

## UTI in children: diagnosis, treatment and long-term management.

Dr J Thomson, September 2017

*Note: this algorithm is based on NICE clinical guideline 54 published in 2007 and updated in 2017. It should not be applied for infants or children with dilated renal pelvis or other urinary tract abnormalities. It is only to be used in babies and children <16 years of age **in whom a urinary tract infection is suspected.***

A urinary tract infection is defined in this guideline by a combination of clinical features and the presence of bacteria in the urine.

Symptoms and signs:

- Infants and children presenting with unexplained fever of 38°C or higher should have a urine sample tested within 24 hours. [2007]
- Infants and children with an alternative site of infection should not have a urine sample tested. When infants and children with an alternative site of infection remain unwell, urine testing should be considered after 24 hours at the latest [2007]

**Consider UTI in children with the following signs and/or symptoms:**

The most common presentation in infants is an undiagnosed fever. Some older children present with typical urinary symptoms.

**History** should include details of risk factors for UTI and serious underlying pathology:

*Poor urine flow (always ask about urinary stream in boys)*

*History suggesting, or confirmed, previous UTI*

*Recurrent PUO*

*Antenatally-diagnosed renal abnormality*

*Family h/o VUR or renal disease*

*Constipation*

*Dysfunctional voiding*

**Table 1 Presenting symptoms and signs in infants and children with UTI**

Age group		Symptoms and signs Most common -----> Least common		
Infants younger than 3 months		Fever Vomiting Lethargy Irritability	Poor feeding Failure to thrive	Abdominal pain Jaundice Haematuria Offensive urine
Infants and children, 3 months or older	Preverbal	Fever	Abdominal pain Loin tenderness Vomiting Poor feeding	Lethargy Irritability Haematuria Offensive urine Failure to thrive
	Verbal	Frequency Dysuria	Dysfunctional voiding Changes to continence Abdominal pain Loin tenderness	Fever Malaise Vomiting Haematuria Offensive urine Cloudy urine

**Testing:**

**CHILDREN UNDER 3 MTHS & between 3mths and 3yrs if systemically unwell**

- Urgent urine micro & culture
- Manage in line with the ‘**Feverish illness in children**’ guideline.
- Antibiotics may need to be started before results are known in unwell children (red and amber groups)

**CHILDREN OVER 3 MONTHS:**

Use Urine Dipstick test:

Both leucocyte esterase (LE) & nitrite +ve	<ul style="list-style-type: none"> <li>- Start antibiotics for UTI</li> <li>- Send urine for culture</li> </ul>
LE –ve, nitrite +ve	<ul style="list-style-type: none"> <li>- (ensure urine sample was fresh)</li> <li>- Start antibiotic treatment</li> <li>- Send urine for culture</li> </ul>
LE +ve, nitrite -ve	<ul style="list-style-type: none"> <li>- Send urine for culture if unsure but note that this result may indicate infection elsewhere</li> <li>- Only start antibiotic treatment for UTI if there is good clinical evidence for UTI</li> </ul>
LE & nitrite -ve	<ul style="list-style-type: none"> <li>- Do not start treatment for UTI</li> <li>- Explore other causes of illness</li> <li>- Do not send urine for culture unless at least one of the “Indications for culture” criteria below is present</li> </ul>

## INDICATIONS FOR CULTURE:

- in infants and children who are considered to have acute pyelonephritis/upper urinary tract
- in infants and children with a high to intermediate risk of serious illness
- in infants under 3 months
- in infants and children with a positive result for leukocyte esterase or nitrite
- in infants and children with recurrent UTI
- in infants and children with an infection that does not respond to treatment within 24–48 hours, if no sample has already been sent
- when clinical symptoms and dipstick tests do not correlate [2017]

## Guidance on microscopy results:

	Pyuria +ve <sup>2</sup>	Pyuria -ve
Bacteriuria +ve <sup>1</sup>	UTI	UTI (but note that <i>asymptomatic</i> bacteriuria is not a UTI and therefore should <b>not</b> be treated with antibiotics)
Bacteriuria -ve	Start antibiotics if clinically UTI	Not UTI

## What constitutes “bacteriuria” and “pyuria”?

<sup>1</sup>Typically, a urine infection is caused by a single organism which is present in a high concentration, usually > 100 000 colony-forming units (cfu) per ml. When contaminating organisms have entered the sample after the urine has left the bladder, there is usually either a smaller concentration of bacteria or a mixed growth of organisms. However, it is possible to have an infection which gives rise to a lower colony count or to a mixed growth and it is possible to have contamination with a pure growth of a single organism. The colony count has not been formally validated in children. Bacterial counts as low as 1000 cfu/ml can, in certain unusual clinical situations, represent a true UTI but when bacterial numbers are lower than 10<sup>5</sup> cfu/ml the chance of the identified bacteria representing contamination increases. The results from urine culture can therefore not be interpreted in isolation, but should be done in relation to the clinical setting, symptoms and findings.

(<https://www.nice.org.uk/guidance/cg54/evidence/full-guideline-pdf-196566877>)

The presence of at least 50,000 CFU/mL of a uropathogen is the American Academy of Pediatrics definition for a UTI but with clean catch samples, if the patient is asymptomatic, bacterial growth is usually >100,000 CFU/mL of the same organism on different days. If pyuria is absent, this result probably indicates colonization rather than infection.

(<http://emedicine.medscape.com/article/969643-workup#c8>)

<sup>2</sup>NICE unfortunately does not define significant pyuria. From a BMJ paper: “Clinically important pyuria has been defined as more than 10x10<sup>6</sup> leucocytes/l of urine. Only 1.5% of healthy schoolchildren exceed this.” (<http://www.bmj.com/content/311/7010/924>). This is the same as >10 WBC/microliter. There is a lot of research material on what constitutes significant pyuria – and no conclusions as yet. >10 WBC per high power field is the number mentioned in some of the NICE material but not really emphasized in the algorithms.

If in doubt about the significance of microscopy findings – repeat the test. And remember that the diagnosis of a UTI relies on a “combination of clinical features and bacteriuria”.

**NB:** in the hospital, we are often looking at urine results without the patient. That is not the situation that this guideline was written for. A urine sample should only have been sent if there was a clinical suspicion of a UTI however, for practical reasons, they are sometimes sent before the child has been examined. You will need to check the clinical notes and try to

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decide if this child had a UTI clinically when you are assessing the urine microscopy result. Asymptomatic bacteriuria should not be treated with antibiotics. If in doubt, repeat the test.

### Acute management

Treatment should be provided according to the risk of serious illness as shown below. When there is doubt about the level of risk of serious illness the child should be managed in accordance with the higher risk level.

High risk of serious illness and/or Children younger than 3 mths	Admit. If UTI seems likely, treat with IV antibiotics (see Microguide). Consider adding gentamicin (once daily dosage) if clinical condition warrants (especially if under 3 mths age). Check renal function first.
Acute pyelonephritis/ upper UTI ie. Bacteriuria and fever of 38°C or higher Bacteriuria, loin pain/tenderness and fever < 38°C	Consider admission Treat with 7-10 days broad spectrum oral antibiotics (see Microguide) If oral antibiotics cannot be used, give IV for 2-4 days followed by oral antibiotics for total duration of 10 days.
Cystitis/lower UTI All other infants and children with symptoms or signs of UTI who have bacteriuria but no systemic features	Probably no need to admit Treat with oral antibiotics (see Microguide) for 3 days Ask parents to seek further medical advice if no improvement after 24-48 hrs.

### Also:

- Consider IM treatment if parenteral treatment is required and IV treatment is not possible
- Treat with a different antibiotic, not a higher dose of the same antibiotic, if a child is receiving prophylactic medication and develops an infection.
- Don't treat asymptomatic bacteriuria with antibiotics (asymptomatic bacteriuria (also known as occult or covert or screening bacteriuria) is defined as the presence of bacteria in the urine without symptoms.)
- Don't routinely use antibiotic prophylaxis after first-time UTI but consider it after recurrent UTI pending results of renal imaging. The decision to continue will be made in OPD. Give trimethoprim:
  - < 12 year 2 mg/kg once daily at night (max 100mg)
  - 12-18 years 100mg once daily at night

To prevent recurrence:

- Address any constipation
- Encourage a good fluid intake
- Emphasise importance of not delaying voiding

### IMAGING post UTI

Children younger than	Responds well to Rx in 48hrs	Atypical	Recurrent
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6 months	No features of atypical and/or recurrent UTI	UTI	UTI
USS during acute infection	No	Yes <sup>b</sup>	Yes
USS within 6 weeks	Yes <sup>a</sup>	No	No
DMSA after 4-6mths	No	Yes	Yes
MCUG	No	Yes	Yes
<sup>a</sup> if abnormal, consider MCUG <sup>b</sup> in a child with non-EColi UTI, responding well to antibiotics & with no atypical features, the USS can be requested on non-urgent basis within 6 weeks			

Children 6 mths – 3 years age	Responds well to Rx in 48hrs No features of atypical and/or recurrent UTI	Atypical UTI	Recurrent UTI
USS during acute infection	No	Yes <sup>b</sup>	No
USS within 6 weeks	No	No	Yes
DMSA after 4-6mths	No	Yes	Yes
MCUG	No	No <sup>a</sup>	No <sup>a</sup>
<sup>a</sup> Consider MCUG if there is dilatation on USS, poor urine flow, non-E.coli infection, F/H of VUR <sup>b</sup> As above			

Children over 3 years age	Responds well to Rx in 48hrs No features of atypical and/or recurrent UTI	Atypical UTI	Recurrent UTI
USS during acute infection	No	Yes <sup>ab</sup>	No
USS within 6 weeks	No	No	Yes <sup>a</sup>
DMSA after 4-6mths	No	No	Yes
MCUG	No	No	No
<sup>a</sup> USS in toilet trained children should be performed with a full bladder with an estimate of bladder vol. pre & post micturition <sup>b</sup> As above			

**Definitions:**

**Atypical UTI** includes:

- seriously ill
- poor urine flow
- abdominal or bladder mass
- raised creatinine
- septicaemia
- failure to respond to antibiotics in 48 hrs
- infection with non-E.coli organisms

**Recurrent UTI**

- 2 or more episodes of acute pyelonephritis
- 1 episode pyelonephritis with 1 or more episodes cystitis

3 or more episode cystitis/lower UTI

**FOLLOW –UP**

If no imaging has been needed or if the imaging is normal in a child with a first UTI → refer back to GP.

Ensure the parents/carers are aware of the possibility of recurrence, the need to be vigilant and the need to seek prompt treatment if another UTI is suspected. OPD follow up should be arranged for all children

with a h/o recurrent UTI or where imaging results are abnormal.

Children with cystitis/lower UTI should undergo USS (within 6 wks) only if they are under 6 mths age or have had recurrent infection. No other investigations are required for any child with cystitis/lower UTI unless they have recurrent UTI and/or USS is abnormal. Then a DMSA scan at 4-6 mths should be considered