Healthcare systems and end-stage renal disease (ESRD) therapies—an international review: access to ESRD treatments

W. H. Hörl, F. de Alvaro and P. F. Williams

Division of Nephrology, Department of Medicine, University of Vienna, Austria, Hospital La Paz, Servicio de Nefrología, Madrid, Spain and Dialysis Unit, Health Road Hospital, Ipswich, UK

Abstract

Assessment of healthcare technology and economics can be used to assess the access to healthcare, its quality and efficacy as well as its cost and cost efficiency. This report addresses these issues for the provision of care for end-stage renal disease (ESRD) patients. An international comparison of access to ESRD treatment modalities was made with reference to the healthcare provider structure in a range of industrial countries. The countries were grouped into 'public' (Beveridge model), 'mixed' (Bismarck model) and 'private' (Private Insurance model). In 'public' provider countries, 20–52% of dialysis patients are treated with home therapies (haemodialysis and peritoneal dialysis), and the number of patients with renal transplants is 45–81% of all ESRD patients. In 'mixed' provider countries, only 9–17% of all dialysis patients are treated with home therapies, and 20–48% of ESRD patients have renal transplants. In 'private' provider countries, 17% of US and 6% Japanese dialysis patients are treated with home therapies. Japan has 0.3% and the US has 26% of ESRD patients who receive renal transplants. It thus seems that provider structure influences access to and choice of ESRD treatment. With a growing elderly population and longer life expectancy, there will be an increased requirement for ESRD treatments in all industrial countries. Equal access to, and quality of ESRD care in the future will require adequate funding and reimbursement strategies in a cost-constrained healthcare environment.

Key words: healthcare; health technology; haemodialysis; peritoneal dialysis; renal transplantation

Introduction

Today, all healthcare systems in industrial countries are confronted with the same challenges, namely a growing elderly population, new and innovative healthcare technologies, increasing expectations of the population and the dilemma of economic constraints. Therefore, new disciplines such as health technology assessment and healthcare economics are developing to support the needs of health policy decision makers. Their main objective is to create a balance between the three key factors of a healthcare system: access to healthcare (equity for all), quality of healthcare (efficacy) and finally the cost or cost efficiency of healthcare provision [1; see also Lameire et al., this issue]. This report will assess access to healthcare in a very specific and very costly area—that of end-stage renal disease (ESRD). An international comparison of access to ESRD treatment for patients from a series of industrial countries will be used as a means for evaluation of this access.

Results

There currently are three modes of treatment available for patients with ESRD in the countries to be considered: renal transplantation, haemodialysis (HD) and peritoneal dialysis (PD). The majority of patients, at least those under the age of 70 years, are candidates for renal transplantation. Prior to transplantation, the criteria for choosing between HD and PD are shown in Table 1 [2]. This table summarizes the medical and social factors agreed upon by a leading group of nephrologists [2]. Patients with the criteria on the left of the table have clear indications for HD treatment; those with the criteria on the right have clear indications for PD. The majority of patients, represented by the middle block, can be offered either therapy. Although in these patients a tendency towards either HD, continuous ambulatory peritoneal dialysis (CAPD) or automated peritoneal dialysis (APD) may exist, these patients may do well on either mode of therapy.

We therefore analysed the provision of ESRD therapies in a number of countries in order to find out whether this 'consensus' distribution of patients is in agreement with patient care in the countries investi-
Options in Renal Therapy: Criteria for Patient’s Selection

<table>
<thead>
<tr>
<th>Usually do better on HD</th>
<th>Usually do well on either therapy</th>
<th>Tending toward PD (CAPD, APD)</th>
<th>Usually do better on PD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe inflammatory bowel disease</td>
<td>Tending toward HD</td>
<td>Independent lifestyle</td>
<td>Unstable vascular disease</td>
</tr>
<tr>
<td>Diverticulitis/ischemic bowel disease</td>
<td>- Dependent lifestyle</td>
<td>Dementia</td>
<td>Difficulty in vascular access</td>
</tr>
<tr>
<td>Marked intellectual disability with no helper</td>
<td>- Chronic poor hygiene</td>
<td>Multiple abdominal adhesions/ostomies</td>
<td>Children under 5 years</td>
</tr>
<tr>
<td>Severe psychotic disorder</td>
<td>- Severe, recurrent hernias</td>
<td>Severe diabetic gastroparesis</td>
<td>Younger diabetics</td>
</tr>
<tr>
<td>Homeless</td>
<td>- Frequency and substantial therapy changes</td>
<td>Transmissible disease</td>
<td>Strong patient need for independence, autonomy or control</td>
</tr>
<tr>
<td>Unresolvable PD complications</td>
<td></td>
<td>Variable schedule</td>
<td>Distance from centre</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Travel</td>
<td>Unresolvable HD complications</td>
</tr>
</tbody>
</table>

Tending toward APD
- Pressure-related complications
- Lifestyle – free days
- More prescriptions flexibility
- Social support filled by helper at home

<table>
<thead>
<tr>
<th>Centre</th>
<th>Centre/Home</th>
<th>Home</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>


gated. We subdivided the countries into three groups according to their predominant healthcare system.

Figure 1 [Lameire et al., this issue] shows the countries studied and their distribution between ‘public’, ‘mixed’ and ‘private’ providers under the Beveridge, the Bismarck and the Private Insurance models, respectively. Within each country, the distribution of dialysis patients between public and private providers is demonstrated.

Dialysis care is in agreement with the healthcare system in Canada [3,4], the UK [5], Denmark [6] Finland [7], Norway [8] and Sweden [9]. Six out of the eight countries studied that use the Beveridge model offer dialysis therapy by public providers in 95–100% of cases. However, the other two countries using the Beveridge model, namely Italy and Spain, have 27 (Italy) [10] and 54% (Spain) [11] of dialysis provision in private settings.

Dialysis care is in agreement with the respective healthcare system in Bismarck model countries, such as Germany [12], France [13,14], Belgium [15,16] and Austria [17], whereas Switzerland [18] and The Netherlands [19], also utilizing the Bismarck model, have almost 100% of dialysis provided by the public sector. Japan [20,21] with 78% private provision (but utilizing the Bismarck model) is more akin to the US.

![Figure 1](Fig. 1. Share of dialysis patients covered by private/public providers of countries under the Beveridge model, the Bismarck model and the Private Insurance model.)
which with 77% private provision is in conformity with its healthcare system.

As a consequence, the countries studied had to be regrouped according to the nature of dialysis provision in either ‘public’, ‘mixed’ private and public, or ‘private’ provision: (i) ‘public’ provision countries included The Netherlands, Switzerland, the UK, Norway, Finland, Sweden, Denmark and Canada; (ii) ‘mixed’ provision countries are Germany, Austria, Belgium, France, Italy and Spain; and (iii) ‘private’ provision countries are the US and Japan.

Based on this regrouping of countries, the access to ESRD treatment was assessed by means of country registries and publications from the year 1994/1995 [5-37].

Since there is no widely accepted single indicator defining access to ESRD treatment, the following parameters were used: (i) the prevalence of ESRD; (ii) the take on rate of new ESRD patients; (iii) the percentage of the ESRD population with a functioning kidney transplant; (iv) the percentage of ESRD patients treated at home (HD or PD); and (v) the ESRD population growth rate.

Prevalence of ESRD (Figure 2)

The prevalence of ESRD is defined as the total number of ESRD patients with transplants, or treated by HD or PD per million population (pmp). In ‘public’ countries, the prevalence ranges from 419 to 572 pmp, but it is lower than in ‘mixed’ countries where it ranges from 600 to 748 pmp. The prevalence in the two ‘private’ countries is the highest of the three groups, namely Japan and the US with 1150 and 790 patients pmp, respectively.

Take on rate of new ESRD patients (Figure 3)

The take on rate is defined as the number of patients per million population taken on to renal replacement therapy in any given year. Figure 3 shows the take on rates for 1995 in the three groups of countries. Again the ‘public’ countries have the lowest take on rate, ranging from 60 to 104 pmp, and the ‘mixed’ countries have higher take on rates, ranging from 94 to 125 pmp. The ‘private’ countries again have the highest rates, with Japan at 194 and the US at 214 new patients per million population in 1995.

Percentage of the ESRD population with a functioning kidney transplant (Figure 4)

There is major difference between the three groups of countries in this indicator of access to ESRD patient care (Figure 4). The ‘public’ countries have the greatest percentage of patients with functioning renal transplants, ranging from 45 to 81%, whereas in the ‘mixed’ countries the range is from 20 to 48%. Of the two ‘private’ countries, the US [22] has 26% of patients with functioning grafts, whereas Japan [20] has only 0.3% of patients with functioning grafts due to the presence of a rather limited transplant programme for cultural and/or religious reasons.

Percentage of ESRD patients treated at home (HD or PD) (Figure 5)

Access to home-based treatment for ESRD also differs between the three groups of countries. Figure 5 shows the total percentage of patients receiving treatment at

![Prevalence of ESRD therapies: number of patients per million (pmp) 1994/1995 according to the kind of dialysis provision.](image-url)
Access to ESRD treatments

<table>
<thead>
<tr>
<th>Country</th>
<th>Dialysis pmp</th>
<th>Transplantation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>310</td>
<td>262</td>
</tr>
<tr>
<td>UK</td>
<td>220</td>
<td>257</td>
</tr>
<tr>
<td>Denmark</td>
<td>162</td>
<td>260</td>
</tr>
<tr>
<td>Finland</td>
<td>82</td>
<td>337</td>
</tr>
<tr>
<td>Norway</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>256</td>
<td>312</td>
</tr>
<tr>
<td>Holland</td>
<td>250</td>
<td>239</td>
</tr>
<tr>
<td>Switzerland</td>
<td>268</td>
<td>277</td>
</tr>
<tr>
<td>Austria</td>
<td>323</td>
<td>302</td>
</tr>
<tr>
<td>Spain</td>
<td>397</td>
<td>244</td>
</tr>
<tr>
<td>Germany</td>
<td>475</td>
<td>143</td>
</tr>
<tr>
<td>France</td>
<td>388</td>
<td>241</td>
</tr>
<tr>
<td>Italy</td>
<td>601</td>
<td>228</td>
</tr>
<tr>
<td>Belgium</td>
<td>371</td>
<td>147</td>
</tr>
<tr>
<td>Japan</td>
<td>579</td>
<td>1147</td>
</tr>
<tr>
<td>USA</td>
<td>206</td>
<td>212</td>
</tr>
</tbody>
</table>

**Fig. 3.** Take on rate of ESRD patients: new patients per million population per year (pmp) 1994/1995 according to the kind of dialysis provision.

home for both HD and PD. With the worldwide decline in home HD treatment, the majority of patients on home treatment actually receive PD. In the 'public' countries, 20–52% of patients have home-based treatment; in the 'mixed' countries the percentage is lower, varying from 9 to 17%. In the 'private' countries, Japan has 6% of dialysis patients on home treatment and the US 17%.

**ESRD population growth rate**

The ESRD population growth rate from 1994 to 1995 is higher in the 'public' countries (4–8.3%) compared with the 'mixed' countries (4–6.3%), whereas the highest growth rate is seen in the 'private' countries Japan and the US.

**Discussion**

According to Figures 2 and 3, 'public' countries have lower prevalence rates of ESRD treatment and lower take on rates of ESRD patients than observed in 'mixed' and 'private' countries. This may be due to differences in the healthcare systems themselves, in particular in the provision of treatment for ESRD patients.
For example, the number of doctors per 10,000 population is 16.1 in the UK, 32.8 in Germany and 51.9 in Italy [24]. Likewise, the number of doctors involved in ESRD care differs—the UK four, Germany 23 and Italy 66 per million population. The number of dialysis chairs pmp differs between 'public', 'mixed' and 'private' countries. There is a range between 45 and 88 dialysis stations pmp in 'public' countries, while in 'mixed' countries the range is from 55 to 152. In the two 'private' countries, Japan has 468 and the US 144 dialysis chairs pmp.

Again 'public' countries have a much higher share of renal transplantation and access to home care, particularly PD, compared with 'mixed' and 'private' countries. This may be explained, at least in part, by the lack of private interest and investment in 'public' countries [37]. There is a correlation between the percentage of PD patients in the three groups of countries with the percentage of public dialysis provision in each country. It seems that the higher the percentage of public provision, the higher the PD utilization, reaching a plateau at 50%. 'Public' countries with a public provision of 94–100% have a share of PD patients which ranges from 17 to 45%. 'Mixed' countries with a public dialysis provision of between 40 and 85% have a share of PD patients which ranges between 8.3 and 10.4% of PD utilization, respectively. The explanation for these differences lies in the fact that private providers (with the exception of the US) treat only small numbers of patients with PD regardless of the healthcare system operating in their country. Private providers in all countries have a range of peritoneal dialysis utilization ranging from 0 to 13%, whereas public providers in all countries have a range of peritoneal dialysis utilization ranging from 11 to 47% of all dialysis patients.

Today, there exists inequality of access to, and unmet needs for, ESRD treatment, particularly in 'public' countries. However, there is also only limited access to home care modalities and transplantation in 'mixed' and 'private' countries. Continued expansion of the ESRD population is expected, particularly with the demographic changes such as the increase in the elderly population with increased life expectancy and greater expectations and demands of their healthcare systems [Lameire et al., this issue].

It will be a major task for health policy makers to ensure that the increased numbers of ESRD patients receive equal access to all modalities and quality care in the future. With regard to patient suitability for and choice of treatment modality, governments will need to use appropriate funding and reimbursement strategies in a cost constraint healthcare environment.

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Access to ESRD treatments

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