Chapter 16
International Comparisons with the UK RRT Programme

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Key Words

Acceptance rates · Dialysis · End stage renal disease · End stage renal failure · Haemodialysis · Incidence · International comparison · Peritoneal dialysis · Renal Registry · Renal replacement therapy · Transplantation

Abstract

Background: International comparisons between renal registries are important to highlight epidemiological and practice differences in RRT provision between countries. This report aims to compare the rates of RRT incidence and prevalence in the UK with a number of different countries. *Methods:* Data from 19 countries or regions between 2003 and 2007 from four international renal registries were analysed. Rates of RRT incidence, prevalence, transplantation and dialysis modality were compared. A crude mortality rate for each country was calculated. *Results:* Despite continued growth, the UK ranked 16th highest in incidence rate and 15th in prevalence rate in 2007. This may partly be related to successful primary care preventing stage 5 CKD. The UK had the 8th fastest rate of increase in RRT prevalence of 18 countries (4.2%/year). The age profile of UK RRT patients was comparable with other countries. The UK had the 6th highest use of home dialysis therapies. The UK has the 8th highest incidence and 9th highest prevalence rate of kidney transplantation of 16 countries. *Conclusion:* Meeting the growing demand for RRT is a problem for all countries that choose to offer it. The UK continues to provide for growth in demand for RRT.

Introduction

The number of patients receiving renal replacement therapy worldwide has been rising on an annual basis. It has previously been recognised that there is marked international variation in the rates of incident and prevalent RRT patients, as well as rates of transplantation. The recognition of this variation, by the comparison of results of a number of national renal registries, has generated hypotheses for a number of studies to investigate the underlying reasons behind the observed variation in practice [1–3].

The aim of this chapter is to compare epidemiological factors relating to the provision of renal replacement therapy across a number of different countries representing a spectrum of economic, cultural and geographic backgrounds.

Methods

Data used in this chapter are from National and International registries, specifically:

- The United Kingdom Renal Registry (UKRR)
  - *http://www.renalreg.org*
- The United States Renal Data System (USRDS)
  - *http://www.usrds.org/2008/view/esrd_12.asp*
- The European Dialysis and Transplant Association/European Renal Association (EDTA/ERA)
  - *http://www.era-edta-reg.org/index.jsp?p=annrep*
- The Australian and New Zealand renal database (ANZDATA)
  - *http://www.anzdata.org.au/v1/index.html*

All of the collated and summarised unadjusted data are published and in the public domain. Links to the reports are cited above.

The USRDS has well defined data specification in its collection forms. It is thus in the best position to collate a large amount of information from countries and registries across the world. The ERA/EDTA undertakes a similar exercise for many European countries, and the ANZDATA registry provides very comprehensive data for the Australia/New Zealand population. Whilst other detailed audit data, such as that collected by iDOPPS, are undoubtedly important in drawing international comparisons and provoking discussion, they were not included in the analyses.

The analyses concentrate on the basic demographics of RRT, to highlight the position of the UK in providing this treatment, and to describe the evolving size and practice patterns in the use of RRT globally. These analyses have principally used some of the well defined and organised unadjusted data supplied from around the world to the USRDS for the years 2003 to 2007. For the sake of clarity, data are not shown for all countries in the USRDS report. Instead, 19 countries or regions were selected that represent a spread of global geography, culture and economies.

The only deviation from the USRDS report data is for the UK analysis. This is currently reported in the USRDS as two parts – England/Wales/Northern Ireland as one group and Scotland as another. For this chapter the UK is defined as it should be with the raw data combined.

Limitations of methods

These have been well described in iterations of this chapter in previous reports. Complete congruence of data definitions, timeline events and even the age ranges reported is challenging. There is now much more agreement than before, and the specification of the USRDS data collection form has gone some way to help achieve this. The data used here is for countries that submitted complete data for the period 2003–2007 enabling analysis of trends across the globe over the 5 year period.

Results

Incidence of RRT

The incidence of patients starting RRT gives an indication of the immediate demand for treatment. Increasing incidence and/or better survival of prevalent patients is what drives the annual increases in the number of patients receiving treatment.

The median incidence of these selected countries in 2007 was 136 pmp. The incidence of new patients starting RRT varied from 13 pmp (Bangladesh) to 415 pmp (Taiwan). The UK ranked 4th lowest amongst the countries studied at 109 pmp (figure 16.1). The median annual increase in RRT incidence was 3.5% per annum. Some countries (New Zealand, Finland and
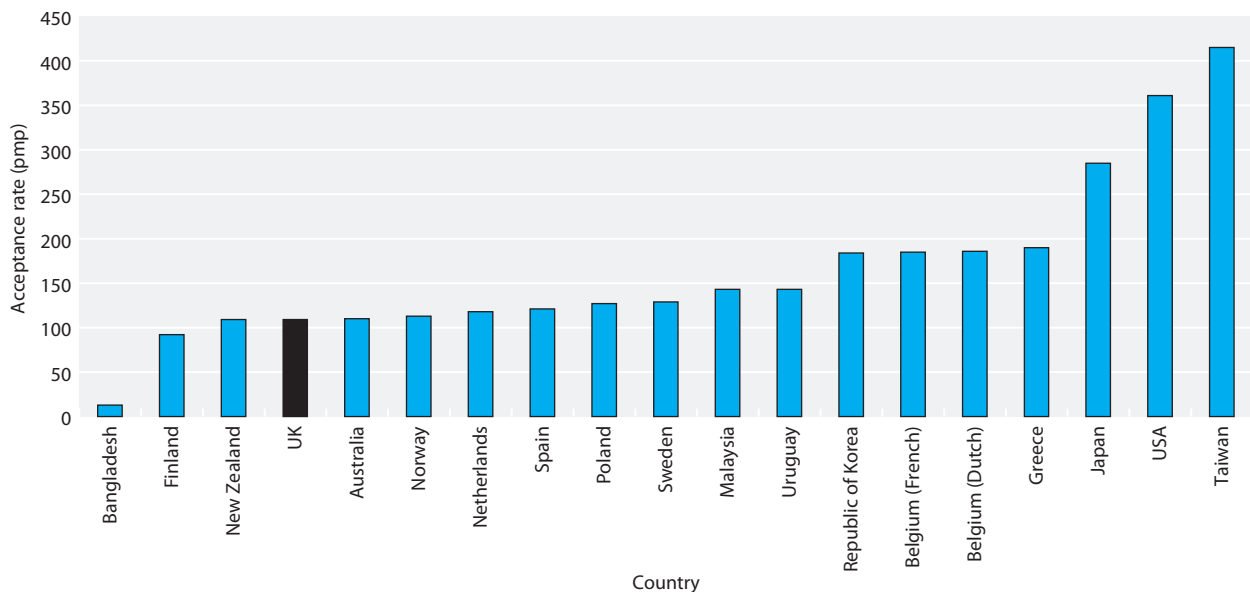
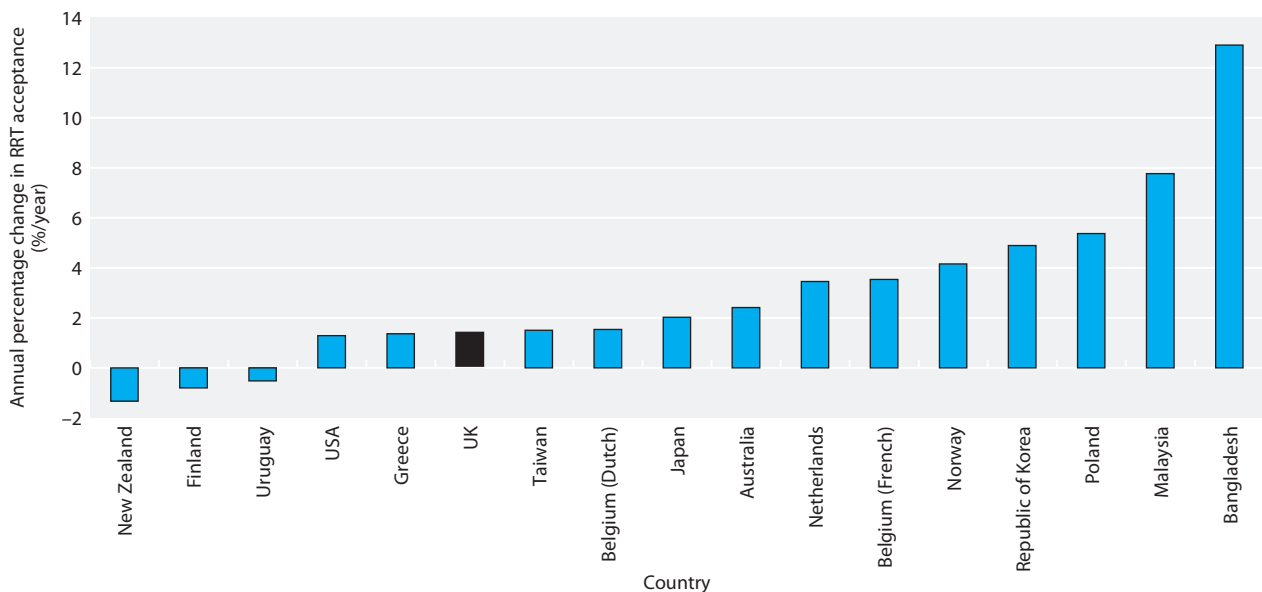**Fig. 16.1.** Annual RRT acceptance rate (pmp) by country in 2007
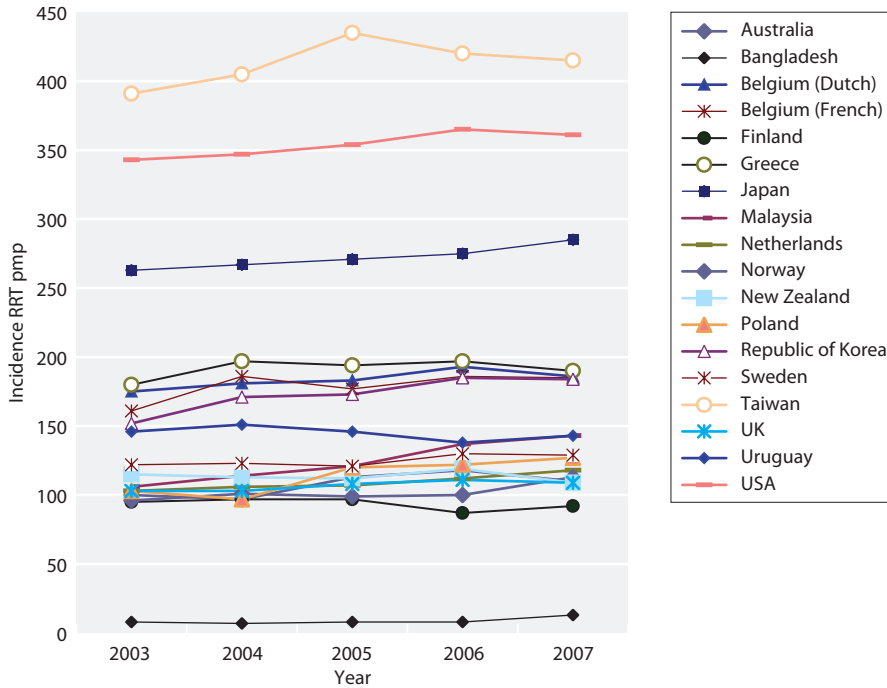
Fig. 16.2. Incidence of RRT between 2003 and 2007

Uruguay) even showed a fall in their incidence rates (figures 16.2 and 16.3).

Prevalence of RRT

The prevalence of RRT is the principal determinant of the need for resource and funding required to treat severe kidney disease. Planning for the future using accurate past data to generate forecast models is now a cornerstone in providing adequate capacity to treat growing numbers of patients. The point prevalence of the selected countries at the end of 2007 varied over 20 fold (Bangladesh 99 pmp v. Taiwan 2,288 pmp). The UK (746 pmp) ranked 15th highest of the 19 countries included (figure 16.4). Three countries (USA, Taiwan and Japan) had considerably higher prevalence than others, whilst Bangladesh had the lowest in this cohort (figure 16.5).

Fig. 16.3. Annual percentage change in RRT acceptance rate between 2003 and 2007
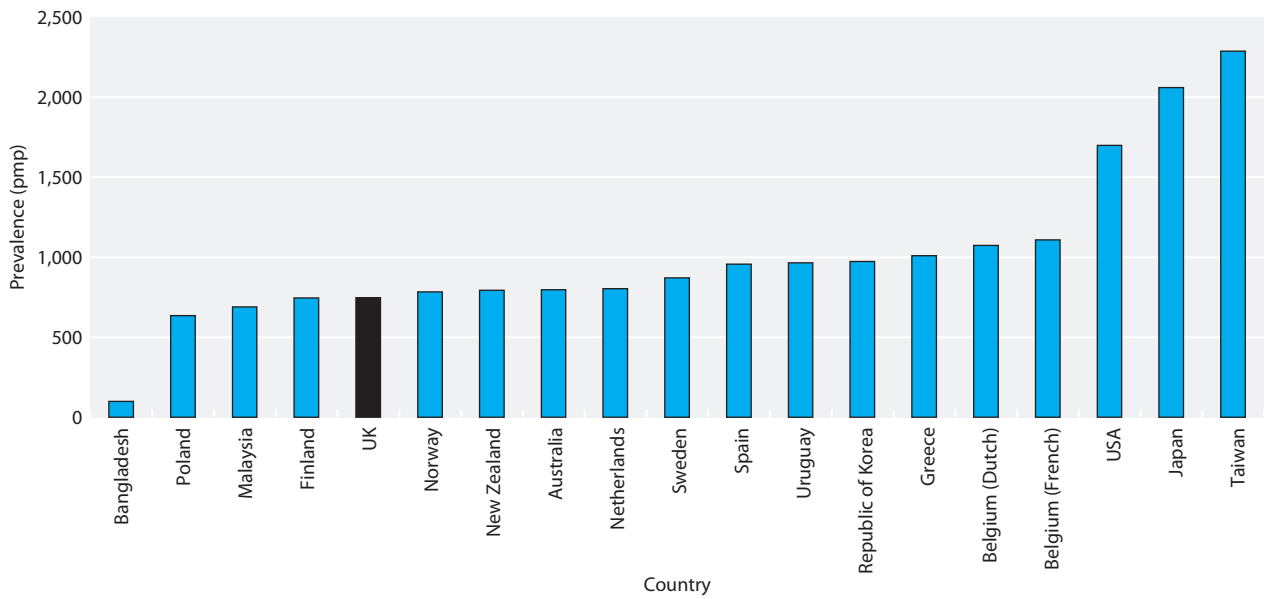
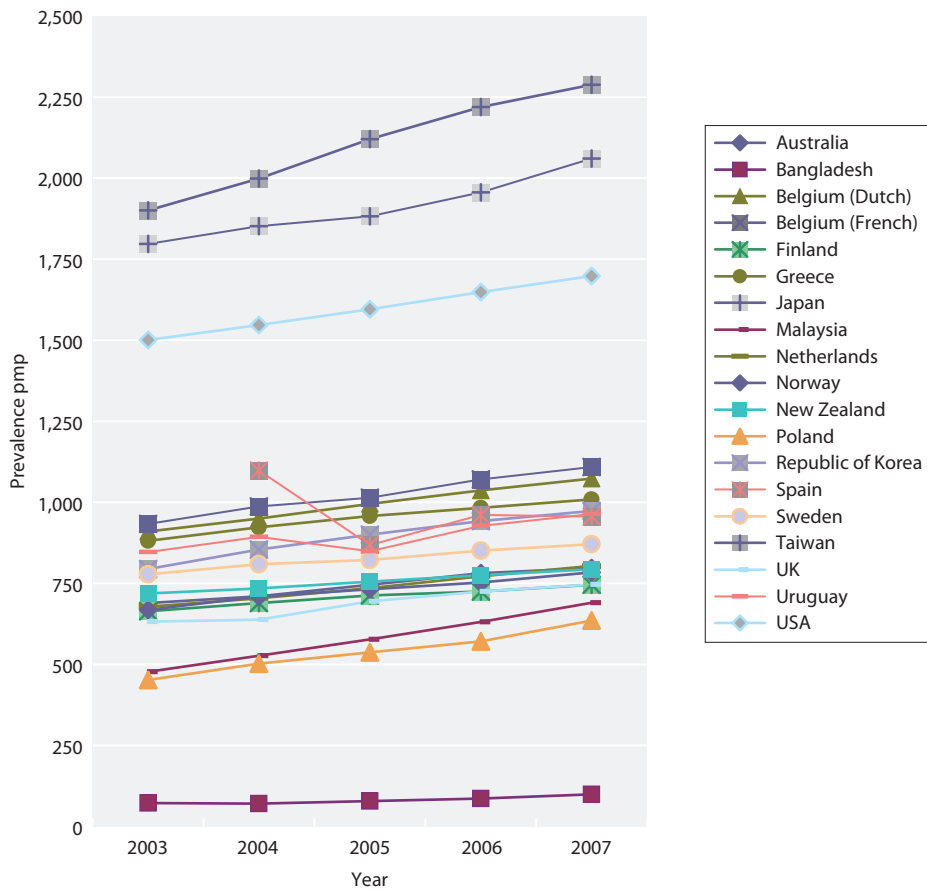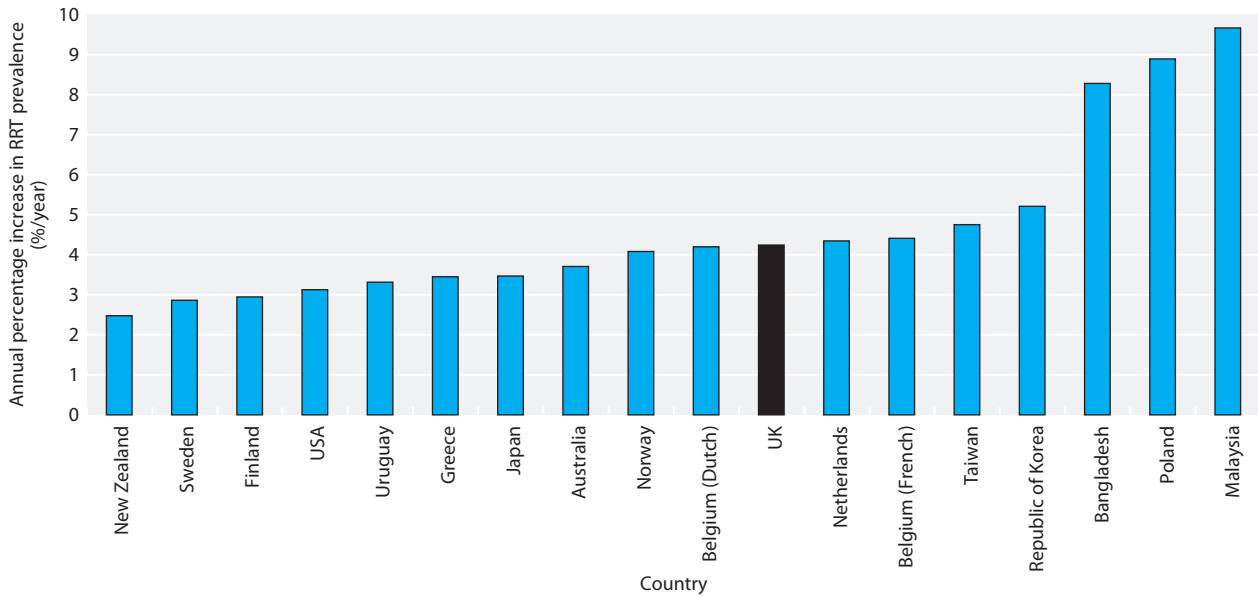**Fig. 16.4.** Prevalence of RRT (pmp) by country in 2007

**Fig. 16.5.** Prevalence of RRT between 2003 and 2007

Fig. 16.6. Annual percentage increase in RRT prevalence between 2003 and 2007

Despite the large variability in prevalence, there was sustained growth in the number of treated patients in all the countries. The median annual increase in RRT prevalence was 3.9% per year. This increase varied from 2.5%/year in New Zealand to 9.7%/year in Malaysia (which has a relatively new public funded dialysis programme). The UK RRT prevalence grew at a rate of 4.2%/year (figure 16.6).

Relationship between incidence and prevalence
There was a very clear relationship between incidence and prevalence rates across all countries in 2007, as demonstrated in figure 16.7.
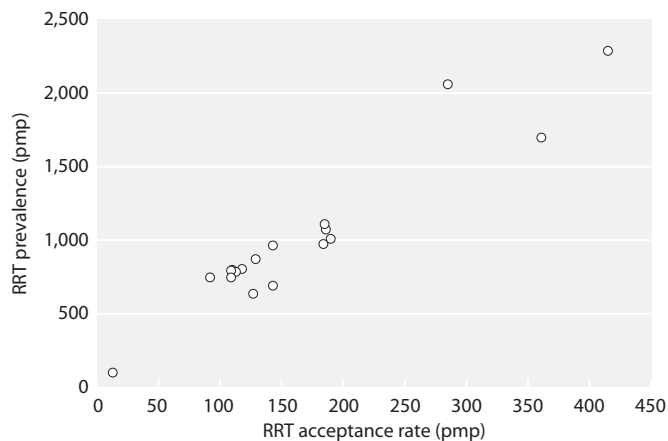

Fig. 16.7. Relationship between RRT prevalence and annual acceptance rate in 2007

Estimated crude annual mortality on RRT
Using the incidence rate per annum and the prevalence data the average crude mortality for the period 2004–2007 was estimated. The estimate required several assumptions. If the annual incident patients all remained on RRT, at the end of the year the new prevalence should be the previous year's prevalence plus the incidence. However, this is never the case as patients also leave the RRT programme. The vast majority of these 'leavers' are patients who died, with a very small number presumably either recovering function or leaving the country. The difference between the estimated prevalence and the actual prevalence thus principally represents the death rate. In this section the average death rate as a percentage of the programme size was calculated for the period 2004–2007. It should be recognised that there are a number of limitations to this methodology. First, this is a crude mortality calculation based upon prevalent patients as opposed to the UKRR's preferred method of measuring survival in incident patients. Second, the raw data were not available to adjust for a number of factors which would be expected to influence outcome, such as: age, ethnicity, duration, primary renal disease or other comorbidity, expected survival in the native population or RRT modality, for example. These results should therefore be interpreted with caution.

The highest mortality was in the USA at 18.7% per annum. The UK ranked 11th highest at 11.1% (figure 16.8). After accounting for Bangladesh as an outlier,
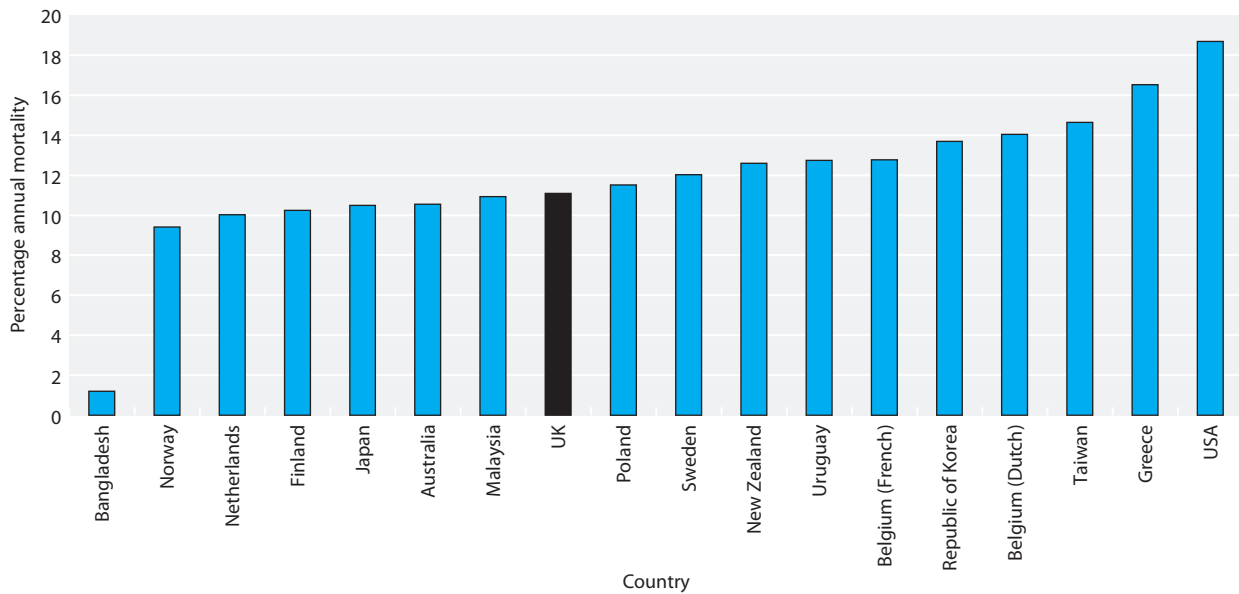
Fig. 16.8. Crude average annual mortality 2004–2007

there is no relationship seen between the size of the country's RRT programme and the estimated crude mortality (figure 16.9).

Treatment modality

Although it is clear that all countries that choose to treat severe kidney disease using RRT face having to treat more and more patients, the methods used to deliver treatment differ substantially. In this analysis, the focus was on traditional methods i.e. dialysis and transplantation in this analysis. However many countries are starting to challenge the concept that treating all patients using RRT is appropriate. This may be particularly applicable to those who are very elderly and/or have severe medical comorbidities and who are also heavily physically dependent.

The whole area of 'non dialytic therapy' or 'conservative management' is controversial, but some programmes have a high proportion of such patients who may have a prognosis not dissimilar to those treated with RRT. Collecting data on such cohorts is a challenge for the future of all registries and is dependent on agreeing definitional criteria that are currently disparate and confusing. The UKRR is starting to collect electronic data on all stage 5 CKD patients so that the number of these patients can be identified and outcomes investigated.

The mode of RRT used is dependent on many factors including finance, availability, attitudes of nephrologists, transplant expertise, geography, cultural and religious beliefs. The variation in RRT modality is demonstrated in figure 16.10. Detailed data for dialysis modes also show disparate international practice. In all countries studied haemodialysis is the most common mode of dialysis ranging from 64.5% (New Zealand) to 100% (Bangladesh) (figure 16.11).

Some countries have embraced home therapy more than others. New Zealand leads the way with 51.8% of dialysis patients treated at home rather than 'in centre'. The UK home patients constitute 20.7% of all dialysis numbers, ranking 6th of the 18 countries. Home haemodialysis was also most prevalent in New Zealand (15.9% of all dialysis) with the UK ranking 6th again at 1.9%. In some countries with large dialysis programmes, home
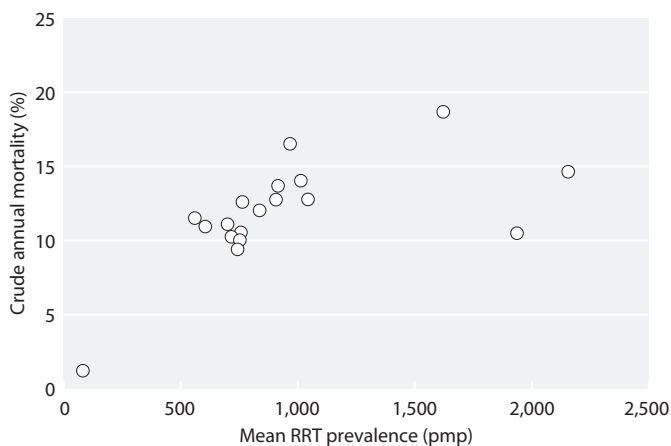
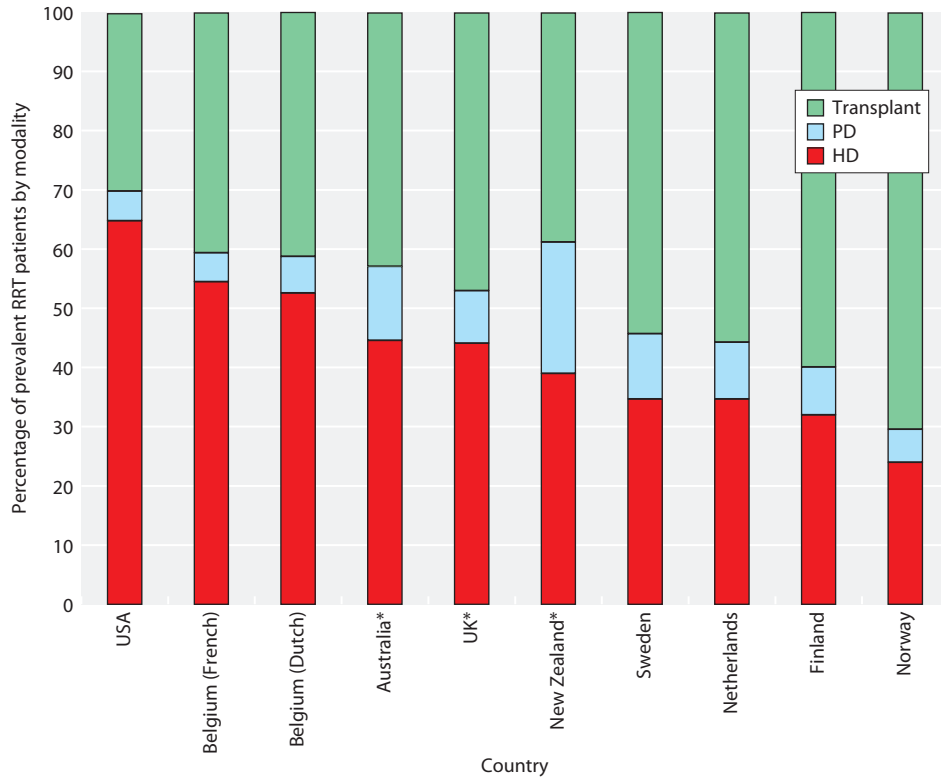**Fig. 16.9.** Relationship between crude annual mortality and average prevalence 2004–2007

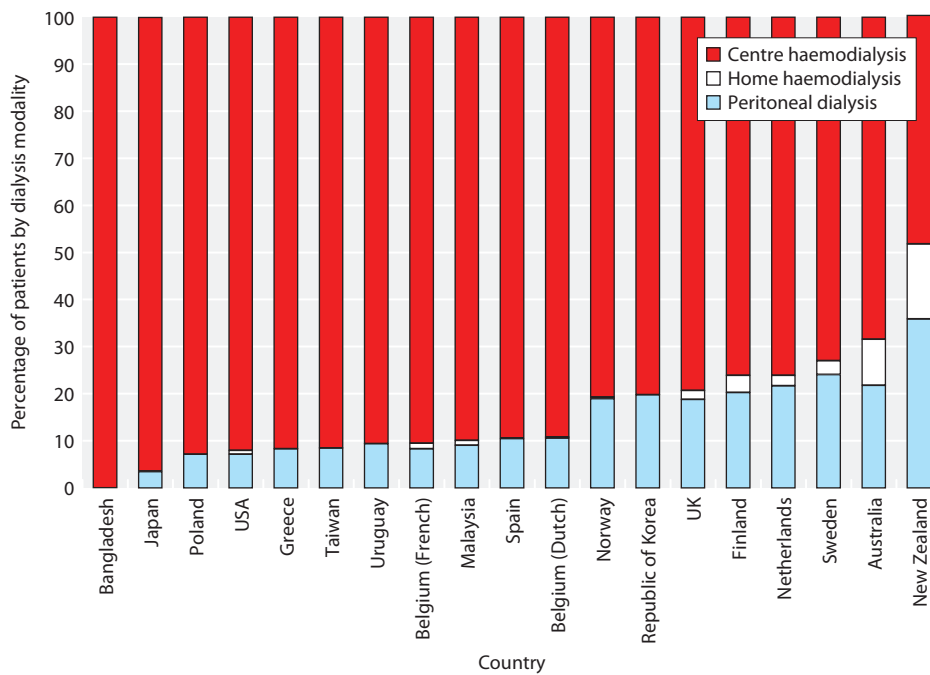**Fig. 16.10.** Proportion of prevalent RRT patients by modality (2007 and 2008*)
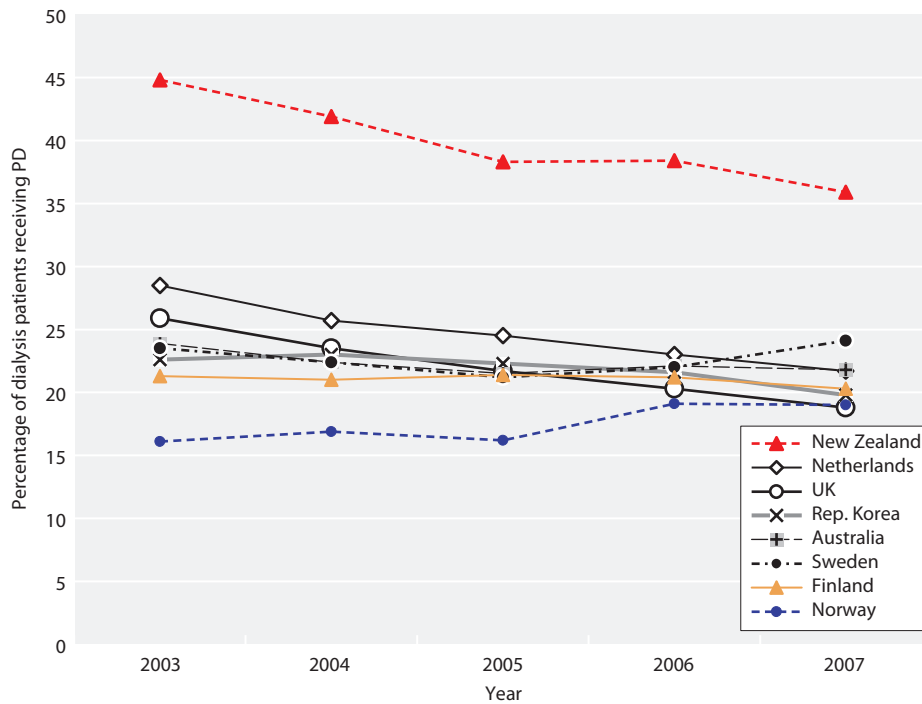

Fig. 16.11. Percentage of prevalent dialysis patients by dialysis modality in 2007

Fig. 16.12. Change in proportion of dialysis patients receiving peritoneal dialysis between 2003 and 2007

haemodialysis was either non-existent (e.g. Taiwan) or very small (Japan 0.07%) (figure 16.11).

Peritoneal dialysis prevalence varied considerably from 0% in Bangladesh to 35.9% in New Zealand, with the UK (18.8%) ranking 7th out of 18. In the top 8
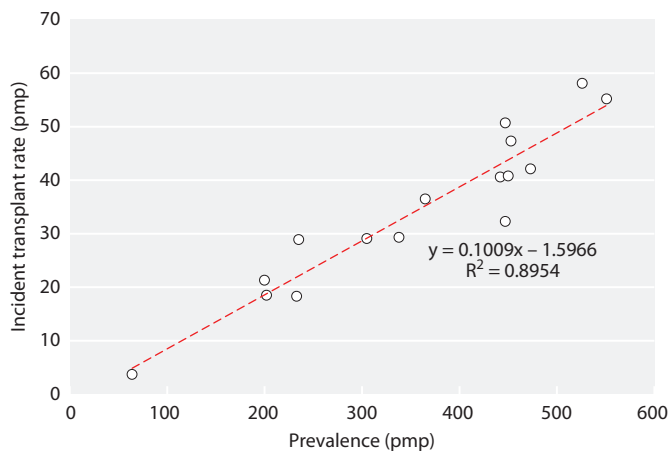
countries with PD programmes many, including the UK, experienced a fall in numbers for reasons that remain unclear (figure 16.12).

There was wide variation in both incidence and prevalence of transplant patients (figure 16.13).
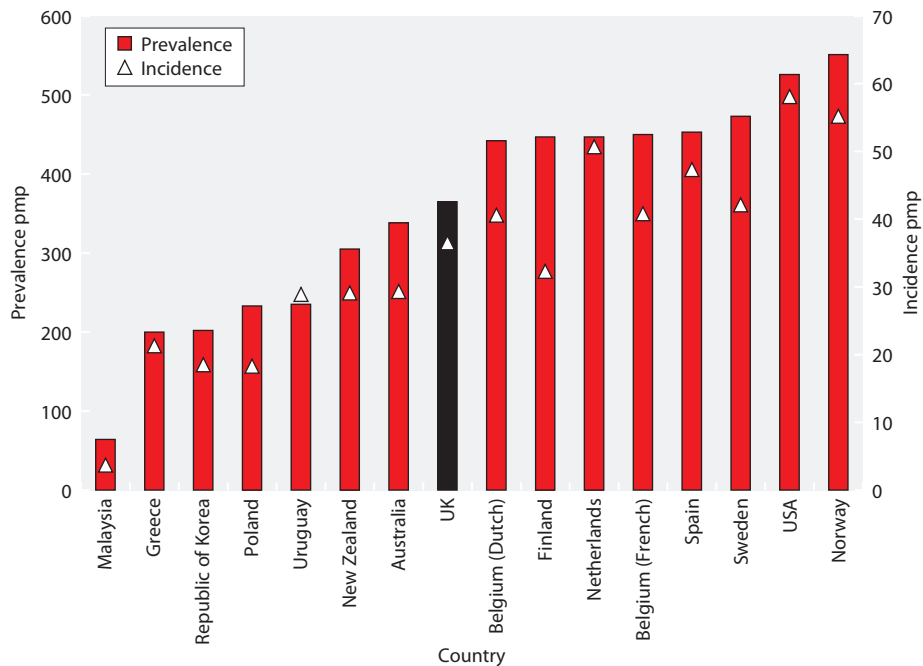
Fig. 16.13. Incidence and prevalence (pmp) of kidney transplants in 2007

Fig. 16.14. Correlation between incident and prevalent transplant rates by country in 2007

Prevalence of transplant patients ranged from 64 pmp in Malaysia to 551 pmp in Norway. There was a strong correlation between incident rate and prevalence (figure 16.14).

Age

Data on the age of patients on RRT are collected and collated in differing methods within each registry. This makes direct comparisons very difficult. There is however consistent recording of age data for patients aged >44 within the UKRR, EDTA-ERA and the ANZdata registries.

In the USA completely different age ranges were used, which makes proportional comparison difficult without access to the raw numbers and ages. When the percentages of patients in each age group were compared between countries (figure 16.15), the most noticeable spread was within the elderly cohort. In New Zealand this cohort accounted for only 7.6% of the RRT population whereas in Belgium it accounted for 25% and 28% within the French and Dutch sub-populations.

Median ages were not always reported but where they were they appear comparable except for the Belgian cohort who were considerably older, reflecting the high proportion aged >75 (figure 16.16). Although there was no age range data from Italy, this country reported the highest median age on RRT at 67 years.

Discussion

In the UK, the increased awareness of CKD and the implementation of National Service Frameworks have improved access to RRT. In conjunction with the
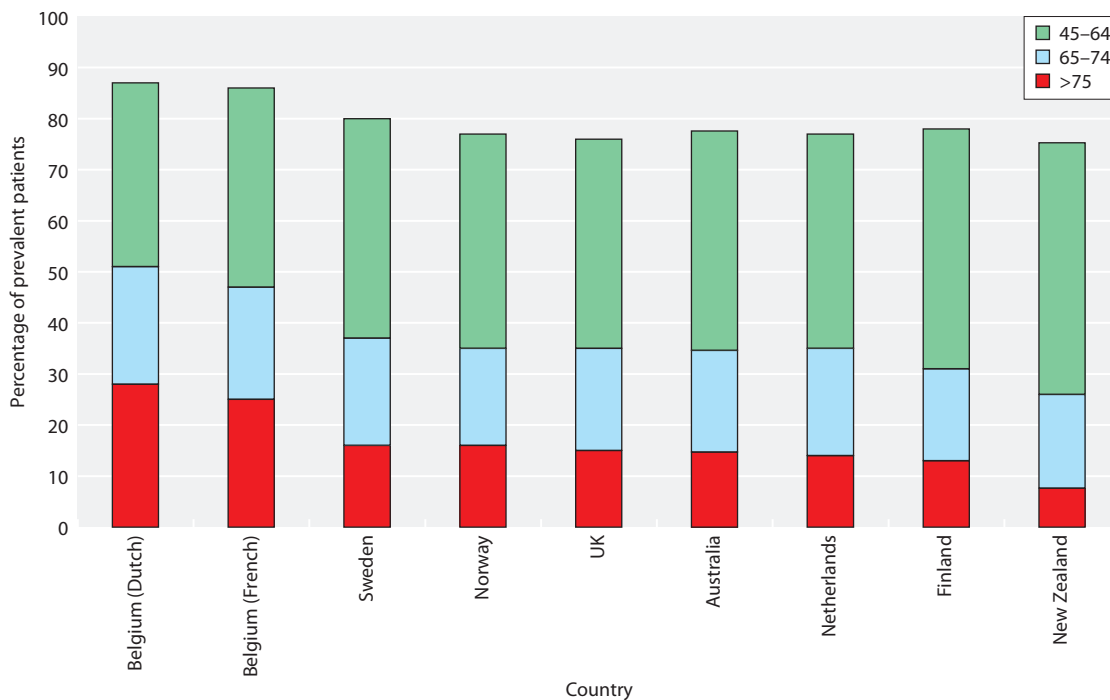
Fig. 16.15. Percentage of prevalent patients receiving RRT by age group
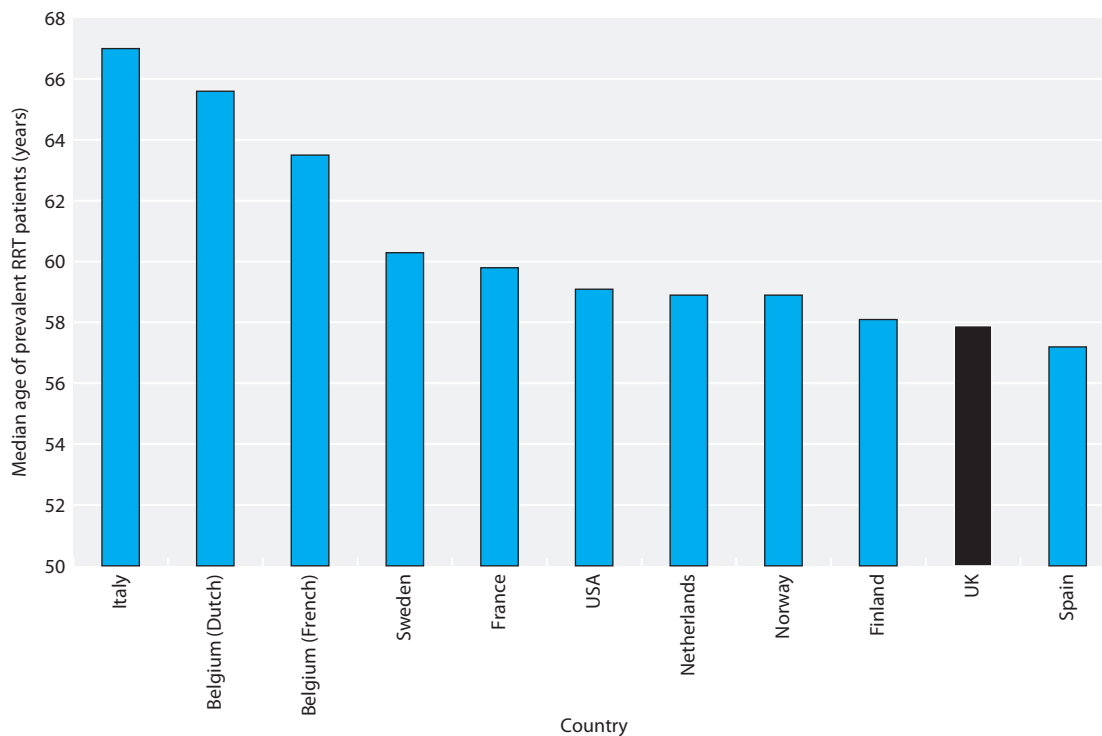
Fig. 16.16. Median age on RRT 2007

annual improvements in survival on RRT (chapter 7) this has resulted in consistent increases in prevalence. Internationally, there remained marked variation in the annual incident and prevalent rates of RRT.

The very high prevalence in some countries reflects many compounding differences in susceptibility to renal disease; obesity causing type 2 diabetes, ethnic mix, attitudes towards kidney disease treatment; affluence, death from ischaemic heart disease in CKD stages 1–4 and the accessibility to treatment. What is clear from this analysis is that an apparent ceiling in prevalence is yet to be seen. The growth in RRT represents a major challenge for all countries that choose to treat severe kidney disease. What these data show is that, whatever the baseline, growth is still the norm and that unless nations provide resource at a rate to match growth, restrictions in the access to treatment will become inevitable. Continued growth in demand, with no apparent end in sight of reaching a steady state, has huge implications for planning and health budgets across the globe.

The disparate approach to the use of home therapies is of interest. The variety reflects geographical and economic factors as well as attitude of nephrologists. The falling number of patients on PD is of concern and the reasons for the fall, particularly in the UK, require more investigation beyond the scope of this chapter. Transplantation is not undertaken in all countries, but in those that do Norway leads the way with a programme strongly underpinned by a successful living donation programme.

The mortality data presented here are not without limitations. The crude rate does not take into account the different modalities, age structure, comorbidity and prevalence. Transplant patients in general, are fitter with lower comorbidity than the average patient on dialysis. Although it is accepted that transplantation confers some survival benefit over dialysis, Taiwan and Japan who have the highest prevalence and no transplantation, appear to have crude mortality rates that are low.

Comparison with others is one of the lynchpins of audit. Reliable interpretation of reported data requires consistent definitions and formatting. It appears there is a slow movement towards congruous datasets and therefore international comparisons will become more reliable and detailed.

Conflict of interest: none

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