Home Hemodialysis:
Benefits and Barriers to a Promising Modality of
Renal Replacement Therapy

By

RANDALL CHOKA, BSN, RN

A manuscript submitted in partial fulfillment of the requirements for the degree of:

MASTER OF NURSING

WASHINGTON STATE UNIVERSITY – SPOKANE
College of Nursing

April 2012
To the faculty of Washington State University:

The members of the Committee appointed to examine the master’s project of RANDALL BRADFORD CHOKA find it satisfactory and recommend that it be accepted.

Mel Haberman, PhD, RN, FAAN, chair

Cynthia Corbett, PhD, RN

Linda Ward, PhD, ARNP
Home Hemodialysis:
Benefits and Barriers to a Promising Modality of Renal Replacement Therapy

Abstract

By Randall Bradford Choka

April 2012

Chair: Mel Haberman

Patients requiring hemodialysis in the United States have poor clinical outcomes and quality of life. Home-based hemodialysis therapies have been shown to improve clinical outcomes, patient functioning and patient satisfaction at potentially reduced cost to society. Despite evidence that such therapies can be attractive alternatives to traditional in-center hemodialysis, substantial obstacles exist to its more frequent use including technical obstacles, social obstacles and systemic barriers. The purpose of this paper is to examine the literature for evidence of the benefits to more frequent use of home hemodialysis and to examine the barriers that prevent its more frequent implementation.
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Home Hemodialysis:

Benefits and Barriers to a Promising Modality of Renal Replacement Therapy

Statement of the Problem

Dr. Belding Scribner started the first outpatient hemodialysis (HD) facility, the Seattle Artificial Kidney Center, at the University of Washington in 1962 (as cited in Blagg, 2007). He advanced the technology developed by Kolff and Adwall (as cited in Blagg, 2007). Prior to this, there had been sporadic use of peritoneal dialysis (PD) for treatment of renal failure but access was difficult and survival was poor (Qamar, Bender, Rault, & Piraino, 2009).

Few patients with end stage renal disease (ESRD) had access to either modality until Congress authorized medical coverage for dialysis treatments and renal transplants in 1972. At that time, there were approximately 11,000 citizens who were able to benefit at a modest cost to the nation of $135 million per year (Fields, 2010). Since then, the treatment of ESRD in the United States (U.S.) has burgeoned into a program that covered approximately 110,000 patients in 2007 at a cost of over $20 billion and it is projected that the number of ESRD patients will grow to over 140,000 by 2020 (United States Renal Data System Coordinating Center [USRDS], 2009). These patients represent only 0.6% of the number covered by Medicare but the amount spent on their treatment consumes approximately 7% of the Medicare budget (Jaber et al., 2009).

The outcomes of patients undergoing dialysis in the U.S. are perhaps the worst of any industrialized nation despite annual spending per patient being the highest (Fields, 2010). Only one of three patients who start HD is alive five years later and “there is little evidence of any favorable trend, and comparisons with other nations place the United States at almost a third-world status” (Hodge, 2010, p. 5). The mortality rate for HD patients in the U.S. is over three
times that of Japan, the country that has the lowest HD mortality rate in the world (Strogoff de Matos & Lugon, 2010).

Recent research has shown that the best clinical outcomes occur when patients receive more frequent HD but the costs of dialysis center treatments associated with this approach are greater (Ouwendyk & Pierratos, 2008; Perl & Chan, 2009; Rayment & Bonner, 2008). However, the total costs for care may be the same or less due to decreased hospitalization and medication requirements (Howard et al., 2009; Ouwendyk & Pierratos, 2008).

There is increased interest in the use of daily home-based HD which could potentially offer the greatest cost savings. Home hemodialysis is performed either at night while sleeping or utilizing short, approximately two hour treatments on a daily basis, with daily dialysis defined as dialysis treatments performed five or more times a week. The National Institutes of Health are currently funding the FREEDOM (Following Rehabilitation, Economics and Everyday-Dialysis Outcome) Study to compare the clinical outcomes and economic implications of short daily hemodialysis treatments using a small portable hemodialyzer in the home versus conventional thrice weekly dialysis in-center treatments (Jaber et al., 2009). There have been many smaller observational studies which have examined the use of more frequent and home HD. The International Quotidian Dialysis Registry was launched in 2003 to collect data and conduct research to examine the possible benefits of more frequent and home-based HD (Lindsay et al., 2011). There are many advocates for the use of home-based HD but whether the benefits are worth changing the current paradigm of HD treatment in this country is a question that remains to be answered.
The purpose of this paper is to examine the literature for evidence of the possible benefits of home hemodialysis and barriers to adoption of this promising modality of renal replacement therapy for the treatment of persons suffering from end-stage renal disease in the U.S.

**Theoretical Framework**

Home hemodialysis requires people to take a greater role in the performance of their own treatments. Consequently, Dorothea Orem’s Self Care Theory is a natural fit for the study of this modality. Much of the nursing work with patients who perform home HD involves training patients and their families to independently perform treatments. This training includes kidney disease education and dialysis theory; set up, take down and maintenance of equipment; accessing one’s own fistula or dialysis catheter and maintenance of the access; medication management; and when the patient should seek help or advice (Rayment & Bonner, 2008).

Orem believed that patients can be capable of caring for themselves and that nurses should concentrate on enhancing that ability (Orem, 1985). Although patients who dialyze in a center have the potential to be quite educated regarding their disease process, it becomes essential that those patients who self-dialyze become proficient regarding the dialysis process and their own bodily responses to treatment. Thus the role of the nurse is multifaceted: teacher, educator, advisor and partner in the patient’s self-treatment. Self Care Theory elucidates the concept of a “self care deficit” and the nurse’s role is to teach and encourage the patient to overcome deficiencies that hinder participation in self care. Patient self advocacy becomes paramount to a successful outcome. The disease process -- renal failure -- is owned by patients and they assume responsibility for its treatment. Teaching and encouraging patients from the first encounter when the disease and treatment processes are discussed is intended to empower patients, thus increasing the potential for higher care quality.
Search Strategy

A literature review was performed using a PubMed search of MEDLINE. Key words used were home hemodialysis, daily hemodialysis, quotidian hemodialysis, and barriers to home hemodialysis. The search was limited to adult patients, to journals in English and to articles in the date range of 2004 – 2011. Articles identified (N=108) were screened first by title then by abstract when available. Articles were excluded whose focus was only on daily hemodialysis where no mention was made of home-based therapy, as were articles that were concerned primarily with PD. Also, articles that were judged little more than advertisement for specific brands of hemodialysis equipment were eliminated from consideration. Sixty eight articles were chosen based on their relevance and use of research to support their opinions and conclusions. These articles were categorized into two sections: benefits of home hemodialysis (32 articles) and barriers to more frequent utilization of home hemodialysis (25 articles). Eleven articles relevant to the purpose of the paper were included in both sections. These sections and subsections provide the organizational framework for the literature review. Each is now elaborated.

Literature Review

Benefits of Home Hemodialysis

Benefits of home HD can be broadly grouped into clinical parameter improvements, patient function/quality of life improvements, and cost savings. Some improvements, such as decreased hospitalization, impact multiple benefit groupings so many of the benefits discussed in one group have significant overlap with others.

Clinical parameter improvements. The most powerful argument for the use of home HD is decreased mortality. Kjellstrand, et al. (2008), in a frequently referenced multicenter study
of 415 patients over 1096 patient-years, reported that after correcting for differences in age and
diagnosis, survival of patients using short daily HD treatments was at least twice as long as that
of matched conventional HD patients using the USRDS database. Additionally, those dialyzing
at home survived longer than those dialyzing in a center. Similarly, Blagg, Kjellstrand, Ting and
Young (2006) reported that patients (n=117) who dialyzed at home using short daily HD had
61% longer survival compared to conventional HD patients in the USRDS database when
adjusted for differences in age, race and cause of renal failure. Although both studies could be
criticized in regards to patient selection, one-third of the patients in the first study were included
specifically because of cardiovascular or metabolic instability that frequently required a fourth
weekly dialysis treatment, usually over the weekend. Other authors (Johansen et al. 2009; Rocco,
2009; Strogoff de Matos & Lugon, 2010) also advocated for the more frequent use of short daily
HD because survival is improved.

Nocturnal HD as renal replacement therapy shows even better survival than does short
daily HD. In a study of 87 patients over 12 years who performed nocturnal HD at home, it was
found that survival at five years was 79% and at ten years it was 64%, compared to the
conventional HD patient whose average survival is only 35% at five years and 8% at ten years
(Lockridge & Kjellstrand, 2011). This study could be criticized for its small sample size and for
the fact that all patients were from a single dialysis center, however participants had considerable
comorbidities. Johansen et al. (2009), in a study of 93 patients performing nocturnal HD and 43
patients performing short daily HD, reported that although survival was longer in both frequent
dialysis groups (both matched with USRDS cohorts), those who performed nocturnal HD
survived 60% longer than those who performed short daily HD. Saner, Nitsch, Descoëudres,
Frey, and Uehlinder (2008) reported longer survival in those performing nocturnal HD at home compared to patients dialyzing nightly in a center.

Although renal transplantation is considered the treatment of choice for patients with ESRD due to survival advantage and improved quality of life (QOL), this option is not available to most patients due to the lack of suitable donor organs. However, Kjellstrand et al. (2008) and Blagg et al. (2006) found that both short daily HD and nocturnal HD have nearly the same survival rates as that of deceased-donor transplant recipients. This finding is impressive, especially when renal transplant recipients were required to meet stricter inclusion criteria to be considered for transplant compared to the dialyzing patients in these studies. Nocturnal HD was similarly found to have equal survival to those with cadaveric transplant by Lockridge and Kjellstrand (2011) and both short daily HD and nocturnal HD may actually be better choices than transplant in the elderly or immunosuppressed (Pauly, 2009).

The reasons for improved survival are multifactorial. Deaths occur twice as frequently on Mondays and Tuesdays in patients on conventional HD than they do on other days (Kjellstrand et al., 2010), reflecting the harm that comes from a second day of nondialysis that occurs every weekend for conventional HD patients who dialyze three times per week. Cardiovascular disease is the most frequent cause of death for patients with ESRD. In a critical appraisal, Culleton and Asola (2011) reviewed numerous studies which demonstrate that left ventricular mass can be significantly reduced by more frequent HD, likely from less intradialytic fluid gain. Also demonstrated were much improved blood pressure control, better phosphorus control and decreased C-reactive protein levels. Research examining more frequent HD has unequivocally demonstrated its efficacy in reducing left ventricular mass (Culleton et al., 2007; Jefferies, Virk, Schiller, Moran, & McIntyre, 2011; Murashima, Kumar, Doyle, & Glickman, 2010). Although
left ventricular mass reduction is primarily associated with volume control, there is improvement in left ventricular function, including ejection fraction, even when measured extracellular volume is left unchanged (Hamlett & Haragsim, 2007).

Frequent HD increases the clearance of all sizes of solutes ("uremic toxins") present in the blood (Ayus et al., 2005; Culleton et al., 2007; Lorenzen, Thum, Eisenbach, Haller & Kielstein, 2011), with an improvement in phosphorus clearance likely to be the most important factor influencing survival concurrent with parathyroid hormone reduction (Achinger & Ayus, 2005). Many patients who do more frequent HD are able to reduce or eliminate the use of phosphate binders. Virtually all patients using nocturnal HD are able to discontinue phosphate binders because of improved fluid dynamics and overall decrease in inflammation (Culleton et al., 2007). Many are also able to reduce the number and/or dosages of antihypertensive medications (Culleton et al., 2007). The increased clearance of mid-sized molecules, notably proinflammatory substances such as interleukin-6 and C-reactive protein, is thought to improve the function of endothelial cells (Hamlett & Haragsim, 2007; Pauly & Chan, 2007). Frequent HD likely increases clearance of asymmetrical dimethylarginine, a substance known to inhibit endothelial cell relaxation and therefore increase peripheral vascular resistance (Kotanko, 2006). Frequent HD also increases the clearance of catecholamines (Pauly & Chan, 2007). Because there is a larger diffusion gradient between the blood and the dialysate at the beginning of a dialysis treatment, more frequent HD increases the amount of total "first hour" dialysis time thus maximizing solute clearance.

There are other potential clinical improvements when patients dialyze more frequently. Removing less fluid with each treatment reduces the incidence of interdialytic hypotension (Kliger, 2009; Strogoff de Matos & Lugon, 2010) with the most hemodynamically stable dialysis
treatments occurring with nocturnal HD (Jefferies et al., 2011). Murashima et al. (2010) reported significant reductions in blood pressure variability using short daily HD, concluding that this makes it safer for patients to perform short daily HD at home. There is evidence that nocturnal HD stimulated genes responsible for hematopoietic stem cell proliferation which increased growth and function of red blood cells (Chan, Liu, Arab, Jamal & Messner, 2009). Other benefits of more frequent HD are: improved nutrition and lean body mass (Chazot, 2009; Rayment & Bonner, 2008); improved sleep quality, lower incidence of sleep apnea and restless legs (Hanly, 2009; Jaber et al., 2011); reduced recovery times after dialysis treatments (Lindsay, Heidenheim, Nesrallah, Garg, & Suri, 2006); less pruritis (Rayment & Bonner, 2008); reduced osteodystrophy (Lockridge & Moran, 2008); and lower rates of infection, likely due to nonexposure to other patients and better nutrition (Blagg, 2005; Johansen et al., 2009). Nocturnal HD is associated with a return of fertility in women (McFarlane, 2009) and all frequent HD modalities are associated with enhanced sexual function (Kurella, Suri & Chertow, 2005).

**Patient function and quality of life improvements.** The clinical benefits of frequent HD described above correspond to improved functional status and QOL. Improvement in appetite is associated with an increase in lean body mass and strength, and improved sleep quality leads to marked decrease in fatigue (Kurella et al., 2005; Lindsay, 2005). More frequent dialysis allows liberalization of the otherwise restrictive dietary regimen normally imposed on dialysis patients (Ouwendyk & Pierratos, 2008). Lockridge and Moran (2008) reported a rapid improvement in well-being in those performing short daily HD as well as a greatly reduced dialysis recovery time. Lindsay et al. (2006) reported a recovery time in those performing short daily HD that was 10% that of conventional HD patients. Those performing nocturnal HD had less than 2% of the recovery time of patients receiving conventional HD. Decreased recovery
Home HD eliminates the travel time of those dialyzing in a center and allows more flexible scheduling of treatments. Time saving is particularly noteworthy for those who perform nocturnal HD as they are able to perform therapy at a time they would be sleeping. Patients gain confidence and independence (Blagg, 2005). Increase in functional status gives patients a greater ability to meet emotional roles and better sexual function leads to greater intimacy. Home HD also allows patients more time and energy to give to family and friends and be productive. Indeed, many patients who previously were unable to work were able to resume employment (Lockridge & Moran, 2008; Martins Castro, et al., 2006; Van Eps et al., 2010). Most studies demonstrated a decrease in use of antihypertensive and phosphate binding medications; however, Cardone et al. (2011) showed that total medication burden may actually increase with more frequent HD because more water-soluble vitamins and phosphate are removed during treatments subsequently requiring replacement.

QOL is very poor in patients with ESRD but frequent home HD has been shown to improve QOL scores. Modest but statistically significant improvements in selected measures of QOL were reported by Culleton et al. (2007) and Van Eps et al. (2010). Home HD was reported to improve QOL nearly to that of kidney transplantation (Ng and Tan, 2010). The literature is replete with the praises of the ability of more frequent HD to improve QOL, and a brief review of studies demonstrating its beneficial effect on QOL, survival and cardiovascular risk is presented by Culleton and Asola (2011).

Cost savings improvements. Although the cost of supplies is naturally higher compared with conventional HD, labor costs are lower with home HD therapies (Perl & Chan, 2009).
Howard et al. (2009) found that significant savings are possible when switching patients from center or hospital-based therapies to home-based therapies. After the initial training of patients and partners, one nurse is able to provide care and support to perhaps twice as many patients compared to a nurse working in a center with assisting technicians (Schatell, 2005). Home HD has been shown to equal the costs of conventional HD during the first year and to be less expensive than conventional HD in subsequent years (Culleton & Asola, 2011). Economic analysis found a 15% - 20% savings associated with HD compared to in-center HD (Hodge, 2010).

Potentially the greatest cost saving could come from decreased hospitalization due to improvements in clinical functioning discussed previously. Although Johansen et al. (2009) failed to find significant differences in hospitalization using short daily HD or nocturnal HD compared to conventional HD, Kumar, Ledeza, Idroos, Burchette, and Rasgon (2008) found that short daily HD patients had greater than a 75% reduction in hospitalization days compared with similarly matched PD patients in the USRDS database.

Studies have generally been more supportive of nocturnal HD being associated with decreased hospitalization than short daily HD. Bergman, Fenton, Richardson and Chan (2008), in a cohort study of conventional HD patients switched to nocturnal HD, found a 65% decrease in hospitalizations in those using nocturnal HD. Similarly, in an in-center study of 247 patients switched from conventional HD to three times per week (eight hour each treatment) nocturnal HD, the nocturnal HD patients had a 72% reduction in hospitalization days compared to the conventional HD patients (Ok et al., 2007). Owendyk and Pierratos (2008) argued that if hospitalization and medications are included in total cost then nocturnal HD is the most economically feasible renal replacement modality.
Barriers to More Frequent Utilization of Home Hemodialysis

Despite the many advantages of home HD, the obstacles to its more frequent adoption are considerable and many arguments against its use are valid. Identified barriers can be generally classified into technical challenges, patient social barriers and systemic barriers. Similar to the previous discussion, these broad categories can have considerable overlap.

**Technical challenges.** An oft discussed concern in the literature is the potential for more frequent access complications such as infection or clotting. (Kumar et al., 2008; Kurella et al., 2005; Priester-Coary, 2004). This is a logical concern since frequent dialysis requires more frequent access of one’s fistula, graft or catheter. However, Johansen et al. (2009) found no greater vascular access complications in those performing nocturnal HD five or six nights a week. In a systematic review, Puñal, Lema, Sanhez-Guisande, and Ruano-Ravina, (2008) found no differences in vascular access complications using frequent HD modalities. Other articles actually report better vascular outcomes using home HD (Hodge, 2008; McPhatter & Lockridge, 2004; Priester-Coary, 2004).

The fear of patients having to cannulate their own implanted fistula or graft, which is a potentially painful procedure, can be a disincentive for patients considering home HD. However, the relatively new “buttonhole” technique of accessing a fistula – whereby blunt needles are used to access through the skin once a track has been made with repeated cannulations by sharp, traditional fistula needles – has made self-cannulation much easier for patients and partners with no increase in arteriovenous fistula complications (Lindsay, 2004; Priester-Coary, 2004; Suri et al., 2006). Another valid fear of both patients and providers is needle disconnection during treatment which could potentially cause exsanguination, although this risk is also present with conventional HD. Dialysis machines are replete with alarms that sense abrupt pressure changes.
that such disconnections cause and enuresis alarms that can sense blood leaks are available.

Remote monitoring via the internet is also available which offers an increased measure of safety but can be costly (Benaroia, Pierratos & Nesrallah, 2008; Rayment & Bonner, 2008).

The long training required of patients and their partners, usually around 4 to 6 weeks, is also a frequently-mentioned barrier to the use of home HD (Alhomayeed & Lindsay, 2009; Benaroia et al., 2008; Culleton & Asola, 2011; Perl & Chan, 2009). Orem’s Self Care Theory defines the need for education as a self care deficit but notes this as an opportunity for learning. Indeed, patients who are capable of performing home HD do not need to have a high school education (Ahlomayeed & Lindsay, 2009) and encouraging participation in their own treatment empowers patients to regain some control over their lives and disease process (Simmons, 2009).

An associated problem is a lack of relatively easy to use home dialysis machines (Kjellstrand & Kjellstrand, 2008; Kumar et al., 2008). Although the ideal machine as envisioned by Kjellstrand and Kjellstrand (2008) has not yet been created, manufacturers are developing more patient friendly equipment (Moran, 2009). Possible plumbing and electrical modifications and a lack of space required in homes to accommodate equipment and supplies are closely related concerns (Alhomayeed & Lindsay, 2009). Absolute cognitive contraindications for home HD include moderate to severe uncontrolled psychiatric disease, current drug abuse and severe dementia or encephalopathy. Physical contraindications include decreased manual dexterity and low visual acuity (Perl & Chan, 2009).

Whether another person needs to be present in the home is an important consideration. Both Blagg (2008a) and Schatell (2005) identify the need for having someone else present in the home during dialysis treatments as a barrier to home HD. The availability of remote monitoring and alarms as previously discussed may obviate the need for having a partner present during the
entire treatment time in some cases. Alhomayeed and Lindsay (2009) state that some patients are actually able to carry out nocturnal HD while sleeping alone in the home and Wise, Schatell, Klicko, Burdan and Showers (2010) make a cogent case that because patients have fewer hypotensive episodes when they dialyze more frequently at home, it is relatively safer for patients to dialyze alone. Although most dialysis programs do require a partner, patients on home HD who perform more of their own care without a partner are more likely to thrive (Diaz-Buxo, Crawford-Bonadio, St. Pierre, & Ingram, 2010). The most reasonable conclusion is that the need for an in-home partner should be determined on an individual basis (Priester-Coary, 2004).

Social barriers. The question regarding whether or not noncompliant/nonadherent patients – those who frequently miss dialysis appointments or frequently end treatments early – are candidates for home HD modalities is equivocal. Both Priester-Coary (2004) and Yee (2009) make strong arguments that home HD may actually be the best modality for such patients. Some patients who miss appointments would find nocturnal HD or short daily HD an easier fit for their lives and patients who end treatments early frequently do so because of cramping and/or hypotension, which occur much less when dialyzing more frequently. However, the criteria for predicting which types of patients could be successful with in-home dialysis have not yet been established.

Another possible social barrier to those performing home HD is more social isolation compared to dialyzing in a center (Kurella, et al., 2005; Rayment & Bonner, 2008). Also, burdens placed on families have been found to be an obstacle to home-based therapy (Blagg, 2005; Suri et al., 2007) although research exploring the effects of home HD on families is sparse (Van Eps et al., 2010). Blagg (2005, 2008a) and Hodge (2008) discuss that learned helplessness can be a barrier, especially for patients who have been receiving in-center dialysis who would
otherwise be candidates for home HD. Paradoxically, in a study examining the willingness of patients to switch from conventional HD to daily HD, the longer patients had been on conventional HD, the more likely they were to switch (Halpern, Berns & Israni, 2004).

Systemic barriers. Any change in conventional practice is likely to encounter resistance. At the time that Medicare began covering dialysis treatments in 1972, 40% of patients were on home HD (Qamar et al., 2009). The growth of for-profit dialysis units and inadequate reimbursement to dialysis units for home HD led to a reduction in the number of patients who chose this modality. The increasing success of PD in the 1970s gave an outlet for those patients with ESRD who wished to take responsibility for their own care, provided they retained some residual kidney function (Qamar et al., 2009; Blagg, 2008b). Another factor was lucrative fees that accrued to nephrologists as medical directors of dialysis units, some who actually owned the dialysis units to which they referred their patients. Physician reimbursement is higher for in-center HD than for home HD (Qamar et al., 2009) and in-center dialysis is profitable (Fields, 2010; Qamar, et al., 2009). Additionally, the three times per week dialysis schedule became popular with dialysis staff because this allows a convenient six day schedule with Sundays off (Rayment & Bonner, 2008; Strogoff de Matos & Lugon, 2010).

The lack of physician incentive to give patients the option of home HD, concurrent with providers' unfamiliarity and lack of education regarding home-based therapies in general (including PD), has decreased the numbers of patients choosing home HD and PD modalities (Chan & Lok, 2009). This reduction occurs despite research showing physician recommendation to be the most important factor influencing patients' choice of renal replacement modality and that those on home therapy or kidney transplant recipients are more satisfied with their care than
those doing in-center dialysis (Fadem et al., 2011). Also, late nephrology referral in patients who have kidney disease leads to reduced use of all home-based therapies (Qamar et al., 2009).

Despite the modest, though welcome, increase in reimbursement to dialysis centers for home HD patient training which occurred in 2010 (Curtis & Schatell, 2010), costs for dialysis centers to start and maintain home HD programs can be substantial. The majority of up-front increased costs for home HD are borne by the centers despite significant total societal savings (Blagg, 2008b) and there is no increase in reimbursement for more than three dialysis treatments a week except in rare cases (Komenda & Sood, 2009). Thus there is little incentive for centers to offer home HD programs (Blagg, 2005).

As of yet, no randomized clinical trials (RCTs) have examined whether home HD is superior to conventional HD, and recruitment for large scale studies has been problematic (Levin, Raimann & Rocco, 2011). Moreover, Hodge (2010) argues that most studies, including the currently concluding Frequent Home Hemodialysis study, lack sufficient power to establish a difference in hospitalization or survival rates. Ironically, it may be the adoption of the RCT as the pinnacle of research that has been a barrier to greater use of home HD. According to Gordon (2006), policymakers have been reluctant to approve greater Medicare reimbursement for daily HD despite the preponderance of observational studies showing its superiority over conventional HD. Due to the select nature of patients appropriate for daily HD, randomization may be unethical. The use of quasi-experimental research designs may be a viable alternative. The limited number of patients who are able to perform home HD makes comparisons between conventional HD and home HD difficult. The differences in those able to perform home HD “...reflect[s] actual practice and are not likely to disappear even if a concerted effort is made to increase the use of frequent HD” (Johansen, et al., 2009, p. 987). Hopefully in the next few years
more conclusive and definitive evidence will become available to help guide policymakers, insurance companies, providers and patients.

**Significance for Family Nurse Practitioners**

The literature identifies several therapeutic options for family nurse practitioners. Most significantly, patients who are able to perform home HD should be strongly encouraged to do so. Although it has been estimated that only 15 – 40% of all dialysis patients may be suitable for home HD (Hodge, 2010; Alhomayeed & Lindsay, 2009), this modality of renal replacement therapy is associated with the greatest survival and highest QOL, with potentially the least cost to society. Australia, New Zealand and Finland use a “home-first” policy – either home HD or PD – for ESRD treatment (Blagg, 2005; Chan & Lok, 2009). It seems timely for the U.S. to also adopt this policy. According to two international surveys, home HD was considered the long-term modality of renal replacement therapy that nephrology professionals themselves would chose if they were unable to obtain a transplant (Ledebo & Ronco, 2008; Schiller, Neitzer & Doss, 2010). The results of research in progress by the National Institutes of Health, the Frequent Home Dialysis Network and the International Quotidian Dialysis Registry have the ability to increase utilization of home HD. Hopefully these research findings will proffer cumulative evidence in support of the superiority of home HD over conventional HD.

Family nurse practitioners have a duty to facilitate the most effective therapies for their patients. Orem believed that patients should maximally participate in their own care within their capabilities. Self Care Theory postulates that when unprepared patients, who are capable of performing home HD, are not encouraged to utilize home HD, this self-care deficit results in suboptimal care, and a greater cost to society.
Promotion and facilitation of self-care is a hallmark of the nurse’s role when Self Care Theory is the theoretical framework. Family nurse practitioners can inform chronic renal failure patients about home HD early in discussions about possible future renal replacement needs so that patients are given time to discuss with their loved ones the advantages of home dialysis. ESRD patients often feel dependence and a profound loss of control when they are travelling to a dialysis center for treatments. Home HD helps these patients become less dependent as they gain a sense of personal control from self-care successes. Moreover, they can develop more responsibility for their lives. Family nurse practitioners also can educate their colleagues and staff regarding the benefits of home HD so that others may also be able to support patients’ decisions to elect home HD.

All nurses can become involved in the policymaking decisions that would allow more ESRD patients to utilize home-based dialysis therapies. Also, nurses will be called upon to help establish the criteria regarding which patients are likely to be successful with home HD as these criteria need to be more clearly established. Research will be ongoing regarding home HD eligibility and how best to support patients. Nephrology nurses in particular are likely to be called upon to participate in such research.

Summary

The evidence in the literature supports home-based hemodialysis as a superior method of delivering dialysis services although barriers prevent its frequent utilization. Although many economic, social and technical barriers remain, most are modifiable given time to address these complex issues. The literature provides evidence that the benefits of home HD substantially outweigh potential barriers. The research is mounting to support the eventual conclusion that
home hemodialysis can become the default modality for delivering dialysis to people with ESRD in the United States.
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