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Home Dialysis in the Coronavirus Disease 2019 Era



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The coronavirus disease 2019 pandemic has had a significant impact on patients with end-stage kidney disease and their care, especially given the potential for severe coronavirus disease 2019 in those with a depressed immune status. Patients receiving in-center hemodialysis have been particularly affected by this pandemic because of their need to travel multiple times a week to receive treatment. Although patients on home dialysis are able to avoid such exposure, they face their own unique challenges. In this review, we will discuss the challenges posed by the coronavirus disease 2019 pandemic for patients on home dialysis, the impact of coronavirus disease 2019 on various aspects of their care, and the resultant rapid adaptations in policy/health-care delivery mechanisms with implications for the future care of patients on home dialysis.

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The coronavirus disease 2019 (COVID-19) pandemic has upended every aspect of life as we know it. Its effect on the health-care system has been uniquely profound, laying bare the shortcomings of our systems and processes, while at the same time creating new opportunities by rapid adaptation and utilization of available technology.

Patients with end-stage kidney disease (ESKD) requiring dialysis are considered a vulnerable group with the potential for severe COVID because of their immunosuppressed status and multiple comorbidities. Patients who receive hemodialysis in the in-center setting have been significantly affected by the COVID-19 pandemic because of the specific logistics involved (need to travel to their dialysis units and receive dialysis in a communal setting, typically 3 times a week), thus increasing their risk of exposure. Although patients on home dialysis are usually able to avoid such exposure, they face their own unique challenges. In this review, we will discuss the challenges posed by the COVID-19 pandemic for patients on home dialysis, the impact of COVID-19 on various aspects of their care, and the resultant rapid adaptations in policy and health-care delivery mechanisms with significant future implications. In the context of an evolving situation and a lack of data, we have shared our personal experiences relating to these issues, where appropriate.

COVID-19 EPIDEMIOLOGY AND DISEASE BURDEN IN PATIENTS WITH ESKD

In general, patients with ESKD are considered to be at risk for developing severe COVID-19 as a result of multiple comorbidities and immunocompromised status.¹ However, due to the evolving nature of the pandemic, the epidemi-

ology and disease burden of COVID-19 in patients with ESKD remain unclear. According to the Kidney Community Emergency Response data as of April 8, 2020, there were 6592 patients on dialysis in the United States who tested positive for COVID-19; of these, 305 patients died, 1206 patients were receiving dialysis in the hospital, and 928 patients were receiving treatment in the outpatient setting. There were 86 patients on home dialysis self-monitoring at home while continuing home therapy.² It is important to note that these numbers do not provide the full picture, given the ongoing spread of COVID-19.

A recent multicenter retrospective observational study from Wuhan, China, reported that 154 of 7154 patients on maintenance hemodialysis had laboratory-confirmed COVID-19 between January 1 and March 10, 2020. The incidence of COVID-19 in this patient cohort was noted to be 2.15% based on the diagnostic criteria used in the study. At the end of the study period (March 10, 2020), the authors included 131 laboratory-confirmed cases of COVID-19 in the final analysis and noted the following: 47 (35.9%) patients were treated and discharged from the hospital, 43 (32.8%) patients remained in the hospital, and 41 (31.2%) patients died. This study suggests that patients on maintenance hemodialysis are highly susceptible to COVID-19, with higher mortality rates and significant risk of disease spread in hemodialysis units.³

Another article from Wuhan, China, reported 5 COVID-19 cases in an outpatient hemodialysis unit, with a prevalence rate of around 2.5%. All 5 patients in this case series presented only with mild disease. The authors acknowledged that the prevalence of COVID-19 infection in outpatient hemodialysis patients is likely underestimated because of diagnostic limitations.⁴

Beyond these few reports, data specific to the epidemiology and clinical presentation of COVID-19 in the home dialysis population are lacking. There are many clinical characteristics common to all dialysis patients (e.g. comorbidity burden, metabolic derangement, immunocompromised state), and it is reasonable to assume that the vulnerability to COVID-19 infection noted in in-center hemodialysis patients can be extrapolated to home dialysis population as well.

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ADVANTAGES AND CHALLENGES OF HOME DIALYSIS IN THE COVID-19 ERA

The theoretical advantage of home dialysis during the COVID-19 era, compared with in-center hemodialysis, is the ability to do dialysis at home, thereby limiting unnecessary exposure to infection. However, patients on home dialysis may encounter unique challenges such as difficulty in obtaining dialysis supplies due to strained supply chains, administration of injectable medications, and timely lab draws. It may also be challenging for these patients to obtain advice on access and technical issues, in addition to having a perception of lack of support in emergencies, resulting in avoidance of dialysis/reduced frequency of dialysis. Mental health issues arising from social isolation and anxiety related to perceived increased vulnerability are other potential concerns.

The goal for nephrology providers during this time should be to keep patients on home dialysis at home and to resolve any issues that would jeopardize this. To this end, the International Society for Peritoneal Dialysis and the UK Renal Association issued guidelines for management of patients on peritoneal dialysis during the COVID-19 pandemic.^{5,6} Most of this guidance can be extrapolated to the home hemodialysis population as well.

Impact of COVID-19 on Care of Patients on Home Dialysis

Impact on Clinical Care. As a result of the ongoing COVID-19 pandemic, on March 18, 2020, the Center for Medicare and Medicaid Services (CMS) announced expansion of telehealth services under the 1135 waiver authority and Coronavirus Preparedness and Response Supplemental Appropriations Act. The CMS released a telemedicine and telehealth toolkit for ESRD providers to help establish a telehealth program and increase patients' access to health care.⁷ The CMS issued more waivers on April 30, 2020, further expanding telehealth services, including increasing payments for audio-only telephone visits to the same level as other office visits.⁸ (Table 1).

Before this, the CMS did allow patients on home dialysis to be seen for their monthly visits via telehealth regardless of the originating site, starting in 2019. However, this was not widely adopted by nephrology practices, including our own, because of restrictions relating to the frequency of telehealth visits each quarter (only 2 of 3 visits can be performed via telehealth) as well as the requirement for in-person visits for at least the first 3 months after starting home dialysis. However, in the current environment of social distancing and 'shelter at home' recommendations due to the COVID-19 pandemic, as well as widespread personal protective equipment and personnel shortages, efforts have been made in most health systems to convert

in-person visits to telehealth visits when appropriate, primarily as a result of the CMS waivers mentioned previously. Nephrology providers and dialysis organizations have also been quick to adapt to this change. In our practice, all monthly visits for patients on home dialysis were successfully converted to telehealth visits via Zoom video software, starting on the last week of March. Our nurses are also using telehealth to perform nursing visits, evaluate exit sites, and carry out various troubleshooting tasks as needed. Patients who require laboratory monitoring are being directed to local laboratories close to their homes. Review of our performance measures and grievances/occurrence data from the last 2 months suggests that this arrangement has worked well without any adverse patient events or trends in our performance metrics. Patients who do require in-person clinic visits for reasons that cannot be addressed via telehealth (eg., infections, exit site care, intravenous medication administration such as iron infusions) are screened ahead of time on phone for symptoms and exposure before their clinic visit. Staff follow standard infection precautions and make efforts to get patients in and out of the clinic as quickly as possible. This approach has allowed us to care for at least 1 COVID-19–positive patient so far; we have been

able to care for the patient entirely by telehealth, thus limiting exposure to our staff and other patients. A recent article from New York reported on the use of telehealth in the home dialysis unit. The authors note that telehealth allowed them to provide excellent patient care while maintaining patient and staff safety during the COVID-19 pandemic.⁹

Remote monitoring of patients on home dialysis in conjunction with telehealth visits, and frequent contact with patients by nursing staff, can help detect potential issues quickly. By this method, most issues can be resolved while patients remain at home, thereby reducing the need for face-to-face visits. Several patients on peritoneal dialysis in our practice currently use Baxter's AMIA automated peritoneal dialysis system, which allows the dialysis team to monitor patients' vital signs and treatment data through a secure web-based portal. El Shamy and colleagues described the successful use of remote monitoring in patients on peritoneal dialysis across the world. Notably, 1 center was successful in treating peritoneal dialysis–associated peritonitis remotely, utilizing telehealth and home delivery of antibiotics.¹⁰

Selected medications such as erythropoietin-stimulating agents, which are typically administered in the dialysis unit, could be shipped to patients' homes for self-administration. Patients who are unfamiliar with this process can be trained via a telehealth visit or a quick in-person visit as needed. In specific situations, such as a

CLINICAL SUMMARY

- The coronavirus disease 2019 pandemic has had a significant impact on patients with end-stage kidney disease and their care.
- Patients on home dialysis have an advantage over in-center patients because of a lower risk of exposure to infection but may face some unique challenges.
- The use of telehealth and remote monitoring technologies along with strategizing for potential challenges can help effectively take care of patients on home dialysis during the coronavirus disease 2019 pandemic.

Table 1. Impact of COVID-19 on Various Aspects of Care of Patients on Home Dialysis and Strategies to Cope

COVID-19 Impact	Strategies to Cope
Effect on clinical protocols	<ul style="list-style-type: none"> • The use of Telehealth technology for nursing/monthly physician visits • The use of telemonitoring • Prescribe 90-day supply of medications if possible • Ship injectable medications for self-administration or at a local provider's office • Streamline in-person visits when needed with proper infection precautions • Defer routine lab draws, adequacy studies, PET, if not clinically indicated • Arrange for local laboratories when needed
Dialysis supply chain disruptions	<ul style="list-style-type: none"> • Ensure patients have dialysis supplies to last at least a month • Reuse surgical masks/use homemade masks for connections/disconnections
Alterations to dialysis prescription	<ul style="list-style-type: none"> • Start new patients on CAPD rather than APD • Make PD or HHD prescriptions as clinically indicated
Modifications to patient training protocols	<ul style="list-style-type: none"> • Train new patients on PD on CAPD instead of APD • Use telehealth to supplement and shorten time spent on in-person training
Dialysis staff management	<ul style="list-style-type: none"> • Develop contingency plans for potential staff shortages and share staff among other dialysis units in the area • Consider rotating staff on a schedule for remote/in-person work to allow staff to satisfy their care obligations, improve morale, and decrease exposure to infection.

PET, peritoneal equilibration test; APD, automated peritoneal dialysis; CAPD, continuous ambulatory peritoneal dialysis; PD, peritoneal dialysis; HHD, home hemodialysis.

patient who is hesitant with self-administration of injectable medications, primary care providers can be a useful resource in caring for dialysis patients remotely. As long as there is high-quality communication between providers, primary care providers and their staff may be able to help coordinate care, ensure delivery of medications, and carry out patient teaching via telehealth. It is important to keep in mind that, despite efforts to minimize face-to-face contact, there will be instances when patients must be evaluated and treated in the clinic; for example, a patient with worsening anemia parameters will likely need to come to clinic for intravenous iron infusion.

Impact on Dialysis Supply Inventory. In light of the increased demand for dialysis machines and supplies to cater to hospitalized patients with COVID-19 requiring dialysis, there is concern that strain on medical supply chains will affect delivery of home dialysis supplies to patients. As a result, we instruct our patients to keep a stock of supplies to last for at least 4 weeks. In addition, we advise our patients to reuse surgical masks or use homemade cloth masks during connections and disconnections. Prescriptions to dispense 90-day supply of all routine oral medications should be provided if allowed by patients' insurance plans.

Impact on Dialysis Prescriptions and Clinical Protocols. Continuous ambulatory peritoneal dialysis may be a preferable option for new patients on peritoneal dialysis because the training for automated peritoneal dialysis is more time-consuming and perhaps more complex. There is a steep learning curve associated with cyclical-related technology such as automated peritoneal dialysis, specifically when compared with continuous ambulatory peritoneal dialysis. Automated peritoneal dialysis is also more frequently associated with drain alarms and lost dwells, especially during the first few weeks of initiating peritoneal dialysis. This can necessitate further intervention and/or machine replacement, thereby staining patient, staff, and supply chain. Dialysis prescription changes for peritoneal dialysis and patients on home hemodialysis should be made as needed based on patients' clinical status and laboratory data. Nonessential testing, such as the peritoneal equilibration test, can be safely deferred in the short term as long as patients feel well and remain clinically stable. Deferral of nonessential testing is recommended by the International Society for Peritoneal Dialysis and the UK Renal Association. Furthermore, for suspected or diagnosed patients with COVID-19, the UK Renal Association guidelines recommend disposing of peritoneal dialysis effluent per standard protocols, but with additional precautions to avoid splash contamination. In addition, they recommend that plastic waste be double-bagged and stored in a safe place for 3 days before disposal in the trash.⁶

Urgent start peritoneal dialysis can be valuable in the current situation, as patients with chronic kidney disease requiring dialysis can be quickly initiated on peritoneal dialysis without the need for central venous catheter placement and in-center hemodialysis treatments, thus minimizing their exposure to infection. In this regard, transitional care units can play an important role during such transitions and serve well to educate and prepare patients for the ongoing challenges. Transitional care units can also help prevent patients on home dialysis with dialysis access issues or other complications from having to go to an in-center hemodialysis unit while those issues are being resolved. In our experience, the transitional care unit (housed in our home dialysis unit) has helped us successfully transition patients to a home modality while also allowing us to manage clinical problems of our prevalent

home dialysis population in a relatively safer environment.

Impact on Patient Training. Training new patients requires significant duration of face-to-face contact between nursing staff and patients. In our home unit, we have implemented a policy that all new patients initiating dialysis must have a documented negative COVID-19 test before starting training. As mentioned previously, continuous ambulatory peritoneal dialysis should be offered as the default option unless contraindicated, and automated peritoneal dialysis training should be deferred to minimize patient-provider contact time during the COVID-19 pandemic. In addition, telehealth video platforms can be used to supplement and shorten the time spent on face-to-face training for both patients on peritoneal dialysis and home hemodialysis. Patients' family members are encouraged to join the training via a video platform as much as possible.

For other routine matters related to ongoing training, telehealth can be used effectively to reinforce practices or perform skill checks, thus avoiding home visits by dialysis staff.

Impact on Dialysis Staff. The current situation has placed significant amount of strain on health-care providers in many ways. Staff shortages should be expected. These shortages can result from staff becoming infected with COVID-19 or from inability to work due to care needs at home resulting from 'lockdowns' and 'shelter-at-home' orders. Facilities should develop contingency plans anticipating staff shortages and coordinate potential sharing of staff among neighboring units. In addition, the use of a shift system could be advantageous in this setting. Staff would take turns working from home, thereby helping to ease the care burden at home for staff and limit exposure to infection. We are currently using this shift system in our home dialysis unit without any noted negative effect on patient care, but improved staff morale and satisfaction.

Effect on Future Care. The current pandemic has profoundly affected the way health care is currently delivered and is bound to have significant implications for future patient care. Telehealth has been quickly embraced by patients and health-care providers during this pandemic. Based on anecdotal experience and limited available data, telehealth appears to be a powerful tool, allowing providers to deliver excellent patient care remotely with high levels of patient and provider satisfaction. Telehealth can also be a valuable tool in the care of patients with ESRD who have multiple comorbidities and may potentially benefit from close monitoring. However, it is unclear at this time to what extent the CMS will continue to allow the use of telehealth in the future or if it will roll back currently granted waivers once the COVID-19 pandemic is over. Nevertheless, there is no doubt that telehealth is here to stay by nature of its many strengths.

The current situation is also leading us to re-evaluate and streamline our systems and processes, to identify

deficiencies and to improve our resource management. We can only hope that the experiences gained from this pandemic will make our health-care system better prepared and more resilient for any future calamities with the potential to affect patient care.

As we try to 'reopen' and return to 'business as usual,' it is important to carefully consider the risks, and take all possible infection control precautions as previously outlined, when bringing patients back to the clinics. Local rates of community prevalence of COVID-19 should also guide this effort. In our own practice, we have started offering our patients a choice of doing their monthly visits either in-person or via telehealth (with labs being carried out locally), as long as they remain clinically stable. In view of the uncertainty of the course of the pandemic, we will have to improvise and make changes to our reopening plans as appropriate.

CONCLUSION

Patients with ESKD are a vulnerable group considered high risk for severe illness with COVID-19 infection. Patients on home dialysis may have an advantage over in-center hemodialysis patients because of a lower risk of exposure to infection because of the in-home nature of their dialysis treatments. However, these patients can encounter unique challenges including, but not limited to dialysis supply chain constraints, dialysis safety, perceived lack of help with problem solving, social isolation, and vascular access issues. Many such issues can be effectively managed by telehealth. Telehealth technology also allows closer monitoring of patients with higher comorbid load leading to prevention of adverse clinical events by preemptive problem-solving. Going forward, virtual platforms will be required to adhere to stringent privacy regulations. However, in the current relatively relaxed regulatory environment, this pandemic offers us a unique model for testing the provision of home dialysis via remote technology. Our learning experience from this pandemic will continue to help us identify hitherto unknown barriers for telehealth in this population, underscoring the aphorism that every cloud has a silver lining.

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