NHS

National Institute for Health and Clinical Excellence

Quick reference guide

Issue date: August 2007

UTI in children

Urinary tract infection in children: diagnosis, treatment and long-term management

NICE clinical guideline 54
Developed by the National Collaborating Centre for Women's and Children's Health

About this booklet

This is a quick reference guide that summarises the recommendations NICE has made to the NHS in 'Urinary tract infection in children: diagnosis, treatment and long-term management' (NICE clinical guideline 54).

Who should read this booklet?

This quick reference guide is for healthcare professionals and other staff who care for infants and children with urinary tract infection (UTI). It contains what you need to know to put the guideline's recommendations into practice.

Who wrote the guideline?

The guideline was developed by the National Collaborating Centre for Women's and Children's Health, which is based at the Royal College of Obstetricians and Gynaecologists. The Collaborating Centre worked with a group of healthcare professionals (including consultants, GPs and nurses), patients and carers, and technical staff, who reviewed the evidence and drafted the recommendations. The recommendations were finalised after public consultation.

For more information on how NICE clinical guidelines are developed, go to www.nice.org.uk

Where can I get more information about the guideline on UTI in children?

The NICE website has the recommendations in full, summaries of the evidence they are based on, a summary of the guideline for patients and carers, and tools to support implementation (see inside back cover for more details).

National Institute for Health and Clinical Excellence
MidCity Place
71 High Holborn
London
WC1V 6NA

www.nice.org.uk

ISBN 1-84629-455-X

This guidance is written in the following context

This guidance represents the view of the Institute, which was arrived at after careful consideration of the evidence available. Healthcare professionals are expected to take it fully into account when exercising their clinical judgement. The guidance does not, however, override the individual responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or guardian or carer.

Contents

Child-centred care

Treatment and care should take into account the individual needs and preferences of children with UTI, and those of their parents and carers. Good communication is essential, supported by evidence-based information, to allow parents and carers to reach informed decisions about their child's care.

Introduction

UTI is a common bacterial infection causing illness in infants and children. It may be difficult to recognise UTI in children because the presenting symptoms and signs are non-specific, particularly in infants and children under 3 years. Current management, which includes imaging, prophylaxis and prolonged follow-up, has placed a heavy burden on NHS primary and secondary care resources. It is costly, based on limited evidence and is unpleasant for children and distressing for their parents or carers. The aim of this guideline is to achieve more consistent clinical practice, based on accurate diagnosis and effective management.

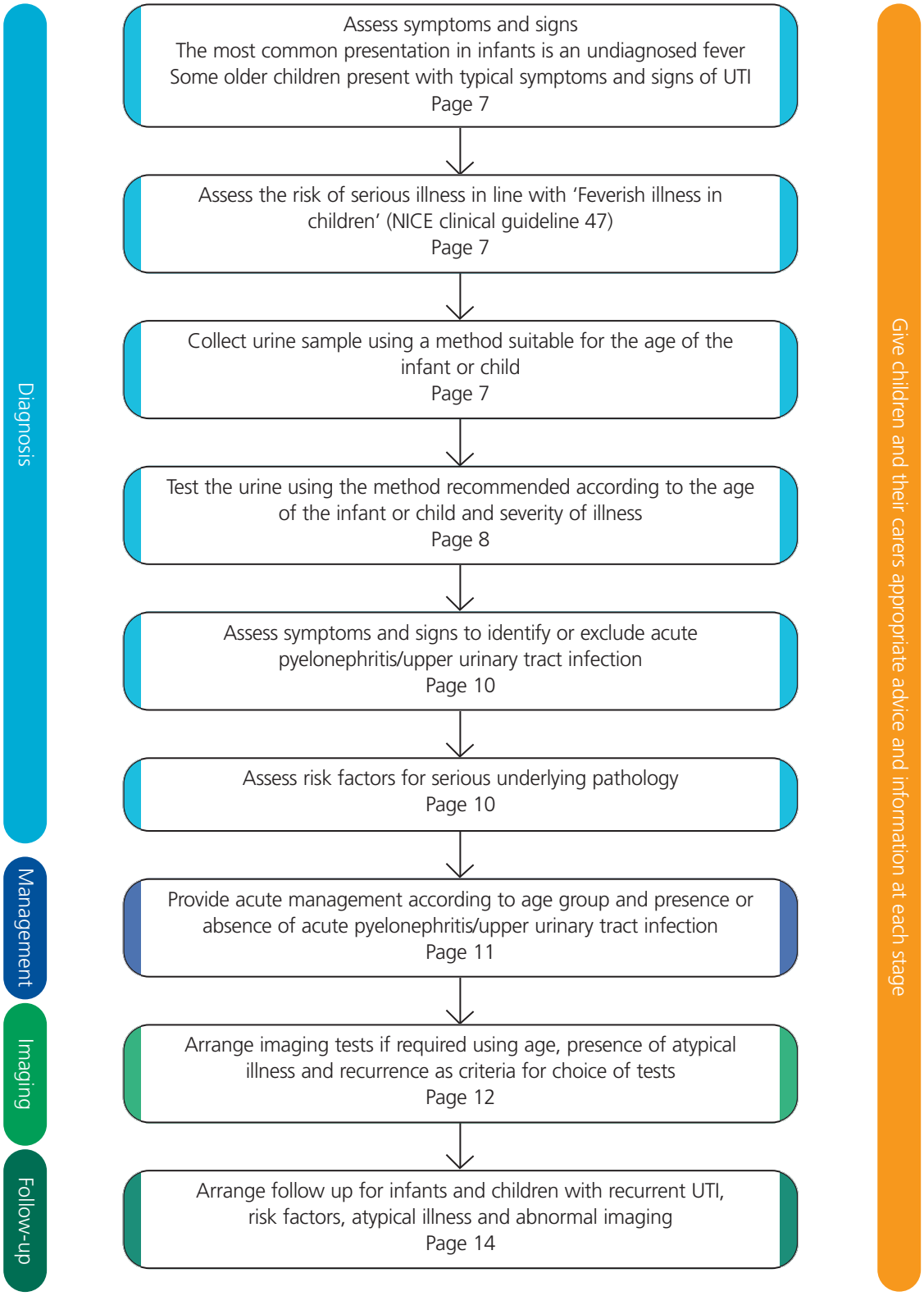
Key priorities for implementation

- Infants and children presenting with unexplained fever of 38°C or higher should have a urine sample tested after 24 hours at the latest.
- Infants and children with symptoms and signs suggestive of urinary tract infection (UTI) should have a urine sample tested for infection. The table on page 7 is a guide to the symptoms and signs that infants and children present with.
- A clean catch urine sample is the recommended method for urine collection. If a clean catch urine sample is unobtainable:
  - other non-invasive methods such as urine collection pads should be used. It is important to follow the manufacturers' instructions when using urine collection pads. Cotton wool balls, gauze and sanitary towels should not be used to collect urine in infants and children.
  - when it is not possible or practical to collect urine by non-invasive methods, catheter samples or suprapubic aspiration (SPA) should be used.
  - before SPA is attempted, ultrasound guidance should be used to demonstrate the presence of urine in the bladder.
- The urine-testing strategies shown in the tables on page 8 are recommended.[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.
- 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).

[1] Assess the risk of serious illness in line with 'Feverish illness in children' (NICE clinical guideline 47) to ensure appropriate urine tests and interpretation, both of which depend on the child's age and risk of serious illness.

- For infants and children 3 months or older with acute pyelonephritis/upper urinary tract infection:
  - consider referral to a paediatric specialist
  - 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
  - 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.
- 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
  - 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.
- Antibiotic prophylaxis should not be routinely recommended in infants and children following first-time UTI.
- Infants and children who have had a UTI should be imaged as outlined in the tables on page 12.

Patient flow pathway



Diagnosis

Assess the symptoms and signs

Consider UTI in an infant or child presenting with the following symptoms and signs.

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

Assess the risk of serious illness

Assess the child's level of illness in line with 'Feverish illness in children' (NICE clinical guideline 47).

Test urine sample in infants and children:

- with symptoms and signs of UTI (see table above).
- with unexplained fever of 38°C or higher (test urine after 24 hours at the latest).
- with an alternative site of infection but who remain unwell (consider urine test after 24 hours at the latest).

Collecting the urine sample

A clean catch urine sample is the recommended method for urine collection.

- If a clean catch urine sample is not possible:
  - use other non-invasive methods such as urine collection pads. Follow the manufacturer's instructions.
  - do not use cotton wool balls, gauze or sanitary towels.
- If other non-invasive methods are not possible:
  - use a catheter sample or suprapubic aspiration (SPA).

Do not delay treatment if the sample cannot be obtained and the infant or child is at high risk of serious illness.

Preserving the urine sample

If the sample needs to be cultured but cannot be cultured within 4 hours of collection, either refrigerate it or preserve it with boric acid immediately (refer to the manufacturer's instructions).

Urine testing strategies

It is important for clinicians to use clinical criteria for their decisions in cases where urine testing does not support the clinical findings.

Infants younger than 3 months	• Refer to paediatric specialist care. • Urine sample for urgent microscopy and culture. • Manage in line with 'Feverish illness in children' (NICE clinical guideline 47).

Infants and children 3 months or older but younger than 3 years	**Use urgent microscopy and culture to diagnose UTI**
Specific urinary symptoms	• Urine sample for urgent microscopy and culture. • Start antibiotic treatment. • If urgent microscopy is not available, send a urine sample for microscopy and culture, and start antibiotic treatment.
Non-specific symptoms	**High risk of serious illness:** • Urgent referral to paediatric specialist care. • Urine sample for urgent microscopy and culture. • Manage in line with 'Feverish illness in children' (NICE clinical guideline 47).
	Intermediate risk of serious illness: • Consider urgent referral to a paediatric specialist as described in 'Feverish illness in children' (NICE clinical guideline 47). • When specialist paediatric referral is not required: – urgent microscopy and culture should be arranged – antibiotic treatment should be started if microscopy is positive – when urgent microscopy is not available, dipstick testing may be used as a substitute – the presence of nitrites suggests the possibility of infection and antibiotic treatment should be started. • In all cases, a urine sample should be sent for microscopy and culture.
	Low risk of serious illness: • Urine sample for microscopy and culture. • Start antibiotic treatment if microscopy or culture is positive.

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

Children 3 years or older	Use dipstick test to diagnose UTI
If both leukocyte esterase and nitrite are positive	• Start antibiotic treatment for UTI. • If high or intermediate risk of serious illness or past history of UTI, send urine sample for culture.
If leukocyte esterase is negative and nitrite is positive	• Start antibiotic treatment if fresh sample was tested. • Send urine sample for culture.
If leukocyte esterase is positive and nitrite is negative	• Send urine sample for microscopy and culture. • Only start antibiotic treatment for UTI if there is good clinical evidence of UTI. • Result may indicate infection elsewhere. • Treat depending on results of culture.
If both leukocyte esterase and nitrite are negative	• Do not start treatment for UTI. • Explore other causes of illness. • Do not send urine sample for culture unless recommended in 'Indications for culture'.

Indications for culture:

- diagnosis of acute pyelonephritis/upper urinary tract infection
- high to intermediate risk of serious illness
- under 3 years
- a single positive result for leukocyte esterase or nitrite
- recurrent UTI
- infection that does not respond to treatment within 24–48 hours
- clinical symptoms and dipstick tests do not correlate.

Determine location

Localisation of UTI is important and is generally a clinical process (see table below).

Bacteriuria and fever of 38°C or higher	Acute pyelonephritis/upper urinary tract infection
Bacteriuria, loin pain/tenderness and fever of less than 38°C	Acute pyelonephritis/upper urinary tract infection
Bacteriuria but no systemic features	Cystitis/lower urinary tract infection

On the rare occasions when it is not possible to localise UTI clinically, and it is important to confirm or exclude acute pyelonephritis/upper urinary tract infection, use power Doppler ultrasound or a dimercaptosuccinic acid (DMSA) scan.

Record the following risk factors for UTI and serious underlying pathology:

- poor urine flow
- history suggesting, 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.

Acute management

If there is a high risk of serious illness	• Arrange urgent referral to a paediatric specialist in line with 'Feverish illness in children' (NICE clinical guideline 47).
If the infant or child is younger than 3 months	• Immediately refer to a paediatric specialist. • Treat with parenteral antibiotics in line with 'Feverish illness in children' (NICE clinical guideline 47).
If the infant or child is 3 months or older with acute pyelonephritis/ upper urinary tract infection	• Consider referral to a paediatric specialist. • Treat with oral antibiotics for 7–10 days. Use antibiotic with low resistance pattern. • If oral antibiotics cannot be used, use intravenous (IV) antibiotics for 2–4 days followed by oral antibiotics for a total duration of 10 days.
If the infant or child is 3 months or older with cystitis/ lower urinary tract infection	• Treat with oral antibiotics for 3 days. • If the child is still unwell after 24–48 hours they should be reassessed. • If no alternative diagnosis, send urine for culture.

Do:

- use once daily dosing if an infant or child is being treated with aminoglycosides
- consider intramuscular 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 an infant or child is receiving prophylactic medication and develops an infection
- laboratories should monitor resistance patterns of urinary pathogens and advise prescribers accordingly.

Don't:

- treat asymptomatic bacteriuria with antibiotics
- routinely use antibiotic prophylaxis after first-time UTI but consider it after recurrent UTI.

Preventing recurrence

- Address dysfunctional elimination syndromes and constipation.
- Encourage children to drink an adequate amount.
- Emphasise the importance of not delaying voiding.

Imaging tests

Definitions

Atypical UTI	Recurrent UTI
• Seriously ill (for more information refer to 'Feverish illness in children' [NICE clinical guideline 47]) • 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. coli* organisms	• Two or more episodes of UTI with acute pyelonephritis/upper urinary tract infection • One episode of UTI with acute pyelonephritis/upper urinary tract infection plus one or more episode of UTI with cystitis/lower urinary tract infection • Three or more episodes of UTI with cystitis/lower urinary tract infection

Infants and children who have had a UTI should be imaged as outlined in the tables below.

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 for definitions
[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

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 for definitions
[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.

[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

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 c]	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 for definitions
[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

If the infant or child has a subsequent UTI while awaiting DMSA, review the timing of the DMSA and consider doing it sooner.

When a micturating cystourethrogram (MCUG) is performed, give oral prophylactic antibiotics for 3 days with MCUG taking place on the second day.

Surgical intervention

Surgical management of VUR is not routinely recommended.

Follow-up

Agree how to communicate the results of imaging tests with the parents or carers (or young person if appropriate).

No follow-up

- Infants and children who do not undergo imaging investigations should not routinely be followed up.
- When results are normal, a follow-up outpatient appointment is not routinely required. Inform parents or carers of the results of all the investigations in writing.
- Infants and children who are asymptomatic following an episode of UTI should not routinely have their urine re-tested for infection.
- Asymptomatic bacteriuria is not an indication for follow-up.

Referral and assessment

- Infants and children who have recurrent UTI or abnormal imaging results should be assessed by a paediatric specialist.
- Assessment of infants and children with renal parenchymal defects should include height, weight, blood pressure and routine testing for proteinuria.
- 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.

Long-term follow-up

- 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.

Information and advice following a UTI

Give children, parents and carers information and advice about the following:

- the need for treatment, the importance of completing treatment and advice about prevention and long-term management (if appropriate)
- the possibility of a UTI recurring, and the importance of being vigilant and seeking prompt treatment from a healthcare professional
- recognising symptoms quickly
- urine collection, storage and testing
- treatment
- prevention
- the nature of and reason for UTIs
- prognosis
- long-term management (if required).

Implementation

NICE has developed tools to help organisations implement this guidance (listed below). These are available on our website (www.nice.org.uk/CG054).

- Slides highlighting key messages for local discussion.
- Implementation advice on how to put the guidance into practice and national initiatives which support this locally.
- Audit criteria to monitor local practice.
- Costing tools:
  - costing report to estimate the national savings and costs associated with implementation
  - costing template to estimate the local costs and savings involved.

The National Collaborating Centre for Women's and Children's Health and the Guideline Development Group have also devised an algorithm. This is available on our website (www.nice.org.uk/CG054).

Further information

Ordering information

You can download the following documents from www.nice.org.uk/CG054

- A quick reference guide (this document) – a summary of the recommendations for healthcare professionals.
- The NICE guideline – all the recommendations.
- 'Understanding NICE guidance' – information for patients and carers.
- The full guideline – all the recommendations, details of how they were developed, and summaries of the evidence they were based on.

For printed copies of the quick reference guide or 'Understanding NICE guidance', phone the NHS Response Line on 0870 1555 455 and quote:

- N1304 (quick reference guide)
- N1305 ('Understanding NICE guidance').

Related NICE guidance

For information about NICE guidance that has been issued or is in development, see the website (www.nice.org.uk).

- Feverish illness in children: assessment and initial management in children younger than 5 years. NICE clinical guideline 47 (2007). Available from www.nice.org.uk/CG047

Updating the guideline

This guideline will be updated as needed, and information about the progress of any update will be posted on the NICE website (www.nice.org/CG054).

National Institute for
Health and Clinical Excellence
MidCity Place
71 High Holborn
London
WC1V 6NA

www.nice.org.uk

N1304 1P 70k Aug 07

ISBN 1-84629-455-X