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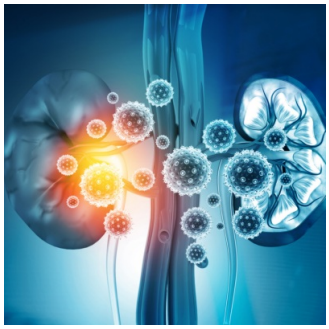
# New Clinical Decision Support System Benefits Patients With Acute Kidney Injury



From wearable devices to artificial intelligence, the health care world has seen a boom in new digital health technologies. But while these new robotic medical assistants are exciting, they are only relevant if their benefits can be backed by scientific evidence.

One promising new technology is an electronic alert system that could benefit patients suffering with acute kidney injury [AKI]. In the event of AKI, certain commonly used medications should immediately be stopped to avoid further damage. This new clinical decision support system works by sending an alert containing information about a patient's creatinine—a marker of kidney function—and medications of concern, prompting clinicians to take immediate action. In a new study published May 17 in *Nature Communications*, a team of researchers found that the alert system is highly effective in getting physicians to discontinue medications in a more timely way.

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-F. Perry Wilson, MD

"Doctors have to make hundreds of decisions a day," says F. Perry Wilson, MD, associate professor and director of Yale School of Medicine's Clinical and Translational Research Accelerator (CTRA). "We hope to take some of these off their plates so they'll have more time to focus on the more complicated health issues."

AKI is an abrupt decline in kidney function. The condition is fairly common—about 10 to 15% of all hospitalized patients will experience it. It also can pose a serious threat to patients. The risk of dying during hospitalization increases tenfold in individuals who suffer from it.

Many medications can contribute to AKI. Some of these substances are directly toxic to the kidney, including some antibiotics and intravenous contrast media used during CAT scans or cardiac catheterization. For others, an immune response to the drug damages the kidneys. "This is very person-dependent," Wilson says. "Some people tolerate these medications completely fine and will never have an issue. But for others, exposure to these medications activates their immune system in such a way that it harms the kidneys." Because AKI is largely asymptomatic, physicians may not instantly see a need to stop harmful medications.

### Actionable Alerts Are More Effective Than Informational Alerts

Furthermore, while previous alert systems would warn doctors if their patients developed AKI, they didn't give specific recommendations about what to do about it. "This is what we call purely informational alerts, and studies show that they don't do very much. They don't really push people to take an action," says Wilson. "What we're realizing is that in order to move the needle, systems need to provide very specific, concrete instructions in addition to the information."

To address this, Wilson has been involved in building a new kind of experimental clinical decision support system that sends alerts through patients' electronic health records. When a doctor enters a patient's chart, they receive an alert that not only informs them what's wrong, but also suggests a way to fix it, such as discontinuing a medication. Furthermore, the system allows doctors to fix the problem right within the patient's chart. "Our lab has been part of iterating different system models, and now we feel we're on a successful path where we can show that structured alerts improve not only prescribing habits, but also patient outcomes," he says.

**Clinical Decision Support System Effective in Getting Clinicians to Take Action**

Wilson's latest study is a pragmatic, randomized control trial. From August 2020 to November 2021, the team's clinical decision support system enrolled any patient admitted to Yale New Haven Hospital, Bridgeport Hospital, Greenwich Hospital, and Yale New Haven Hospital Saint Raphael Campus who developed AKI. In total, the study involved 5,060 participants.

The system then randomized participants to be either control participants, in which no alerts fired, or intervention participants. For intervention participants, the system sent an alert once a day for as long as the patient had an AKI. It also offered suggestions for corrective action. There were three classes of medications the alerts signaled to discontinue: non-steroidal anti-inflammatory drugs (NSAIDs), renin-angiotensin-aldosterone system inhibitors, or proton pump inhibitors. Once clinicians discontinued the problematic medication or the patient recovered, the alerts ceased.

14 days after randomization, the team compared three participant outcomes. First, they looked at progression of AKI—whether the condition got substantially worse compared to the control. They also looked at whether participants required dialysis, meaning kidney function had plummeted. Finally, they measured survival in both groups.

The study found that the alert was highly effective in getting clinicians to stop medications of concern. Overall, intervention participants had slightly better clinical outcomes than the controls, though they were not statistically significant. But among patients who were specifically taking proton-pump inhibitors, intervention participants had significantly better outcomes. For this group, the alerts were highly effective in reducing the risk of worsening AKI, the need for dialysis, or death.

This finding is important, says Wilson, because proton-pump inhibitors are very common medications. In fact, nearly 65% of participants resolved in the study were receiving these drugs. "This is a really intriguing finding because it suggests that these types of alerts may be more or less beneficial depending on the medication," he says. "Some medications might be worse for the kidneys than others, so the alert is likely going to be better for the medication that is potentially more harmful."

**Improving the Future of Medical Technologies**

The study supports the idea that through giving targeted recommendations, clinical decision support systems can help improve care substantially. Now, Wilson's team is conducting another trial called the Kidney Action Team Trial, which focuses on a variety of early acute injury actions beyond discontinuing problematic medications, "from how to diagnose AKI properly to what early treatments might be effective," he says. This more holistic approach may help clinical decision support systems offer even more detailed guidance. "For patients both in and out of the hospital, I hope we can use more electronic tools to make sure there are no missing pieces to the puzzle," he says. "That is how we can improve our care of patients—by making sure we fill in those small gaps that may have been overlooked by providers."

Wilson is also interested in teaching artificial intelligence to help guide clinicians. "It's conceivable that someday, we could have an artificial intelligence that can make really appropriate recommendations across a wide variety of domains, sort of like a doctor's assistant," he says. "I think that would be a really cool place for this technology to go."

**Source: Yale School of Medicine**

**Image Credit: iStock**

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