

Urine sample collection from young pre-continent children:

common methods and the new Quick-Wee technique

BACKGROUND

Urinary tract infections (UTIs) are one of the most common bacterial infections of early childhood. However, as signs and symptoms are frequently non-specific in young children, a urine sample is required to diagnose or exclude UTI. National Institute for Health and Care Excellence (NICE) guidelines recommend that children with unexplained fever or signs suggestive of UTI should have a urine sample collected.¹

Collecting urine from pre-continent children is challenging. Collection methods all have limitations. The choice of sample collection method must balance time, resources, contamination, invasiveness, and clinician and carer preferences. Despite being so commonly required for young children, there is significant variation in international guideline recommendations for the optimal method. NICE recommends the clean catch method, other non-invasive methods such as pads if clean catch is not possible, and catheter or suprapubic aspirate (SPA) if non-invasive methods are not possible.¹

Sample contamination occurs when urine flushing over the perigenital skin collects incidental skin flora, or from inadvertent contact between skin and specimen jar. Contamination corrupts the test result. Precise contamination rates for each method of urine collection may be difficult to compare as definitions of contamination vary between centres and studies. However, perigenital skin cleaning before collection and care with collection technique may help to minimise contamination.

Suboptimal sample collection is detrimental to patient care. A lack of timely, accurate sampling may delay effective treatment. Missed sample collection increases the likelihood of both missed diagnosis and misdiagnosis, which may in turn increase inappropriate antibiotic prescribing and antimicrobial resistance. Optimising sample collection has many benefits.

We present an overview of common urine sample collection methods used for young pre-continent children that can be considered for use in primary care (Figure 1 and Table 1).

NON-INVASIVE COLLECTION METHODS

Non-invasive collection methods involve waiting for the child to void spontaneously and then collecting urine with a urine bag, pad, or clean catch of the urine stream. These methods seem convenient, but can be time consuming, unsuccessful, or contaminated. Newer voiding stimulation techniques may improve the speed and success of non-invasive collection.

Nappy pads and cotton wool balls

Nappy urine collection pads are placed inside the nappy until the child voids. Urine can then be extracted from the wet pad with a syringe. Frequent checking is required to avoid faecal soiling. Nappy pads have the highest contamination of all urine collection methods,² reported at >60% in some primary care settings.³ Continuous contact between pad and perineum makes avoiding contamination difficult, even with meticulous care. Cotton wool balls placed in the nappy

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Figure 1. Common urine sample collection methods.

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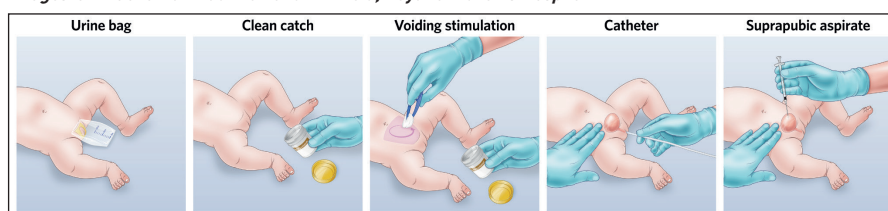


Table 1. Advantages and limitations of common methods

Method	Advantages	Limitations
Nappy pad	Convenient Can be used to exclude UTI	Very high contamination: >60% ³ Unreliable to confirm UTI
Urine bag	Convenient Can be used to exclude UTI	High contamination: ≈50% ⁴ Unreliable to confirm UTI
Clean catch	Can increase success with voiding stimulation More reliable than pad/bag to confirm UTI	Moderate contamination: ≈25% ⁵ Can be time consuming or unsuccessful
Catheterisation	Low contamination: ≈10% ⁵ Effective even if little urine in bladder Very reliable to confirm UTI	Equipment and expertise required Invasive and painful for the child
Suprapubic aspiration	Ultra-low contamination: 1% ⁵ Can increase success with ultrasound Very reliable to confirm UTI	Equipment and expertise required Invasive and painful for the child

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Provenance

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are sometimes used in a similar fashion, but are specifically discouraged by NICE guidance.¹

Urine bags

Urine collection bags are attached with gentle adhesive over the child's genitalia. They are placed inside the nappy, or the nappy can be slit to visualise the bag. While seemingly convenient, bags can leak or detach, so care with collection is still required. Discomfort and skin irritation with bag removal may occur, but is usually minor. Urine collected in bags is also highly susceptible to contamination. A meta-analysis of 21 studies (7659 samples) found 47% contamination and 61% false positives with urine bags.⁴

Clean catch

The clean catch method for pre-continent young children replicates the midstream technique used in continent older children and adults. The nappy is removed, and a clinician or carer waits with a specimen jar, ready to opportunistically catch a sample when the child voids. Vigilance and quick reflexes are required. This can sometimes be difficult and time consuming, and not all attempts are successful. Clean catch has the lowest contamination of non-invasive methods for pre-continent children, at around 25%.⁵

Voiding stimulation techniques

Voiding stimulation techniques trigger involuntary newborn voiding reflexes, to facilitate faster clean catch urine collection. Bladder-lumbar stimulation involves suspending the infant under the armpits and applying alternating bladder tapping and lumbar massage.⁶ Success is high in newborns, but three operators are required and it may be less practical in older infants. The Quick-Wee method uses cold fluid-soaked gauze to gently rub the suprapubic area.⁷ The method is simple, gentle, and can

be performed by a single operator, being the doctor, nurse, or parent. Thirty per cent of children <1 year old had a sample collected within 5 minutes in a large randomised trial.⁷ If not successful, waiting for a clean catch should be continued and optimising hydration or trying stimulation again later considered.

INVASIVE COLLECTION METHODS

Invasive collection methods involve urethral catheterisation or suprapubic needle aspiration to sample urine directly from the bladder. These methods can be more reliable, but require equipment and expertise to perform, and cause pain to the child and distress to parents.

Catheterisation

Catheterisation involves inserting and removing a catheter or feeding tube into the bladder via the urethra. This can be effective even with scant urine in the bladder, and has low contamination of around 10%.⁵

Suprapubic aspiration

SPA uses a needle and syringe to sample urine through the abdomen and bladder wall. Success is higher with a full bladder, preferably confirmed with ultrasound, or suggested by an absence of recent voiding. SPA contamination is around 1%, the lowest of all collection methods.⁵

DISCUSSION

Pads and bags are often favoured collection methods in primary care and seem convenient, particularly for parents collecting samples at home. High contamination and false positive rates, however, limit their diagnostic utility. Pad and bag urine samples therefore may be useful for dipstick screening or to exclude UTI if culture results are negative, but positive results must be interpreted with caution. Positive screening should be confirmed with a more reliable sample if possible.

Catheter and SPA procedures are invasive and more commonly performed in the hospital setting, but have lower contamination than other methods. These methods may also be useful in geographically isolated primary care settings.

Clean catch is recommended by NICE and has the lowest contamination of non-invasive methods. Motivation and attention is required for a successful catch, so parental engagement is crucial. Voiding stimulation techniques such as the Quick-Wee method are simple and can increase success. We have created a parent education handout to assist with clean catch collection at home, which may be helpful for clinicians (see Supplementary Figure 1).