

Clinical Pearl

## Prospects for Daily Nocturnal Hemodialysis (DNHD)

**Studies have shown that patients undergoing daily nocturnal hemodialysis have better medical results and lower overall health costs than patients treated with tradition dialysis.**

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As our population ages, more people are developing chronic renal failure. It is predicted that 520 000 people will require dialysis by 2010 [1]. Forty-four percent of patients with end-stage renal disease (ESRD) in 2001 were diabetics, and diabetes, too, is on the rise. In 2000, patients with ESRD comprised 0.7 percent of the Medicare population and consumed 6 percent (\$14 billion) of the Medicare budget. This cost figure is expected to rise to \$26 billion in 2010 [1]. Clearly, current renal replacement therapies need to produce better outcomes at a lower cost, or we will have to ration care.

Home dialysis, which may be better for many patients, is underutilized. In 1985, some 20 000 patients were using home dialysis through Medicare. But budget cuts forced the elimination of paid assistants for home dialysis patients, and the number of home dialysis patients shrank to the low numbers we see today, as few as 2000 nationwide [1]. The typical regimen for patients on traditional dialysis consists of regular visits to a local dialysis center, 3 times a week for 3-4 hours at a time.

More importantly for patients, conventional in-center hemodialysis, thrice weekly, produces significant side effects. Cleaning the blood rapidly in 12 hours per week is an "unphysiologic" therapy [2,3]. Patients become short of breath, their blood pressures rise, and symptomatic uremic toxins rise between treatments. When these conditions are reversed rapidly by hemodialysis, the patients are often exhausted, nauseated, and hypotensive for 4 to 8 hours after dialysis. Patients actually feel good for a few days a week at best. Their physical fatigue is compounded by the psychological oppression of chronic illness and a treatment regimen in which they are passive recipients with little control over their own destiny.

### Home Nocturnal Dialysis

In 1994, Drs Robert Uldall and Andreas Pierratos in Toronto, Canada, initiated a new form of dialysis by which patients were hemodialyzed at home at night while they slept [4]. They received 8 hours of hemodialysis 6 or 7 nights a week. The clinical results have been stunning and consistently reproducible. Patients on daily nocturnal hemodialysis (DNHD) feel "normal." They are not tired after dialysis. They have no restrictions on their fluids or diets. They have the daytime free, and many continue to work or return to work [4-8].

DNHD has been demonstrated to improve nutrition [7-12], reduce or eliminate the need for blood pressure medications with continued good blood pressures [8-10], and reduce the need for expensive medicines to treat anemia [4,8,9,14]. Sleep patterns improve [16-17] and so does cognition [13]. Left ventricular hypertrophy and other cardiac risk factors are reduced [17-22]. This is an especially important finding because most dialysis patients die of heart disease, not kidney failure. Phosphorus, calcium, and parathyroid hormone are normalized without dietary restrictions, phosphate binders, or expensive vitamin D analogues [23-25]. Finally, patients have fewer hospitalizations [4,26-30].

Several studies have demonstrated decreased *total* annual health care expenditures per DNHD patient, even though the actual cost of dialysis is higher [26-30]. One study of the Toronto patients showed an 18.2 percent decrease in total

expenditures by DNHD patients when compared to similar in-center patients [29]. Although DNHD has higher expenditures for training, supplies, dialysis machines, and remote monitoring, DNHD patients still cost the health care system less.

And these benefits don't include intangibles like increased rates of rehabilitation and improved family life. For example, patients report improved libido which disappears in chronically and acutely ill people. DNHD patients report a return of libido, indicating that their individual physiologies have improved to the point that this human function returns.

The Rubin Dialysis Center has offered DNHD for 6 years [10]. It employs 37 people trained in DNHD and currently has 25 patients on nocturnal home hemodialysis. Patients have ranged in age from 27 to 76; one-third are female, and a quarter are African American and Hispanic. They live throughout upstate New York, and one travels 300 miles to the center's monthly clinic. Some live in apartments in inner cities; others live in rural trailer parks. The only extra expense our patients incur is an initial investment in plumbing adjacent to their bedrooms and the monthly cost of an extra phone line and Internet access. (The center monitors patients online over the Internet while they sleep) [31]. The only criteria for selection to this program are motivation, "reasonable" hearing, eyesight, dexterity, and memory. Thirty percent of the patients are diabetics with neuropathy and retinopathy.

## **An Underutilized Therapy**

If DNHD's potential is so great, why do only 25 centers in the United States and Canada offer this modality to only 300 patients? Reimbursement for dialysis in the United States does not cover the cost of 6 treatments per week, thus discouraging dialysis units, most of which are operating on a very small margin, from taking the risk of this initially costly program. Savings by payers, patients, and society on medications, decreased hospitalizations, and improved rehabilitation are not passed on to dialysis providers, again reducing the incentive to offer this modality.

Finally there is appropriate skepticism of claims based on small numbers of patients. Given the experience with entitlements like dialysis, where the anticipated need was estimated to be only several thousand patients when passed by Congress in 1973, one has to respect the payers' and government's insistence on scientifically proven results in good studies with larger numbers of patients. This research is already in the formative stages. DNHD will be studied in the United States in a prospectively randomized controlled trial funded by National Institutes for Health and Centers for Medicaid Services beginning this fall [32].

DNHD is a win-win innovation for dialysis patients tired of feeling lousy, physicians frustrated by high morbidity and mortality, providers unable to staff or fund new units, and payers crippled by double-digit cost increases without improved outcomes.

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