Urinary tract infection - Emergency management in children

Purpose

This document provides clinical guidance for all staff involved in the care and management of a child presenting to an Emergency Department (ED) with symptoms suggestive of a urinary tract infection (UTI) in Queensland.

This guideline has been developed by senior ED clinicians and Paediatricians across Queensland, with input from Pharmacy and Nephrology, Queensland Children’s Hospital, Brisbane. It has been endorsed for use statewide by the Queensland Emergency Care of Children Working Group in partnership with the Queensland Emergency Department Strategic Advisory Panel and the Healthcare Improvement Unit, Clinical Excellence Queensland.

Key points

- Urinary tract infections (UTI) are a common cause of serious bacterial illness (SBI) in children under five years of age.
- Diagnosing a UTI in young children can be challenging as symptoms are non-specific.
- Microscopy of uncontaminated urine which shows pyuria +/- bacteriuria followed by culture is the gold standard in diagnosis of UTI.
- Urinalysis cannot reliably exclude a UTI in infants and young children.
- A presumptive UTI diagnosis can be made on dipstick urinalysis for older children but urine microscopy and culture is always required to provide a definitive diagnosis.
- Empirical antibiotic therapy is recommended for a presumptive UTI diagnosis (providing a urine specimen has been collected and sent for culture).
- Most children with a UTI can be safely discharged with GP follow-up to review laboratory results.
- Undiagnosed and/or inadequately treated UTI can lead to renal scarring and further complications.

Introduction

UTIs are common in childhood. An estimated 2% of boys and 8% of girls will experience a UTI by seven years of age. UTIs are the most common SBI in children aged less than 5 years.¹-³
Frequency of UTI in febrile children

<table>
<thead>
<tr>
<th>Age</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 year</td>
<td>6.5% girls, 1.2% circumcised boys, 8% uncircumcised boys</td>
</tr>
<tr>
<td>1 – 2 years</td>
<td>8.1% girls, 1.9% boys.</td>
</tr>
<tr>
<td>Greater than 2 years</td>
<td>Decreased frequency thereafter</td>
</tr>
</tbody>
</table>

Children at increased risk of UTI
- congenital genitourinary tract malformations
- surgical alterations to urinary tract (i.e. Mitrofanoff)
- spina bifida or other causes of neurogenic bladder
- phimosis or labial adhesions

Assessment
Non-specific clinical presentation and difficulties in obtaining urinary specimens in infants and young children can make the diagnosis of UTI challenging.\(^\text{1-6}\)

Consider a sepsis diagnosis in child presenting with toxic features including tachypnoea, increased work of breathing, grunt, weak cry, marked/persistent tachycardia, moderate to severe dehydration. Refer to the Sepsis guideline.

Refer to the Fever guideline for the assessment of children with a fever ≥38°C without localising signs. In general, the younger the infant or child, the lower the threshold for urine screening.\(^\text{3-6}\)

History
The clinical features on history are variable and age-dependant.

Clinical features of a UTI by age (listed in order of decreasing frequency)

<table>
<thead>
<tr>
<th>Age less than 3 months</th>
<th>Age between 3 months and 3 years</th>
<th>Age 3 years and older</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
<td>Fever</td>
<td>Urinary frequency</td>
</tr>
<tr>
<td>Vomiting</td>
<td>Abdominal pain</td>
<td>Dysuria</td>
</tr>
<tr>
<td>Lethargy</td>
<td>Loin tenderness</td>
<td>Dysfunctional voiding</td>
</tr>
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<td>Poor feeding</td>
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<td>Irritability</td>
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</tr>
<tr>
<td>Jaundice</td>
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<tr>
<td>Haematuria</td>
<td>Offensive urine</td>
<td>Vomiting</td>
</tr>
<tr>
<td>Offensive urine</td>
<td>Failure to thrive</td>
<td>Haematuria</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Offensive urine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cloudy urine</td>
</tr>
</tbody>
</table>
History should also include specific information on:

- fever and use of anti-pyretics
- presence of pain including loin or suprapubic tenderness
- difficulties passing urine (where age-appropriate)
- presence of underlying conditions associated with an increased risk of UTI (refer to Introduction)

**Examination**

Physical examination should include a thorough abdominal examination (to identify masses or suggestion of pyelonephritis), examination of external genitalia (to identify genitourinary abnormalities which predispose to UTI), lower limb neurological examination (impairment bladder emptying due to neurological aetiology) and hydration status. Blood pressure should be measured.

No physical sign is pathognomonic for a UTI.\(^7\)\(^8\) Other than fever, signs may include hypertension, a palpable bladder, dribbling or straining, and loin or suprapubic tenderness.

**Pyelonephritis/peri-nephric abscess**

Suspect upper renal tract involvement for a child with any of the following:

- loin/flank pain
- renal angle tenderness
- abdominal pain

**Investigations**

**Urine testing**

All children who present with urinary symptoms should undergo urine testing. In addition, all neonates who present with a fever ≥38° C should have urine sent for microscopy to screen for UTI.\(^3\)\(^6\)\(^9\) A step-by-step approach can be taken for children aged between 29 days to 3 months, with a low threshold to consider UTI as a diagnosis.\(^3\)\(^6\) Urine testing can be safely deferred in children with an unexplained fever who are ≥3 months of age and otherwise well.\(^4\) For these children urine testing is only recommended if fever persists for more than 48 hours.\(^5\) Refer to the [Fever guideline](#) for the additional investigations recommended in children with an unexplained fever.

Urine testing is not recommended on first presentation for children aged ≥3 months who have a clear alternative site of infection, and if verbal, no urinary symptoms.\(^5\) Consider testing for those who remain unwell on subsequent review.

**Urine collection methods**

The most appropriate urine collection method varies depending on age and clinical presentation.\(^2\)\(^4\)\(^6\)

**Selecting the most appropriate method of urine collection is crucial.**
### Urine collection methods in children

<table>
<thead>
<tr>
<th>Collection method</th>
<th>Utility</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supra-pubic bladder aspiration (SPA)</td>
<td>- age &lt;6 months and toxic phimosis or labial adhesion</td>
<td>- invasive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- gold standard as lowest contamination rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- success rate varies (23 - 90%) depending on operator, use of ultrasound and the presence of at least 20mL of urine</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- ultrasound significantly increases success rate</td>
</tr>
<tr>
<td>Urethral catheterisation (CSU) “in-out catheter”</td>
<td>- age &gt;6 months and toxic</td>
<td>- invasive</td>
</tr>
<tr>
<td></td>
<td>- age &lt;6 months and toxic with failed SPA</td>
<td>- low contamination rate</td>
</tr>
<tr>
<td></td>
<td>- non-urgent collection where CCU/MSU not possible/failed</td>
<td>- highest success rate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- risk of iatrogenic infection</td>
</tr>
<tr>
<td>Clean catch specimen (CCU)</td>
<td>- non-urgent collection and unable to void on request</td>
<td>- non-invasive</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- high false positive rate if poor collection technique - refer to <a href="#">How to collect a clean urine specimen Factsheet</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- research supports the <a href="#">Quick Wee method</a></td>
</tr>
<tr>
<td>Midstream urine (MSU)</td>
<td>- non-urgent collection and able to void on request</td>
<td>- preferred method for toilet-trained children who can void on request</td>
</tr>
<tr>
<td>Bag specimens</td>
<td>- not recommended</td>
<td>- unacceptably high contamination rate so <strong>CANNOT</strong> be used for UTI diagnosis**14</td>
</tr>
</tbody>
</table>

Well appearing children over 12 months of age with an unexplained fever can be discharged with a urine jar to collect a specimen for urine microscopy via their GP if assessment has otherwise been completed.

In catheterised children, collect a specimen and contact the treating team. Catheters should only be removed on specialist advice.
UTI diagnosis

Dipstick urinalysis

<table>
<thead>
<tr>
<th>Leucocytes</th>
<th>Nitrites</th>
<th>Send for M/C/S</th>
<th>Likelihood of UTI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive</td>
<td>Positive</td>
<td>Y</td>
<td>Likely</td>
</tr>
<tr>
<td>Negative</td>
<td>Positive</td>
<td>Y</td>
<td>Possible</td>
</tr>
<tr>
<td>Positive</td>
<td>Negative</td>
<td>Y</td>
<td>Possible</td>
</tr>
<tr>
<td>Negative</td>
<td>Negative</td>
<td>Only if age &lt;3 months</td>
<td>Unlikely (unless aged &lt;3 months)</td>
</tr>
</tbody>
</table>

Considerations
- Not all urinary organisms produce nitrites, so the absence of nitrites does not exclude UTI.
- Urine has to be present in the bladder for enough time for the reaction to occur – non-toilet trained child may have a false negative due to more frequent bladder emptying.
- White cells may come from other anatomically related areas e.g. appendicitis.
- The presence of blood or protein on dipstick testing is not a reliable marker of UTI.
- Dipstick analysis is less reliable in neonates and young infants with the risk of falsely negative testing.

Urine microscopy

Urine microscopy can be used as an additional screening tool to dipstick testing. The presence of bacteria and leucocytes on microscopy in a sample with less than 10 epithelial cells per high powered field are suggestive of UTI.¹

A presumptive diagnosis of UTI can be made if:
- both the leucocyte esterase and nitrite tests are positive on dipstick in child aged over 3 months OR
- white cells and/or bacteria are seen on urine microscopy in child of any age

Definitive diagnosis of a UTI requires growth of a single organism on urine culture.

Mixed growth may indicate a contaminated specimen.

Other investigations

Investigations including USS and bloods are not routinely recommended.

Consider imaging (initially ultrasound) for the following children:
- upper renal tract features
- recurrent UTI (to identify/exclude a structural abnormality).

Consider sexually transmitted infection (STI) screening including gonorrhoea and chlamydia PCR testing on urine where appropriate.
Management

Refer to Appendix 1 for a summary of the emergency management of children presenting with a urinary tract infection

Child with toxic features

Seek urgent paediatric critical care advice (onsite or via Retrieval Services Queensland (RSQ)) for a child with life-threatening sepsis

Seek senior emergency/paediatric advice if sepsis is suspected

Children with apparent sepsis or in shock should be treated with parenteral antibiotics and intravenous fluids – refer to CHQ antibiocard. Refer to the Sepsis guideline for recommended investigations.

**ALERT** – Do not delay antibiotic administration for urine collection in child with suspected sepsis.

Consider a lumbar puncture in neonates (age less than 29 days) with a UTI given the relatively higher incidence of co-existing meningitis.15-16

Child with no toxic features

Seek senior emergency/paediatric advice as per local practice for the following children:

- age less than three months
- upper renal tract features
- renal tract anomalies
- long-term catheter
- on prophylactic antibiotics

Uncomplicated presentation of UTI in child aged three months or more

Empiric antibiotic therapy is recommended following a presumptive UTI diagnosis on dipstick testing or initial urine microscopy while the sample is being cultured and tested for sensitivities.

Treatment is age-dependent and should be tailored to clinical severity. Broad spectrum oral antibiotics will treat most uncomplicated UTIs. In the non-vomiting child, oral antibiotics are as effective as parenteral antibiotics due to high urinary concentrations.17-18

Antibiotics IV are recommended for children who are unable to tolerate oral antibiotics

Clinicians working in Townsville (access via QH intranet), Cairns (access via QH intranet) and Gold Coast University Hospital and Health Services’ should follow their local paediatric empirical antimicrobial therapy guidelines. Clinicians elsewhere in Queensland should follow the Children’s Health Queensland paediatric antimicrobial prescribing guidelines until the results of microbiological investigations are available.

**Requirements for all** non-toxic children receiving empiric antibiotic therapy

- urine **must** be sent for bacterial culture prior to the commencement of antibiotics
- child should be reassessed 48 hours after starting antibiotics (usually by GP) with treatment modified as directed by cultures and sensitivities
Duration of treatment for an uncomplicated lower UTI is 2-4 days. Children with symptoms that persist following the initial course of treatment may need a longer course of the initial treatment or a different antibiotic.

Special considerations

Children aged less than three months of age
Administer empiric antibiotic therapy following a presumptive UTI diagnosis on initial urine microscopy while the sample is being cultured and tested for sensitivities. Antibiotics IV are recommended for all infants less than three months of age. See above for links to empirical antibiotic guidelines. Co-existing meningitis can occur especially in neonates. Seek senior advice regarding lumbar puncture for an infant with a presumptive UTI diagnosis.

Children with suspected pyelonephritis/peri-nephric abscess
Patients with a presumptive UTI diagnosis and loin/flank pain, renal angle tenderness or abdominal pain, should be investigated for pyelonephritis or a perinephric abscess. Recommended investigations include a FBC, renal function, blood culture and an ultrasound of the renal tract to identify a perinephric collection.

Children on prophylactic antibiotics
Prophylactic antibiotics are typically changed to an empiric antibiotic until definitive cultures and sensitivities are obtained. Discuss with the child’s General Paediatrician.

Children with catheters
Pyuria should not be used as the sole criteria for the diagnosis of UTI in catheterised children. Bacterial colonisation of long-term catheters is common, and these children are often asymptomatic despite pyuria and bacteriuria. Empiric and/or prophylactic antibiotics should be decided on a case by case basis, ideally after discussion with the child’s General Paediatrician and where relevant, Infectious Disease physician or Surgical team. Improper use of antibiotics in this cohort may encourage the development of antibiotic resistance.

Children with renal tract anomalies
Empiric antibiotics in children with renal tract anomalies (including congenital genitourinary tract malformations, dysfunctional or surgically altered urinary tract) should be decided on a case by case basis, ideally after discussion with their General Paediatrician and where relevant Infectious Disease physician or Surgical team. Improper use of antibiotics in this cohort may encourage the development of antibiotic resistance.

Sexually active children
Sexually transmitted infections (STIs) can have a similar clinical presentation to UTIs. Untreated STIs may lead to poor fertility and pelvic inflammatory disease. Consider gonorrhoea and chlamydia PCR testing on urine in older symptomatic children. Children diagnosed with a gonorrhoea or chlamydia infection may require testing for other sexually transmitted disease (i.e. HIV, Hepatitis B or C).
# Escalation outside of ED

Clinicians can contact the services below if escalation of care outside of senior clinicians within the ED is needed, as per local practices. Most children will be managed as an outpatient.

## Critically unwell or rapidly deteriorating child

<table>
<thead>
<tr>
<th>Service</th>
<th>Reason for contact</th>
<th>Contact</th>
</tr>
</thead>
</table>
| Paediatric critical care | For urgent advice/assistance in child with life-threatening sepsis.                | Onsite or via Retrieval Services Queensland (RSQ). If no onsite service contact RSQ (1300 799 127):  
  • for access to paediatric critical care telephone advice  
  • to coordinate the retrieval of a critically unwell child  
  RSQ (access via QH intranet)  
  Notify early of children potentially requiring transfer.  
  In the event of retrieval, inform your local Paediatric service.  |

## Non-critical child

<table>
<thead>
<tr>
<th>Reason for contact by clinician</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>For specialist advice on management, disposition and follow-up of the following:</td>
<td>Onsite/local paediatric service as per local practice</td>
</tr>
</tbody>
</table>
|   • less than 3 months of age  
|   • possible early sepsis  
|   • if considering admission  
|   • suspected pyelonephritis/peri-nephric abscess  
|   • failed outpatient treatment                                                             |                                                                         |
| For advice on empiric antibiotic therapy for the following children:                          | The first point of call should be the child’s General Paediatrician. Additional advice may be sought from onsite/local ID specialist.  |
|   • long-term catheters  
|   • on prophylactic antibiotics  
|   • renal tract anomalies                                                              |                                                                         |
| For assistance with local inter-hospital transfers of non-critical patients.                  | Onsite/local paediatric service as per local practice                  |
| For assistance with inter-hospital transfer of non-critical patients into and out of Queensland Children’s Hospital.  
View the [QH Inter-hospital transfer request form](#) (QH only) | Children’s Advice and Transport Coordination Hub (CATCH)  
(07) 3068 4510 (24-hour service)                                                                  |
| For assistance with decision making regarding safe and appropriate inter-hospital transfer of children in Queensland.  
View the [Queensland Paediatric Transport Triage tool – Medical](#) or call CATCH on (07) 3068 4510 (24-hour service) | View the Telehealth Emergency Management Support Unit (TEMSU)  
1800 11 44 14 (24-hour service)  
TEMSU (access via QH intranet)                                                              |
| For access to generalist and specialist acute support and advice via videoconferencing, as per locally agreed pathways, in regional, rural and remote areas in Queensland. | Retrieval Services Queensland (RSQ)  
1300 799 127 (24-hour service)  
RSQ (access via QH intranet)                                                              |
| To request aeromedical inter-hospital transfer in Queensland.                                |                                                                         |
When to consider discharge from ED

Discharge with GP follow-up of culture and sensitivity results may be considered for relatively well children aged three months or older.

Seek senior emergency/paediatric advice prior to considering discharge for all children with fever aged between 29 days and 3 months regardless of urine microscopy results.

On discharge educate carers on measures to minimise the risk of future UTIs including:

- management of constipation
- adequate fluid intake to allow clear light-coloured urination
- wiping front to back in toileting
- wearing breathable fabric underwear

Follow-up

- with GP in 1-2 days for clinical review and urine culture and sensitivity results.
- consider renal tract ultrasound (via GP) in the following children:
  - age less than 1 year with presumptive UTI
  - recurrent or atypical UTIs

When to consider admission

Admission is recommended for the following children:

- infants less than 3 months with a presumptive UTI
- neonates with a fever regardless of urine microscopy results (refer to the Fever guideline)
- children requiring antibiotics IV

Consider admission and further investigation (including renal ultrasound) for the following children:

- suspected concurrent bacteraemia pending laboratory confirmation
- urine culture with atypical organisms (e.g. Staphlococcus aureus or Pseudomonas)

Related documents

Guidelines

- NICE Guideline Urinary tract infection in under 16s: diagnosis and management
- Sepsis: Recognition and emergency management in children
- Febrile Illness – Emergency Management in children
- Meningitis- Emergency Management in children

Factsheet

- UTI factsheet
- How to collect a clean urine specimen Factsheet
References


Guideline approval

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<th>CHQ-GDL-60026</th>
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<td>Executive Director Medical Services</td>
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<td></td>
<td>Effective date</td>
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<tr>
<td>Author/custodian</td>
<td>Queensland Emergency Care Children Working Group</td>
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<td>Review date</td>
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Keywords
- Paediatric, emergency, guideline, urinary tract infection, UTI, SBI, serious bacterial illness, 60026

Accreditation references
- NSQHS Standards (1-8): 1, 3, 4, 8
Disclaimer
This guideline is intended as a guide and provided for information purposes only. The information has been prepared using a multidisciplinary approach with reference to the best information and evidence available at the time of preparation. No assurance is given that the information is entirely complete, current, or accurate in every respect.

The guideline is not a substitute for clinical judgement, knowledge and expertise, or medical advice. Variation from the guideline, taking into account individual circumstances may be appropriate.

This guideline does not address all elements of standard practice and accepts that individual clinicians are responsible for:

- Providing care within the context of locally available resources, expertise, and scope of practice
- Supporting consumer rights and informed decision making in partnership with healthcare practitioners including the right to decline intervention or ongoing management
- Advising consumers of their choices in an environment that is culturally appropriate and which enables comfortable and confidential discussion. This includes the use of interpreter services where necessary
- Ensuring informed consent is obtained prior to delivering care
- Meeting all legislative requirements and professional standards
- Applying standard precautions, and additional precautions as necessary, when delivering care
- Documenting all care in accordance with mandatory and local requirements

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Child presents to ED with suspected UTI (see over page for clinical features by age)

**No toxic features**

- Age < 3 months?
  - Yes: Refer to Fever guideline for additional investigations required if fever ≥ 38°C.
  - No: Toxic features

**Toxic features**

- Management as per Sepsis guideline.
  - Urine collection: Age < 6 months – SPA (CSU if failed SPA), Age > 6 months – CSU
  - Do not delay antibiotic administration for urine collection if sepsis is suspected.

**Urine collection**

- Age < 6 months: SPA (CSU if failed SPA)
- Age > 6 months: CSU

- Do not delay antibiotic administration for urine collection if sepsis is suspected.

- Refer to Fever guideline for additional investigations required if fever ≥ 38°C.

**Presumptive UTI diagnosis? (Box A)**

- Yes: Confirm by urine microscopy.

**Urine microscopy positive?**

- Yes: Specialist advice required? (Box B)
- No: Consider discharge. GP review 1-2 days when lab results available.

**Specialist advice required? (Box B)**

- Yes: Administer antibiotics IV*; Consider concurrent meningitis especially if age < 28 days; Refer to inpatient service
- No: Additional investigations as per advice; Refer to inpatient service

**Additional investigations may be required if fever ≥ 38°C - refer to Fever guideline.**

- In well child with unexplained fever, consider deferring urine screening until 48 hours of fever.

**Box A: Criteria for presumptive UTI diagnosis**

- Both the leucocyte esterase and nitrite tests are positive on dipstick (in child aged over 3 months)
- OR
- White cells and/or bacteria are seen on urine microscopy (in child of any age)

See over page for interpretation of dipstick testing.

**Box B: Children requiring specialist advice**

- Seek senior emergency / paediatric advice as per local practice if:
  - Suspect pyelonephritis / peri-nephric abscess (consider bloods, USS)
  - Contact the child’s general paediatrician as per local practice if:
    - Known renal tract anomalies
    - Catheter (due to potential for colonisation not infection)
  - On prophylactic antibiotics (as influences antibiotic choice)

*Follow local empirical antibiotic guidelines if in Townsville, Cairns or Gold Coast HHSs else refer to CHQ Antibiotic Card. Oral route preferred in child ≥ 3 months if well.
Clinical features of a UTI by age (listed in order of decreasing frequency)

<table>
<thead>
<tr>
<th>Aged &lt;3 months</th>
<th>Child aged ≥3 months and &lt;3 years</th>
<th>Aged ≥3 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fever</td>
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<td>Frequency</td>
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<tr>
<td>Vomiting</td>
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Urine dipstick testing interpretation

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<td>Negative</td>
<td>Only if age &lt;3 months</td>
<td>Unlikely (unless aged &lt;3 months)</td>
</tr>
</tbody>
</table>

Considerations
- Not all urinary organisms produce nitrites, so the absence of nitrites does not exclude UTI.
- Urine has to be present in the bladder for enough time for the reaction to occur – non-toilet trained child may have a false negative due to more frequent bladder emptying.
- White cells may come from other anatomically related areas e.g. appendicitis.
- The presence of blood or protein on dipstick testing is not a reliable marker of UTI.
- Dipstick analysis is less reliable in neonates and young infants with the risk of falsely negative testing.

Clean catch urine specimen

High false positive rate if poor collection technique.

The collector should be advised:
- to wash the child’s perineum prior to collection with saline soaked gauze
- the inside of the clean/sterile container used for collection should not be contaminated by touching the collector’s or the child’s skin

Refer to [How to collect a clean urine specimen Factsheet](#)