Urine Collection Methods in Children: Which is the Best?

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KEYWORDS

• Urine collection • Urinalysis • Pediatrics • Children • Urinary tract infection

KEY POINTS

- Urinary tract infection is one of the most common bacterial infections in infants and young children.
- There are 5 commonly used methods to obtain a urine specimen from an infant or young child: suprapubic aspiration, urethral catheterization, clean catch void, urine collection bag, and urine collection pad.
- Suprapubic aspiration and urethral catheterization are invasive but more reliable than the other methods when obtaining an accurate urine sample.
- Urinalysis and urine culture may not substitute for each other in the diagnosis of urinary tract infection in the pediatric population.

Urinary tract infection (UTI) is one of the most common bacterial infections in infants and young children, especially girls. Accurate and early diagnosis is essential to avoid long-term complications, such as hydronephrosis or permanent renal scarring, from under-treatment or delayed treatment of pyelonephritis and unnecessary treatments, such as antibiotics, invasive procedures, and radiographic studies. The diagnosing of UTI can be difficult when based on history and physical examination alone, because most young, nonverbal children present with fever as the only symptom and assessment finding. In addition to fever, older children may come to a clinic with vomiting, loose stools, and abdominal or flank pain. Cystitis and pyelonephritis are more likely in older children.[1]

Infants and young children are more likely to have bacteremia and/or sepsis than older children, and accurate diagnosis and appropriate treatment are essential for this age group. Febrile infant girls are twice as likely to have a UTI as febrile infant boys. Uncircumcised boys are 4 time to 20 times more likely to have a UTI than circumcised boys.[2] The likelihood of a UTI is significantly reduced when another

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clinically obvious source of infection is observed, placing further importance on the role of the urinalysis in the diagnosis. There are 5 common methods to obtain urine specimens from children for urinalysis and culture. Invasive techniques include suprapubic aspiration (SPA) and urethral catheterization, and noninvasive techniques include urine bags, collection pads, and clean catch void.[3] There are advantages and disadvantages to each method.

ROLE OF THE URINALYSIS AND URINE CULTURE

Diagnostic testing for a UTI begins with the simple urinalysis and urine culture. Clinical practice guidelines from the American Academy of Pediatrics (AAP)[2] recommend the following for children ages 2 months to 24 months (**Box 1**). A simple urine dipstick provides rapid results, which makes it useful in the presumptive diagnosis of a UTI. Nitrites are produced by the bacterial conversion of nitrates, which are present in the normal flora of urine. Most UTI-causing gram-negative bacteria are capable of producing nitrites, but not all UTIs are caused by gram-negative bacteria. Children who empty their bladders frequently, especially infants, may have a false-negative result. Therefore, the test for nitrites has a low sensitivity but high specificity for the diagnosis of UTI in the pediatric population.[4] Nitrite presence is suggestive of UTI but its absence does not rule out a diagnosis.

The leukocyte esterase test has a 94% sensitivity when used for a suspected UTI. Although it is rare, it is possible for a child to have a UTI without the presence of pyuria. White blood cells can be found in the urine with Kawasaki disease, streptococcal infections, and vigorous exercise. Therefore, pyuria cannot confirm that an infection is present. A microscopic examination of the urine and a culture should follow even when the simple urinalysis is negative for leukocytes.[2] Asymptomatic bacteriuria occurs when low virulent bacteria colonize the urinary tract without causing inflammation. This is common in infant and school-aged girls. The presence of pyuria can help distinguish asymptomatic bacteriuria from a true UTI. Antibiotic therapy for asymptomatic bacteriuria is not necessary.

A urine culture is the most definitive way to diagnose a UTI, and the final result, positive or negative, can be affected by the method of collection. The perineal area and distal urethra are normally colonized with fecal bacteria, which make contamination of the specimen likely when obtained by a collection pad or bag.[4] A negative result can confirm that a UTI is not present when obtained using one of these methods. There is also the possibility that a culture may produce a low colony count when the specimen is collected through a clean catch void (CCV) or catheterization, even

Box 1
Criteria for diagnosing a urinary tract infection in infants and children ages 2 months to 24 months

1. Positive urinalysis: dipstick testing positive for leukocyte esterase and/or nitrites, or microscopic examination detects white blood cells or bacteria
2. Positive urine culture: at least 50,000 colony-forming units per milliliter (1 species)
3. Both an abnormal urinalysis and a positive culture are needed to confirm inflammation/infection

Data from American Academy of Pediatrics. Urinary tract infection: Clinical practice guideline for the diagnosis and management of the initial UTI in febrile infants and children 2 to 24 months. Pediatrics 2011;128(3):595–610.