Guideline Summary NGC-10289

Guideline Title

**Guidelines on paediatric urology.**

Bibliographic Source(s)


Guideline Status

This is the current release of the guideline.


Scope

**Disease/Condition(s)**

Urological clinical problems in children:

- Phimosis
- Cryptorchidism
- Hydrocele
- Acute scrotum
- Hypospadias
- Congenital penile curvature
- Varicocele
- Urinary tract infection
- Daytime lower urinary tract conditions
- Monosymptomatic enuresis
- Neurogenic bladder
- Dilatation of the upper urinary tract (ureteropelvic junction and ureterovesical junction obstruction)
- Vescoureteric reflux
- Urinary stone disease
- Ureterocele
- Ectopic ureter
- Disorders of sex development
- Posterior urethral valves
- Paediatric urological trauma
- Post-operative metabolic disturbances
- Post-operative pain

**Guideline Category**

Diagnosis
Evaluation
Management
Prevention
Screening
Treatment

**Clinical Specialty**

Family Practice
Nursing
Pediatrics
Surgery
Urology

**Intended Users**

Advanced Practice Nurses
Nurses
Physician Assistants
Physicians
Guideline Objective(s)

To outline a practical and preliminary approach to paediatric urological problems

Target Population

Infants, children, and adolescents with urological clinical problems

Interventions and Practices Considered

1. Management of phimosis
   - Conservative treatment with a corticoid ointment or cream
   - Circumcision
   - Emergency management of paraphimosis (manual reposition or dorsal incision of the constrictive ring)
   - Routine neonatal circumcision to prevent penile carcinoma (not recommended)

2. Management of cryptorchidism
   - Close follow-up until puberty of boys with retractile testes
   - Surgical orchidolysis and orchidopexy by age of 12-18 months
   - Laparoscopy in case of non-palpable testes and no evidence of disorders of sex development
   - Hormonal therapy (not standard treatment)
   - Removal of intra-abdominal testis

3. Management of hydrocele
   - Initial observation alone in infants
   - Early surgery if suspicion of a concomitant inguinal hernia or underlying testicular pathology
   - Scrotal ultrasound
   - Ligation of the patent processus vaginalis via inguinal incision
   - Avoidance of sclerosing agents

4. Management of acute scrotum
   - Emergent intervention in neonates
   - Doppler ultrasound
   - Scintigraphy
   - Dynamic contrast-enhanced subtraction magnetic resonance imaging (MRI)
   - High-resolution ultrasonography
Surgical exploration of torsion of the appendix testis
Urgent surgical exploration of testicular torsion within 24 hours of symptom onset

5. Management of hypospadias
- Differentiation between functionally necessary and aesthetically feasible operative procedures
- Original and modified tubularised incised plate urethroplasty for distal hypospadias
- Onlay urethroplasty or two-stage procedures for more severe hypospadias
- Long-term follow-up to adolescence to detect urethral stricture, voiding dysfunction, and recurrent penile curvature

6. Management of varicocele
- Diagnosis by Doppler colour flow mapping in the supine and upright position
- Surgical ligation using some form of optical magnification (microscopic or laparoscopic magnification)
- Lymphatic-sparing varicocelectomy

7. Management of urinary tract infections (UTI)
- Diagnosis through medical history, clinical signs and symptoms, physical examination, and urine culture
- Exclusion of bladder and bowel dysfunction
- Urine sampling (plastic bags [can be used only to exclude a UTI], clean-catch of urine, bladder catheterization, suprapubic bladder aspiration)
- Urinalysis (dipsticks, microscopic investigation, flow imaging analysis to classify particles in uncentrifuged urine)
- Oral or parenteral antibacterial therapy
- Long-term antibacterial prophylaxis in cases of high susceptibility to UTI and risk of acquired renal damage
- Imaging: renal and bladder ultrasound in infants with febrile UTI
- Changes in dimercaptosuccinic acid (DMSA) clearance
- Voiding cystourethrogram (VCUG) to exclude or confirm vesicoureteral reflux (VUR)

8. Management of daytime lower urinary tract (LUT) conditions
- Use of a stepwise treatment approach, starting with the least invasive approach
- Urotherapy (non-invasive training and re-education, non-invasive neurostimulation)
9. Management of monosymptomatic enuresis
   • Voiding diaries or questionnaires to exclude daytime symptoms
   • Urine test to exclude the presence of infection or potential causes such as diabetes insipidus
   • Supportive measures in conjunction with other treatment modalities
   • Alarm treatment
   • Desmopressin
   • Parental counselling

10. Management of dilatation of the upper urinary tract (ureteropelvic junction and ureterovesical junction obstruction)
    • Postnatal investigations including serial ultrasound and subsequent diuretic renogram and VCUG
    • Surgical intervention (pyeloplasty)

11. Management of VUR
    • Informing parents of children with VUR that siblings and offspring have a high prevalence of VUR
    • Screening of siblings by renal ultrasound and VCUG
    • Initial treatment of VUR with continuous antibiotic prophylaxis (CAP)
    • Immediate, parenteral antibiotic treatment for febrile breakthrough infections
    • Detailed investigation for the presence of lower urinary tract dysfunction (LUTD)
    • Endoscopic surgical correction

12. Management of urinary stone disease
    • Plain abdominal X-ray and ultrasound for diagnosis and follow-up
    • Non-contrast computed tomography (CT) in cases with a doubtful diagnosis or complex cases requiring surgery
    • Use of appropriate-size instruments in surgical treatment
    • Surgical treatment based on stone size and location: percutaneous nephrolithotomy, shock-wave lithotripsy, retrograde intrarenal surgery, ureteroscopy
13. Management of obstructive pathology of renal duplication

- **Ureterocele**
  - Diagnosis: ultrasonography, radionuclide studies (technetium-99m mercaptoacetyltriglycine [MAG III]/DMSA), VCUG, magnetic resonance urography, high-resolution MRI, and cystoscopy
  - Choice of treatment depending on symptoms, function and reflux as well on surgical and parenteral choices: observation, endoscopic decompression, ureteral reimplantation, partial nephroureterectomy, complete primary reconstruction

- **Ectopic ureter**
  - Diagnosis: ultrasound, DMSA scan, VCUG, MRI
  - Choice of treatment option depending on degree of upper urinary tract function: (hemi-) nephroureterectomy, ureteral reimplantation, ureteroureterostomy, or ureteropyelostomy

14. Treatment of disorders of sex development

- Use of a multidisciplinary approach (neonatology, paediatric endocrinology, paediatric urology, child psychology)
- Emergency management of any neonate presenting with ambiguous genitalia (evaluation for salt-losing in a 46XX congenital adrenal hyperplasia)
- Gender assignment based on multidisciplinary consensus taking into account the latest knowledge
- Timing of surgery dependent on the severity of the condition and on the assigned sex

15. Management of posterior urethral valves

- Diagnosis: ultrasound and VCU, split renal function assessed by DMSA scan, serum creatinine
- Antenatal treatment: option of a vesico-amniotic shunt to reverse oligohydramnios
- Postnatal treatment: endoscopic valve ablation after bladder drainage and stabilization
- Life-long monitoring for bladder dysfunction and end-stage renal failure
- Renal transplantation

16. Management of paediatric urological trauma
• Renal trauma
  • Imaging (rapid spiral CT scanning)
  • Conservative management
  • Surgical intervention for haemodynamic instability and a grade V renal injury
• Ureteral trauma
  • Retrograde pyelogram
  • Endoscopic treatment, such as internal stenting or drainage of a urinoma, either percutaneously or via a nephrostomy tube
  • Open procedures for distal and proximal ureteral injuries
  • Direct re-anastomosis and ureteroneocystostomy for distal injuries
  • Transureteroureterostomy, ureteral replacement with bowel or appendix, or autotransplantation for proximal injuries
• Bladder injuries
  • Retrograde cystography
  • Conservative management of extraperitoneal bladder ruptures (transurethral catheter)
  • Immediate surgical exploration and repair and post-operative drainage for intraperitoneal bladder ruptures
• Urethral trauma
  • Imaging of the urethra with a retrograde urethrogram
  • Rectal examination to determine the position of the prostate
  • Conservative management of bulbous urethral injuries (transurethral catheter)
  • Management of posterior urethral disruption: primary reconstruction, primary drainage with a suprapubic catheter alone and delayed repair, primary re-alignment with a transurethral catheter

17. Post-operative fluid management
  • Pre-operative fasting periods for elective surgeries
  • Use of fluids with lower dextrose concentrations to avoid intraoperative hyperglycaemia
  • Avoiding the routine use of hypotonic fluid
  • Measurement of baseline and daily levels of serum electrolytes, glucose, urea
and/or creatinine in children receiving intravenous fluids

- Encouraging early oral fluid intake in patients receiving minor surgical procedures

18. Post-operative pain management

- Prevention and treatment of pain in children of all ages
- Evaluation of pain using age-compatible assessment tools
- Accurately informing patients and parents about pain
- Pre-emptive and balanced analgesia to decrease the side effects of opioids

**Major Outcomes Considered**

- Sensitivity and specificity of diagnostic tests
- Effectiveness of treatments
- Complications of treatments
- Morbidity
- Mortality

**Methodology**

**Methods Used to Collect/Select the Evidence**

Searches of Electronic Databases

**Description of Methods Used to Collect/Select the Evidence**

**General Search Strategy**

A structured literature search is performed for all guidelines but this search is limited to randomised controlled trials and meta-analyses, covering at least the past three years, or up until the date of the latest text update if this exceeds the three-year period. Other excellent sources to include are other high-level evidence, Cochrane review and available high-quality guidelines produced by other expert groups or organizations. If there are no high-level data available, the only option is to include lower-level data. The choice of literature is guided by the expertise and knowledge of the Guidelines Working Group.

**Specific Strategy for This Guideline**

The guidelines were compiled based on current literature following a systematic review using MEDLINE. Application of a structured analysis of the literature was not possible in many conditions due to a lack of well-designed studies. The literature search period was generally 12 months preceding the cut-off date.
Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

<table>
<thead>
<tr>
<th>Level</th>
<th>Type of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Evidence obtained from meta-analysis of randomised trials.</td>
</tr>
<tr>
<td>1b</td>
<td>Evidence obtained from at least one randomised trial.</td>
</tr>
<tr>
<td>2a</td>
<td>Evidence obtained from one well-designed controlled study without randomisation.</td>
</tr>
<tr>
<td>2b</td>
<td>Evidence obtained from at least one other type of well-designed quasi-experimental study.</td>
</tr>
<tr>
<td>3</td>
<td>Evidence obtained from well-designed non-experimental studies, such as comparative studies, correlation studies and case reports.</td>
</tr>
<tr>
<td>4</td>
<td>Evidence obtained from expert committee reports or opinions or clinical experience of respected authorities.</td>
</tr>
</tbody>
</table>

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses
Systematic Review

Description of the Methods Used to Analyze the Evidence

Not stated

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

General Methods Used to Formulate the Recommendations

- The first step in the European Association of Urology (EAU) guidelines procedure is to
define the main topic.

- The second step is to establish a working group. The working groups comprise about 4-8 members, from several countries. Most of the working group members are academic urologists with a special interest in the topic. Specialists from other medical fields (radiotherapy, oncology, gynaecology, anaesthesiology, etc.) are included as full members of the working groups as needed. In general, general practitioners or patient representatives are not part of the working groups. Each member is appointed for a four-year period, renewable once. A chairman leads each group.

- The third step is to collect and evaluate the underlying evidence from the published literature.

- The fourth step is to structure and present the information. All main recommendations are summarized in boxes and the strength of the recommendation is clearly marked in three grades (A–C), depending on the evidence source upon which the recommendation is based. Every possible effort is made to make the linkage between the level of evidence and grade of recommendation as transparent as possible.

**Specific Methods Used for This Guideline**

It should be noted that when recommendations are graded, there is not an automatic relationship between the level of evidence and the grade of recommendation. The availability of randomised controlled trials (RCTs) may not necessarily translate into a grade A recommendation if there are methodological limitations or disparities in the published results. Conversely, an absence of high-level evidence does not necessarily preclude a grade A recommendation if there is overwhelming clinical experience and consensus. In addition, there may be exceptional situations in which corroborating studies cannot be performed, perhaps for ethical or other reasons. In this case, unequivocal recommendations are considered helpful for the reader. Whenever this occurs, it has been clearly indicated in the text with an asterisk as "upgraded based on panel consensus".

**Rating Scheme for the Strength of the Recommendations**

**Grade of Recommendation**

<table>
<thead>
<tr>
<th>Grade</th>
<th>Nature of Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Based on clinical studies of good quality and consistency addressing the specific recommendations and including at least one randomised trial.</td>
</tr>
</tbody>
</table>
Based on well-conducted clinical studies, but without randomised clinical trials.

Made despite the absence of directly applicable clinical studies of good quality.

Cost Analysis

The European Association of Urology (EAU) Guidelines Office does not perform cost assessments, nor can they address local/national preferences in a systematic fashion. However, whenever such data are available, the expert panels will include the information.

Method of Guideline Validation

Internal Peer Review

Description of Method of Guideline Validation

There is no formal external review prior to publication.

The Appraisal of Guidelines for Research and Evaluation (AGREE) instrument was used to analyse and assess a range of specific attributes contributing to the validity of a specific clinical guideline.

The AGREE instrument, to be used by two to four appraisers, was developed by the AGREE collaboration (www.agreetrust.org) using referenced sources for the evaluation of specific guidelines (see the "Availability of Companion Documents" field for further methodology information).

Recommendations

Major Recommendations

Note from the European Association of Urology (EAU) and the National Guideline Clearinghouse (NGC): The following recommendations were current as of March 2013. However, because the EAU updates their guidelines frequently, users may wish to consult the EAU Web site for the most current version available.

Definitions for levels of evidence (1–4) and grades of recommendation (A–C) are provided at the end of the "Major Recommendations" field.

Phimosis

Conclusion
Treatment for phimosis usually starts after 2 years of age or according to parents’ preference.

**Recommendations**

- In primary phimosis, conservative treatment with a corticoid ointment or cream has a success rate of more than 90% (**Level of evidence: 1; Grade of recommendation: A**).
- In primary phimosis, recurrent balanoposthitis and recurrent urinary tract infection (UTI) in patients with urinary tract abnormalities are indications for active intervention (**Level of evidence: 2; Grade of recommendation: A**).
- Secondary phimosis is an absolute indication for circumcision (**Level of evidence: 2; Grade of recommendation: A**).
- Paraphimosis is an emergency situation and treatment must not be delayed. If manual reposition fails, a dorsal incision of the constrictive ring is required (**Level of evidence: 4; Grade of recommendation: A**).
- Routine neonatal circumcision to prevent penile carcinoma is not indicated (**Level of evidence: 2; Grade of recommendation: B**).

**Cryptorchidism**

**Recommendations**

- Boys with retractile testes do not need medical or surgical treatment, but require close follow-up until puberty (**Level of evidence: 2; Grade of recommendation: A**).
- Surgical orchidolysis and orchidopexy should be concluded at the age of 12 months, or 18 months the latest (**Level of evidence: 3; Grade of recommendation: B**).
- In case of non-palpable testes and no evidence of disorders of sex development, laparoscopy still represents the gold standard because it has almost 100% sensitivity and specificity in identifying an intra-abdominal testis as well as the possibility for subsequent treatment in the same session (**Level of evidence: 1a; Grade of recommendation: A**).
- Hormonal therapy, either in an adjuvant or neo-adjuvant setting, is not standard treatment. Patients have to be evaluated on an individual basis (**Level of evidence: 2; Grade of recommendation: C**).
- For an intra-abdominal testis in a 10-year-old boy or older, with a normal contralateral testis, removal is an option because of the theoretical risk of a later malignancy (**Level of evidence: 3; Grade of recommendation: B**).
Hydrocele

Recommendations

- In the majority of infants, surgical treatment of hydrocele is not indicated within the first 12–24 months due to the tendency for spontaneous resolution. Little risk is taken by initial observation because progression to hernia is rare (Level of evidence: 2; Grade of recommendation: B).

- Early surgery is indicated if there is suspicion of a concomitant inguinal hernia or underlying testicular pathology (Level of evidence: 2; Grade of recommendation: B).

- In case of doubts about the character of an intrascrotal mass, scrotal ultrasound should be performed (Level of evidence: 4; Grade of recommendation: C).

- In the paediatric age group, an operation would generally involve ligation of the patent processus vaginalis via inguinal incision. Sclerosing agents should not be used because of the risk for chemical peritonitis (Level of evidence: 4; Grade of recommendation: C).

Acute Scrotum in Children

Recommendations

- Acute scrotum is a paediatric urological emergency and intervention should not be delayed.

- Neonates with acute scrotum, and bilateral cases, should be treated as surgical emergencies. In neonates, the contralateral scrotum should also be explored (Level of evidence: 3; Grade of recommendation: C).

- Doppler ultrasound is a highly effective imaging tool to evaluate acute scrotum and comparable to scintigraphy and dynamic contrast-enhanced subtraction magnetic resonance imaging (MRI).

- High-resolution ultrasonography is better for direct visualisation of spermatic cord twisting (Level of evidence: 3; Grade of recommendation: C).

- Torsion of the appendix testis can be managed conservatively but in equivocal cases and in patients with persistent pain, surgical exploration is indicated.

- Urgent surgical exploration is mandatory in all cases of testicular torsion within 24 hours (h) of symptom onset (Level of evidence: 3; Grade of recommendation: C).

Hypospadias
Conclusions

- The age at surgery for primary hypospadias repair is usually 6–18 (24) months (Level of evidence: 4).
- The therapeutic objectives are to correct the penile curvature, to form a neo-urethra of an adequate size, to bring the neomeatus to the tip of the glans, if possible, and to achieve an overall acceptable cosmetic appearance (Level of evidence: 4).
- After hypospadias repair, sexual functions are usually well preserved (Level of evidence: 2).

Recommendations

- At birth, isolated hypospadias has to be differentiated from disorders of sex development which are mostly associated with cryptorchidism or micropenis (Grade of recommendation: A).
- Differentiation between functionally necessary (functional indications) and aesthetically feasible operative procedures (psychological, cosmetic indications) is important for therapeutic decision-making. As all surgical procedures carry the risk of complications and thorough pre-operative counselling of the parents is crucial.
- Original and modified tubularised incised plate urethroplasty has become the most popular type of surgery for distal hypospadias; the onlay urethroplasty or two-stage procedures are used in more severe hypospadias (for the algorithm, see Figure 1 in the original guideline document) (Grade of recommendation: B).
- After hypospadias repairs, long-term follow-up is necessary, up to adolescence, to detect urethral stricture, voiding dysfunction and recurrent penile curvature (Grade of recommendation: A).

Varicocele in Children and Adolescents

Conclusions

- Varicocele becomes more frequent at the beginning of puberty and is found in 14%–20% of adolescents. Fertility problems are expected in 20% of them.
- Varicocele is examined in the standing position and classified into 3 grades. Venous reflux is diagnosed using Doppler colour flow mapping in the supine and upright position. In up to 70% of patients with grade II and III varicocele, left testicular volume loss was found; in late adolescence the contralateral right testis may become smaller as well.

Recommendations
Surgery is recommended for:

- Varicocele associated with a small testis
- Additional testicular condition affecting fertility
- Pathological sperm quality (in older adolescents)
- Bilateral palpable varicocele
- Symptomatic varicocele

(Level of evidence: 2; Grade of recommendation: B)

- For surgical ligation, some form of optical magnification (microscopic or laparoscopic magnification) should be used (Level of evidence: 2; Grade of recommendation: B).
- Lymphatic-sparing varicocelectomy is preferred to prevent hydrocele formation and testicular hypertrophy (Level of evidence: 2; Grade of recommendation: A).

## Urinary Tract Infections in Children

**Conclusions**

- Urinary tract infection represents the most common bacterial infection in children <2 years of age. The incidence varies depending on age and sex.
- Classifications can be made according to the site, episode, severity, symptoms and complicating factors. For acute treatment, site and severity are most important.
- The number of colony forming units (cfu) in the urine culture can vary and be related to the method of specimen collection, diuresis, and time and temperature of storage until cultivation occurs. The classical definition of >105 cfu/mL of voided urine is still used to define a significant UTI.

**Recommendations**

- Diagnosis includes medical history, clinical signs and symptoms (signs of a UTI may be vague and unspecific in small children) as well as a physical examination (including a general examination as well as the genitalia).
- Exclusion of bladder and bowel dysfunction is strongly recommended in any child with febrile and/or recurrent UTI, and it should be treated if there is evidence of a dysfunctional elimination syndrome.
- Urine sampling:
  - Urine sampling with plastic bags is commonly used in daily practice. They are helpful only when the dipstick and/or the culture result are negative. There is high risk of false positive results (Level of evidence: 3; Grade of
recommendation: B).

- Clean-catch of urine could be an acceptable technique for obtaining urine only in toilet-trained children (Level of evidence: 2b; Grade of recommendation: B).
- Bladder catheterisation is traumatic especially in boys. It may be an alternative to suprapubic bladder aspiration (Level of evidence: 2b; Grade of recommendation: B).
- Suprapubic bladder aspiration is the most sensitive method to obtain an uncontaminated urine sample in an infant (Level of evidence: 2a; Grade of recommendation: B).

- Urinalysis:
  - Dipsticks yield rapid results, but should be used with caution in infants who empty their bladder frequently as conversion of nitrates to nitrites by bacteria requires approximately 4 h (Level of evidence: 2a; Grade of recommendation: B).
  - Microscopic investigation is the standard method of assessing pyuria after centrifugation, but it is rarely done in an outpatient setting (Level of evidence: 2a; Grade of recommendation: B).
  - Flow imaging analysis is increasingly used to classify particles in uncentrifuged urine. The numbers of white blood cells (WBCs), squamous epithelial cells and red cells correlate well with manual methods (Level of evidence: 3; Grade of recommendation: B).

- Treatment:
  - The choice between oral and parenteral therapy should be based on patient age; clinical suspicion of urosepsis; illness severity; refusal of fluids, food and/or oral medication; vomiting; diarrhoea; non-compliance; and complicated pyelonephritis (e.g., urinary obstruction).
  - Long-term antibacterial prophylaxis should be considered in cases of high susceptibility to UTI and risk of acquired renal damage.
  - Parenteral therapy is advised when there is clinical suspicion of urosepsis; illness severity; refusal of fluids, food and/or oral medication; vomiting; diarrhoea; non-compliance; and complicated UTI (Level of evidence: 2a; Grade of recommendation: B).
  - As a result of the increased incidence of urosepsis and severe pyelonephritis in
newborns and infants aged <2 months, parenteral antibiotic therapy is recommended. In an emergency setting, intravenous (IV) fluid replacement is necessary (Level of evidence: 2a; Grade of recommendation: B)

- Outcomes of short courses (1–3 days) are inferior to those of 7-4-day courses (Level of evidence: 1b; Grade of recommendation: B)
- Oral therapy with a third-generation cephalosporin (e.g., cefixime or ceftibuten) may be equivalent to the usual 2–4 days IV therapy followed by oral treatment (Level of evidence: 1b; Grade of recommendation: B)
- In complicated UTI, parenteral treatment with broad-spectrum antibiotics is indicated (Level of evidence: 1b; Grade of recommendation: B)

- Imaging:
  - Renal and bladder US is strongly recommended in infants with febrile UTI to exclude obstruction of the upper and/or lower urinary tract (Level of evidence: 3; Grade of recommendation: B)
  - Changes in dimercaptosuccinic acid (DMSA) clearance during acute UTI indicate pyelonephritis or parenchymal damage. If it is positive, reflux may be present (Level of evidence: 2b; Grade of recommendation: B)
  - Voiding cystourethrogram (VCUG) is the gold standard to exclude or confirm vesicoureteral reflux (VUR). Due to the risk of renal scarring, it is recommended after the first episode of febrile UTI in boys and girls. The timing of VCUG does not influence the presence or severity of VUR (Level of evidence: 2a; Grade of recommendation: B)

**Daytime Lower Urinary Tract (LUT) Conditions**

**Recommendations**

- Daytime LUT symptoms in children are common and a stepwise treatment approach is recommended, starting with the least invasive approach (Level of evidence: 4; Grade of recommendation: B).

- Initial management consists of urotherapy. Urotherapy includes non-invasive training and re-education, as well as non-invasive neurostimulation (Level of evidence: 2; Grade of recommendation: B).

- Pharmacotherapy (mainly antispasmodics and anticholinergics) would be the next step (Level of evidence: 1; Grade of recommendation: C).

- In case of therapy resistance, re-evaluation will be required which may consist of
video-urodynamics and MRI of lumbar spine which can guide to off-label treatment like some of the non-licensed drugs in children, botulinum toxin injection and sacral nerve stimulation. Such treatment should only be offered in highly experienced centres (Level of evidence: 3; Grade of recommendation: C).

**Monosymptomatic Enuresis**

**Recommendations**

- Treatment is unnecessary in younger children (<5 years of age) in whom spontaneous cure is likely. (Level of evidence: 2; Grade of recommendation: A).
- Voiding diaries or questionnaires should be used to exclude daytime symptoms (Level of evidence: 2; Grade of recommendation: A).
- A urine test is indicated to exclude the presence of infection or potential causes such as diabetes insipidus (Level of evidence: 2; Grade of recommendation: B).
- Supportive measures have limited success when used alone; they should be used in conjunction with other treatment modalities, of which pharmacological and alarm treatment are the two most important (Level of evidence: 2; Grade of recommendation: B).
- Alarm treatment is the best treatment for arousal disorder with low relapse rates. There may be family compliance problems (Level of evidence: 1; Grade of recommendation: A).
- For the treatment of night time diuresis, desmopressin treatment has shown to be effective. The response rate is high around 70%, relapse rates are high (Level of evidence: 1; Grade of recommendation: A).
- The choice of the treatment modality can be made during parental counselling. The parents should be well informed about the problem and advantages and disadvantages of each one of the two treatment modalities should be explained (Level of evidence: 4; Grade of recommendation: B).

**Dilatation of the Upper Urinary Tract (Ureteropelvic Junction and Ureterovesical Junction Obstruction)**

**Conclusions**

- Nowadays, most hydronephrotic kidneys have already been diagnosed prenatally during a maternal ultrasound investigation (Level of evidence: 2).
- Ureteropelvic junction obstruction is the leading cause of hydronephrotic kidneys (40%) (Level of evidence: 1).
**Recommendations**

- Postnatal investigations include serial ultrasound and subsequent diuretic renogram and sometimes VCUG (Level of evidence: 2; Grade of recommendation: B).

- A decision about surgical intervention should be based on the time course of the hydronephrosis and the impairment of renal function (Level of evidence: 2; Grade of recommendation: B).

- Indications for surgical intervention are an impaired split renal function due to obstruction or a decrease of split renal function in subsequent studies and increased anteroposterior diameter on the ultrasound, and grade IV dilatation as defined by the Society for Fetal Urology (Level of evidence: 2; Grade of recommendation: B).

- For uteropelvic junction obstruction, the gold standard of treatment is pyeloplasty (Level of evidence: 2; Grade of recommendation: B).

- Most primary megaureters require no surgical intervention (Level of evidence: 2; Grade of recommendation: B).

**Vesicoureteric Reflux in Children**

**Recommendations for Paediatric Screening for VUR**

- The parents of children with VUR should be informed that siblings and offspring have a high prevalence of VUR.

- If screening is performed, siblings should be screened by renal ultrasound. VCUG is recommended if there is evidence of renal scarring on ultrasound or a history of UTI.

- In older children who are toilet-trained, there is no added value in screening for VUR.

**Recommendations for the Management of VUR in Childhood**

- Regardless of the grade of reflux or presence of renal scars, all patients diagnosed within the first year of life should be treated initially with continuous antibiotic prophylaxis (CAP). During early childhood, the kidneys are at higher risk of developing new scars. Immediate, parenteral antibiotic treatment should be initiated for febrile breakthrough infections. Definitive surgical or endoscopic correction is the preferred treatment in patients with frequent breakthrough infections (El-Ghoneimi, 2003).

- Surgical correction should be considered in patients with persistent high-grade reflux (grades IV/V). There is no consensus about the timing and type of surgical correction. The outcome of open surgical correction is better than endoscopic correction for higher grades of reflux, whereas satisfactory results can be achieved by endoscopic injection for lower grades.
There is no evidence that correction of persistent low-grade reflux (grades I–III) without symptoms and normal kidneys offers a significant benefit. These patients may be candidates for endoscopic treatment.

In all children presenting at age 1–5 years, CAP is the preferred option for initial therapy. For those with high-grade reflux or abnormal renal parenchyma, surgical repair is a reasonable alternative. In patients with lower grades of reflux and without symptoms, close surveillance without antibiotic prophylaxis may be an option.

A detailed investigation for the presence of lower urinary tract dysfunction (LUTD) should be performed in all children after toilet-training. If LUTD is found, the initial treatment should always be for LUTD.

If parents prefer definitive therapy to conservative management, surgical correction may be considered. Endoscopic treatment is an option for all children with low grades of reflux.

The traditional approach of initial medical treatment after diagnosis and shifting to interventional treatment in case of breakthrough infections and new scar formation needs to be challenged, because the treatment should be tailored to different risk groups.

The choice of management depends on the presence of renal scars, clinical course, grade of reflux, ipsilateral renal function, bilaterality, bladder function, associated anomalies of the urinary tract, age, compliance, and parental preference (Jayanthi & Patel, 2008). Febrile UTI, high-grade reflux, bilaterality, and cortical abnormalities are considered to be risk factors for possible renal damage. The presence of LUTD is an additional risk factor for new scars.

In high-risk patients who already have renal impairment, a more aggressive, multidisciplinary approach is needed.

### Urinary Stone Disease

#### Recommendations for Interventional Management in Paediatric Stones

<table>
<thead>
<tr>
<th>Stone Size and Localisation*</th>
<th>Primary Treatment Option</th>
<th>LE</th>
<th>Secondary Treatment Options</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staghorn stones</td>
<td>PCNL</td>
<td>2B</td>
<td>Open/SWL</td>
<td>Multiple sessions and accesses with PCNL may be needed. Combination with SWL may be useful.</td>
</tr>
</tbody>
</table>
Pelvis <10 mm  |  SWL  |  **1A**  |  RIRS/PCNL  |  

Pelvis 10–20 mm | SWL | **2B**  | PCNL/Open  | Multiple sessions with SWL may be needed. PCNL has similar recommendation grade.

Pelvis >20 mm  | PCNL  |  **2B**  | SWL/Open  | Multiple sessions with SWL may be needed.

Lower pole calyx <10 mm | SWL | **2B**  | RIRS/PCNL  | Anatomical variations are important for complete clearance after SWL.

Lower pole calyx >10 mm | PCNL |  **2B**  | SWL  | Anatomical variations are important for complete clearance after SWL.

Upper ureteric stones  | SWL  |  **2B**  | PCNL/URS/Open  |  

Lower ureteric stones  | URS  |  **1A**  | SWL/Open  | Additional intervention need is high with SWL.

Bladder stones  | Endoscopic  |  **2B**  |  | Open is easier and with less operative time with large stones.

*Cystine and uric acid stones excluded.

PCNL = percutaneous nephrolithotomy; SWL = shock-wave lithotripsy; RIRS = retrograde intrarenal surgery; URS = ureteroscopy.

Conclusions

- The incidence of stone disease in children is increasing (**Level of evidence: 2**).
- Any child with urinary stone disease deserves metabolic and anatomical evaluation (**Level of evidence: 2**).
- Treatment should be supported with medical treatment for the underlying metabolic abnormality if detected (**Level of evidence: 1**).
- Open surgery for stone disease in children is an exceedingly rare requirement (**Level of evidence: 1**).
- Surgical treatment is based on minimally invasive modalities. (**Level of evidence: 1**).

Recommendations

- In most cases, plain abdominal X-ray and ultrasound is sufficient for diagnosis and
follow-up (Level of evidence: 2; Grade of recommendation: B).

- Non-contrast computed tomography (CT) may be required in cases with a doubtful diagnosis or complex cases requiring surgery (Level of evidence: 2; Grade of recommendation: B).
- The use of appropriate-size instruments will decrease the number of complications in surgical treatment (Level of evidence: 1; Grade of recommendation: A).

**Obstructive Pathology of Renal Duplication: Ureterocele and Ectopic Ureter**

**Conclusions**

- Ureterocele and ectopic ureter are associated with complete renal duplication, but they also occur in a single system.
- In most cases, in young children (first years of life) diagnosis is done by ultrasonography.
- In older children clinical symptoms will prompt assessment.
- Management includes a conservative approach, endoscopic decompression, partial nephroureterectomy, or complete primary reconstruction. Choice of treatment will depend on:
  - Clinical status of the patient (e.g., urosepsis)
  - Patient age
  - Function of the upper pole
  - Presence of reflux or obstruction of the ipsilateral or contralateral ureter
  - Presence of bladder neck obstruction caused by ureterocele
  - Intravesical or ectopic ureterocele
  - Parents' and surgeon's preferences

**Recommendations**

**Ureterocele**

- Diagnosis:
  - Ultrasonography, radionuclide studies (MAG III/DMSA), VCUG, magnetic resonance urography, high-resolution MRI, and cystoscopy are the diagnostic tools to assess function, to detect reflux and rule out ipsilateral compression of the lower pole and urethral obstruction (Level of evidence: 3; Grade of recommendation: B)

- Treatment:
• Choice of treatment will depend on symptoms, function and reflux as well as surgical and parenteral choices: observation, endoscopic decompression, ureteral reimplantation, partial nephroureterectomy, complete primary reconstruction (Level of evidence: 3; Grade of recommendation: B)
  • In patients (single/duplex systems) with no hydronephrosis and no symptoms, the risk for renal injury is low and conservative treatment is a good option.
  • In those with reflux, endoscopic treatment is an option; open reimplantation especially in dilating reflux provides better results.
  • In patients with an obstructing ureterocele, early endoscopic decompression is indicated. In half, to two-thirds of children with an extravesical ureterocele a secondary procedure is needed (compared to 20%–25% of those with an intravesical ureterocele).
  • In patients with a non-functioning moiety and symptoms, heminephrectomy is indicated.

Ectopic Ureter

• Diagnosis:
  • Ultrasound, DMSA scan, VCUG, MRI should be used for a definitive diagnosis (Level of evidence: 3; Grade of recommendation: B).

• Treatment:
  • Choice of treatment option will depend on the function of the upper urinary tract (Level of evidence: 3; Grade of recommendation: B):
    • In poorly or non-functioning moieties, (hemi-) nephroureterectomy is a definite solution.
    • In patients with a functioning renal moiety, ureteral reimplantation, ureteroureterostomy and ureteropyelostomy are reliable options, especially in cases in which the upper pole has function worth preserving.

Disorders of Sex Development

Guidelines for the Treatment of Disorders of Sex Development

• Disorders of sex development (DSD) are the example of conditions for which a multidisciplinary approach is mandatory and gold standard. These children should be referred to experienced centres where neonatology, paediatric endocrinology,
paediatric urology, child psychology and transition to adult care are guaranteed.

- Any neonate presenting with ambiguous genitalia is an emergency since salt-losing in a 46XX congenital adrenal hyperplasia (CAH) girl can be fatal.
- Gender assignment is imminent and should be based on multidisciplinary consensus taking into account the latest knowledge.
- Timing of surgery will be dependent on the severity of the condition and on the assigned sex.
  - In severe anomalies in girls early surgical treatment is indicated.
  - In less severe cases, in consultation with the parents, a more conservative approach might be followed.
  - In boys the surgical correction will mainly consist of hypospadias repair and orchiopexy, so the timing will follow the recommendations for hypospadias repair and orchiopexy (from 6 months onwards and before 2 years of age).

**Posterior Urethral Valves**

**Recommendations**

- **Diagnosis:**
  - An ultrasound can indicate an anomaly, but a VCUG is required to confirm the diagnosis (Level of evidence: 3; Grade of recommendation: B).
    - Split renal function is to be assessed by DMSA scan.
    - Serum creatinine is the prognostic marker.
  - Treatment antenatal:
    - A vesico-amniotic shunt is effective in reversing oligohydramnios, but it has a relatively high complication rate. There is no difference in the renal outcome and long-term results (Level of evidence: 3; Grade of recommendation: B).
  - Treatment postnatal:
    - After bladder drainage and stabilization of the child, endoscopic valve ablation should be performed (Level of evidence: 3; Grade of recommendation: B).
      - In case the child is too small, a vesicostomy is an option for bladder drainage.
      - If bladder drainage is insufficient to drain the upper urinary tract, high urinary diversion should be considered (see Figure 6 in the original
Follow-up:
- Life-long monitoring is mandatory (bladder dysfunction; end-stage renal failure) in all patients (Level of evidence: 3; Grade of recommendation: B).
- Those with serum creatinine nadir above 80 µmol/L have a poor prognosis. Despite optimal treatment 10%–47% of cases develop end-stage renal failure.
- Renal transplantation can safely be performed if bladder function is stable.

**Paediatric Urological Trauma**

**Recommendations for the Diagnosis and Treatment of Paediatric Renal Trauma**

- Imaging is recommended in all children who have sustained a blunt or penetrating trauma with any level of haematuria, especially when the history reveals a deceleration trauma, direct flank trauma or a fall from a height (Grade of recommendation: B).
- Rapid spiral CT scanning is the cornerstone in the diagnostic work-up and allows accurate staging (Grade of recommendation: B).
- Most injured kidneys can be managed conservatively (Grade of recommendation: B).
- Haemodynamic instability and a grade V renal injury are absolute indications for surgical intervention (Grade of recommendation: A).

**Recommendations for the Diagnosis and Treatment of Paediatric Ureteral Trauma**

- Retrograde pyelogram is the most sensitive diagnostic method and is the method of choice. However, in the initial phase of an injury, it is very likely that ureteral injuries will not be detected by routine imaging methods, including contrast-enhanced spiral CT (Grade of recommendation: A).
- Endoscopic treatment is the method of choice, such as internal stenting or drainage of a urinoma, either percutaneously or via a nephrostomy tube (Grade of recommendation: B).
- For distal and proximal ureteral injuries, open procedures are the methods of choice (Grade of recommendation: B).
- For distal injuries, they include direct re-anastomosis and ureteroneocystostomy.
(Grade of recommendation: B).

- For proximal injuries, they include transureteroureterostomy, ureteral replacement with bowel or appendix, or even autotransplantation (Grade of recommendation: B).

**Recommendations for the Diagnosis and Treatment of Paediatric Bladder Injuries**

- Retrograde cystography will allow for an accurate diagnosis, provided that the bladder has been filled full to its capacity and an additional film is taken after drainage (Grade of recommendation: A).
- Extraperitoneal bladder ruptures are usually managed conservatively with a transurethral catheter left in place for 7–10 days (Grade of recommendation: A).
- Intraperitoneal bladder ruptures require immediate surgical exploration and repair as well as post-operative drainage for 7–10 days (Grade of recommendation: A).

**Recommendations for the Diagnosis and Treatment of Paediatric Urethral Trauma**

- Imaging of the urethra with a retrograde urethrogram is mandatory in suspected urethral trauma (Grade of recommendation: A).
- Rectal examination is recommended to determine the position of the prostate (Grade of recommendation: B).
- Bulbous urethral injuries can usually be managed conservatively with a transurethral catheter (Grade of recommendation: B).
- There is still controversy about the optimal management for posterior urethral disruption. The options include primary reconstruction; primary drainage with a suprapubic catheter alone and delayed repair; primary re-alignment with a transurethral catheter (Grade of recommendation: C).

**Post-operative Fluid Management**

**Conclusion**

- Children are not simply smaller physiological versions of adults. They have their own unique metabolic features, which must be considered during surgery (Level of evidence: 2).

**Recommendations**

- Pre-operative fasting periods for elective surgeries (up to 4 h) can be shorter than normally used (Grade of recommendation: B).
- Care should be taken for hyperglycaemia, which is common in children, compared to
intra-operative hypoglycaemia, which is very rare. Fluids with lower dextrose concentrations should therefore be considered (Grade of recommendation: B).

- Avoid the routine use of hypotonic fluid in hospitalised children because they are at high risk of developing hyponatremia (Grade of recommendation: A).
- There is an increased risk of electrolyte abnormalities in children undergoing surgery. It is therefore essential to measure the baseline and daily levels of serum electrolytes, glucose, urea and/or creatinine in every child who receives intravenous fluids, especially in intestinal surgery (e.g., ileal augmentation), regardless of the type of solution chosen (Grade of recommendation: B).
- In patients treated with minor surgical procedures, early oral fluid intake should be encouraged (Grade of recommendation: A).

Post-operative Pain Management in Children: General Information

Conclusions

- Neonates experience pain (Level of evidence: 3).
- Pain may cause behavioural and somatic sequelae (Level of evidence: 3).
- Every institute must develop their own well-structured strategy for post-operative analgesia (Level of evidence: 4).

Recommendations

- Pain must be prevented/treated in children of all ages (Grade of recommendation: B).
- Pain must be evaluated by age-compatible assessment tools (Grade of recommendation: B).
- Patients and parents must be informed accurately (Grade of recommendation: B).
- Pre-emptive analgesia is important and balanced analgesia should be used in order to decrease the side effects of opioids (Grade of recommendation: B).

Definitions:

Level of Evidence

<table>
<thead>
<tr>
<th>Level</th>
<th>Type of Evidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>Evidence obtained from meta-analysis of randomised trials.</td>
</tr>
<tr>
<td>1b</td>
<td>Evidence obtained from at least one randomised trial.</td>
</tr>
</tbody>
</table>
Evidence obtained from one well-designed controlled study without randomisation.

Evidence obtained from at least one other type of well-designed quasi-experimental study.

Evidence obtained from well-designed non-experimental studies, such as comparative studies, correlation studies and case reports.

Evidence obtained from expert committee reports or opinions or clinical experience of respected authorities.

<table>
<thead>
<tr>
<th>Grade</th>
<th>Nature of Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Based on clinical studies of good quality and consistency addressing the specific recommendations and including at least one randomised trial.</td>
</tr>
<tr>
<td>B</td>
<td>Based on well-conducted clinical studies, but without randomised clinical trials.</td>
</tr>
<tr>
<td>C</td>
<td>Made despite the absence of directly applicable clinical studies of good quality.</td>
</tr>
</tbody>
</table>

Clinical Algorithm(s)

The following algorithms are provided in the original guideline document:

- Algorithm for the management of hypospadias
- Assessment and treatment of nocturnal enuresis
- Diagnostic algorithm for dilatation of the upper urinary tract
- Algorithm for metabolic investigations in urinary stone disease in children
- Algorithm for the management of duplex system ureteroceles after the first 3–6 months of life
- An algorithm providing information on assessment, treatment and follow-up of newborns with possible PUV

Evidence Supporting the Recommendations

References Supporting the Recommendations


**Type of Evidence Supporting the Recommendations**

The type of supporting evidence is identified and graded for most recommendations (see the "Major Recommendations" field).

**Benefits/Harms of Implementing the Guideline Recommendations**

**Potential Benefits**

Appropriate diagnosis and management of urological clinical problems in children

**Potential Harms**

- Exposure to radiation from diagnostic imaging
- False negative and false positive results of diagnostic tests
- Use of α-mercaptopropionil glycine can be associated with severe side effects, such as bone marrow depression and nephrotic syndrome.
- See Table 19 in the original guideline document for side effects of drugs used for post-operative pain management in children.
- Clitoral surgery has been reported to have an adverse outcome on sexual function and clitoral surgery should therefore be limited to severely enlarged clitorises.
- Complications of suprapubic aspiration are rare and have been reported in only 0.22% of cases, ranging from transient haematuria to bowel perforation. However, bladder puncture causes more pain than catheterisation in infants <2 months old.
- The placing of a vesicoamniotic shunt has a complication rate of 21% to 59%, dislocation of the shunt occurs in up to 44%, mortality lies between 33% and 43%, and renal insufficiency is above 50%.
- As all surgical procedures carry the risk of complications; thorough pre-operative counselling of the parents is crucial.

**Contraindications**

- Contraindications
• Contraindications for circumcision are coagulopathy, an acute local infection and congenital anomalies of the penis, particularly hypospadias or buried penis, because the foreskin may be required for a reconstructive procedure.

• Nitrofurantoin is contraindicated in the case of renal insufficiency.

**Qualifying Statements**

• The aim of clinical guidelines is to help clinicians to make informed decisions about their patients. However, adherence to a guideline does not guarantee a successful outcome. Ultimately, healthcare professionals must make their own treatment decisions about care on a case-by-case basis, after consultation with their patients, using their clinical judgment, knowledge, and expertise. A guideline is not intended to take the place of physician judgment in diagnosing and treatment of an individual patient.

• Guidelines may not be complete or accurate. The European Association of Urology (EAU) and their Guidelines Office, and members of their boards, officers and employees disclaim all liability for the accuracy or completeness of a guideline, and disclaim all warranties, express or implied to their incorrect use.

• Guidelines users always are urged to seek out newer information that might impact the diagnostic and treatment recommendations contained within a guideline.

• Due to their unique nature – as international guidelines, the EAU Guidelines are not embedded within one distinct healthcare setting – variations in clinical settings, resources, or common patient characteristics, are not accounted for.

• Due to the limited availability of large randomised controlled trials (RCTs) - influenced also by the fact that a considerable number of treatment options relate to surgical interventions on a large spectrum of different congenital problems - this document will largely be a consensus document. Also, there is clearly a need for continuous re-evaluation of the information presented in the current document.

• It must be emphasised that clinical guidelines present the best evidence available but following the recommendations will not necessarily result in the best outcome. Guidelines can never replace clinical expertise when making treatment decisions for individual patients, also taking individual circumstances and patient and parent preferences into account.
Implementation of the Guideline

Description of Implementation Strategy

The European Association of Urology (EAU) Guidelines long version (containing all EAU guidelines) is reprinted annually in one book. Each text is dated. This means that if the latest edition of the book is read, one will know that this is the most updated version available. The same text is also made available on a CD (with hyperlinks to PubMed for most references) and posted on the EAU Web site Uroweb.

Condensed pocket versions, containing mainly flow-charts and summaries, are also printed annually. All these publications are distributed free of charge to all (more than 17,000) members of the Association. Abridged versions of the guidelines are published in European Urology as original papers. Furthermore, many important websites list links to the relevant EAU guidelines sections on the association websites and all, or individual, guidelines have been translated to some 25 languages.

Implementation Tools

Clinical Algorithm
Foreign Language Translations
Mobile Device Resources
Pocket Guide/Reference Cards

For information about availability, see the Availability of Companion Documents and Patient Resources fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better
Living with Illness
Staying Healthy

IOM Domain

Effectiveness
Patient-centeredness
Timeliness
Identifying Information and Availability

Bibliographic Source(s)

Adaptation
Not applicable: The guideline was not adapted from another source.

Date Released
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Financial Disclosures/Conflicts of Interest
All members of the Paediatric Urology Guidelines working panel have provided disclosure statements on all relationships that they have that might be perceived to be a potential source of a conflict of interest. This information is publicly accessible and can be viewed online through the European Association of Urology (EAU) website. This guidelines document was developed with the financial support of the European Association of Urology. No external sources of funding and support have been involved. The EAU is a non-profit organisation, and
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**Guideline Endorser(s)**

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- Czech Urological Society - Medical Specialty Society
- Dutch Association of Urology - Medical Specialty Society
- Hellenic Urological Association - Medical Specialty Society
- Hong Kong Urological Association - Medical Specialty Society
- Hungarian Urological Association - Medical Specialty Society
- Italian Association of Urology - Medical Specialty Society
- Malaysian Urological Association - Medical Specialty Society
- Portuguese Urological Association - Medical Specialty Society
- Russian Society of Urology - Medical Specialty Society
- Spanish Association of Urology - Medical Specialty Society
- Swedish Urology Association - Medical Specialty Society
- Turkish Association of Urology - Medical Specialty Society
- Ukrainian Association of Urology - Medical Specialty Society

**Guideline Status**

This is the current release of the guideline.


**Guideline Availability**

Electronic copies: Available from the [European Association of Urology Web site](http://www.eau.org). Also available in a variety of translations from the [EAU Web site](http://www.eau.org).

Print copies: Available from the European Association of Urology, PO Box 30016, NL-6803, AA ARNHEM, The Netherlands.

**Availability of Companion Documents**
The following are available:


**Patient Resources**

None available

**NGC Status**

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