

Projecting the United States ESRD population: Issues regarding treatment of patients with ESRD

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Projecting the United States ESRD population: Issues regarding treatment of patients with ESRD. In 2001, there were 406,081 patients who received treatment for end-stage renal disease (ESRD), increasing by 4.2% since 2000. The number of patients with ESRD has grown consistently over the past decade, with the greatest rate of growth occurring among patients older than 75 years of age, and patients with comorbidities such as diabetes mellitus and hypertension. Current projections indicate that the population of patients with ESRD may reach more than 2 million by 2030. The overall mortality rate has fallen by 10% since 1988, with the greatest decline among patients incident to dialysis, and an increase among patients receiving dialysis for greater than five years. While the rate of hospitalization for ESRD patients has remained relatively constant, recent improvements in mortality are temporally associated with a greater proportion of patients achieving adequate benchmarks of care in dialytic processes, such as anemia correction and dose of dialysis. The ESRD program consumes 6.4% of the Medicare budget. On a per-patient per month basis, Medicare costs have risen between 1991 and 2001. While payments fell slightly during 1998 and 1999 because of changes in Medicare policies, more recent years have seen an upswing in total expenditures, presumably related to use of injectables not included in the composite rate. Continued growth in the number of new patients reaching ESRD, as well as improved mortality rates of ESRD patients, are both contributing to the current rise and projected epidemic of ESRD over the next 25 years. The current public health strategy of identification of patients with early kidney disease to slow their progression to ESRD, in addition to aggressive treatment strategies to minimize the morbidity and mortality of patients with ESRD, is essential toward affecting the growth and health of this population.

THE EPIDEMIC OF ESRD

During the year 2001, 406,081 patients received treatment for end-stage renal disease (ESRD). Over 96,000 new patients began treatment that year, representing a 4.2% increase since 2000 [1]. The ESRD population has grown consistently over the past decade (Fig. 1) due to

both an increase in incidence and a decline in mortality rate. While this growth has occurred in all demographic groups, the rate of growth among elderly patients (older than 75 years of age) has been the greatest and is most noteworthy (Fig. 2). Moreover, the trend for growth among the proportion of patients with comorbidities such as diabetes mellitus and hypertension may be related to the increase in ESRD incidence rates of elderly patients (Fig. 3). This disproportionate growth among older patients and those with certain comorbidities has led to an increase in the median age of the prevalent population, from 51 to 58 years since 1978, with a similar increase in the proportion of patients with diabetes mellitus.

The overall mortality rate for dialysis patients has declined by 10% since 1988. This decline was seen only in patients who received dialysis for less than two years, and for those on dialysis for two to five years. In contrast, the mortality rate for patients receiving dialysis for greater than five years has recently increased (Fig. 4). Given that a greater proportion of patients are surviving five years after starting dialysis, the lack of continued improvement in survival beyond five years is not easily explained. In spite of some improvement in survival in the early years on dialysis, it is noteworthy that the mortality risk for a patient with ESRD remains strikingly elevated compared to age-, gender-, and race-matched control patients without kidney disease [2]. For example, a 50-year-old white male without ESRD can expect to live an additional 28.0 years, while a similar patient with ESRD can expect to live only 5.3 years.

The same consideration should be given to patients with chronic kidney disease (CKD) who do not yet require renal replacement therapy. Based on the National Kidney Foundation's classification system for CKD, approximately eight million people in the United States have an estimated glomerular filtration rate (GFR) of less than 60 mL/min/1.73 m² [3]. Similar to the ESRD population, the proportion of the CKD population with diabetes mellitus is increasing [1]. While the mortality rates for patients with CKD may have slightly declined in recent years [1], it is noteworthy that CKD patients

Key words: end-stage renal disease, hypertension, hemodialysis, chronic kidney disease.

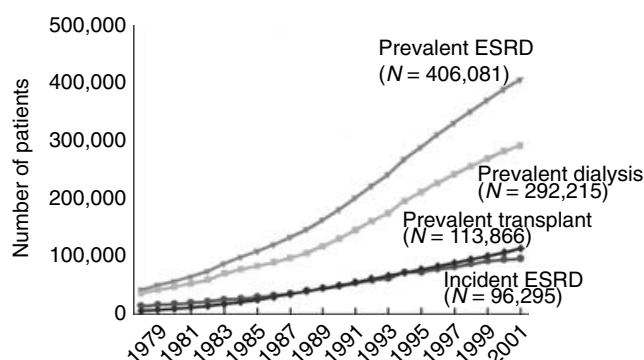


Fig. 1. Number of patients incident and prevalent to end-stage renal disease (ESRD) by renal replacement therapy modality (USRDS 2003 Annual Data Report).

are still five to 10 times more likely to die than to reach ESRD [3]. The strikingly disproportionate rate of sudden cardiac death in this population is further supported by the increased risk for the development of new cardiovascular disease. Patients with CKD who have no previous need for cardiovascular care have a 60% to 70% greater risk for requiring initial and subsequent care for cardiovascular disease (i.e., development of incident cardiovascular disease) than their non-CKD counterparts during the subsequent year [1].

It is projected that the current growth in the size of population of patients with diabetes mellitus and CKD will lead to a steady increase in the number of ESRD patients, so that by the year 2030, 2.24 million patients will require some form of renal replacement therapy [1]. This means that an enormous number of CKD and ESRD patients will be at significant risk for cardiovascular disease, and with strikingly high mortality rates compared with patients without kidney disease. Consequently, it will be essential to plan recruitment of the necessary resources for the growth in size of these populations, as well as for the issues of aging and worsening comorbidities.

MORBIDITY AND MORTALITY ASSOCIATED WITH ESRD

Overall, there have been significant improvements in both morbidity and mortality among patients with ESRD over the last decade [1]. Among these patients, admissions for vascular access fell by 24%, but admissions related to circulatory and respiratory diseases grew by 13.5% and 11.5%, respectively. This resulted in a relatively stable all-cause hospitalization rate for prevalent dialysis patients, decreasing by barely 1% between 1993 and 2001. Interestingly, however, this was accompanied by a 15% to 20% reduction in total hospital days per year. On the other hand, the mortality rate has decreased by 10% since 1980, clearly seen among patients incident to dialysis. However, the change in mortality has been quite

different among different patient groups. Those with less than two years on dialysis, as well as those who were on dialysis for two to five years experienced a 22% and 15% decline in mortality rates, respectively. By contrast, those who had been on dialysis for more than five years had a 7% increase in mortality rate. The increase in mortality among patients with a greater dialysis vintage entails greater clinical and research focus on complications that occur over time, such as accelerated atherosclerosis, hypertension, hypervolemia, lipid abnormalities, insulin resistance, disordered mineral metabolism, hyperhomocysteinemia, and/or physical inactivity seen among patients with ESRD [4–12].

Factors that have been linked to increasing mortality in large observational studies include demographic and clinical characteristics that may or may not be modifiable. Examples of these include low serum albumin levels, increasing age, female gender, and white race [13, 14, 15]. Moreover, dialysis-related factors have also been linked to mortality. These include issues that have led to the development of various National Kidney Foundation (NKF) clinical practice guidelines (Dialysis Outcomes Quality Initiative, or DOQI) including dialysis dose [as measured by either urea reduction ratio (URR) or Kt/V], anemia, and calcium and phosphorus metabolism. For instance, numerous observational studies have demonstrated an association between increased dose of dialysis and a decreased mortality rate [15–24]. Based on these findings, the National Kidney Foundation's Dialysis Outcomes Quality Initiative Guidelines recommend a minimum delivered dose of dialysis of a Kt/V of 1.2 or a URR of 65% [25]. Similarly, increased hematocrit and hemoglobin levels have been associated with improvements in muscle strength and function [26], cognitive and brain electrophysiologic function [27], cardiac function [28–33], sexual function [34], quality of life [35], and survival [36, 37]. The exception was the result of a clinical trial by Besarab et al [38] that randomized patients with ESRD and cardiac disease to either a hematocrit of 30% or 42%. This trial failed to demonstrate a benefit for normalizing the hematocrit. Therefore, the current NKF-DOQI guidelines recommended that the target for anemia correction is a hematocrit of 33% to 36%, or hemoglobin of 11 to 12 g/dL.

It is interesting that in studies utilizing two large datasets representative of the United States dialysis population, the recent decline in mortality rate was accompanied by a simultaneous improvement in the proportion of patients reaching the goals for dialysis dose and hematocrit level [39, 40]. However, in spite of the decline in mortality rate, the relative proportions of deaths attributed to cardiovascular, infectious, and other causes of death have not changed substantively [1].

Similar relationships between serum calcium, serum phosphorus, and the calcium-phosphorus product and

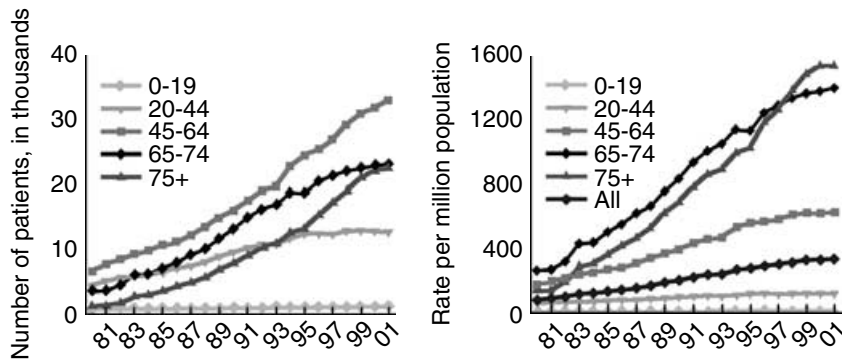


Fig. 2. Number and rates of patients incident to end-stage renal disease (ESRD) by age (USRDS 2003 Annual Data Report).

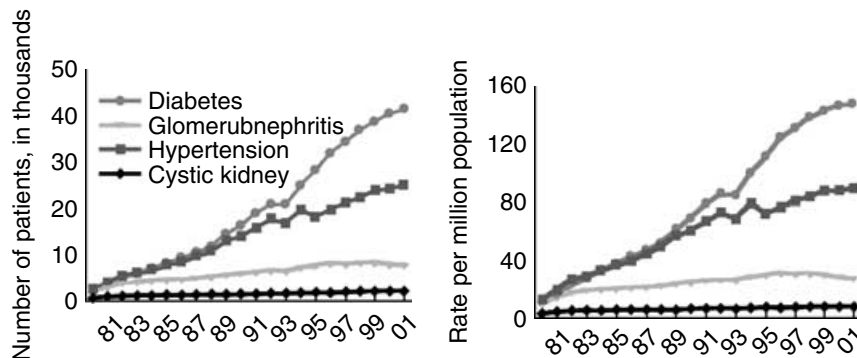


Fig. 3. Number and rates of patients incident to end-stage renal disease (ESRD) by primary diagnosis (USRDS 2003 Annual Data Report).

mortality have also been examined. Recommendations to maintain serum calcium within normal range (e.g., 8.4 to 9.5 mg/dL) are supported by observational studies that showed an association between hypocalcemia and increased mortality [41–44]. Moreover, recommendations to maintain the serum phosphorus between 3.5 and 5.5 mg/dL and calcium-phosphorous product below 55 mg/dL² are supported by similar observational data that revealed an 11% increase in mortality with each 10 mg/dL² increase in the product [45]. The impact of these guidelines on subsequent trends in morbidity and mortality will have to be reassessed in subsequent years.

IMPACT OF ESRD POPULATION GROWTH ON HEALTH CARE COSTS

Strategies for caring for patients with ESRD must take into account the needs of the current patient population, and simultaneously plan for the future growth of this population. These include the provision of dialysis and dialysis related-services, creation and maintenance of vascular access, kidney transplantation, the cost of medications, and care for other comorbidities of this population through both inpatient and outpatient services.

On a per-patient basis, Medicare costs have risen each year between 1991 and 2001. During 1998 and 1999, however, the rate of growth for payments fell slightly at only 1.8% and 4.2%, presumably because of changes in Medicare policies for home health and skilled nursing facilities.

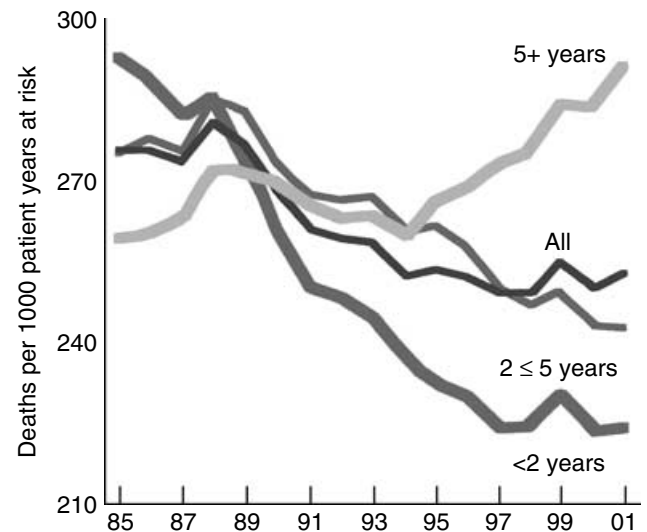


Fig. 4. Mortality rates (adjusted) for patients receiving dialysis, by vintage (USRDS 2003 Annual Data Report).

ties. Total Medicare expenditures for the remaining years, however, have continued to increase, concomitant with the rise in the ESRD population, with increases in total expenditures of 8.1% and 11.5% in the last two years. The increases appear to be related to services not currently included in the composite rate. Examining costs per-patient per month demonstrates increasing billing for injectables such as intravenous (IV) vitamin D, IV iron, and erythropoietin (Fig. 5). Expenditures for IV iron increased by

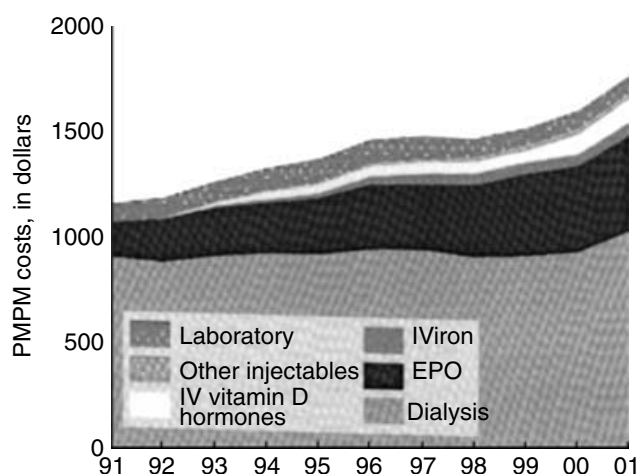


Fig. 5. Per-patient per month costs for clinical services for prevalent dialysis patients (USRDS 2003 Annual Data Report).

almost 16% in 2001, and expenditures for IV vitamin D increased by 41% and 19% in 2000 and 2001 as a result of billing for Zemplar rather than Calcijex.

The changing demographics of the ESRD population have and will likely continue to affect Medicare expenditures. The aging of the ESRD population, and the greater number of patients with diabetes mellitus, are consuming an increasing part of the ESRD program expenditures. The ESRD program currently consumes 6.4% of the entire Medicare budget of \$242 billion. This is a 33% increase over the last 11 years. Given the changes to the ESRD population and projected trends for growth, the projected costs of this program for third party payers over the next decades are daunting.

These projections include Medicare costs but do not reflect the out of pocket costs for patients. Noteworthy is the fact that the increase in cost of injectables occurred temporally with the NKF guidelines for benchmarks of dialytic care [25]. If this was true, then a similar relationship between increased use of oral medications and these guidelines may have occurred, but was not reflected in the summary estimates or projections. These costs may be borne directly by the patients or other third party payers and may contribute to the increasing costs paid for outside the Medicare program.

CONCLUSION

The recent increase in the number of ESRD patients and the decline in mortality rate among these patients have both contributed to a projected epidemic of ESRD over the next 25 years. Healthy People 2010 are a set of national health objectives designed to address preventable threats to health and to establish national goals to reduce these threats [46]. Given the demonstrated current increase in ESRD population and the cost of this program

to Medicare, strategies to reduce the ESRD burden are timely and appropriate.

In spite of tremendous advances in understanding the factors that contribute to the increased morbidity and mortality of patients with ESRD, the fact remains that the risk of cardiovascular disease is greater than that in the general population without kidney disease. Hence, further research is essential in order to understand the underlying mechanisms for the enormous burden of cardiovascular disease and accelerated atherosclerosis. Moreover, research should also focus on identifying modifiable risk factors that negatively impact outcomes experienced by patients with ESRD. Furthermore, it will be imperative to focus on identifying patients with early kidney disease and to implement therapeutic strategies in an attempt to slow their progression to ESRD. By employing this two-pronged approach, we may be able to both slow the growth of the ESRD population and simultaneously decrease their morbidity and mortality.

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