

Cost of illness associated with renal transplantation and dialysis in end stage renal disease in the United States

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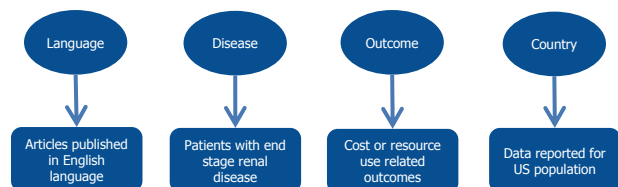


Introduction

End-stage renal disease (ESRD) is a life threatening condition and can be fatal without treatment. The number of patients receiving renal replacement therapy (RRT) was 822 patients per million population (ppmp) in Australia, 808 ppmp in New Zealand, 774 ppmp in UK in 2008, 730 ppmp in Canada and 354 ppmp in the United States (US) in 2007 [1,2,3,4]. There is a paucity of credible data from the developing world due to a lack of adequately representative registries [5]. ESRD is the irreversible loss of kidney function which results from progressive disease of kidneys. Patients with ESRD are likely to experience clinical symptoms as a result of the retention of waste products and toxins, and also as a result of anaemia, hypertension, oedema and acidosis. RRT is initiated when kidneys are deemed unable to support life [6]. The treatment modalities in ESRD include haemodialysis (HD), peritoneal dialysis (PD) and transplantation [7]. ESRD is associated with significant Medicare expenditure in the US [8]. The objective of the review is to determine the cost of illness associated with renal transplantation and dialysis in ESRD in the US.

Methods

The information was retrieved from sources such as databases including Medline, EMBASE, United States Renal Data System (USRDS), UK Renal Registry (UKRR), WHO and relevant grey literature. Studies reporting data for costs associated with transplantation and dialysis in ESRD in the US were included. Only English language articles were included. Details of inclusion criteria are presented below:



The included citations were extracted with emphasis on data related to outcomes such as costs associated with treatment of ESRD and related resource usage.

Results

- In the US the incidence rate of ESRD in patients of all age groups was 111,000 in 2007 compared to 94,527 in 2000 and 50,859 in 1990. In patients aged >50 years it was 35,974, 73,776 and 88,643 in 1990, 2000 and 2007 respectively while for patients aged <50 years it was 14,883, 20,751 and 22,356 respectively as presented in Figure 1 [4].
- In the UK, the incidence rate of ESRD was 6639 in 2008, 6644 in 2007 and 4784 in 2003. The median age of patients starting RRT was 64.1 years [2].
- Overall Medicare costs (approximately) for ESRD were \$21.5 billion in 2007 (Figure 2) with \$8.02 billion as outpatient costs, \$7.34 billion as inpatient costs and \$4.39 billion as physician costs. Further details are provided in Figure 2 [8].
- In 2007, haemodialysis (HD) was initiated in 99,886 patients, peritoneal dialysis (PD) in 6376 patients and transplantation in 2500 patients in the US [4].
- Total Medicare costs associated with these were \$17.6 billion for HD, \$949 million for PD and \$1.9 billion for transplantation in 2007 compared to 14.8 billion for dialysis (HD + PD) and 0.8 billion for transplantation in 2003. The per person per year costs were \$73,008 for HD, \$53,446 for PD and \$24,572 for transplantation in 2007 as reported in Table 1 [8, 9].
- Unadjusted average annual Medicare expenditure (2004 US\$) for PD and HD as first modalities was \$53,277 (95% CI \$50,626-\$55,927) and \$72,189 (95% CI \$67,513 - \$76,865) respectively [10].
- Patients with HD were twice as likely to be hospitalised over a 12 month period compared to matched PD patients (hazard ratio, 2.17; 95% CI, 1.34-3.51; P <.01). The median (Inter quartile range) health care costs per patient were \$173,507 (\$98,706 - \$335,719) for HD patients vs. \$129,997 (\$73,212-\$207,578) for PD patients [11].
- The mean total hospital charges for a PD discharge were \$35,846 compared to \$41,336 for HD (p <.0001). The mean length of stay was significantly less for PD with 6.57 days (p<0.0001) vs. 7.25 days for HD [12].
- The mean (SD) cost of treating *S. aureus* bacteraemia in HD patients, including readmissions and outpatient costs, was \$24,034 per episode. The mean initial hospitalization cost was significantly greater for patients with complicated (\$32,462) versus uncomplicated (\$17,011) *S. aureus* bacteremia (p = 0.002) [13].
- Over a 25 year time horizon, renal transplantation resulted in significant cost savings with a cost of \$376,577/patient and life expectancy of 7.4 years compared to \$568,670/patient and life expectancy of 6.7 years with long term dialysis [14].
- Patients with ESRD due to diabetes had the highest cost of treatment modalities compared to other primary diagnosis conditions such as hypertension, glomerulonephritis etc. The cost of HD treatment in patients with ESRD secondary to diabetes was \$78,363 compared to \$60,770 with PD and \$31230 with transplantation [8].
- Total per-patient-per-year (PPPY) cost of anaemia management with epoetin averaged \$548 (range \$342-\$651) compared \$104 (range \$79-\$136) with erythropoiesis-stimulating agents in HD patients [15].

Figure 1: Incidence rate of end stage renal disease in the United States⁴

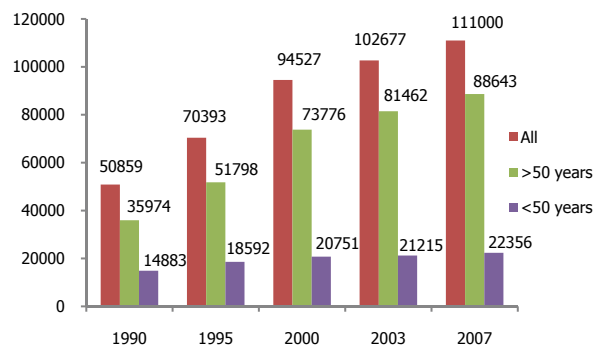


Figure 2: Overall Medicare costs for ESRD in billion US dollars⁸

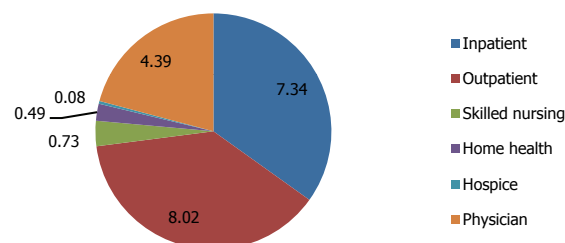


Table 1: Cost of ESRD treatment per person per year in US Dollars⁸

	2000	2003	2007
Haemodialysis	\$55,854	\$64,267	\$73,008
Peritoneal dialysis	\$44,870	\$48,039	\$53,446
Transplant	\$18,637	\$22,038	\$24,572

Conclusions

The incidence of ESRD is increasing continuously in the US and patients aged greater than 50 years are at higher risk. There is significant economic burden associated with ESRD. Patients with ESRD secondary to diabetes bear the highest treatment costs. Renal transplantation is the treatment of choice in ESRD but it is limited by the availability of donor organs. Patients with PD are less likely to be hospitalised than HD patients. The cost of treatment associated with PD is lower compared to HD.

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