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Managing the COVID-19 pandemic: international comparisons in dialysis patients OPEN



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Nations around the world are working to find the best ways to manage the ongoing coronavirus disease 2019 (COVID-19) pandemic. They are pairing efforts to detect viral infection, prevent transmission, and manage patients who are infected, with knowledge of previous seasonal coronavirus outbreaks and growing experience with COVID-19 to craft best-evidence guidance. Recent data show that as many as 25% of patients who are infected remain asymptomatic, and viral shedding may begin up to 48 hours before symptoms appear. Worldwide regulatory authorities remain committed to guidance that is clearly evidence-based. As new information appears, updated guidance produces many similarities, and some differences in these guidance documents, in part deriving from regional and population differences. We here review guidance for detecting and mitigating COVID-19 infections in patients who are on dialysis, noting where there is universal agreement and where there are differences.

Preventing epidemic spread of infection requires early recognition of infection, isolation, and meticulous tracking of contacts. Reverse transcriptase polymerase chain reaction test kits developed early in this pandemic in Berlin, and deployed by the World Health Organization, assisted many Asian and European countries in limiting infection and “lowering the peak” of infected individuals over time. Limited availability and slow deployment of such test kits in places like parts of the United States and Italy hindered efforts to prevent epidemic spread, with rapidly rising numbers of patients overwhelming parts of the health care system. Once the pandemic was established, efforts switched from prevention to mitigation—with efforts to reduce person-to-person viral transmission and protect the most vulnerable parts of the population. Key features of mitigation include patient and health care worker (HCW) education and implementation of strategies to prevent further spread such as social distancing, widespread use of face masks for patients with suspected or

confirmed disease to limit transmission, and appropriate personal protective equipment (PPE) for HCWs and others who have direct contact with patients infected with COVID-19.

Patients on in-center hemodialysis are particularly vulnerable to COVID-19 for 2 reasons. First, while the world’s population shelters at home to avoid contact with infected individuals, patients who are on in-center dialysis must come together for hours thrice weekly and travel to and from these treatments, increasing possible exposure. Second, patients with end-stage kidney disease who acquire the infection are at higher risk of complication and death due to older age and common comorbidities that increase mortality risk, including diabetes, heart disease, obesity, and hypertension; and in part because patients with end-stage kidney disease may have impaired immune systems. To provide information on how to best protect these patients from COVID-19, we examined the guidance provided by the US Centers for Disease Control and Prevention (CDC), the European Renal Association–European Dialysis and Transplant Association, Italy, and India,^{1–5} noting where they provide similar guidance and where there are differences (Tables 1 and 2):

- (i) Education of patients and HCWs: All guidance documents emphasize the basics of hand and respiratory hygiene, coughing etiquette, and use of PPE.
- (ii) Screening and recognition of symptoms: All guidance documents advise screening patients for most common symptoms including fever, new cough, or dyspnea. There is less uniform screening for sore throat, myalgia, chills, fatigue, conjunctivitis, diarrhea, and rhinorrhea. There is also consistency in screening for travel to endemic areas, asking patients to call ahead if they have symptoms of infection or potential exposure, and establishing a triage protocol prior to patient arrival at the facility. All advise masking patients prior to entering the facility and throughout the treatment, designating a

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Table 1 | A comprehensive list of approaches to prevention and control of COVID-19 infection in dialysis facilities

Education
Education of patients and related individuals
<ol style="list-style-type: none"> 1. Hand and respiratory hygiene and coughing etiquette 2. Use of masks 3. Basic signs and symptoms associated with the disease 4. Place signs to direct patients who are symptomatic or have been exposed to a designated screening location in an appropriate space
Education of HCWs
<ol style="list-style-type: none"> 1. Training for appropriate use of PPE 2. Reemphasis of universal precautions for infection control in the facility
Screening
<ol style="list-style-type: none"> 1. Instruct all patients to call ahead 2. Temperature check for all patients on arrival and departure 3. Implement triage protocol for patients who are suspected to have COVID-19 4. Transfer sicker patients to emergency departments 5. Perform screening RT-PCR test in all patients who are on dialysis 6. Prioritize testing of dialysis personnel
Management of patients with symptoms or illness
Administrative preparedness
<ol style="list-style-type: none"> 1. Create backup lists if staff become sick 2. Create COVID-19 teams 3. Implement workflow to protect nonworking HCWs from potential exposure to healthy backup 4. Cross-train staff when applicable
Transportation
<ol style="list-style-type: none"> 1. Personal transportation: use, fixed route, no public, driver mask 2. EMT/ambulance: CDC guidance
Facility workflow
<ol style="list-style-type: none"> 1. Define separate area and shift for patients with symptoms (COVID-19–positive section) 2. Separate all patients who are COVID-19–positive 6 feet in all directions from each other 3. PPE utilization <ol style="list-style-type: none"> a. Provide all patients a surgical mask b. Use eye and face protection for management of patients who are suspected or positive for disease 4. Use separate medical equipment for patients with suspected or positive disease 5. Maintain routine cleaning and disinfection procedures
Other recommendations
Clearance of recovered patients
<ol style="list-style-type: none"> 1. Negative RT-PCR test 2. Resolution of symptoms
Return-to-work for recovered HCWs
<ol style="list-style-type: none"> 1. Best-evidence guidance using timing after symptom cessation, negative PCR testing, and serologic testing
Routine care for patients on dialysis
<ol style="list-style-type: none"> 1. Minimize face-to-face physician rounding 2. Distance HCWs during team rounds 3. Consider telehealth for care planning 4. Prioritize access to surgeries and procedures 5. Consider decreased frequency during peak periods

CDC, US Centers for Disease Control and Prevention; COVID-19, coronavirus disease 2019; EMT, emergency medical transport; HCW, health care worker; PCR, polymerase chain reaction; PPE, personal protective equipment; RT-PCR, reverse transcriptase polymerase chain reaction.

separate waiting area for screening or waiting in a personal vehicle for screening, and treating patients under investigation (PUIs), those with moderate or high likelihood of disease, before testing confirmation, as potentially positive.

- (iii) PPE: All guidance documents advise use of surgical masks for patients and HCWs. While in the United States, N95 or higher-level respirators are advised if available, elsewhere N95 masks are advised only for aerosol-generating procedures. Surgical masks are otherwise advised for all HCWs

including those cleaning machines. All advise disposable gloves, and most advise face shields or goggles. Some suggest hair covers and shoe covers. In the United States, the CDC advises PPE competency evaluation for staff and auditing compliance with PPE and hand hygiene, advice not documented in other guidance documents.

- (iv) Managing patients who are symptomatic or positive for COVID-19: This is one area where there are differences in guidance around the world, although most

Table 2 | Comparison of COVID-19 guidance provided for different geographic regions in the world

	USA ^a	Europe	Asia/other
Education			
Patients			
Basic hygiene and disease education	X	X	X
HCWs			
PPE training and evaluation	X	N/A	N/A
Screening			
Symptom check on arrival	X	X	X
Temperature check on arrival and departure	X	X	X
Screening diagnostic test in all patients on dialysis	NSG	NSG	NSG
Management			
Administrative			
COVID-19 teams	X	X	X
Backup lists	X	N/A	N/A
Facility workflow			
Dedicated space and shift	X	X	X
Surgical face mask to all patients	X	X	X
Routine cleaning and disinfection procedures	X	X	X
Supply chain			
Recycling of PPE	X	X	N/A
Other recommendations			
Transportation	X ^b	NSG	NSG
Return-to-work for HCWs	X ^b	NSG	NSG
Clinical management of PUIs or patients who are infected	RS	RS	RS

COVID-19, coronavirus disease 2019; HCW, health care worker; N/A, not available; NSG, no specific guidance; PPE, personal protective equipment; PUI, patient under investigation; RS, region-specific with different recommendations; X, availability of a recommendation that is similar across different regions.

^aUS guidelines are based on Centers for Disease Control and Prevention’s recommendations and published recommendations to date.

^bLimited guidance from the Centers for Disease Control and Prevention.

Data are excerpted from available publications and are not intended to be inclusive of all available local documents.

guidance is similar. All guidance documents advise cohorting multiple confirmed cases or PUIs and assigning designated staff to care for them. The majority suggest that supplies be positioned close to hemodialysis chairs and nursing stations to ensure adherence to hand and respiratory hygiene. Routine cleaning and disinfection procedures are recommended by all guidance documents. For stable PUIs or patients with confirmed coronavirus, some countries advise hospitalization and admission to an airborne infection isolation room. The US CDC specifically states that an airborne infection isolation room is not needed in the outpatient management of COVID-19 dialysis. While Asian guidance documents advise that PUIs be admitted to an infectious disease ward, others advise that PUIs and patients who are confirmed positive can be dialyzed in the outpatient unit, if clinically stable. This is to be performed in a designated COVID-19 facility, dialysis shift, an isolation room within a facility that treats noninfected patients, or in a separate room with the door closed. If none of these are available, then the advice is to dialyze these patients at the end of the

line or corner position of the facility, with separation from other patients by 6 feet in all directions. For patients who are ill with progressive dyspnea, organ dysfunction, or acute respiratory distress syndrome, all guidance documents advise hospitalization.

- (v) Resource utilization: The US CDC discusses supply chain management, preserving and prioritizing PPE, extended use of eye and face protection, recycling of PPE, and alternate PPE. They also discuss sick leave policy, cross-training and back-up plans, staff return-to-work guidelines, and after return-to-work guidance. These recommendations are not provided in publications from other countries although they may exist locally. Telemedicine is widely used worldwide, when technically possible, to minimize face-to-face contact.
- (vi) Home dialysis: There is consistency that patients on home hemodialysis and peritoneal dialysis continue care at home, and HCWs use telemedicine or other electronic systems for clinical management, with home visits if necessary. Implementation of these recommendations are likely to be resource- and geography-dependent.

(vii) Some guidance documents advise clinicians to consider reducing the frequency of hemodialysis sessions from 3 to 2 times weekly in patients who tolerate this regimen. This would reduce the need to travel by car or ambulance in the event of a shortage of these means of transport, decrease the risk of infection exposure during transport, and reduce the likelihood of patients on dialysis spreading infection in the dialysis unit or the hospital. There is consensus to implement reduced individual dialysis in extreme shortage crisis conditions.

Why might regional differences in guidance exist? In countries where early recognition of endemic infection spread was initiated, aggressive steps to identify and isolate patients with COVID-19 and identify their contacts permitted a prevention plan that limited their local epidemic. In China, recognition of infection was initially slow in Wuhan, but aggressive preventive measures in other parts of the country were probably successful. While some European countries have been successful in containment and prevention, others were less successful and focused on mitigation strategies. Availability and use of diagnostic tests have been major determinants of prevention, best practice, and mitigation. In the United States, the limited and slow dispersal of testing capacity has hindered mitigation efforts. Availability and utility of serologic tests may allow accurate identification of patients who have had COVID-19 and developed immunity, including those who are asymptomatic as well as HCWs who are no longer at risk, hence allowing them to return to work.

Despite its major unwanted adverse consequences, this major health crisis has perhaps taught us major lessons. Some of these learned so far include:

- (i) Many people have previously warned that worldwide preparedness for previously unknown epidemic illness is inevitable, and that we must prepare now for this likelihood. This warning has previously received little attention outside Asia. We now know the importance and priority of such readiness.
- (ii) Early recognition of new infectious diseases requires a new discipline, awareness, and vigilance. This will require a worldwide effort to record and report symptom clusters, changes in hospitalization, morbidity and mortality rates, and a 21st-

century epidemiologic registry. Analytic tools can be used to develop new algorithms to assess changes in population health. A new discipline of worldwide surveillance and early recognition will allow countries to contain infection and prevent pandemics.

- (iii) If we have a reactive approach, responding to spreading infection rather than anticipating and containing it, we will fail. A well-designed proactive approach that includes early case identification, careful contact mapping and isolation, and swift implementation of protocols will permit infection containment and substantially reduce population exposure, morbidity, and mortality.
- (iv) If implemented appropriately, infection prevention works. This can be observed in countries such as Taiwan, New Zealand, and Singapore. Information to date also suggests a limited in-facility transmission in patients on dialysis, most likely related to an infection prevention culture that has been imbedded in the care of these vulnerable patients.
- (v) Once a pandemic is established, aggressive mitigation techniques such as social distancing, testing for specific organisms, and serologic evidence of infection and immunity are critically important.
- (vi) Equipment and personnel shortages are predictable during a pandemic. National and perhaps worldwide preparedness for this will require new flexible algorithms and coordinating and sharing resources. The 20th-century model of independent, sometimes competing health care systems using just-in-time ordering to minimize inefficient shelving of supplies, will need 21st-century updating to allow international stockpiling of critical equipment with flexible plans to anticipate needs and quickly move them as needed.
- (vii) To prepare for the next pandemic, a multinational research group should be assembled to investigate all aspects of the organism and the host response, including the source reservoir, genetics, host response, vaccination and more. Regional puzzles need investigation: for example, why in New York is there a predominance of African Americans affected by COVID-19 and complications leading to death? Frameworks for international trials of vaccines and medications should be prepared and ready to dispatch.

As the COVID-19 pandemic spread around the world, lessons learned from its challenges have shaped the guidance offered in each region. It is striking that this guidance, as it matured around the globe, has largely come together in uniformity. If we are to learn from this experience and be better prepared for the next epidemic challenge, it will be wise to think globally, act locally, and create an international structure to anticipate and guide best practice.

DISCLOSURE

All the authors declared no competing interests.

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