Treatment of end-stage renal failure in the aging patient

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The numbers of patients being treated by the various renal replacement therapies including hemodialysis, peritoneal dialysis, and transplantation continue to increase in the United States at a rate of about 8 percent per year[1]. Furthermore, the mean age of patients receiving these therapies has also tended to become higher on an annual basis with an average age in 1995 of 59.6 year (fig. 1). Due to the large number of patients being treated for end-stage renal disease and the variety and magnitude of costs associated with these therapies, 13 billion U.S. dollars in 1995 with an almost 13 percent increase in 1996 (fig. 2), greater and greater evaluation is being made in regard to the cost benefit of the various treatment available. In considering the economics of end-stage renal disease therapy, it seems important not only to consider costs of specific therapies but also factors such as quality of life, patient life expectancy and time commitment costs both on the part of the part of the patients as well as the staff. All these should be evaluated in any serious analysis of dialysis care costs.

A variety of interesting studies have attempted to quantitate costs over the last several years. A recent Canadian study evaluating renal transplantation suggested that pretransplant dialysis care in 1994 amounted to a figure of approximately $66,000 (Canadian dollars) per patient and the cost of care of the first year after transplantation also created costs of about $66,000[2]. It is significant that this cost varied from $27,903 to $237,523. Second year costs were $27,875. The USRDS from 1990 to 1995 reported in 1997 found a cost of $16,000 per year per patient post transplant. Data regarding quality of life issues and employment tend to suggest beneficts of transplantation when compared to other forms of renal replacement therapy[2]. Patients who are diabetic, living related donors and, of course, patients who experience transplant graft loss tended to be more expensive, while patients transplanted earlier and younger tended to have lower costs. In the study by Laupacis y cols., however, age above or below sixty years of age did not affect cost to any great degree[2]. These factors, although rather clear in their implication, do not address important issues such as stresses involved in conjunction with living donations, emotional issues related to transplantation in general, short and long term complications resulting from immunosupression, including infection and vascular disease, and the fact that studies in regard to cost effectiveness are often limited to only a few years.

Changing profile of incident ESRD patients by year of incidence

Year of incidence	Average age	Percent diabetic	Unadjusted death rate*	Adjusted** death rate*
1988	57.5	31.2	26	30
1989	58.3	32.8	26	28
1990	58.7	34.4	25	27
1991	59.2	36.1	26	27
1992	59.6	36.6	25	26
1993	60.0	36.4	25	25
1994	59.8	38.2	24	25
1995	59.6	40.6	23	24

*deaths per 100 patient years at risk in the first year of ESRD therapy.
**adjusted for age, race, sex and diabetes as the primary cause of ESRD.
Source: Reference tables A.1, A.14, E.14 and E.22

USRDS 1998

Fig. 1.—Age profiles of ESRD patients 1988 to 1995[1].

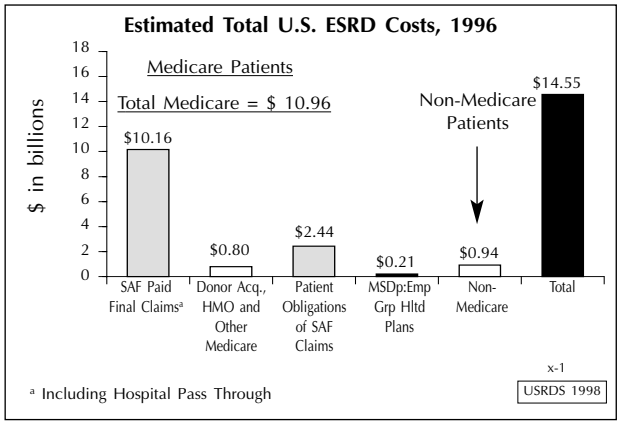

Fig. 2.—U.S. ESRD costs estimated for 1996[1].

Continuous ambulatory peritoneal dialysis (CAPD) has proved to be an especially useful therapy in a variety of circunstances and for a variety of reasons. It can provide certain patients with clear benefits when compared with other forms of renal replacement therapy. Benefits of peritoneal dialysis include the fact that it can be done at home, it can be done overnight, it can be done painlessly and it is under the control of the patient. Some of these benefits may not avoid serious complications for some patients, however. A recent study suggested that diabetic patients on peritoneal dialysis were more likely to withdraw from therapy[3]. It would appear that isolation and multiple medical problems contribute to such an observation. A study by Bruns y cols., at the University of Pitt-sburgh, evaluated dialysis costs over a one year period between July 1, 1994 and June 30, 1995[4]. The interesting factor in this study was that patients were separated by quartile in regard to cost (table 1). Hemodialysis patients experienced annual costs that averaged almost $70,000 U.S. dollars per year but ranged between $32,000 and $138,000 per patient per year. Peritoneal dialysis patients averaged $45,000 per patient per year with a range of $25,000 to $80,000. When patients were stratified by age and diseases, there was some increase in cost noted as patients were older and if patients were diabetic.

The Pittsburgh data revealed that a diabetic patient aged 20-44 years averaged close to $50,000 in expense while a diabetic patient aged 65-74 experienced a cost 50% higher. This difference was not as high in the United States Renal Data System (USRDS) data which included more patients and amounted to an increase for only $3,000, however. The issues in regard to evaluation of costs and cost comparisons should include consideration of hourly rate for patients involvement, costs imposed by the choice of high risk patients, cost of possible modality changes, the potential for decreasing hospital costs by improvement in access procedures, and transportation costs. It is notable that the most expensive patients account for almost 50% of the total cost of dialysis programs (table I). Also, almost 30% of the patients who were most expensive died. Predictors of poor outcomes should be further refined if cost savings are to be realized. Further, inpatient costs are about 40% of total expenditures. It also should be noted that 50% of inpatient costs involve expenses for the hospital room and the dialysis treatments.

In the Bruns y cols., study, peritoneal dialysis patients experienced less hospital days and outpatient therapy was less expensive. On the other hand, it should be noted that peritoneal dialysis patients have

Table I. Costs for care of dialysis patients by modality and quartile

Model/Quartile	Cost/Pt.-Yr.
HD	
top	$ 138,107
second	$ 63,116
third	$ 41,695
fourth	*$ 32,600*
All HD (average/pt/yr)	$ 68,891
PD	
top	$ 81,698
second	$ 44,007
third	$ 20,459
fourth	*$ 25,372*
All PD (average/pt/yr)	$ 45,420
All HD/PD (average/pt/yr)	$ 63,340

Modified from Bruns FJ y cols. *J Am Soc Nephrol* 9: 884-890, 1998.

a mean time on that modality of somewhat over two years[5]. The life expectancy of an 75 year old U.S. citizen can average ten or more years[6], while the expected lifetime of an ESRD patient of similar age is 2.7 years[1]. Therefore, if CAPD is chosen, a patient may be treated by two modalities if the patient survives. Economic evaluations of peritoneal dialysis, therefore, probably should include an attempt at assessment of costs involved in both decreasing efficiency of the procedure and also difficulties and costs involved in a change in this modality to another type of renal replacement therapy. The reality also is that at our unit there seems to be decreasing interest in self care including peritoneal dialysis. In the United States, in general, the peritoneal dialysis component of end-stage renal disease (ESRD) moved to 11.3% by 1993[7], but by 1996 peritoneal dialysis patients accounted for 9.7 percent of all ESRD patients[1].

Chronic hemodialysis also raises many intersting issues in regard to expense. It has also become customary to evaluate this form of therapy in regard to age and diabetic status. There is a tendency for increased expense to occur with the presence of diabetes and as patients age. It should also be noted, however, that although patients older than 75 years of age may experience costs 8% above average cost for all ages ($50,000 vs $46,000), the differences in survival could be interpreted to suggest a cost benefit for older patients. In other words, if a therapy is more expensive but the years treated are less, the cost difference may not be as significant. Also, percent of life expectancy resulting from a therapy has been cited. In 1995, mean age of ESRD patients was almost 60 years and median age 64 years. The cost of care for patients of age 45-64 years was mean of $45,000 vs $50,000 for 75+ years. Survival data sug-

gest that in dialysis patients of advanced age, greater than 85 years old, one year survival is 53.6% compared to 59.8% for younger patients. Two year survival is 27.6% and five year survival 3.5%[8]. It seems clear that such life expectancy data can be used to develop cost prediction when treating patients in various age groups.

An additional major issue in regard to hemodialysis expenses is the issue regarding cost related to vascular access procedures. These costs from the USRDS Data Report of 1997 suggest a total expenditure of between $750,000,000 and $950,000,000[9]. These costs are rapidly rising since data from one decade also estimated that 15% of end-stage renal disease patient hospitalizations were related to vascular access with a total cost of $150,000,000. In addition, present data also include outpatient cost as well as the cost of placing the initial vascular access. It is generally felt that these costs are underestimated because many expenses are not captured. For example, antibiotics given for an access problem may not be designated as such. In addition, ambiguity and errors in regard to coding result in additional potential for error.

It can be seen, therefore, that many issues require consideration when cost benefit issues are contemplated in regard to ESRD therapy. In particular, in regard to the elderly, questions of survival, quality of life, patient preference, expected complications of therapy and resources availability all have special significance. Therapies which may be less expensive such as peritoneal dialysis and transplantation can present certain special problems when questions such as surgical stress, patient and organ life expectancy, immunosuppression, treatment failure, and catheter and membrane dysfunction are considered[10,11]. Hemodialysis, a more expensive modality, may have advantages such as convenience and opportunities for close observation, while vascular access and patient travel costs and inconvenience requiere continued discussion and study by both patients and physicians interested in this subject[12]. Preventive measures against cardiovascular disease, a major cause of death in the ESRD population[9], may present the greatest opportunities for cost savings both before and after the initiation of ESRD therapy.

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