Annexes

Annex 1. Figures and tables

Table 13. AGREE scores for the different GPCs evaluated

<table>
<thead>
<tr>
<th>AGREE instrument Area</th>
<th>NICE 2007¹¹</th>
<th>CINCINATTI 2006²⁹</th>
<th>RVU 2008³⁰</th>
<th>EPIC 2¹¹</th>
<th>EUROP ASIAN 2008³²</th>
<th>HICPAC 2009³³</th>
<th>NICE 2003³⁴</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Scope and Purpose</td>
<td>100%</td>
<td>86%</td>
<td>86%</td>
<td>92%</td>
<td>25%</td>
<td>92%</td>
<td>100%</td>
</tr>
<tr>
<td>2 Stakeholder Involvement</td>
<td>67%</td>
<td>44%</td>
<td>40%</td>
<td>67%</td>
<td>29%</td>
<td>54%</td>
<td>77%</td>
</tr>
<tr>
<td>3 Rigour of Development</td>
<td>87%</td>
<td>68%</td>
<td>85%</td>
<td>88%</td>
<td>39%</td>
<td>89%</td>
<td>89%</td>
</tr>
<tr>
<td>4 Clarity and Presentation</td>
<td>83%</td>
<td>79%</td>
<td>81%</td>
<td>88%</td>
<td>67%</td>
<td>90%</td>
<td>94%</td>
</tr>
<tr>
<td>5 Applicability</td>
<td>78%</td>
<td>0%</td>
<td>31%</td>
<td>72%</td>
<td>0%</td>
<td>67%</td>
<td>72%</td>
</tr>
<tr>
<td>6 Editorial Independence</td>
<td>96%</td>
<td>92%</td>
<td>96%</td>
<td>100%</td>
<td>96%</td>
<td>92%</td>
<td>92%</td>
</tr>
</tbody>
</table>
Table 14. Symptoms and signs present in infants and children with UTI

<table>
<thead>
<tr>
<th>Age group</th>
<th>Symptoms and signs</th>
<th>Most Common → Least common</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infants under 3 months old</td>
<td>Fever</td>
<td>Refusing food</td>
</tr>
<tr>
<td></td>
<td>Vomiting</td>
<td>Failure to thrive</td>
</tr>
<tr>
<td></td>
<td>Lethargy</td>
<td>Abdominal or suprapubic pain</td>
</tr>
<tr>
<td></td>
<td>Irritability</td>
<td>Jaundice</td>
</tr>
<tr>
<td></td>
<td>Refusing food</td>
<td>Haematuria</td>
</tr>
<tr>
<td></td>
<td>Foul-smelling and/or cloudy urine</td>
<td></td>
</tr>
<tr>
<td>Infants and children over 3 months old</td>
<td>Abdominal or suprapubic pain</td>
<td>Lethargy</td>
</tr>
<tr>
<td></td>
<td>Lower back pain</td>
<td>Irritability</td>
</tr>
<tr>
<td></td>
<td>Vomiting</td>
<td>Haematuria</td>
</tr>
<tr>
<td></td>
<td>Refusing food</td>
<td>Foul-smelling and/or cloudy urine</td>
</tr>
<tr>
<td></td>
<td>Pollakiuria</td>
<td>Failure to thrive</td>
</tr>
<tr>
<td></td>
<td>Dysuria</td>
<td>Foul-smelling and/or cloudy urine</td>
</tr>
</tbody>
</table>

Adapted from the NICE CPG (2007).11

Table 15. Effective doses (ED) of radiation received by a 5-year old child during different imaging studies for nephrourologic pathology diagnosis, expressed in equivalent chest x-rays* and days of natural background radiation**

*1 chest x-ray causes an ED of radiation of 0.007 mSv (millisievert)
** 1 day of background radiation in Spain is 0.003 mSv

<table>
<thead>
<tr>
<th>Diagnostic study</th>
<th>Equivalent number of chest x-rays</th>
<th>Equivalent number of days of background radiation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retrograde cystography (VCUG)</td>
<td>32</td>
<td>73</td>
</tr>
<tr>
<td>Isotopic cystography</td>
<td>20</td>
<td>47</td>
</tr>
<tr>
<td>DMSA renal scintigraphy</td>
<td>16</td>
<td>37</td>
</tr>
<tr>
<td>Diuretic renogram</td>
<td>16</td>
<td>37</td>
</tr>
<tr>
<td>Intravenous urography</td>
<td>44</td>
<td>103</td>
</tr>
<tr>
<td>Abdominal CT</td>
<td>300</td>
<td>700</td>
</tr>
</tbody>
</table>

Table adapted from the Rodriguez et al. 2005368 and Roson et al. 2008 studies.369
Table 16. Kappa coefficient\textsuperscript{270}

<table>
<thead>
<tr>
<th>Kappa</th>
<th>Degree of agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;0.00</td>
<td>None</td>
</tr>
<tr>
<td>0.00-0.20</td>
<td>Slight</td>
</tr>
<tr>
<td>0.21-0.40</td>
<td>Fair</td>
</tr>
<tr>
<td>0.41-0.60</td>
<td>Moderate</td>
</tr>
<tr>
<td>0.61-0.80</td>
<td>Substantial</td>
</tr>
<tr>
<td>0.81-1.00</td>
<td>Almost perfect</td>
</tr>
</tbody>
</table>
Annex 2. General considerations on information for families and patients

As with any medical intervention, when starting the study, treatment or care of children with UTI, the rights of both the patient (depending on their age) and their relatives or carers to be fully informed must be taken into account. Only after receiving accurate information can relevant decisions be made and consent given to receive timely care proposals. While consent is granted by relatives or carers, the opinions of patients between 12-16 years of age must also be considered.371

Medical professionals should be respectful, sensitive and understanding, and seek to provide simple, clear information about UTI. The information should include details of the potential risks and benefits of treatment and tests to be scheduled.

Families and patients should be encouraged to ask questions on any aspect of UTI. Moreover, the religious, ethnic and cultural family environment and difficulties related to the language should be taken into account.

<table>
<thead>
<tr>
<th>SUMMARY</th>
</tr>
</thead>
<tbody>
<tr>
<td>An effort must be made to give the best information about this process.</td>
</tr>
<tr>
<td>The information should include aspects related to diagnosis, treatment, preventive measures and prognosis.</td>
</tr>
<tr>
<td>When making special tests, information should be given about their nature, risks and benefits, when they should be done, whether hospitalisation is needed, as well as appropriate information on the results.</td>
</tr>
<tr>
<td>Information should be tailored to the personal, family, social and cultural rights of patients.</td>
</tr>
</tbody>
</table>
Urinary Tract Infection in Children

Contents

- Introduction
- **What** is urinary tract infection (UTI) and how common is it?
- What are the **signs and symptoms** for suspecting UTI?
- How is UTI **diagnosed**?
- How is UTI **treated**?
- What is UTI **recurrence**?
- How can we **prevent** UTI recurrence?
- What kinds of tests are performed with UTI?
- What is the **prognosis** after UTI?
Introduction

This annex is intended for families and carers of children. It may also be useful for patients over 12 years of age, who are able to understand the situation. The aim of this chapter is to help understand the care and treatment options available for a child with urinary tract infection.

What is urinary tract infection (UTI) and how common is it?

The urinary system consists of the kidneys, the bladder, the tube connecting these, the ureter, and the urethra, which is the tube where urine exits the body (Fig. 1). The kidneys filter blood and produce urine which passes through the ureters to the bladder, where it is stored for a time before being ejected to the exterior, either automatically in young children or voluntarily in those older. This whole urinary tract area is sterile, i.e. free of bacteria or germs.

When bacteria appear and grow in this urinary space, they can cause tissue abnormalities and lead to a number of symptoms, either of a general type, such as high fever or feeling unwell, or a local type, such as pain or itching or abnormal urination; this is what is known as “urinary tract infection (UTI)”.

The infection can affect any part of the urinary tract. When it affects only the lower part (the bladder and urethra), there are usually local symptoms (pain or burning during urination) with little fever. This type of UTI does not cause kidney damage and can also be called “cystitis”, “urethritis”, “afebrile UTI” or “lower UTI”. When the infection spreads to the upper urinary tract, reaching the kidneys, it usually causes fever and is called “febrile UTI,” “acute pyelonephritis (APN)” or “upper UTI”.

Sometimes, even when the patient is completely well without any symptoms, there are bacteria in the urine. This situation is called “asymptomatic bacteriuria”. It is best not to treat asymptomatic bacteriuria, as it poses no risk or harm to the patient. However, treatment with antibiotics does pose risks to the patient, such as allergic reactions to medications and increased bacterial resistance. When this happens, antibiotics may not be effective in removing other infections that can be more severe.

Bacteria coming mostly from the intestinal tract can enter the urinary tract via the skin around the anus. This is especially so for girls, who are thus advised to clean themselves from front to back (instead of back to front) after going to the toilet. There are situations that promote the occurrence of UTI, such as urine going back into the ureters or kidneys, a situation known as vesicoureteral reflux; urinary tract malformations or impaired bladder function, which prevent urine from draining properly; or poor hygiene of the area surrounding the urethra.

Urinary tract infections are not contagious.

UTI appears in about 9% of girls and 2% of boys below seven years of age. Although during the first months of life, UTI is more common in boys than in girls, from twelve months of age this proportion is reversed, and there are more girls with UTI than boys.
The diagnosis of UTI is based on finding **bacteria in the urinary tract, associated with clinical symptoms** of a general type (fever or feeling unwell) or local type (pain or burning when urinating).

When fever is the main or only symptom, this is called **febrile UTI, upper UTI or acute pyelonephritis**. This can temporarily affect one or both kidneys. Sometimes it can leave permanent damage, but almost always of a small extent.

When local symptoms predominate (pain or burning during urination) without fever, this is called **afebrile UTI, cystitis, urethritis or lower UTI**; it does not lead to kidney damage.

UTI is not contagious.

What are the signs and symptoms for suspecting UTI?

It can be very difficult for both physicians and families or carers to know if a child has UTI, especially younger children, when the symptoms for UTI are common to other types of infections:

- Seemingly inexplicable fever
- Vomiting
- Fatigue
- Irritability
- Lack of appetite and no weight gain

Conversely, there may be more specific signs and symptoms that, when observed by those close to the patient, may help in diagnosing UTI:

- Pain and a burning sensation when urinating
- Feeling of urgency and increased number of voids
- Leakage of urine during the day or night from a child usually capable of controlling urination.
- Pain in the abdomen, lower abdomen or side
- Cloudy urine with an unpleasant odour
- Urine with blood at the beginning or end of urination

The smaller the child, the less specific the symptoms are, and in most cases the only symptom will be high fever, usually above 38.5°C, without observing any other symptoms that may indicate another type of infection, such as coughing, diarrhoea, runny nose, etc. This is fever “without focus”.
**REMEMBER**

- Febrile UTI produces more general symptoms such as malaise, flank pain and chills.
- Afebrile UTI or cystitis is not often accompanied by fever and produces specific symptoms localised to the bladder or urethra.
- The smaller the child, the **less specific are the symptoms**; most of the time the only symptom is fever “without focus” which is above 38.5°C.

How is UTI diagnosed?

UTI may be suspected after reviewing the clinical history and examination by the physician. The diagnosis is guided by analysis with dipsticks (urine test strips impregnated with substances which change colour when detecting bacteria or leukocytes in the urine, see Figure 2), or by microscopic examination (direct viewing of bacteria or leukocytes in the urine, see Figure 3). If microscopic examination or dipstick analysis detects no bacteria or leukocytes, UTI is rarely present. When bacteria and/or leukocytes are detected by any of the previous procedures, the possibilities of UTI are high. If this is the case, a urine sample is sent to the lab for a urine culture analysis to identify the bacteria type and study its sensitivity to antibiotics. This will confirm the diagnosis of UTI.

Proper urine collection is important, without the sample being contaminated by commonly occurring bacteria in the skin or faeces. It is therefore essential to follow the instructions for collecting urine to avoid contaminating the sample.

When the child is older and capable of controlling urination, the sample is collected directly from the urine stream after a little has been released; this is the mid-stream clean catch method of collection.

For children who cannot control urination, a sterile bag is stuck to the skin around the labia or penis, depending on whether it is a girl or boy. This method may lead to contamination of the urine by the bacteria present in the skin, so the result is trustworthy only if the result is normal or the culture is negative. Sometimes the doctor will require a urine sample collected at home, in which case families or carers should request all information necessary for the adequate collection and proper preservation of the urine until delivery to the doctor.

Sometimes, more invasive urine collection techniques must be used to prevent diagnostic errors arising from contamination of the urine collection bag. This involves the use or the introduction of a small sterile catheter through the urethra, which is a very simple procedure in girls, or suprapubic aspiration. The latter technique involves puncturing the bladder above the pubis,
like an intramuscular injection, and aspirating a small amount of urine into a sterile syringe. This
technique is usually done with ultrasound guidance to see the bladder, and usually more in boys
to avoid having to catheterise.

As an aid to diagnosis of UTI, the health professional will probably ask for the following
information to compile a medical history:

- History of renal disease in close family members.
- History of relatives who have had abnormalities or malformations of the urinary tract.
- Report on the results of the scans made at the time of pregnancy.
- Other early episodes of fever without a cause which the child had, and any diagnosis
  of them.

In addition, the doctor may ask about certain urination habits, for example, if the patient now
has urine leakage when before they did not; if the patient cannot wait to go to the bathroom; or
if instead urination occurs only a few times a day; or if the child adopts strange postures before
going to the bathroom: e.g., sitting on his heels, crossing his legs, dancing or squatting.

Bowel habits may also be asked about, e.g., if the child is constipated or there is a leakage
of faeces or underwear is stained.

REMEMBER

- **Diagnosis of UTI** is confirmed by a positive urine culture, which detects the bacteria
  causing the problem and leads to the choice of the most effective antibiotic.
- **Proper collection of urine is essential** for diagnosis. Instructions for sterile (without
  contamination) sample collection must be followed to preserve it until it reaches the
  laboratory.
- Remember or observe the child's voiding habits and communicate them to the doctor.

How is UTI treated?

UTI is generally treated with antibiotics, although urinary antiseptics
may be used for cystitis or afebrile UTI. Sometimes treatment will begin
before the culture analysis result is known, by considering the most ef-
fective antibiotics in the patient’s environment. Depending on the results
of the urine culture, this treatment may be modified, when the most effec-
tive antibiotic against the bacteria is known.

Treatment may be in hospital, on an outpatient basis at home, de-
pending on several factors:

- Age: Children with febrile UTI under three months old are generally hospitalised, as
  they may have or develop more serious complications
- Severity of the illness, based on appearance and the opinion of the attending physician.
- Inability of the patient to drink fluids or medication, or constant vomiting.
- Inability to control the process.
Medication can be administered intravenously, according to general status or oral tolerance. Once the patient’s situation has improved, treatment can be completed orally.

In most cases, fever and symptoms disappear within 48-72 hours of starting the treatment. If the symptoms and fever within that period persist, the health professional will review the situation and will likely decide on further urine analysis and other tests to rule out urinary tract malformations or kidney damage. The duration of antibiotic therapy in febrile UTI is usually 10 days. If there are major malformations of the urinary tract or renal abscesses, this period may be extended up to 2-3 weeks, although this is very rare.

If the UTI is afebrile, the treatment period is usually 3-5 days. As mentioned above, a urinary antiseptic can be used; this is excreted in the urine and kills the bacteria.

As a general rule, it is very important to complete the recommended treatment.

In addition to treatment, any poor urinary or bowel habits the children have must be corrected, i.e., urination should be performed with a given frequency, it should be performed calmly by taking time to try and evacuate all the urine in the bladder; and constipation must be resolved.

There is no objection to administering medication to relieve pain or fever, such as paracetamol.

**REMEMBER**

- **UTI is treated with antibiotics** that are effective in the environment where the patient lives against the common micro-organisms found in the urine cultures.
- **Oral treatment** is as effective as intravenous treatment, but sometimes treatment is started this way because of difficulties in oral intake.
- In general, it is **not necessary to go into hospital**, unless the patient is younger than 3 months, is in a poor state or cannot tolerate oral medication and intravenous medication must be administered.
- **48-72 hours** after initiation of treatment, clinical symptoms and fever may return to normal, and no bacteria will be detected in the urine.
- **Bladder and bowel habits must be corrected or educated** upon as part of the treatment and to prevent recurrent UTI.
- It is important to **complete the antibiotic treatment** according to the medical prescription.

What is UTI recurrence?

Children who have suffered UTI may suffer it again. This is called a “relapse” or “recurrence” of UTI.

Children who have had a first UTI may experience a recurrence, especially within 3-6 months after the first episode. It is estimated that approximately 18% of boys and 26% of girls may suffer a recurrence within the first 12 months.

After the first year of life, recurrent UTI in boys is rare, while in girls it can reach 40-50%.

Possible causes of recurrence, such as the following, must be investigated:
Urinary tract abnormalities (e.g., birth defects, vesicoureteral reflux, kidney stones).
Abnormalities in bladder and/or urethra functioning that hinder their coordination (lower urinary tract dysfunction). It is sometimes accompanied by problems in the complete elimination of faeces.
Hygiene-related conditions in young children, or phimosis in boys.
There are times when no reason to explain the recurrence of UTI can be found. This may be due to personal predisposing factors which may be related to genetic factors.

How can we prevent UTI recurrence?

Prevention of UTI recurrence is based on the following factors:

- Correction of structural and functional urinary tract abnormalities, assessed by urologists.
- Correction and education of bladder and bowel habits: urinating frequently, proper posture during urination and relaxation. Also adequate fluid intake; combating constipation via a proper diet; use of laxatives or cleansing enemas, as prescribed.
- Encouraging breastfeeding in the first months of life.
- Evaluating correction of phimosis by a healthcare professional.
- Teaching girls to wipe from front to back after using the bathroom, so that bacteria from the rectum does not reach the vagina.
- Frequent change of nappies.
- Wearing cotton underwear instead of synthetic fibre underwear.

**REMEMBER**

- Preventing further recurrences of UTI depends on correcting predisposing factors detected in the patient.
- Sometimes a urologist must be consulted to resolve structural or functional problems.

What kinds of tests are performed for UTI?

There is a relationship between UTI and anomalies or malformations of the urinary tract. Therefore, some further tests may be needed after the diagnosis of a UTI.

Firstly, it is important to know the results from ultrasound scans performed during pregnancy, to see the development of the urinary tract during pregnancy.

The type of scans to be performed may vary from one health facility to another, as the protocols for each centre are different. The tests required will depend on the family history of urinary tract disorders, the patient’s age when diagnosed, the severity of the UTI, if there have been recurrences or not, if there are other malformations in other areas and according to the patient’s response to treatment.
However, the tests more frequently performed are as follows:

- **Ultrasound of kidney and urinary tract, including the bladder.** This is a safe, non-invasive exploration, requiring no injection of any contrast and no side effects. It is useful for detecting malformations or kidney or urinary tract defects.

- **Renal scintigraphy.** This test involves administering a radioactive contrast intravenously. It shows any acute (temporary) or chronic (permanent) kidney damage. It can be done in the acute phase, i.e., a few days after the UTI is diagnosed or 6-12 months later. The substance administrated does not cause any allergic type reaction, and in a child of about 5 years of age it produces radiation similar to that of 16 chest radiographs (Annex 1, Table 15).

- **Cystographic studies** are used to look for vesicoureteral reflux or abnormalities of the bladder or urethra. The technique involves inserting a catheter into the bladder and injecting a substance that acts as a contrast. The risks of the test are associated with the catheter, its inconvenience and the radiation involved if done by radiology or isotope. This test may be indicated in the acute phase (a few days after the UTI) or 1-2 months after treatment for the UTI. This test produces radiation equivalent to 20-32 chest radiographs in a child of 5 years old, depending on the type of test (Annex 1, Table 15).

- In very specific cases, another type of examination, such as **intravenous urography**, may be necessary. This test involves injecting a contrast containing iodine through a vein to obtain a photographic image and anatomical details of the kidney and urinary tract. There are radiation hazards and the possibility of an allergic reaction to the injected contrast dye. This test produces radiation equivalent to about 44 chest radiographs in a 5-year old child (Annex 1, Table 15).

- Some cases may also need **blood and urine tests** to study the function of the kidney.
REMEMBER

Given the importance of birth defects or other structural and functional alterations of the urinary tract as a factor favouring UTI, other tests may need to be done to find the cause.

These tests may include blood and urine tests to assess kidney function.

As a general rule, hospitalisation is not needed to conduct these tests.

What is the prognosis after UTI?

Most cases of UTI are cured with antibiotic treatment without any complications, even if there is recurring infection.

A small number of patients will develop permanent kidney damage, and this occurs in approximately 5-15% of cases of febrile UTI. If the kidney damage affects only one kidney and is of little extension, there are usually no complications. However, the patient must attend the follow-up visits and controls established by the physician.

A poor prognosis or evolution will depend on any urinary tract malformations or severe vesicoureteral reflux affecting both ureters or those which are very dilated. In these cases, kidney damage may have been caused by a developmental abnormality in the kidneys of the foetus while growing in the womb, so-called “renal dysplasia”. The association of renal dysplasia with UTI, especially if not treated properly, may result in a greater progression of kidney damage.

The consequences therefore result from impaired kidney function and may lead to serious complications such as hypertension, loss of protein in the urine and chronic kidney damage. In these cases, the patient should be monitored in a paediatric nephrology unit.

REMEMBER

The antibiotic treatment prescribed resolves the urinary tract infection in the vast majority of cases.

The long-term prognosis depends not so much on the UTI itself, but those factors which contributed to its occurrence, such as malformations, vesicoureteral reflux and severe lower urinary tract dysfunction, especially with coexisting renal dysplasia.
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Annex 4. Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABPM</td>
<td>Ambulatory blood pressure monitoring</td>
</tr>
<tr>
<td>ABU</td>
<td>Asymptomatic bacteriuria</td>
</tr>
<tr>
<td>AFBN</td>
<td>Acute focal bacterial nephritis</td>
</tr>
<tr>
<td>AGREE</td>
<td>Appraisal of Guidelines for Research &amp; Evaluation</td>
</tr>
<tr>
<td>ALN</td>
<td>Acute lobar nephronia</td>
</tr>
<tr>
<td>Amoxicillin-clavulanate</td>
<td>Amoxicillin and clavulanic acid</td>
</tr>
<tr>
<td>APN</td>
<td>Acute pyelonephritis</td>
</tr>
<tr>
<td>ARI</td>
<td>Absolute risk increase</td>
</tr>
<tr>
<td>ARR</td>
<td>Absolute risk reduction</td>
</tr>
<tr>
<td>BD</td>
<td>Bladder or urinary dysfunction</td>
</tr>
<tr>
<td>BP</td>
<td>Blood pressure</td>
</tr>
<tr>
<td>CAT</td>
<td>Computed tomography</td>
</tr>
<tr>
<td>CAUTI</td>
<td>Catheter-Associated Urinary Tract Infection</td>
</tr>
<tr>
<td>CEUS</td>
<td>Echocystography with contrast</td>
</tr>
<tr>
<td>CI</td>
<td>Confidence interval</td>
</tr>
<tr>
<td>CKD</td>
<td>Chronic kidney disease</td>
</tr>
<tr>
<td>CPG</td>
<td>Clinical Practice Guidelines</td>
</tr>
<tr>
<td>Cr</td>
<td>Creatinine</td>
</tr>
<tr>
<td>CrCl</td>
<td>Creatinine clearance</td>
</tr>
<tr>
<td>CRP</td>
<td>C-reactive protein</td>
</tr>
<tr>
<td>DES</td>
<td>Dysfunctional Elimination Syndrome</td>
</tr>
<tr>
<td>DIC</td>
<td>Direct isotopic cystography</td>
</tr>
<tr>
<td>DMSA</td>
<td>Renal scintigraphy with technetium-labelled dimercaptosuccinic acid (99mTc-m)</td>
</tr>
<tr>
<td>EPINE</td>
<td>Prevalence study of nosocomial infections in Spain</td>
</tr>
<tr>
<td>ESR</td>
<td>Erythrocyte sedimentation rate</td>
</tr>
<tr>
<td>ESRD</td>
<td>End-stage renal disease</td>
</tr>
<tr>
<td>Fr</td>
<td>French catheter scale</td>
</tr>
<tr>
<td>GDG</td>
<td>Guideline development group</td>
</tr>
<tr>
<td>GF</td>
<td>Glomerular filtration rate</td>
</tr>
<tr>
<td>HR</td>
<td>Hazard ratio</td>
</tr>
<tr>
<td>HT</td>
<td>Hypertension</td>
</tr>
<tr>
<td>IC</td>
<td>Intermittent catheterisation</td>
</tr>
<tr>
<td>IL</td>
<td>Interleukin</td>
</tr>
<tr>
<td>IM</td>
<td>Intramuscular</td>
</tr>
<tr>
<td>IQR</td>
<td>Interquartile range</td>
</tr>
<tr>
<td>IVU</td>
<td>Intravenous urography</td>
</tr>
<tr>
<td>LE</td>
<td>Leucocyte esterase</td>
</tr>
<tr>
<td>LR-</td>
<td>Negative likelihood ratio</td>
</tr>
</tbody>
</table>
LR+  Positive likelihood ratio  
MAG3  Mercaptoacetyltriglycine  
MAP  Mean arterial pressure  
MAu  Microalbumin in urine  
MIF  Macrophage migration inhibitory factor  
NAGu  N-acetylglucosaminidase in urine  
NICE  National Institute for Health and Clinical Excellence  
NMR  Nuclear magnetic resonance  
NNH  Number needed to harm  
NNT  Number needed to treat  
NPV  Negative predictive value  
OR  Odds ratio  
Osmu  Urine osmolality  
PC  Primary care  
PCr  Plasma creatinine  
PCT  Procalcitonin  
PMN  Polymorphonuclear  
PPV  Positive predictive value  
RA  Renal abscess  
RCT  Randomised clinical trial  
RN  Reflux nephropathy  
RR  Relative risk  
RRF  Relative renal function  
RS  Renal scarring  
SIGN  Scottish Intercollegiate Guidelines Network  
SMX  Sulfamethoxazole  
sns  Sensitivity  
SNS  Spanish National Health System  
SPA  Suprapubic aspiration  
spc  Specificity  
SR  Systematic review  
TLR  Toll-like receptor  
TMP  Trimethoprim  
TMP-SMX  Trimethoprim and sulfamethoxazole  
UTI  Urinary Tract Infection  
VCUG  Voiding cystourethrogram  
VUR  Vescicoureteral reflux
Annex 5. Glossary

**Acquired renal scarring**: Non-dysplastic segmental renal injury, characterised by interstitial fibrosis and tubular atrophy, which is secondary to UTI. Although VUR may accompany this type of injury, it does not cause it. The term chronic pyelonephritis is sometimes used.

**Acquired vesicoureteral reflux**: A not very well-defined process that includes any reflux appearing after birth which is closely related to UTI and a malfunctioning bladder (bladder or sphincter dysfunction).

**Acute focal bacterial nephritis**: See “acute lobar nephronia”.

**Acute lobar nephronia**: Nephritis confined to a kidney lobule, which may progress to a renal abscess. Also called “acute focal bacterial nephritis”.

**Acute pyelonephritis**: Bacterial infection of the upper urinary tract, usually with fever, which causes kidney damage; the term upper UTI is sometimes used. The kidney damage has to be checked with an imaging study such as renal scintigraphy. See “febrile urinary tract infection”.

**Afebrile urinary tract infection**: UTI with temperature below 38.5°C. See “cystitis”.

**Asymptomatic bacteriuria**: Presence of bacteria in the urine without specific symptoms associated.

**Bacteriuria**: Presence of bacteria in the urine with or without associated symptoms.

**Catheter-associated urinary tract infection**: Presence of symptoms or signs of urinary tract infection in patients who are catheterised or who recently underwent catheterisation.

**Charriere**: Measure used to express the different diameters of medical devices including catheters and catheter tubes. Each Charriere unit is equivalent to 0.33 mm.

**Chronic Kidney Disease**: Progressive loss of renal function determined by glomerular filtration, classified into the following stages:

- **Stage I**: Kidney damage with a GFR >90 ml/min/1.73m².
- **Stage II**: Decrease in GFR: 60-89 ml/min/1.73m².
- **Stage III**: Decrease in GFR: 30-59 ml/min/1.73m².
- **Stage IV**: Decrease in GFR: 15-29 ml/min/1.73m².
- **Stage V**: Decrease in GFR: <15 ml/min/1.73m².

**Chronic pyelonephritis**: See “renal scarring”.

**Clean catheterisation**: The use of clean gloves (or without gloves if performed by the patient), a cleaning but non-sterile solution and a clean receptacle for the urine. It can be performed using a sterile or a clean (multi-use) catheter tube.

**Coated catheter**: One with a hydrophilic or other lubricant as coating. Coated catheters are not intended to be re-used, and so are considered sterile catheters.

**Congenital renal scarring**: Malformation with dysplastic features accompanying congenital primary VUR, which reflects abnormal metanephric development in utero.

**Constipation**: Delay or difficulty in defecation lasting for 2 or more weeks and sufficient to cause discomfort in the patient.

**Continuous antibiotic prophylaxis**: Long-term treatment with low doses of urinary antibiotics or antiseptics, taken once at night only, to prevent recurrent episodes of UTI and renal damage.
Cystitis: Inflammation of the bladder that produces clinical signs in the lower tract; generally associated with afebrile UTI or lower urinary tract UTI. See “Afebrile urinary tract infection”.

Daytime wetting or dysfunctional voiding: Abnormal pattern of bladder emptying of unknown etiology characterised by both urinary and faecal leakage and retention.

Dimercaptosuccinic acid renal scintigraphy with Te99m: This is the “gold standard” for identifying acute or chronic renal parenchymal defects (renal scarring). The DMSA uptake in each kidney can be compared, giving an estimate of the relative function of each.

Direct isotope cystography: Cystographic study with a small dose of a radioactive isotope (Tc-99m-pertechnetate) diluted in water. This test is very sensitive to the lower degrees of reflux. It is insufficient to assess anatomical detail and degree of VUR.

Dysuria: Difficulty with or without pain in starting urination.

Echocystography: (Cystosonography or cystouretrosonography) Ultrasound method of diagnosing VUR with a liquid contrast (microparticles in suspension) introduced by catheter into the bladder. VUR is identified by the appearance of echoes of these particles in the ureter and collecting system. It has the advantage of not using ionising radiation and can explore the anatomy of the urinary tract at the same time.

Encopresis: Voluntary or involuntary passage of stools in a child of 4 years or more (or mental age equivalent) after excluding organic causes. It must occur at least once a month for 6 months.

Enuresis: Intermittent urinary incontinence during sleep, also called bedwetting. The term is used regardless of whether or not incontinence occurs during the day or night or there are other lower urinary tract symptoms. The qualifier ‘nocturnal’ can be added for clarity.

Febrile urinary tract infection: UTI with temperature above 38.5°C. See “acute pyelonephritis”.

Goldraich classification of renal scarring by DMSA:
- Type 1: No more than 2 areas of scarring.
- Type 2: More than 2 scarring areas with areas of normal parenchyma between them.
- Type 3: Widespread damage throughout the entire kidney, similar to obstructive nephropathy. For example, global contraction of the kidney with or without scars on the outline.
- Type 4: Final stage, kidneys very small, with little or no uptake of the radiopharmaceutical.

Haematuria: Blood in the urine.

Hydronephrosis: Dilatation of the renal pelvis or calyces.

Indwelling catheterisation: Urinary catheter inserted under sterile conditions and maintained for an indefinite period of time (usually 6-10 days in children).

Intermittent catheterisation: Urinary catheter inserted in non-sterile (clean) conditions at fixed intervals to empty the bladder.

Intravenous urography: Intravenous injection of iodinated contrast medium which is eliminated by the kidney. It provides details of the urinary tract anatomy.

Kappa coefficient: An index that determines the degree of agreement, above that expected by chance, of several methods or evaluators classifying the patient into mutually exclusive categories.
**Kidney damage:** See “Renal scarring”.

**Phimosis:** Condition in which the foreskin cannot be fully retracted over the glans penis.

**Power Doppler ultrasound:** Ultrasound technique based on the changes in amplitude of the Doppler signal, capable of displaying low speed flows such as renal perfusion.

**Primary vesicoureteral reflux:** A heterogeneous process defined as the retrograde non-physiological passage of urine from the bladder to the ureter with no anatomical or neurological reason to explain it.

**Probiotic dietary supplements:** Contain live microorganisms that stay alive in the gut after ingestion and contribute to the balance of bacterial flora.

**Pyonephrosis:** Distention of the kidney with pus and suppurative renal parenchymal destruction. It is often associated with renal obstruction and can lead to complete, or almost complete, loss of kidney function.

**Pyuria:** Discovery of more than 5 leukocytes per field in a centrifuged urine specimen viewed under a microscope with 400X power.

**Pyuria:** Presence of pus in the urine.

**Recurrent urinary tract infection:** 2 or more episodes of febrile UTI or APN; 1 episode of APN or febrile UTI with 1 of afebrile UTI; or more than 3 episodes of afebrile UTI.

**Reflux nephropathy:** See “renal scarring”.

**Renal dysplasia:** Abnormal metanephric development in utero.

**Renal scarring:** A broader term and more modern term than the so-called “reflux nephropathy”, referring to kidney damage, which may be focused or diffuse, with irreversible renal parenchyma. Its etiology is multifactorial. In some cases it is present at birth, thus suggesting a congenital origin. This term applies to both acquired (or post-natal) abnormalities and pre-natal anomalies, also called primary or congenital; both types may or may not be associated with VUR. The reference imaging technique is dimercaptosuccinic acid renal scintigraphy with Tc99m.

**Renal ultrasound:** Use of high frequency sound waves reflecting from internal structures which are reconstructed into images, giving excellent anatomical information without irradiating the patient. This technique cannot determine kidney function and is insensitive to assessing renal scarring. There are no known risks with this technique.

**Single sampling catheterisation:** Urinary catheter inserted under sterile conditions at a given time for a single purpose, most often for diagnostic procedures (sampling for urine culture, cystography, urodynamics, urinary retention and interventions that require control of urine or urination).

**Sterile catheterisation:** The implementation of this technique involves the use of sterile gloves, sterile single-use catheter, sterile drain pan and an aseptic technique to insert the catheter.

**Uncoated catheter:** Catheter which requires a lubricant to be applied before insertion. When used once, it is considered as sterile; if reused, it is considered as clean and for multiple use.

**Urinary or bladder dysfunction:** Any abnormality in the activity of the detrusor or sphincters, either alone or in combination, in the absence of underlying neurological damage. As a result, it can lead to increased intravesical pressure or post-voiding residue that may induce deterioration in the upper urinary tract.

**Urinary tract infection:** Presence of bacteria in the urine combined with clinical symptoms (fever, urinary symptoms, general symptoms).
**Urine dipstick:** Semi-quantitative diagnostic test consisting of a strip impregnated with chemical reagents to detect leukocytes, glucose, protein, blood, nitrites and other compounds in a urine sample.

**Vesicoureteral reflux:** A heterogeneous process defined as the retrograde non-physiological passage of urine from the bladder into the upper urinary tract.

**Voiding cystourethrography (VCUG):** The “gold standard” for demonstrating VUR. The study is performed with a contrast media inserted into the bladder via a catheter and shows fluoroscopic images of the urinary tract. It offers good anatomical detail of the bladder and urethra and allows the degree of VUR to be established by the International Reflux Grading System.
Annex 6. Conflicts of interest

The following members of the development group declare absence of interests: Ramón Carlos Areses Trapote, José Antonio Castillo Laita, Gloria María Fraga Rodríguez, Susana García Rodríguez, César Joaquín García Vera, Andrés Gómez Fraile, Jesús Gracia Romero, César Loris Pablo, Juan Ignacio Martín Sánchez, Carlos Ochoa Sangrador, Lidia Rocha Gancedo, Teresa Serrano Frago and Blanca Valenciano Fuente.

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