Mid Essex Hospital Services NHS Trust

| URINARY TRACT INFECTION IN CHILDREN; DIAGNOSIS, TREATMENT AND LONG-TERM MANAGEMENT (0-16YRS) | **Type: Clinical Guideline**<br>**Register No: 10042**<br>**Status: Public** |
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## Index

## 1.0 Purpose

1.1 The aim of this guideline is to support consistent clinical practice by considering the importance of accurate diagnosis and the effectiveness of subsequent investigations and treatment.

## 2.0 Background

2.1 Urinary tract infection UTI is a common bacterial infection causing illness in children. It may be difficult to recognize UTI in children because the presenting symptoms and/or signs are non-specific, particularly in younger children.

2.2 Urine collection and interpretation of urine tests in children are not easy and therefore it may not always be possible to unequivocally confirm the diagnosis.

2.3 In the past 30–50 years, the natural history of UTI in children has changed as a result of the introduction of antibiotics and improvements in health care. This change has contributed to uncertainty about the most appropriate and effective way to diagnose and treat UTI in children and whether or not investigations and follow-up are justified.

## 3.0 Equality and Diversity

3.1 Mid Essex Hospital Services NHS Trust is committed to the provision of a service that is fair, accessible and meets the needs of all individual.

## 4.0 Areas Outside of Scope

- Children with urinary catheters in situ
- Children with neurogenic bladders
- Children already known to have significant pre-existing uropathies
- Children with underlying renal disease (for example, nephrotic syndrome)
- Immunosuppressed children
- Infants and children in intensive care units
- Preventative measures or long-term management of sexually active girls with recurrent UTI

## 5.0 Clinical Assessment and Diagnosis

### 5.1 Symptoms and signs

5.1.1 Infants and children presenting with unexplained fever of 38°C or higher should have a urine sample tested within 24 hours.

5.1.2 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.

5.1.3 Infants and children with symptoms and signs suggestive of urinary tract infection (UTI) should have a urine sample tested for infection. Table 1 is a guide to the symptoms and signs that infants and children present with.

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

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

## 5.2 Assessment of risk of serious illness

5.2.1 The illness level in infants and children should be assessed in accordance with recommendations in appendix 2.

## 5.3 History and examination on confirmed UTI

5.3.1 The following risk factors for UTI and serious underlying pathology should be recorded:

- Poor urine flow
- History suggesting previous UTI or confirmed previous UTI
- Recurrent fever of uncertain origin
- Antenatally-diagnosed renal abnormality
- Family history of vesicoureteric reflux (VUR) or renal disease
- Constipation
- Dysfunctional voiding
- Enlarged bladder
- Abdominal mass
- Evidence of spinal lesion
- Poor growth
- High blood pressure

## 5.4 Clinical differentiation between acute pyelonephritis/upper urinary tract infection and cystitis/lower urinary tract infection

5.4.1 Infants and children who have bacteriuria and fever of 38°C or higher should be considered to have acute pyelonephritis/upper urinary tract infection. Infants and children presenting with fever lower than 38°C with loin pain/tenderness and bacteriuria should also be considered to have acute pyelonephritis/upper urinary tract infection. All other infants and children who have bacteriuria but no systemic symptoms or signs should be considered to have cystitis/lower urinary tract infection.

## 5.5 Clinical differentiation between atypical and recurrent UTI

5.5.1 Atypical UTI includes:

- Seriously ill (for more information refer to 'Feverish illness in children' (Refer to guideline entitled Feverish Illness in Children; register number 10043)
- Poor urine flow
- Abdominal or bladder mass
- Raised creatinine
- Septicaemia
- Failure to respond to treatment with suitable antibiotics within 48 hours infection with non-E. coliorganisms.

5.5.2 Recurrent UTI:

- Two or more episodes of UTI with acute pyelonephritis/upper urinary tract infection, or
- One episode of UTI with acute pyelonephritis/upper urinary tract infection plus one or more episode of UTI with cystitis/lower urinary tract infection, or
- Three or more episodes of UTI with cystitis/lower urinary tract infection

## 5.6 Urine collection

5.6.1 A clean catch urine sample is the recommended method for urine collection. If a clean catch urine sample is unobtainable:

5.6.2 Other non-invasive methods such as urine collection pads should be used. It is important to follow the manufacturer's instructions when using urine collection pads. Cotton wool balls, gauze and sanitary towels should not be used to collect urine in infants and children.

5.6.3 When it is not possible or practical to collect urine by non-invasive methods, catheter samples or suprapubic aspiration (SPA) should be performed by a trained clinician.

5.6.4 Before SPA is attempted, ultrasound guidance should be used to demonstrate the presence of urine in the bladder.

5.6.5 In an infant or child with a high risk of serious illness it is highly preferable that a urine sample is obtained; however, treatment should not be delayed if a urine sample is unobtainable.

## 5.7 Urine preservation

5.7.1 If urine is to be cultured but cannot be cultured within 4 hours of collection, the sample should be refrigerated or preserved with boric acid immediately.

5.7.2 The manufacturer's instructions should be followed when boric acid is used to ensure the correct specimen volume to avoid potential toxicity against bacteria in the specimen.

## 5.8 Urine testing procedures

5.8.1 The urine-testing strategies shown in tables 2–5 are recommended.

5.8.2 As with all diagnostic tests there will be a small number of false negative results; therefore clinicians should use clinical criteria for their decisions in cases where urine testing does not support the findings.

**Table 2 Urine-testing strategy for infants younger than 3 months**

| |
|---|
| All infants younger than 3 months with suspected UTI (see table 1) should be referred to paediatric specialist care and a urine sample should be sent for urgent microscopy and culture. These infants should be managed in accordance with the recommendations for this age group in 'Feverish illness in children' (NICE clinical guideline 47). |

**Table 3 Urine-testing strategies for infants and children 3 months or older but younger than 3 years**

| Urgent microscopy and culture is the preferred method for diagnosing UTI in this age group; this should be used where possible. | |
|---|---|
| **If the infant or child has specific urinary symptoms** | □ Urgent microscopy and culture should be arranged and antibiotic treatment should be started.<br>□ When urgent microscopy is not available, a urine sample should be sent for microscopy and culture, and antibiotic treatment should be started. |
| **If the symptoms are non-specific to UTI** | □ For an infant or child with a high risk of serious illness: the infant or child should be urgently referred to a paediatric specialist where a urine sample should be sent for urgent microscopy and culture. Such infants and children should be managed in line with 'Feverish illness in children' (NICE clinical guideline 47).<br>□ For an infant or child with an intermediate risk of serious illness: if the situation demands, the infant or child may be referred urgently to a paediatric specialist. For infants and children who do not require paediatric specialist referral, urgent microscopy and culture should be arranged. Antibiotic treatment should be started if microscopy is positive (see table 5). When urgent microscopy is not available, dipstick testing may act as a substitute. The presence of nitrites suggests the possibility of infection and antibiotic treatment should be started (see table 4). In all cases, a urine sample should be sent for microscopy and culture.<br>□ For an infant or child with a low risk of serious illness: microscopy and culture should be arranged. Antibiotic treatment should only be started if microscopy or culture is positive. |

**Table 4 Urine-testing strategies for children 3 years or older**

| | |
|---|---|
| Dipstick testing for leukocyte esterase and nitrite is diagnostically as useful as microscopy and culture, and can safely be used. | |
| **If both leukocyte esterase and nitrite are positive** | The child should be regarded as having UTI and antibiotic treatment should be started. If a child has a high or intermediate risk of serious illness and/or a past history of previous UTI, a urine sample should be sent for culture. |
| **If leukocyte esterase is negative and nitrite is positive** | Antibiotic treatment should be started if the urine test was carried out on a fresh sample of urine. A urine sample should be sent for culture. Subsequent management will depend upon the result of urine culture. |
| **If leukocyte esterase is positive and nitrite is negative** | A urine sample should be sent for microscopy and culture. Antibiotic treatment for UTI should not be started unless there is good clinical evidence of UTI (for example, obvious urinary symptoms). Leukocyte esterase may be indicative of an infection outside the urinary tract which may need to be managed differently. |
| **If both leukocyte esterase and nitrite are negative** | The child should not be regarded as having UTI. Antibiotic treatment for UTI should not be started, and a urine sample should not be sent for culture. Other causes of illness should be explored. |

**Table 5 Guidance on the interpretation of microscopy results**

| **Microscopy results** | **Pyuria positive** | **Pyuria negative** |
|---|---|---|
| **Bacteriuria positive** | The infant or child should be regarded as having UTI | The infant or child should be regarded as having UTI |
| **Bacteriuria negative** | Antibiotic treatment should be started if clinically UTI | The infant or child should be regarded as not having UTI |

## 5.9 Indication for culture

5.9.1 Urine samples should be sent for culture:

- in infants and children who have a diagnosis of acute pyelonephritis/upper urinary tract infection
- in infants and children with a high to intermediate risk of serious illness
- in infants and children under 3 years
- in infants and children with a single 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

## 5.10 Laboratory tests for localising UTI

5.10.1 C-reactive protein alone should not be used to differentiate acute pyelonephritis/upper urinary tract infection from cystitis/lower urinary tract infection in infants and children.

### 5.11 Imaging tests for localising UTI

5.11.1 The routine use of imaging in the localisation of a UTI is not recommended.

5.11.2 In the rare instances when it is clinically important to confirm or exclude acute pyelonephritis/upper urinary tract infection, power Doppler ultrasound is recommended. When this is not available or the diagnosis still cannot be confirmed, a dimercaptosuccinic acid (DMSA) scintigraphy scan is recommended.

## 6.0 Acute Management

6.1 Antibiotic requirements for infants and children with conditions that are outside the scope of this guideline (for example, infants and children already known to have significant pre-existing uropathies) have not been addressed and may be different from those given here.

6.2 Infants and children with a high risk of serious illness should be referred urgently to the care of a paediatric specialist.

6.3 Infants younger than 3 months with a possible UTI should be referred immediately to the care of a paediatric specialist. Treatment should be with parenteral antibiotics in line with 'Feverish illness in children' (NICE clinical guideline 47).

6.4 For infants and children 3 months or older with acute pyelonephritis/upper urinary tract infection:

6.4.1 Treat with oral antibiotics for 7–10 days. The use of an oral antibiotic with low resistance patterns is recommended, for example cephalosporin or co-amoxiclav

6.4.2 If oral antibiotics cannot be used, treat with an intravenous (IV) antibiotic agent such as cefotaxime or ceftriaxone for 2–4 days followed by oral antibiotics for a total duration of 10 days.

6.5 For infants and children 3 months or older with cystitis/lower urinary tract infection treat with oral antibiotics for 3 days. The choice of antibiotics should be directed by locally developed multidisciplinary guidance. Trimethoprim, nitrofurantoin, cephalosporin or amoxicillin may be suitable.

6.6 The parents or carers should be advised to bring the infant or child for reassessment if the infant or child is still unwell after 24–48 hours. If an alternative diagnosis is not made, a urine sample should be sent for culture to identify the presence of bacteria and determine antibiotic sensitivity if urine culture has not already been carried out.

6.7 For infants and children who receive aminoglycosides (gentamicin or amikacin), once daily dosing is recommended.

6.8 If parenteral treatment is required and IV treatment is not possible, intramuscular treatment should be considered.

6.9 If an infant or child is receiving prophylactic medication and develops an infection, treatment should be with a different antibiotic, not a higher dose of the same antibiotic.

6.10 Asymptomatic bacteriuria in infants and children should not be treated with antibiotics

## 7.0 Long-term Management

### 7.1 Prevention of recurrence

7.1.1 Dysfunctional elimination syndromes and constipation should be addressed in infants and children who have had a UTI.

7.1.2 Children who have had a UTI should be encouraged to drink an adequate amount
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7.1.3 Children who have had a UTI should have ready access to clean toilets when required and should not be expected to delay voiding.

### 7.2 Antibiotic Prophylaxis

7.2.1 Antibiotic prophylaxis should not be routinely recommended in infants and children following first-time UTI.

7.2.2 Antibiotic prophylaxis may be considered in infants and children with recurrent UTI.

7.2.3 Asymptomatic bacteriuria in infants and children should not be treated with prophylactic antibiotics.

### 7.3 Imaging tests

7.3.1 Infants and children with atypical UTI (see box 1) should have ultrasound of the urinary tract during the acute infection to identify structural abnormalities of the urinary tract such as obstruction, as outlined in tables 6, 7 and 8. This is to ensure prompt management.

7.3.2 For infants younger than 6 months with first-time UTI that responds to treatment, ultrasound should be carried out within 6 weeks of the UTI, as outlined in table 6.

7.3.3 For infants and children aged 6 months and older with first-time UTI that responds to treatment, routine ultrasound is not recommended unless the infant or child has atypical UTI, as outlined in tables 7 and 8.

7.3.4 Infants and children who have had a lower urinary tract infection should undergo ultrasound (within 6 weeks) only if they are younger than 6 months or have had recurrent infections.

7.3.5 A DMSA scan 4–6 months following the acute infection should be used to detect renal parenchymal defects, as outlined in tables 6, 7 and 8.

7.3.6 If the infant or child has a subsequent UTI while awaiting DMSA, the timing of the DMSA should be reviewed and consideration given to doing it sooner.

7.3.7 Routine imaging to identify VUR is not recommended for infants and children who have had a UTI, except in specific circumstances, as outlined in tables 6, 7 and 8.

7.3.8 When a micturating cysto-urethrogram (MCUG) is performed, prophylactic antibiotics should be given orally for 3 days with MCUG taking place on the second day.

7.3.9 Infants and children who have had a UTI should be imaged as outlined in tables 6, 7 and 8.

. **Table 6 Recommended imaging schedule for infants younger than 6 months**

| Test | Responds well to treatment within 48 hours | Atypical UTI[a] | Recurrent UTI[a] |
|---|---|---|---|
| Ultrasound during the acute infection | No | Yes[c] | Yes |
| Ultrasound within 6 weeks | Yes[b] | No | No |
| DMSA 4–6 months following the acute infection | No | Yes | Yes |
| MCUG | No | Yes | Yes |

[a] See box 1 for definition

[b] If abnormal consider MCUG

[c] In an infant or child with a non-*E. coli*-UTI, responding well to antibiotics and with no other features of atypical infection, the ultrasound can be requested on a non-urgent basis to take place within 6 weeks

**Table 7 Recommended imaging schedule for infants and children 6 months or older but younger than 3 years**

| Test | Responds well to treatment within 48 hours | Atypical UTI[a] | Recurrent UTI[a] |
|---|---|---|---|
| Ultrasound during the acute infection | No | Yes [c] | No |
| Ultrasound within 6 weeks | No | No | Yes |
| DMSA 4–6 months following the acute infection | No | Yes | Yes |
| MCUG | No | No[b] | No[b] |

a See box 1 for definition

b While MCUG should not be performed routinely it should be considered if the following features are present:

- dilatation on ultrasound
- poor urine flow
- non-*E. coli*-infection
- family history of VUR.

cIn an infant or child with a non-*E. coli*-UTI, responding well to antibiotics and with no other features of atypical infection, the ultrasound can be requested on a non-urgent basis to take place within 6 weeks

**Table 8 Recommended imaging schedule for children 3 years or older**

| Test | Responds well to treatment within 48 hours | Atypical UTI[a] | Recurrent UTI[a] |
|---|---|---|---|
| Ultrasound during the acute infection | No | Yes[b] | No |
| Ultrasound within 6 weeks | No | No | Yes[b] |
| DMSA 4–6 months following the acute infection | No | No | Yes |
| MCUG | No | No | No |

[a] See box 1 for definition

[b] Ultrasound in toilet-trained children should be performed with a full bladder with an estimate of bladder volume before and after micturition.

[c] In a child with a non-*E. coli*-UTI, responding well to antibiotics and with no other features of atypical infection, the ultrasound can be requested on a non-urgent basis to take place within 6 weeks

### 7.4 Surgical intervention

7.4.1 Surgical management of VUR is not routinely recommended.

## 8.0 Follow-up

8.1 Infants and children who do not undergo imaging investigations should not routinely be followed up.

8.2 The way in which the results of imaging will be communicated should be agreed with the parents or carers or the young person as appropriate.

8.3 When results are normal, a follow-up outpatient appointment is not routinely required. Parents or carers should be informed of the results of all the investigations in writing.

8.4 Infants and children who have recurrent UTI or abnormal imaging results should be assessed by a paediatric specialist.

8.5 Assessment of infants and children with renal parenchymal defects should include height, weight, blood pressure and routine testing for proteinuria.

8.6 Infants and children with a minor, unilateral renal parenchymal defect do not need long-term follow-up unless they have recurrent UTI or family history or lifestyle risk factors for hypertension.

8.7 Infants and children who have bilateral renal abnormalities, impaired kidney function, raised blood pressure and/or proteinuria should receive monitoring and appropriate management by a paediatric nephrologist to slow the progression of chronic kidney disease.

8.8 Infants and children who are asymptomatic following an episode of UTI should not routinely have their urine re-tested for infection.

8.9 Asymptomatic bacteriuria is not an indication for follow-up.

## 9.0 Information and Advice for Children, Young People and Parents or Carers

9.1 Healthcare professionals should ensure that when a child or young person has been identified as having a suspected UTI, they and their parents or carers as appropriate are given information about the need for treatment, the importance of completing any course of treatment and advice about prevention and possible long-term management.

9.2 Healthcare professionals should ensure that children and young people, and their parents or carers as appropriate, are aware of the possibility of a UTI recurring and understand the need for vigilance and to seek prompt treatment from a healthcare professional for any suspected reinfection.

9.3 Healthcare professionals should offer children and young people and/or their parents orcarers appropriate advice and information on:

- Prompt recognition of symptoms
- Urine collection, storage and testing
- Appropriate treatment options
- Prevention
- Nature of and reason for any urinary tract investigation
- Prognosis
- Reasons and arrangements for long-term management if required.

## 10.0 Staff Training

10.1 All medical and nursing staff are to ensure that their knowledge, competencies and skills are up to date in order to complete their portfolio and appraisal.

10.2 During induction all staff will receive instruction on current policies and guidelines and how to access them.

10.3 Staff will regularly receive updated guidelines to read.

## 11.0 Infection Prevention

11.1 All staff should follow Trust guidelines on infection prevention ensuring that they effectively ‘decontaminate their hands’ before and after procedures.

## 12.0 Audit and Monitoring

12.1 Where a Patient’s notes have demonstrated that the appropriate action has not been taken then a ‘DATIX’ form is to be completed. This will highlight further staff training needs.

12.2 A quarterly DATIX audit will be examined by the Lead Nurse and the clinical director and risk lead for CYP.

12.3 Where a child's notes have demonstrated that the appropriate action has not been taken a 'risk event form' is to be completed. This will address any further training needs for staff that require updating.

12.4 Audit of compliance with this guideline will be considered on an annual audit basis in accordance with the Clinical Audit Strategy and Policy (register number 08076), the Corporate Clinical Audit and Quality Improvement Project Plan and the Maternity annual audit work plan; to encompass national and local audit and clinical governance identifying key harm themes. The Women's and Children's Clinical Audit Group will identify a lead for the audit.

12.5 The findings of the audit will be reported to and approved by the Multi-disciplinary Risk Management Group (MRMG) and an action plan with named leads and timescales will be developed to address any identified deficiencies. Performance against the action plan will be monitored by this group at subsequent meetings.

12.6 The audit report will be reported to the monthly Directorate Governance Meeting (DGM) and significant concerns relating to compliance will be entered on the local Risk Assurance Framework.

12.7 Key findings and learning points from the audit will be submitted to the Patient Safety Group within the integrated learning report.

12.8 Key findings and learning points will be disseminated to relevant staff.

## 13.0 Communication

13.1 Approved guidelines are published monthly in the Trust's Focus Magazine that is sent via email to all staff.

13.2 Ratified guidelines will be uploaded to the intranet and website.

13.3 It is the responsibility of the author to ensure that all clinical staff working with children are individually notified by email.

## 14.0 References

NICE 2007 Clinical Guideline 54, Urinary Tract Infection in Children; diagnosis, treatment and long-term management.

**Appendix 1**

## Traffic Light System for Identifying Risk of Serious Illness

Children with fever and **any** of the symptoms or signs in the red column should be recognised as being at high risk. Similarly, children with fever and any of the symptoms or signs in the amber column and none in the red column should be recognised as being at intermediate risk. Children with symptoms and signs in the green column and none in the amber or red column are at low risk. The management of children with fever should be directed by the level of risk.

| | Green – low risk | Amber – intermediate risk | Red – high risk |
|---|---|---|---|
| **Colour** | • Normal colour of skin, lips and tongue | • Pallor reported by parent/carer | • Pale/mottled/ashen/blue |
| **Activity** | • Responds normally to social cues<br>• Content/smiles<br>• Stays awake or awakens quickly<br>• Strong normal cry/not crying | • Not responding normally to social cues<br>• Wakes only with prolonged stimulation<br>• Decreased activity<br>• No smile | • No response to social cues<br>• Appears ill to a healthcare professional<br>• Unable to rouse or if does not stay awake<br>• Weak, high-pitched or continuous cry |
| **Respiratory** | | • Nasal flaring<br>• Tachypnoea:<br>• RR > 50 breaths/minute age 6–12 months<br>• RR > 40 breaths /minute age > 12 months<br>• Oxygen saturation ≤ 95% in air<br>• Crackles | • Grunting<br>• Tachypnoea:<br>• RR > 60 breaths/minute<br>• Moderate or severe chest indrawing |
| **Hydration** | • Normal skin and eyes<br>• Moist mucous membranes | • Dry mucous membrane<br>• Poor feeding in infants<br>• CRT ≥ 3 seconds<br>• Reduced urine output | • Reduced skin turgor |
| **Other** | • **None** of the amber or red symptoms or signs | • Fever for ≥ 5 days | • Age 0–3 months, temperature<br>• Age 3–6 months, ≥ 39°C |
| | | • Swelling of a limb or joint<br>• Non-weight bearing/not using an extremity | • Non-blanching rash<br>• Bulging fontanelle<br>• Neck stiffness<br>• Status epilepticus<br>• Focal neurological signs<br>• Focal seizures |
| | | • A new lump > 2 cm | • Bile-stained vomiting |

CRT- capillary refill time; RR - respiratory rate.