Perspective

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Telenephrology with Remote Peritoneal Dialysis Monitoring during Coronavirus Disease 19

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Across the globe, healthcare providers today have abandoned standard procedures in order to address the immediate needs of the coronavirus disease 19 (COVID-19) pandemic, which is spreading at an alarming rate. In spite of many challenges [1], the response of the nephrology specialty to COVID-19 has been proactive, prompt, and widespread. COVID-19 is highly contagious with the potential to affect a large number of individuals especially those with comorbid conditions. Prior experience has demonstrated that the 2003 severe acute respiratory syndrome-COV epidemic and the 2012 MERS-COV outbreak had high mortality rates – approximating 75–92% – in patients developing AKI [2, 3]. In COVID-19 cases, preexisting chronic kidney disease or dialysis dependence is a risk factor for poor prognosis. In a cohort of 21 patients admitted to the intensive care unit, 47.6% had a preadmission comorbidity of chronic kidney disease and 9.5% had preexisting dialysis dependence [4]. Thus, it is critical to protect this vulnerable population and a majority of these people need to congregate 3 times a week for going through life-saving procedures.

Across the world, in-center hemodialysis (HD) units have scrambled to reduce potential risks in the spreading of the infection to patients by creating new and working extra shifts, reducing the number of HD patients dialyzing at the same time, allowing at least 6 feet of space between HD chairs/stations, and even decreasing the duration of patients' sessions. Despite these efforts, some patients in New York City are so fearful of contracting COVID-19 and not showing up for in-center HD, because of which there is an increase in the number of emergency room visits and hospital admissions for fluid overload and electrolyte disturbances. The same scenario is seen in other HD centers across the United States.

While home dialysis is the ideal option for social distancing during a pandemic, resource constraints lead to the formation of barriers in converting in-center HD patients to home HD or peritoneal dialysis (PD). For patients currently on PD, telemedicine and advances in remote PD monitoring have been paramount in managing PD patients remotely.

Broadening Access to Telehealth

In March 2020, the Centers for Medicare and Medicaid Services broadened their access to Medicare telehealth services following President Trump's emergency Declaration. This new waiver (1,135) allows Medicare to pay for office, hospital, and other visits furnished via telehealth. This is encouraging in the context of reimbursements, and therefore, the use of telehealth has increased exponentially, and many centers are working through logistical challenges.

In California's COVID-19 epicenter, some Silicon Valley hospitals place emphasis on data privacy, main-

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taining strict policies with strong preference for providers and patients to use hospital-approved technology. On the other hand, Mount Sinai Hospital in New York City has taken a more patient-centric approach where nephrologists are using all available technologies that the patient may be comfortable using including FaceTime, Zoom, or WhatsApp. Since March 15, 2020, the Mount Sinai staff rescheduled all routine monthly PD visits to virtual visits using whichever technology each patient preferred. With limited staff in the clinic, the PD nurse inspects the exit site remotely, the nephrologist virtually "sees" the patient, and PD logs are reviewed.

Remote Monitoring of Treatments

Performing monthly telehealth visits would not be possible for this patient population without the ability to remotely monitor their treatments to assess the quality of the home therapy delivered and troubleshoot any issues that may arise. Sharesouce, a cloud-based connectivity platform that shares information from the patients' dialysis cycler and enables nephrologists and clinical staff to remotely monitor each cycle's information (fill volume and time, dwell time, drain volume and time, and ultrafiltration volume) provides a solution to this problem.

The PD unit at Mount Sinai has approximately 80 patients and over 80% of patients utilize Sharesource. It has been an invaluable resource to get patient's information directly from home and has been a pivotal cog in facilitating the implementation of telehealth. To date, over 90% of Mount Sinai's home dialysis patients have had their monthly visits conducted through telehealth without having to come to the unit for any of their needs.

The same holds true in Chicago, Illinois, a growing epicenter, where the Medical District Home Dialysis staff are calling PD patients 2–3 times per week. Sharesource has become key for handling this crisis, allowing them to track treatment and compliance. Patients skipping treatments or who are not the most compliant are identified and educated about the importance of their treatments. The risk of this behavior, which could bring them up to the emergency room, where there is a high risk of COVID-19 exposure, is also discussed.

In less urban areas not currently affected as much by COVID-19, such as at Baylor Scott and White Healthcare in Temple, Texas, nephrologists are bracing for an onslaught and have preemptively started using telemedicine for the monthly visits with their home dialysis patients while utilizing the benefits of Sharesource to remotely monitor, adjust, and troubleshoot their patients' dialysis treatments. One hundred percent of their patients' data is on the Sharesource platform, and to date, over 80% of their patients have had telehealth encounters. Patients have been more than willing to adopt this technology and are appreciative of avoiding unnecessary exposure, further assisting their providers' efforts to flatten the curve.

In other parts of the world, Italy and Spain, are weeks ahead of the United States in the pandemic wave. In Vicenza Italy, one of the largest PD centers in Europe, remote patient management has been utilized now in 100% of the 132 patients. All patients receive virtual visits and communicate from home with the center. Fill volume and time, dwell time, and general PD prescription are modified based on the collected data such as drain volume and time, and overall ultrafiltration volume per session. By implementing a complete telemonitoring of patients also using tablets and other communication devices, in the middle of the epidemic peak, only 1 patient resulted positive to COVID-19 due to a contact with his previously infected daughter. A special protocol for remote management of peritonitis was also implemented with home delivery of antibiotics. One patient had to have the catheter removed for omentum trapping and no other complications were observed in the time span of the epidemic.

While the world is adapting to telehealth and managing patients remotely, Renal Therapy Services (RTS), an independent entity owned by Baxter International, Inc., oversees 77 renal care centers with 4,500 PD patients worldwide. Back in 2016, RTS Colombia implemented a Remote Patient Monitoring program for automated PD patients using Sharesource, starting with a standardized training with structured follow-up using Key Performance Indicators. Education and a well-structured plan were crucial for successful implementation. It has been demonstrated that the use of standardized remote patient monitoring program for the management of automated PD patients was associated with lower hospitalization rates and decreased hospital length of stay [5]. Having a well-established home dialysis program where 40% of the RTS dialysis population utilizing PD as their dialysis modality has allowed RTS Colombia dialysis facilities to adapt quickly during the pandemic.

While most patients are unable to switch to home dialysis currently, experts expect the COVID-19 pandemic to act as a catalyst for a surge in this modality for the future. The utilization of telehealth rebukes the perception that care is substandard to in-center dialysis and also al-

lays the fear of receiving care without medical oversight. Telenephrology fosters the patient-clinician relationship and allows for substantial medical oversight as clinicians can observe (via video) a patient's dialysis environment in their home, providing feedback and recommendations. When the curve starts to flatten, social distancing will still need to be maintained. The continued ability to provide clinical staff with detailed, real-time information about PD patients' treatments and prescriptions protects this vulnerable patient population and healthcare providers from unnecessary potential exposure to COVID-19.

Disclosure Statement

H.T. is an employee of Baxter International and owns stock in the company. In the last 3 years, C.R. has been consulting or part of advisory boards for ASAHI, Astute, Baxter, Biomerieux, B. Braun, Cytosorbents, ESTOR, FMC, GE, Jafron, Medtronic, and Toray. O.E.S., S.S., J.U., and M.N. have no conflicts of interest or disclosures.

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