



Editorial on Covid-19 and Acute Kidney Injury in Hospital Summary of NICE Guidelines

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INTRODUCTION: Acute kidney injury (AKI), a sudden reduction in kidney function, is seen in some people with covid-19 infection. A subset of patients develops severe AKI and requires renal replacement therapy (RRT). As in many settings, the development of AKI is associated with an increased risk of mortality.

Although our understanding is incomplete, a picture is emerging from case reports and autopsy series of covid-19 specific causes of AKI. Intrinsic renal pathology including thrombotic vascular processes, viral mediated tubular cell injury, and glomerulonephritis have been reported, as well as AKI resulting from extrinsic factors such as fluid depletion, multi-organ failure, and rhabdomyolysis.

Anecdotal reports have emerged of proximal tubular injury with Fanconi syndrome that manifests as hypokalemia, hypophosphatemia, normal anion gap metabolic acidosis, and hypovolaemia from salt wasting. Importantly, AKI can occur at all stages of covid-19 infection, so clinical vigilance and consideration of risk factors for AKI alongside early detection and diagnosis are essential components of general supportive care. Fluid management is central to this.

Recommendations: Communicating with patients: Communicate effectively with patients, their families, and careers, and support their mental wellbeing to help alleviate any anxiety they may have about COVID-19. Sign post to charities and UK government guidance on the mental health and wellbeing aspects of COVID-19.

2. Minimising risk for patients and healthcare workers: All healthcare workers involved in receiving, assessing, and caring for patients who have known or suspected covid-19 should follow UK government guidance for infection prevention and control. If covid-19 is later diagnosed in a patient not isolated from admission or presentation, follow UK government guidance on management of exposed healthcare workers and patients in hospital settings.

3. Planning treatment and care: Discuss the risks, benefits, and likely outcomes of treatment options with patients with covid-19, and their families and careers. This will help them make informed decisions about their treatment goals and wishes, including treatment escalation plans where appropriate. Find out if patients have advance care plans or advance decisions to refuse treatment, including “do not attempt cardiopulmonary resuscitation” decisions, and take account of these in planning care. Monitor patients for the development or progression of chronic kidney disease (CKD) after AKI. Guidance on care after hospital discharge produced jointly by Think Kidneys and the Royal College of General Practitioners is designed to support safer transitions of care and post-discharge monitoring, and is of relevance to both hospital and general practice team.

4. Assessing for AKI in patients with suspected or confirmed covid-19: Be aware that, in patients with covid-19, AKI may be common, but prevalence is uncertain and depends on clinical setting; the Intensive Care National Audit and Research Centre’s report on covid-19 in critical care reported that 31% of patients on ventilators and 4% not on ventilators needed renal replacement therapy for AKI is associated with an increased risk of dying. Can develop at any time before or during hospital admission. Causes may include volume depletion (hypovolaemia), hemodynamic changes, viral infection leading directly to kidney tubular injury, thrombotic vascular processes, glomerular pathology, or rhabdomyolysis. May be associated with hematuria, proteinuria, and abnormal serum electrolyte levels (both increased and decreased serum sodium and potassium).

Maintaining optimal fluid status (euvoemia) is critical in reducing the incidence of AKI, but this can be hard to achieve. Treatments being used to manage covid-19 may increase the risk of AKI—for example, diuretics if they have caused volume depletion (hypovolaemia). Fever and increased respiratory rate increase insensible Dehydration (often needing correction with intravenous fluids) is common on admission to hospital and may also develop later risk of coagulopathy is increased.

On hospital admission or transfer, assess for AKI in all patients. Record medical history and comorbidities, including factors that further increase the risk of AKI (such as CKD, heart failure, liver disease, diabetes, history of AKI). Fluid status by clinical examination (for example, peripheral perfusion, capillary refill, pulse rate, blood pressure, postural hypotension, jugular venous pressure, or pulmonary or peripheral edema). Fluid status by fluid balance (fluid intake, urine output, and weight), Fluid loss, Full Blood count, serum urea, creatinine, and electrolytes (sodium, potassium, bicarbonate). Review the use of medicines that can cause or worsen AKI and stop these unless essential. Ask a pharmacist for advice about optimizing the choice and dosage of medicines, including anticoagulants for treatment or prophylaxis. More detailed information is available in the think Kidneys guidelines for medicines optimization in patients with continue to assess for AKI. Record and monitor fluid status by clinical examination and fluid balance daily. Measure serum urea, creatinine, and electrolytes (sodium, potassium, bicarbonate) at least every 48 hours or more often if clinically indicated (Example; in those at increased risk of AKI, in those who have sustained AKI, and those with electrolyte abnormalities).

5. Detecting and investigating AKI in patients with suspected or confirmed COVID-19:

Detect AKI using NHS England’s AKI algorithm or any of the following criteria:

- An increase in serum creatinine of ≥ 26 $\mu\text{mol/L}$ in 48 hours.
- An increase of $\geq 50\%$ in serum creatinine, known or presumed to have occurred in the past seven days.
- A fall in urine output to ≤ 0.5 mL/kg/hour for more than six hours.

Do urinalysis for blood, protein, and glucose to help identify the cause of AKI. Record the results and take action if these are abnormal (including referral if needed; see section below on referral in patients with suspected or confirmed covid-19). Perform imaging if urinary tract obstruction is suspected.

6. Managing fluid status in patients with suspected or confirmed covid-19: Aim to achieve and maintain optimal fluid status (euvolaemia) in all patients. If there is volume depletion (hypovolaemia) and fluid needs cannot be met orally or enterally, give patients intravenous fluids as part of a protocol to restore and maintain optimal fluid status (euvolaemia). Ensure patients have an intravenous fluid management plan that is reviewed daily.

7. Managing hyperkalemia in patients with suspected or confirmed COVID-19: Be aware of the risk of hyperkalemia and manage according to local protocols. The potassium binders' patiromer and sodium zirconium cyclosilicate can be used alongside standard care for the emergency management of acute life threatening hyperkalemia (these agents have been approved by NICE for this indication).

8. Referral in patients with suspected or confirmed COVID-19: Refer patients with AKI for further specialist advice if there is diagnostic uncertainty about the cause of AKI, which may need further tests or imaging they have abnormal urinalysis results, which may be a sign of COVID-19 induced kidney damage or other intrinsic renal disease. Fluid management needs are complex. AKI is worsening despite initial management or has not resolved after 48 hours the patient has usual indications for renal replacement therapy, particularly if there is no urine output, such as life threatening hyperkalemia refractory fluid overload severe metabolic acidosis.

9. Renal replacement therapy in patients with suspected or confirmed covid-19: The scope of the guideline did not include a detailed review of the technical aspects of provision of renal replacement therapy (RRT) in covid-19. Resources were signposted as follows: NHS England has produced a clinical guide on renal replacement therapy options in critical care during the coronavirus pandemic for options for patients with usual indications for RRT based on local availability, equipment, supplies, staffing, and local expertise.

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