

Renal replacement therapy in the ICU during COVID-19 pandemic

This document provides the framework to support the provision of renal replacement therapy (RRT) during an escalating pandemic. It should be used to inform local policies and procedures, which should be current and reviewed regularly.

Renal replacement therapy (RRT) is used to treat adult patients with acute kidney injury (AKI) in the intensive care unit (ICU). In NSW there are an estimated 169 machines that are capable of providing renal replacement therapy. Level 5 and 6 ICUs have the capacity to provide continuous renal replacement therapy (CRRT). Some ICUs also have the ability to provide intermittent renal replacement therapy (IRRT), intermittent haemodialysis (IHD) or sustained low efficiency dialysis (SLED). There are another 277 machines in outpatient dialysis units in NSW.

During the COVID-19 pandemic, there may be an increased need for patients requiring dialysis with AKI in the ICU. In this instance, state wide and local contingency plans should be in place to guide resource allocation and patient prioritisation for treatment.

Background

In May 2020, a rapid evidence review was conducted by the COVID-19 Critical Intelligence Unit (Appendix 1). This document includes international evidence and data, as well as expert opinions. Senior clinicians, both medical and nursing from the NSW Intensive Care and Renal Communities of Practice, were consulted during the development of this document.

International data suggests that the prevalence of AKI in patients with COVID-19 is 3-9% and is more common in patients with severe disease, affecting up to 30% of critically ill patients in the ICU.¹⁻⁴ The need for renal dialysis usually arises during the second week of infection with COVID-19, with studies reporting up to 25% of patients in ICU required RRT.^{5,6}

The indications for RRT for AKI in COVID-19 patients may result from hypovolaemia, haemodynamic changes, viral infection leading to kidney tubular injury, thrombotic vascular processes, glomerular pathology, rhabdomyolysis or fluid overload associated with respiratory failure.⁷ AKI is more common among patients with severe infection of COVID-19 and is considered a negative prognostic factor with respect to survival.

The option of which type of RRT used, CRRT or IHD, will depend on the patient's clinical status and the ICU's resources.⁸ ICUs in NSW vary in types of machines and modes of RRT provided. If the patient is haemodynamically-stable, consider IHD, if available, as the first option due to human resource and cost-efficiency. CRRT is preferable for more haemodynamically-unstable patients.

Considerations during COVID-19 pandemic in NSW

Complex ethical and clinical treatment issues can occur during a pandemic, especially when healthcare demand exceeds supply. It may be necessary at some point to begin prioritising limited critical care resources to those with a need for treatment and those who are most likely to survive. Such prioritisation decisions would need to take into account all patients' probability of survival, as well as the availability of limited critical care resources.

Recommendations

Based on possible resource limitations, local health districts (LHDs) and facilities in NSW should plan and prepare by considering the following recommendations:

- Each facility should have a RRT surge plan, including ability to use all existing RRT machines, borrow from other facilities and have sufficient stock of consumables, including dialysis fluid, sets, filters, etc.
- Consider using a checklist to assist in planning (Appendix 2).
- Optimise medical management before commencement of RRT, including appropriate dose loop diuretics, potassium binders and sodium bicarbonate.⁷
- Explore alternate methods of treating AKI (depending on mechanism of kidney injury), vascular access options, coagulation status and local expertise, e.g. CRRT, intermittent RRT or peritoneal dialysis, as appropriate.⁷
- Transfer dialysis machines and equipment to other facilities as an alternative to transferring patients with COVID-19.
- Consider utilising facility renal unit dialysis machines and human resources. This may be dependent on the availability of portable reverse osmosis water supply.
- Implement a local plan to review prescribing practices of treatments, for example reduce the time for intermittent treatments or restricting CRRT to 10 hours with increased flow rates.
- Use a conservative approach to use of RRT consumables, including altered antithrombotic protocols to prevent clotting of CRRT filter and circuit.
- Educate and upskill ICU staff on RRT early in preparation.
- Consider alternative nursing workforce arrangements (e.g., team-based nursing model, designated RRT nurses, deployment of renal unit nurses to the ICU).

References

1. Durvasula R, Wellington T, McNamara E, Watnick S. COVID-19 and Kidney Failure in the Acute Care Setting: Our Experience From Seattle. *Am J Kidney Dis.* 2020; April. doi: 10.1053/j.ajkd.2020.04.001. Epub ahead of print.
2. Yang X, Yu Y, Xu J, Shu H, Xia J, Liu H, et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study. *Lancet Respir Med.* 2020;8(5):475-81.
3. Chen T, Wu D, Chen H, Yan W, Yang D, Chen G, et al. Clinical characteristics of 113 deceased patients with coronavirus disease 2019: retrospective study. *Bmj.* 2020;368:m1091.
4. Fanelli V, Fiorentino M, Cantaluppi V, Gesualdo L, Stallone G, Ronco C, et al. Acute kidney injury in SARS-CoV-2 infected patients. *Crit Care.* 2020;24(1):155.
5. Rubin S OA, Prevel R, Garric A, Bats M, Dabernat S, et al. Characterisation of Acute Kidney Injury in Critically Ill Patients with Severe Coronavirus Disease-2019 (COVID-19). *MedRxiv preprint server for health sciences.* 2020. Available from: <https://www.medrxiv.org/content/10.1101/2020.05.06.20069872v1>.
6. Mahase E. Covid-19: increasing demand for dialysis sparks fears of supply shortage. *BMJ* 2020; 369. doi: <https://doi.org/10.1136/bmj.m1588>.
7. National Institute for Health and Care Excellence. COVID-19 rapid guideline: acute kidney injury (AKI). NICE: London; 2020. Available from: <https://www.nice.org.uk/guidance/ng175/>
8. Centres for Disease Control and Prevention. Considerations for Providing Hemodialysis to Patients with Suspected or Confirmed COVID-19 in Acute Care Settings. CDC: Virginia; 2020.
9. Centres for Disease Control and Prevention. Coronavirus Disease 2019 (COVID-19) Outpatient Dialysis Facility Preparedness Assessment Tool. CDC: Virginia; 2020. <https://www.cdc.gov/coronavirus/2019-ncov/downloads/COVID-19-outpatient-dialysis.pdf>

Appendix 1

[COVID-19 Critical Intelligence Unit – Evidence Check](#)

Appendix 2

ANZSN renal unit COVID-19 acute kidney injury (AKI) preparedness checklist

This checklist is for use by renal unit senior management teams in Australia and Aotearoa New Zealand to assist in considering key components of COVID-19 contingency planning for their units and hospitals.

The checklist is for general information only and is not a list of mandatory requirements. It is recognised that each unit will have specific circumstances and challenges that will require local solutions. The topics in this checklist are intended to cover major themes that should be considered.

Please refer to the important notice at the end of the checklist.

Status	Completed	In Progress	Not Started	Not Applicable
Meet/liase with ICU to determine management plan for AKI				
Consider when ICU will manage CRRT and if this differs from current practice.				
Determine ICU capacity for CRRT and/or SLED.				
Consider which circumstances will intermittent HD be used and if this differs from current practice.				
Evaluate access to water in the ICU or other critical care areas to enable HD.				
Consider how ICU plans to cohort COVID-19 confirmed/suspected patients requiring dialysis.				
Review which negative pressure rooms are available (if needed) and do they have water ports.				
Does ICU have adequate supplies of consumables for CRRT/SLED?				
Is there a plan for the transition of care of the dialysis dependent AKI patient discharged from ICU?				
What capacity the renal unit has for intermittent HD for AKI?				
Determine whether HD can be performed in designated COVID-19 ward(s)? (water access, isolation, cohorting of staff, clinical COVID-19 expertise, etc.)				
Are suitable safe transport routes and procedures in place to move COVID-19 patients to and from the dialysis unit?				
Assess use and capacity of portable ROs.				
Assess use and capacity of spare HD machines.				
Assess capacity of dialysis staff to provide dialysis out of the usual haemodialysis unit.				
Does the renal unit have adequate supplies of consumables?				

Status	Completed	In Progress	Not Started	Not Applicable
Managing COVID-19 patients in the dialysis unit				
Plan for cohorting of COVID-19+ patients with AKI.				
Isolation/infection control protocols in place?				
Staff adequately trained?				
Other issues				
Vascular access placement in COVID-19 positive patients - access to non-tunnelled and tunnelled central line.				
Acute PD – capacity for peritoneal dialysis catheter insertion in COVID-19 confirmed/suspected patient.				
Acute PD – protocol established to perform acute PD?				
Acute PD – staff trained and sufficient capacity to enable acute PD?				
Nephrology follow-up procedures in place for AKI patients once discharged home?				
Consider mechanisms to ensure non-nephrology staff are aware of the risk of AKI and related referral practices/ processes.				

Important notice

This checklist has been developed by the Australian and New Zealand Society of Nephrologists (ANZSN) for the information of Australian and New Zealand renal units to support their COVID-19 contingency planning. It has had regard to materials developed by the Centers for Disease Control (CDC), USA, relating to dialysis facility preparedness.⁹

The original CDC materials are available free-of-charge on the CDC website. The use or publication of this checklist, including any links to the materials on the CDC website and any information or other content contained in this checklist, does not constitute or imply endorsement or recommendation by the CDC or the United States Government of this checklist or the information or other content therein, or the Australian and New Zealand Society of Nephrology (ANZSN), any of its officers, employees, agents or members, or any other person or organisation that uses or publishes this checklist.

The COVID-19 pandemic is rapidly evolving and there is currently limited information about the SARS-CoV-2 virus or COVID-19 disease aetiology or treatment. Application or use of this checklist is to be considered in this context.

The ANZSN has made reasonable efforts to ensure that the information in this checklist is as accurate as possible, however ANZSN does not in any way guarantee or warrant the accuracy, completeness, currency or source of any material in this checklist.

The ANZSN reserves the right to change any information in this checklist at any time.

This checklist is made available for general information purposes only and should in no way be considered as specific medical or clinical advice nor as a substitute for professional advice and judgement provided by a healthcare service, healthcare professional or other subject matter expert in individual cases. Each health service or organisation operating a renal unit is responsible for ensuring and assuring its own COVID-19 preparedness.

ANZSN does not endorse, or warrant, or make any other representation whatsoever, or take any responsibility whatsoever for the relevant CDC materials to which it has had regard or any other CDC materials appearing on the CDC website.

The ANZSN accepts no liability for any loss or damage whatsoever suffered either directly or indirectly as a result of using or otherwise relying upon any material or information made available in this checklist, or in connection with the suitability, for any purpose, of the contents of this checklist.

This checklist may be accessed from other countries around the world and may contain references to products, services, and programs that have not been announced in your country. These references do not imply that ANZSN intends to announce such products, services or program in your country.

Glossary

CRRT – continuous renal replacement therapy

ICU – intensive care unit

IHD – intermittent haemodialysis

PD - peritoneal dialysis

SLED - sustained low efficiency dialysis

RO – reverse osmosis

Document information	
Version number	1
Original publication date	16 July 2020
Developed by	ICNSW ACI
Consultation	Consulted with senior clinicians, both medical and nursing, from NSW intensive care units through the intensive care community of practice, the renal community of practice and the ICNSW Executive, ACI.
Endorsed by	Nigel Lyons
Review date	
Reviewed by	
For use by	To support adult intensive care and ward staff with surge in COVID-19 pandemic