 5 months of the year.

This finding is statistically unlikely and suggests either that the centre were not reporting the deaths from this period or were not reporting patients that had started RRT earlier and then died within this timeframe. As the Registry does not solely rely on the centre to report the date of death but also uses the NHS tracing service to verify death (linked to the Office for National Statistics Deaths Register), under-reporting of deaths by the centre, in patients already registered with the UKRR, could not be the cause. There must therefore be an incomplete cohort of patients being sent by this centre to the UKRR. This centre has therefore been excluded from the incident and prevalent survival analysis.

Incident (new RRT) patient survival results

The 2005 cohort included 6,085 patients who were starting RRT (Table 6.1).

Comparison with audit standards

The 2002 UK Renal Standards document[2] (www.renal.org) concluded that:

> ***It is hard to set survival standards at present because these should be age, gender and co-morbidity adjusted and this is not yet possible from Registry data. The last Standards document (1998) recommended at least 90% one year survival for patients aged 18–55 years with standard primary renal disease. This may have been too low as the rate in participating centres in the Registry was 97%, though numbers were small.***

The Renal Standards document defines standard primary renal disease using the EDTA-ERA diagnosis codes (including only codes 0–49), this excludes 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 were also included in this report to allow comparison with reports from other registries. The results are shown in Table 6.2 and are similar to the previous year.

Between country

The Northern Ireland figures have not been included in this table as data are only available from 2005 onwards. Two years incident data have been combined to increase the size of the patient cohort, so that any differences between the three other UK countries are more likely to be identified (Table 6.3). These data have not been adjusted for differences in primary renal diagnosis, ethnicity or co-morbidity.

Table 6.1: Summary of the exclusions from the 2005 incident cohort

Reasons for exclusion	No of Patients
Recovered and started again in 2005 (2nd start only included)	−1
Recovered in 2004 with 2nd start in 2005 and had a recovery period <90 days (so remain in the 2004 cohort)	−5
Recovered in 2005 with 2nd start in 2006 and had a recovery period ⩾90 days (these will be included in the 2006 analysis)	−7
Patients with date of death before RRT start date	−3
Patients without a treatment modality at start	−18
Total incident survival cohort	6,051
Number of deaths in the first year	1,139

Table 6.2: One-year patient survival, patients aged 18–54, 2005 cohort

First treatment	Standard primary renal disease	All primary renal diseases except diabetes
All %	96.1	93.8
95% CI	*94.7–97.2*	*92.4–94.9*
HD %	94.9	91.5
95% CI	*92.8–96.3*	*89.5–93.1*
PD %	98.7	98.8
95% CI	*96.6–99.5*	*97.2–99.5*

Modality

The age-adjusted one year survival estimates on HD and PD were 85.8% and 93.1% respectively with the improvement in HD survival from 2002 (83.9%) being maintained. There appears to be better survival on PD compared with HD (Table 6.4) after age adjustment, similar to data from the USRDS and Australasian (ANZDATA) registries. However, a straightforward comparison of the modalities in this way is not valid, as there are significant factors in

Table 6.3: Incident patient percentage survival across the UK, combined 2 year cohort (2004–2005), adjusted to age 60

	England	Wales	Scotland	UK
% 90 day	94.4	93.5	94.3	94.3
95% CI	*93.9–94.9*	*92.1–95.0*	*93.1–95.4*	*93.8–94.8*
% 1 year after 90 days	87.9	86.1	83.9	87.3
95% CI	*87.1–88.6*	*83.9–88.6*	*81.9–86.0*	*86.65–88.08*

Table 6.4: One-year after day 90 survival by first established treatment modality (adjusted to age 60)

Year		HD	PD
2005	Adjusted 1 year after 90 days %	85.8	93.1
	95% CI	*84.6–87.1*	*91.6–94.5*
2004	Adjusted 1 year after 90 days %	85.5	90.3
	95% CI	*84.3–86.8*	*88.7–92.0*
2003	Adjusted 1 year after 90 days %	85.7	92.5
	95% CI	*84.3–87.2*	*90.9–94.1*
2002	Adjusted 1 year after 90 days %	83.9	90.2
	95% CI	*82.4–85.5*	*88.46–92.1*

Table 6.5: Unadjusted 90 day survival of new patients, 2005 cohort, by age

Age	KM* survival (%)	KM 95% CI	N
18–64	96.2	95.5–96.9	2,957
⩾65	88.2	87.0–89.3	3,112
All ages	92.1	91.4–92.8	6,069

*KM = Kaplan–Meier.

selection for the modalities and the patients in the two groups are not comparable.

Age

Tables 6.5 to 6.10 show survival of all patients and those above and below 65 years of age, for up to eight years after initiation of renal replacement therapy. The UK is showing an improvement in both short and longer term survival on dialysis for patients aged both under and over 65 years. As to be expected there was also a steep age related decline in survival over all time periods (see also Figures 6.1 and 6.2).

If the survival data in Tables 6.8 to 6.10 are calculated from day 90 (1 year after day 90

Table 6.6: Unadjusted 1 year after day 90 survival of new patients, 2005 cohort, by age

Age	KM survival (%)	KM 95% CI	N
18–64	91.5	90.4–92.5	2,837
⩾65	78.0	76.4–79.5	2,737
All ages	84.9	83.9–85.8	5,574

Table 6.7: Increase in proportional hazard of death for each 10 year increase in age, at 90 days and for 1 year thereafter

Interval	Hazard of death for 10 year age increase	95% CI
First 90 days	1.69	1.56–1.83
1 year after first 90 days	1.55	1.47–1.64

Table 6.8: Unadjusted KM survival of new patients 1997–2005 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	95% CI for latest yr	N
2005	89.5									88.4–90.6	2,957
2004	89.8	83.8								82.3–85.1	2,650
2003	89.4	82.5	77.1							75.3–78.7	2,364
2002	88.4	81.5	75.9	70.7						68.6–72.6	2,075
2001	87.4	79.9	74.3	68.8	64.1					61.8–66.3	1,844
2000	89.5	81.9	75.2	70.4	65.2	60.2				57.7–62.6	1,585
1999	87.7	81.5	74.1	68.1	63.2	59.2	55.1			52.4–57.8	1,366
1998	86.9	79.6	72.9	67.7	61.6	56.8	52.8	50.4		47.5–53.1	1,278
1997	86.0	78.5	71.3	65.8	60.7	56.1	52.5	50.3	48.5	44.9–52.0	789

Table 6.9: Unadjusted KM survival of new patients 1997–2005 cohort for patients aged ⩾65

Cohort	1 year	2 year	3 year	4 year	5 year	6 year	7 year	8 year	9 year	95% CI for latest yr	N
2005	72.7									71.1–74.2	3,112
2004	68.8	54.8								52.9–56.7	2,733
2003	69.2	53.9	42.6							40.6–44.6	2,378
2002	66.0	51.5	41.1	33.0						31.0–35.0	2,180
2001	67.2	52.1	39.5	30.6	23.2					21.3–25.2	1,861
2000	66.8	53.3	40.2	29.3	22.9	18.2				16.3–20.2	1,508
1999	66.3	50.6	38.4	28.9	21.5	15.4	11.1			9.4–12.9	1,266
1998	63.8	46.7	36.4	27.5	20.6	14.8	10.8	7.4		5.9–9.0	1,140
1997	64.0	46.0	33.2	23.9	16.5	11.6	7.9	6.3	4.6	3.1–6.5	582

Table 6.10: Unadjusted survival of new patients 1997–2005 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	95% CI for latest yr	N
2005	80.9									79.9–81.9	6,069
2004	79.1	69.0								67.8–70.3	5,383
2003	79.2	68.1	59.8							58.3–61.2	4,742
2002	76.9	66.1	58.0	51.3						49.8–52.8	4,255
2001	77.3	66.0	56.8	49.6	43.5					41.9–45.1	3,705
2000	78.4	68.0	58.2	50.4	44.6	39.8				38.1–41.5	3,093
1999	77.4	66.6	56.9	49.2	43.1	38.1	33.9			32.1–35.8	2,632
1998	76.0	64.1	55.7	48.8	42.3	37.1	33.0	30.1		28.3–32.0	2,418
1997	76.7	64.8	55.2	48.1	42.1	37.3	33.7	31.7	29.9	27.5–32.4	1,371

survival, 2 year after day 90 survival, etc) the survival in all cases increased by an additional 3–4% across both age bands. These are the results most comparable to the figures quoted by the USRDS from the USA and most other national registries[3,4] (see Chapter 12 on international comparisons).

There was a nonlinear increase in death rate per 1,000 patient years with age, shown in

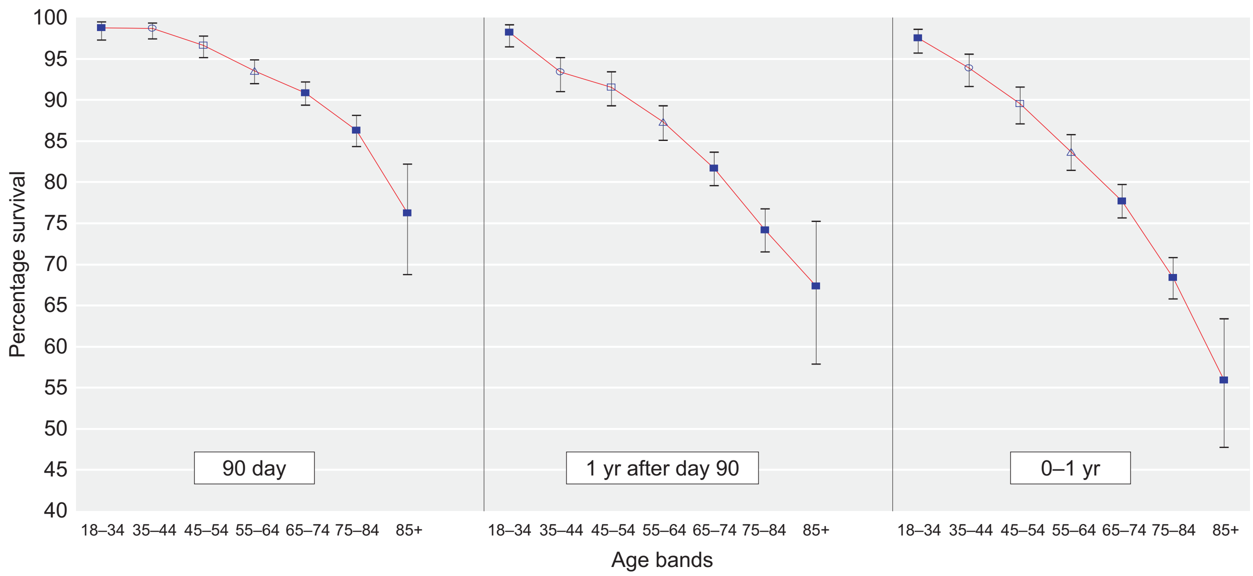

Figure 6.1: Unadjusted survival of all incident patients 2005 by age band

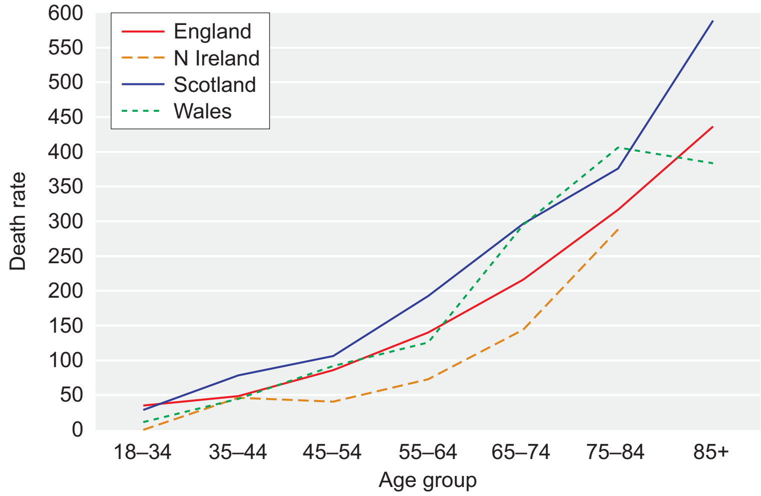

Figure 6.2: One year after 90 days death rate per 1,000 patients years by nation and age group for incident patients, 2002–2005 cohort

Figure 6.2 for the period one year after 90 days. There were no differences between UK countries.

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

The KM long term survival curves published in all previous years reports, were censored at the time of transplantation. This was not made clear in the analysis and although not incorrect, will make the longer term outcomes of younger patients (who are more likely to have undergone transplantation) appear worse. This is because those younger patients remaining on dialysis (who may have more co-morbidity) will have only been included in the survival analysis. To demonstrate this difference in outcome between these two methods, Figure 6.3a is shown below without censoring for transplantation and Figure 6.3b with censoring. In future reports it is planned to only reproduce the single figure of the longer term age related survival which is uncensored at the time of transplantation.

In addition, it should be noted that in the printed version and CD copy of the 2006 Report, Figure 12.2 showing the 8 year KM survival of

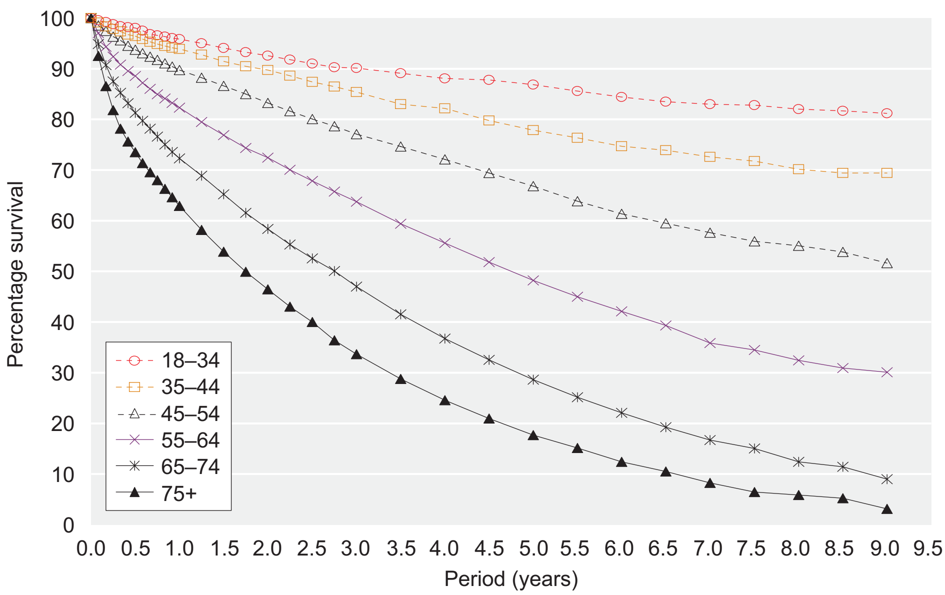

Figure 6.3a: Kaplan–Meier 9-year survival of incident patients 1997–2005 cohort (from day 0), without censoring at transplantation

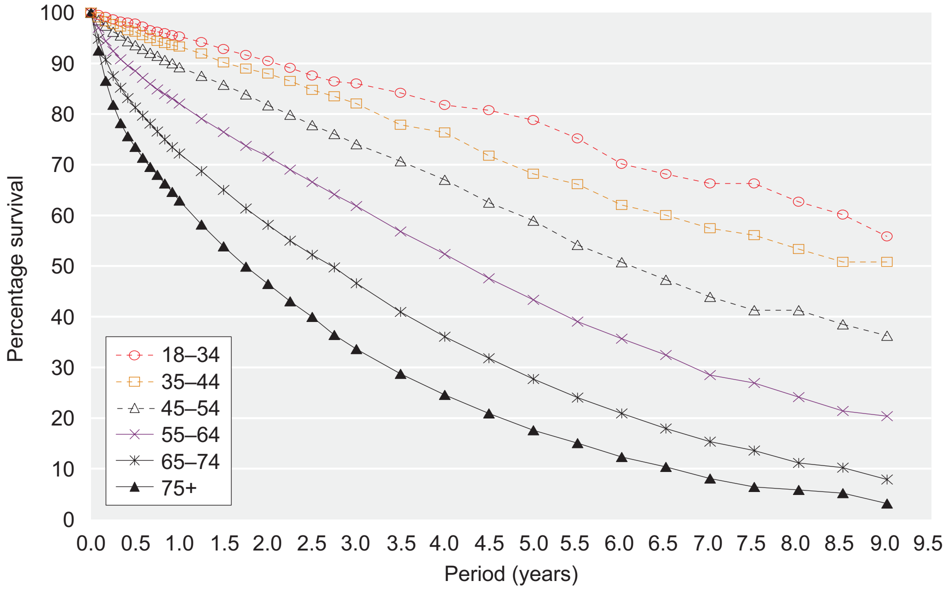

Figure 6.3b: Kaplan–Meier 9-year survival of incident patients 1997–2005 cohort (from day 0), with censoring at transplantation

incident patients was incorrect, with the incorrect figure showing very much ***poorer*** *survival than is the case. An error has been found in the SAS code previously used to calculate these data and this has now been corrected.*

The change in hazard of death by age, during the first 12 month period

As discussed earlier in this chapter, the UKRR collects data from the 1st day of starting RRT. Figure 6.4 shows that the monthly hazard of death for patients aged over 55 is 60% lower in those patients that have survived beyond 4 months. This reduction in hazard of death was not seen in the younger aged patients and will therefore affect proportionality in any Cox model analysis that uses data starting from day zero and combines these different aged cohorts.

The USRDS in contrast reports a rising mortality throughout the first recorded 3 month period[3] and this was most likely to reflect lack of reporting to the USRDS of patients that start on RRT who do not survive the first 90 days. A similar pattern of rising death rates has

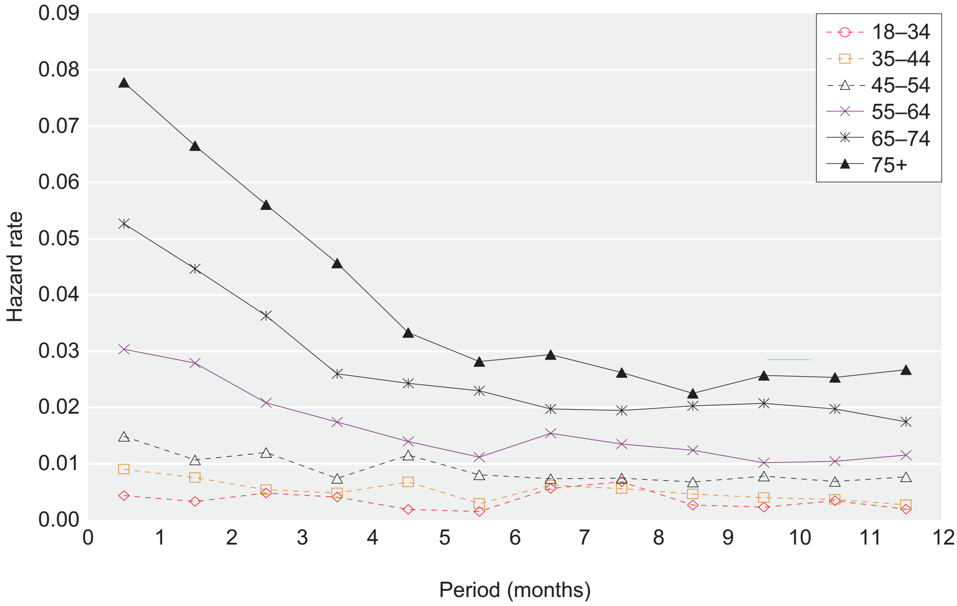

Figure 6.4: 1st-year monthly hazard of death, by age band 1997–2005 cohort

been shown in analysis of data from the German Renal Registry, with under-reporting of patients with early deaths highlighted as the cause (Caskey F, verbal communication).

Changes in survival from 1997–2005

The KM survival tables have been included as in previous years. The one year death rate per 1,000 patient years has also been included this year (Figure 6.5). These death rates are not directly comparable with those produced by the USRDS Registry, as the UK data included the first 90 day period where the death rates will be much greater.

The unadjusted KM survival data (Tables 6.8 and 6.9, Figures 6.6 and 6.7) and annual death rates appear to be showing a large improvement in 1 to 7 year survival across the time periods for both the under and over 65s. This has happened even though the average age of patients starting RRT has risen by 5 years during this period. The patients aged under 65 years have seen the 1st year survival improve from 86% to 89.5%. As survival rates were already high in these patients, the overall survival improvement was only 4%. The reduction in risk of death (=relative survival improvement) in Figure 6.5 shows that this equates to a 26% relative improvement over this 8 year period (=3% annual improvement in the reduction in risk of death). Similar reduction in risk of death was seen in the 2 year and 3 year cohorts.

Similarly for patients aged over 65 years there has been a 14% improvement in 1st year survival, which translates into a similar 25% relative reduction in risk of death over this 8 year period.

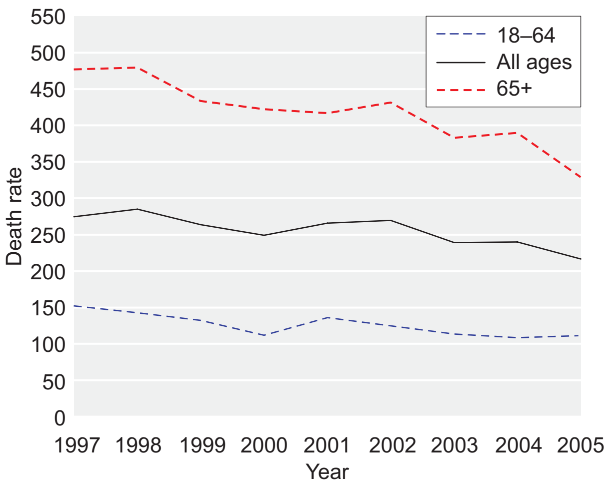

Figure 6.5: One-year incident death rate per 1,000 patient years for all age groups

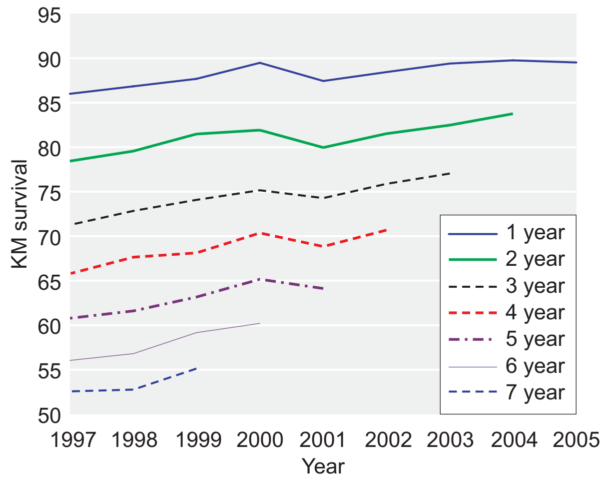

Figure 6.6: Change in KM long term survival by year of starting RRT; for incident patients aged 18–64 years

A confounding factor may be the fact that additional renal centres have joined the Registry over these intervening years. To attribute this year on year improvement to this fact, then every renal centre joining in each subsequent year must have better patient survival than all renal centres in each of the previous years. This would be statistically very improbable. Additionally, a separate analysis of survival in the earlier vs latter centres has shown this not to be the reason.

As these are observational data it is difficult to attribute this reduction in risk of death to any specific improvement in care. During this period

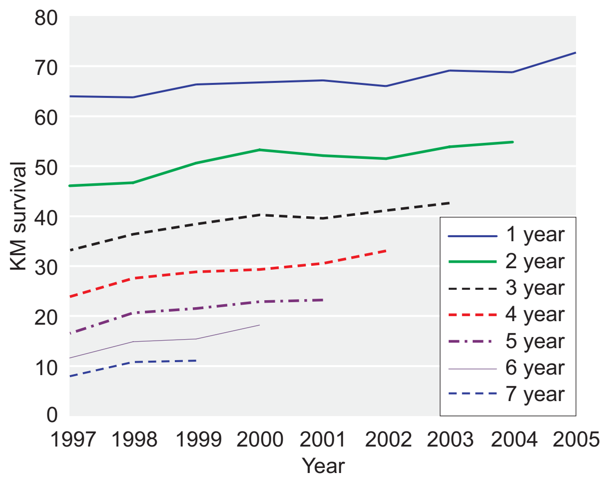

Figure 6.7: Change in KM long term survival by year starting RRT; for incident patients aged ⩾65 years

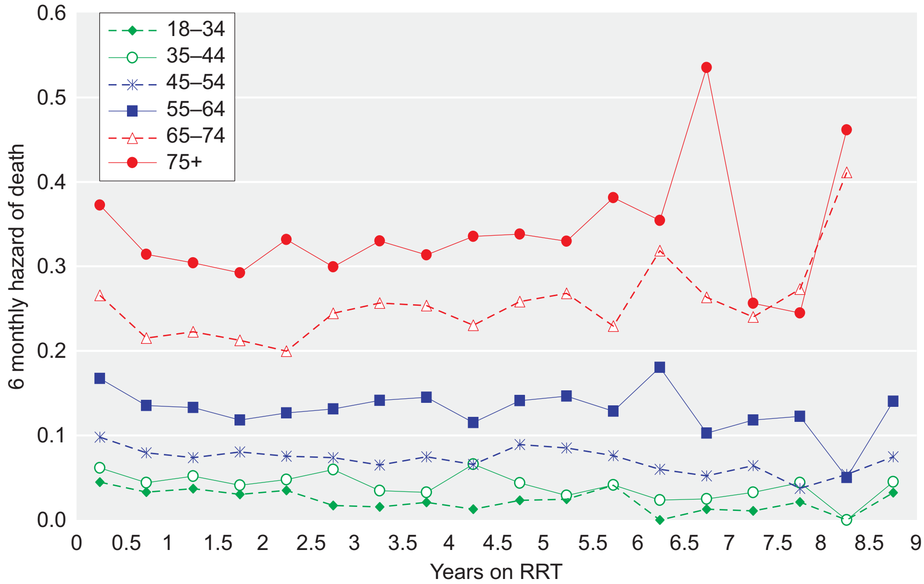

Figure 6.8: Six monthly hazard of death, by vintage and age band, 1997–2005 incident cohort after day 90

mean haemoglobin in HD patients has shown annual improvement rising from 10.2 g/dl in 1998 to 11.6 g/dl in 2006. Other improvements in phosphate and calcium control have been restricted to the last 3 years. This recent improvement contrasts with dialysis dose where the main improvements were in the first 4 years.

Change in survival on renal replacement therapy by vintage

RRT patients in the UK continued to show no evidence of a worsening prognosis with time on RRT (vintage), even with the follow up period now increased to 9 years. Figure 6.8 demonstrates this clearly for patients aged under 65 years. For those patients aged over 65 years, no vintage effect was seen within the first 7 years, though with the decreasing numbers remaining alive beyond 7 years the numbers become too small to draw any further conclusions. Figures 6.9 and 6.10 show these data for the non-diabetic and diabetic patients respectively.

As highlighted in last years report, these data contrast with the USRDS data[3] which shows worsening prognosis with increasing length of time on RRT.

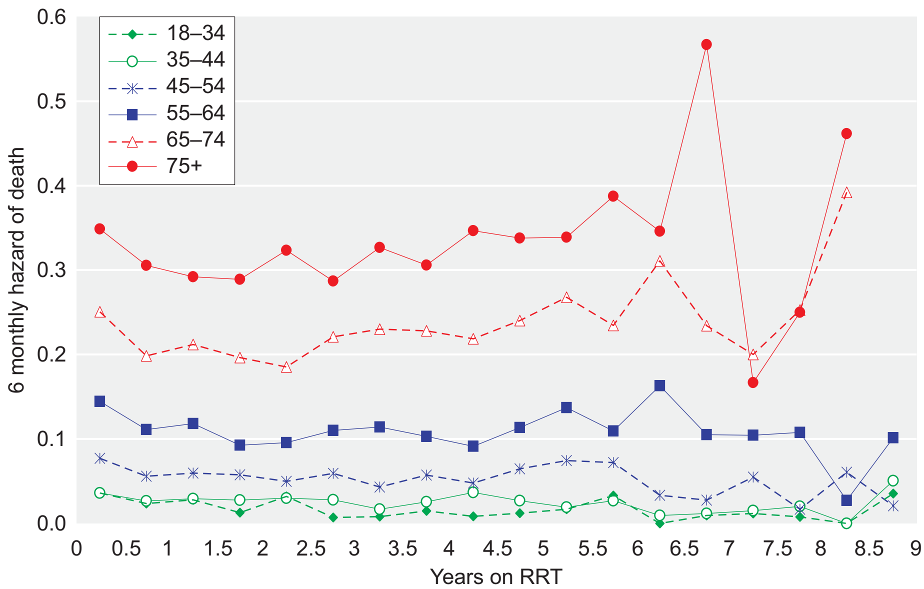

Figure 6.9: Six monthly hazard of death, by vintage and age band, 1997–2005 non-diabetic incident cohort after day 90

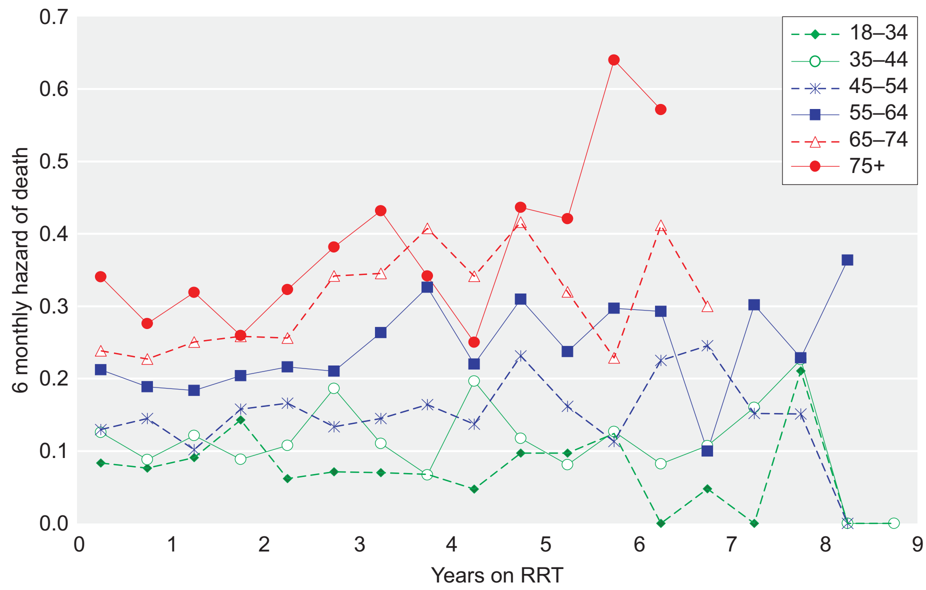

Figure 6.10: Six monthly hazard of death, by vintage and age band, 1997–2005 diabetic incident cohort after day 90

Time trend changes in incident patient survival, 1999–2005

The time trend changes are shown in Figure 6.11.

Analysis of centre variability in 1 year after 90 days survival

The one year after 90 day survival for the 2005 incident cohort is shown in Figure 6.12 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 6.16 and 6.17). The age adjusted individual centre survival for each of the last 7 years can also be found in Appendix 1, Table 6.18.

In the analysis of 2005 survival data, some of the smaller centres had wide confidence intervals (Figure 6.12). This can be addressed by including a larger cohort, which will also assess sustained performance. In the previous Report, the data were presented for the 4 year 2001 to 2004 cohort. The data this year are for the 4 year period 2002 to 2005.

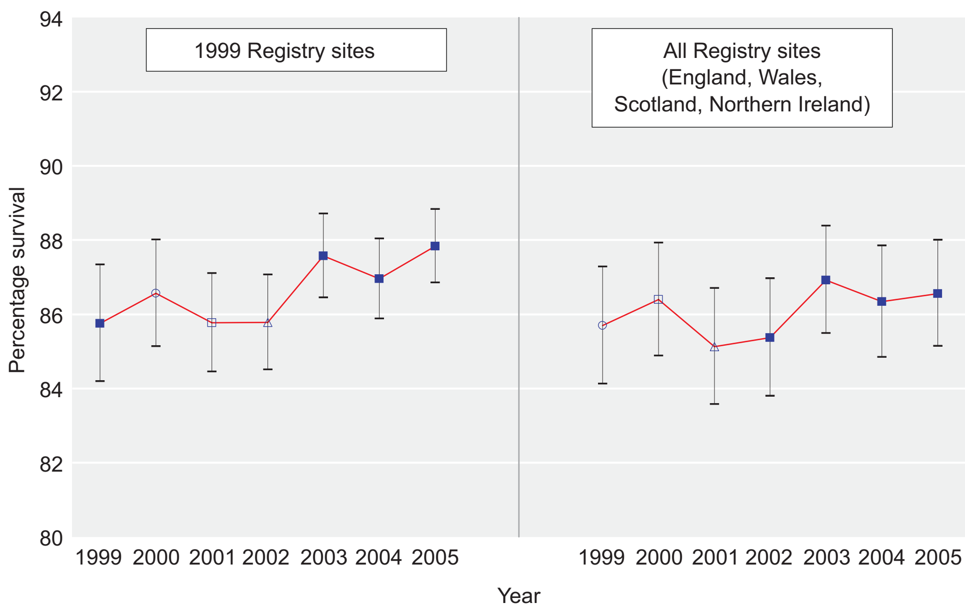

Figure 6.11: Change in one-year after 90 day adjusted (age 60) survival, 1999–2005
Showing 95% confidence intervals

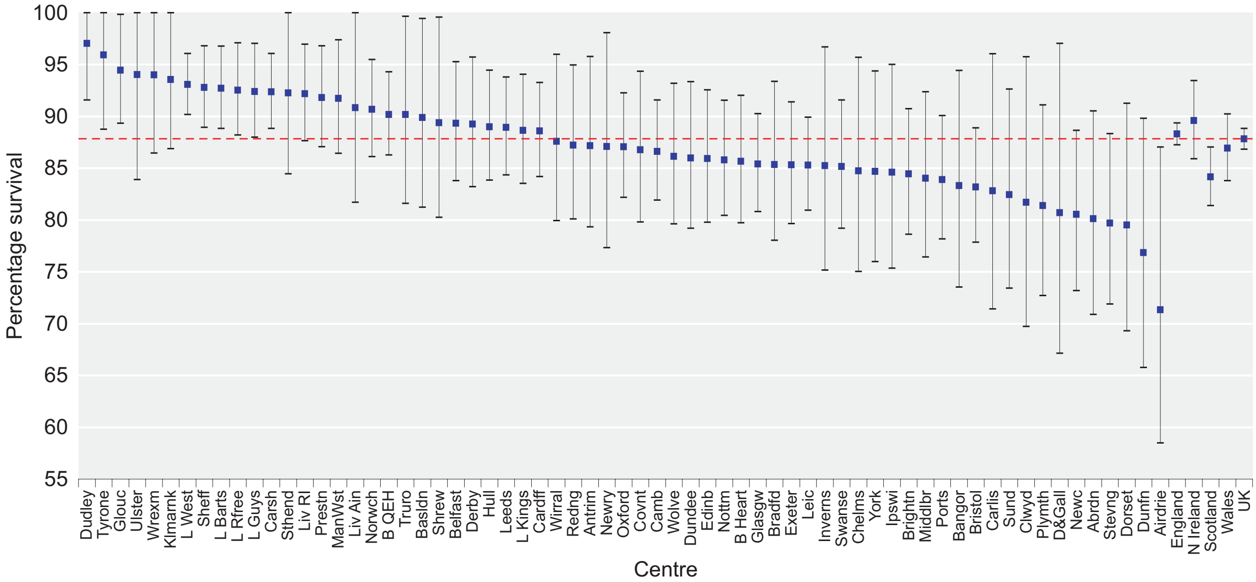

Figure 6.12: Survival one-year after 90 days, adjusted to age 60, 2005 cohort
Showing 95% confidence intervals

A few centres have been contributing data to the Renal Registry for only part of this period so they will have fewer years included. Following the well received approach last year, where these data were for the first time presented using a funnel plot, it was decided to continue with this method to identify possible outliers (Figure 6.13). From Figure 6.13, for any size of 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% confidence interval) or 3 standard deviations (dotted lines, 99.8% confidence interval). Table 6.11 helps centres to identify themselves on this graph by finding their number of patients and then looking up this number on the x-axis.

There are 3 centres that fall between 2 and 3 standard deviations below average (Aidrie, Sunderland and Middlesbrough) and 5 centres between 2 and 3 sds above average (Basildon, London Royal Free, Ipswich, Preston and London Guys). These data have not been adjusted for any patient related factor except age (i.e. not co-morbidity, primary renal disease or ethnicity).

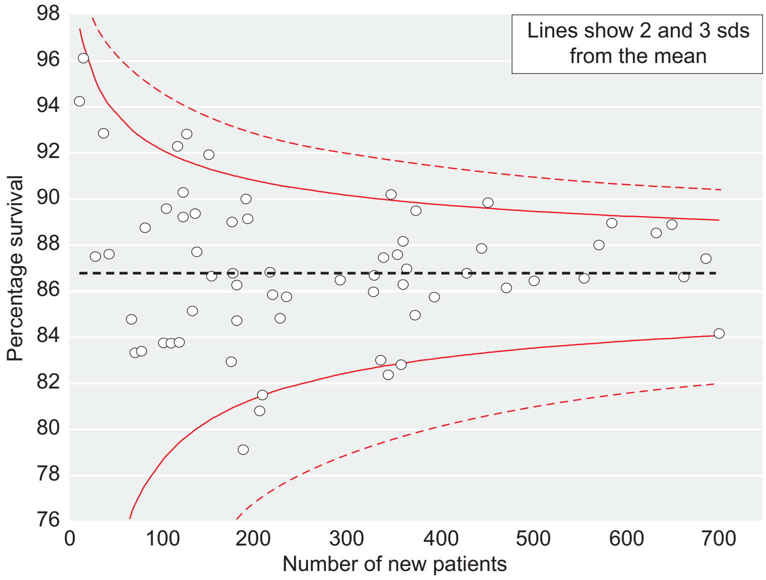

Figure 6.13: Funnel plot for age adjusted 1 year after 90 days survival; 2002–2005 cohort
(patients who died within the first 90 days have been excluded)

Table 6.11: Adjusted 1 year after 90 day survival 2002–2005

Centre	No. of incident pts	1 year after 90 day survival %	Centre	No. of incident pts	1 year after 90 day survival %
Ulster	11	94.2	Brightn	217	86.8
Tyrone	15	96.1	Abrdn	220	85.8
Newry	28	87.5	Bradfd	228	84.8
Liv Ain	37	92.9	Dundee	235	85.7
Antrim	43	87.6	Covnt	293	86.5
Clwyd	67	84.8	Wolve	329	86.0
D&Gall	71	83.3	B Heart	330	86.7
Chelms	78	83.4	Edinb	337	83.0
Shrew	82	88.7	ManWst	340	87.5
Bangor	102	83.7	Middlbr	345	82.4
Belfast	105	89.6	L Barts	348	90.2
Carlis	110	83.7	Prestn	355	87.6
Basldn	117	92.3	Swanse	359	82.8
Dunfn	119	83.8	Exeter	361	86.3
Sthend	123	89.2	Stevng	361	88.2
Wrexm	123	90.3	Hull	365	87.0
L Rfree	127	92.8	Newc	374	84.9
Inverns	133	85.1	B QEH	375	89.5
Dudley	136	89.4	Nottm	395	85.7
Klmarnk	138	87.7	Camb	430	86.8
Ipswi	151	91.9	L Kings	446	87.8
Dorset	154	86.6	L Guys	453	89.8
York	175	82.9	Liv RI	473	86.1
Norwch	176	89.0	Ports	503	86.4
Derby	177	86.8	Bristol	557	86.5
Glouc	181	86.2	Leeds	573	88.0
Wirral	181	84.7	Sheff	587	89.0
Airdrie	188	79.1	Oxford	635	88.5
Redng	191	90.0	Carsh	652	88.9
Truro	193	89.1	Cardff	665	86.6
Sund	206	80.8	Leic	689	87.4
Plymth	209	81.5	Glasgw	703	84.2

These data have not been censored at transplantation, so the effect of differing centre rates of transplantation was not taken into account.

There are known regional differences in the life expectancy of the general population within the UK. Table 6.12 shows differences in life expectancy between the UK countries[5,6]. The Registry is investigating ways to adjust centre survival for the differences in the underlying population.

Table 6.12: Life expectancy 2003–2005 in UK countries (source ONS)

	At Birth		At age 65	
	Male	**Female**	**Male**	**Female**
England	76.9	81.2	16.8	19.6
Wales	76.3	80.7	16.4	19.2
Scotland	74.2	79.3	15.5	18.4
Northern Ireland	76.0	80.8	16.4	19.3
UK	**76.6**	**81.0**	**16.6**	**19.4**

Analysis of the impact of adjustment for co-morbidity on the 1 year after 90 day survival

Co-morbidity returns to the Registry have remained static (Chapter 5). With the de-anonymisation of centre names, it is essential to show what the importance is of adjusting patient survival for co-morbidity.

Preliminary analysis (Figure 6.14a) showed that several centres demonstrated a large reduction in survival after adjusting for co-morbidity.

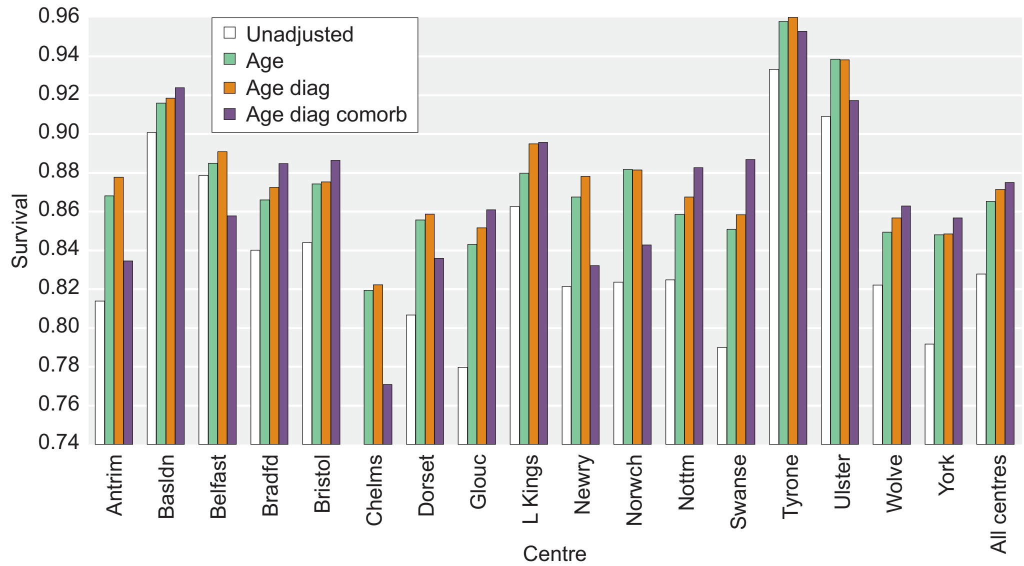

Figure 6.14a: Change in 1 year after 90 day survival after adjustment for age, diagnosis and co-morbidity, using centres with incorrect co-morbidity returns

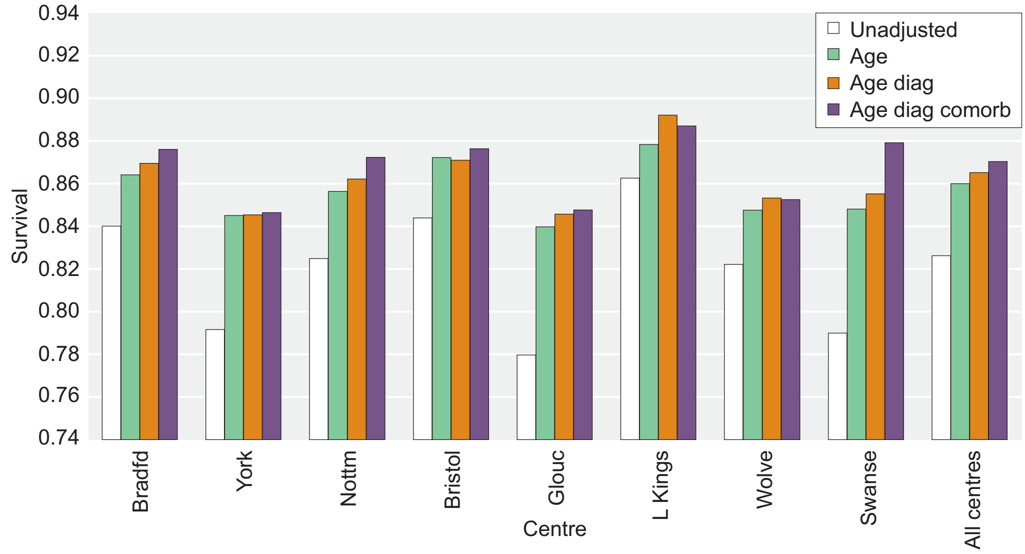

Figure 6.14b: Change in 1 year after 90 day survival after adjustment for age, diagnosis and co-morbidity, using only centres with correct co-morbidity returns

These centres were showing 100% completeness of data and more than the expected number of patients were recorded as having no co-morbidity. This anomaly was confined to centres using a specific renal software package and investigation revealed that a 'null co-morbidity entry' was being returned as 'no co-morbidity present'. Figure 6.14a has been included to highlight the effect of adjusting centre survival for centres with poor co-morbidity returns as if patients had no co-morbidity. Figure 6.14b shows the correct analysis with the centres returning incorrect data having been removed from the analysis.

Using the combined incident cohort from 2000–2004, 9 centres had returned co-morbidity data for more than 85% of patients. Adjustment was first performed to age 60, then to the average primary diagnosis mix for all the 9 centres. Further adjustment was then made to the average co-morbidity mix present at these centres (Figure 6.14b).

This highlights the importance of improving the quality of co-morbidity returns to the Renal Registry.

Prevalent patient survival

Table 6.13 demonstrates the effect on calculation of survival on dialysis, before and after censoring at the time of transplantation, overall there was a 0.5% increase in survival using the censored data.

In Table 6.14 the one year death is shown for dialysis patients. The median age of prevalent patients in Wales was older than those in England.

One year survival of prevalent dialysis patients by centre

The one year survival of dialysis patients in each centre is shown in Table 6.15 and is illustrated in Figures 6.16 and 6.17, dividing the data into those patients aged <65 years and those 65 years and over. Figure 6.19 shows the age adjusted data (60 years) in Figure 6.18, as a funnel plot. The solid lines showing the 2 standard deviation limit (95% CI) and the dotted lines the limits for 3 standard deviations (99.9%

Table 6.13: Prevalent 1 year KM survival of dialysis patients with and without censoring at transplantation (adjusted for age = 60)

	Censoring at transplant			Not censoring at transplant		
Centre	Adjusted 1 year survival	Lower 95% CI	Upper 95% CI	Adjusted 1 year survival	Lower 95% CI	Upper 95% CI
Abrdn	88.5	84.5	92.7	88.7	84.8	92.8
Airdrie	79.2	73.4	85.5	79.7	74.1	85.9
Antrim	92.5	88.7	96.5	92.7	88.9	96.6
B Heart	86.5	83.3	89.8	86.5	83.4	89.8
B QEH	88.6	86.5	90.7	88.6	86.6	90.7
Bangor	90.4	85.2	95.9	90.5	85.3	96.0
Basldn	91.2	86.9	95.7	91.2	87.0	95.7
Belfast	87.1	83.7	90.6	86.5	83.1	90.2
Bradfd	82.1	77.2	87.2	82.3	77.6	87.4
Brightn	88.3	85.4	91.3	88.5	85.7	91.5
Bristol	87.9	85.3	90.6	87.5	84.9	90.2
Camb	88.8	85.9	91.9	88.7	85.7	91.7
Cardff	84.6	81.8	87.6	84.4	81.6	87.3
Carlis	83.5	76.6	90.9	83.9	77.3	91.2
Carsh	89.3	87.0	91.7	89.4	87.1	91.7
Chelms	84.7	79.0	90.8	84.9	79.3	90.9
Chestr	93.4	86.7	100.0	93.8	87.3	100.0
Clwyd	81.5	73.2	90.6	81.8	73.7	90.8
Covnt	85.7	82.3	89.3	85.9	82.5	89.5
D&Gall	82.0	74.0	90.9	82.5	74.6	91.2
Derby	89.2	85.7	92.8	89.3	85.9	92.8
Derry	84.9	62.8	100.0	97.0	91.3	100.0
Dorset	85.2	80.5	90.1	85.6	81.0	90.4
Dudley	87.5	82.6	92.6	87.1	82.2	92.3
Dundee	88.1	84.1	92.4	88.5	84.5	92.6
Dunfn	87.9	82.7	93.5	88.3	83.3	93.7
Edinb	87.4	83.9	91.1	87.4	83.8	91.1
Exeter	90.7	87.9	93.6	91.1	88.4	93.8
Glasgw	86.7	84.3	89.1	86.8	84.5	89.2
Glouc	90.9	87.2	94.8	91.0	87.3	94.8
Hull	84.7	81.2	88.5	85.2	81.7	88.8
Inverns	86.3	80.7	92.4	86.6	81.1	92.5
Ipswi	84.8	79.7	90.1	84.9	79.9	90.2
Klmarnk	91.9	87.8	96.2	92.3	88.3	96.4

Table 6.13: (continued)

	Censoring at transplant			Not censoring at transplant		
Centre	**Adjusted 1 year survival**	**Lower 95% CI**	**Upper 95% CI**	**Adjusted 1 year survival**	**Lower 95% CI**	**Upper 95% CI**
L Barts	88.2	85.8	90.8	88.3	85.8	90.8
L Guys	87.9	85.1	90.8	88.2	85.5	91.0
L Kings	88.8	85.7	92.0	88.9	85.9	92.1
L Rfree	90.5	88.3	92.7	90.6	88.5	92.8
Leeds	89.7	87.3	92.2	89.8	87.4	92.3
Leic	84.7	82.2	87.2	84.6	82.1	87.1
Liv Ain	86.3	78.5	94.9	87.3	80.0	95.3
Liv RI	89.0	86.3	91.9	89.0	86.2	91.8
ManWst	86.8	83.4	90.4	87.3	84.1	90.8
Middlbr	85.2	81.2	89.4	85.3	81.3	89.4
Newc	85.6	81.7	89.6	85.0	81.0	89.1
Newry	87.8	82.3	93.8	88.0	82.5	93.9
Norwch	89.5	86.4	92.8	89.7	86.5	92.9
Nottm	83.8	80.6	87.1	83.7	80.5	87.0
Oxford	88.4	85.9	91.0	88.8	86.4	91.3
Plymth	83.8	78.9	89.0	84.1	79.2	89.2
Ports	84.9	81.6	88.3	85.0	81.8	88.3
Prestn	86.6	83.5	89.9	86.7	83.6	89.9
Redng	89.3	85.5	93.2	89.3	85.6	93.1
Sheff	89.3	87.2	91.6	89.6	87.5	91.8
Shrew	85.9	81.0	91.2	86.0	81.1	91.3
Stevng	89.9	87.4	92.6	90.0	87.5	92.7
Sthend	83.4	77.9	89.3	83.4	78.0	89.2
Sund	78.8	72.5	85.7	80.4	74.5	86.8
Swanse	86.0	82.6	89.5	86.1	82.8	89.6
Truro	91.8	88.4	95.4	92.0	88.7	95.5
Tyrone	84.2	78.3	90.5	80.7	73.7	88.2
Ulster	91.3	84.5	98.8	93.0	87.2	99.0
Wirral	87.8	83.1	92.8	88.1	83.4	93.0
Wolve	89.9	86.8	93.1	89.9	86.8	93.2
Wrexm	85.3	79.7	91.3	85.7	80.2	91.5
York	83.1	77.8	88.9	83.6	78.3	89.1
England	**88.0**	**87.4**	**88.5**	**88.1**	**87.5**	**88.6**
N Ireland	**88.1**	**85.9**	**90.3**	**88.1**	**86.0**	**90.3**
Scotland	**86.8**	**85.4**	**88.3**	**87.0**	**85.6**	**88.4**
Wales	**85.4**	**83.5**	**87.4**	**85.4**	**83.5**	**87.3**
UK	**87.7**	**87.2**	**88.2**	**87.8**	**87.3**	**88.3**

Table 6.14: One-year death rate per 1,000 dialysis patient years by country

	England	**N Ireland**	**Scotland**	**Wales**
Death rate	155	161	170	202
95% CI	150–161	131–195	151–190	175–233
Median age	63.1	64.6	63.6	64.7

Table 6.15: One-year survival of established prevalent RRT patients in UK (unadjusted unless stated otherwise)

Patient group	Patients	Deaths	KM survival	KM 95% CI
Transplant patients 2006				
Censored at dialysis	15,476	358	97.6	97.4–97.9
Not censored at dialysis	15,476	388	97.5	97.2–97.7
Dialysis patients 2006				
All 2006	20,079	2,834	85.3	84.8–85.8
All 2006 adjusted age = 60	20,079	2,834	87.7	87.2–88.2
2 year survival – dialysis patients 2005				
All 1/1/2005 (2 year)	19,069	4,951	72.0	71.3–72.6
Dialysis patients 2006				
All age <65	10,754	910	91.0	90.4–91.5
All age 65+	9,325	1,924	79.1	78.3–79.9
Non-diabetic <55	5,346	268	94.6	94.6–93.9
Non-diabetic 55–64	2,963	325	88.6	88.6–87.3
Non-diabetic 65–74	3,671	582	83.9	83.9–82.6
Non-diabetic 75+	3,583	900	74.7	74.7–73.3
Non-diabetic <65	8,309	593	92.4	91.8–93.0
Diabetic <65	1,759	275	83.5	81.6–85.2
Non-diabetic 65+	7,254	1,482	79.3	78.4–80.2
Diabetic 65+	1,508	357	76.1	73.8–78.1

KM = Kaplan–Meier survival.
Cohorts of patients alive 1/1/2006 unless indicated otherwise.

CI). With over 60 centres included, it would be expected by chance that 3 centres would fall outside the 95% (1 in 20) confidence intervals. The graph shows 6 centres outside the 2 sd interval, with 2 clearly below (Airdrie and Sunderland), 2 marginally below (Nottingham 83.8 v 2 sd 84.0 and Leicester 84.7 v 2 sd 84.8) and 2 above 2 sds (Antrim and London Royal Free). Similarly to the incident survival, one centre (London West) was demonstrating a survival that was beyond 3 sds better than expected.

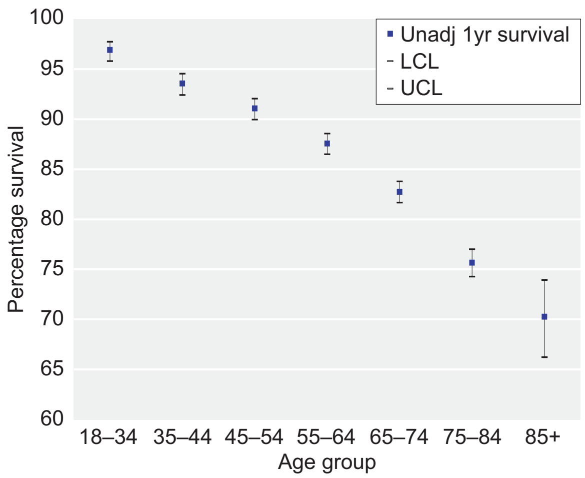

Figure 6.15: One year survival of prevalent dialysis patients in different age groups – 2006

This was a statistical outlier and excluded from calculation of the mean survival figure.

The 2006, one year death rate in prevalent dialysis patients by age band

The death rates on dialysis, by age band are shown in Figure 6.20. The younger patients are a selected higher risk group, as transplanted patients have been excluded. In younger patients, the death rate increased by about 25 per 1,000 patient years for a 10 year increase in age, while in the older age group it increased by about 100 per 1,000 patient years. This demonstrates the death rates for UK dialysis patients were lower than dialysis patients in the USA across all age bands (Figure 6.12 USRDS Report 2007).

One year survival of prevalent dialysis patients in England, Wales, Scotland and Northern Ireland from 1997–2006

For the year 2006 (Figure 6.21), there was a significant difference in the one year age

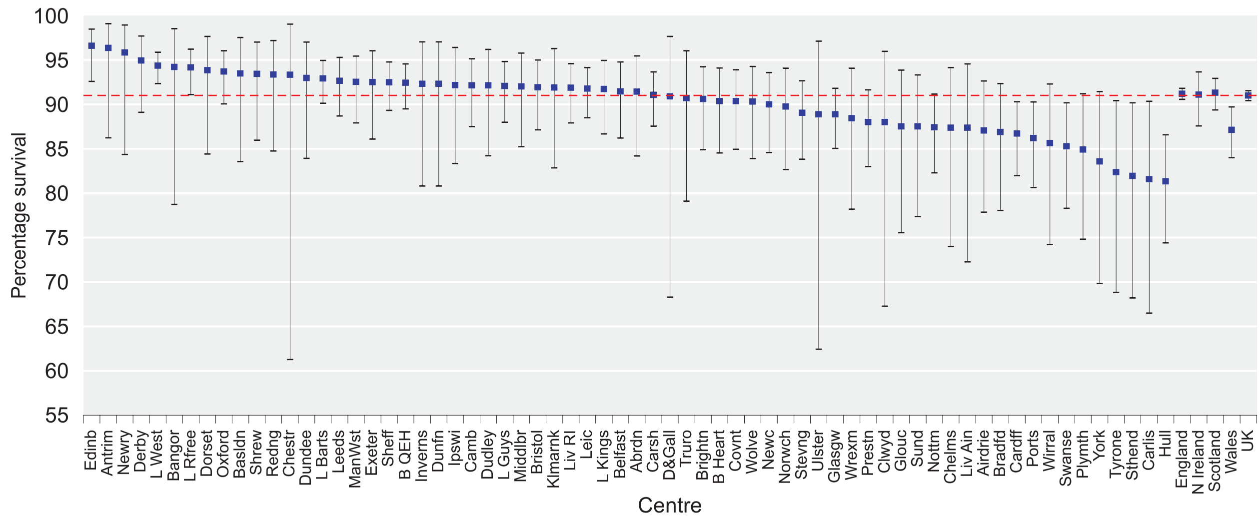

Figure 6.16: One year survival of prevalent dialysis patients aged under 65 in each centre

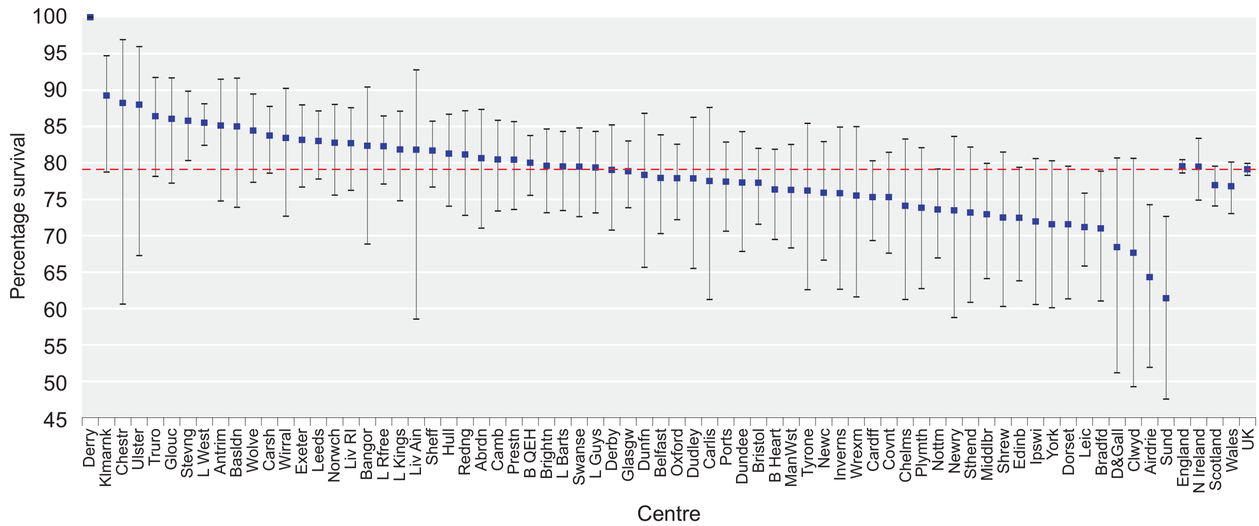

Figure 6.17: One year survival of prevalent dialysis patients aged 65 and over in each centre

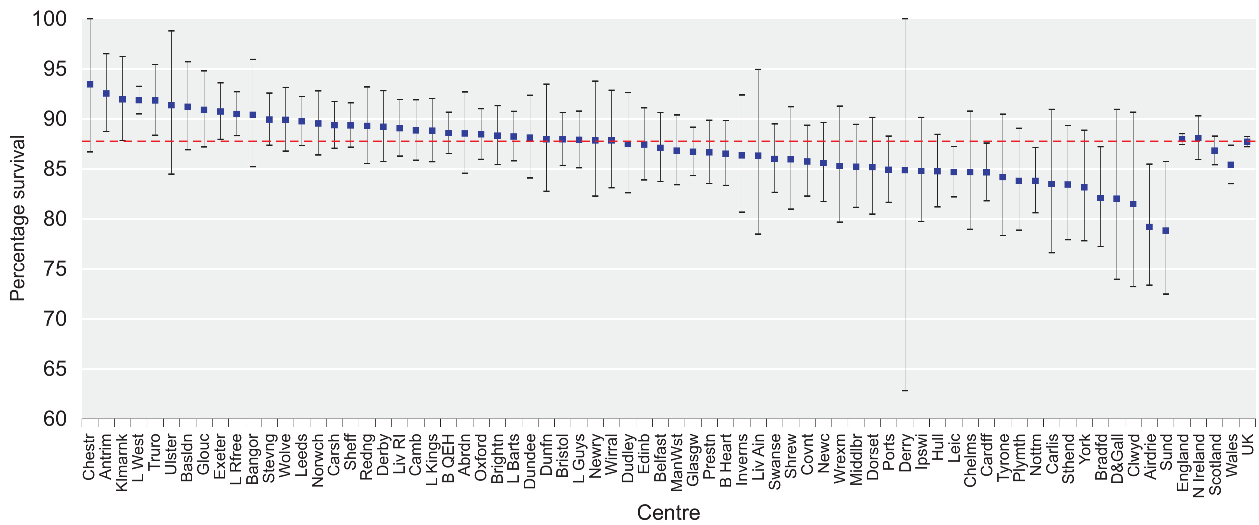

Figure 6.18: One year survival of prevalent dialysis patients in each centre adjusted to age 60

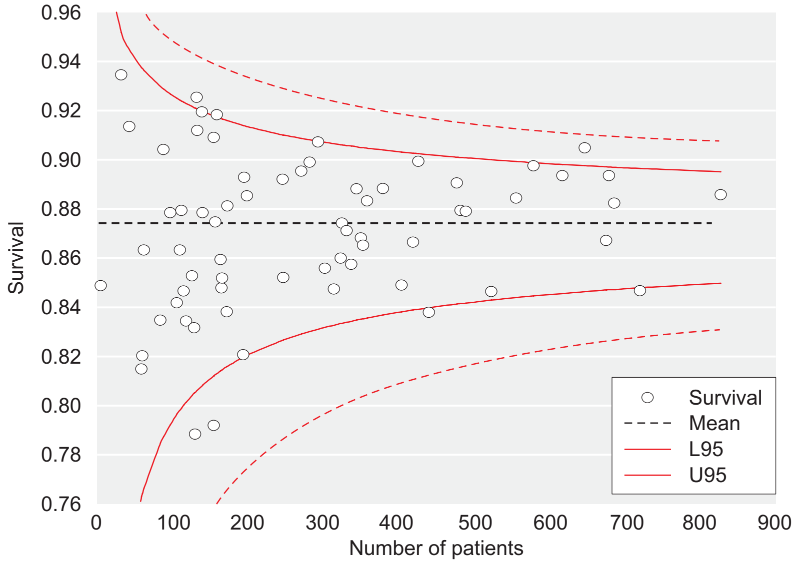

Figure 6.19: One year funnel plot of prevalent dialysis patients in each centre adjusted to age 60

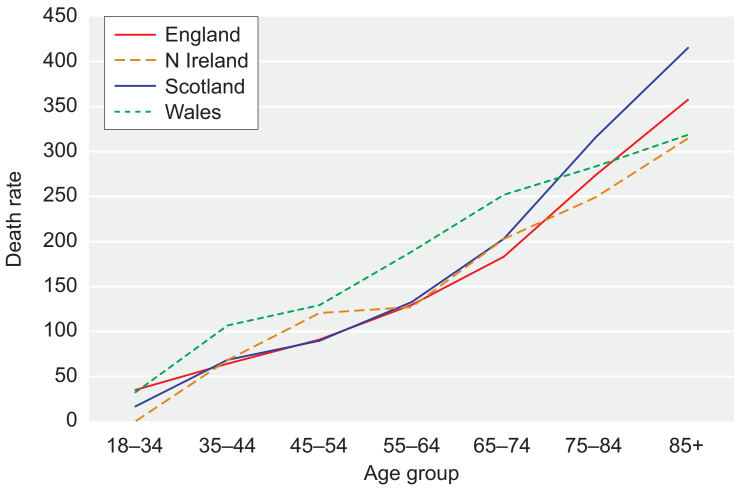

Figure 6.20: Death rate per 1,000 patients years by UK country and age group for prevalent dialysis patients

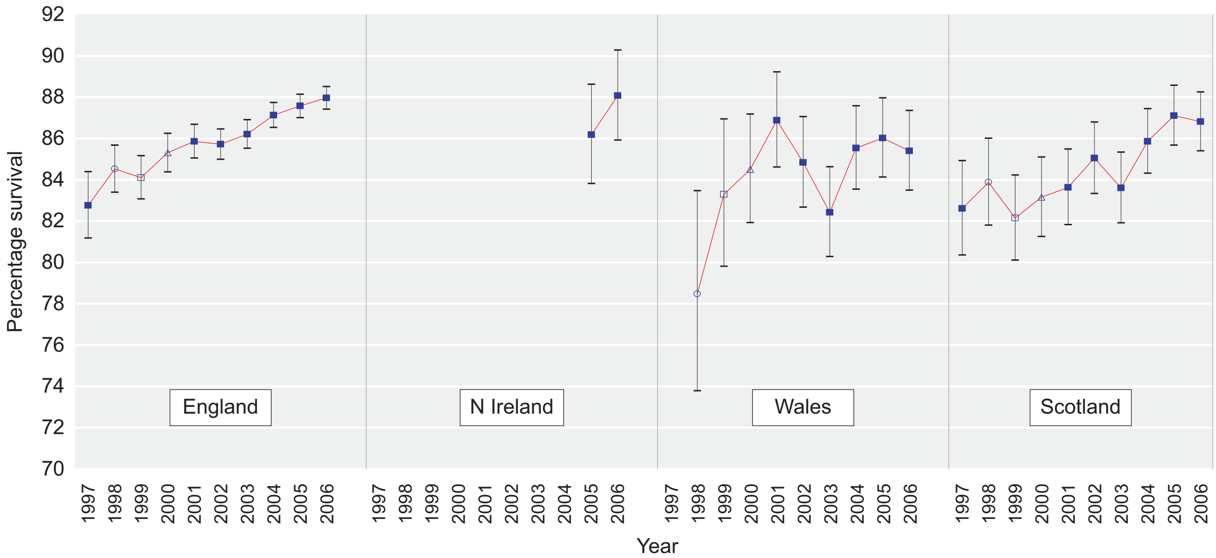

Figure 6.21: Serial one year survival for dialysis patients in England, Wales and Scotland from 1997–2006 adjusted to age 60

adjusted prevalent dialysis survival between UK countries ($p = 0.016$). The change in prevalent survival by centre over the years 2000 to 2006 is shown in Appendix 1, Table 6.19.

The data for Northern Ireland were only available for the last 2 years, so were not tested for trend. For England and Scotland, the test for a linear trend improvement in dialysis survival was significant ($p = <0.00001$ and $p = 0.0001$ respectively).

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6. Office for National Statistics http://www.statistics.gov.uk

Appendix 1: Survival tables

Table 6.16: 1 year after 90-day survival by centre for 2005 unadjusted and adjusted to age 60

Centre	Unadjusted 1 yr after 90d survival	Adjusted 1 yr after 90d survival	Adjusted 1 yr after 90d 95% CI
Abrdn	77.3	80.1	70.9–90.5
Airdrie	68.9	71.3	58.5–87.0
Antrim	81.4	87.2	79.3–95.8
B Heart	82.8	85.7	79.7–92.0
B QEH	88.3	90.2	86.3–94.3
Bangor	74.2	83.3	73.5–94.4
Basldn	85.7	89.9	81.2–99.5
Belfast	88.1	89.3	83.8–95.3
Bradfd	80.0	85.4	78.0–93.4
Brightn	77.5	84.5	78.6–90.7
Bristol	78.7	83.2	77.9–88.9
Camb	83.5	86.6	81.9–91.6
Cardff	86.3	88.6	84.2–93.3
Carlis	80.6	82.8	71.4–96.0
Carsh	90.3	92.4	88.8–96.1
Chelms	77.6	84.7	75.0–95.7
Clwyd	75.0	81.7	69.7–95.8
Covnt	84.1	86.8	79.8–94.4
D&Gall	70.1	80.7	67.1–97.0
Derby	85.1	89.3	83.2–95.7
Dorset	70.9	79.5	69.3–91.3
Dudley	96.9	97.0	91.6–100
Dundee	80.7	86.0	79.2–93.3
Dunfn	71.9	76.9	65.8–89.8
Edinb	83.1	85.9	79.8–92.6
Exeter	78.5	85.3	79.7–91.4
Glasgw	82.2	85.4	80.8–90.3
Glouc	91.3	94.4	89.3–99.8
Hull	86.0	89.0	83.8–94.5
Inverns	85.1	85.3	75.2–96.7
Ipswi	81.0	84.6	75.4–95.0
Klmarnk	92.2	93.6	86.9–100
L Barts	93.1	92.7	88.8–96.8
L Guys	91.8	92.4	88.0–97.0
L Kings	87.4	88.6	83.5–94.1
L Rfree	91.7	92.5	88.2–97.1
L West	91.7	93.1	90.2–96.1
Leeds	85.7	88.9	84.3–93.8
Leic	83.0	85.3	80.9–89.9
Liv Ain	89.9	90.9	81.7–100
Liv RI	91.1	92.2	87.7–97.0
ManWst	91.6	91.7	86.4–97.4
Middlbr	81.7	84.0	76.4–92.4
Newc	76.6	80.6	73.2–88.7
Newry	82.1	87.1	77.3–98.1
Norwch	85.5	90.7	86.1–95.5

Table 6.16: (continued)

Centre	Unadjusted 1 yr after 90d survival	Adjusted 1 yr after 90d survival	Adjusted 1 yr after 90d 95% CI
Nottm	82.2	85.8	80.4–91.5
Oxford	85.4	87.1	82.2–92.3
Plymth	75.0	81.4	72.7–91.1
Ports	82.6	83.9	78.2–90.1
Prestn	89.9	91.8	87.1–96.8
Redng	83.0	87.2	80.1–95.0
Sheff	91.1	92.8	89.0–96.8
Shrew	88.0	89.4	80.3–99.6
Stevng	76.9	79.7	71.9–88.3
Sthend	88.9	92.3	84.4–100
Sund	78.6	82.5	73.4–92.6
Swanse	78.9	85.2	79.2–91.6
Truro	85.9	90.2	81.6–99.7
Tyrone	93.3	95.9	88.8–100
Ulster	90.9	94.0	83.9–100
Wirral	82.9	87.6	79.9–96.0
Wolve	81.6	86.1	79.6–93.2
Wrexm	93.3	94.0	86.4–100
England	**85.5**	**88.3**	**87.3–89.4**
Scotland	**80.6**	**84.2**	**81.4–87.0**
Wales	**82.8**	**86.9**	**83.8–90.2**
N Ireland	**86.4**	**89.6**	**85.9–93.4**
UK	**84.8**	**87.8**	**86.8–88.8**

Table 6.17: 90-day survival by centre for 2005 unadjusted and adjusted to age 60

Centre	Unadjusted 90d survival	Adjusted 90d survival	Adjusted 90d 95% CI
Abrdn	95.3	96.6	92.8–100
Airdrie	94.9	95.7	90.2–100
Antrim	97.7	98.6	96.1–100
B Heart	96.4	97.4	94.9–99.9
B QEH	96.4	97.3	95.3–99.3
Bangor	81.6	89.5	82.4–97.1
Basldn	93.3	95.8	90.4–100
Belfast	88.2	91.3	86.9–95.8
Bradfd	91.0	94.0	89.5–98.8
Brightn	90.0	94.3	91.0–97.7
Bristol	86.3	90.5	86.9–94.3
Camb	95.8	97.0	94.8–99.2
Cardff	90.8	93.1	90.0–96.4
Carlis	100.0	100.0	–
Carsh	93.4	95.2	92.6–97.9
Chelms	78.0	86.4	78.5–95.1
Clwyd	88.9	92.9	85.9–100
Covnt	89.0	91.7	86.7–97.1
D&Gall	81.0	88.3	78.3–99.6

Table 6.17: (continued)

Centre	Unadjusted 90d survival	Adjusted 90d survival	Adjusted 90d 95% CI
Derby	97.1	98.1	95.6–100
Dorset	93.3	96.0	91.7–100
Dudley	85.0	87.8	79.3–97.2
Dundee	88.3	92.3	87.6–97.3
Dunfn	90.9	93.8	88.2–99.8
Edinb	96.0	97.0	94.2–99.9
Exeter	88.4	93.0	89.4–96.8
Glasgw	91.6	94.0	91.3–96.9
Glouc	88.5	93.5	88.6–98.7
Hull	89.6	92.8	89.0–96.7
Inverns	93.2	93.7	87.1–100
Ipswi	92.2	94.5	89.5–99.8
Klmarnk	90.7	93.0	86.7–99.7
L Barts	98.3	98.4	96.5–100
L Guys	97.8	98.1	95.9–100
L Kings	97.1	97.6	95.4–99.9
L Rfree	97.7	98.0	95.8–100
L West	97.3	98.0	96.5–99.5
Leeds	87.3	91.2	87.6–95.1
Leic	93.6	95.1	92.7–97.6
Liv Ain	93.9	95.1	88.7–100
Liv RI	87.4	89.8	85.3–94.6
ManWst	91.9	92.6	88.0–97.3
Middlbr	86.9	89.9	84.4–95.8
Newc	92.6	94.5	90.7–98.5
Newry	93.3	95.7	90.1–100
Norwch	83.8	90.9	86.9–95.0
Nottm	91.5	94.1	90.9–97.4
Oxford	95.1	96.0	93.4–98.8
Plymth	89.8	93.8	89.1–98.7
Ports	93.4	94.6	91.4–97.9
Prestn	92.9	94.8	91.4–98.4
Redng	90.0	93.8	89.4–98.3
Sheff	88.5	91.5	87.8–95.4
Shrew	92.5	94.2	88.2–100
Stevng	96.6	97.4	94.5–100
Sthend	79.4	87.5	79.5–96.4
Sund	93.2	95.3	90.9–99.9
Swanse	95.7	97.4	95.0–99.9
Truro	93.5	96.0	90.9–100
Tyrone	68.2	82.2	71.1–95.0
Ulster	84.6	90.9	80.0–100
Wirral	88.7	92.2	86.5–98.4
Wolve	90.0	93.5	89.5–97.7
Wrexm	80.4	85.8	77.2–95.4
England	**92.4**	**94.7**	**94.0–95.4**
Scotland	**92.1**	**94.5**	**92.9–96.0**
Wales	**89.9**	**93.4**	**91.3–95.5**
N Ireland	**88.6**	**92.7**	**89.9–95.5**
UK	**92.1**	**94.5**	**93.8–95.2**

Table 6.18: 1 year after 90-day survival by centre for incident cohort years 1999–2005 adjusted to age 60

	1 year after 90 days survival by centre						
Centre	1999	2000	2001	2002	2003	2004	2005
Abrdn	81.65	79.65	92.30	87.77	82.82	89.77	80.12
Airdrie	74.61	81.47	84.70	78.24	80.15	85.55	71.35
Antrim							87.17
B Heart	86.01	81.93	84.46	86.36	85.57	87.75	85.66
B QEH						88.24	90.20
Bangor				80.72	86.15	83.66	83.33
Basldn					91.61	95.08	89.89
Belfast							89.35
Bradfd			92.29	82.51	83.29	85.18	85.36
Brightn						87.96	84.46
Bristol	85.79	86.09	86.02	88.25	87.36	87.48	83.19
Camb			90.60	82.56	89.48	88.26	86.62
Cardff	88.16	89.07	84.00	82.79	89.69	86.28	88.61
Carlis	74.95	77.53	95.31	88.58	77.18	86.42	82.81
Carsh	85.62	85.73	75.76	85.27	90.37	86.74	92.38
Chelms						81.12	84.74
Clwyd				88.28	79.22	90.01	81.72
Covnt	78.76	82.87	88.45	90.80	82.18	85.48	86.78
D&Gall	87.17	87.20	74.35	77.92	85.37	88.98	80.72
Derby		87.90	85.00		83.55	86.65	89.26
Dorset					86.05	91.21	79.52
Dudley	89.14	85.82	90.12	88.10	88.22	85.35	97.04
Dundee	89.42	77.39	86.27	83.72	89.53	83.98	85.98
Dunfn	79.88	71.93	70.14	86.68	85.98	87.77	76.86
Edinb	84.74	80.27	80.31	82.34	83.49	80.40	85.94
Exeter	86.71	86.26	86.02	87.40	86.17	86.62	85.33
Glasgw	85.02	84.68	79.79	84.51	84.95	81.59	85.40
Glouc	88.01	95.00	80.63	80.62	83.62	86.09	94.45
Hull	87.82	86.40	89.74	85.19	87.48	86.22	88.99
Inverns	94.13	84.03	91.65	83.47	88.34	83.47	85.25
Ipswi				98.24	93.70	90.87	84.61
Klmarnk	90.43	91.40	88.18	87.22	85.22	83.85	93.57
L Barts						87.55	92.72
L Guys		89.20	88.08	84.67	95.46	88.18	92.41
L Kings				88.39	86.37	88.27	88.64
L Rfree							92.54
L West				92.57	94.62	91.99	93.08
Leeds	79.89	90.43	88.51	84.38	86.90	89.72	88.94
Leic	85.68	84.81	87.57	88.24	91.68	85.53	85.31
Liv Ain							90.85
Liv RI			87.70	84.68	82.54	83.28	92.19
ManWst					87.94	82.77	91.74
Middlbr	80.87	88.40	83.72	78.45	82.23	85.09	84.02
Newc				87.77	88.86	82.83	80.56
Newry							87.10
Norwch						86.10	90.68
Nottm	86.70	89.96	89.34	86.65	86.28	83.60	85.81
Oxford	94.17	89.89	85.63	88.22	87.40	90.70	87.07
Plymth	82.05	86.18	73.02	81.08	81.30	81.20	81.38

Table 6.18: (continued)

	1 year after 90 days survival by centre						
Centre	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Ports			87.11	85.94	88.14	87.49	83.91
Prestn	87.91	86.83	86.41	86.83	86.48	84.42	91.81
Redng		75.96	81.44	90.92	90.06	93.01	87.22
Sheff	85.21	94.75	93.74	83.54	89.99	88.87	92.80
Shrew						88.10	89.39
Stevng	86.83	91.35	80.77	87.29	94.80	87.86	79.70
Sthend	87.72	81.36	80.83	85.96	90.46	88.45	92.26
Sund	80.99	85.00	84.70	69.37	81.13	87.33	82.46
Swanse		84.95	84.18	82.64	81.25	82.76	85.17
Truro			91.40	83.60	88.46	93.16	90.18
Tyrone							95.95
Ulster							94.04
Wirral				76.01	94.15	80.97	87.59
Wolve	86.18	87.79	76.53	86.49	82.95	87.59	86.15
Wrexm	80.31	83.32	82.93	92.99	81.88	91.74	94.01
York		83.16	85.42	80.91	76.65	89.20	84.69
England	**85.50**	**87.50**	**86.26**	**86.09**	**87.99**	**87.47**	**88.30**
N Ireland							**89.60**
Scotland	**85.13**	**81.85**	**82.62**	**83.63**	**85.19**	**83.77**	**84.17**
Wales	**86.75**	**87.11**	**84.08**	**84.18**	**85.88**	**85.68**	**86.95**
UK	**85.52**	**86.41**	**85.59**	**85.59**	**87.47**	**86.95**	**87.83**

Chester and Derry have been excluded as these centres were too small to calculate a single year survival figure.

Table 6.19: 1 year survival by centre for prevalent cohort years 2000–2006 adjusted to age 60

	1 year survival by centre and year						
Centre	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Abrdn	85.8	89.3	87.2	80.4	85.3	87.4	88.5
Airdrie	77.3	76.8	81.2	83.6	84.2	82.6	79.2
Antrim						83.5	92.5
B Heart	86.6	87.4	87.8	87.4	87.3	87.8	86.5
B QEH					89.0	89.1	88.6
Bangor			86.0	81.5	89.7	86.7	90.4
Basldn				82.8	88.5	91.2	91.2
Belfast						86.5	87.1
Bradfd		77.6	87.9	82.6	87.9	86.1	82.1
Brightn					86.6	84.4	88.3
Bristol	87.2	86.3	87.8	89.0	86.9	87.6	87.9
Camb		85.9	86.6	87.1	87.5	87.8	88.8
Cardff	85.2	85.7	86.0	81.1	84.5	84.5	84.6
Carlis	82.8	88.8	80.6	83.0	82.5	85.8	83.5
Carsh	83.6	83.6	82.9	85.3	88.6	86.7	89.3
Chelms					86.4	81.7	84.7
Chestr				85.9	93.1	88.5	93.4
Clwyd			87.9	87.6	75.8	82.3	81.5
Covnt	87.2	85.7	85.1	87.8	88.6	89.5	85.7
D&Gall	87.2	83.9	84.6	86.3	83.1	91.3	82.0
Derby	88.8	89.5		86.5	88.8	88.4	89.2

Table 6.19: (continued)

	1 year survival by centre and year						
Centre	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**
Derry							84.9
Dorset				90.0	88.3	89.7	85.2
Dudley	85.4	83.3	83.2	84.7	86.7	86.3	87.5
Dundee	76.7	85.7	84.9	84.0	85.4	87.9	88.1
Dunfn	76.1	78.6	82.1	83.5	88.9	91.0	87.9
Edinb	83.7	82.5	84.8	83.8	86.3	86.5	87.4
Exeter	85.9	84.9	87.2	86.3	85.8	84.0	90.7
Glasgw	86.1	83.4	86.0	83.8	85.8	87.6	86.7
Glouc	89.0	78.7	83.7	81.7	89.0	88.3	90.9
Hull	81.0	86.7	87.5	85.3	85.8	84.7	84.7
Inverns	80.8	88.8	88.3	87.4	87.5	87.1	86.3
Ipswi			81.7	85.5	90.3	86.4	84.8
Klmarnk	80.2	85.3	82.5	82.0	86.9	84.5	91.9
L Barts					84.1	85.5	88.2
L Guys	86.1	86.9	86.2	88.7	88.7	89.3	87.9
L Kings			81.0	77.8	81.5	86.5	88.8
L Rfree						90.3	90.5
L West			90.2	91.5	91.3	92.1	91.9
Leeds	83.2	85.9	87.4	86.0	85.4	89.0	89.7
Leic	83.2	84.7	84.1	83.8	85.3	87.3	84.7
Liv Ain		92.5	90.5	90.5	86.4	96.8	86.3
Liv RI		81.4	82.4	85.2	86.4	84.1	89.0
ManWst				85.1	82.2	84.1	86.8
Middlbr	84.0	84.0	84.2	84.3	82.9	86.0	85.2
Newc			83.9	81.7	82.8	87.6	85.6
Newry						85.9	87.8
Norwch					86.3	86.9	89.5
Nottm	85.0	87.0	82.8	85.2	86.3	85.2	83.8
Oxford	87.9	88.5	85.5	86.8	87.9	87.7	88.4
Plymth	84.9	87.4	76.8	85.2	86.9	88.0	83.8
Ports		83.7	81.1	81.5	89.0	86.3	84.9
Prestn	85.6	87.1	86.2	84.5	85.8	85.6	86.6
Redng	83.5	78.3	84.9	82.9	89.8	87.2	89.3
Sheff	84.1	87.9	90.3	91.1	87.7	87.0	89.3
Shrew					84.8	87.8	85.9
Stevng		90.9	86.7	88.4	89.5	88.9	89.9
Sthend	85.1	88.7	88.7	86.9	88.7	86.3	83.4
Sund	76.7	79.3	77.6	75.5	82.8	86.5	78.8
Swanse	83.9	88.1	80.9	82.4	87.9	89.5	86.0
Truro		88.9	82.4	90.2	89.9	85.8	91.8
Tyrone						89.1	84.2
Ulster						85.9	91.3
Wirral			91.6	84.4	85.6	88.6	87.8
Wolve	84.2	90.1	86.3	83.5	86.6	87.9	89.9
Wrexm	83.9	87.7	86.9	85.3	85.7	84.2	85.3
York	87.1	78.9	84.6	81.6	82.6	89.0	83.1
England	**85.3**	**85.9**	**85.7**	**86.2**	**87.1**	**87.6**	**88.0**
N Ireland						**86.2**	**88.1**
Scotland	**83.2**	**83.6**	**85.1**	**83.6**	**85.9**	**87.1**	**86.8**
Wales	**84.5**	**86.9**	**84.8**	**82.4**	**85.5**	**86.0**	**85.4**
UK	**84.9**	**85.6**	**85.6**	**85.6**	**86.9**	**87.4**	**87.7**

Appendix 2: Statistical 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 accounting for the characteristics of the members of that cohort. 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 are interpreted using a hazard ratio. When comparing two groups, the hazard ratio is the ratio of the estimated hazards 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 this ratio remains constant throughout the period under consideration. Whenever used, the proportional hazards model was tested for validity.

Validity of the centre adjustment for proportional hazards

For the Cox model to be used to adjust centre survival to a specific age (eg 60 years), the assumption of constant proportionality means that the relationship of survival (hazard of death) to age is similar in all centres within the time period studied. If one centre had a relationship of survival with age different from the other centres, the adjustment would not be valid. Testing showed the relationship to be similar for all centres.