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Authors

Agarwal, Anil

Sequeira, Adrian

Oza-Gajera, Bharvi

et al.

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Anil K Agarwal¹ , Adrian Sequeira², Bharvi P Oza-Gajera³ ,
Karthik Ramani⁴, Jeffrey Packer⁵, Terry Litchfield⁶,
Mary Lea Nations⁷ and Edgar V Lerma⁸ 

Abstract

Background: The COVID 19 pandemic adversely impacted delivery of preventive, routine, urgent, and essential care worldwide. Dialysis access care was particularly affected due to the lack of specific guidelines regarding procedures for its creation and maintenance. Early guidance by Centers for Medicare and Medicaid was inadvertently interpreted as guidance to stop dialysis access procedures. Prompt action by professional societies was needed to furnish detailed guidance to establish essential nature of these procedures.

Methods: The American Society of Diagnostic and Interventional Nephrology (ASDIN) issued a joint statement with Vascular Access Society of the Americas (VASA) – “Maintaining Lifelines for ESKD Patients” to clearly establish the role of vascular access as a lifeline for ESKD (End Stage Kidney Disease) patients and the importance and urgency of its timely management. ASDIN also conducted a survey in mid-2020, that was administered to the ASDIN database as well as shared with the general public via the organization’s social media platforms. The respondents reported their experiences in the care of dialysis access, practice patterns and the utility of the ASDIN-VASA statement during the COVID 19 pandemic.

Results: Of the 2030 individual surveys sent, 581 were opened and 53 (9.1%) responses were received from different parts of the country and from different practice settings. ASDIN COVID 19 triage document was frequently utilized and 83% of respondents found the document valuable. The survey also revealed multiple obstacles, including logistical and financial issues that led to significant disruption of services.

Conclusions: The care of dialysis access was significantly affected in the United States during the COVID 19 pandemic due to multiple reasons. ASDIN actions provided valuable specific guidance regarding and explored barriers to dialysis access care. We describe those results and discuss strategies to prevent COVID 19 transmission with innovative strategies of providing access care. Individualized decision making is of essence when considering dialysis access procedures.

Keywords

Dialysis access, COVID 19, pandemic, maintaining lifelines, ASDIN, procedure guidance, telemedicine

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¹University of California San Francisco, Fresno, California, USA

²Louisiana State University, Shreveport, LA, USA

³University of Cincinnati, Cincinnati, OH, USA

⁴University of Michigan, Ann Arbor, MI, USA

⁵University of Arizona College of Medicine, Phoenix, AZ, USA

⁶Access Solutions, Blanchardville, WI, USA

⁷American Society of Diagnostic and Interventional Nephrology, Clinton, MS, USA

⁸University of Illinois at Chicago/Advocate Christ Medical Center, Oak Lawn, IL, USA

Corresponding author:

Anil K Agarwal, University of California San Francisco at Fresno, Academy Professor of Medicine, Ohio State University, Chief of Medicine, VA Central California Health Care System (111), 2615 East Clinton Avenue, Fresno, CA 93703, USA.
Email: anil.agarwal@osumc.edu

The SARS CoV 2 (COVID 19) pandemic emerged and spread during the late 2019 and early 2020, culminating in an unprecedented public health emergency of the modern times. COVID 19 has transformed the social, interpersonal, and economic aspects of life and has exposed weaknesses, limitations, and unpreparedness of the healthcare systems worldwide. The workforce has suffered from scarcity of resources in handling the pandemic with inadequate availability of testing, personal protective equipment, hospital and intensive care unit beds, ventilators, dialysis supplies, and other equipment and resources. A sudden, frantic rush to limit “unnecessary” hospital visits for “non-essential” procedures to isolate, prevent dissemination of virus, and save resources, has led to an unintended delay in the delivery of routine medical care. Additionally, prevalent confusion as to what was essential vs non-essential and fear of COVID 19 among the patients and providers has caused delays in performance of many “essential” procedures including interventional procedures related to the dialysis access.

The dialysis access care during the pandemic is in evolution as the experiences are slow to be reported. The American Society of Diagnostic and Interventional Nephrology (ASDIN) has been proactively involved in providing guidance to and collecting experiences of its members. We hereby describe those experiences and suggest management strategies for safe procedural care of dialysis access.

The patient experience: Missed procedures due to the fear of COVID 19

As COVID 19 spread across the U.S., dialysis patients represented one of the most vulnerable patient populations. The first two U.S. deaths involved dialysis patients from Seattle. Dialysis patients were very worried and fearful about coming into the dialysis center, considering that the typical center accommodates them next to each other for several hours, three times a week for their treatment sessions. The American Association of Kidney Patients survey indicated a high level of anxiety and concern about COVID 19, but few felt that their dialysis center or nephrologist had given them the information to stay safe. More than 5000 patients and their families viewed or replayed the webinar on keeping yourself healthy on dialysis during COVID 19 (<https://www.youtube.com/watch?v=xwU5FZ9HpK4&feature=youtu.be>).

Few issues are more emergent than vascular access problems- with no access there is no dialysis. With the CMS announcement banning “elective” surgery in mid-March, most hospitals cancelled dialysis access procedures including urgent thrombectomies and catheter exchanges. Kidney Patient organizations received numerous calls from patients who had access care cancelled by

their usual providers. Despite educational offerings related to dialysis access care, many patients chose to cancel or simply did not keep previously scheduled appointments. For instance, a patient from the northeast with a failing graft and history of several previous thrombectomies missed the appointment in April 2020 as the surgeon’s office was closed due to COVID 19. The hospital was not allowing the surgeon to place new accesses due to COVID 19, personal protective equipment (PPE) shortages, and a lack of ICU beds. Several patients from his dialysis unit who had COVID 19 had been sent to the dialysis isolation unit across town and he was very worried about contracting the infection. Indeed, his access soon clotted, but he refused to go to the hospital and missed dialysis treatment with no plans for access repair. Only through the persistent efforts of his nephrologist and an outpatient access center was he able to be treated and receive dialysis without needing a hospital stay.

It is estimated that almost 40% of necessary access care has been either delayed or cancelled during the COVID 19 infection in the U.S.¹ Reports from CMS indicate that dialysis patients have the highest rate of hospitalization of all COVID-19 infections, furthering the newer pandemic of “Patient Fear.”

Early procedural guidance

On March 18, 2020, Centers for Medicare and Medicaid (CMS) issued a recommendation in the United States to triage adult elective surgeries to aggressively address COVID 19, while conserving critical healthcare resources (PPE, hospital beds, ventilators) and limiting exposure of patients and staff to the virus that causes COVID 19.^{2,3} This document provided recommendations to defer services that were non-emergent, elective, and preventive for patients of all ages. The risks and benefits of each treatment or surgery required consideration of local resources as well as the urgency of the procedure. The tiered framework defined low, intermediate, and high acuity treatments and locations where the services should be performed.³ It was recommended that “elective angioplasty” as well as “highly symptomatic patients” and patients requiring “limb threatening vascular surgery” should not be postponed and performed in the hospital setting.

This non-specific and non-granular guidance by CMS was interpreted by many hospitals and institutions to stop nearly all but the most emergent procedural care, including procedures such as access surgeries and organ transplantations. Further, each state developed its own directives and mandates ranging from recommendations to scale back elective procedures or to mandates that these cases should be postponed or cancelled.⁴

Nephrology professionals are well aware that for end stage kidney disease (ESKD) patients dialysis access is their lifeline and that access dysfunction is nearly always an

urgent issue. Delaying care can convert a relatively low resource consuming outpatient procedure into a high resource requiring inpatient procedures. It can sometimes even create a life-threatening emergency. As in our patient mentioned above, outpatient arteriovenous (AV) access angioplasty to treat a critical stenosis, if not promptly performed, can progress to complete thrombosis. This requires an inpatient thrombectomy and other procedures, with a risk of access loss, catheter placement and life-threatening complications resulting from such delay. Without restrictions on life-sustaining dialysis access care, most procedures in the United States could be safely performed in vascular access centers on an outpatient basis as was done prior to the COVID 19 pandemic. Postponing dialysis initiation because of delayed AV access surgery or peritoneal dialysis (PD) catheter placement may not always be safe. Further, untreated access failures may result in unnecessary hospitalizations for immunocompromised ESKD patients, exposing them to hospital acquired infections including COVID 19. The kidney community quickly realized that vascular access creation, maintenance surgeries, and related procedures were being categorized as “elective” by healthcare organizations and therefore being denied, creating significant barriers for the ESKD and advanced CKD patient populations.²⁻⁵ In addition to the potential patient harm, the impact of these limitations on vascular access centers was also adverse and some access centers had to close permanently.

ASDIN-VASA response (Maintaining Lifelines)

In response to the risk of neglect of dialysis access procedures, the ASDIN issued a joint statement with Vascular Access Society of the Americas (VASA) – “Maintaining Lifelines for ESKD Patients.”⁶ This document clearly delineated the role of vascular access as a lifeline for ESKD patients, the importance and urgency of timely management of issues, as well as the efficacy and safety of performance of these procedures in the outpatient setting. The statement urged local governments and healthcare systems to categorize all dialysis access procedures in the high acuity tiers with the ability of performing them in an outpatient setting, including hospital outpatient departments, ambulatory surgical centers, and office-based surgery. The statement also included three appendices offering a triage process for endovascular procedures providing a thorough, detailed list of possible clinical scenarios requiring specific procedures; a performance plan for open surgical cases and a list of commonly performed procedures with associated CPT codes (Appendices: see published online). This updated guidance was necessary to continue vascular access care throughout the pandemic and provided the structure and support needed to justify to healthcare organizations that this ongoing care is essential for this vulnerable patient population.

Shortly thereafter on March 26th, a critical clarification was released from CMS that identified placement or repair of arteriovenous fistulas, arteriovenous grafts, peritoneal dialysis catheters, and intravenous catheters as essential.⁷ The AAKP also produced a webinar on keeping your vascular access healthy during COVID that was helpful to the patients (<https://www.youtube.com/watch?v=VO8o1YMatC4&feature=youtu.be>) to provide more insight to dialysis patients.

ASDIN survey: COVID 19 challenges to interventional community in performing dialysis access procedures

ASDIN conducted a survey between May 1 and 15, 2020, that was administered to the ASDIN database that included current members, former members and individuals who had attended ASDIN meetings. The survey was also shared with the general public via the organization’s social media platforms, that is, Facebook and Twitter. In the dataset, respondents were asked about their experiences in the care of dialysis access and the utility of the “ASDIN COVID 19 triage document: Maintaining Lifelines for patients with ESKD” and various practice patterns during the COVID 19 pandemic.

Of the 2030 individual surveys sent, 581 were opened and 53 (9.1%) responses were received from different parts of the country and from different practice settings (Figures 1 and 2). Overall, 71% of nephrologists (respondents) had utilized the ASDIN COVID 19 triage document. Eighty-three percent (83%) of respondents providing specific comments indicated that they found value in the document such that they shared it with their colleagues and respective networks. One respondent indicated that it was incorporated into the guidelines for NY state Office Based Surgery practices.

With regard to specific access-related procedures among non-COVID 19 patients, the respondent indicated tunneled hemodialysis catheter placements, PD catheter placements, and endovascular AVF creations were able to be performed. Vein mapping, access surveillance, and elective HD catheter removals were limited. In centers that offered renal biopsies (transplant and native), those were also limited particularly when considered non-emergent.

For patients (COVID 19 and non-COVID 19) presenting with thrombosed AV accesses, 90% of the respondents indicated performing thrombectomies while only 6% were doing tunneled HD catheter placements. Some respondents reported not allowing COVID-19 patients to come to their centers.

Sixty-two (62%) percent of respondents indicated that they were not performing access-related procedures on COVID 19 patients. Whether this was due to policy or personal preferences could not be determined with the survey limitations. In the 36% of practices that did attend to

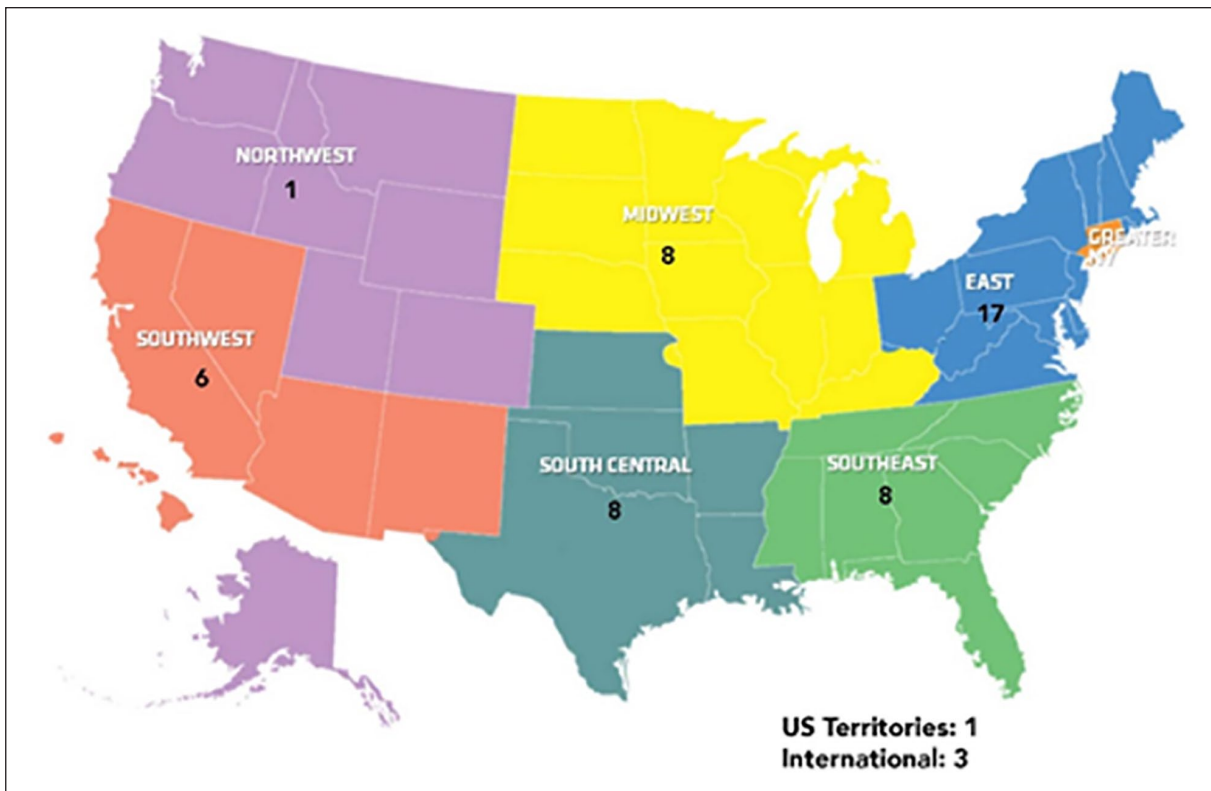


Figure 1. Distribution of ASDIN survey respondents and their regional practice locations.

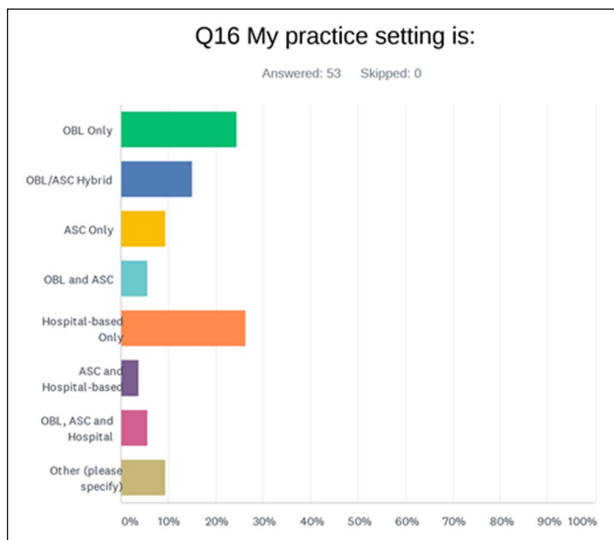


Figure 2. Practice settings of ASDIN survey respondents.

COVID 19 patients, there was a large variation in practices, as the proportion of COVID 19 patients who underwent access-related procedures ranged between 1% and 40%.

Another noticeable practice variation involved testing for COVID 19 prior to performing procedures. Seventy-six (76%) percent indicated not testing and 14% indicated doing pre-procedural COVID 19 testing (Table 1). The timing of survey may play a role in these variations.

Initially COVID testing was not readily available; later with COVID testing being more widely available, some policies have indicated requirement for at least 1 or 2 COVID negative tests.

During dialysis access procedures, typical Centers for Disease Prevention and Control (CDC) recommended practices were universally adhered to, for example, checking temperatures, obtaining pertinent historical information (fever, cough, exposure to COVID 19, etc.), as well as use of PPEs (masks, etc.). Regarding supply chain/ PPE issues, there was a concern about shortage of procedural medications (fentanyl, midazolam), PPE (N95 masks, face shields, gowns, gloves, bouffant head caps, shoe covers), alcohol hand sanitizers, etc. Practices also varied with some re-using surgical masks and some using N95 masks only when treating COVID 19 patients. Staffing issues were similarly varied, for example, furloughs or 50% operating room staffing. This has been attributed to decreased total practice volumes as well as elective cases being put on hold. Still, some practices reported not having any staffing issues. Some staff members were noted to be concerned about working in the high-risk environment, for example, potential exposure, etc.

Several respondents expressed concern about financial/reimbursement issues and the economic implications of the pandemic. In general, there were a lower number of procedures leading to lower revenues (particularly during March–April 2020). One practice reported as much as

Table 1. Comments regarding use of screening for COVID 19 prior to procedures.

Comments
For symptomatic and patients with high risk for exposure per facility guidelines.
We are screening but not treating positives – they are triaged to the hospital.
We have no means to test patients.
We assume that every patient is potentially positive. We obtain information over the phone, including a history of fevers. We also obtain COVID testing information collected at the dialysis units. We try to plan procedures on COVID positive patients, or patients suspicious for COVID, at the end of the day.
We do a phone screen prior to scheduling and another screen when patient arrives at the facility lobby.
We do not currently have this capability as a private office-based lab.
Not testing asymptomatic patients who have a negative pre-procedure screening.
Retired.
We try to screen them out before entering facility.
We enquire dialysis center for recent test results, if any, and check temperature/symptoms.
Most are asymptomatic, with COVID 19 risk score zero.
Not testing but screening with questions.
We are testing those patients who may require assistance with maintaining their airway. Otherwise, we are using surgical masks for all patients and staff.

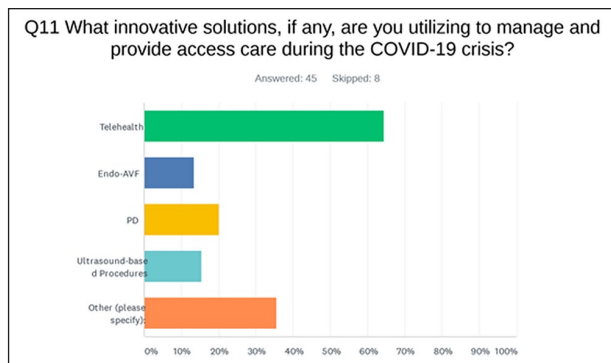


Figure 3. Spontaneous innovations in care of dialysis access during the pandemic.

90% shortfall during the month of April compared to a normal monthly case load. This was a common theme, with particular mention of office-based practices (Ambulatory Surgery Centers) being particularly affected. This sentiment however, seemed to be less of a concern with hospital-based and academic practices.

Regarding the patient care, there were challenges with patient transportation, adherence with appointments as well as miscommunications. The check-in process (triaging) and family communications impacted efficient use of time. Whereas social distancing and use of masks were encouraged, one respondent indicated that “some patients do not want to wear masks.”

Innovations for dialysis access care in public health emergency

Kidney professionals, among other providers, have innovated to meet the challenge of COVID 19. Nephrologists used urgent peritoneal dialysis (PD) for management of

acute kidney failure. Placement of fluoroscopic or peritoneoscopic PD catheters was done in outpatient access centers. Additionally, AV access creation, sometimes using newer technologies, was performed in outpatient centers to avoid exposure to inpatient operating rooms. Remote care was also explored in the survey. Over 60% (29/45) of respondents had utilized telehealth services to manage and provide access care. This appeared to be the only innovative solution utilized to manage and provide access care during this time. One respondent indicated that although they had the ability to provide endovascular AVF creation, they did not feel that it was a major contributor to COVID 19 access strategy (Figure 3).

Whereas some of the respondents expressed appreciation for the “ASDIN COVID 19 Triage Document: Maintaining Lifelines for patients with ESKD,” there was a clamor for guidelines regarding viral testing, appropriate use of PPE) and position papers regarding treatment of patients with dialysis access-related issues during pandemics. Respondents felt that among federal or state regulatory issues, the following needed to be addressed: COVID 19 testing (volume and timing), telehealth regulations, reimbursement deregulation and financial assistance if needed.

COVID 19 coagulopathy and dialysis access

In COVID 19 infection, kidney involvement often presents as AKI, hematuria, or proteinuria, with need of renal replacement therapy in severe cases. A major clinical finding in COVID 19 is thrombosis, with increased incidence of venous thromboembolism (VTE).⁸⁻¹¹ Dialysis catheters are associated with recurrent clotting despite prophylactic-intensity anticoagulation and often need full-dose anticoagulation during continuous renal replacement therapy in

COVID 19 patients.¹¹ Regarding prevalent dialysis patients, there are no reports of increased clotting of dialysis access fistula/grafts attributed to COVID 19 as the primary etiology. No specific pharmacologic interventions have been suggested for dialysis access in COVID 19 infection.

Reducing risk of COVID 19 transmission for patients with access issues

Due to rather intimate settings of dialysis units and often crowded nature of access centers use of masks, frequent handwashing and decontamination of surfaces are extremely important measures for prevention of transmission. Close to 50% of patients may be asymptomatic but are capable of spreading it.^{12–16}

The following control mechanisms can be utilized to limit or prevent transmission in the interventional suite/office:

Registration area

The registration area should have visual alerts (signs, posters etc.) on respiratory hygiene, cough etiquette and social distancing. In addition, this area should also have face masks, hand sanitizers, and paper tissues available. A no touch trash bin with a lid should also be available to discard paper tissues. The CDC recommends the use of Environmental Protection Agency (EPA) approved disinfectants against SARS-CoV-2.¹⁷ Areas or objects that are touched often will need frequent cleaning during each day.

Waiting rooms should be properly ventilated to bring in fresh air. Thus, HVAC (Heating, Ventilation, and Cooling) units with capability to bring in outdoor air are desirable.¹⁷ This dilutes aerosols and prevents recirculation. Data on HEPA filters is scarce as they can remove particles 0.3 microns in size while the SARS-CoV-2 virus is 0.1 microns.

Physical distancing

Physical distancing should be practiced in the waiting room as well as in holding areas of the intervention suite. The number of people in the waiting room can be reduced by having patients wait in their vehicles, reducing the number of attendants with the patient and by scheduling patients at different times of the day. A recent meta-analysis showed that maintaining a distance of at least 1–2 m reduced the transmission of the virus.¹⁸ It may be necessary to extend the hours of operation to prevent overcrowding in both the waiting and holding areas. Holding areas should have curtains separating patient beds.

Universal masking

Wearing a mask by patients and attendants should be mandatory as mask use is protective.¹⁸ All health care workers

(HCWs) should always wear a surgical mask. If an N95 mask is desired, it should be properly fitted as poorly fitted masks reduce efficiency by at least 50%.¹⁹ One should avoid touching the front of the mask as well as their eyes, nose, and mouth.

Handwashing

Avoidance of handshaking and frequent hand washing (for 20 s) are prudent. Hand sanitizers should have at least 60% ethanol (viricidal) if used. HCWs can adhere to World Health Organization's "My 5 Moments for Hand Hygiene": before touching a patient, before procedures, after body fluid exposure or risk, after touching a patient, and after touching patient surroundings.²⁰

Triage

Vascular access procedures are considered low risk aerosol generating procedures by The Joint Commission. A triage system should consider clinical urgency and the facility resources (beds, staff supplies etc.).

One must also ascertain if a patient is symptomatic or has a high-risk exposure by having the registration office call the patients or schedule a telemedicine visit. In addition, patients should be advised to call ahead if symptoms arise. At arrival, temperature should be taken, and patients should be asked about development of symptoms.

Intra-procedure

Since the virus is viable for a few days on different surfaces, it is logical to inform patients about potential fomite spread of the virus. Symptomatic patients should preferably have a separate room for procedures and should have procedure done at the end of the day with a minimum number of personnel in the suite. The nurse should obtain all the necessary drugs and the technicians should have required equipment in the room before the procedure if it is to be done on a suspected or COVID 19 positive patient. Facility based disinfection protocols are to be followed after the procedure.

Personal protective equipment (PPE)

All HCWs should have access to PPE. These include face masks/ respirator, face shields (eye protection), gowns, and gloves. Since interventional procedures require physicians to be within 3 feet of the patient, patients should also wear a surgical mask.

Telehealth and access care

Access failure leads to increased patient morbidity, mortality, and cost.^{21–25} While direct physical examination by providers has always been important, the risk of transmission

Table 2. Potential uses of telehealth in remote assessment of dialysis access.

Online clearance measurement and adequacy changes
Dilution flow measurement
Ultrasonic Flow/Doppler/PSV
Arterial and venous pressure changes
Static venous pressures
Remote auscultation/telestethoscopy
Recirculation measurements
Cannulation issues
History and symptoms – inability to run
Video/photographic examination of access

of infection creates barriers to necessary evaluation and interventions. The application of telehealth is uniquely beneficial in this circumstance.^{26–32}

Even though telehealth has been utilized as a clinical tool in the past, it has only been allowed by CMS as a management modality in the kidney disease and dialysis population since March 2020.^{33–37} Telehealth can allow access evaluation for AVG, AVF, hemodialysis catheter and PD access monitoring by a physician utilizing a health care worker in the dialysis unit (Table 2). Findings of aneurysms, infections, depigmentation, skin thinning, ulcerations, edema, and catheter exit site issues can all be detected remotely in a HIPPA compliant setting.³⁸ Weekly monitoring of the dialysis access, as recommended by KDOQI (Kidney Disease Outcomes Quality Initiative), can continue with a team approach despite the pandemic. Creation and maintenance of the appropriate dialysis access for each patient can still be pursued.²⁸

Peritoneal dialysis (PD) as a treatment modality that has benefited from telehealth.^{39,40} Monitoring the peritoneal catheter exit site is easily adaptable to remote evaluation using serial photography.^{41–43} Even prior to the COVID 19 pandemic, remote telehealth in the PD population was well accepted.^{44–46}

The information collected by telehealth should be assessed by a provider either at the dialysis facility, with appropriate infection control and privacy provisions, or at a dedicated facility caring for and treating the dialysis access. A typical scenario can involve a webcam/laptop on a cart at the chairside in the dialysis center. With the concurrent virtual presence of an Access Coordinator and of the Interventional Nephrologist (or dedicated dialysis access physician), the patient can be interviewed, and the access can be visualized. The dialysis unit staff member at the chairside in appropriate PPE can provide adjunctive information including flows, pressure readings and any specifics regarding cannulation issues or patient care problems. Preliminary data suggests telehealth techniques are proving effective in hemodialysis units and that patient satisfaction with these techniques is significant.⁴⁷

Role of professional societies

The public health emergency resulting from the COVID-19 pandemic has posed a direct threat to health care systems due to the dynamic nature of the pandemic and the patchwork method of delivery of health care. The Council of Medical Specialty Societies (CMSS) notes that with 45 member organizations representing 800,000 (65%–70% of all) physicians, the medical societies can have a far-reaching impact on the response to the pandemic to permit fair and equitable delivery of care to reduce morbidity and mortality.^{48–50}

ASDIN addressed the importance of dialysis access procedures as an essential lifeline for our CKD/ESRD population by releasing its joint statement with VASA on maintaining lifelines. With its continued advocacy efforts CMS recognized and made the critical clarification as to the life-saving nature of dialysis access procedures and deemed it essential.⁶ The American College of Physicians (ACP) and American Medical Association (AMA) urged federal, state and local authorities to ensure that there was an adequate supply and distribution of PPE for all clinicians and health care workers.^{51,52} The American Society of Nephrology (ASN), ASDIN, and many other medical societies developed Coronavirus task forces, created tool kits, and curated resources to address clinical challenges and controversies in delivery of care.⁵³ Medical societies have been at the forefront of educating health care professionals and patients in the utilization of socially distanced/remote health care, such as telehealth, in optimizing health care delivery. Further, these societies have also advocated for novel financial models to pay for services provided remotely.^{52–54} Medical societies have also played an important role in health care system delivery both horizontally (virtual, outpatient, inpatient) and vertically (hospital, health care coalition, state/region, federal) while sharing information, leveraging resources, and providing guidance to ensure the greatest equity and consistency of care. This has resulted in better preparedness as the pandemic continues to surge on.⁵⁵

Future after COVID-19: Lessons learnt

COVID 19 is likely to continue to adversely impact health care of billions around the world, until effective public health strategies are devised and implemented. Development of effective vaccines now may be able to contain the epidemic, though the timeline is not clear at this time. The preparedness of healthcare systems would affect outcomes of not only the COVID 19 pandemic, but also of any other potential public health emergencies in the future.

Healthcare professionals, including nephrology workforce, will need to create fresh, innovative strategies that

define practices, resources, protocols, and approaches of taking care of patients with advanced kidney disease with dialysis access issues. Guidance regarding triaging of vascular procedures will need to be flexible enough to adapt the classification of procedures into routine, urgent or emergent based on local practice patterns, available expertise, and resources. The ideal approach will consider procedural safety of patients and providers, as it can create ethical, socio-economic, and medico-legal dilemmas. A personalized approach, rather than a blanket group policy regarding type of procedure, will ensure proper care of the individual.⁵⁶ Retrospective and prospective translational research will be critical in formulating preparedness against unforeseen public health emergencies.

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ORCID iDs

Anil K Agarwal  <https://orcid.org/0000-0003-3608-2848>

Bharvi P Oza-Gajera  <https://orcid.org/0000-0001-5702-7384>

Edgar V Lerma  <https://orcid.org/0000-0002-0976-5478>

Supplemental material

Supplemental material for this article is available online.

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