NATIONAL INSTITUTE FOR HEALTH AND CLINICAL EXCELLENCE

Health and social care directorate

Quality standards and indicators

Briefing paper

Quality standard topic: Urinary tract infection in children

Output: Prioritised quality improvement areas for development.

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Contents

1 Introduction

This briefing paper presents a structured overview of potential quality improvement areas for a NICE quality standard on urinary tract infection (UTI) in children.

It provides the Committee with a basis for discussion when prioritising quality improvement areas for developing the draft quality standard statements and measures. The draft quality standard will be the subject of public consultation.

Key development source(s)

Unless otherwise stated, the key development source referenced in this briefing paper as follows:

> Urinary tract infection in children: diagnosis, treatment and long-term management. NICE clinical guideline 54 (2007). (Review decision date: May 2011; next review date: August 2013)

Where relevant, guideline recommendations from the key development source are presented alongside each of the suggested areas for quality improvement within the main body of the report.

2 Overview

2.1 Focus of quality standard

The focus of this quality standard is the care of infants and children from birth up to the age of 16 years with first or recurrent upper or lower tract UTI who are not already known to have underlying renal tract disease (specifically uropathy).

2.2 Definition

Urinary tract infection is a common bacterial infection causing illness in infants and children. A UTI is defined in NICE clinical guideline 54 by a combination of clinical features and the presence of bacteria in the urine (significant bacteriuria).

2.3 Incidence and prevalence

Urinary tract infection is a common bacterial infection. Around 1 in 10 girls and 1 in 30 boys will have had a UTI by the age of 16 years.

First occurrence of UTI is most common in infancy and affects boys most often in the first 3 months of life while in girls the peak incidence is after 6 months. Infants are

often systemically unwell and have acute pyelonephritis/upper urinary tract infection while older children more often have lower UTI and typical symptoms of cystitis.

The incidence of first UTI falls with age in both sexes but UTI is less common in boys than in girls after the first 6 months. Recurrent infections in boys are relatively uncommon whereas they are very common in girls.

It is estimated that a general practice of 10 000 patients, six GPs and 100 births per year, each GP will expect to have:

- two consultations a year with a child younger than 5 years about UTI (girls : boys = 3 : 1)
- one consultation a year with a boy (aged 0–14 years) about UTI
- four consultations a year with a girl (aged 0–14 years) about UTI.

2.4 Management

Between 1991 and 2007 guidance issued by Royal College of Physicians and adopted in UK practice[1] recommended that UTI should be considered in every child with a fever or urinary symptoms, that the diagnosis should be confirmed by culture of a urine sample and that, following treatment of the acute illness, all infants and children younger than 7 years should have specific renal imaging and receive prophylactic antibiotics until these investigations have been completed.

This model of management, which includes imaging, antibiotic prophylaxis (long term treatment with antibiotics) and prolonged follow-up, places a heavy burden on NHS primary and secondary care resources including local radiology departments. This approach is costly, is based on limited evidence of clinical effectiveness, it is unpleasant for children and distressing for their parents or carers.

The publication of NICE clinical guideline 54 in 2007 led to a significant change in practice. The aim of NICE clinical guideline 54 is to achieve a more consistent and rational approach to the management of a UTI in children, with less diagnostic imaging investigations and antibiotic prophylaxis. This involves GPs making a diagnosis and deciding on appropriate referrals on who to refer to secondary care for further investigations.

A severe infection can make a child extremely unwell and may sometimes have serious consequences, and even minor infections can be distressing. Prompt and accurate diagnosis of UTI is essential if this condition is to be managed correctly. The initial assessment will usually involve a combination of clinical assessment and diagnostic testing. Most children with a first-time UTI in the UK present to primary care or to an emergency department.

[1] Guidelines for the management of acute urinary tract infection in childhood. Report of a Working Group of the Research Unit, Royal College of Physicians. Published in 1991.

It should also be noted that NICE also issued more general guidance on the management of the febrile child in 2007 that offers a “traffic light” system for assessing possible illness severity and highlights the need for a UTI to be considered as the possible cause of a febrile illness. See NICE clinical guideline 47 on feverish illness in children for recommendations on urinary tract infection in children with fever. *Note: a NICE quality standard on feverish illness in children will be developed as part of the quality standards topic library.*

See appendices 1, 2 and 3 for patient pathway, algorithms and key priority for implementation recommendations from NICE clinical guideline 54.

3 Summary of suggestions

3.1 Responses

In total six stakeholders submitted suggestions for quality improvement as part of the 2-week engagement exercise (19/09/12 – 03/10/12). Suggestions were also provided by specialist committee members.

Table 1 Summary of suggested quality improvement areas

Stakeholders were asked to suggest up to 5 areas for quality improvement. These have been merged and summarised in the table below for further consideration by the Committee (incorporating stakeholder and specialist committee member suggestions).

The full detail of the suggestions is provided in appendix 4 for information.

Suggested area for improvement	**Stakeholder (see table 2 for abbreviations)**
Education and awareness • Improved awareness amongst the public and first-line health care information providers and educators about UTI in children.	NUTH, NHS NorthEast, RCN
Diagnosis • Accurate diagnosis of UTI including accurate clinical differentiation of upper/lower UTI.	HPA, NHS NorthEast, NUTH, RCN, RCPH, SCM
Diagnosis • Identification of risk factors for renal disease.	RCPH
Diagnosis • Early treatment where high likelihood of UTI with adjustment depending on culture result.	NUTH, NHS NorthEast, RCN
Acute management – immediate referral to paediatric specialist • Referral of young babies with possible UTI to a secondary centre for confirmation of diagnosis and rapid treatment.	NUTH, NHS NorthEast, RCN,
Acute Management – individualised care plans • Individualised care plans for rapid access to diagnosis, treatment and management of further UTIs for children identified with a high risk of identifying abnormality i.e. children with scarring, family history of scarring or children with recurrent UTI's or other existing renal or functional anomalies.	NHS NorthEast NUTH RCN
Standards for imaging • Standards for imaging in UTI.	BSPR/RCR

Suggested area for improvement	Stakeholder (see table 2 for abbreviations)
Laboratory reporting standards • Standards for definition of UTI in the laboratory	SMC

Additional areas

Additional suggestions provided in appendix 4 but not included in the above table are noted below. General statements cannot be developed so these need further discussion by the Committee to determine focus and suitability.

- Monitoring of vital signs. (RCN)
- Prompt investigations as per NICE guideline 54. (RCPH)
- Improvement of the use of antibiotic prophylaxis in children who have had a UTI. (SCM)
- Standards for definition of UTI in the laboratory with variable reporting between 105 colony forming units (CFU)/ml or 104 CFU/ml or 103 CFU/ml if pure culture. (HPA)

Table 2 Stakeholder details (abbreviations)

The details of stakeholder organisations who submitted suggestions are provided in the table below.

Abbreviation	Full name
BSPR/RCR	British Society of Paediatric Radiology supported by The Royal College of Radiologists
HPA	Health Protection Agency Primary Care Unit - Microbiology Department
NHS North East	Child Health and Maternity - UTI children sub-group of the Northern Child Health Clinical Network
NUTH	The Newcastle Upon Tyne Hospitals NHS Foundation Trust, The Great North Children's Hospital, Department of Paediatric Nephrology
RCN	Royal College of Nursing
RCPH	Royal College of Paediatrics and Child Health
SCM	Specialist Committee Member(s)

4 Suggested improvement area: education and awareness

4.1 Summary of suggestions

Stakeholders highlighted the need for improved awareness of signs and symptoms and signs of UTI, especially in very young children, amongst parents, the public and first-line health care information providers.

The importance of awareness was highlighted as crucial to reducing the risk associated with childhood urinary tract infections and ensuring that parents and carers act quickly and appropriately when their child is unwell by seeking help.

4.2 Selected recommendations from development source

General awareness of UTI

NICE clinical guideline 54 (the key development source) does not provide specific recommendations to cover general awareness in the population.

**NICE clinical guideline 47 on feverish illness in children provides recommendations on urinary tract infection in children with fever. *Note: a NICE quality standard on feverish illness in children will be developed.*

NICE CG47 Recommendation 1.2.2.7

> Urinary tract infection should be considered in any child younger than 3 months with fever.

NICE CG47 Recommendation 1.2.2.8

> Urinary tract infection should be considered in a child aged 3 months and older with fever and one or more of the following:
>
> - vomiting
> - poor feeding
> - lethargy
> - irritability
> - abdominal pain or tenderness
> - urinary frequency or dysuria
> - offensive urine or haematuria.

Symptoms and signs

NICE clinical guideline 54 provides recommendations on recognition of diverse presenting symptoms and signs in infants and children with UTI, especially in the

very youngest. These are covered in the suggested improvement area for ‘diagnosis’ (section 5).

Information and advice for children, young people and parents or carers

NICE clinical guideline 54 provides recommendations on advice that should be given to children and their parents/carers when they have had a UTI.

These are presented below to inform the Commission discussion.

NICE CG 54 - Recommendation 1.6.1.1

> 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.

NICE CG 54 - Recommendation 1.6.1.2

> 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 re-infection.

NICE CG 54 - Recommendation 1.6.1.3

> Healthcare professionals should offer children and young people and/or their parents or carers appropriate advice and information on:
>
> - prompt recognition of symptoms
> - urine collection, storage and testing
> - appropriate treatment options
> - prevention
> - the nature of and reason for any urinary tract investigation
> - prognosis
> - reasons and arrangements for long-term management if required.

4.3 Current UK practice

The suggested improvement area for improvements in education and awareness is based on stakeholders’ knowledge and experience. Stakeholders drew attention to existence of under diagnosis of UTI in some areas, although no published studies were provided.

5 Suggested improvement area: diagnosis

5.1 Summary of suggestions

Most of the stakeholders highlighted the importance of 'accurate and prompt diagnosis of UTI' to underpin appropriate further management.

It was noted that many children are often provided with 'possible' UTI without a conclusive diagnosis, resulting in some children being referred to a secondary care specialist centre and unnecessary tests.

The following key areas for quality improvement relating to diagnosis were highlighted:

- Symptoms and signs. In particular, stakeholders highlighted the importance of including children with unexplained fever who may not be adequately assessed for the presence of UTI and urine testing within 24 hours.
- Urine collection. Stakeholders highlighted the importance of collection of an uncontaminated urine sample.
- Speed of transportation of samples to laboratory and importance of urine preservation (if urine cannot be cultured within 4 hours of collection).
- Urine testing. In particular, as part of the urine testing strategies, stakeholders highlighted importance of prompt antibiotic treatment where there is high likelihood of UTI with subsequent adjustments of treatment according to culture result.
- History and examination on confirmed UTI, specifically the identification and recording of risk factors for renal disease.
- Clinical differentiation between upper and lower UTI.

5.2 Selected recommendations from development source

Recommendations from the development source relating to the suggested improvement areas have been provisionally selected and are presented below to inform the Committee in their discussions.

Symptoms and signs

NICE CG 54 Recommendation 1.1.1.1 (KPI)

> Infants and children presenting with unexplained fever of 38°C or higher should have a urine sample tested after 24 hours at the latest.

NICE CG 54 Recommendation 1.1.1.3 (KPI)

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.

Urine collection

NICE CG 54 Recommendation 1.1.3.1 (KPI)

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 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.
- When it is not possible or practical to collect urine by noninvasive 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.

Urine preservation

NICE CG 54 Recommendation 1.1.4.1

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.

Urine testing

NICE CG 54 Recommendation 1.1.5.1 (KPI)

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

History and examination on confirmed UTI

NICE CG 54 Recommendation 1.1.7.1 (KPI)

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

[2] 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.

- 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.

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

NICE CG 54 Recommendation 1.1.8.1

> 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.

5.3 Current UK practice

There is currently a limited amount of published current practice information to fully assess baseline practice relating to diagnosis of UTI in children.

No published reports were highlighted by respondents, so these suggested areas for quality improvement are based on stakeholders' knowledge and experience. However, stakeholders drew attention to variations in respect to accurate and prompt diagnosis.

The NICE Guideline Development Group, based on their expert opinion, noted wide variation in practice in diagnosis of UTI in children, both in the choice and combination of tests, in the type of dipstick test used and in how laboratories perform microscopy and culture.

An online survey[3] of 186 paediatric trainees in a region assessed awareness of NICE clinical guideline 54. In respect to diagnosis, 99% reported that they diagnosed UTI in children based on positive dipstick testing and 80% reported they used clean catch as the primary collection method. It is noted that this is a limited study of small sample size.

[3] Bhojani S et al. (2010) Compliance with NICE guidelines for urinary tract infections: A survey among the paediatric trainees of the London Deanery. Archives of Disease in Childhood. 95:12

6 Suggested improvement area: acute management

6.1 Summary of suggestions

The suggested key area for quality improvement is the ‘referral of young babies with possible UTI to a secondary centre for confirmation of diagnosis and rapid treatment’.

Stakeholders highlighted this is an important quality marker, emphasising that youngest children are at increased likelihood of underlying renal pathology and may rapidly deteriorate with sepsis.

6.2 Selected recommendations from development source

Recommendations from the development source relating to the suggested improvement area have been provisionally selected and are presented below to inform the Committee in their discussions.

NICE CG 54 Recommendation 1.2.1.2 (KPI)

> 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).

6.3 Current UK practice

Based on their knowledge and experience, stakeholders drew attention to variation in local arrangements for referral of infants to paediatric specialists.

7 Suggested improvement area: individualised care plans

7.1 Summary of suggestions

The suggested key area for quality improvement is ‘individualised care plans to support rapid access to diagnosis, treatment and management of further UTIs for children identified with a high risk of identifying abnormality i.e. children with scarring, family history of scarring or children with recurrent UTIs or other existing renal anomalies’.

This was suggested as an important area because children with underlying renal anatomical or functional abnormality identified after presenting with a UTI are more likely to have recurrence of UTI and have poorer outcomes.

7.2 Selected recommendations from development source

NICE clinical guideline 54 does not provide specific recommendations relating to the use of care plans.

No recommendations are presented.

Further discussion is required to determine focus and suitability for this suggested area within the draft quality standard.

7.3 Current UK practice

The suggested improvement area is based on stakeholders’ knowledge and experience.

8 Suggested improvement area: standards for imaging

8.1 Summary of suggestions

One stakeholder highlighted the importance of standards for imaging in UTI in children as a quality improvement area for consideration by the Committee.

It was highlighted that quality of imaging, if performed without appropriate level of expertise, affects diagnosis and management and can result in poor outcomes including adverse psychological outcomes.

To support the rationale for improvement, it is suggested that the level of expertise may have fallen as a result of reduced investigations following a change in current practice and implementation of the NICE guidance.

8.2 Selected recommendations from development source

Imaging is a key feature of NICE clinical guideline 54. The NICE Guideline Development Group reviewed and made recommendations on which tests are to be performed but not how they are to be carried out.

No recommendations are presented.

Further discussion is required to determine focus and suitability for this suggested area within the draft quality standard.

8.3 Current UK practice

The suggested improvement areas are based on stakeholders' knowledge and experience. No published reports were identified.

9 Suggested improvement area: laboratory reporting standards

9.1 Summary of suggestion

The suggested area for quality improvement is 'reporting of *E. Coli* coliforms which should be differentiated from non-*E. Coli* coliforms'.

This is highlighted as important for overall quality because of the need to ensure reporting of organisms in a way that will identify atypical UTIs. The identification of atypical UTI (non *E Coli*) is important for ensuring infants and children with atypical UTI have ultrasound of the urinary tract during the acute infection to identify structural abnormalities of the urinary tract such as obstruction.

9.2 Selected recommendations from development source

The identification of non-*E. Coli* organisms is part of the definition of atypical UTI as set out in NICE clinical guideline 54 and which underpin a number of recommendations relating to acute management.

NICE clinical guideline 54 provides the following definitions, including infection with non-E. coli organisms.

Box 1 Definitions of atypical and recurrent UTI

Atypical UTI includes:

- 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.**

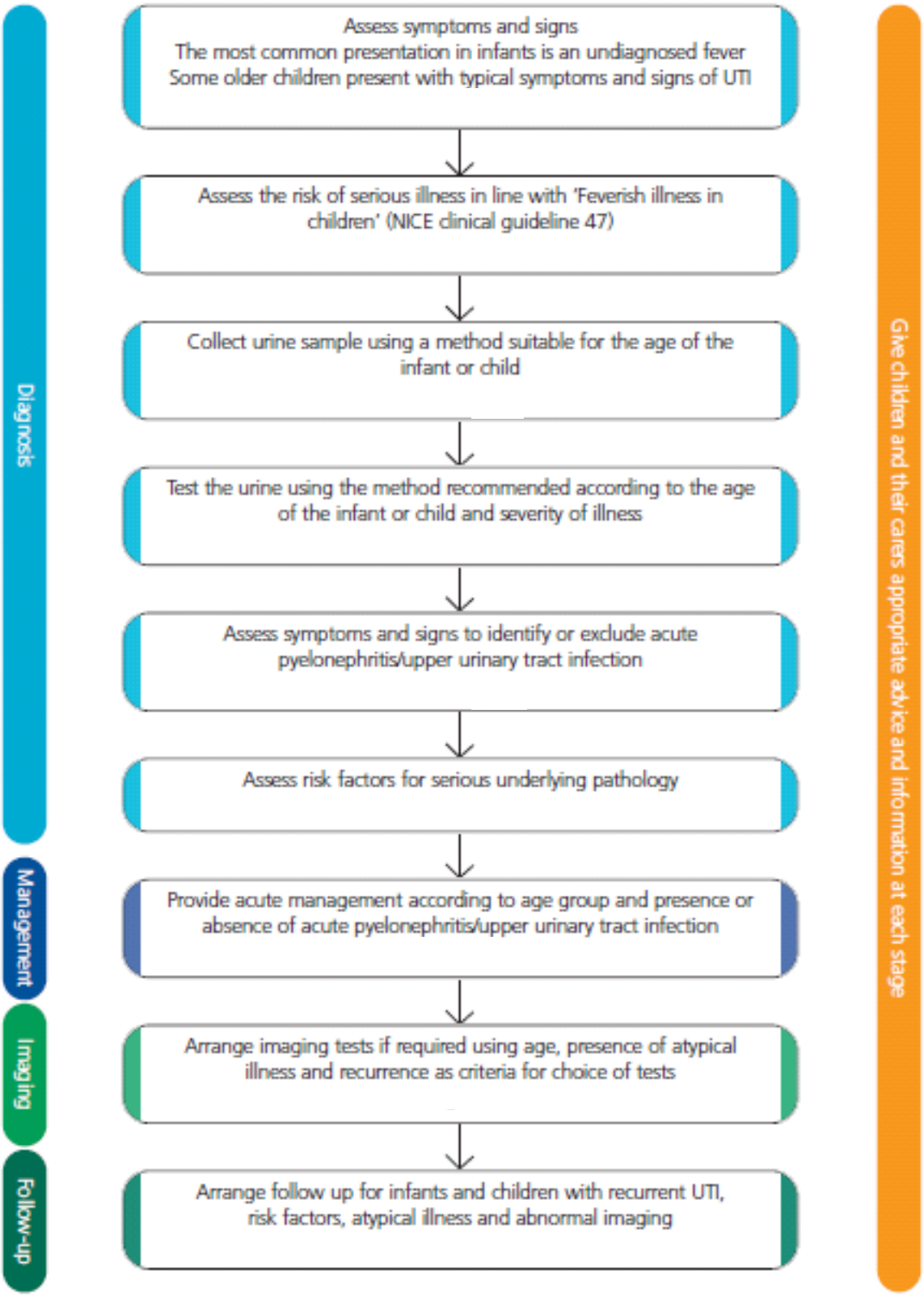
Recurrent UTI:

- 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.

9.3 Current UK practice

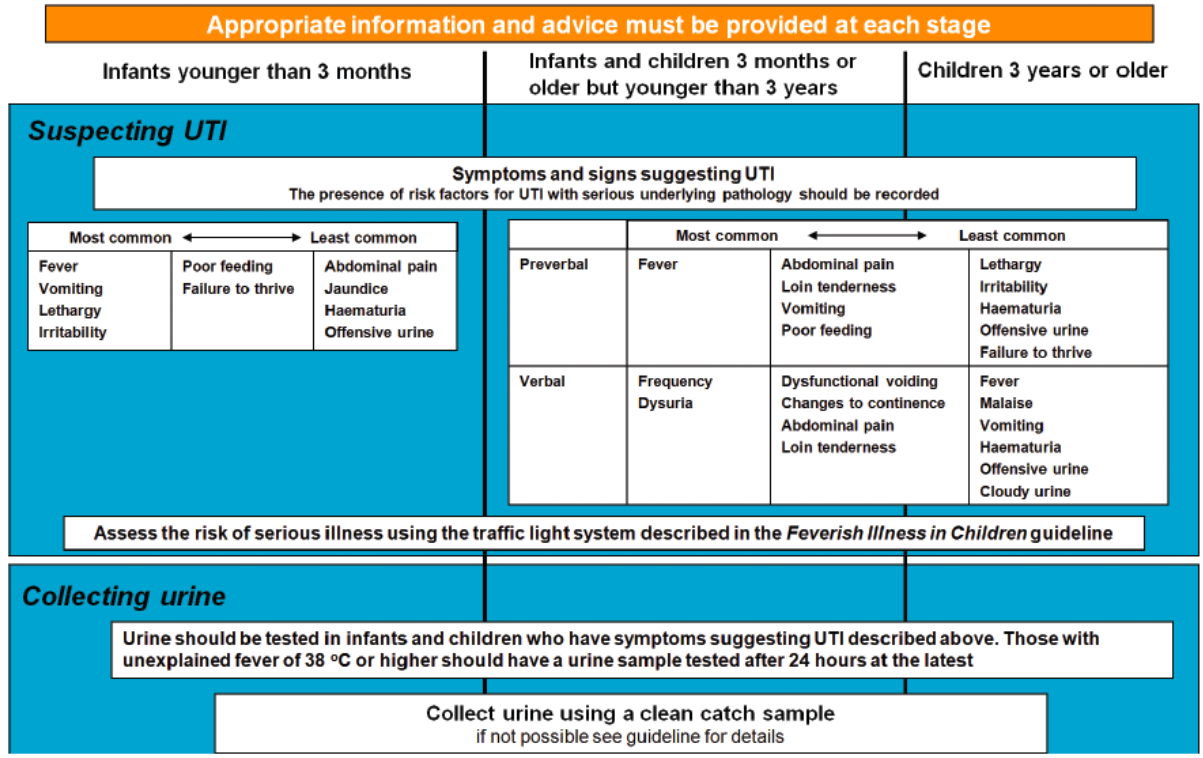
These suggested improvement areas are based on the respondents' knowledge and experience, citing that historically there is variable implementation of this criterion (E Coli vs non E Coli differentiation).

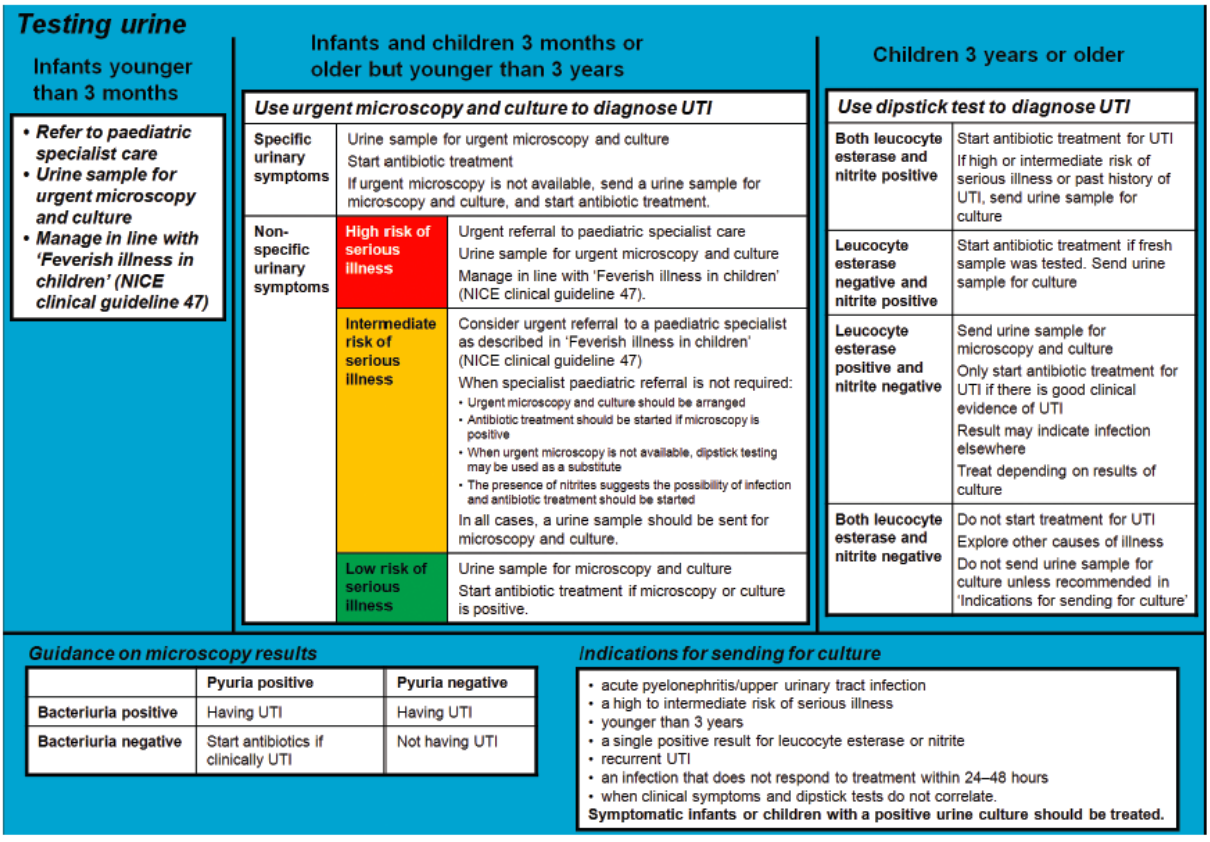
Appendix 1 Pathway diagram (CG54)



Appendix 2 Algorithm from full clinical guideline (CG54)

The following algorithm is taken from the full clinical guideline 'Diagnosis, treatment and long-term management of urinary tract infection in infants and children'.





Acute management

Treatment required

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. *Children with atypical UTI should have early imaging (see 'Imaging strategies')

High risk of serious illness and/or **Children younger than 3 months with suspicion of UTI**	Immediately refer to paediatric specialist care Microscopy and culture Treat with IV antibiotics if younger than 3 months
Acute pyelonephritis/upper urinary tract infection Children who have bacteriuria and fever 38 °C or higher Children presenting with fever lower than 38 °C with loin pain/tenderness and bacteriuria	Consider referral to paediatric specialist care Urine culture if not already done Treat with 7–10 days oral antibiotics (if oral antibiotics cannot be used, consider IV antibiotics)
Cystitis/lower urinary tract infection All other infants and children with symptoms or signs of UTI who have bacteriuria but no systemic symptoms or signs	Treat with 3 days oral antibiotics Review if still unwell after 24–48 hours

Imaging strategies

Children with cystitis/lower urinary tract infection should undergo ultrasound (within 6 weeks) only if they are younger than 6 months or have had recurrent infection. No other investigations are required for any child with cystitis/lower urinary tract infection unless they have recurrent UTI and/or abnormality on ultrasound, in which case late DMSA should be considered

Children younger than 6 months	Responds well to treatment within 48 hours without any features for atypical and/or recurrent UTI	Atypical UTI	Recurrent UTI
Ultrasound during the acute infection	No	Yes[b]	Yes
Ultrasound within 6 weeks	Yes[a]	No	No
DMSA 4–6 months following the acute infection	No	Yes	Yes
MCUG	No	Yes	Yes

[a] If abnormal consider MCUG.
[b] 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.

Children 6 months or older but younger than 3 years	Responds well to treatment within 48 hours without any features for atypical and/or recurrent UTI	Atypical UTI	Recurrent UTI
Ultrasound during the acute infection	No	Yes[b]	No
Ultrasound within 6 weeks	No	No	Yes
DMSA 4–6 months following the acute infection	No	Yes	Yes
MCUG	No	No[a]	No[a]

[a] 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.
[b] 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.

Children 3 years or older	Responds well to treatment within 48 hours without of features for atypical and/or recurrent UTI	Atypical UTI	Recurrent UTI
Ultrasound during the acute infection	No	Yes[a,b]	No
Ultrasound within 6 weeks	No	No	Yes[a]
DMSA 4–6 months following the acute infection	No	No	Yes
MCUG	No	No	No

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

Definitions

Atypical UTI[a] includes:
- seriously ill
- 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.

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.

[a]Presence of any of these features should be documented

Follow-up

No routine follow-up but ensure awareness of the possibility of recurrence and the need to be vigilant, and to seek prompt treatment if UTI is suspected

No imaging test

Normal imaging test — First-time UTI / Recurrent UTI

Abnormal imaging test

See paediatric care specialist
See full guideline for details

Appendix 3 Key priorities for implementation recommendations (CG54)

Symptoms and signs

- 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. Table 1 is a guide to the symptoms and signs that infants and children present with.

Urine collection

- 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 noninvasive 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.

Urine testing

- The urine-testing strategies shown in tables 2–5 are recommended.[1]

History and examination on confirmed UTI

- 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.

Acute management

- 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).
- 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

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

Imaging tests

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

NICE clinical guideline 54 tables

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

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. 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). • 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. • 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

Appendix 4 Suggestions from stakeholder engagement exercise

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
001	BSPR/RCR	• Standards for imaging in UTI	Imaging is a key feature of the current NICE guidance, when they were introduced imaging pathways were standardised for the first time and practice was affected in many centres. The guidance specifies which tests are to be performed but not how they are to be carried out. The frequency of some investigations (MCUG, DMSA) has been drastically reduced which means that in many centres the level of expertise has fallen.	The quality of the imaging affects the diagnosis, management and outcome. Imaging tests are potentially traumatic for the child and their family and may have adverse psychological outcomes if performed inexpertly. There are new techniques which can vastly improve patient experience (e.g. entenox administration for catheterisation) which are not used in many centres. Some of the investigations involve ionising radiation with potentially harmful effects. The radiation exposure can be limited if guidance is issued and adhered to.	None provided
002	Newcastle Hospitals NHS Trust	• Improved awareness of symptoms & signs of UTI especially in the very young amongst public and first-line health care info providers educators eg HVs, practice nurses, NHS direct type services	There is evidence that increased risk of scarring is associated with delay in treatment. Delays in diagnosis & starting treatment are likely to be multi-factorial & will require a multi faceted improvement. Some evidence of under diagnosis of UTI in some areas compared to expected incidence.	Improved parent education & information is associated with empowerment, better & efficient use of health care resources & higher satisfaction with health services	NICE CG 54 emphasises diverse symptoms & signs of UTI especially in the very youngest; emphasises importance of prompt treatment & ensuring appropriate advice & info given to families. NICE CG 37 postnatal

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
					care Parents should be offered information & advice to enable them to identify symptoms & signs of common health problems seen in babies. Compare public awareness of meningitis after recent health education campaigns compared to awareness re UTI in babies.
003	Newcastle Hospitals NHS Trust	• Accurate diagnosis of UTI & accurate diagnosis of upper verses lower UTI	Accurate diagnosis underpins appropriate further management. Differentiation between upper & lower UTI underpins CG54 management advice (eg. length of time of treatment with antibiotics, number of UTIs needed to have investigations performed)	Despite emphasis on diagnosis in NICE CG54 Many children still being labelled as 'possible' UTI without a conclusive diagnosis, resulting in some children being referred to secondary services with dysuria from other causes etc This may waste resources & also may submit some children to unnecessary tests. Differentiation between upper & lower UTI as advised in NICE CG 54 is difficult to do clinically & outcomes need auditing.	NICE CG54
004	Newcastle	• Starting treatment early	Evidence of increased risk of	Evidence of variation in practice which may	CG54

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
	Hospitals NHS Trust	if high likelihood of UTI, sending urine for culture & adjusting treatment depending on culture result.	scarring with delay in treatment	contribute to delay in treatment.	
005	Newcastle Hospitals NHS Trust	• Investigation plans should focus on those with highest likelihood of identifying abnormality eg those with recurrent UTI, the youngest. Those who are identified after 1st UTI or recurrence to have scarring or VUR or other anatomical or functional urinary tract problem, should have individualised care plan for rapid access to diagnosis & treatment & management of any further UTIs.	Evidence that those with underlying renal anatomical or functional abnormality identified after presenting with a UTI are more likely to have recurrence of UTI& poorer outcome. Access to prompt diagnosis of UTI & rapid treatment important & needs to be individualised to circumstances of the child, family & local services.	Is there any point of detecting significant underlying renal abnormality if no active management started? Management may include treatments like antibiotics but also education & advice about regular voiding, avoiding vulval irritants, drinking plenty & managing constipation etc. Prevention of worsening of chronic kidney disease. Prevention of prolonged & recurrent illness	NICE CG54 NICE Quality standards for management of Chronic Kidney Disease.
006	Newcastle Hospitals NHS Trust	• Young babies with possible UTI refer to secondary centre for confirmation of diagnosis and rapid treatment.	Evidence youngest children most likely to have underlying renal pathology & get most unwell with sepsis.	Local arrangements for referral vary from place to place. Delay in accessing secondary assessment has been implicated in some case reviews with adverse outcomes.	CG54 CG47

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
				Age range needs careful consideration; CG54 advises <3m but older infants & children who are unwell should also be included –as advised in CG 47 Feverish illness in children.	
007	NHS NorthEast	• Public and first-line health care education & awareness of symptoms & signs of UTI especially in the very young.	Delays in diagnosis & treatment are multi-factorial. Some evidence of under diagnosis of UTI in some areas compared to expected incidence. Evidence that increased risk of scarring associated with delay in treatment.	Improved parent education & information is associated with empowerment, better use of health care resources & higher satisfaction with health services	NICE CG 37 postnatal care Parents should be offered information & advice to enable them to identify symptoms & signs of common health problems seen in babies. Compare public awareness of meningitis after recent health education campaigns compared to awareness re UTI in babies.
008	NHS NorthEast	• Accurate diagnosis of UTI	Accurate diagnosis underpins appropriate further management.	Despite emphasis on diagnosis in NICE CG54 Many children still being labelled as 'possible' UTI without a conclusive diagnosis, resulting in some children being referred to secondary services with dysuria from other causes etc	CG54
009	NHS	• Start treatment early if	Evidence of increased risk of	Evidence of variation in practice	CG54

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
	NorthEast	high likelihood of UTI & adjust depending on culture result.	scarring with delay in treatment		
010	NHS NorthEast	• Investigation plans should focus on those with high likelihood of identifying abnormality eg. recurrent UTI, youngest. Those identified after 1st UTI or recurrence with scarring or VUR or other anatomical or functional urinary tract problem, should have individualised care plan for rapid access to diagnosis & treatment of further UTIs	Evidence that those with underlying renal anatomical or functional abnormality identified more likely to have recurrence of UTI & poorer outcome. Access to prompt diagnosis of UTI & rapid treatment important & needs to be individualised to circumstances of the child, family & local services.	Prevention of worsening of chronic kidney disease. Prevention of prolonged & recurrent illness	NICE Quality standards for management of Chronic Kidney Disease.
011	NHS NorthEast	• Young babies with possible UTI refer to secondary centre for confirmation of diagnosis and rapid treatment.	Evidence youngest children most likely to have underlying renal pathology & get most unwell with sepsis. Age range needs careful consideration; CG54 says <3m but older infants & children who are unwell should also be included - CG 47 Feverish illness in children.	Local arrangements for referral vary from place to place. Delay in secondary assessment implicated in some case reviews with adverse outcomes.	CG54 CG47

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
012	RCN	• Monitoring of vital signs • First-line health care and public awareness of the importance of the signs and symptoms of childhood UTI specifically in very young babies.	1. Important information gained by assessing and measuring vital signs can be indicators of health and ill health. However, we believe they should not be performed in isolation to the broader observation and assessment of the infant, child or young person. In many instances vital signs will be assessed, measured and monitored by health care assistants and nursing students, under the direction and supervision of a registered nurse. There is variation in practice and quality standard in this area will be beneficial and will improve standard of practice. 2. Delay in diagnosis and treatment are multi factorial, some evidence of under diagnosis in some areas compared to expected incidence. Evidence that there is an increased risk of scarring is associated with delay	1.The assessment, measurement and monitoring of vital signs are important basic skills for all health care practitioners working with infants, children and young people. 2.Improvements in both parental and professional education is associated with parental empowerment, improved appropriate use of health care resources and improved satisfaction in health care	1.Standards for assessing, measuring and monitoring vital signs in infants, children and young people: RCN guidance for children's nurses and nurses working with children and young people http://www.rcn.org.uk/__data/assets/pdf_file/0004/114484/003196.pdf 2. NICE CG 37 postnatal care stresses the need for parents to be offered appropriate information to enable them to identify signs and symptoms of common health conditions in babies.

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
			in recognition and treatment.		
013	RCN	• Accuracy in the diagnosis of Childhood UTI	Accurate prompt diagnosis underpins prompt treatment and appropriate further management	Inspite of the emphasis placed on accurate diagnosis by NICE in CG54 many children are still being inadequately diagnosed with inconclusive diagnoses being made	NICE CG54
014	RCN	• Prompt treatment of high risk of UTI with subsequent adjustments of treatment according to culture result	Increased risk of renal scarring if treatment delayed	Evidence of practice variation	NICE CG 54
015	RCN	• Children identified with a high risk of identifying abnormality i.e. children with scarring, family history of scarring or children with recurrent UTI's or other existing renal anomalies should have a individualised plan for rapid access for prompt accurate diagnosis and treatment	Evidence for children with underlying renal or functional abnormalities are at increased risk of poor outcome and should have a individualised plan for rapid access for prompt accurate diagnosis and treatment	Prevention of worsening of chronic kidney disease Prevention of prolonged recurrent disease with associated costs to the individual and society	NICE Quality standards for management of Chronic kidney disease
016	RCN	• Young babies with potential UTI should be referred to a secondary centre for accurate confirmation of a diagnosis of UTI and	1.Evidence that the youngest children are at increased likelihood of underlying renal pathology and may rapidly deteriorate with sepsis. Age range needs to be carefully considered:	Arrangements for referral vary greatly from place to place. Delays in secondary assessment have been implicated in some case reviews with marked adverse outcome.	CG54 CG47

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
		rapid appropriate treatment	CG54 states that <3 months but older children who are unwell should also be included. Also CG 47 (as in 1st key area)		
017	RCPH	• Urine infections in children should be diagnosed and treated promptly	Urine infections in children (especially young children) can be difficult to diagnose as symptoms can be very non-specific. There is good evidence that untreated urine infections can, in some children, lead to renal scarring with consequent risk of hypertension and chronic kidney disease.	The collection of an uncontaminated urine sample is essential for the diagnosis of UTI but can be difficult in some children. There is anecdotal evidence of great variability in practice. In particular, children with unexplained fever may not be adequately assessed for the presence of UTI. There is also variability in the speed with which samples are transported to the laboratory.	Two ongoing studies are likely to provide very useful information regarding the diagnosis and management of children with UTI: The HQIP funded multisite audit on Childhood UTI which is looking comprehensively at the standards of care delivery in children with UTI; auditing across primary, secondary and tertiary care as well as Microbiology standards derived from the NICE guideline. the DUTY study, looking at symptoms of UTI and urine results in Primary Care Both of these studies are expected to report within

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
					12 months.
018	RCPH	• Children diagnosed to have a urine infection should be investigated promptly as per NICE guideline (54)	Some children with UTI have underlying abnormalities of the urinary tract and bladder that predispose them to UTI. These abnormalities must be recognised and managed appropriately to avoid the risk of recurrent UTI.	UTI can lead to renal scarring with risks of hypertension and chronic kidney disease. Prevention of recurrent UTI reduces the risk of renal damage and the long term health implications accruing from such damage.	
019	RCPH	Identification of risk factors for renal disease	Identification of risk factors for renal disease is key to determining further investigations	Anecdotal evidence suggests that recording of risk factors for renal disease in children with suspected UTI is poor	
	HPA	Diagnosis of UTI in under 3 year olds	this is still very valuable in primary and secondary care and therefore rates of diagnosis, or rate of submission of urines in this age group may give you some indication of numbers being diagnoses and how much improvement is needed.		
	HPA	How to improve identification of those children with UTI which require further investigation due to increased risk of underlying pathology.	NICE needs to be very definite about who should be referred and then audit the parameters chosen.		
	HPA	Standards for definition of	Standards for definition of UTI in	Currently there is variable reporting by labs.	

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
		UTI in the laboratory	the laboratory – 105 CFU/ml or 104 CFU/ml or 103 CFU/ml if pure culture?		
	Specialist committee member 1	Diagnosis (clinical) -1	Under-diagnosis, especially in young children may lead to adverse health outcomes and an inability to stratify future management according to risk	Accurate diagnosis prevents future morbidity including end-stage renal failure in a small minority. This is a key issue for both the North-East guideline group and NICE but they have come to moderately different conclusions, most particularly on localisation of UTI	CG54
	Specialist committee member 1	Diagnosis (clinical)-2	Inappropriate diagnosis: as diagnostic tests have an element of inaccuracy, and a diagnosis of UTI leads to investigations that may be unpleasant and harmful, it is important to ensure that tests are undertaken appropriately.	Urine samples should not be tested where there is an alternative source of fever (and where an alternative diagnosis would adequately explain the symptoms and level of fever)	CG54 (bracketed info is non-evidence-based)
	Specialist committee member 1	Investigations 1	When UTI is suspected, urine testing should be undertaken within 24 hrs	Ensures accurate diagnosis and risk stratification. There are practical difficulties, especially in primary care that may prevent this from occurring.	CG54
	Specialist committee member 1	Investigations 2: urine collection	Accurate sampling is essential to ensure neither under- nor over-diagnosis	Clean-catch is recommended and pads if this cannot be achieved. Prior to CG 54 it was common to use U-bags. Clean-catch is seen as difficult but gives good results and may be quicker and simpler. Potties, suitable washed, may provide an alternative, but this method has not been	CG54 (+ some personal anecdote). Potties: Vernon S, Coulthard M et al

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
				extensively trialled.	
	Specialist committee member 1	Investigations 3: urine containers	Refrigeration or boric acid containers should be used if urine cannot reliably be cultured within 4hrs. (Smaller volume urine collection tubes should be used for children)	In primary care, especially at more remote locations, refrigeration and/or transport to a laboratory within 4 hrs are impractical, so boric acid tubes are used. However, adult tubes require larger volumes and risk under-filling and therefore, false negative results	CG54 (bracketed info from North-East guidelines)
	Specialist committee member 1	Investigations 4: laboratory reports	Urine reports should report the organisms grown in a way that will identify atypical UTIs	There is historically variable implementation of this criteria – presumably for reasons of cost – but E Coli should be differentiated from non E Coli coliforms	CG54/ personal experience/ HQIP audit Implementation of NICE guidelines in primary and secondary care (NB pre-publication so confidential information)
	Specialist committee member 2	Accurate diagnosis of UTI and in particular of true bacteriuria in infants and small children	Collection of clean urine is very difficult in infants and small children. There is a high chance both for over and under diagnosis of true UTIs. Infants and small children have a high chance to either be over treated for and wrongly diagnosed UTI or not be treated for a missed UTI.	Over treatment of a true UTI exposes the child to unnecessary antibiotic treatment and unnecessary follow-up. Not treating a missed febrile UTI gives that child a chance to develop kidney scarring.	Recent recommendations for GPs published in the BMJ last year do not suggest how these problems can be solved. Hay AD et al, How to best diagnose urinary tract infection in preschool children on primary care? BMJ 2011 Oct 25;343:d6316
	Specialist committee member 2	Upper UTI (acute pyelonephritis) and lower UTI (acute cystitis) are not	Acute pyelonephritis and acute cystitis needs very different treatment and follow-up.	Children with too little treatment for an upper UTI risk kidney scarring from that under treatment. Children with too much antibiotic	Recent recommendations as published in the BMJ, see above, do not

ID	Stakeholder	Suggested key area for quality improvement	Why is this important?	Why is this a key area for quality improvement?	Supporting information
		dealt with a separate entities.		treatment of a cystitis risk unnecessary side effects from that treatment which also causes unnecessary development of antibiotic resistance.	separate the management of upper and lower UTI.
	Specialist committee member 2	Improvement of the use of antibiotic prophylaxis in children who have had a UTI	Appropriate use of prophylactic antibiotics can protect children from developing kidney scarring. Over use of antibiotic prophylaxis will cause unnecessary side effects and bacterial resistance.	Protecting kidney function and reducing development of antimicrobial resistance are too important goals in medicine.	At the time the recent UTI guidelines were written by NICE no scientific knowledge existed in this field. Since then six good studies have been published.