

# Scientists invent kidney dialysis machine for babies and safely treat newborn with multiple organ failure

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In this image made available by the San Bortolo Hospital in Vicenza on Thursday May 22, 2014 a nurse Mariangela Mettifogo, left, and Dr. Claudio Ronco treat a baby hooked up to a new dialysis machine at the San Bortolo Hospital in Vicenza, Italy, in the summer of 2013. Doctors in Italy have designed a miniature dialysis machine for babies, used for the first time last year to save a newborn girl, according to a new report. Usually, doctors adapt standard dialysis machines for babies, but that can be risky since the devices can't always be accurately tweaked. About 1 to 2 percent of hospitalized infants have kidney problems that may require dialysis, which cleans toxins from the blood when the kidneys aren't working. (AP Photo/San Bortolo Hospital )

Italian scientists have developed a miniaturised kidney dialysis machine capable of treating the smallest babies, and have for the first time used it to safely treat a newborn baby with multiple organ failure. This technology has the potential to revolutionise the treatment of infants with acute kidney injury, according to new research published in *The Lancet*.

The new continuous renal replacement therapy (CRRT) machine—named CARPEDIEM (Cardio-Renal Pediatric Dialysis Emergency Machine)—was created to overcome the problems of existing dialysis machines that are only designed for adults and have to be adapted for use in newborns and small infants.

"Such modifications make adult devices inaccurate when used in infants smaller than 15kg and can result in complications with fluid management and treatment delivery", explains lead author Professor Claudio Ronco from San Bortolo Hospital in Vicenza, Italy. "A major problem is the potential for errors in ultrafiltration volumes—adult dialysis equipment has a tendency to either withdraw too much fluid from a child, leading to dehydration and loss of blood pressure, or too little fluid, leading to [high blood pressure](#) and edema."

To address these technical challenges, Professor Ronco and colleagues developed a miniaturised device for kidney support in newborn babies and small infants weighing between 2kg and 10kg. It has the capacity to accurately handle very low blood and ultrafiltration flows compared with existing machines, allowing the use of a much smaller sized catheter than is typically used in children, which could prevent damage to blood vessels.

In August, 2013, at the San Bortolo Hospital in Italy, a [newborn baby](#)

weighing just 2.9kg became the first person in the world to be treated with the device following multiple organ failure due to a complicated delivery. After more than 20 days of treatment with the device, doctors were able to discontinue renal support. Organ function was restored and the newborn patient was discharged from hospital after 50 days.

According to Professor Ronco, "We have shown how the technical challenges of providing CRRT can be overcome without relying on the adaptation of technology used in adult settings, and that a CRRT device designed specifically for use in neonates and small children can be used to safely and effectively treat acute [kidney injury](#) in small paediatric patients. We hope that our success will encourage the development of other medical technologies (eg, catheters, fluids, and monitors) specifically designed for infants and [small children](#)."

It is estimated that 18% of low-birthweight infants are affected by [acute kidney injury](#) and it is increasingly common in children admitted to hospital, with an incidence of almost 20% in children admitted to intensive care.

Writing in a linked Comment, Benjamin Laskin from The Children's Hospital of Philadelphia in the USA and Bethany Foster from Montreal Children's Hospital in Canada say, "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...[However] 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."

**More information:** Paper: [www.thelancet.com/journals/lan...](http://www.thelancet.com/journals/lan...)  
[/lan... \(14\)60799-6/abstract](http://www.thelancet.com/journals/lan...)

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