

Lab studies new steps in urine and anemia screening

Kevin B. O'Reilly

August 2015—Despite the demonstrated value of implementing reflex testing algorithms to improve patient care and avert wasteful spending, the road from conceptual understanding to plan-in-action can be rocky.

A pathologist at one academic medical center recently talked about his experience with reflex testing algorithms in the areas of urine screening and preoperative anemia screening. His story illustrates the barriers to change as well as the enviable outcomes that could potentially be achieved.



Dr. Donaldson

Often the first roadblock is resistance from clinicians who are satisfied with the status quo, Keri Donaldson, MD, MSCE, tells CAP TODAY.

“Commonly, the first response is, ‘We don’t have a problem’ or ‘There’s no issue,’” says Dr. Donaldson, assistant professor of biochemistry, molecular biology, and public health at Penn State College of Medicine. He also directs Penn State’s clinical processing specimen laboratory and the CLIA laboratory at the medical school’s Institute for Personalized Medicine.

“How you tend to build consensus that there’s an opportunity to improve practice is with data,” he says.

In the area of urine screening, for example, Dr. Donaldson initially was suspicious about what he considered a high rate of urine cultures and a high rate of negatives for those cultures. To comply with pay-for-performance measures regarding health-care-associated infections such as catheter-associated urinary tract infections, the urine is tested for virtually every newly admitted hospital patient. At Penn State Milton S. Hershey Medical Center, that adds up to about 33,000 urine cultures annually, with a 72 percent negative rate.

That elevated rate was not “shocking,” Dr. Donaldson says. One expects, after all, that a screening test will yield mostly negative results, but it seemed to offer an opportunity.

“With a 70 percent negative rate, if you can figure out a way to preclude that test from being needed, or make the testing more efficient, you can have a big impact,” he says. “If that number is seven percent, then I don’t bother to go looking, but when that number is 70 percent, then you can go looking and try to find a way to more efficiently perform that testing and make a difference.”

“We showed the high percentage of negative cultures and said we believe this is an opportunity to improve current practice,” says Dr. Donaldson, who chairs the CAP’s Instrumentation Resource Committee. “It is not only a fair amount of negative cultures. In addition to what we’re seeing, there is a known false-positive rate associated with urine sitting out for long times prior to culture.”

“So we said here’s the rate, but we didn’t stop there. We went to the next level of descriptive analysis,” he says.

Instead of ordering a culture on each urine specimen, Dr. Donaldson and his team suggested an initial

microscopic analysis of specimens using an automated urine particle analyzer—the Sysmex UF-1000i. But how many UTIs would be missed by taking that route? Dr. Donaldson ran the numbers.

“We decided to do a model using the retrospective data, to discuss whether this change would do any harm,” he says. “We have this high rate of cultures. If we went through and did the effects modeling, what percentage of those would actually be an issue?”

At the Executive War College in May, Dr. Donaldson presented data from microscopic analysis of more than 4,000 unique urine specimens from adult inpatients at Hershey Medical Center. The urine screen achieved a sensitivity of 98 percent and a specificity of 93.7 percent. Thirty percent of the specimens were positive for bacteria and had high white blood cell counts that would indicate the need to reflex to culture; 70 percent were negative.

Of that 30 percent, only 55 specimens had positive cultures, amounting to a 95.5 percent negative predictive value of the urine microscopic analysis. Just eight of those 55 specimens had positive cultures with more than 100,000 colony-forming units that would indicate infection, which works out to a 99.3 percent negative predictive value.

Among pediatric inpatients, the value of microscopic analysis as the initial screen for UTI was even more impressive. Of 373 unique urine specimens, 28 percent were negative but only five of these had positive cultures and none of them had colony counts greater than 100,000. That means a nearly 100 percent predictive value for urine microscopic analysis among pediatric patients. Improvement is needed, however, for detecting yeast.

Among both groups of patients, then, initial screening of urine specimens using microscopic analysis could help slash about 30 percent of urine cultures performed—nearly 10,000 a year—with virtually no false-negatives. The potential savings go well beyond the avoided expense of urine cultures. All those patients treated empirically with antibiotics for two days during the wait for culture results could go without the medicine, saving the medical center between \$11,000 and \$900,000 annually depending on physicians’ antibiotic prescribing habits.

“The reason for the gap in estimated cost of these services is how you model what drug that patient would have been on,” Dr. Donaldson says. “On the lower end is the cheapest antibiotic, and on the more expensive end is the most expensive drug. It’s hard to predict what people would have been put on. . . . In certain systems, people prescribe more expensive drugs.”

After using these data to build consensus, the Hershey laboratory started to discuss a workflow to allow physicians to order microscopic urinalysis as the first screen, reflexing to urine cultures for positives. While some clinicians—Dr. Donaldson points to neurosurgeons and surgeons as his shining stars—have bought in quickly to this new method of urine screening, he says it is too early to tell how overall ordering patterns have changed, and the automatic reflexing to culture has not been initiated.

The move to the new reflex testing approach in urine screening remains at the educational level, Dr. Donaldson says.

“We haven’t gone through and done any real tertiary decision support,” he says. “We have gone through and proposed order-set generation to increase appropriate practice, but we haven’t done that yet. I’d argue that, probably, the default on any order set should be urine screening with reflex to culture. But right now it’s still in the development stages.”

Not every opportunity to use reflex testing offers the hope for big-dollar savings, as Dr. Donaldson and his Penn State colleagues discovered when they accepted the challenge to revise their approach to preoperative screening of patients for anemia.

A local health insurer set a pay-for-performance target related to the percentage of patients evaluated for anemia before elective surgery, seeing in its data an opportunity to close so-called gaps in care. The faster the patients’ anemia could be evaluated and acted upon, the likelier they were to have a smooth surgery and quick recovery, racking up fewer bills for the insurer to pay. A look at the stream of testing found room for improvement.

"The current process is complicated, with a lag of many weeks or months. That's an opportunity," Dr. Donaldson said during his War College talk.

"So if your baseline labs come back as abnormal, there will be a follow-up visit with the nurse practitioner or the surgeon," he tells CAP TODAY. "Then they get set up with an appointment to see a hematologist. That appointment could take a few weeks to get. Now you've already waited one month. Then they see the hematologist who says you're anemic, let's order some labs. Then that hematologist orders the appropriate labs.... Then you've got a follow-up visit two weeks later. You've got a month and a half gone by before you've identified the reason for the anemia. When we saw that process, we said we can improve this within our reflex testing system."

A hematology colleague developed a reflex testing algorithm that would alert hematology when a preoperative patient is shown to be anemic through CBC testing. That hematologist would then immediately order the next steps in the algorithm to measure the patient's ferritin, serum iron, and total iron-binding capacity. Then the results would be available for the hematologist to evaluate and potentially treat the anemia during that first visit with the preoperative patient.

"This takes the time-to-care delivery and compresses it down from three to four weeks to, at best, a single visit. That's a huge deal," Dr. Donaldson said.

However, the impact has not been that great. It turns out that only four percent of Hershey Medical Center's elective surgery patients are anemic before surgery. So while, ideally, the testing would be reflexed through the laboratory information system, the work needed to do that has been delayed.

"We analyzed the way to do this very well and slickly, and it turned out not to be a great opportunity to do this. We prioritized it lower on the list."

Yet, for Dr. Donaldson, even that decision shows the value of gathering data to inform laboratory efforts to implement reflex testing. Since such efforts are rarely painless, having the information available to show where the most impact can be made is vital to setting the right priorities.

As for the still oft-heard refrain that evidence-based reflex testing algorithms reflect a "cookbook" approach to medicine, Dr. Donaldson offers a pithy reply: "There are exceptions to these rules, but the rules should not be the exception."

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