Antimicrobial Stewardship News

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Diagnostic Stewardship: An alternative approach to reduce HAIs and improve clinical care

Unnecessary diagnostic testing can lead to over-diagnosis, inappropriate antibiotic therapy, and increased rates of healthcare-associated infections (HAI). In order to avoid these unintended consequences, diagnostic stewardship should be a key focus area for both infection prevention and antimicrobial stewardship teams in community hospitals. Diagnostic stewardship is coordinated guidance and interventions to improve appropriate use of microbiological diagnostics to guide therapeutic decisions.[1] In this newsletter, we'll examine some useful techniques to reduce unnecessary diagnostic testing for two commonly overused tests: urine cultures and *C. difficile* tests.

Why do clinicians overuse tests?

Clinicians overuse diagnostic tests for several potential reasons. Quick ordersets improve clinician efficiency, but they also enable providers to order multiple (and frequently unnecessary) tests, leading to clinically irrelevant findings.[2] Patterned behavior, such as performing a "full fever work-up" with pan-cultures for every fever instead of testing based on clinical findings also contributes to overdiagnosis. Additionally, increasing pressure to reduce admission duration and a desire to practice defensive medicine incentivize clinicians to order any test they believe may become clinically relevant as early as possible instead of taking a step-wise approach to diagnosis.

Required reporting of healthcare-associated infections can also lead to unnecessary testing. For example, concerns over reduced reimbursement or negative hospital reputation have led many hospitals to increase unnecessary diagnostic testing at the time of admission. The rationale behind this unnecessary testing is to ensure community-acquired processes are not labeled as HAIs due to a delay in testing. Unfortunately, this practice leads to overdiagnosis and treatment of conditions that may not be infectious.

Urine cultures

Inappropriate testing for urinary tract infections in hospitalized patients is common, particularly in the ICU.[3,4] This leads to increased CAUTI rates and increased treatment of asymptomatic bacteriuria.[5,6] In most cases, over testing occurs due to incomplete assessments of patients' symptoms and signs of infection. The following examples of diagnostic test stewardship promote urine cultures only when there is clinical evidence of a potential urinary source of infection.

As discussed in our August 2016 DICON newsletter, the Mayo Clinic incorporated a clinical decision support system in their computerized physician order entry (CPOE) in order to provide clinicians with "point-of-care" education and advice about appropriate criteria for obtaining urine cultures in catheterized patients. This led to an impressive 50% reduction in urine culture ordering over the 2-year study period.[7]

Another approach to reducing inappropriate urine cultures is reflex testing, or only performing urine cultures if the urinalysis shows pyuria. Pyuria is the presence of increased number of polymorphonuclear leukocytes in the urine (usually WBC > 10), and it is frequently associated with infection in non-catheterized patients who don't have a history of bacterial colonization.[8] Performing urine cultures only on patients with pyuria reduces overdiagnosis and treatment. A single-health system retrospective study of reflex urine culturing demonstrated a 25% reduction in urine cultures performed after the lab reverted to reflex testing without any change in urinalysis ordering habits.[9] They also observed statistically significant reductions in inpatient trimethoprim/sulfamethoxazole prescriptions

and both inpatient and outpatient levofloxacin prescriptions.[9] A prospective study from 5 intensive-care units at the University of Maryland Medical Center in 2011-2014 demonstrated a similar reduction in urine cultures with reflex testing. Over the course of their study, ICU urine cultures decreased by 32-48% even though device utilization increased in one of the ICUs.[10]

Neither implementation of a clinical decision support system in CPOE nor the change in urine cultures to reflex testing resulted in increased adverse outcomes in these studies, but it is important to keep in mind that both of these approaches may be seen as a barrier to appropriate testing.[7,9,10] Urine cultures in the absence of pyuria or symptoms may be appropriate if the patient is pregnant, immunocompromised, or pending an invasive urologic procedure, so any system implemented with the goal of reducing unnecessary testing should also enable clinicians to perform appropriate testing. This is vital to ensuring buy-in from local providers in stewardship and infection control efforts.

C. difficile tests

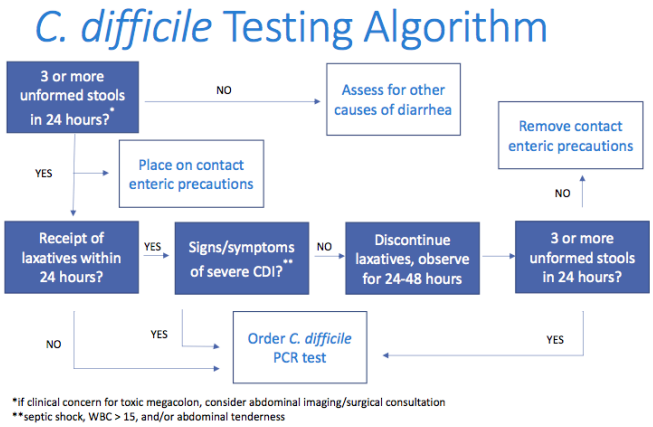
C. difficile is another commonly over-diagnosed infection.[11-14] This issue has become more evident as testing has shifted to more sensitive, molecular methods. *C. difficile* PCR is highly sensitive in detecting the presence of *C. difficile*, but it lacks the specificity to distinguish between colonization and clinical infection. One prospective observation cohort study at UC Davis noted that asymptomatic colonization with *C. difficile* is 5-10 times more common than symptomatic CDI in hospitalized patients.[14] The same study demonstrated that over half (55.3%) of patients who had diarrhea and a positive *C. difficile* PCR had a negative toxin immunoassay.[14] The majority of patients with a negative toxin assay were not treated for CDI and they experienced faster resolution of their diarrhea and no CDI-related complications. This data suggests that over-diagnosis and treatment can actually lead to worse perturbation of the gut microbiome and put colonized patients at higher risk of a true *C. difficile* infection later.

Inappropriate testing for *C. difficile* may include testing in patients receiving laxatives, experiencing less than 3 diarrheal stools per day, and using *C. diffile* PCR as a "test-for-cure." A 2016 retrospective cohort study at Northwestern Memorial Hospital examined all positive *C. difficile* tests reported as hospital-onset CDI (HO-CDI) during one year. Of the 168 HO-CDI cases reported, 25 (14.8%) were deemed to be clinically inappropriate tests for HO-CDI.[11] In fact, only 33 (19.6%) had sufficient documentation to substantiate testing; the remaining 110 patients (65.5%) were labeled as "indeterminate" due to a lack of documentation about signs or symptoms that warranted *C. difficile* testing.[11]

The optimal laboratory diagnostic approach for *C. difficile* is an open area of clinical debate, and it's unclear that the upcoming 2017 update to the *C. difficile* management guidelines will put this question to rest. Many labs are using only the highly sensitive PCR test alone. Some have adjusted to performing a 2-step approach of screening with GDH and then performing PCR on those with positive GDH tests. Finally, some labs are using combinations of three tests: a GDH, PCR, and toxin EIA tests. Consequently, the utility of diagnositic stewardship is dependant on the microbiologic approach at each site, and the pros/cons of each approach must be evaluated collaboratively by microbiologists, infection prevention, and antimicrobial stewardship teams.

Efforts to improve diagnostic stewardship are the most beneficial for those using highly sensitive molecular testing for *C. difficile*. Options for implementation include: development of local criteria for appropriate testing, clinical decision support systems in the EMR to provide "point-of care" education about appropriate testing criteria, audit and feedback of testing appropriateness in individual patients, and/or local education to highlight the impact of diagnostic stewardship on local HAI rates and unnecessary antibiotic use. A key point to consider in developing test appropriateness criteria or algorithms must be to ensure early identification and testing of patients who show signs or symptoms of severe CDI. Be aware that severe and life-threatening CDI can also occur in patients receiving laxatives; thus delayed testing in these patients

is a safety risk. Testing algorithms should be seen as a guide instead of inflexible rules. Implementation of test stewardship must strike an appropriate balance between reducing inappropriate testing and interfering with the clinical care of patients. The following example from Duke University Hospital provides an algorithm to educate about inappropriate *C. difficile* testing while also considering patients who have signs or symptoms of severe *C. difficile*:



Summary and Recommendations

Unnecessary diagnostic testing leads to falsely elevated rates of HAIs, poor antimicrobial stewardship, and worse patient outcomes. Infection prevention and antimicrobial stewardship teams can collaborate to improve testing practices at their facility.

- Diagnostic test stewardship is coordinated guidance and interventions to improve appropriate use of microbiological diagnostics to guide therapeutic decisions.
- Clinicians over use tests for several reasons: ease of ordering with quick ordersets, patterned behavior, pressure to reduce length-of stay, and a desire to practice defensive medicine to prevent legal or financial ramifications.
- Encourage clinicians to visit the American Board of Internal Medicine (ABIM)'s Choosing Wisely website for ways to reduce unnecessary testing.
- Approaches to diagnostic test stewardship for urine cultures have included opting out of performing urine cultures on samples in the absence of pyuria (WBC > 10) and "point-of-care" education about appropriate criteria for obtaining urine cultures in hospitalized patients. Clinical suspicion for a UTI should be the primary trigger for ordering a urine culture.
- The optimal microbiologic approach for *C. difficile* testing is an open area of debate.
- Stewardship of *C. difficile* tests are most beneficial in facilities using highly sensitive molecular tests.
- Implementation of *C. difficile* test stewardship should carefully balance the avoidance of inappropriate tests and the need for timely diagnosis for patients who show signs and symptoms of severe *C. difficile*.

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