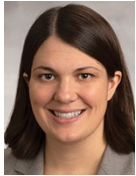


Urine test ordering—good and going for better

Charna Albert

December 2022—Reflex urine culture algorithms have become common and have been shown to reduce urine culture utilization, but efforts to sharpen clinical decision support continue.



Dr. Howard-Anderson

“You want to make it as easy as possible to do the right thing,” says Jessica Howard-Anderson, MD, MSc, assistant professor of medicine, Emory University School of Medicine, and associate hospital epidemiologist, Emory University Hospital Midtown. She advises making the reflex culture the default pathway. And when it comes to educational support on appropriate urine test ordering, “you don’t want that to be something that they [physicians] always have to click through or take a lot of time to read to get to the correct order set you want them to use.”

Making it easy was front of mind for the multidisciplinary team of physicians at Emory Healthcare who in 2017 implemented a reflex urine culture algorithm in three hospitals in the Emory network. In that intervention, the default inpatient urine culture order was replaced with an order set with two options: a prechecked order for urinalysis with microscopy, which reflexes to a urine culture if 10 or more white blood cells per high-power field are found, and a urine culture without a urinalysis (non-reflex urine culture). They kept the second option in the order sets for obstetric, neutropenic fever, neonatal, renal transplant, and pre-procedure urology patients, or for unusual circumstances in which clinicians wanted to order a urine culture directly. A retrospective study of inpatient urine culture rates before and after the order system intervention was put in place revealed a 47.2 percent reduction in the number of urine cultures ordered per 1,000 patient-days (Howard-Anderson J, et al. *Infect Control Hosp Epidemiol.* 2020;41[3]:369–371).

New order interface updates that went live this October, when the health system transitioned its electronic medical record from Cerner Millennium to Epic, should make inappropriate urine testing still less frequent, Dr. Howard-Anderson says. “We want to make sure people are really thinking about ordering appropriate urine cultures. The new order set should make it easier to order the right test for the patient.”

With the new interface they’re providing more education on when patients should be treated for urinary tract infections, she says. “Just because a patient has pyuria and their urinalysis has enough white blood cells to meet the urine culture threshold doesn’t necessarily mean the patient has a UTI.” So in Epic, “the big new thing is you have to provide an indication for why you’re ordering even the urinalysis with reflex to urine culture. We didn’t require that in Cerner, so that will be the newest intervention.” The indications, which are presented as multiple-choice options, include UTI symptoms (urinary frequency, fever, or an obstruction of the urinary tract), septic shock, and spinal cord injury, with nonspecific symptoms such as bladder spasm, malaise, autonomic dysfunction, or fever. The option to proceed directly to urine culture, such as for those who are pregnant, remains with enhanced clinical decision support.

They plan to track whether the indications physicians choose when they order the reflex culture match up with the clinical information in the patient’s chart “to look for gaps in the current process and better understand the drivers of ordering urine cultures,” Dr. Howard-Anderson says.

Before the health system went live with Epic, Jesse Jacob, MD, MSc, senior author on the 2020 article and hospital epidemiologist at Emory University Hospital Midtown, spoke about the new order interface with the heads of hospital medicine services and critical care leads at all the hospitals. “He presented it to them and got their feedback,” Dr. Howard-Anderson says, noting that the inclusion of septic shock as an indication for ordering the reflex culture came out of those discussions. Conversations about how to optimize the order set are ongoing, she says. “So it’s an iterative process.”

New also are instructions within the order on how to collect urine cultures. These differ for patients who have urinary catheters, Dr. Howard-Anderson says. “If they have a urinary catheter and it’s been in for over seven days, the instructions are to remove the catheter, if possible, get a clean catch urine sample, and ideally not reinsert the catheter if they don’t need it anymore. If they do need it, it prompts providers to order the repeat catheter, and then they have to give an indication for the urinary catheter. So it’s trying to target both urine culture ordering as well as catheter use, wrapped up in the same order set.” They’ve also incorporated new educational support. “There’s a little bit of text about when urine cultures are not indicated,” she says. “We’re trying to educate people that a change in urine color, odor, or cloudiness shouldn’t be a reason to get a urine culture unless it’s paired with symptoms” or the other listed indications.

With the transition to Epic, hospital processes have been standardized across the health system, Dr. Howard-Anderson says, and the reflex algorithm now has been implemented across all hospitals in the network. They also have made a minor change to reflex criteria. The urinalysis now reflexes to a culture if 20 or more white blood cells are found, she says, a decision that came out of a quality improvement process in which charts of patients who had urine cultures were reviewed. In patients who had between 10 and 20 white blood cells in their urinalysis results and a positive urine culture, she says, “almost all of those cases were attributed to something other than a UTI.” With the 10 WBC threshold, then, unnecessary urine cultures still were being ordered. “In clinical practice when we see people with UTIs, they usually have greater than 150 white blood cells.” And in the chart review they didn’t find any missed UTIs in the 10 to 20 threshold range, she says.

Dr. Jacob and others worked with Epic on the order interface, Dr. Howard-Anderson says. “A lot of institutions use Epic and have thought about urine culture stewardship, and so there were some things that were already built. But they built this order set based on our specific requests, so it’s our own sort of homegrown Epic order set.”

The prechecked setting on the reflex urine culture order has been critical to the intervention’s ongoing success, Dr. Howard-Anderson says. “It’s what we call a nudge in terms of making something easier to do without restricting anything or significantly changing the choice architecture.” When a busy physician sees that the order for the reflex culture is already selected, they’re more likely to place the order, she says. It’s helped, too, that the reflex order is the first option to appear when physicians search for a urine culture. “Because people far and away are going to pick the first option.”

Some may be reluctant to use a prechecked setting, says David Murphy, MD, PhD, coauthor of the 2020 *Infection Control & Hospital Epidemiology* article and associate professor of medicine in the Division of Pulmonary, Allergy, Critical Care, and Sleep Medicine at Emory. “We are often hesitant to set defaults because we recall the one in a hundred, one in a thousand patient scenario, and we need to have a robust enough system to account for those.” But those rare situations shouldn’t deter the use of default settings, Dr. Murphy says. “And in fact if we don’t set a default, we’re making the decision to provide no real guidance, and that’s problematic.”

Physicians are well aware that the standard urine culture should be ordered for some populations, such as pregnant patients, he says. And beyond the stated exceptions, “there certainly is room for variation,” he says. “Doing something 100 percent of the time for 100 percent of people is rarely the right thing to do.” If a patient has a history of resistant bacteria, for example, or if a patient is immunosuppressed in a way that’s not captured in the text of the order set, “clinicians at the bedside are going to understand those variations need to be made.”

Dr. Howard-Anderson and coauthors also reported a decrease in urinary tract infection diagnoses after the intervention went into effect in 2017. “A lot of institutions have implemented similar pathways in terms of having a

reflex order set," she says. "But we're not aware of other studies that have looked at how that changes how clinicians are actually diagnosing patients and subsequently treatment." She and her coauthors weren't able to measure antibiotic use with the available data, "but we did see a modest but statistically significant decrease in the amount of UTIs diagnosed." (The monthly median rate of UTIs/1,000 patient-days decreased from 16.1 to 14.7, for a potential monthly decrease of 49 UTIs.) By limiting urine cultures to patients with pyuria, "our hope is that people were more appropriately diagnosing UTIs."



Dr. Murphy

Says Dr. Murphy, "We're trying to decrease the false-positive cultures, or rather patients who are incorrectly classified as having a urinary tract infection based purely on a culture." Such improper classifications also have infection prevention surveillance implications, "because infection prevention uses the clinical information to determine whether it meets the CDC surveillance criteria for a catheter-associated urinary tract infection," he says. "When coders are looking at this they may see the clinician documentation saying 'we've got a positive urine culture, or a UTI,' and then they abstract out of the chart, based upon clinician documentation, a diagnosis." So cases of asymptomatic bacteriuria with a positive culture but no pyuria or symptoms, he says, may be incorrectly classified as UTIs by clinicians at the bedside and subsequently by administrative coders.

"If one looks at the CDC for frequency of urinary tract infections, that number is somewhat inflated by asymptomatic bacteriuria [cases]," he says. Discharge diagnoses in administrative data are similar. "So we're trying to get to the root of that."

At Barnes-Jewish Hospital in St. Louis, where a reflex urine culture algorithm was instituted in 2015, physicians are given a choice of three reflex orders, says Ronald Jackups Jr., MD, PhD, associate professor of pathology and immunology, Washington University School of Medicine, and associate chief medical information officer for laboratory informatics, BJC Healthcare. "The simplest one is a urinalysis reflex to microscopic, and that begins with a macroscopic urinalysis," Dr. Jackups says. If it's positive for one of four triggers—blood, leukocyte esterase, nitrates, or more than trace protein—it reflexes to a microscopic urinalysis. "And that is it," he says. "It will not trigger a urine culture. And that is used by clinicians who want to do routine urinalysis testing but have no suspicion of a UTI because the patient's asymptomatic."

The second is a standard macroscopic urinalysis with reflex to microscopic and culture. It goes through the same steps as the first option, but "if the microscopic contains more than 10 white cells per microliter, it will trigger the culture," he says. The third is for neutropenic patients. "It starts the same way, macro, and if that reflexes, it orders both the urinalysis microscopic and the urine culture, no matter what. It doesn't look at the white count," Dr. Jackups says. And they do allow urine culture to be ordered separately, with the expectation that it will be limited to the populations in which urinalysis is considered less capable of ruling out UTI—pediatric, urology, and pregnant patients.



Dr. Jackups

Dr. Jackups and colleagues may soon eliminate the reflex order for neutropenic patients. “We found that a lot of clinical providers, including in oncology, are not using the urinalysis reflex specific for neutropenic patients, and we fear that’s simply communication or lack of awareness,” he says. Rather than put the onus on physicians to follow a different pathway for neutropenic patients, “we’re looking into the ability to combine the two reflexes into one.” The way this would work, he says, is they would build a new condition in the standard reflex order that would consider the patient’s most recent CBC. If the patient is neutropenic, the white count rule would then be ignored and the culture would be ordered. “So it would basically trigger more cultures in neutropenic patients than it is now.” The combined rule would eliminate the awareness problem for physicians, he says. “They don’t have to be aware as long as they know there’s one order to go to.”

Dr. Jackups and others reported a reduction in the number of urine cultures performed at Barnes-Jewish Hospital in 2018 and 2019 studies reported in CAP TODAY (<https://tinyurl.com/22234xsb>). “After COVID hit everything changed,” he says. But after the initial few months of the pandemic, urine culture rates stabilized at a lower rate than what they had seen pre-COVID, with rates slightly lower in 2021 and 2022 than in 2019. “I can’t say if all of that is due to COVID, but it seems we are now in a stable place post-pandemic.”

Laboratories that might move to adopt a reflex urine culture algorithm or otherwise attempt to reduce the number of urine cultures should expect a lot of trial and error, Dr. Jackups says. “Your first effort to improve the process could be surprisingly successful or a complete failure.” He advises incorporating stakeholders, “particularly the clinicians you’re going to be affecting, because if they’re not included, they can decide to not participate and continue to use orders in the old way.” And it’s critical throughout the process to monitor effects. “Because the effect can always surprise you, in either direction. So it is important to monitor and to change the process based on the new data you find.”

He advises, too, not to rely on order alerts. “They tend to be overridden a lot more because they tend to be aggressive” and to resemble the pop-ups seen on websites. “All those annoying pop-ups. And so it’s easy for providers to ignore them without seriously considering the language within them.” Other forms of clinical decision support have been more successful, in his view, “and that includes building reflexes and using order-entry questions to elicit information from providers and to give them a warning that doesn’t feel like a pop-up.”

Responses to order-entry questions can be required. “And because it’s not presented as a pop-up, clinicians may be more thoughtful and willing to provide a useful response.” With reflexes, “as long as the order name is clear, the provider doesn’t have to do anything else. They can order the reflex and then our rules within the lab will make what we feel are the best decisions for the test algorithm.”

A reflex algorithm would be built in the laboratory information system, and order-entry questions would be implemented in the EHR. “So partly it depends on which teams you have the easiest access to,” Dr. Jackups says. “But all things being equal, order-entry questions are usually fairly easy to implement,” whereas reflex algorithms are more complicated. “It does take a long time to build a reflex because you have to build all the rules and you have to validate them, both in a test environment and then in the live environment. But once they’re built, as long as you’re monitoring for surprises, it’s usually pretty stable after that.”

With order-entry questions, it’s important to monitor how physicians are responding, he says, and with such questions he usually includes the option to use free text. “Sometimes when the provider doesn’t like the answer options it’s helpful to hear what they think. It isn’t always what I expect or want to hear, but it’s often illuminating. And a good number of them are happy to provide text.”

For smaller hospitals with fewer IT resources, Dr. Jackups urges building relationships and becoming visible. “Number one, if you want your interests to be heard, you need to work with your clinicians. We need to stop thinking of the pathologist as the person who stays in the lab or stays in their office and signs out cases. We need to be more visible to the system.”

“If you can get buy-in from system leaders,” he continues, “they can help connect you with the information systems teams. And in the same way you want to be visible to the clinicians, you also want to be visible to your

information system teams. You don't want your request to feel like a demand coming from a faceless group." Be engaged with the team, understand their work and the bandwidth they have, and be patient, he says, because in smaller hospitals in particular, the information systems teams tend to be overworked—though it's true of all hospitals, he notes. Once a relationship has been established, "you can explain which initiatives are higher priorities than others and help them arrange their schedules as to which they want to focus on first."

Support for reflex urine culture algorithms isn't universal. "In some ways they miss the boat," Dr. Howard-Anderson says. "They get at the low-hanging fruit—that urine cultures generally are not indicated if there is no pyuria." But they don't address the fact that for patients without UTI symptoms, there may be no need to order even the urinalysis. "So there's still a lot of excessive ordering that it doesn't target," she says. "And one could argue that you should focus on education," rather than put in place a reflex algorithm. Cutting out unnecessary testing completely, she says, is "the ideal world."

"There are different beliefs about whether you should shoot for that ideal standard."

Charna Albert is CAP TODAY associate contributing editor.