Appendix D
Methodology used for analyses of PCT incidence and prevalence rates and of standardised ratios

Described here are the methods for calculating the standardised acceptance ratios for the incident UK RRT cohort, the standardised prevalence ratios for the total UK RRT cohort and the ratios for prevalent transplant patients.

Patients

For the acceptance rate analyses, all new cases recorded by the Registry as accepted on to RRT in each year were included. For the prevalence rates analyses, prevalent patients at the end of the year were included. The analyses used the patient postcode rather than the GP postcode. Each postcode was matched to a 2001 Census output area and hence to the relevant area code.

Years used

Analyses have been done for each of the last 6 years. Combined analyses have also been done using the data from as many of the years as are available for each area. This combined analysis is especially useful for the acceptance rates and rate ratios analyses as there can be small numbers of incident patients particularly in the smaller areas.

Geography

The areas used were the 152 (English) Primary Care Trusts (PCTs), the 22 Welsh local health boards, the 32 Scottish council areas and the 26 Northern Ireland district council areas – these different types of area are collectively called PCTs here.

Prior to 2007, only some of the boundaries of PCTs and Local Authorities (LAs) in England were similar. There were roughly twice as many PCTs as LAs and the registry reports published analyses by LA in the main report and prevalence rates by PCT as an appendix. In October 2006, the Office for National Statistics reduced the number of PCTs and re-aligned many of the PCT boundaries in England with those of Local Authorities. As a result, in the 2008 Report these analyses will be presented by PCT (not LA). For data for years before the boundaries changed, patients are allocated to the new PCTs as they are now. In Northern Ireland, Scotland and Wales, the Health Authority boundaries align with the LAs and these areas have been included along with the English PCTs in the tables.

Areas included in the UK Registry 'covered' population

Up until now, not all renal centres have been sending data to the Registry. This means estimates could not be

obtained for all PCTs but only for those which were covered by the Registry in the relevant year. The UKRR identified all areas which were estimated to have complete coverage and analyses were restricted to those areas. Whether an area was covered or not was dependant on whether the renal centre in the area was sending data to the UKRR and whether there were any overlapping areas with renal centres not yet connected to the UKRR.

Due to various renal centres beginning to send data to the UKRR at different times, the covered PCTs are different for the analyses for each year. For example, for the 2007 data, 148 of the 152 English PCTs and all parts of Wales, Scotland and Northern Ireland were covered by the Registry. This is a total coverage of 228 areas out of 232.

Population data

Mid-2006 population estimates were obtained from the ONS website (www.statistics.gov.uk) by PCT, gender and age group. These 2006 estimates have been extrapolated by the ONS from the 2001 census data. The areas range in population size from 17,000 (Moyle in NI) to 1.27 million (Hampshire).

This 2006 population data is used for the analysis for each year. As the analyses only cover 6 years this was a reasonable approximation.

Calculation of rates and rate ratios

Crude rates

The crude rates, per million population (pmp), were calculated for each PCT for each year:

$$1{,}000{,}000 \times (\text{observed number})/(\text{population size})$$

Confidence intervals have not been calculated for these rates but, if required, an assessment can be made of whether the rate for a given area is consistent with the rate in the whole covered population. This can be done by using the figures provided in the relevant report chapters showing the confidence intervals around the overall average rates for a range of PCT population sizes. These confidence intervals have been obtained using the Normal approximation to the Poisson distribution. For the incident analyses, confidence intervals have only been calculated around the overall average for populations of over 80,000. This is because below this level the number of cases you would expect per area is low and so the Poisson distribution is skewed and the Normal approximation is not appropriate. Due to the prevalence rates being higher, the plot for these can cover lower population sizes.

For the combined years analyses the observed cases are summed over the available years and the population is multiplied by the number of years that the area has been covered for. For example, if area × (population 100,000) became a covered area for the first time in 2006 and had 14 new patients in 2006 and 19 in 2007 then the combined years crude rate would be $1{,}000{,}000 \times (14 + 19)/(2 \times 100{,}000) = 165$ pmp. Again, this is a rate per million population per year. It is an average over the available years.

Note that when using the figures mentioned earlier in this section to assess how different an area's combined years crude rate is from the overall average then the population shown on the x-axis should be the area's population multiplied by the number of years of data that has been used (e.g. 2 for the example above). By doing this, the confidence intervals obtained become narrower as the analysis is now based on more than one year of data.

Standardised acceptance/prevalence ratios (SRR/SPR or just SR)

There are large differences in acceptance and prevalence rates for RRT between age and gender groups. As there are also differences in the age/gender breakdowns of the different areas it is useful to produce estimates standardised for age and gender. The method used is *indirect standardisation.*

Observed cases (O_i) were calculated by summing all cases in all age and gender bands for each PCT. Expected cases (E_i) for each PCT were calculated as follows:

> Overall crude rates (for each year) were calculated for the whole covered population (the *standard population*) by summing the observed numbers, over the PCTs, for each age/gender band and dividing this by the total covered population in that age/gender band. These crude rates (by age/gender band) were then multiplied by the population each PCT has in each band to give the number of cases expected in that band if that PCT had the same rates as the standard population.

These expected numbers were then summed over the age/gender bands to give an expected total number of cases in each PCT. The age/gender standardised ratio (SR) for PCT i is then O_i/E_i.

The expected number of cases is the number you would see if the rates seen in the standard population applied to that individual PCT's age/gender breakdown. 95% confidence intervals were calculated for each area using an error factor (EF) as follows:

$$\mathrm{LCL} = \mathrm{SR}/\mathrm{EF}$$

$$\mathrm{UCL} = \mathrm{SR} \times \mathrm{EF}$$

where $\mathrm{EF} = \exp(1.96\sqrt{(O_i)})$

A SR of 1 indicates that the area's rate was as expected if the age/gender rates found in the total covered population applied to the PCT area's population structure; a value above 1 indicates that the observed rate was greater than expected given the area's population structure, if the lower confidence limit was above 1 this was statistically significant at the 5% level. The converse applies to standardised ratios under one.

The combined years analyses are similar to the above except that the observed and expected numbers are summed over the years.

Remaining variability between rates

Even after standardisation there remains a large amount of variability between PCTs – as can be seen by the large numbers of significantly low or high rate ratios. This is partly because these ratios have only been adjusted for age and gender and have not been adjusted for ethnicity. Much higher rates are expected in populations with a high percentage of patients from South Asian and Black backgrounds.

Caution needed when comparing a PCT's standardised incidence or prevalence ratios over time

As the covered areas have changed over time, the 'total' population used for standardisation is different each year. For example, the rate ratios for 2005 and 2006 are not strictly comparable as they are standardised to different populations. However, for most years the change in numbers of covered areas is relatively small.