Rapidly removing fluid from ICU patients in kidney failure linked to increased death risk

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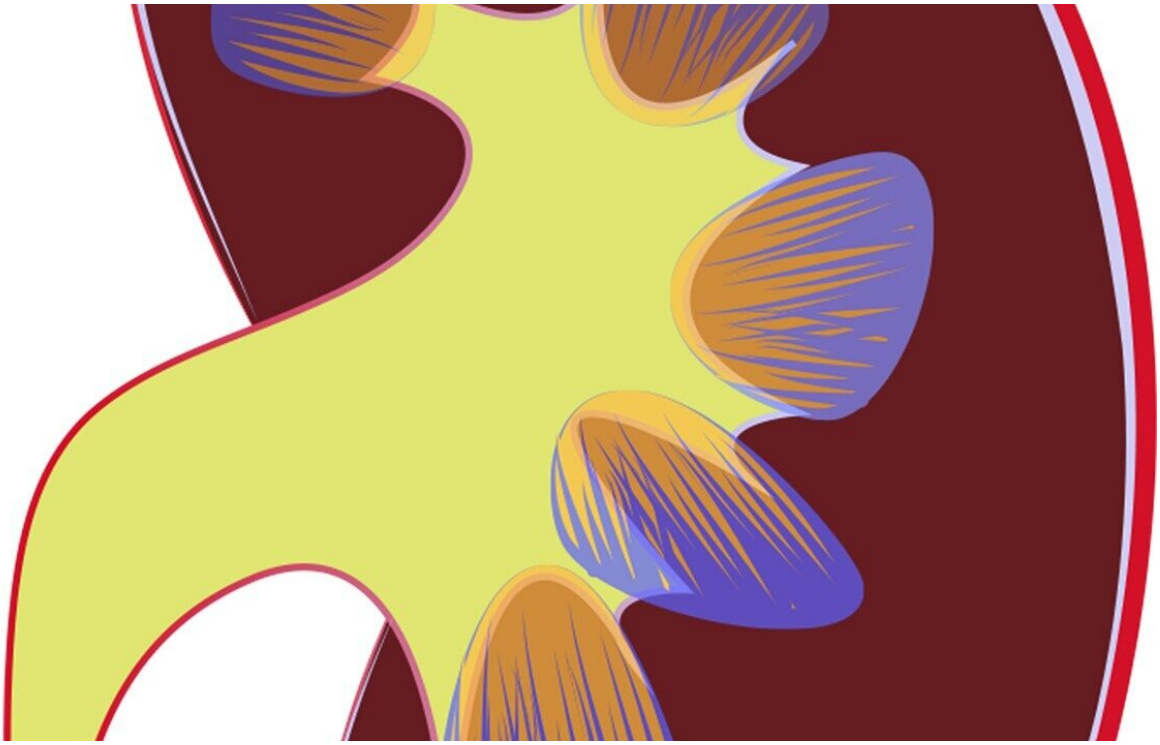

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The faster fluid is removed using continuous dialysis from patients with failing kidneys, the higher the likelihood they will die in the next several months, according to a study published today in *JAMA Network Open* by University of Pittsburgh School of Medicine researchers.

Nearly two-thirds of critically ill patients with acute kidney injury have extra fluid accumulating in their bodies, which can put pressure on their lungs and cause injury to other organs. To relieve that pressure, clinicians routinely remove the excess fluid from the blood while performing dialysis in the intensive care unit. But there is no guidance on how fast that fluid should be removed.

"We want to get this excess fluid out of our patients before it causes damage but, in removing it, we're actually causing a controlled loss of fluid that can sometimes cause stress on the heart and lead to dangerously low blood pressure," said lead author Raghavan Murugan, M.D., M.S., associate professor in Pitt's Department of Critical Care Medicine and UPMC physician. "So the question—how rapidly to remove fluid?—has been asked in the critical care community for many years, but there's been no good answer."

Previous studies in outpatients who are not critically ill found that routine dialysis—a procedure to remove waste, toxins, salt and extra water from the blood of people whose kidneys have failed—when performed too quickly, is associated with increased risk of death.

Murugan partnered with senior author Rinaldo Bellomo, M.D., Ph.D., a professor of intensive care medicine at the University of Melbourne in Australia to find out if that finding extends to critically ill patients. Their team examined data from 1,434 patients that Bellomo had previously collected for the Randomized Evaluation of Normal vs. Augmented Level of Renal Replacement Therapy trial, which was conducted between December 30, 2005 and November 28, 2008 in 35 intensive care units in Australia and New Zealand.

The research team found that for every 0.5 milliliter increase in fluid removed per kilogram of the patient's weight per hour (0.5 mL/kg/hr), their risk of death increases. That translates to a 51% to 66% higher risk

of death in the next three months for critically ill patients for whom excess fluid is removed at a rate greater than 1.75 mL/kg/hr, compared to patients for whom excess fluid is removed at a rate less than 1.01 mL/kg/hr.

For the average older American male, that's a difference of removing a gallon of fluid in about one day versus a little under two days.

Murugan is quick to point out that his analysis shows association, not causation; until a clinical trial is performed to specifically test the effects of removing fluid faster versus slower, he cannot say for sure that removing fluid slowly is better for the patient. And, in some cases, such as imminent heart failure, Murugan says a more rapid removal of fluid might be warranted to prevent sudden death.

"You have to balance the pros and the cons, and decide how fast to remove fluid based on your patient's clinical condition," said Murugan, who also is a member of Pitt's Clinical Research, Investigation, and Systems Modeling of Acute Illness Center and the Center for Critical Care Nephrology. "But in a patient where I can't find an immediate need to get fluid out quickly, I'll be removing fluid at a slower rate until we get definitive results and guidance from a clinical trial."

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