Challenges, Facilitators, and Recommendations for Implementation of Home Dialysis in the Veterans Health Administration: Patient, Caregiver, and Clinician Perceptions

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Key Points
- Several challenges and facilitators for home dialysis implementation were found and aligned with attitudes and perceived behavior control.
- Many novel recommendations from diverse stakeholder groups (patients, caregivers, dialysis staff) for home dialysis implementation emerged.
- Findings reveal factors that future research or implementation efforts should address and/or incorporate into home dialysis care.

Abstract
Background Home dialysis confers similar survival and greater quality of life than in-center hemodialysis for adults with ESKD but remains underutilized. We examined challenges and facilitators to implementation of home dialysis and identified stakeholder-centered strategies for improving it.

Methods We conducted a qualitative, cross-sectional, multisite evaluation that included five geographically dispersed Veterans Health Administration (VHA) home dialysis programs. Participants included patients with ESKD receiving home dialysis, their informal caregivers, and home dialysis staff. Semistructured telephone interviews were conducted and audio-recorded from 2017 through 2018, to assess perceived barriers and facilitators to patient home dialysis use in VHA. Transcribed interviews were analyzed thematically by each participant group.

Results Participants included 22 patients receiving home dialysis (18 on peritoneal dialysis [PD] and four hemodialysis [HD]); 20 informal caregivers, and 19 home dialysis program staff. Ten themes emerged as challenges to implementing home dialysis, of which six (60%) spanned all groups: need for sterility, burden of home dialysis tasks, lack of suitable home environment, physical side effects of home dialysis, negative psychosocial effects of home dialysis, and loss of freedom. Four themes (40%), identified only by staff, were insufficient self-efficacy, diminished peer socialization, geographic barriers, and challenging health status. Twelve themes emerged as facilitators to implementing home dialysis, of which seven (58%) spanned all groups: convenience, freedom, avoidance of in-center HD, preservation of autonomy, adequate support, favorable disposition, and perceptions of improved health. Two themes (17%) common among patients and staff were adequate training and resources, and physical and cognitive skills for home dialysis. Recommendations to promote implementation of home dialysis common to all participant groups entailed incorporating mental health care services, offering peer-to-peer coaching, increasing home visits, providing health data feedback, and reducing patient burden.

Conclusions Stakeholder-centered challenges were rigorously identified. Facilitators and recommendations can inform efforts to support home dialysis implementation.

Introduction
Adults with ESKD receiving maintenance dialysis are burdened by high morbidity and mortality (1). Compared with in-center hemodialysis (IC-HD), home dialysis (home peritoneal dialysis [H-PD] and home hemodialysis [H-HD]) confers similar health
outcomes and is associated with fewer hospitalizations and reduced costs (2–6). Home dialysis is substantially underutilized in the United States. In 2017, nearly 90% of patients with ESKD received IC-HD, whereas approximately 10% received home dialysis (1). This pattern contrasts with other countries where proportions of patients on home dialysis often exceed 25% (1).

In July 2019, the US Department of Health and Human Services announced the Advancing American Kidney Health Initiative, which aims to increase home dialysis use among Americans with ESKD. Estimates suggest over half of patients with ESKD are suitable candidates (7–10). Systematic reviews identifying barriers to home dialysis are on the basis of studies of mostly racially/ethnically homogenous, single-centered cohorts outside the United States, which limits generalizability (10–14). Additionally, current recommendations to increase home dialysis are primarily on the basis of expert opinion and multidisciplinary workshop panels, rather than empirical investigations of stakeholder perspectives (15–17). Although much research has examined patient decision-making around dialysis modality selection (18–21), little attention has focused on factors affecting the initiation, daily maintenance, and sustainability of home dialysis. Because discontinuation of home dialysis is frequent, examination of these factors is important to improve the low rates of home dialysis use in the United States (22). Accordingly, a Veterans Affairs Evidence-based Synthesis Program systematic review called for examination of barriers to home dialysis and strategies to improve its implementation (23).

The Veteran’s Health Administration (VHA) has home dialysis programs at approximately 30 medical centers. Similar to non-Veterans, >95% of Veterans with ESKD use IC-HD for maintenance dialysis, whereas <5% use home dialysis (1,17,24). Increasing home dialysis use is a VHA strategic priority (24), with potential to enhance continuity of care to Veterans (17,24), improve access to dialysis care for Veterans in rural areas (25), and reduce dialysis contract costs with non-VHA providers (17,24). In this study, we identify challenges and facilitators to home dialysis implementation and stakeholder-centered recommendations for supporting home dialysis in VA.

Materials and Methods
Design and Setting
We used a multicenter, qualitative, cross-sectional design. Participants were recruited from five VHA home dialysis programs geographically dispersed across four regions (the West, n=1; the Midwest, n=1; the Northeast, n=1; and the South, n=2). Data were collected from June 2017 through May 2018. Interview guides were informed by the Theory of Planned Behavior/Theory of Reasoned Action (TPB/TRA), existing literature, and our ESKD clinical and research expertise. The TPB/TRA posits that the proximal basis of behavior is a “behavioral intention” determined by one’s attitudes, injunctive and descriptive norms, and perceived behavior control (Figure 1) (26,27). We adhered to the Consolidated Criteria for Reporting Qualitative Research (28).

Sample Population and Recruitment
Three groups of adults (age ≥18 years) were eligible: (1) patients with ESKD using home dialysis (H-PD or H-HD); (2) informal caregivers of these patients (i.e., an individual identified by the patient as one who assists them with home dialysis); and (3) dialysis staff at VHA home dialysis programs (e.g., nephrologists, nurses, dieticians, social workers).

Patients and informal caregivers were recruited by mailed introductory letters, and dialysis staff through an introductory email. Follow-up calls were made to patients and caregivers a week later (≤3 attempts) to obtain informed consent and arrange for telephone interviews. Up to three follow-up emails were sent to dialysis staff over a 1-month period. Recruitment goals included a minimum of 15 patients, 15 caregivers, and 15 dialysis staff on the basis of minimum thresholds for thematic saturation (29). Interviews were conducted by M.J.F. (male, physician-researcher) and L.A.J. (female, researcher). The interviewers had medical or master’s degrees and were trained by an established social scientist (E.J.G.) in interviewing and thematic analysis. No relationships were established between interviewers and participants before project commencement. Interviewers stated their occupation/research role and provided an overview of the project purpose before initiating interviews.

Before initiation, the Edward Hines, Jr. VA Hospital Institutional Research Board reviewed the project protocol and determined on April 13, 2017 that it represented a Quality Assurance/Quality Improvement activity, and not human subjects research.

Data Collection
Interviews included 32 open-ended and 29 close-ended questions for Veterans, 33 open-ended and five close-ended questions for caregivers, and 37 open-ended and five close-ended questions for staff (Supplemental Appendices 1, 2, and 3). Telephone interviews lasted approximately 60 minutes and were audio-recorded. Interviewers recorded field notes during interviews. Participants were compensated US$20.

Analysis
Interviews were transcribed and analyzed for emergent themes using deductive and inductive coding (29). Only data from open-ended interview questions were used in the analysis. Two team members (M.J.F. and L.A.J.) independently coded the transcripts. Codes were compared and discrepancies resolved to reach consensus. The broader team (M.J.F., L.A.J., E.J.G., T.P.H., K.S., and B.S.) met to review and further refine codes. Codes were clustered and refined into themes consistent with the TPB/TRA, including factors that may impede or ease implementation of home dialysis from patient, caregiver, and staff perspectives (Figure 1). Thematic saturation was achieved for each stakeholder group.

Results
Participant Characteristics
Participants included 22 patients (45% response rate) with 18 using H-PD and four using H-HD, 20 informal
caregivers (91% response rate), and 19 home dialysis staff (79% response rate) (Table 1). Reasons for nonparticipation included absence of caregiver, unwilling or unable to participate, or inability to reach participant again after scheduling an interview.

**Challenges to Implementing Home Dialysis**

Ten themes emerged as challenges to home dialysis. Six spanned all participant groups: the need for sterility, burden of home dialysis tasks, lack of suitable home environment, physical side effects of home dialysis, negative psychosocial effects of home dialysis, and loss of freedom. Four themes were identified only by staff: insufficient self-efficacy, diminished peer socialization, geographic barriers, and challenging health status (Tables 2). Identified themes were mapped to domains of the TRA/TPB (Figure 1).

**Need for Sterility**

Patients on PD described pressure to maintain sterile technique and the possibility of infectious complications (e.g., peritonitis). In reference to home PD, maintaining a clean home was identified as a challenge attributed to inadequate home hygiene, illness or physical disability, and/or presence of pets.

**Burden of Home Dialysis Tasks**

Patients and caregivers reported burdens associated with home dialysis: the large size, quantity, and frequency of supplies delivered to homes (PD and HD), the need to maintain an accurate supply inventory (PD and HD), and the need to dispose of dialysis waste (PD). Regarding home PD, all groups identified the need to perform dialysis daily as a “burden.” Home PD Veterans and caregivers commented on burdens associated with operating the PD machine including troubleshooting machine errors, machine malfunctions, and dealing with defective components.

**Lack of a Suitable Home Environment**

All groups discussed lacking a suitable home environment as a challenge (home PD and HD). Staff identified lacking adequate living space as a challenge. All groups
Table 1. Patient, informal caregiver, and dialysis staff characteristics

| Characteristics                                      | Patients (n=22) | Informal Caregivers (n=20)* | Dialysis Staff (n=19) |
|------------------------------------------------------|----------------|-----------------------------|-----------------------|
| Male sex, n (%)                                      | 21 (96)        | 1 (5)                       | 0 (0)                 |
| Age, yr, mean (SD) (range)                           | 64 (9.4) (45–76) | 63 (8.1) (47–77)           | 49 (10.0) (28–63)     |
| Race, n (%)                                          |                |                             |                       |
| White                                                | 17 (77)        | 15 (79)                     | 13 (68)               |
| Black                                                | 5 (23)         | 2 (11)                      | 1 (5)                 |
| Asian                                                | 0 (0)          | 0 (0)                       | 4 (21)                |
| Native Hawaiian, Other Pacific Islander or Other     | 0 (0)          | 2 (11)                      | 1 (5)                 |
| Hispanic Ethnicity                                   | 2 (9)          | 1 (5)                       | 2 (11)                |
| Geographic location, n (%)                           |                |                             |                       |
| West                                                 | 3 (14)         | 3 (15)                      | 4 (21)                |
| Midwest                                              | 4 (18)         | 2 (10)                      | 3 (16)                |
| Northeast                                            | 6 (27)         | 6 (30)                      | 4 (21)                |
| South                                                | 9 (41)         | 9 (45)                      | 8 (42)                |
| Marital status, n (%)                                |                |                             |                       |
| Married or partnered                                 | 19 (86)        | 18 (95)                     | N/A                   |
| Divorced                                             | 1 (5)          | 1 (5)                       |                       |
| Never married                                        | 2 (9)          | 0 (0)                       |                       |
| Education, n (%)                                     |                |                             | N/A                   |
| Grades 9–11                                          | 0 (0)          | 1 (5)                       |                       |
| Grade 12 or GED                                      | 3 (14)         | 6 (32)                      |                       |
| College 1–3 yr                                       | 11 (50)        | 10 (53)                     |                       |
| College 4+ yr                                        | 8 (36)         | 2 (11)                      |                       |
| Employment, n (%)                                    |                |                             | N/A                   |
| Retired                                              | 15 (68)        | 11 (58)                     |                       |
| Employed                                             | 2 (9)          | 4 (21)                      |                       |
| Out of work >1 yr                                    | 4 (18)         | 1 (5)                       |                       |
| Out of work <1 yr                                    | 1 (5)          | 0 (0)                       |                       |
| Homemaker                                            | 0 (0)          | 3 (16)                      |                       |
| Annual income, US$, n (%)                            |                |                             | N/A                   |
| <15,000                                              | 2 (9)          | 0 (0)                       |                       |
| <35,000                                              | 1 (5)          | 1 (5)                       |                       |
| <50,000                                              | 5 (23)         | 6 (32)                      |                       |
| <75,000                                              | 4 (18)         | 4 (21)                      |                       |
| $75,000                                              | 4 (18)         | 4 (21)                      |                       |
| Don’t know                                           | 3 (14)         | 1 (5)                       |                       |
| Refuse to answer                                     | 3 (14)         | 3 (16)                      |                       |
| Type of home dialysis, n (%)                         |                |                             | N/A                   |
| CCPD                                                 | 16 (73)        | N/A                         | N/A                   |
| CAPD                                                 | 2 (9)          | N/A                         | N/A                   |
| HD                                                    | 4 (18)         | N/A                         | N/A                   |
| Caregiver involved, n (%)                            |                |                             | N/A                   |
| Yes                                                  | 20 (91)        | N/A                         | N/A                   |
| No                                                   | 2 (9)          | N/A                         | N/A                   |
| Type of caregiver, n (%)                             |                |                             |                       |
| Spouse/partner                                       | 18 (90)        | N/A                         |                       |
| Daughter                                             | 1 (5)          | N/A                         |                       |
| Mother                                               | 1 (5)          | N/A                         |                       |
| Staff position, n (%)                                |                |                             | N/A                   |
| Physician                                            | N/A            | N/A                         | N/A                   |
| Nurse                                                | 5 (26)         | 8 (42)                      |                       |
| Social worker                                        | 8 (42)         | 3 (16)                      |                       |
| Dietician                                            | 3 (16)         | N/A                         |                       |
| Training, n (%)                                      |                |                             | N/A                   |
| US school                                             | 15 (79)        | N/A                         |                       |
| Non-US school                                        | 4 (21)         | N/A                         |                       |
| Length in practice, yr, mean (SD) (range)            | N/A            | N/A                         |                       |
| Overall                                              | 19.1 (13.2) (2–42) | N/A                     | 11.0 (8.8) (2–32)     |
| At VA                                                | 19.1 (13.2) (2–42) | N/A                     | 11.0 (8.8) (2–32)     |

GED, tests of general educational development; N/A: not applicable; CCPD, continuous cycling peritoneal dialysis; CAPD, continuous ambulatory peritoneal dialysis; HD, hemodialysis; VA, Veterans Affairs.
*Demographic data could not be collected for one of the 20 caregivers interviewed.
discussed the need for adequate storage space. Veterans and caregivers cited a need to carry supplies upstairs, lack of a bathroom near where dialysis is performed, and the potential for power outages. PD Veterans and caregivers discussed poor climate control.

**Physical Side Effects of Home Dialysis**

Disruption of sleep emerged as a challenge (home PD) across all groups due to machine noise, machine alarms, repositioning for draining, and/or inability to position oneself comfortably while connected. PD Veterans also reported catheter site pain and leg cramps. Complications with dialysis access were discussed by caregivers (e.g., vein infiltration for home HD, catheter migration for home PD).

**Negative Psychosocial Impacts of Home Dialysis**

All groups reported negative effects of the PD catheter on body image. Veterans and staff discussed patient burnout caused by feeling emotionally, mentally, and/or physically taxed by performing home PD.

**Loss of Freedom**

All groups identified the ways home dialysis limits patient freedom in aspects of daily life. Regarding PD, all groups identified the inability to perform heavy lifting, extra precautions necessary for participation in water sports, and lack of mobility when connected to the machine as challenges. Some Veterans and caregivers believed participation in water sports was not possible for patients on
Patients on PD and HD and their caregivers discussed intrusions on daily life caused by home dialysis (e.g., time required for setup and treatments).

**Insufficient Self-Efficacy**

Staff commonly reported a lack of patient self-confidence in performing PD or HD at home as a challenge. Examples

| Themes and Subthemes | Patients | Informal Caregivers | Dialysis Staff |
|----------------------|----------|---------------------|---------------|
| Convenience          | X        | X                   | X             |
| Flexible scheduling  | X        | X                   | X             |
| No transportation required for treatments | X        | X                   | X             |
| Option for nocturnal treatment<sup>b</sup> | X        | X                   | X             |
| **Home comfort**     | X        |                     |               |
| Privacy of home<sup>b</sup> | X        |                     |               |
| Relaxing home environment<sup>c</sup> | X        |                     |               |
| Avoidance of conflict with other patients | X        |                     |               |
| **Freedom**          | X        |                     |               |
| Ability and time for leisure travel | X        |                     |               |
| Minimal interruption to daily life activities | X        |                     |               |
| Less dietary restrictions<sup>b</sup> | X        |                     |               |
| **Avoidance of in-center hemodialysis** | X        | X                   | X             |
| Fear of needles<sup>b</sup> | X        |                     |               |
| Avoidance of hospital/clinic setting<sup>b</sup> | X        |                     |               |
| Exhausted vascular access options<sup>b</sup> | X        |                     |               |
| Fear of hemodialysis process and/or side effects<sup>b</sup> | X        |                     |               |
| Belief that PD is safer than in-center HD<sup>b</sup> | X        |                     |               |
| **Preservation of autonomy** | X        | X                   | X             |
| Being in control of one’s health | X        |                     |               |
| Option to maintain employment<sup>b</sup> | X        |                     |               |
| Continuation of independent lifestyle | X        |                     |               |
| **Adequate support** | X        | X                   | X             |
| Caregiver support | X        |                     |               |
| Staff support | X        |                     |               |
| Patient peer support | X        |                     |               |
| **Adequate training and resources** | X        | X                   | X             |
| Tailored training<sup>b</sup> | X        |                     |               |
| Access to and use of internet<sup>b</sup> | X        |                     |               |
| Effective education from nurses | X        |                     |               |
| Re-training sessions for patients | X        |                     |               |
| **Physical and cognitive skills for home dialysis** | X        | X                   | X             |
| Strength and dexterity | X        |                     |               |
| Health literacy and decision-making | X        |                     |               |
| **Favorable disposition** | X        | X                   | X             |
| Being alert | X        |                     |               |
| Self-discipline<sup>b</sup> | X        |                     |               |
| Attention to detail | X        |                     |               |
| Patience<sup>b</sup> | X        |                     |               |
| Self-confidence | X        |                     |               |
| Adherent | X        |                     |               |
| Self-motivation | X        |                     |               |
| **Perceptions of improved health** | X        | X                   | X             |
| Feeling better having dialysis daily<sup>b</sup> | X        |                     |               |
| Less side-effects than in-center hemodialysis<sup>b</sup> | X        |                     |               |
| Better health outcomes than in-center hemodialysis | X        |                     |               |
| Better satisfaction than in-center hemodialysis | X        |                     |               |
| Better quality of life than in-center hemodialysis | X        |                     |               |
| **User-friendly procedure/technology** | X        |                     |               |
| Ease of using home dialysis machine<sup>b</sup> | X        |                     |               |
| Ease of home dialysis procedure | X        |                     |               |
| **Lower societal costs** | X        | X                   | X             |

<sup>a</sup>X indicates from which stakeholder group(s) each theme emerged.

<sup>b</sup>Indicates the subtheme emerged only during interviews with patients on home PD, caregivers of patients on home PD, or with staff in reference to patients on home PD.

<sup>c</sup>Indicates the subtheme emerged only during interviews with patients on home HD, caregivers of patients on home PD, or with staff in reference to patients on home HD.
included patients feeling fearful about performing home dialysis or feeling unable to assume its responsibilities.

**Geographical Barriers**
Staff described geographical factors that can make patient travel to clinic appointments difficult, including rural facility location, and poor transportation infrastructure. Staff discussed ways that these factors impose limitations on dialysis staff to perform home visits.

**Diminished Peer Socialization**
Staff discussed the absence of socialization with other patients on IC-HD dialysis as a challenge. They explained that some patients enjoy the opportunity IC-HD offers to bond with other Veterans in similar circumstances.

**Challenging Health Status**
Staff identified health conditions that can prevent initiation or require discontinuation of home dialysis, including PD procedure complications (e.g., recurrent peritonitis, membrane failure, hernias), disabilities (e.g., poor vision, cognitive decline), old age, and history of substance abuse.

**Facilitators to Implementing Home Dialysis**
Twelve themes emerged as facilitators to home dialysis. Seven spanned all participant groups: convenience, freedom, avoidance of IC-HD, preservation of autonomy, adequate support, favorable disposition, and perceptions of improved health. Two themes common among patients and staff were adequate training and resources, and physical and cognitive skills for home dialysis. One theme was common among Veterans and caregivers (home comfort), one among caregivers and staff (lower societal costs), and one among patients (user-friendly procedure/technology) (Tables 3). Identified themes were mapped to domains of the TRA/TPB (Figure 1).

| Themes and Subthemes                           | Patients | Informal Caregivers | Dialysis Staff |
|------------------------------------------------|----------|---------------------|----------------|
| **Incorporate mental health care**             | X        | X                   |                |
| **Offer peer-to-peer coaching**                | X        | X                   | X              |
| **Patient mentoring program**                  | X        |                     |                |
| **Patient support program**                    | X        |                     |                |
| **Increase frequency of home visits**          | X        | X                   | X              |
| **Staff home visits**                          | X        |                     |                |
| **Patient-to-patient home visits**             | X        |                     |                |
| **Decrease patient burden**                    | X        | X                   | X              |
| **Reduce time for treatment**                  | X        |                     |                |
| **Improve patient comfort**                    | X        |                     |                |
| **Telemedicine to reduce travel**              |          |                     |                |
| **Care coordination with outlying clinics**    |          |                     |                |
| **Improve functionality of equipment**         | X        |                     | X              |
| **Improve function of home dialysis machine**  | X        |                     |                |
| **Improve usability of home dialysis equipment**| X        |                     |                |
| **Innovations in dialysis access**             | X        |                     |                |
| **Reduce time for home dialysis setup**        | X        |                     |                |
| **Enhance support for caregivers**             | X        | X                   | X              |
| **Caregiver financial stipends**               | X        |                     |                |
| **Caregiver support groups**                   | X        |                     |                |
| **Seek continuity with physicians**             | X        |                     |                |
| **Provide health data feedback**               | X        |                     |                |
| **Transmission of home treatment data to staff**| X        |                     |                |
| **Caregiver access to patient treatment data** | X        |                     |                |
| **Improving education**                        | X        |                     |                |
| **Formal caregiver training**                  | X        |                     |                |
| **Standardize educational materials for patients**| X        |                     |                |
| **Retraining sessions for patients**           | X        |                     |                |
| **Earlier patient education**                  | X        |                     |                |

| aX indicates from which stakeholder group(s) each theme emerged. |
| bIndicates the subtheme emerged only during interviews with patients on home PD, caregivers of patients on home PD, or with staff in reference to patients on home PD. |

1934 Kidney360
### Table 5. Illustrative quotations by patients, informal caregivers, and dialysis staff

| Themes                              | Quotations                                                                                                                                                                                                                                                                                                                                 |
|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| **Patient challenges to home dialysis** |                                                                                                                                                                                                                                                                                                                                 |
| Need for sterility                  | “… you have to be very sanitary on everything you’re doing. Everything has to be hospital clean. I mean, it’s not a massive challenge, but it’s something that you have to pay attention to, because the repercussions of not doing that, not being careful in what you’re doing, not doing everything in a very sanitary measure are uh, very serious.” 73-year-old male on home peritoneal dialysis |
|                                    | “You have to make sure you have your mask on. You have to make sure that your hands are thoroughly, thoroughly clean. Uh, making sure that after you wash your hands if you touch something, again, you have to wash your hands. The cleanliness is extremely, extremely important.” 70-year-old female caregiver/patient spouse |
|                                    | “If they are going to do the dialysis at home overall you want them to have sanitary living environment. I know our team looks to see if they have any pets. Especially cats with all of the supplies involved. They do the home visit to see if it is free of clutter.” Dietician |
|                                    |                                                                                                                                                                                                                                                                                                                                 |
| **Burden of home dialysis tasks**   |                                                                                                                                                                                                                                                                                                                                 |
|                                    | “The boxes, boxes that come in of the dialysis solution. Got to find a place to put all of them, and it’s not just the solution… Got to have room to do all the keep all of the extra equipment.” 76-year-old male on home peritoneal dialysis |
|                                    | “The machine, when the cartridges aren’t any good, or the machine malfunctions, or the catheter breaks. We have sleepless nights.” 58-year-old female caregiver/patient spouse |
|                                    | “Like PD initially they are very happy but the longer they are on it, they seem to become much more unhappy. I think they just get tired of doing it every day.” Nurse |
|                                    |                                                                                                                                                                                                                                                                                                                                 |
| **Insufficient self-efficacy**      | “There are a lot of our patients who just the idea of doing something like dialysis themselves scares them. I think if they don’t know or are aware of it to doing medical procedures. They think the medical procedure should be done by a nurse or a doctor in the hospital or a center or something like that.” Physician |
|                                    |                                                                                                                                                                                                                                                                                                                                 |
| **Lack of suitable home environment** | “It’s just, the only thing is that people need decent insulation and central heat and air so that they can provide a controlled storage and temperature for their solutions.” 72-year-old male on home peritoneal dialysis |
|                                    | “… and another disadvantage is because we are in a rural area, we just went through this last week, power outages out here are quite frequent... Um, for an example last week we were out 36 hours and doing manual dialysis in candlelight. Brought a whole new level of fear and anxiety on both of us.” 57-year-old female caregiver/patient spouse |
|                                    | “I often will start first with my contraindications for dialysis, home dialysis. Because, do they have a stable home situation? If they don’t, how are they going to store the supplies? How are they going to do it daily?” Physician |
|                                    |                                                                                                                                                                                                                                                                                                                                 |
| **Physical side effects of home dialysis** |                                                                                                                                                                                                                                                                                                                                 |
|                                    | “The only thing I don’t like is that you can’t really sleep. So, it messes you up for actually trying to get a job and work a job because you don’t really sleep. When you hook up the machine you have a beep for some reason or another and you’ve got to wake up and reposition yourself or check the lock out, and I don’t sleep in one position, so that’s a problem.” 62-year-old male on home peritoneal dialysis |
|                                    | “Yep, migration of the coil, and developing hernias, that was probably the two biggest things for us.” 68-year-old female caregiver/patient spouse |
|                                    | “There was one other gentleman he just could not get used to the thought of, he could not sleep at night with the machine. Anytime an alarm went off at night he would be just up the whole night. It was making him very, very uneasy.” Physician |
|                                    |                                                                                                                                                                                                                                                                                                                                 |
| **Negative psychosocial effects of home dialysis** |                                                                                                                                                                                                                                                                                                                                 |
|                                    | “So, uh, you know, you’re probably, your mind probably isn’t as much at rest as it was when you weren’t on something like this, because you have to be attentive to what you’re doing. You have to be concerned about your fluid intakes. You have to be concerned about your blood pressure and your weight, and, uh, you know, these tax your mind.” 73-year-old male on home peritoneal dialysis |
|                                    | “Well, I know he mentioned yesterday, in his viewpoint it’s a disadvantage just to have a catheter sticking out your body, and I can only imagine.” 60-year-old female caregiver/patient spouse |
|                                    | “Some of them burn out because there is a lot of work at home.” Physician |
Table 5. (Continued)

| Themes                        | Quotations                                                                                                                                                                                                 |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Loss of freedom               | “With home dialysis you have all your day free, and before you go to bed, before you hook up, your night’s not free. So, if you want to see a night movie, you can’t. If you wanted to see a movie at 7:00 and it gets out at 9:00, if you want to suffer staying in bed until like 8:00 in the morning while you’re still doing your dialysis, you can’t. Like, I want to go see the high school football team. I have to leave at half time because that’s at 8:00, and I have to come here, because it takes an hour to set up the machine, the tests, all of the cassettes, and everything, and by the time you wake up it’s 9:30. I can’t do that, so I only see half the game.” 50-year-old male on home peritoneal dialysis                                                                                                                                                                                                                                                                                                                                 |
| Geographical barriers        | “It limits being able to go out and enjoy certain activities, because it’s like, you have to come back home, do your next treatment.” Female caregiver/daughter of patient                                                                                                                                                                                                                                                                                                                                 |
| Diminished peer socialization | “I think that you have some people who say I don’t want to do it every night. For the peritoneal dialysis, I don’t want to be attached to a machine. At night I want to get out. I want to move around.” Physician                                                                                                                                                                                                                                                                                                                             |
| Challenging health status     | “You also have patients who for some reason or another their body isn’t working with peritoneal dialysis. They had multiple abdominal surgeries, or hernias, it just doesn’t work for them. In that case in-hemo is the way. It just depends on the patient.” Dietician                                                                                                                                                                                                                                                                                  |
| Patient facilitators to home dialysis | “If I have to get up at 6:00 and be somewhere at 7:00 in the morning. I’ll just start a little earlier. I’ll start at 7:30 or 8:00 in the evening and then that way I’m up in the morning. If I have somewhere to go at night and I don’t get on the machine until midnight or after then I just sleep in the next morning, and um, stay in bed basically until it’s finished. It’s not a big deal.” 58-year-old male on peritoneal dialysis                                                                                                                                                                                                                                                                 |
| Convenience                  | “Not having to go to another facility to have the dialysis done. You’re able to stay in your own home and manage your dialysis on your own time” 68-year-old female caregiver/patient spouse                                                                                                                                                                                                                                                                                                                                                                         |
| Home comfort                  | “For the guys who are able to do in their home, it seems to be much better. They have a better quality of life. They don’t have to come in every other day and stay here for a few hours. As long as they have that system at home they seem to do very well.” Dietician                                                                                                                                                                                                                                                                                                                                 |
| Freedom                      | “I can do it at home in my own privacy and relax.” 62-year-old male on home peritoneal dialysis                                                                                                                                                                                                                                                                                                                                 |
|                               | “I think it’s great. I think it’s wonderful. It’s like, less invasive of your privacy and your time.” 61-year-old female caregiver/spouse                                                                                                                                                                                                                                                                                                                                                                                  |
| Avoidance of in-center hemodialysis | “The freedom that it allows me to do all my activities and stuff like that. I can do dialysis at night and then venture out during the daytime and do whatever I need to do.” 71-year-old male on home peritoneal dialysis                                                                                                                                                                                                                                                                                        |
|                               | “It’s something that can be done at home in your own time, and it also benefits us in being able to have a quality of life with traveling or, um, basically with travelling.” 75-year-old female caregiver/patient spouse                                                                                                                                                                                                                                                                                           |
|                               | “One of the factors would be the time they would have available during the day. Do the treatments at night. Helps them carry on with their routines better. That they only have to come once a month. Minimizing the visits, that really helps them. Giving them the flexibility to do what they want to do.” Physician                                                                                                                                                                                                                                                                 |
|                               | “I don’t like playing with blood, and with the hemodialysis it filters the blood. It takes the blood out of the body and filters it and puts it back in. I ain’t too hip with that. So, I chose peritoneal because I thought it was a lot easier and safer for me” 62-year-old male on home peritoneal dialysis                                                                                                                                                                                                 |
|                               | “I was looking up, um, it looked to me like there was more cardiac events in the chair than there are in peritoneal dialysis.” 60-year-old female caregiver/patient spouse                                                                                                                                                                                                                                                                 |
### Table 5. (Continued)

| Themes | Quotations |
|--------|------------|
| Preservation of autonomy | “I think just the thoughts of being tied to a machine three times a week is overwhelming. Kind of like thinking you have to go to the dentist three times a week, and that is only an hour. I just think that they like being on their own.” Physician |
| Adequate support | “Well, there was also the idea, I wanted to control my own disease and peritoneal gave me that freedom to do things, and to do it at home, and to do it on my own.” 67-year-old male on home hemodialysis |
| Adequate training and resources | “The disease is less scary when you have more control over it. There’s a lot of fear in putting your whole life in someone else’s hands.” 50-year-old female caregiver/patient spouse |
| Physical and cognitive skills for home dialysis | “I pretty much like to start all my patients with CKD 5 on home modality of any kind. It gives them a lot of control over CKD, such a debilitating disease, and a big sense of that is the patient has, is they lose control of their life. It gives them a sense of control to participate in their own chores. They do a better job of it. I ask them, the one question I ask them is who do you think will be invested in your care better than you?” Physician |
| Adequate support | “Their communication level is excellent. Like I said, I can call them anytime, and then if there’s a problem during the night, there’s a peritoneal dialysis nurse on staff at the VA, so I can call in if there’s something like that. Also, the company Baxter has a 24-hour line of course.” 45-year-old male on home peritoneal dialysis |
| Adequate training and resources | “You know, if you get down and out, you know, ‘I don’t want to do this,’ you know, they’re always behind you. If you have a question you can always call them. Sometimes I’ll call them and say, ‘Am I doing this right?’ You know, ‘Should the yellow be attached to the blue?’ No question is ever too small.” 64-year-old female caregiver/spouse |
| Adequate training and resources | “We actually have a patient that has been successful using peritoneal dialysis for quite some time come in. Talk about it. Show his catheter placement in his stomach. Allow patients to ask questions of him. I have sat there before and that is pretty powerful because it instills hope.” Social worker |
| Adequate training and resources | “They should have all of the pamphlets they gave me and keep reading everything that you can get your hands on and go online also. Online was very helpful to me. It gives you a better perspective of how the treatments are treating other people, you know, it’s not going to work for everybody but, you’ve got to try it. You’ve got to investigate it.” 71-year-old male on home peritoneal dialysis |
| Favorable disposition | “I think that to the nurses. They are very good. They don’t rush the training for our patients. I know a lot of places will do it in a week and you are done. If the patient is not ready we take our time with the patient and train. I will see them when they are training. Look at their labs and blah blah blah and look at the patient and make sure they don’t need to be pushed harder. They really do take their time with the patient. They don’t send them home before they know that they are ready.” Physician |
| Favorable disposition | “You’ve got to be able to keep inventory, you have to, you know, have a clear mind when it comes to recording your figures, keeping a log on your blood pressure and your weight. You have to keep a log on your, you have to pay attention very closely to your medications, and uh, the routine that you use in taking your meds. You’ve got to pay very close attention to the fluids you’re retaining or not retaining. You’ve got to pay very close attention to dehydration or hydration. So, I would say that you would at least have to have an average IQ to do this. I mean I wouldn’t even attempt this thing if I wasn’t somewhat in control of my thoughts.” 73-year-old male on home peritoneal dialysis |
| Favorable disposition | “First thing is, patient’s IQ. I mean, does he understand? How well does he understand? Then, clinical factors. We have peritoneal dialysis nurse assess him for dexterity and that. Can he make the connection physically to see if he can do it?” Physician |
| Favorable disposition | “You have to be responsible. You have to follow the rules.” 50-year-old male on home peritoneal dialysis |
| Favorable disposition | “Also, I think with the home dialysis, um, to be able, for the family to be able to monitor the patient; however, I wouldn’t suggest, um, if the patients are less alert to do it.” Female caregiver/daughter of patient |
| Favorable disposition | “I think that somebody has to have pretty full cognition to do it in the home
| Themes | Quotations |
|--------|------------|
| Perceptions of improved health | “I feel a ton better. I have more energy. My mind is working. I had actually gotten to the stage where I was getting cloudy in my brain. I call it cloudy, and my brain wasn’t actually working right, and so, when I went on dialysis that all got better. I had a lot more energy.” 71-year-old male on home peritoneal dialysis |
| User-friendly procedure/technology | “The patient feels better because they’re being dialyzed on a daily basis. Um, there’s not a lot of discomfort with it. There’s some cramping sometimes, but mostly my partner feels much better being able to dialyze on a daily basis.” 68-year-old female caregiver/patient spouse |
| Recommendations for implementation of home dialysis | “For the guys who are able to do in their home, it seems to be much better. They have a better quality of life. They don’t have to come in every other day and stay here for a few hours. As long as they have that system at home they seem to do very well.” Dietician |
| | “I really feel that the way that the machine’s set up, it makes it easy for just about anybody to do this.” 58-year-old male on home peritoneal dialysis |
| Incorporate mental health care | “I would think people who were on dialysis need some kind of psychological help, because you realize that you are not going to be able to do anything else, ever. This is it from now on, and you start to get depressed. So, I would like to see somebody come up with some psychological help.” 70-year-old male on home peritoneal dialysis |
| | “I think maybe sometimes they need somebody to talk to other than, um, other than the medical support that he gets. I think mentally they need somebody to talk to. You’re doing home dialysis. You can’t work. So, I think they need some type of stress relief, also. If they could talk or rant and do whatever they need to do. It’s very hard for him, because if they don’t have the support to do that then of course the caretaker has to deal with it. So, I think they need mental counseling to help them accept and deal with the fact that they’re doing home dialysis.” 58-year-old female caregiver/patient spouse |
| Offer peer-to-peer coaching | “I would encourage the social worker to work alongside the nurse in the community and do the home visits and do the caregiver supports and assessments in that natural environment. Rather than making them come to the facility. That takes time. Then on top of that, I would want to have that roll be a little more clinical where they do the KDQOLs, and tend to look at depressions. Maybe do a depression inventory or anxiety inventory and look at adjustment issues having a chronic illness that is end stage and maybe doing a little counseling on top of that.” Social worker |
| | “I think that would be, if somebody had the option ahead of time of calling somebody and talking to somebody who’s actually doing it, sometimes that might help them feel better about doing it.” 58-year-old male on home peritoneal dialysis |
| | “I think, making, or having the guys, or whoever is doing it, just talk about it every once in a while to see how it goes for each of them, and that kind of thing, but that’s it. Group support.” 56-year-old female caregiver/patient spouse |
| | “I think that during those proactive times there could be some type of mentorship program. Where there are probably Veterans out there that are very strongly aligned with their peritoneal dialysis and are giving and want to show somebody exactly what that looks like beyond coming to the CKD class.” Social worker |
| Increase frequency of home visits | “I think for some of the older patients that had trouble with it, they should probably do, uh, come and check the house every 6 months, maybe.” 45-year-old male on home peritoneal dialysis |
| | “It would be helpful to have a professional provider that you know, attached to the hospital, there at least for the first two treatments.” Female caregiver/daughter of patient |
| | “I think it would have been better if we could have had the social work roll...
| Themes                        | Quotations                                                                                                                                 |
|------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| Decrease patient burden      | “The only way it would be easier is if it worked better and that would be a shorter period of time.” 71-year-old male on home peritoneal dialysis |
|                              | “Some type of benefits, medical supplies. Something that can make him comfortable at home, like a nice pillow, something like a complimentary support for them.” Female caregiver/daughter of patient |
|                              | “So, I think the main way you can think about them coming to the VA is if we could start doing more telemedicine and decrease the monthly visits. Just have a connection and their relationship that maybe they only need to see us quarterly.” Physician |
| Improve functionality of     | “We’ve had problems with the Baxter machines. We’ve had to exchange the machines three times now. The old machine, the first machine was a big bulky thing and it was dated, you could tell, but it worked fairly well. Then, they went to this new, smaller machine that’s supposed to be all updated and great, and all this stuff. Well, so far they’re still working on it. They um, they have a lot of alerts you know where middle of the night a big alarm will go off and it will say many things, like the flow is slow, or that uh, cassette failed, or things like that now.” 70-year-old male on home peritoneal dialysis |
| equipment                    |                                                                                                                                              |
| Enhance support for          | “Well, I mean it’s, it is really stressful on her. I’d like to have her be able to talk to somebody about what’s going on. She needs psychological help also, because this is very, very difficult for her. You know, the joke of death is nature’s way of telling you to slow down. She’s worried I’m going to die. If I sleep past 9:00 in the morning, which is very, very seldom. I slept until 10:00 about a week ago, she tiptoed into the room to see if I was dead. Can you imagine the stress? I wish there was somebody that she can go talk to, somebody that understands what dialysis is and what the affect is on the caregivers. I will tell you, it is killing her. I mean she is just miserable, and I can’t say, honey, it’s going to be ok, because it’s not going to be ok. It’s going to be this way forever. So, I mean she’s worried about me dying, and I’m not. If I die, I die. I’ll never know it, but she has to do that every morning. Amazing, and I don’t know if this will help at all, but you need to get somebody to help her, help all these caregivers.” 70-year-old male on home peritoneal dialysis |
| caregivers                   |                                                                                                                                              |
| Seek continuity with         | “Um, I hate to say this because this sounds so horrible, but some financial aid. I mean, with me giving up my work that I did 12 years ago. We just live off his [unclear], and God forbid when the time comes, there’s really nothing for me, except the little limited that the VA gives me. I think the benefits get cut in half. Yeah so, unfortunately, I could start crying. I know that’s a very stressful thing because we talk about it a lot, because if I wasn’t here and he would have to pay for somebody, there’s no way that he could pay the little bit that they give us. So, it would be nice to have some kind of compensation.” 57-year-old female caregiver/spouse of patient |
| physicians                   | “To be perfectly honest with you, and I’m sure there’s a reason that they can’t do it, but you would be better off with assigned a particular doctor opposed to five doctors rotating your visits. Only because, each one of those doctors has their own approach and their own opinion on your dialysis, on your medication and on your treatment, and, and, it can be, it can be, that can be a problem, because you’re constantly flip-flopping on medications, and flip-flopping on your dialysis solution prescriptions.” 73-year-old male on home peritoneal dialysis |
|                              | “I think another thing that is a little confusing for the peritoneal dialysis folks as a whole is that here at least at our VA, our physicians change. So, depending on the month, each renal attending kind of does their practice a little different which makes a lot of sense. But every month the patients come back for an appointment and they are seeing a different provider. I feel that, that can be quite confusing. Obviously, folks have preference. They might prefer one over somebody else for various reasons. That is tough for us as like the support staff that is here all of the time. Myself, the pharmacist, dietician, nurse. It is kind of hard. We even have to change it up. But for the patients I could imagine it is more confusing.” Social worker |
and delivering supplies to other locations enabled leisure travel.

**Avoidance of IC-HD**

Patients and staff reported that many patients on PD have a fear of needles. Patients on PD expressed concerns about HD and potential side effects (e.g., fatigue, nausea). Caregivers of patients on PD shared beliefs that PD is safer than HD. Patients on PD and staff discussed a preference for home dialysis for those who dislike the hospital or clinic setting.

**Preservation of Autonomy**

All groups indicated that home dialysis can help patients maintain independence and have greater control of their treatment and health. For patients performing nocturnal PD, participants discussed the ability to maintain employment.

**Adequate Support**

Support was discussed as an important facilitator for home PD and HD. All participant groups reported the importance of caregiver support (e.g., caregiver attendance at appointments, assistance with supply inventories, set-up/dismantling equipment) and staff support (e.g., ready access to dialysis nurses by phone, home visits from dialysis nurses, emotional support from staff, meal-planning support, supply ordering assistance). Patients and staff described the importance of patient peer support during home dialysis initiation (e.g., during training sessions), and after initiation (e.g., patient support groups and social events).

**Favorable Disposition**

All groups mentioned alertness of mind as a facilitator, and patients and staff identified attention to detail, self-confidence, and self-discipline. Patients uniquely identified patience. Staff described self-motivation as a key factor in determining whether a patient is suitable for home dialysis.

| Themes                               | Quotations                                                                                                                                                                                                 |
|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Provide health data feedback         | “You know what would help actually that we’re not getting, and this is not against the VA, it’s the computer system, the automated gizmo. It collects data every day, and it sends those data to the nurses, and they have those data, and I don’t. I mean, when the machine is on, there’s a moment in the menu where you can actually click a menu and go off and look at data, but you’ve got to catch it at the right time. If my husband’s already cycling, I can’t go look. If it’s in the middle of the morning, and his feet are a little swollen and I’m like, ‘Well, how did things go last night?’ and he’s all, ‘I don’t remember the numbers exactly,’ I can’t just go turn it on quickly and grab the numbers and have some knowledge.’” 60-year-old female caregiver/spouse of patient. |
| Improve education                    | “Yeah, if I had a wish list it would definitely be, um, kind of more patient education that was kind of centralized, I think. Or a database I could pull from, because right now I just do web searches for everything to do my education.” Nurse                                                                 |

**Perceptions of Improved Health**

Patients and caregivers commented on improved feelings of health patients experienced after switching from IC-HD to PD. Patients and staff discussed that patients on PD tend to experience fewer side-effects as compared with those on IC-HD, and staff shared perceptions of better health outcomes, patient satisfaction, and quality of life for patients on home PD and HD versus patients on IC-HD.

**Home Comfort**

PD Veterans and caregivers described the comfort of being at home while performing dialysis. PD caregivers described home as more relaxed for the patient than a dialysis facility. Patients on PD and caregivers identified privacy as a major contributor to home comfort.

**Adequate Training and Resources**

Patients on PD and staff discussed extensive training, tailored to individual patient needs as a facilitator. Both groups discussed patient access/use of the Internet to learn more about PD as a facilitator and staff discussed effective nurse education (e.g., nurses who are good teachers), and regular re-training sessions for patients.

**Physical and Cognitive Skills for Home Dialysis**

Patients described the following physical skills as necessary for home dialysis: sterile technique (PD and HD), cannulation (HD), equipment setup (PD and HD), manual exchanges (PD), catheter dressings (PD), waste disposal (PD and HD), and heavy supply transport (PD and HD). Patients and staff mentioned good dexterity as an important physical skill. Patients mentioned the following necessary cognitive skills (PD and HD): checking and understanding vital signs, operating digital and manual scales, operating the machine, maintaining inventories, keeping track of appointments, troubleshooting problems, making sound decisions, maintaining a routine, using linear thinking, and using numeracy skills.

**Lower Societal Costs**

Caregivers and staff appreciated home PD and HD as a less costly option than IC-HD.
User-Friendly Procedure/Technology
Patients described the user-friendly nature of the home dialysis machine (PD) and procedure (PD and HD).

Recommendations to Support Implementation of Home Dialysis
Nine themes emerged as recommendations to support implementation of home dialysis (Table 4). Four were common among all groups: incorporate mental health care, offer peer-to-peer coaching, increase frequency of home visits, and decrease patient burden. Two recommendations were common among patients and caregivers (enhance support for caregivers and provide health data feedback), and two among patients and staff (improve functionality of equipment and seek continuity with physicians). Improving education was recommended by staff.

Illustrative quotations for themes described in the sections above are given in Table 5.

Incorporate Mental Health Care
All groups suggested incorporating mental health care into monthly visits attended by patients on home PD and HD with dialysis staff. Patients and caregivers also recommended increasing the availability of psychosocial support from dialysis staff via telehealth.

Offer Peer-to-Peer Coaching
The need for increased opportunities for patients with ESKD to learn about home PD or home HD from current patients was raised by all groups. Patients and staff suggested creating mentoring programs between experienced and new patients on home dialysis. Patients and caregivers advocated for peer support group meetings and educational seminars.

Increase Frequency of Home Visits
Participants across groups expressed the need for increased frequency of staff home visits to support patients on home PD and HD in adhering to procedures and technique, ensuring maintenance of a suitable home environment, and addressing patient concerns and questions. One patient on PD recommended patient-to-patient home visits to support new patients on home dialysis.

Decrease Patient Burden
Patients expressed the desire for PD to require less time. Staff discussed using telemedicine to reduce patient travel for appointments, and care coordination with outlying clinics to expand geographical options for dialysis-related laboratory testing.

Enhance Support for Caregivers
Patients on PD and caregivers discussed the need for caregiver support groups and psychosocial support. Both groups suggested offering financial stipends to caregivers.

Improve Functionality of Equipment
Patients and staff emphasized the need to improve the function of PD machines to reduce error frequency. Patients stressed the need for improved usability of PD equipment (e.g., longer tube, quieter machine), innovations in dialysis access (e.g., single needle for HD), and faster machine and equipment setup (PD and HD).

Seek Continuity with Physicians
Patients on home PD and HD and staff underscored the importance of patients being cared for by the same physician rather than rotating staff to foster continuity in home dialysis care.

Provide Health Data Feedback
Patients on PD highlighted the advantages of transmitting daily dialysis treatment data to the home program for quality assessment. PD caregivers discussed that their own real-time access to treatment-related data (e.g., laboratory results, staff notes) would help guide home dialysis care.

Improve Education
Staff stressed a need for standardization of educational materials for patients on home PD and HD, earlier introduction to dialysis education for patients with kidney disease, re-training programs for patients on home dialysis (PD and HD), caregiver training programs, and a common set of educational materials for staff.

Discussion
We identified factors that impede or ease the implementation of home dialysis among adults with ESKD using home dialysis. We characterized themes infrequently reported in prior literature, including lack of peer socialization and geographic barriers as challenges and favorable disposition and user-friendly procedure/technology as facilitators. Our findings corroborate challenges to home dialysis identified by others including the need for sterility (12,30–34), burden of home dialysis tasks (12,30–34), lack of suitable home environment (12,30,31,33–37), physical side effects of home dialysis (31,33,34), negative psychosocial effects of home dialysis (12,31,32,34,35,38), and loss of freedom (30–32,34).

Similarly, our findings corroborate previously identified facilitators, including convenience (12,31–33,35,36), home comfort (12,32,35), freedom (12,30–33,35,39), avoidance of IC-HD (12,40), preservation of autonomy (12,33–35,37,38), adequate support (31–33,35,36,38–40), and adequate training and resources (36,38,40). In the context of the TPB/TRA framework, most challenges and facilitators corresponded to perceived behavioral control and attitudes rather than injunctive and descriptive norms. Accordingly, enhancing home dialysis initiation, daily maintenance, and sustainment may be most effective through alleviating treatment side effects, reducing burden of treatment tasks, and bolstering usability of technology for patients and caregivers.

The challenges and facilitators we identified informed many important recommendations raised by stakeholders, including incorporating mental health care and using telemedicine in dialysis care. Poor mental health, especially depression, can affect up to 40% of adults on maintenance dialysis (41,42). Depression is associated with worse dialysis treatment, dietary, and medication adherence and poorer quality of life, increased hospitalization, and mortality (43–45). Patient and caregiver mental distress (e.g., depression, burnout) contribute to home dialysis discontinuation (22). Pharmacologic and behavioral treatments for mental health are underutilized in patients with ESKD (45). Therefore, improving access to mental health care may enhance home dialysis implementation (15,16), especially...
among Veterans whose rates of major depression are twice the general US population (15,46). Telemedicine may overcome challenges in home dialysis implementation by surmounting geographic barriers, eliminating travel time, enhancing patient education, fostering self-care, reducing patient/caregiver isolation, facilitating interdisciplinary supervision, and improving patient/caregiver access to the dialysis team (e.g., ad hoc troubleshooting) (47–50). Especially during the coronavirus disease 2019 pandemic, telemedicine can address patient/caregiver dialysis concerns while maintaining physical distancing (50). VA is well positioned to rigorously examine best practices, outcomes, and cost effectiveness of telemedicine for home dialysis because of its robust education, training, and research infrastructure and the lack of regulatory and reimbursement-related constraints (17). Other recommendations we identified corroborate prior research including: improve awareness of home dialysis (15,16,47), peer-to-peer coaching (17), increase frequency of home visits (51), decrease patient burden (reduce treatment time, improve comfort) (15), improve functionality of equipment (15,47), enhance support for caregivers (15,16,52), improve education (15–17,47,51), and provide health data feedback (e.g., immediate real-time, dialysis-related laboratory treatment data and staff notes) (53). Consistent with common practices in implementation research (54,55), supporting home dialysis will likely require drawing on several recommendations in combination to address challenges and capitalize on facilitating factors at the patient, provider, and health care system levels.

Our evaluation was strengthened by a multicenter approach, geographically diverse high-risk cohort, strong theoretical framework, inclusion of three stakeholder perspectives, and rigorous data collection. Although prior studies focused on decision-making about home dialysis, our study examined challenges and facilitators to the day-to-day implementation of home dialysis. Although expert opinion and stakeholder workshops have underpinned home dialysis recommendations (15–17), we utilized rigorous qualitative techniques to thematically identify recommendations by participants in home dialysis programs.

Our study has limitations. First, although nonresponse bias may have occurred, our participant response rates are within acceptable standards for qualitative investigations (29). Participants’ responses may reflect recall bias because certain questions assessed matters occurring several years prior. Second, population and infrastructure differences between VA and non-VA home dialysis programs may limit application of our findings outside of the VA. Although our VHA home dialysis sample is similar to the national VHA dialysis population, it is made up of older, mostly male, non-Hispanic White patients, and experiences a greater comorbidity burden than the non-VA dialysis population (1). Non-VA dialysis programs are governed by the Centers for Medicare and Medicaid Services, which has instituted financial incentives for home dialysis, leading to an increase in home dialysis (56). These differences may contribute to the lower use of home dialysis in VA (5%) compared with the non-VA population (12%) (1). In contrast to most non-VA programs, nearly all VA home dialysis programs are affiliated with academic medical centers whose health care teams often include multiple nephrology trainees and attendings. Third, although the sample size did not afford subgroup analyses by home modality (i.e., PD versus HD), most themes were shared by participants in both groups.

In summary, we identified important stakeholder-derived challenges, facilitators, and recommendations for implementing home dialysis. Our findings help address the need for research called for by a recent national stakeholder home dialysis workgroup (15,16), namely to develop and evaluate patient-centered strategies that address the factors identified herein to support home dialysis and improve patients’ health outcomes.

Disclosures

B. Smith reports being a scientific advisor or member of the Journal of Spinal Cord Medicine. E.J. Gordon reports receiving honoraria and travel reimbursements for presentations and meetings from Advisory Committee on Blood and Tissue Safety and Availability (ACBTA), National Institute of Allergy and Infectious Diseases (NIAID) Data Safety Monitoring Board (DSMB), National Institutes of Health ad hoc study section grant reviewer, and National Heart, Lung, and Blood Institute (NHLBI) DSMB; reports being a scientific advisor or member as Associate Editor for Narrative Inquiry in Bioethics, Associate Editor for American Journal of Transplantation, Member of ACBTA, National Academies of Sciences, Engineering, and Medicine Committee, NIAID DSMB, and NHLBI DSMB; reports other interests/relationships as a Member of the American Society of Transplantation (AST) Living Donor Community of Practice, Co-Chair of AST Psychosocial and Ethics Community of Practice, Member AST IDEAL Task Force. M.J. Fischer reports being a scientific advisor or member of Department of Veterans Affairs Dialysis Steering Committee, Department of Veterans Affairs VAi2 Renal Information System Technical Expert Panel, National Kidney Foundation of Illinois Scientific Advisory Board and Executive Committee, National Quality Forum Renal Endorsement Maintenance Steering Committee, and Renal Physicians Association Kidney Quality Safety Accountability Committee. All remaining authors have nothing to disclose. This project was supported by a VA Center of Innovation SPARK grant.

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Author Contributions

M. Fischer, E. Gordon, T. Hogan, L. Jones, B. Smith, and K. Stroupe were responsible for the project design; C. Fiandaca, M. Fischer, and L. Jones were responsible for data collection; M. Fischer, E. Gordon, T. Hogan, L. Jones, B. Smith, and K. Stroupe were responsible for data analyses; C. Fiandaca, M. Fischer, E. Gordon, T. Hogan, L. Jones, B. Smith, and K. Stroupe wrote the manuscript; and C. Fiandaca, M. Fischer, E. Gordon, T. Hogan, L. Jones, B. Smith, and K. Stroupe approved the final version of the
manuscript. Each author made important contributions to manuscript content, drafting or revision, and accepts responsibility for these contributions. The authors agree to appropriately address any questions regarding content accuracy or integrity.

Supplemental Material

This article contains the following supplemental material online at http://kidney360.asnjournals.org/lookup/suppl?doi=10.34067/KID.0000642021/*DCSupplemental.

Supplemental Appendix 1. Veteran semistructured interview guide.

Supplemental Appendix 2. Caregiver semistructured interview guide.

Supplemental Appendix 3. Dialysis staff semistructured interview guide.

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