New Options to Improve Hemodialysis Patient Outcomes

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Early three decades after the National Cooperative Dialysis Study showed that survival was related to time on dialysis and urea removal (1), little progress has been made to improve outcomes. The Hemodialysis Study (HEMO), a prospective randomized, controlled trial (RCT) comparing high- versus low-dosage and high- versus low-flux thrice-weekly dialysis failed to show improvement in survival for patients receiving the higher dosage dialysis (2). A move away from conventional thrice-weekly hemodialysis (HD) to more intensive treatments seems more promising. Enhanced solute removal is possible with hemodiafiltration (HDF), whereby diffusion and convection are combined across a highly permeable membrane. Several HDF techniques that may reduce morbidity and dialysis adverse effects have been developed (3). Although a meta-analysis of mortality showed no advantage of HDF (4), a more recent analysis of 2165 patients reported lower mortality for patients treated with HDF when compared with those receiving HD (5).

Two intensive dialysis techniques are addressed in this issue of CJASN. Bujeja et al. (6) describe their experience with in-center nocturnal HD (INHD). Thirty-nine patients who might benefit from more intensive HD were converted from standard HD to thrice-weekly overnight treatments lasting 7 to 8 h, with reduced blood pump speeds targeted at 300 ml/min. After conversion to INHD, serum phosphorus and calcium-phosphorus product improved, antihypertensive medication needed to control BP fell, erythropoietin-stimulating agent use declined, and quality of life as assessed with a 10-point Likert scale improved. The overnight technique did not seem to induce fatigue or increased intrusion into daily life. These findings are similar to those published by Troidle et al. (7), who described reduced phosphorus and improved Kt/V urea, and unchanged psychosocial assessments 6 mo after initiation of INHD. Improved outcomes may be more than enhanced solute clearance. The Dialysis Outcomes and Practice Patterns Study (DOPPS) (8) showed that lower rates of ultrafiltration may provide a survival advantage. Perhaps the most impressive experience with long-duration, slow-flow HD was first published more than 25 yr ago: Charra et al. (9) from Tassin, France, showed dramatic fluid and BP control and remarkable survival. The practical opportunity for overnight in-center HD is compelling: Most dialysis facilities are closed at night, so the marginal cost of opening in-center nocturnal dialysis is relatively low. Bujeja et al. point out several barriers to this program, including nurse recruitment, nocturnal physician visits, and ways to accommodate comfortable sleep for patients.

In addition to thrice-weekly INHD, more frequent (four to six treatments each week) dialysis can increase standard Kt/V urea by more than 50% (10). A thorough literature review of daily dialysis (11) showed consistently better BP control and reduced left ventricular hypertrophy; however, the effects of daily HD on quality of life, anemia, phosphorus control, and nutritional status were inconsistent. More recently, Kjellstrand et al. (12) reported survival of 415 patients treated with short daily HD. The 10-yr survival was 42 ± 9%. When compared with matched patients from the US Renal Data System 2005 data report, the daily dialysis patient survival was two to three times higher and the predicted survival times 2.3 to 10.9 yr longer than that of matched US HD patients.

Nocturnal home HD (NHHD), performed four to six times a week, offers the most marked enhancement of solute clearance. Observational studies of NHHD (13) showed improved BP control, anemia, and health-related quality of life; however, all studies examined very few patients. A recent RCT compared NHHD performed five to six nights per week with conventional thrice-weekly HD (14). Left ventricular mass decreased significantly in the NHHD group, whereas it remained unchanged in the conventional dialysis patients. BP fell with the use of fewer antihypertensive medications and phosphorus levels and parathyroid hormone levels fell in the NHHD group. NHHD was associated with improvements in selected kidney-specific quality-of-life domains (15). Here again, the number of patients is low: Only 52 patients were randomly assigned to standard or NHHD treatment. Why are the numbers of patients recruited to these NHHD studies so low? Cafazzo et al. (16) report the patient-perceived barriers to NHHD in this issue of CJASN. Fifty-six nocturnal HD patients and 153 conventional HD patients completed surveys concerning their perceptions of the benefit and barriers of NHHD. NHHD patients were healthier and had better physical quality-of-life scores. The barriers to NHHD identified were fear of self-cannulation, lack of confidence in conducting NHHD, fear of a catastrophic event, and the burden this therapy placed on family members.

The Frequent Hemodialysis Network (FHN) is currently performing two parallel RCT, one examining short in-center daily dialysis versus conventional thrice-weekly dialysis and the other studying NHHD versus thrice-weekly conventional HD at home (10,17). The initial recruitment goal was 250 patients randomly assigned in each study. The daily dialysis study has proceeded as planned; however, recruitment to the NHHD study has proved more difficult, and the recruitment goal was reduced first to 150 patients and then to 90. The barriers described by Cafazzo et al. inform us about steps that might be...
taken to reduce these barriers and encourage more patients to consider NHHD. The low numbers of patients choosing NHHD make it difficult to assess hard end points, such as mortality and hospitalization rates: Previous studies were underpowered to examine these outcomes. Perhaps the best chance to assess them will come with the International Quotidian Dialysis Registry (18). Established in 2002, the registry has enrolled 2457 patients on alternate HD schedules as of February 2009 (G.E. Nesrallah, Quotidian Dialysis International Working Group, personal communication, February 18, 2009). This higher number of enrolled patients studied prospectively should allow analysis of mortality and other clinical end points for these alternative dialysis regimens.

At this time, the limited information on outcomes for INHD, NHHD, and daily in-center dialysis make it challenging for nephrologists and patients with chronic kidney disease to make informed decisions about dialysis modality. An international survey of nephrology professionals found that more frequent home dialysis was considered the best long-term dialysis treatment (19). Continuous peritoneal dialysis, an effective alternative home dialysis for many patients, is chosen by less than 8% of patients in the United States. While we await the results of current RCT such as FHN, clinicians and their patients must use their best judgment after careful review of the available observational and randomized studies to inform their decisions.

**Disclosures**

None.

**References**


See related articles, “In-center Nocturnal Hemodialysis: Another Option in the Management of Chronic Kidney Disease,” on pages 778–783, and “Patient-Perceived Barriers to the Adoption of Nocturnal Home Hemodialysis,” on pages 784–789.