

# 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.<sup>1-3</sup>



Frequency of UTI in febrile children	
Age	Frequency
Less than 1 year	6.5% girls, 1.2% circumcised boys, 8% uncircumcised boys
1 – 2 years	8.1% girls, 1.9% boys.
Greater than 2 years	Decreased frequency thereafter

### 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.<sup>1-6</sup>

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  $\geq 38^{\circ}$  C without localising signs. In general, the younger the infant or child, the lower the threshold for urine screening.<sup>3-6</sup>

## History

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

Clinical features of a UTI by age (listed in order of decreasing frequency)		
Age less than 3 months	Age between 3 months and 3 years	Age 3 years and older
Fever	Fever	Urinary frequency
Vomiting	Abdominal pain	Dysuria
Lethargy	Loin tenderness	Dysfunctional voiding
Irritability	Vomiting	Changes to continence
Poor feeding	Poor feeding	Abdominal pain
Failure to thrive	Lethargy	Loin tenderness
Abdominal pain	Irritability	Fever
Jaundice	Haematuria	Malaise
Haematuria	Offensive urine	Vomiting
Offensive urine	Failure to thrive	Haematuria
		Offensive urine
		Cloudy urine

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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 (impaired bladder emptying due to neurological aetiology) and hydration status. Blood pressure should be measured.

No physical sign is pathognomonic for a UTI.<sup>7,8</sup> 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  $\geq 38^{\circ}$  C should have urine sent for microscopy to screen for UTI.<sup>3,6,9</sup> 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.<sup>3,6</sup> Urine testing can be safely deferred in children with an unexplained fever who are  $\geq 3$  months of age and otherwise well.<sup>4</sup> For these children urine testing is only recommended if fever persists for more than 48 hours.<sup>5</sup> 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  $\geq 3$  months who have a clear alternative site of infection, and if verbal, no urinary symptoms.<sup>5</sup> 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.<sup>2,4,6</sup>

**Selecting the most appropriate method of urine collection is crucial.**



Urine collection methods in children		
Collection method	Utility	Notes
<b>Supra-pubic bladder aspiration (SPA)</b>	<ul style="list-style-type: none"> <li>age &lt;6 months and toxic</li> <li>phimosis or labial adhesion</li> </ul>	<ul style="list-style-type: none"> <li>invasive</li> <li>gold standard as lowest contamination rate</li> <li>success rate varies (23 - 90%) depending on operator, use of ultrasound and the presence of at least 20mL of urine</li> <li>ultrasound significantly increases success rate</li> </ul>
<b>Urethral catheterisation (CSU) "in-out catheter"</b>	<ul style="list-style-type: none"> <li>age &gt;6 months and toxic</li> <li>age &lt;6 months and toxic with failed SPA</li> <li>non-urgent collection where CCU/MSU not possible/failed</li> </ul>	<ul style="list-style-type: none"> <li>invasive</li> <li>low contamination rate</li> <li>highest success rate</li> <li>risk of iatrogenic infection</li> </ul>
<b>Clean catch specimen (CCU)</b>	<ul style="list-style-type: none"> <li>non-urgent collection and unable to void on request</li> </ul>	<ul style="list-style-type: none"> <li>non-invasive</li> <li>high false positive rate if poor collection technique - refer to <a href="#">How to collect a clean urine specimen Factsheet</a>.</li> <li>research supports the <a href="#">Quick Wee</a> method<sup>10-13</sup></li> </ul>
<b>Midstream urine (MSU)</b>	<ul style="list-style-type: none"> <li>non-urgent collection and able to void on request</li> </ul>	<ul style="list-style-type: none"> <li>preferred method for toilet-trained children who can void on request</li> </ul>
<b>Bag specimens</b>	<ul style="list-style-type: none"> <li>not recommended</li> </ul>	<ul style="list-style-type: none"> <li>unacceptably high contamination rate so <b>CANNOT</b> be used for UTI diagnosis<sup>14</sup></li> </ul>

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

Urine dipstick testing interpretation			
Leucocytes	Nitrites	Send for M/C/S	Likelihood of UTI
Positive	Positive	Y	Likely
Negative	Positive	Y	Possible
Positive	Negative	Y	Possible
Negative	Negative	Only if age <3 months	Unlikely (unless aged <3 months)

**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.<sup>8</sup>

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.<sup>15-16</sup>

### 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.<sup>17-18</sup>

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.<sup>4</sup>

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.<sup>19</sup> 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 and advice 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.



### Child is critically unwell or rapidly deteriorating child

#### Includes the following children (as a guide)

- suspected sepsis (see Sepsis guideline)
- physiological triggers based on age (see below)

Less than 1 year	1-4 years	5-11 years	Over 12 years
<ul style="list-style-type: none"> <li>• RR &gt;50</li> <li>• HR &lt;90 or &gt;170</li> <li>• sBP &lt;65</li> <li>• SpO2 &lt;93% in oxygen or &lt;85% in air</li> <li>• GCS ≤12</li> </ul>	<ul style="list-style-type: none"> <li>• RR &gt;40</li> <li>• HR &lt;80 or &gt;160</li> <li>• sBP &lt;70</li> <li>• SpO2 &lt;93% in oxygen or &lt;85% in air</li> <li>• GCS ≤12</li> </ul>	<ul style="list-style-type: none"> <li>• RR &gt;40</li> <li>• HR &lt;70 or &gt;150</li> <li>• sBP &lt;75</li> <li>• SpO2 &lt;93% in oxygen or &lt;85% in air</li> <li>• GCS ≤12</li> </ul>	<ul style="list-style-type: none"> <li>• RR &gt;30</li> <li>• HR &lt;50 or &gt;130</li> <li>• sBP &lt;85</li> <li>• SpO2 &lt;93% in oxygen or &lt;85% in air</li> <li>• GCS ≤12</li> </ul>

Reason for contact	Who to contact
<b>For immediate onsite assistance including airway management</b>	The most senior resources available onsite at the time as per local practices. Options may include: <ul style="list-style-type: none"> <li>• paediatric critical care</li> <li>• critical care</li> <li>• anaesthetics</li> <li>• paediatrics</li> <li>• Senior Medical Officer (or similar)</li> </ul>
<b>Paediatric critical care advice and assistance</b>	Onsite or via Retrieval Services Queensland (RSQ). If no onsite paediatric critical care service contact RSQ on <b>1300 799 127</b> : <ul style="list-style-type: none"> <li>• for access to paediatric critical care telephone advice</li> <li>• to coordinate the retrieval of a critically unwell child</li> </ul> <a href="#">RSQ</a> (access via QH intranet) <b>Notify early of child potentially requiring transfer.</b> <b>Consider early involvement of local paediatric/critical care service.</b> In the event of retrieval, inform your local paediatric service.





## Non-critical child

### Including the following:

- less than 3 months of age
- possible early sepsis
- suspected pyelonephritis/peri-nephric abscess
- failed outpatient treatment
- any other significant clinical concern

Reason for contact	Who to contact
<b>Advice</b> (including management, disposition or follow-up of children with no known comorbidities)	Follow local practice. Options: <ul style="list-style-type: none"> <li>• onsite/local paediatric service</li> <li>• Queensland Children's Hospital experts via <a href="#">Children's Advice and Transport Coordination Hub (CATCH)</a> on 13 CATCH (13 22 82) (24-hour service)</li> <li>• local and regional paediatric videoconference support via Telehealth Emergency Management Support Unit <a href="#">TEMSU</a> (access via QH intranet) on 1800 11 44 14 (24-hour service)</li> </ul>
<b>Advice</b> (re empiric antibiotic therapy for child with long-term catheter, on prophylactic antibiotics or with renal tract anomalies)	The first point of call should be the child's General Paediatrician. Additional advice may be sought from onsite/local ID specialist.
<b>Referral</b>	First point of call is the onsite/local paediatric service

## Inter-hospital transfers

<b>Do I need a critical transfer?</b>	<ul style="list-style-type: none"> <li>• discuss with onsite/local paediatric service</li> <li>• view <a href="#">Queensland Paediatric Transport Triage Tool</a></li> </ul>
<b>Request a non-critical inter-hospital transfer</b>	<ul style="list-style-type: none"> <li>• contact onsite/local paediatric service</li> <li>• contact RSQ on 1300 799 127 for aeromedical transfers</li> <li>• contact <a href="#">Children's Advice and Transport Coordination Hub (CATCH)</a> on 13 CATCH (13 22 82) for transfers to Queensland Children's Hospital</li> </ul>
<b>Non-critical transfer forms</b>	<ul style="list-style-type: none"> <li>• <a href="#">QH Inter-hospital transfer request form</a> (access via QH intranet)</li> <li>• <a href="#">aeromedical stepdown</a> (access via QH intranet)</li> <li>• commercial aeromedical transfers:           <ul style="list-style-type: none"> <li>○ <a href="#">Qantas</a></li> <li>○ <a href="#">Virgin</a></li> <li>○ <a href="#">Jetstar</a></li> </ul> </li> </ul>



## 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. *Staphylococcus aureus* or *Pseudomonas*)

## Related documents

### Guidelines

- NICE Guideline [Urinary tract infection in under 16s: diagnosis and management](#)
- [Sepsis](#)
- [Febrile Illness](#)
- [Meningitis](#)

### Factsheet

- [UTI factsheet](#)
- [How to collect a clean urine specimen factsheet](#)



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## Guideline approval

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**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. We recommend hospitals follow their usual practice for endorsement locally including presenting it to their local Medicines Advisory Committee (or equivalent) prior to use.

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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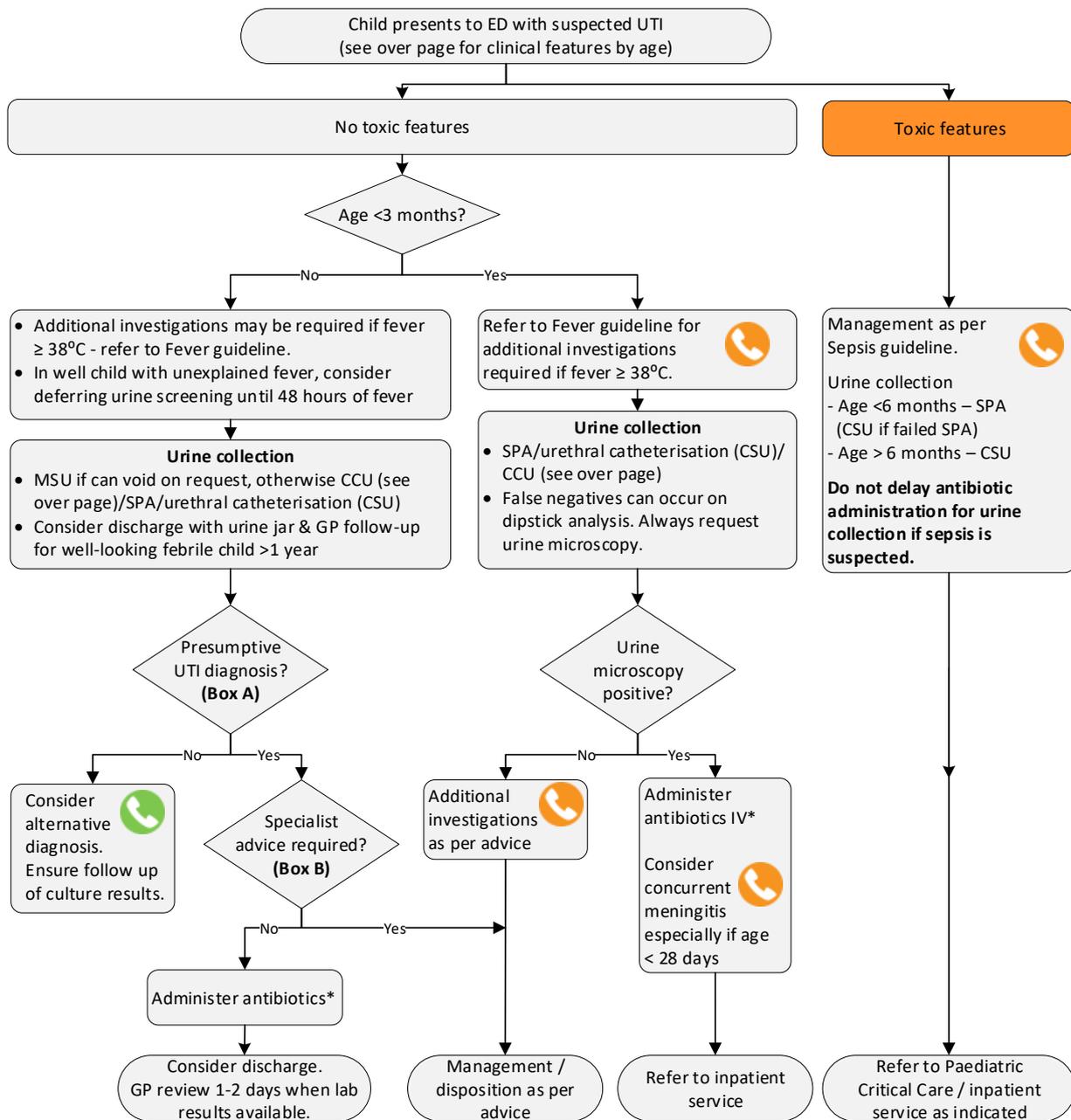


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**Box A: Criteria for presumptive UTI diagnosis**

- 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 Antibiocard. Oral route preferred in child ≥ 3 months if well.

Consider seeking senior emergency/paediatric advice as per local practices

Seek senior emergency/paediatric advice as per local practices

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Clinical features of a UTI by age (listed in order of decreasing frequency)		
Aged <3 months	Child aged ≥3 months and <3 years	Aged ≥3 years
Fever Vomiting Lethargy Irritability Poor feeding Failure to thrive Abdominal pain Jaundice Haematuria Offensive urine	Fever Abdominal pain Loin tenderness Vomiting Poor feeding Lethargy Irritability Haematuria Offensive urine Failure to thrive	Frequency Dysuria Dysfunctional voiding Changes to continence Abdominal pain Loin tenderness Fever Malaise Vomiting Haematuria Offensive urine Cloudy urine

## 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](#)

## Urine dipstick testing interpretation

Leucocytes	Nitrites	Send for M/C/S	Likelihood of UTI
Positive	Positive	Y	Likely
Negative	Positive	Y	Possible
Positive	Negative	Y	Possible
Negative	Negative	Only if age <3 months	Unlikely (unless aged <3 months)

### 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.

