

# Global challenges with providing vascular access care during COVID era

Karthik Ramani<sup>1</sup> , Tushar J Vachharajani<sup>2,3</sup>,  
Edgar Lerma<sup>4</sup>  and Anil K Agarwal<sup>5</sup> 

The Journal of Vascular Access  
1–5

© The Author(s) 2022

Article reuse guidelines:

sagepub.com/journals-permissions

DOI: 10.1177/11297298221106853

journals.sagepub.com/home/jva



## Abstract

**Background:** The COVID-19 pandemic has adversely affected health care systems and dialysis access care in the US and across the globe. Beyond the initial challenges posed by the pandemic and despite the actions taken by health care leaders/organizations/professional societies such as the “Maintaining Lifelines for ESKD Patients” joint statement, there continues to be delays in providing timely care and performing elective and emergent dialysis access procedures worldwide. The aim of this study was to assess the global challenges associated with providing dialysis vascular access care across the international vascular access community during the pandemic.

**Methods:** The American Society of Diagnostic and Interventional Nephrology (ASDIN) conducted an online survey in 2021, that was administered to an expert panel of dialysis vascular access specialists and global leaders spanning across the international community. The respondents who are members of ASDIN, Association of Vascular Access and InTerventionAl Renal physicians (AVATAR), Asia Pacific Society of Dialysis Access (APSDA), Peruvian Vascular Access Society (APDAV), and Australia/New Zealand Society of Interventional Nephrology (ANZSIN) reported their experiences in the care of dialysis vascular access, practice patterns, and challenges faced during the COVID pandemic.

**Results:** Of the 53 individual surveys sent, 16 were opened and 11 (69%) responses were received from across the world and from different practice settings. The survey revealed the continued challenges facing the international community, the stark disparities in care delivery, supply chain disruption and logistical, regulatory, and financial issues that the global community continues to face in the ongoing pandemic.

**Conclusions:** The COVID19 pandemic is far from over, and the challenges and barriers to providing dialysis access care seen on the initial ASDIN survey in the US seem to extend across the globe. We describe those results and discuss options, opportunities, and innovative tools to provide dialysis and access care during these trying times.

## Keywords

Dialysis access, ASDIN, COVID-19, procedure guidance, telemedicine, international health, pandemic

Date received: 8 April 2022; accepted: 24 May 2022

## Introduction

The COVID-19 pandemic has created new challenges to health care systems worldwide and underscored what is already dysfunctional and fragmented care in general, but particularly in dialysis access. In the United States, the Centers for Medicare and Medicaid (CMS) issued recommendations to triage adult elective surgeries on March 18, 2020, with the intent to save health care resources and limit exposure risk of COVID to patients and staff.<sup>1,2</sup>

The brevity and non-specific nature of the tiered framework was however misinterpreted by many organizations such that dialysis access procedures along with many others

<sup>1</sup>Division of Nephrology, University of Michigan, Ann Arbor, MI, USA

<sup>2</sup>Department of Kidney Medicine, Glickman Urological & Kidney Institute, Cleveland, OH, USA

<sup>3</sup>Cleveland Clinic Lerner College of Medicine of Case Western Reserve University, Cleveland Clinic, Cleveland, OH, USA

<sup>4</sup>Section of Nephrology, University of Illinois College of Medicine at Chicago/Associates in Nephrology, Chicago, IL, USA

<sup>5</sup>VA Central California Health Care System, Fresno, CA, USA

### Corresponding author:

Karthik Ramani, Division of Nephrology, University of Michigan, 1500 E Medical Center Dr, Ann Arbor, MI 48109, USA.

Email: ramanik@umich.edu

were deemed as elective. The guidelines recommended that risks, benefits, and local resources should be considered along with the urgency of the procedure to defer non-essential procedures although the dialysis vascular access procedures were not addressed specifically.

As nephrologists fully comprehend the importance of dialysis access as the lifeline of end stage kidney disease (ESKD) patients, it is unquestionable that delaying access care could easily render a relatively low resource consuming outpatient procedure into a high resource requiring inpatient procedure. For instance, a delayed/deferred outpatient arteriovenous (AV) access angioplasty could lead to access thrombosis, which could potentially lead to requirement for an inpatient thrombectomy, risk for permanent access loss, and possibly conversion to a dialysis catheter. In addition, an unnecessary hospitalization could expose the patient with ESKD to COVID-19 and other hospital acquired infections.

These concerns of the dialysis access community were addressed by a joint statement of American Society of Diagnostic and Interventional Nephrology (ASDIN) and Vascular Access Society of the Americas (VASA) in a document titled "Maintaining Lifelines for ESKD Patients."<sup>3</sup> In this document the urgency of timely management of access issues and an outpatient approach to these procedures were emphasized and the local governments and healthcare systems were urged to categorize all dialysis access procedures in the high acuity tiers. A triage process for endovascular procedures was included in three appendices that included a 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. This guidance was instrumental in providing direction not only to the dialysis access community but also to other organizations in viewing dialysis access as a top priority, not a "non-essential" procedure. On March 26th, 2020, CMS also identified placement or repair of arteriovenous fistulas, arteriovenous grafts, peritoneal dialysis catheters, and intravenous catheters as essential.<sup>4</sup> The American Society of Nephrology (ASN), ASDIN, and several other medical organizations developed COVID-19 task forces to address the specific clinical challenges in care that are unique to patients on dialysis.

During the pandemic, these organizations have not only advocated to ensure supply of personal protective equipment (PPE) and equipment to health care professionals, but they have innovated care by better utilization of remote health care such as telehealth to maintain health care. There is now extensive guidance on use of PPE, social distancing, handwashing, and vaccination of ESKD population. Telehealth is well suited to utilize online tools such as online clearance measurement and adequacy changes, access flow measurements, arterial and venous pressure changes, and video or photographic examination of access.

Patients with COVID-19 also have a high incidence of AKI requiring prolonged renal replacement therapy (RRT)<sup>5,6</sup> and often necessitate the placement of a tunneled dialysis catheter (TDC) as the use of non-tunneled dialysis catheters (NTDCs) has been associated with increased number of complications that is, infectious, and mechanical compared to TDC. TDC placement under direct fluoroscopy remains the standard of care; but in certain patients, placement of tunneled dialysis catheter at the bedside using anatomic landmarks with ultrasound without fluoroscopy can be safely and successfully performed without compromising the quality of care, conserving resources, and decreasing personnel exposure and avoiding exposure during transfer/transportation of COVID-19 infected patients outside the ICU.<sup>7,8</sup> We conducted a survey to assess the dialysis access focused challenges encountered by the global community and report our findings here.

## Survey

As the COVID-19 pandemic ravaged across the globe we also reached out to the international vascular access community to assess respective global challenges with providing dialysis vascular access care during these trying times.

## Methods

An online survey was conducted between February 1st and March 15th, 2021, that was administered to the expert panel of Interventional Nephrologists and leaders across the international community who are members of American Society of Diagnostic and Interventional Nephrology (ASDIN), Association of Vascular Access and Interventional Renal physicians (AVATAR), Asia Pacific Society of Dialysis Access (APSDA), Peruvian Vascular Access Society (APDAV), and Australian and New Zealand Society of Interventional Nephrology (ANZSIN). The survey questionnaire details are provided in Table 1 below. The respondents were asked to participate in this survey which addresses global challenges in providing dialysis vascular access care during the COVID pandemic and the response to individual questions is provided in the supplement. (See Supplemental Material 1)

## Results

Of the 53 individual surveys sent, 16 were opened and 11 (69%) responses were received. Overall, the respondents included a mix of nephrologists, interventional nephrologists, and surgeons who were representative of the international community spanning across several countries/continents (Peru, Senegal, UAE, Kenya, Brazil, UK, Nicaragua, Nepal, Kuwait, India, Malaysia, Australia, and New Zealand). The responses are summarized in Table 2.

**Table 1.**

1. What is your current practice location?
2. Are you performing dialysis access related procedures in COVID patients?
3. If you answered YES to question two (2), what access related procedures are you performing?
4. If you answered NO to question two (2), where do you send the patient for access related procedures?
5. What is the length of time before a patient is able to get a de novo access creation (i.e. fistula/graft)?
6. What is the length of time before a patient is able to get a non-emergent dialysis access procedure?
7. In what setting are the emergent dialysis access procedures performed (thrombectomy, temporary/tunneled dialysis catheter related procedures, PD catheter placement)?
8. How do you monitor patients in dialysis unit for their access related issues?
9. Are you performing any testing for COVID prior to procedures?
10. Are you experiencing staff shortages due to COVID?
11. Do you use tele-health regularly for addressing access related issues?
12. Are you facing shortages of PPE/medications/access related procedure stock (i.e. angioplasty balloons, stents, catheters, etc.) due to the pandemic?
13. Are there any financial/regulatory issues that you are facing in your current area of practice?
14. Please share any challenges you faced due to the pandemic and potential solutions which were used to circumvent the problem.

**Table 2.** ASDIN Surveys.

	ASDIN USA survey n = 54	Rest of the World-ASDIN survey n = 11
Performing dialysis access procedures in COVID patients	71% indicated that they were performing access-related procedures on COVID-19 patients	91% indicated that they were performing access-related procedures on COVID-19 patients
Location	<ul style="list-style-type: none"> <li>• Hospital based 25%</li> <li>• Office based labs (OBL) 25%</li> <li>• Ambulatory Surgery Center (ASC) 20%</li> <li>• Hybrid 30%</li> </ul>	<ul style="list-style-type: none"> <li>• 82% procedures were performed in inpatient/hospital/emergency room</li> <li>• 18% rest at the outpatient setting.</li> </ul>
Timing for procedures	<ul style="list-style-type: none"> <li>• Variable</li> <li>• No delay to several days</li> </ul>	<ul style="list-style-type: none"> <li>• 81% reported weeks to months delay with de novo access creation</li> <li>• 56% reported weeks to get a non-emergent dialysis access related procedure</li> </ul>
Types of access related procedures	<ul style="list-style-type: none"> <li>• Fistulogram/angioplasty/thrombectomy—90%</li> <li>• PD catheter placement in 40%</li> <li>• Temporary non-tunneled dialysis catheter placement—not reported</li> <li>• Tunneled dialysis catheter placement and exchange—54%</li> </ul>	<ul style="list-style-type: none"> <li>• Fistulogram/angioplasty/thrombectomy—36%</li> <li>• PD catheter placement—35%</li> <li>• Temporary non-tunneled dialysis catheter placement—81%,</li> <li>• Tunneled dialysis catheter placement and exchange—64%</li> </ul>
Novel solutions	<ul style="list-style-type: none"> <li>• Endo AVF and USG based procedures—15%</li> <li>• Telehealth utilization—60%</li> </ul>	<ul style="list-style-type: none"> <li>• Endo AVF and USG based procedures—9%</li> <li>• Telehealth utilization—29%</li> </ul>
Areas of concern	<ul style="list-style-type: none"> <li>• Shortage of PPE</li> <li>• Supply chain issues</li> <li>• Financial and Reimbursement</li> <li>• Staffing issues</li> <li>• Adequacy of testing kits</li> </ul>	<ul style="list-style-type: none"> <li>• Shortage of PPE</li> <li>• Supply chain issues</li> <li>• Financial and Reimbursement</li> <li>• Staffing issues</li> <li>• Slow bureaucratic processes</li> </ul>
Limitations	<ul style="list-style-type: none"> <li>• Selection bias</li> <li>• Timing of survey can affect response—2020 (Oct/Nov)</li> </ul>	<ul style="list-style-type: none"> <li>• Selection bias—primarily society representatives/leadership responded</li> <li>• Small cohort</li> <li>• Timing of survey can affect response—2021 (Feb/Mar)</li> </ul>

Majority of the respondents (91%) indicated that they were performing access-related procedures on patients with COVID-19. Whether or not this decision is based on policy or personal preferences could not be ascertained with the survey limitations.

With regards to specific access-related procedures performed, NTDC placement was the most common procedure

performed at 81%, followed by TDC placement and exchange in 63%, fistulogram/angioplasty/thrombectomy in 36% and peritoneal dialysis (PD) catheter placement in 35%, and endovascular fistula creation in 9% of the respondents.

Most of the procedures were performed in inpatient/hospital/emergency room setting at 82% whereas the remaining 18% were performed in the outpatient setting.

There were significant delays in weeks to months noted prior to de novo access creation amongst 81% of respondents and weeks to get a non-emergent dialysis access related procedure amongst 56% of respondents.

Seventy-three percent of respondents were able to perform COVID testing prior to conducting procedures and 91% reported experiencing staff shortages with 46% facing shortages due to PPE/medications and other access related procedural stocks. This reflected the supply chain issues which have been addressed partly as the pandemic evolved and continued to reflect the marked effect on human capital across the spectrum.

Only 29% reported utilization of telehealth services in their practices which is in stark contrast to the US survey (conducted by ASDIN in 2020) which showed that over 60% respondents utilized some form of telehealth during the pandemic. In addition, on-site physical examination at 73% appeared to be the most utilized modality to monitor for dialysis access related issues and telehealth appeared to be the only innovative solution utilized to manage and provide access care during this time.

Several respondents expressed concern about financial/reimbursement issues. In particular, areas in Nepal, Kuwait, Nicaragua, and Malaysia noted a backlog of cases, slow bureaucratic processes and inadequate interventional nephrology services in addition to the financial burden. UAE had a dedicated free standing COVID free hospital to take urgent access work. The other respondents also noted there was a lot of heterogeneity in the nephrology approach in each hospital and expressed the need for international support to assist with decision making.

## Discussion

The early days of the pandemic taught the dialysis community to find novel and innovative ways to provide dialysis and access care despite the supply chain issues, shortage of resources, and staffing/personnel concerns. We summarize some of the ways the dialysis community addressed these concerns and continues to cope with the ongoing challenges and pulled together.

Several publications highlighted novel ways of recognizing and addressing critical shortages that involved dialysis resources as well as personnel and highlighted novel ways of managing these resources including rationing.

Burgner et al.,<sup>9</sup> published practical recommendations on handling dialysis resources as part of contingency planning for the crisis. Whenever possible, some patients would be allowed to undergo twice weekly hemodialysis (as opposed to conventional thrice weekly schedule).<sup>10</sup> In order to conserve constrained dialysis resources, several publications and practices have resorted to prescribing shorter hemodialysis times (3–3.5 h, as opposed to conventional  $\geq 4$  h) as well as lower dialysate flow rates (600 mL/min, as opposed to  $\geq 600$ –700 mL/min) to patients deemed to be fairly stable.

Still others, allowed for their respective hospital pharmacies to formulate fluids utilized for continuous renal replacement therapy (CRRT).<sup>11</sup> Although there is limited data as far as outcomes are concerned, some institutions utilized other modalities, for example, sustained low-efficiency daily dialysis (SLEDD), prolonged intermittent renal replacement therapy (PIRRT: 8–12 h with clearances of 40–50 mL/kg/h) for inpatient management. In the ICU setting, some institutions utilized extension tubings (with integrated warming circuits) so that exposure of nursing staff to COVID-19 patients on CRRT is minimized.

As the COVID-19 pandemic created an unprecedented strain on health care systems around the world, urgent peritoneal dialysis (PD) has also been utilized as an alternative renal replacement therapy (RRT) during this state of constrained dialysis resources. According to the International Society of Peritoneal Dialysis guidelines, the use of PD to treat patients with AKI is an acceptable form of treatment.<sup>12</sup> Acute PD is a viable alternative to HD, not only reducing the number of central venous catheters being placed and therefore the number of central line-associated bloodstream infections, but also providing patients with a viable long-term solution for their dialysis needs if they continue to require it in the outpatient setting at the time of discharge.

Upon review of studies, successful acute PD implementation involved assessing the patient's suitability for PD, availability of personnel and guidance for PD catheter insertion and managing same.<sup>5,13</sup> The typical PD prescription involved using automated cyclers (CCPD) when available or manual exchanges (CAPD) when needed and prescriptions were modified according to individual patient ultrafiltration and metabolic needs preferably using low volumes to begin with and most studies described five to eight exchanges/day, depending on dwell time, over 17 h.

PD catheters were flushed and used immediately after insertion with low volume exchanges (500 mL) using continuous ambulatory PD bags with heparinized dialysate.<sup>5,13</sup> Although there are attendant risks, for example, peritonitis, peri-catheter leaks, etc., a systematic review showed that there was no significant difference in mortality when acute PD was compared to other forms of RRT.<sup>11</sup>

For those with residual kidney function (RKF), the use of combination diuretics (for total nephron blockade) as well as novel oral potassium binders was another strategy.

Another challenge during this period of crisis pertained to workforce issues, for example, shortage of personnel (nursing staff) brought about by personal reasons and also regulations pertaining to quarantine requirements, etc. With the goal of minimizing staff exposure to patients with COVID-19, several techniques that are congruent with social distancing have been implemented by most practices. Telemedicine has been at the forefront of maintaining these relations, allowing nephrologists to communicate with the patients while undergoing RRT especially as an outpatient.

These surveys performed have highlighted that most procedures are performed in the hospital/inpatient setting with



catheter-based procedures being preferred on an emergent basis. The information from the surveys provides us with opportunities to develop systems, policies and guidelines to consider for future waves and pandemics such as emphasizing the emergent and essential nature of dialysis access procedures, preference for performing procedures in the outpatient environment, prioritizing creation of accesses with consideration for accesses that would need less follow-up/maturation procedures such as upper arm accesses in addition to performing emergent salvage procedures such as thrombectomy, leveraging tele-technologies for remote monitoring and co-ordination of care, developing local supply chains for PPE, testing, and equipment.

## Conclusion

Finally, the COVID 19 pandemic is far from over, despite the availability of several vaccines and therapeutics. The medical care of the ESKD patient, including performance of dialysis and operationalization of dialysis vascular access creation and maintenance must evolve to deal with the unforeseen challenges. Home dialysis modalities are emerging as a preferred modality by the patient and the provider alike. Nephrology professionals will need to create innovative paradigms to continue to provide safe and effective dialysis while conserving resources. There are opportunities within telemedicine to accomplish many of the tasks remotely. While “Maintaining Lifelines” statement<sup>14</sup> does provide guidance for triaging of dialysis vascular access procedures, the guidelines will need to adapt dynamically to the evolving standards and diversity of available expertise and resources. New technologies have the potential to make the socially distanced care possible. However, the well-known disparities within the health care system can only be remedied by a strong and deliberate awareness of these glaring issues and by engineering of the newly discovered role of technology in the practice of modern health care especially in providing essential dialysis vascular access services.

## Author’s note

Authors are member of American Society of Diagnostic and Interventional Nephrology (ASDIN).

## Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

## Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

## Ethics/informed consent statement

Institutional Review Board approval not needed as there is no patient confidentiality data nor any intervention performed for this study, which is a survey-based analysis.

## ORCID iDs

Karthik Ramani  <https://orcid.org/0000-0001-5374-3236>

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

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

## Supplemental material

Supplemental material for this article is available online.

## References

1. CMS. Non-emergent, elective medical services and treatment recommendations. Published on July 4, 2020, <https://www.cms.gov/files/document/cms-non-emergent-elective-medical-recommendations.pdf> (accessed 11 November 2021).
2. CMS. CMS adult elective surgery and procedures recommendations: limit all non-essential planned surgeries and procedures, including dental, until further notice, <https://www.cms.gov/files/document/covid-elective-surgery-recommendations.pdf> (2020, accessed 11 November 2021).
3. Hentschel DM, Agarwal AK and Lawson JH. Maintaining lifelines for ESKD patients – ASDIN and VASA joint statement, [https://cdn.ymaws.com/www.asdin.org/resource/resmgr/covid\\_19/Maintaining\\_lifelines\\_ASDIN.pdf](https://cdn.ymaws.com/www.asdin.org/resource/resmgr/covid_19/Maintaining_lifelines_ASDIN.pdf) (2020, accessed 30 July 2020).
4. White D. Critical clarification from CMS: PD catheter and vascular access placement is essential. *Kidney News Online*, <https://www.kidneynews.org/view/post/policy-2/critical-clarification-from-cms--pd-catheter-and-vascular-access-placement-is-essential.xml> (2020, accessed 11 November 2021).
5. El Shamy O, Patel N, Abdelbaset MH, et al. Acute state peritoneal dialysis during the COVID-19 pandemic: outcomes and experiences. *J Am Soc Nephrol* 2020; 31: 1680–1682.
6. Gupta S, Coca S, Chan L, et al. AKI treated with renal replacement therapy in critically ill patients with COVID-19. *J Am Soc Nephrol* 2021; 32: 161–176.
7. Hanane T, Lane J, Mireles-Cabodevila E, et al. Safety of bedside placement of tunneled dialysis catheter in COVID-19 patients. *J Vasc Access* 2022; 23: 145–148.
8. Williams AD, Qaqish M, Elnagar J, et al. Bedside tunneled hemodialysis catheter placement in patients with COVID-19. *Ann Vasc Surg* 2021; 73: 133–138.
9. Burgner A, Ikizler TA and Dwyer JP. COVID-19 and the inpatient dialysis unit. *CJASN* 2020; 15: 720–722.
10. Meyer TW, Hostetter TH and Watnick S. Twice-weekly hemodialysis is an option for many patients in times of dialysis unit stress. *J Am Soc Nephrol* 2020; 31: 1141–1142.
11. Taliencio JJ, Nakhoul G, Vachharajani TJ, et al. The production, efficacy, and safety of machine generated bicarbonate solution for CVVHD: The Cleveland Clinic Method. *Kidney Med* 2021; 3: 353–359.e1.
12. Cullis B, Abdelraheem M, Abrahams G, et al. Peritoneal dialysis for acute kidney injury. *Perit Dial Int* 2014; 34: 494–517.
13. Chionh CY, Soni SS, Finkelstein FO, et al. Use of peritoneal dialysis in AKI: a systematic review. *Clin J Am Soc Nephrol* 8: 1649–1660.
14. Agarwal AK, Sequeira A, Oza-Gajera BP, et al. Lessons learnt and future directions in managing dialysis access during the COVID 19 pandemic: patient and provider experience in the United States. *J Vasc Access*. Epub ahead of print 24 June 2021. DOI: 10.1177/11297298211027014.