Acute kidney injury is increasingly common in children admitted to hospital, with an incidence of almost 20% in children who require intensive care.\(^1\) Although the long-term effects of acute kidney injury continue to be debated,\(^2\) in the short-term it increases resource use, length of stay in hospital, and risk of death—all effects that become more pronounced in children who require renal replacement therapy.\(^3,4\)

In The Lancet, Claudio Ronco and colleagues\(^5\) describe their design, development, and testing of a new CRRT machine, named CARPEDIEM (Cardio-Renal Pediatric Dialysis Emergency Machine), specifically for use in neonates and infants. This work expands on the group’s previous experience doing continuous arteriovenous haemofiltration with a minifilter that they designed and used to treat four very young infants (younger than 12 days) with acute kidney injury.\(^6\)

Peritoneal dialysis is generally preferred to extracorporeal methods such as intermittent haemodialysis or continuous renal replacement therapy (CRRT) in neonates and young children who develop acute kidney injury or end-stage kidney disease that requires renal replacement therapy.\(^6\) The reasons for this preference are that peritoneal dialysis does not require large-diameter vascular access, can be haemodynamically less taxing than extracorporeal therapy, and is technically easier to do. However, some children are poor candidates for peritoneal dialysis, such as those with a history of abdominal surgery, severe anasarca, or who present with toxic ingestions or inborn errors of metabolism that require rapid solute removal.\(^7,8\)

In the past few years, dialysis manufacturers have developed smaller filters for use in children receiving intermittent haemodialysis or CRRT. However, because the dialysis machines were designed for adult use, smaller children often need blood priming, which increases the risks of hypotension from bradykinin release and cardiac dysfunction secondary to chelation of calcium by the citrate anticoagulant used in banked blood.\(^9\) The high blood-flow requirements of adult machines also necessitate large-bore vascular access, which can be challenging to insert surgically and can permanently damage central vessels.\(^10\) There is a clear unmet technical need for paediatric-specific dialysis treatment.

Ronco and colleagues\(^5\) describe their design, development, and testing of a new CRRT machine, named CARPEDIEM (Cardio-Renal Pediatric Dialysis Emergency Machine), specifically for use in neonates and infants. This work expands on the group’s previous experience doing continuous arteriovenous haemofiltration with a minifilter that they designed and used to treat four very young infants (younger than 12 days) with acute kidney injury.\(^6\) The investigators should be commended for their efforts in this important area and for their use of several collaborators, including non-profit funding support. Importantly, they report the first ever patient treated with their new machine, a neonate who developed oligoanuric acute kidney injury and several metabolic derangements secondary to severe haemorrhagic shock. The child survived the neonatal period, an outcome that would have been less likely just several years ago, without the new machine or improvements in overall neonatal care.

In addition to having the capability to provide several forms of extracorporeal therapy (CRRT, plasmapheresis, and albumin dialysis), the small volume of the CARPEDIEM circuit does not require blood priming. The importance of limiting exposure to blood products, which decreases the risk of developing sensitising antibodies, should not be underestimated in children.

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with an increased likelihood of needing a future kidney transplant. Because CARPEDIEM is able to achieve lower blood-flow rates than existing machines, dialysis access was achieved with a smaller (4 French) vascular catheter than is typically used in children receiving CRRT (6–7 French).10 One of the most important improvements over the existing practice of adapting adult machines for use in very small children is the ability of CARPEDIEM to control ultrafiltration down to the millilitre. A major limitation of devices designed for adults and adapted to infants is the potential for errors in ultrafiltration volumes that would be trivial for an adult, but not for an infant.

Providers have become increasingly experienced in the care of children with kidney disease and new paediatric-specific technologies have become available over the past decade. In 2013, the National Institute of Diabetes and Digestive and Kidney Diseases convened a multidisciplinary workshop focused on systematically and prospectively studying kidney injury in neonates.11 We hope that such efforts will translate into improved outcomes, both for children who need renal replacement therapy for acute kidney injury and for those who are developing end-stage kidney disease.12,13

In the case reported by Ronco and colleagues,5 although the child survived to hospital discharge, she still had severe chronic kidney disease at the last follow-up. This outcome should motivate investigators to continue to develop new therapeutic strategies not only to manage existing kidney injury, but also to prevent permanent damage from occurring in the first place. Although the initial results with the new device are encouraging, more research will be needed to determine whether adequate solute clearance can be achieved in all patients with the low blood-flow rates and reduced-volume filters of CARPEDIEM.

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Hydration in contrast-induced acute kidney injury

Contrast-induced acute kidney injury is associated with prolonged hospital stay, increased health-care costs, and raised risk of both further deterioration of kidney function and unfavourable clinical outcome.3 A general consensus exists for the beneficial effect of hydration in preventing contrast-induced acute kidney injury. Hydration increases urine flow rates,7 reduces the concentration of contrast media in the tubule, and expedites excretion of contrast media, thus reducing the length of time that tubular cells are exposed to the toxic effects of contrast media.3 Although different hydration solutions and regimens have been suggested, choice of solution (eg, sodium bicarbonate vs sodium chloride) remains controversial.4 The most widely