



“Can’t you just put on a bag?”



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Sarah's case

A 2-year-old Caucasian female is brought to the ED by her father, with a 2-day history of fever, diarrhea and abdominal pain. The patient had decreased appetite over the past 24 hours and her dad described “foul-smelling urine.”

Past medical history revealed an unremarkable pre-, peri- and postnatal period. Sarah's mother was unable to breastfeed but she did well on formula. She has met all developmental milestones and has no previous hospitalizations or surgeries. She has an age-appropriate diet and was in good health until this event.

A review of systems revealed no obvious indication of respiratory, dermatologic, GI or central nervous system infection.

Her immunization status was up-to-date.

Examination

On examination, Sarah's temperature is 39.6°C. All other vitals are within normal limits. Her abdomen has diffuse tenderness but she appears to experience most discomfort during palpation of the suprapubic region. There may be some tenderness over the costovertebral angle when palpated but it is difficult to differentiate this from her generalized discomfort.

Questions & Answers

1. *Could this be a urinary tract infection (UTI)?*

UTIs are among the most common bacterial infections in children. Approximately 2% of children experience UTIs with twice as many females as males affected. Most UTIs are uncomplicated infections of the distal urinary tract, however, cystitis is hard to differentiate from pyelonephritis in young children, which can be responsible for serious long-term sequelae. UTIs often present with non-specific symptoms and clinical diagnosis can be difficult. Fever is the most commonly associated manifestation and may be the only sign of the disease in some children. A UTI should be considered with high fevers ($> 39^{\circ}\text{C}$), fevers that last for > 24 hours in the absence of other sources, or with history of previous undiagnosed febrile illness. Abdominal pain is commonly present, particularly with suprapubic tenderness, which may be the only sign in female infants. Costovertebral angle tenderness is less common but should lead to a higher clinical suspicion of pyelonephritis. Other risk factors include less than one-year-old, previous UTI, lack of circumcision in males, Caucasian ethnicity, not being breastfed and urinary symptoms such as dysuria, frequency, urgency and new-onset urinary incontinence. Neonates and infants may also have nonspecific symptoms such as irritability, anorexia and failure to thrive. While foul-smelling urine is commonly described in the context of UTIs, no link has been found to exist between the two and it should not be used as a diagnostic factor.¹

Table 1

A comparison of the different methods of urine collection in a young child

Sampling method	Pros	Cons	Utility
SPA	Highest specificity for ruling in a UTI	Expertise required, invasive, ultrasonography recommended	<ul style="list-style-type: none"> - Individuals requiring empiric antibiotic therapy - Confirmatory testing from positive bag sample - First choice for neonates or in the presence of urethral injury
Catheterization	High specificity for ruling in a UTI	Risk of urethral injury, invasive	<ul style="list-style-type: none"> - Individuals requiring empiric antibiotic therapy - More healthcare workers are trained in catheterization - Useful for confirmation of positive bag specimen
Perineal bag	Noninvasive, no technical expertise needed, negative test result highly specific to rule out UTI	High risk of contamination, high cost due to required confirmatory testing when positive, delays diagnosis	<ul style="list-style-type: none"> - Generally not recommended - Can be used for dipstick urinalysis and microscopic evaluation in low-risk patients

SPA: Suprapubic aspiration

This patient, as a white female presenting with high fever for 48 hours, suprapubic tenderness, no other likely source of fever and no history of being breastfed, should be worked-up for UTI, as clinical suspicion is high.

2. What is the best method to collect a urine sample for analysis?

Accurate urine collection is crucial to the successful diagnosis of UTI but clean-catch urine sampling is not practical in non-toilet trained children. Three options for urine sampling are available for young children with variable invasiveness and contamination rates. These methods are:

- suprapubic aspiration (SPA),
- catheterization and
- perineal bag specimen.

SPA is the most invasive measure, requiring insertion of a needle directly into the bladder. Performing this method requires training and technical expertise, but with ultrasound guidance it is very accurate and samples collected provide nearly 100% sensitivity and specificity. Catheterization is

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also invasive and poses the risk of urethral trauma even when performed by experienced individuals. It does, however, require less precision, has a high success rate and samples collected have nearly 90% specificity. Bag collection involves securing a sterile bag to the child's genitalia, which collects urine when the child voids. This method is the least invasive and is favoured by many healthcare providers for this reason. This method is, however, highly prone to contamination (reaching 50%) with genital flora. While the sensitivity of bag urine cultures is nearly 100%, the specificity is only 70% and up to 85% of positive urinalysis results are false positives.

The Canadian Pediatric Society's Infectious Disease and Immunization Committee makes the following recommendations for practice. Bag urine specimens cannot be used alone to diagnose UTIs. Any positive UTI result from bag specimens must be confirmed with either SPA or catheterization. Bag specimens should only be used for low-risk patients and are a good option for ruling out a UTI when a negative result is determined by dipstick or microscopy. Bag collection should not be used in cases when empirical antibiotic therapy will be administered (such as sepsis) as confirmatory samples may be affected by treatment (Table 1).²

The ideal method of sampling for most non-toilet trained children is SPA or catheterization and this method should always be used to confirm a positive bag sample. An important factor with all sampling methods, particularly bag samples, is ensuring that the sample is delivered to the laboratory and examined promptly to prevent proliferation of contaminating bacterial populations from influencing test results.

3. *What is the best treatment in this case?*

Specific guidelines exist for each patient population and whether the infection is complicated or uncomplicated. If the diagnosis of UTI is confirmed, it is likely "uncomplicated" and as the child is over two-years-old, oral cefixime would be the first-line of treatment.³ For neonates and infants less than six-weeks-old or older children with more severe symptoms, IV


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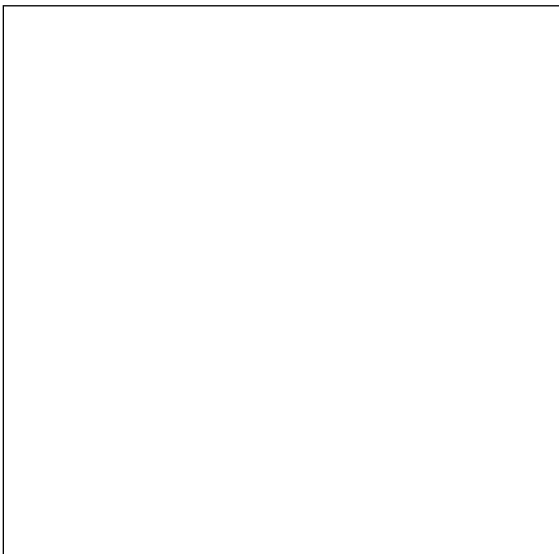
antibiotics are the recommended therapy. For specific treatment programs, physicians should consult practice guidelines for their area.

4. *What if the patient was six-weeks-old, or five-years-old?*

In children under six-weeks-of-age, SPA is the preferred collection method. Whenever possible it should be performed under ultrasound guidance to improve accuracy and yield. Most children five-years-old and older are candidates for the clean-catch collection method, which should be used whenever possible.

5. *What complications can follow a UTI?*

The majority of pediatric UTIs respond well to antibiotic therapy. However, if diagnosis is not made in a timely fashion or infection spreads, renal damage can occur. This can lead to permanent renal scarring, hypertension, renal insufficiency and even renal failure. These outcomes are uncommon but necessitate quick and accurate detection methods in order to deliver treatment efficiently. If a child has recurrent UTIs, they should be investigated for vesicoureteral reflux (VUR) as patients with VUR have worse outcomes and often require treatment for the condition. 



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