

Improving a Urine Culture Callback Follow-up System in a Pediatric Emergency Department

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ABSTRACT

Introduction: Delays in appropriate treatment and unnecessary antibiotic use for urinary tract infections (UTIs) increase the risk for serious adverse events and the potential for antibiotic resistance. The purposes of this quality improvement project were to decrease emergency department laboratory result follow-up time and increase the number of patients who are notified to stop taking an empiric antibiotic.

Method: Nine months of Plan-Do-Study-Act (PDSA) cycles were implemented in a pediatric emergency department and network of care sites. Three months of baseline data were compared with 3 months of postintervention data using *t*-tests and odds ratios.

Results: Time to patient/family laboratory follow-up was reduced from 20.1 hours to 7.1 hours, demonstrating a 64.7% reduction in time to follow-up ($p < .01$). The percentage of patients who received follow-up notification of negative urine cultures and were told to discontinue antibiotic therapy increased from 8.8% to 74.4% ($p < .001$).

Discussion: Implementation of a culture callback system, staffed by advanced practice providers, led to a significant reduction in the amount of time to follow-up and increased the number of follow-up calls to discontinue antibiotics when urine cultures were negative. *J Pediatr Health Care.* (2015) 29, 518-525.

KEY WORDS

Pediatrics, urinary tract infection, emergency medicine, quality improvement

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Conflicts of interest: None to report.

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0891-5245/\$36.00

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Published online July 21, 2015.

<http://dx.doi.org/10.1016/j.pedhc.2015.06.003>

Acute urinary tract infections (UTIs) are one of the most common bacterial infections in children and account for more than 1 million visits to pediatric offices annually (Freedman, 2007). Up to 8% of girls and 2% of boys will have at least one UTI by 7 years of age (National Institute of Diabetes and Digestive and Kidney Diseases [NIDDK], 2012). Although most pediatric UTIs are not serious, some infections can lead to pyelonephritis or other adverse outcomes.

It is often difficult to diagnose UTIs in infants and young children because of wide variation and nonspecific signs and symptoms. Fever, irritability, abdominal pain, and vomiting are all symptoms of a pediatric UTI that can be misinterpreted as an acute self-limited viral illness (American Academy of Pediatrics [AAP], 2011). The potential for misdiagnosis means that additional laboratory data are needed to differentiate a viral illness from a UTI. A urinalysis is indicated in any patient with UTI symptoms or a high fever (104°-105°F) without an

identified cause. Guidelines for pediatric UTIs presented by [Bhat, Katy, and Place \(2011\)](#) suggest that urine culture is the gold standard for diagnosing a pediatric UTI, and [Schroeder and colleagues \(2005\)](#) described merits of procedures to obtain urine for analysis and culture, recommending simply that UTI needs to be confirmed and it doesn't matter which method is used. A pediatric urine culture should be performed for any urine collected by urethral catheterization, when urinalysis results are equivocal, and when a urinalysis is highly suspicious for UTI ([Bensman and Ulinski, 2009](#)). Unfortunately, a urine culture can take up to 48 hours to confirm infection.

Patients with a confirmed UTI who are not treated in a timely fashion, or are treated with an inappropriate antibiotic, can have persistent symptoms or adverse outcomes that could include renal scarring, abscess, or other adverse outcomes ([Kowalsky and Shah, 2013](#)). The potential for these adverse outcomes make timely follow-up for urine cultures in children very important because appropriate antibiotic coverage—both empiric and after a culture is performed—can prevent present and future complications. A follow-up evaluation of the patient is necessary if (a) the child was not treated for a UTI and the urine culture result is positive, (b) the bacteria in the urine is resistant to the prescribed antibiotic, or (c) the child was treated with an antibiotic for a UTI and the urine culture is negative ([AAP, 2011](#)).

EVIDENCE

The AAP Subcommittee on Urinary Tract Infections Technical Report concluded that early evaluation and empiric antimicrobial treatment of UTI (within 24 to 48 hours of onset of fever) mitigates the risk of renal scarring (up to 50%) and that prompt treatment is warranted ([Finnell, Carroll, & Downs, 2011](#)). In addition, delaying treatment can cause serious effects. In children younger than 24 months who have a fever and a UTI, the chance of sepsis developing is about 10% ([Oh et al., 2012](#)). The authors concurred with the AAP Subcommittee recommendations in that a delay in treatment resulted in more renal scarring over time. Conversely, [Larcombe \(2010\)](#) performed a review and concluded that there was no convincing evidence that immediate empiric antibiotic treatment is more effective at preventing renal parenchymal damage when compared with treatment that is delayed up to 24 hours. [Hewitt and colleagues \(2008\)](#) found that a delay of 1 to 5 days posed no increased risk of renal scarring and no difference in scarring between infants and older children. However, the review by [Larcombe \(2010\)](#) also included randomized clinical trials that suggested a reduction in renal parenchymal damage in children treated immediately compared with those who had a delay in treatment of greater than 4 days of fever.

Thus some evidence shows that early treatment and efficient, timely follow-up of pediatric UTIs can prevent/reduce potential renal damage ([Oh et al., 2012](#)), and other research states that delaying treatment does not increase risks and adverse effects of UTIs if treatment is delayed 5 or fewer days. Many patients seek care for UTI symptoms after having fever and other UTI symptoms for several days. In addition, it takes up to 72 hours to obtain final results of urine cultures. Given that damage may occur during the first 4 to 5 days of symptoms, empiric treatment of UTI with timely follow-up is recommended as best practice by the AAP. Reducing the risk for harm and providing improved health care to patients is foundational to the purpose of this quality improvement project (QIP).

LOCAL PROBLEM

In the Emergency Department (ED) and Network of Care (NOC; i.e., urgent care and ED satellite) sites at Children's Hospital of Colorado (CHCO), physicians and advanced practice providers (APPs; i.e., nurse practitioners and physician assistants) are responsible for urine culture follow-up for patients who were seen and discharged home. Previously, urine culture follow-up was completed only by the provider in the ED if there was time during a busy clinical day. No single person was responsible for the laboratory follow-ups, which all too often included the ordering provider. Prior to this QIP, the average delay for culture follow-up from laboratory report to family contact was just over 20 hours. The initial data collected in this QIP showed that this follow-up to stop unnecessary use of antibiotics was occurring only 9% of the time. This substandard effort led to delays in appropriate treatment and unnecessary antibiotic use, increasing the risk for serious adverse events and the potential for increasing antibiotic resistance.

INTENDED IMPROVEMENT

The aim of this QIP was to improve the process by which urine culture follow-up occurs in a pediatric hospital emergency medicine department. Inconsistent UTI culture follow-up was responsible for delays in treatment, inappropriate antibiotic choice, and unnecessary antibiotic exposure, all of which were causes of concern for the medical director and staff of the ED. After discussions and a needs assessment, the quality improvement (QI) team developed the following study questions:

1. Can we decrease the average time to follow-up by centralizing the culture follow-up process?

We aimed to decrease the time to patient follow-up for urine cultures by 33%, from 20 hours (1203.19 minutes/patient) to 13 hours (434.94 minutes/patient) in 9 months.

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