The provision of renal replacement therapy for adults in England and Wales: recent trends and future directions

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Summary

We assessed the level of provision of renal replacement therapy for adults in England and Wales. All autonomous main renal units in England (n = 52) and Wales (n = 5) were surveyed in 1996. Data for England were compared to the 1993 National Renal Review. The acceptance rate in England 1995 was 82 (80–85) per million population (p.m.p.) compared with 67 (65–70) p.m.p. in 1991–2. The rate in 1995 in Wales was 109 (98–122) p.m.p. The prevalence rate in England was 476 p.m.p. at end-1995 compared to 393 p.m.p. in 1993, in Wales it was 487 p.m.p. The number of main renal units in England did not rise between 1993 and 1995; capacity was increased by use of more treatment shifts and temporary haemodialysis stations, and by opening more satellite units. The main growth was in hospital haemodialysis. There was an uneven geographical distribution of services. Patients accepted were older with more comorbidity. The use of better-quality processes of dialysis increased. The steady-state position for RRT will not be reached for over a decade. Health authorities will face continued pressure to fund increases in quantity and quality improvements. A stronger evidence base of the effectiveness of therapies, and a national registry to monitor the equity and cost-effectiveness of services are needed.

Introduction

End-stage renal failure is inevitably fatal unless treated by renal replacement therapy (RRT). Such therapy, whether by haemodialysis, peritoneal dialysis or transplantation, is expensive.¹ Services expanded in the 1980s, partly prompted by a national target set in 1984.² In 1993, the Department of Health undertook a review of renal services in England. This showed that the average annual acceptance rate of new patients starting RRT in 1991–2 was 67 p.m.p., below the estimated need of 80 new cases per million population (p.m.p.) under age 80.³ ³⁵ There was considerable geographical variation in the supply of services and in acceptance rates.³ ³⁶ National Renal Purchasing Guidelines recognized the need for a significant expansion in renal replacement therapy.⁷ ⁸ To increase accessibility and cost effectiveness a ‘hub and spoke’ model was proposed, with development of peripheral satellite and district general hospital (DGH) units linked to fewer traditional academic teaching centres undertaking transplantation. The recent publication of national standards for RRT treatment has emphasized necessary improvements in the quality of RRT.⁹

This paper presents data from a further survey of RRT services for adults in England to the end of 1995, and includes for the first time data on provision in Wales.

Methods

A questionnaire was sent to all adult autonomous renal units in England and Wales in mid-1996.
Information was sought on the structure of care, key processes of treatment (some recommended as standards by the Renal Association—namely bicarbonate fluid for haemodialysis, disconnect catheter for peritoneal dialysis, and thrice-weekly haemodialysis8), numbers of prevalent (stock) patients at end-1995; and new patients accepted onto RRT in 1993–5.

Main renal units are those which offer a wide range of care: general nephrology; acute and chronic renal failure including dialysis; some, but not all, provide transplantation, depending on whether surgical services are available. Satellite units are linked to main units, they do not necessarily have on-site medical cover, and they only provide dialysis, usually only haemodialysis.

Questionnaires were returned by 55/56 identified adult renal units. Data from the 50/51 responding units in England were compared to those collected for the 1993 National Renal Review in England.3

Data on acceptances and stock were missing for two units. To determine the national position in 1995, an estimation was made for these units by taking their data in the 1993 survey and applying the subsequent overall percentage increase between the two surveys found in the other units.

Only 47 units provided data on socio-demographic information and the primary cause of renal failure for patients accepted during 1995. The non-responder units did not differ in size of unit, teaching or non-teaching hospital, or geographical location from responders. Individual patient data were available on 3209 cases (80% of estimated total) in England and 278 (89% of total) in Wales. Age and sex were available on over 99% of these cases; cause of end-stage renal failure was given in 2722 cases in England (68% of total), and 218 in Wales (69% of total). Postcoded data were not available for patients from several renal units, so population-based DHA and regional rates were not derived. Regional rates by region of renal unit of treatment have been estimated.

For comparisons of national acceptance rates over time, aggregate unit levels rather than patient-specific data were used for 1991–2; the English rate used is then 67 p.m.p. rather than 65 p.m.p. It is higher because it is not possible to exclude patients from Wales and Scotland or duplicates from the aggregate unit data.

The data were entered and analysed using the Microsoft Access database and Excel spreadsheet software. The Office for National Statistics (ONS) mid-year population estimates for England and Wales were used to calculate the population denominators for the rates of acceptance and prevalent patients p.m.p.10 Confidence limits (95%) are shown for the national acceptance rates.11

**Results**

**Renal facilities**

The number of renal units in England fell by one between 1993 and 1995, three new units opened and there were mergers in London. The size of existing units grew (Table 1). In England there were 52% more haemodialysis stations, 8% of stations were designated ‘temporary’, meaning that due to lack of facilities, regular out-patients were attending for haemodialysis in wards or other areas not designated for the purpose. There were also more haemodialysis shifts per day. The dialysis service in most main units (51/56) remained under NHS management. CAPD training and care was provided in 54 units.

The number of satellite units rose by 60% with many more being planned (Table 1). Of all haemodialysis stations, 33% were in satellites compared to 20% in 1993. Half of the satellite units were located on district general hospital sites and 19% were privately managed. Medical support varied, only four had permanent medical staff, and nine had 24-h emergency medical cover on site. The majority (49/60) including these 13, had regular visits from consultant, staff grade or clinical assistant nephrologists.

There was geographical variation in service provision. Regional rates of haemodialysis stations varied from 21 to 36 p.m.p., the England rate being 29 p.m.p., and for Wales 33 p.m.p. This compares with the variation in the old regional rates in 1993 from 5 to 29 stations p.m.p., with a national rate of 20 p.m.p.

Consultant nephrology staffing in England increased by 22 additional posts and there was an increase in all grades of non-consultant medical staff. Consultant nephrologist whole-time equivalents (WTE) varied by region from 1.5 to 2.6 p.m.p., the average for England being 2.0 p.m.p. and 1.9 p.m.p. in Wales.

There was one transplant centre in Wales and 24 in England, compared to 29 in 1993. The reduction was largely due to reorganization in London. There were 0.5 WTE transplant surgeons p.m.p.

**Patient treatment rates**

The annual acceptance rate rose from 67 (65–70) p.m.p. (n = 3247) in 1991–2 to 82 (80–85) p.m.p. (n = 4024) in 1995. Annual increases were 9, 5 and 10% respectively (Figure 1). The Welsh rate was significantly higher, and it was 109 (98–122) p.m.p. in 1995. Regional acceptance rates in 1995, uncorrected for cross-boundary flows, varied from 64 to 105 p.m.p.

The prevalence of patients in England increased from 396 p.m.p. (n = 19 212) in 1993 to 476 p.m.p. (n = 23 115) in 1995, and it was 487 p.m.p. (n =
Table 1  Renal unit facilities in England 1993–5 and Wales 1995

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td><strong>Main units</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main renal units</td>
<td>52</td>
<td>51*</td>
<td>5</td>
</tr>
<tr>
<td>Total beds</td>
<td>990</td>
<td>1105</td>
<td>59</td>
</tr>
<tr>
<td>Unit beds median (range)</td>
<td>19 (0–43)</td>
<td>20 (0–64)</td>
<td>11 (0–38)</td>
</tr>
<tr>
<td>Total haemodialysis stations</td>
<td>932</td>
<td>1423</td>
<td>97</td>
</tr>
<tr>
<td>Unit haemodialysis stations median (range)</td>
<td>15 (3–55)</td>
<td>23 (7–86)</td>
<td>13 (10–35)</td>
</tr>
<tr>
<td>Fixed stations</td>
<td>743</td>
<td>832</td>
<td>65</td>
</tr>
<tr>
<td>Satellite stations</td>
<td>189</td>
<td>472</td>
<td>28</td>
</tr>
<tr>
<td>Temporary stations</td>
<td>N/A</td>
<td>119</td>
<td>4</td>
</tr>
<tr>
<td>Haemodialysis shifts / week</td>
<td>694</td>
<td>856</td>
<td>62</td>
</tr>
<tr>
<td>Unit shifts median (range)</td>
<td>12 (0–31)</td>
<td>18 (8–35)</td>
<td>16 (12–18)</td>
</tr>
<tr>
<td><strong>Satellite units</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current satellites</td>
<td>36</td>
<td>60</td>
<td>3</td>
</tr>
<tr>
<td>No. main units with current satellites (range/unit)</td>
<td>17 (1–6)</td>
<td>30 (1–5)</td>
<td>2 (1–2)</td>
</tr>
<tr>
<td>Planned satellites</td>
<td>14</td>
<td>37</td>
<td>5</td>
</tr>
<tr>
<td>No. units with planned satellites</td>
<td>9</td>
<td>28</td>
<td>5</td>
</tr>
<tr>
<td>No. of planned satellites where unit has no existing satellites</td>
<td>5</td>
<td>8</td>
<td>1</td>
</tr>
<tr>
<td>Total patients in satellite units</td>
<td>476</td>
<td>1476</td>
<td>64</td>
</tr>
<tr>
<td>Median patients per satellite (range)</td>
<td>15 (1–41)</td>
<td>24 (1–68)</td>
<td>32 (25–39)</td>
</tr>
<tr>
<td>Total haemodialysis stations in satellite unit</td>
<td>189</td>
<td>472</td>
<td>28</td>
</tr>
<tr>
<td>Median haemodialysis stations per satellite (range)</td>
<td>6 (2–10)</td>
<td>7 (2–31)</td>
<td>8 (6–14)</td>
</tr>
</tbody>
</table>

* Facilities data from 50/51 units.

1420) in Wales. In England this was largely facilitated by expansion of hospital haemodialysis patients (by 1484 or 38%) and an increase in patients with functioning grafts (by 1960 or 19%); peritoneal dialysis numbers rose by 540 or 12% and home haemodialysis declined by 11% (Figure 2).

**Processes of care**

The use of better-quality process measures, many recommended by the Renal Association’s Standards document* increased during this period, particularly use of bicarbonate haemodialysis, thrice-weekly...
haemodialysis and disconnect CAPD systems, although there was wide variation between units (Figure 3). Synthetic haemodialysis membranes were used by 25% of units. There was lower usage in Wales for each of these measures. The proportion of dialysis patients on haemodialysis increased from 43% to 50% with considerable inter-unit variation (27–100% in 1995).

Characteristics of patients
The age distribution for patients accepted in 1995 is shown in Figure 4. The median age of new acceptances in England was 61 compared to 59 in 1991–2, and 41% were over 65 compared with 37% in 1991–2. In Wales, the median age was 60, with 40% over 65. In both countries, 13% were over age 75. The male:female ratio was 1.58 in England and 1.55 in Wales, compared with 1.71 in England in 1991–2. The main single cause of ESRF was diabetes (14%) but in 17% the cause was defined as ‘unknown’ (Table 2). Patterns differed by age, with a greater proportion being unknown in the elderly; the contribution of renovascular disease in the elderly should be noted. In 16% of patients no cause was defined. Renal units varied considerably in their case mix as indicated by the age distribution and incidence of diabetic nephropathy.

Constraining factors
Renal unit directors were asked about potential constraints on the development of their dialysis programme. The most common responses were the level of funding, physical space and shortage of trained nurses (76%, 80% and 70% of units, respectively). Only 22% of units found medical staff availability to be a constraint.

Discussion
This survey of renal unit structure and processes of care had a very high response rate. There has been
Figure 4. Age distribution for patients accepted on to RRT in England and Wales in 1995.

Table 2  Causes of end-stage renal failure in patients accepted on to RRT in England and Wales in 1995

<table>
<thead>
<tr>
<th></th>
<th>Under 65 (n = 2058)</th>
<th>Over 65 (n = 1429)</th>
<th>All ages (n = 3487)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glomerulonephritis</td>
<td>14.9</td>
<td>8.9</td>
<td>12.4</td>
</tr>
<tr>
<td>Pyelonephritis</td>
<td>9.0</td>
<td>9.3</td>
<td>9.1</td>
</tr>
<tr>
<td>Diabetes</td>
<td>15.7</td>
<td>11.1</td>
<td>13.8</td>
</tr>
<tr>
<td>Renal vascular disease</td>
<td>4.1</td>
<td>8.2</td>
<td>5.5</td>
</tr>
<tr>
<td>Hypertension</td>
<td>7.5</td>
<td>8.3</td>
<td>7.8</td>
</tr>
<tr>
<td>Polycystic kidney</td>
<td>7.5</td>
<td>3.5</td>
<td>5.9</td>
</tr>
<tr>
<td>Uncertain</td>
<td>14.3</td>
<td>20.9</td>
<td>17.0</td>
</tr>
<tr>
<td>Other</td>
<td>13.8</td>
<td>10.7</td>
<td>12.6</td>
</tr>
<tr>
<td>Missing</td>
<td>13.2</td>
<td>19.2</td>
<td>15.7</td>
</tr>
</tbody>
</table>

Data are percentages.

a substantial expansion of renal replacement therapy provision in England from 1993–5, with a rise to an annual acceptance rate of 82 p.m.p. This is a continuation of a 15-year trend which has seen a fourfold rise. More elderly patients with associated co-morbid conditions were being accepted; in the UK in 1982, only 11% of patients were over 65 and 8% were diabetic, compared with 41% and 15%, respectively, in England by 1995. In absolute numbers these are approximately 14- and 7-fold increases.

The acceptance rate necessary to meet the need for renal replacement therapy is not certain and may be rising. Population projections suggest an increase in the over 65s by 2011, and with the steep rise in the incidence of end-stage renal failure with age this will increase the need for therapy. The studies on which estimates of need have been based did not include substantial ethnic minority populations which have a higher incidence of renal failure and a lower median age than Whites. As these populations age, those areas with significant ethnic minorities will face substantially increased need. Finally, clinical thresholds for treatment vary. Wales had an acceptance rate in 1995 over 109 p.m.p., despite a smaller ethnic minority population and similar population age distribution to England.

Several European countries have acceptance rates over 100 p.m.p. In the US the overall rate of acceptance in Whites is 185 p.m.p. It is likely that the national acceptance rate in England will have to exceed 100 p.m.p. to meet need, and that it will be even higher in some areas depending on their population’s age distribution and ethnic profile.

The increase in new patients starting renal replacement therapy is usually attributed to a lower threshold for referral to nephrologists and to a lesser extent to greater acceptance by nephrologists of older, sicker patients. Studies of physician and nephrologist attitudes over the last decade demonstrate this liberalization of attitudes. There may also be a rising incidence of end-stage renal failure, partly due to ageing of the population, but this is difficult to establish, as Registry data of renal replacement acceptances cannot distinguish changes in incidence from changes in referral thresholds.

The prevalence rate of patients alive on therapy for ESRF is the main driver to resource provision and costs. This was nearly 500 p.m.p. in England at the end of 1995. Treatment patterns also affect cost. The growing proportion of elderly patients with associated comorbidity and/or social problems will further increase costs.
The main treatment shift has been the increase in hospital haemodialysis, with increase in daily shifts, temporary stations and satellite units. Treatment patterns are similar in Scotland.\textsuperscript{22} The UK has fewer but larger units than other European countries.\textsuperscript{18} Given the space restraints in many main units, further capacity will probably develop in satellite units and in autonomous (consultant-led) DGH units. Satellite haemodialysis is a more accessible form of care which may have begun to address the geographical inequities identified in the last Review. The cost effectiveness of different types of satellite units needs to be established. Since the early 1980s, the number started on home haemodialysis has progressively fallen.

The numbers on peritoneal dialysis rose a little but fell as a proportion of the total, a reversal of the rapid rise after its introduction in the early 1980s. Peritoneal dialysis is now recognized as inadequate for many patients when residual renal function declines, and is unsuitable for many older patients. Initially successful patients may have to stop peritoneal dialysis due to recurrent peritonitis or other technical difficulties.

Transplantation is the least expensive form of therapy, but is infrequently offered to the elderly. The proportion of ESRF patients transplanted reflects both transplant rate and acceptance rate for RRT. Half the ESRF patients had functioning transplants, a high proportion relative to other countries,\textsuperscript{18} but supply of organs does not meet demand\textsuperscript{23} and UK transplantation rates are lower than many European countries and the USA.\textsuperscript{17,18} Strategies to enhance cadaver organ procurement, to increase live donation, and to reduce graft rejection are priorities if more people are to benefit from this treatment, and the overall cost of the renal replacement programme is to fall.

Although shortfalls in the individual patient data limited analysis, it is clear that geographical variations in supply of services remain but have narrowed since 1993.

The upward trend in demand is clear. Simulation modelling estimates that the steady state position (at which cases accepted equal those dying in any time period) will not be reached for at least 15 years.\textsuperscript{8} Specialist nurse shortages are a major limiting factor in service development. Higher acceptance rates or improved survival will further increase the prevalence and costs. An increase in transplant rate could reduce predicted costs.

Investment will be needed to fund this growth as well as maintain improvements in the quality of care. Strategies to stem this rising financial demand include increasing efficiency, reduction in the incidence of end-stage renal failure,\textsuperscript{24} and rationing access to care. In a recent survey 12% of British nephrologists said that because of lack of resources they had recently refused treatment to patients they thought were suitable for such care.\textsuperscript{21} Rationing is a difficult issue. Except for a few patients with severe dementia or terminal malignancy, there is little general agreement or explicit guidelines on which patients might be excluded from care.

A programme as costly as the renal replacement therapy programme needs a strong evidence base to ensure the efficacy of the interventions. There is now a Cochrane Renal Review Group. There is a need for a comprehensive and valid national information system to monitor renal replacement therapy, and identify effective practice by comparative audit of processes and outcomes of care. The developing National Renal Registry aims to achieve this and to provide both regular performance feedback to participating units, and population based information to health authorities.

In summary, there has been continued growth in the quantity and quality of replacement therapy services in England. Many patients treated are older with more co-morbid disease, and models of care will have to adapt to their needs. It is likely that demand will continue to rise over the next 10 years or more. It is important that increased funding be identified despite competing pressures and priorities. Commissioning models need a co-ordinated approach to develop equitable and cost-effective services. A national information system must be established to evaluate these expensive developments.

Acknowledgements

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References


