Crisis Nephrology; Challenges During the COVID-19 Pandemic

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ABSTRACT

Times of crisis unmask all features of the health system and challenge all efforts and morals of health care professionals. Over the last five months, the current COVID-19 pandemic highlighted all these things. Nephrology services have greatly affected during this crisis time. Many medical, logistic, financial, and ethical challenges are facing the whole nephrology human workforce and services. Here we are reflecting on these issues with possible great future consequences. .

Key words: Crisis, Nephrology, Pandemic, COVID-19.

" The darkest places in hell are reserved for those who maintain their neutrality in times of moral crisis."

Dante Alighieri - Inferno

The basic nephrology knowledge had been dated a long time ago with records from Mesopotamia, ancient Egypt, Greece, and others.[1] Pandemics and catastrophe occurred at different points of time in different geographical areas and civilizations. Thus, renal insults and challenges to treating them run in parallel with these history-changing events. So, it's always a daring situation to treat renal patients at such difficult times of the history of humankind. These events included but not limited to the great cholera pandemic, world wars, major earthquakes, tuberculosis, HIV, SARS, Ebola, and the recent COVID-19 pandemic.

During all these major events, different forms of renal injuries emerged mostly acute kidney injury (AKI) with its serious consequences, urinary tract traumas, and renal parenchymal lesions secondary to infective origins.

The complex pathophysiology of renal diseases and the intricate relation with other organs during acute illnesses add more burden to the health care providers to offer the best renal and medical care. This is in addition to the altered body physiology in the milieu of uremic patients with multiple comorbidities, or the immune suppression state in renal transplant recipients.

Clinical challenges

Acute kidney injury is a potentially preventable event. It usually occurs secondary to severe dehydration, rhabdomyolysis, and /or sepsis and cytokines release.[2,3] In previous reports of SARS and MERS-CoV infections, AKI developed in 5% to 15% cases and carried a high (60%–90%) in-hospital mortality rate.[2] All efforts to provide sanitary water, correcting fluid status, and avoidance of nephrotoxic medications are mandatory.

Access to renal replacement therapy (RRT) is a critical issue in such difficult times. The decision to go for haemodialysis (HD), peritoneal dialysis (PD), or continuous renal replacement therapy (CRRT) depends on logistics and availability. High cut-off membranes may be preferable for CRRT which may add more cost. Sometimes the dialysis setup is unable to handle the load and resources may not be enough to provide HD or CRRT for all patients. Here, acute PD may be an option. Thus, the decision for the type of RRT should have a pragmatic approach.

Acute PD can maximize the provision of dialysis resources during the surge of cases. It will decrease the number of inserted dialysis catheters and the possible bloodstream infec-

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tions. Another advantage is the ability to train non-nursing staff in the PD procedure, which is not technically challenging but requires strict sterile technique.[4]

During the 2009 H1N1, there were some reports about a direct viral cytopathic renal injury 5. SARS-CoV-2 has been isolated from the urine sample of an infected patient, suggesting the kidney as the target of this novel coronavirus.[6] Viral RNA has been identified in kidney tissue and urine.[7] In a Chinese report of 710 patients admitted for COVID-19, 44% had proteinuria and haematuria and 26.7% had haematuria on admission.[8] A case of collapsing glomerulonephritis has reported with no evidence of renal inflammation but mostly a direct viral effect on podocytes.[9] A postmortem renal biopsy showed direct parenchymal infection of tubular epithelial cells and podocytes with marked acute tubular injury and erythrocyte aggregation in such severe lethal COVID-19.[10]

No reports were focusing on the outcome after the crisis of non-dialyzed chronic kidney disease (CKD) patients. In such times, the risk of infection acquisition and increased cardiovascular risk is equally serious. This causes difficulties to maintain an appropriate diet and to obtain the medication, next to the stressful conditions in which these patients have to live. Therefore, pandemic certainly generates medical and therapeutic problems in CKD patients, even if they are not yet on dialysis.[11]

The maintenance dialysis program is the most common chronic life-saving medical service around the world. The dialysis facilities are great places for the spread of an air-born disease between the immune-compromised patients themselves and the dialysis staff. This is apparent in developing countries and conflict areas with crowded dialysis units, poor infection control, and limited personal protective equipment (PPE).

Dialysis access and its delivery would be seriously affected. Dialysis mandates large volumes of microbiologically pure, controlled water (500 ml/min of treatment; one hundred twenty l for four hours session). This can be an obstacle to performing adequate dialysis in the developing world, however, it's going to be a downside at explicit times even in developed countries.[12]

In-center HD faces another challenge which is the strict adoption of infection control procedures that involves the whole pathway from patient's transport to discharge from the HD unit.

The major issues for chronic PD patients are the provision of dialysis consumables and the deal with acute complications that bring patients for acute care. Volume management needs special attention and the use of more hypertonic solutions is better than an urgent switch to haemodialysis. Here exposure to excess glucose needs to not be overlooked.[13]

With distorted infrastructures and limited resources or diverted clinical skills, the creation of dialysis access or PD catheter insertion is another challenge that needs to be endorsed well.

During such crisis time, renal transplant programs would be ceased to the degree of total shutdown as in the current COVID-19 pandemic. The SARS-CoV-2 infection has a severe course in renal and other solid organ transplant recipients.[14] While no cases of H5N1 have occurred in transplant patients, and none of the previous pandemics occurred in an era when transplantation and immune-suppressed patients were common, graft dysfunction reported and Kidney transplant recipients had more severe COVID-19 pneumonia than the general population.[15,16]

For transplantation units, The risks include unhygienic conditions, risk of infections of immune-compromised patients. The provision of antirejection medication may be compromised with serious patients risks. The intensification of immune suppression for the management of acute graft dysfunction will add more complexity.

Donor testing with RT-PCR and bronchoalveolar lavage and CT scan would be needed. Still, we do not have data on the sensitivity of multiple RT-PCR tests or RT-PCR tests with bronchoalveolar lavage in asymptomatic individuals. This will increase the costs and efforts in addition to limiting resources for other priorities.[17]

Thus, considering transplantation during this pandemic is complex. It may be easy to defer non-urgent transplantation but the big ethical challenge is transplanting high immu-

nological risk patients.[18]

Both dialysis patients and transplant recipients may be 'super-spreaders' of infection during influenza, or other contagious respiratory virus pandemics. They may shed large amounts of virus for prolonged periods, resulting in spread to a greater number of contacts.[19,20]

Nephropharmacology and drug dosing

This is another challenge while caring for COVID-19 patients. At this time, there is much uncertainty in treatment strategies. All the proposed medications have some crossing points with nephrology. There are variable reports about the drug side effects. The cardiac risk of hydroxychloroquine may limit its use in patients with CKD. Different therapies but mainly antiretroviral therapy can affect calcineurin inhibitors metabolism in transplant patients. The recently increasing interest in using remdesivir can be limited in patients with glomerular filtration rate below 30 ml/min. There are very limited data regarding the use of immunomodulators like tocilizumab and sarilumab in such patients.[21] This is in addition to the possible roles of combined use of ACEI/ARBS and/or statins in patients with multiple comorbidities like renal patients.[22,23]

Vaccination

The influenza vaccination rate among dialysis and wait-listed patients has declined in the past decade in different countries mostly due to non-adherence to standards and inadequate liaison with infectious disease departments.[24,25] A stricter follow of vaccination standards should be adopted and checked regularly. Considering the immune dysfunction in CKD, ESRD, and transplant patients, the introduction and synthesis of vaccines to prevent another COVID-19 wave is another challenge. The vaccine should protect without risking renal patients' lives.

Logistic and Financial Problems

The term logistics refers to 'the procurement, maintenance, distribution, and replacement of personnel and material', to have 'the right measure, at the right place, at the right time'.[26]

These problems include;

- Infrastructures and the need for rapidly establishing safe and accessible dialysis units, high dependency units, and medical words for care.
- Maintenance of easy access to dialysis, and provision of dialysis consumables, and pure water supply.
- The availability of well-trained human resources and their mobilization to areas of need without risking their lives. There would be high rates of worker absenteeism ceasing other services, like transportation and communications. 15
- The strict adoption of infection control procedures and the provision of PPE.
- There is a possible risk of reducing dialysis frequency which will affect the clinical status of patients especially those with fluid overload.
- Acute care initiative will divert the care of nephrology and transplant outpatients with possible patients' risks.
- The need for governmental and financial support which may need to transfer budgets to the care of renal patients amid an increasing need for the whole health system to support. Testing materials and media should be available and labs should be ready and may run in multiple shifts. A continuous supply chain should be available.

Also, the psychological burden on patients and health care providers and the fear of transmitting infections in between during pandemics should add another challenge.

All the above-mentioned challenges will have great future consequences. The complexity of managing renal patients, the increasing need for technology, the stress and exhaustion of healthcare providers, and the fiscal crisis will affect the whole nephrology workforce. Nephrology is facing a critical problem with declining interest and expanding demands.[27]

What to do?

Prepare

Preparedness means the state of readiness, especially for war 28. Such pandem-

ics is just like a war state. When compared to other medical disciplines, renal services should always have a plan for serious events, especially in developing countries to mitigate the serious consequences. The plan should include a clear description of leadership, locations, teams, personnel, resources, and finance. A crisis simulation training and scenario should be practiced. Prepare all dialysis units with strict infection control procedures and always check for them. Disaster preparedness activities lead to improvements in knowledge, skills, or attitude. There needs to be a wider focus on the whole health care team, including allied health professionals and support staff. Evaluation during real disasters and the use of validated competencies and tools to deliver and evaluate disaster preparedness will lead to the best preparedness and response.[29,30,31]

Act

The plan should be implemented. Check all the available human resources and services. Regularly assess the status to update responses and resources allocation. Each unit should follow WHO core components for infection prevention and control in all settings.[32] During pandemics, the first goal in HD units is to maximize social distancing. The second goal is the early detection of any infected patients.[33]

Educate

Never forget to educate colleagues, medical staff, and patients about how to deal with such a difficult situation. Even, you may start informing the patients through letters, text messaging, and phone calls before going to the hospital about any risks and special care or changing management plans.

Reflect on action

During the pandemic aftermath, you should reflect to fill the gaps and be ready for any future events. Better pandemic response education and communication within hospitals and the whole system are mandatory.

In conclusion, pandemics represent a serious challenge to the nephrology practice. Adherence to the principles of crisis medicine, with a well-prepared team and plans, is vital. Assignment of resources, technology, and personnel is mandatory to minimize the extent of medical, logistic, and legal problems, and saving as many lives as possible. This always means making difficult clinical decisions with ethical challenges, but never to be neutral in such times.

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