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# NEPHROLOGY

# *Rounds*

## Quality of care and cost issues in end-stage renal disease

By ELIZABETH WRONE, MD and JEFFREY PETERSEN, MD

### Scope of the problem

The subspecialty of nephrology is witnessing steady improvements in dialysis and renal transplantation, with resultant positive effects on clinical outcomes. However, practicing nephrologists face unique challenges as medical practice shifts under the external pressures of cost containment and expansion of managed care organizations. In addition, the patient pool is expanding at rates faster than those of the general population. Despite these trends, two conflicting developments have emerged: the increasing role for the nephrology specialist provider, and a predicted drop in the number of practicing nephrologists.

The United States Renal Data System (USRDS) reports that incidence of end-stage renal disease (ESRD) for 1995 increased by 7%.<sup>1</sup> This corresponds to 68,870 new ESRD patients in 1995, contributing to a total of 257,266 under treatment for ESRD. While the ESRD population continues to grow, the incidence appears to be lower than the 10% reported pre-1993, and it discredits somewhat the notion of an epidemic of ESRD.

A disturbing increase in crude mortality rates in the mid-eighties incited considerable debate over the quality of care provided to ESRD patients. However, mortality has improved steadily since then, despite an increasing mean age and proportion of patients with diabetes. In 1987, the average age of an incident ESRD patient was 56.8 years; 30.1% were diabetic; and the unadjusted death rate was 26 per 100 patient years at risk. The comparable figures in 1994 were an average age of 59.6 years, 37.3% diabetics, and an unadjusted death rate of 24 per 100 patient years at risk. There clearly were improvements in ESRD patient care, and decreasing death rates contribute to an increased pool of ESRD patients.

The number of renal physicians practicing in the next few years is difficult to predict. The College of Graduate Medical Education (COGME) has made recommendations concerning physician workforce numbers and specialization trends, with the goal of reducing the number of specialist providers. Full implementation would result in a 55% reduction of new nephrologists trained in adult care by the year 2010. Already in 1996, the first year under the COGME guidelines, the number of first-year nephrology fellows decreased by 8%. The shrinking number of nephrologists is quite likely under-estimated, as there is expected to be a high incidence of early retirement among these practitioners. Each nephrologist might be caring for three times the number of ESRD patients by the year

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## Case history

The patient is a 35-year-old woman who transferred her care to the Stanford Renal Clinic in March 1997 for management of chronic, progressive renal insufficiency.

In 1991, the patient had incidental proteinuria of 4.8 g/day. She was normotensive and had normal renal function and serologic values. A kidney biopsy in 1992 revealed "focal segmental necrotizing and segmental and globally sclerosing glomerulonephritis." In 1996, the patient developed progressive chronic renal insufficiency and hypertension. Her hypertension remained difficult to control despite various antihypertensive medications.

In March 1997, the patient was admitted to hospital twice for hypertensive emergencies, with a history of missed medications and blood pressures as high as 240/149. Over the next several months, blood pressure control was variable. Renal function continued to deteriorate, and fatigue and progressive edema developed.

Numerous discussions about impending renal replacement therapy took place with the patient. Close follow-up was arranged for control of edema and monitoring of uremic symptoms. The patient was given appointments

for vascular surgery for placement of a radial-cephalic fistula, with sufficient lead time for maturation. Over the next two months, she missed 7 of 19 appointments scheduled, including those for vascular access. Her blood pressure was below 135/90 on only two occasions, due to her erratic medication compliance habits. During this time, her serum creatinine continued to rise, and her serum albumin eventually began to fall (Figure 1).

Sleeplessness, loss of appetite, malaise, and fatigue ensued. Due to the relative urgency to begin hemodialysis, a temporary catheter was inserted at the time of creation of a radial-cephalic fistula.

Maintenance hemodialysis was begun, with treatment sessions notable for large intra-dialytic fluid gains and poor catheter blood flow rates. One week later, the patient presented to the emergency department for bleeding around the catheter site, which was controlled by local pressure. After she had had 4 weeks on dialysis, there was noticeable fever and purulence at the catheter exit site. Staff took cultures and instituted vancomycin and gentamicin therapy.

2010 as the result of the current growth in patient numbers coupled with the anticipated shortage of nephrology trainees.<sup>2</sup>

### Costs

The total direct cost of treating ESRD in the US during 1995 was \$13 billion. The portion paid by Medicare was \$9.7 billion, up from \$7.8 billion in 1994. This represents an increase of 2.8% per patient per year at risk. The Consumer Price Index for medical items increased by 4.4%, which led the USRDS Annual Report to conclude, as it has in previous years, that the addition of new patients under treatment drove the increase in ESRD program costs.

Vascular access complications are considered the single largest source of morbidity in ESRD patients, accounting for about 16% of total hospitalizations. Medicare costs of vascular access complications reached \$743 million, according to narrowly defined procedure codes, and \$939 million according to more broadly defined codes. This represented between 8.4% and 10.6%, respectively, of total Medicare spending for ESRD

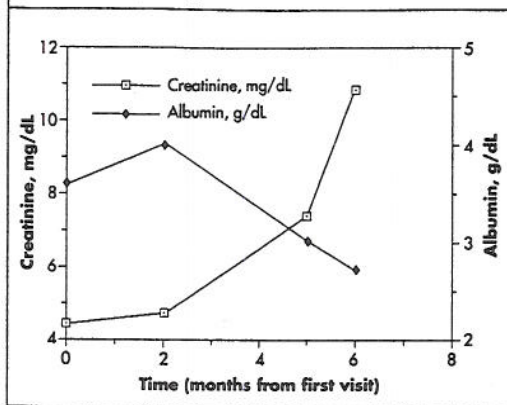
in 1994.<sup>1</sup> Hence, vascular access complications are an important target for cost reduction and outcome improvement.

### Established clinical goals

Initial concerns over high mortality rates, coupled with the lower mortality rates reported in the European and Japanese registries, prompted the National Institutes of Health (NIH) to convene experts in general medicine, nephrology, pediatrics, biostatistics, and nutrition, as well as the public, to address factors that contribute to morbidity and mortality in ESRD patients. Statements from these meetings included (1) that patients, including children, in the pre-dialysis phase should be referred to a renal team to reduce the morbidity and mortality incurred during the pre-dialysis period and when receiving subsequent dialysis therapy, and (2) that the social and psychological welfare and the quality of life of the dialysis patient should be favorably influenced by the early pre-dialysis and continued involvement of a multidisciplinary renal team. Within the consensus



**Figure 1:** Case patient's serum creatinine, mg/dL and serum albumin, g/dL starting from first visit to nephrology clinic.



statement, the onus was placed on managed care programs to "recognize the importance of the continued involvement of the renal team in the care of these patients and that optimum reduction of dialysis morbidity and mortality begins with pre-dialysis intervention."<sup>3</sup> Translating this into clinical goals means:

- early referral to a nephrologist
- early interventions to limit or to prevent progression to ESRD
- early interventions to treat complications associated with renal failure
- improved management of co-morbid conditions.

#### Impact of treating pre-ESRD patients

Treating pre-ESRD patients improves their clinical status and slows progression of chronic renal insufficiency (CRI).

#### Improving clinical status

Several studies have shown that the clinical condition of the patient upon initiation of renal replacement therapy is associated with the outcome of dialysis. Indicators of poor clinical status such as hypertension, left ventricular hypertrophy, malnutrition, and anemia are all treatable. Analysis of these indicators, using the medical evidence form for new patients starting dialysis in the US, suggests that a substantial proportion of patients has had sub-optimal pre-ESRD care. The majority had hypoalbuminemia, and less than one-fifth of anemic patients were receiving erythropoietin treat-

ment.<sup>4</sup> Evidence is lacking, however, that intervening to improve any of these indicators improves outcomes once ESRD develops.

#### Slowing progression

Three measures that delay progression of CRI are dietary protein restriction, antihypertensive therapy, and angiotensin-converting enzyme (ACE) inhibitor therapy. These therapies were reviewed in the November, 1997 issue of *Nephrology Rounds*. Although protein restriction is controversial and difficult to achieve on a practical level, numerous clinical studies, especially when considered together, suggest that there may be some benefit. A potentially harmful effect of dietary protein restriction on the nutritional status of patients with chronic renal insufficiency warrants special attention. Pre-dialysis patients should be followed carefully in conjunction with a skilled dietitian.

#### Early referral

Early referral is a cornerstone in facilitating the above measures and coordinating the commencement of renal replacement therapy, and it has been the target of much investigation. In the US, it has been estimated that only one-fourth of patients with ESRD are referred to a nephrologist before initiation of dialysis.<sup>1</sup> This is similar to referral rates reported in England, France, and Japan. Clearly, there is room for improvement.

#### Benefits

Although there is general agreement on the detrimental consequences of delayed referral, few studies have addressed this directly, especially in the United States. In Scotland, 5-year survival on dialysis was substantially worsened by failure to plan for dialysis. The 5-year survival for those presenting acutely was 5% compared to 69% in those patients followed by a nephrologist prior to their first dialysis.<sup>1</sup> In a case-control study, the majority of early deaths (90 days or less from the onset of dialysis) occurred in patients who presented with advanced renal failure for the first time and had had little pre-dialysis care.<sup>6</sup> Similar results were described in a case-control study from England: patients who died within the first year of starting dialysis averaged 1 month of pre-dialysis care,<sup>7</sup> whereas those who survived beyond one year had received 30 months of pre-dialysis care.

**Table 1: Impact of late referral on temporary catheterization**

Study	Early pts.	Temp.caths.	Late pts.	Temp.caths.	Lost to f/u
Ratcliffe <sup>8</sup>	32	2	23	6	15
Jungers <sup>9</sup>	20	0	20	15	7

A report on 55 patients starting dialysis in 1981 in Oxford, England, showed that 32 patients were referred to the nephrology service more than one month before initiation of dialysis. Only two temporary vascular access catheters were needed in this group; 72% of patients began hemodialysis with a native arteriovenous fistula in place. There were no serious complications. Of the remaining patients, three required urgent hemodialysis for pulmonary edema, and 16 required prolonged hospitalizations for treatment of complications.<sup>8</sup>

In a case-control study from the Necker Hospital in Paris, 20 patients starting dialysis less than one month after referral to a nephrologist required 15 temporary catheters, had 13 cases of pulmonary edema, and had hospital stays ranging from 12–56 days. Patients with more than one month of pre-dialysis care required no temporary catheters, had no complications, and had hospital stays ranging from 2–7 days.<sup>9</sup>

Preliminary reports from the US suggest that patients under nephrology specialty care prior to the institution of maintenance hemodialysis have shorter lengths of stays and less need for temporary vascular access catheters.<sup>10</sup> A nationwide random sample of 1,327 patients developing ESRD during 1996 revealed that 83% had seen a nephrologist before dialysis. Odds of a permanent access and odds that the permanent access was a native fistula were greater for patients under a nephrologist's care at least four months prior to initiation of renal replacement therapy.<sup>11</sup> Clearly, the evidence from retrospective analyses and case-control studies reveals an association between early referral to a nephrologist and improved outcomes; however, a causal relationship is difficult to prove in the absence of randomized trial data.

#### *Economic impact*

The focus of cost-containment efforts is shifting to the pre-ESRD population, as there are opportunities for

prevention of morbidity or for delaying progression to more costly therapies. It is a somewhat intuitive conclusion that better patient preparation will lead not only to better survival but also to cost savings. In France, late referral for dialysis meant five times the cost for hospitalization of patients compared to that for patients followed at least 6 months before commencement of dialysis.<sup>8</sup> A recent preliminary report from the same hospital noted that, of 932 patients who initiated renal replacement therapy in an eight-year period, 78.5% had previously received regular nephrology care. This group of patients had significantly shorter hospital stays (29.7 versus 4.8 days), and lower three-month mortality rates (1.5% versus 7.1%) than those without pre-dialysis nephrology care.<sup>12</sup> The primary component of the increased costs is the increased number of inpatient days in delayed-referral patients. This finding has been confirmed by reports from Canada.

#### *Limitations*

Even with the best of intentions, early referral is difficult to achieve, in part because advanced renal insufficiency is often insidious. Patients who are under nephrology care frequently become lost to follow-up or else "fall through the cracks," as did the patient presented for these *Rounds*. In the Oxford referral study, 15 of 23 late-referral patients had, in the past, seen a nephrologist.<sup>8</sup> In the Paris study, 7 of 20 late-referral patients had also been previously seen by nephrologists.<sup>9</sup> Table 1 shows some consequences of late referral and loss of follow-up – specifically, an increase in temporary catheterizations and, probably, an increase in complications.

#### **Specialty management**

Despite the lack of randomized trials of pre-dialysis outcomes and costs, there is general sentiment that improved pre-dialysis management by a specialty team will improve morbidity and mortality and decrease costs.



A reduction in hospital days was reported in patients who participated in a multidisciplinary pre-dialysis program in the Kaiser Permanente Los Angeles Medical Center. Among the 29 participants, (59% diabetics, mean age 60.3 years) mean hospital days were 1.82 per patient. Among the 17 patients who did not participate in the program (41% diabetics, mean age 57.4 years), mean hospital days were 10.7 per patient, which is similar to the length of hospital stays reported by others.<sup>13</sup>

A study from Vancouver, Canada, reported on a multidisciplinary clinic-based education and follow-up program and compared it with results of routine nephrologic care. In the program group, 13% of patients required temporary vascular catheters and accrued 6.5 inpatient days. Standard-care patients required temporary catheters in 35% of cases and accrued 13.5 inpatient days.<sup>14</sup>

Before these issues can be thoroughly investigated, however, pressures exerted by the current health care climate are already changing how kidney patients are treated. In 1993, Congress mandated the Department of Health and Human Services to conduct a three-year demonstration testing a social health maintenance organization for ESRD beneficiaries.

Reimbursement is capitated at 100% the average fee-for-service costs adjusted for patient age, treatment modality, and diabetes status. Management includes integrated acute and chronic care. Sites are expected to provide case management and clinical protocols for common clinical events.

Of particular interest is whether managed care can improve clinical outcomes. Many observers anticipate that provider networks will be developed before the completion of this project to manage the entire spectrum of kidney disorders.<sup>15</sup> Capitation, however, remains controversial due to the wide variance of costs that dialysis patients accrue. A small program could be vulnerable if several patients accrue large hospital bills from prolonged intensive care unit stays, when reimbursement per patient hovers near a mean of \$45,000.

### Conclusion

Perhaps the single most important intervention in the care of a patient is early placement of a native vascular

**Table 2: Clinical interventions to improve pre-ESRD care**

- Timely vascular access placement as per DOQI guidelines
- Early nephrology referral
- Early transplant referral
- Emphasis on education
- Multidisciplinary, team-based care

access. We strongly encourage adherence to the Dialysis Outcomes Quality Initiative (DOQI) guideline for patient evaluation prior to access placement. This guideline is a key to improving care, and it includes a recommendation of surgical referral for a primary AV fistula when the creatinine clearance is less than 25 mL/min, the serum creatinine is greater than 4 mg/dL, or the patient is within 1 year of anticipated need for dialysis.

Evidence is mounting for the role of pre-ESRD care in improving clinical outcomes and in cost containment. This involves early referral to a nephrologist and multidisciplinary, educational team approaches (Table 2). However, we caution against overly optimistic interpretation of the data, because from a practical standpoint, early intervention is not feasible for all patients.

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#### Upcoming Scientific Meetings

14-16 May 98

#### 10th International Symposium on Radionuclides in Nephrology

Copenhagen, Denmark

(Rontgenafdelingen)

CONTACT: KAS Herlev, DK-2730 Herlev, Germany

30 May - 4 Jun 98

#### American Urological Association

#### 93rd Annual Meeting

San Diego, California

(American Urological Association)

CONTACT: 410-223-4308

31 Jul - 2 Aug 98

#### Summer Research Conference

Houston, Texas

(American Urological Association)

CONTACT: 410-223-4308

12-16 Sep 98

#### 11th Congress of the International Paediatric Nephrology Association

London, UK

(Concorde Services Ltd)

CONTACT: 10 Wendel Road, London, W12 9RT, England

#### Abstract of Interest

#### High costs and morbidity of non-nephrologist care pre-dialysis in a community hospital.

ERIC BROWN, WILLIAM HINES AND ROBERT LONGNECKER. STAMFORD CT.

Higher costs and morbidity at the initiation of dialysis has been reported in University hospitals, France, England and inner city hospitals for patients not followed by nephrologists prior to the diagnosis of ESRD. We report similar, striking findings in a community hospital setting.

40 new dialysis patients were examined prospectively over a one year period. Length of hospitalization (LOS), number of access procedures (PROC), presence of uremic complications (CX) and selected laboratory data were compared in patients seen by a nephrologist (N) prior to the initiation of dialysis and patients followed by their primary care doctors (PC). Of interest, there were no patients with no medical care prior to the onset of ESRD.

	N	PC	P
Number of patients	26	14	
Diabetics	30%	23%	0.273
Average age	66.1	63.9	0.699
LOS (Days)	5.5	27.0	0.005
CX	35%	79%	0.008
PROC	1.1	2.1	0.039
Pre-BUN	114.7	91.6	0.095
Pre-Creatinine	7.0	11.0	0.277
Pre-Albumin	.35	3.2	0.121
Pre-Hematocrit	30.5	24.1	0.004
Pre-Phosphate	6.4	8.1	0.034
Pre-Calcium	8.1	7.4	0.145
Pre-Potassium	4.9	5.1	0.617
Pre-Potassium >6.0	8%	21%	0.210

Although limited by sample size, we conclude that nephrologic care prior to the initiation of dialysis is cost-effective and clinically superior to the alternative. Last, we note that only 65% of new ESRD patients and 57% of new diabetics with ESRD received nephrologic care prior to the initiation of dialysis. We will expand our sample size and compare long-term outcomes between the two cohorts in future work.

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