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Lower urinary tract dysfunction in children – a practical approach

CLINICAL REVIEW

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More than 10 % of schoolchildren suffer from lower urinary tract dysfunction, often leading to contact with the healthcare system. The problem is socially limiting as well as mentally and physically demanding for children and their parents, and it is important to offer treatment. This article describes a structured approach that can form the basis for correct diagnosis and treatment.

Symptoms from the lower urinary tract are commonly referred to as LUTS (lower urinary tract symptoms) based on the terminology of the International Children's Continence Society (ICCS) (1). The terminology has changed somewhat in recent years, and Table 1 shows the definitions for various conditions based on the most recent revision from 2016 (1). Among seven-year-olds, the estimated prevalence of daytime incontinence is 6–9 % and that of enuresis (bedwetting) about 10 % (2). Enuresis is usually an isolated condition in otherwise healthy children, but 20–40 % also have daytime lower urinary tract symptoms, so-called non-monosymptomatic enuresis (3). To be able to help children in the best way possible, it is important to understand the causal relationships and terms associated with lower urinary tract dysfunction, and to understand the significance of the various symptoms.

Table 1

Definitions of incontinence in children (1).

Term	Definition
Primary incontinence	Involuntary urination in children > 5 years who have never been dry
Secondary incontinence	Involuntary urination in children who have previously been dry for > 6 months
Continuous incontinence	Constant leakage of urine day and night
Daytime incontinence	Involuntary urination during the day
Enuresis	Involuntary urination during sleep in children > 5 years
Primary enuresis	Involuntary urination during sleep in children > 5 years who have never been dry
Secondary enuresis	Involuntary urination during sleep in children > 5 years who have previously been dry for > 6 months
Monosymptomatic enuresis	Involuntary urination during sleep **without** daytime urinary tract symptoms
Non-monosymptomatic enuresis	Involuntary urination during sleep **and** daytime urinary tract symptoms

Based on selected literature and our own clinical experience, this article will introduce a targeted approach to the management of lower urinary tract dysfunction in children.

Assessment

The initial assessment will be the same regardless of the presenting problem. With the aid of a thorough anamnesis and targeted clinical examination, and use of a fluid intake and voiding diary, plus a nocturnal bladder diary if appropriate, the likely cause of the incontinence can be identified and treatment started. Referral of the child to the specialist health service can also be considered (Table 2 (1), 4, (5), Figure 1 (6–8)). In cases of bedwetting, it is important to distinguish between enuresis with and without daytime symptoms from the urinary tract, as these require different approaches (3, 9). The initial assessment usually requires two consultations, with use of a fluid intake and voiding diary/nocturnal bladder diary between the two consultations.

Table 2

Assessment of lower urinary tract dysfunction in children (1, 4).

Assessment stage	Key points in assessment
Anamnesis	
Daytime symptoms	Frequency, voiding postponement, sudden and urgent need to urinate, urine leakage (frequency, time, amount), able to delay voiding if necessary, force of boys' urinary stream, use of intra-abdominal pressure to urinate, continuous leakage of urine
Nocturnal symptoms	Number of wet nights per week, time of night at which bedwetting occurs, use of nappies, whether the child urinates in the toilet every morning and evening, whether the child has been dry for > 6 consecutive months previously
Bowel movements	Frequency, amount, consistency (solid, lumpy or loose), any leakage
Sleep patterns	Snoring, nasal congestion, difficulty falling asleep, awakenings
Motivation	Who 'owns' the problem? The child? The parents? Both? How motivated are they?
Additional symptoms	Reduced general condition, weight loss, poor growth, fatigue, polydipsia, polyuria
Clinical examination	
Weight and height	Evaluated with respect to growth charts and previous measurements
Blood pressure	Recommended if equipment is available
Anogenital area	Look for labial adhesion, phimosis, meatal stenosis, haemorrhoids, fissures and signs of faecal incontinence
Sacral region	Look for signs of hidden spina bifida: sacral dimple, hairy patch of skin, altered pigmentation, asymmetry, swelling/lipoma

Assessment stage	Key points in assessment
Neurology	Sensitivity in the anogenital area, reflexes and strength in the lower extremities
Urine dipsticks	Routine use. Urine sample sent for cultivation if dipsticks test positive for leukocytes
Record-keeping	
Voiding diary	Time of micturitions, volume voided, and leakages for at least two days (approximate amount: wet underwear, through to trousers, soaking wet). Voiding frequency: Normally 4–7 micturitions/day. Bladder capacity (maximum voided volume): The highest volume on the form excluding first morning voided volume. Expected bladder capacity: 30 ml + (age in years x 30) (5). Reduced bladder capacity: < 65 % of expected bladder capacity
Fluid intake	Time, volume and type of drinks for at least two days Fluid intake: Recommended 25–30 ml/kg/day or 1 200–1 500 ml/day for schoolchildren
Nocturnal bladder diary	Nappy weight, nocturnal urine volume and morning urine volume for at least seven days (must use nappy when sleeping). Nocturnal urine production: Sum of nappy weight, morning urine volume, and nocturnal urine volume if applicable. Nocturnal polyuria: Nocturnal urine production > 130 % of expected bladder capacity

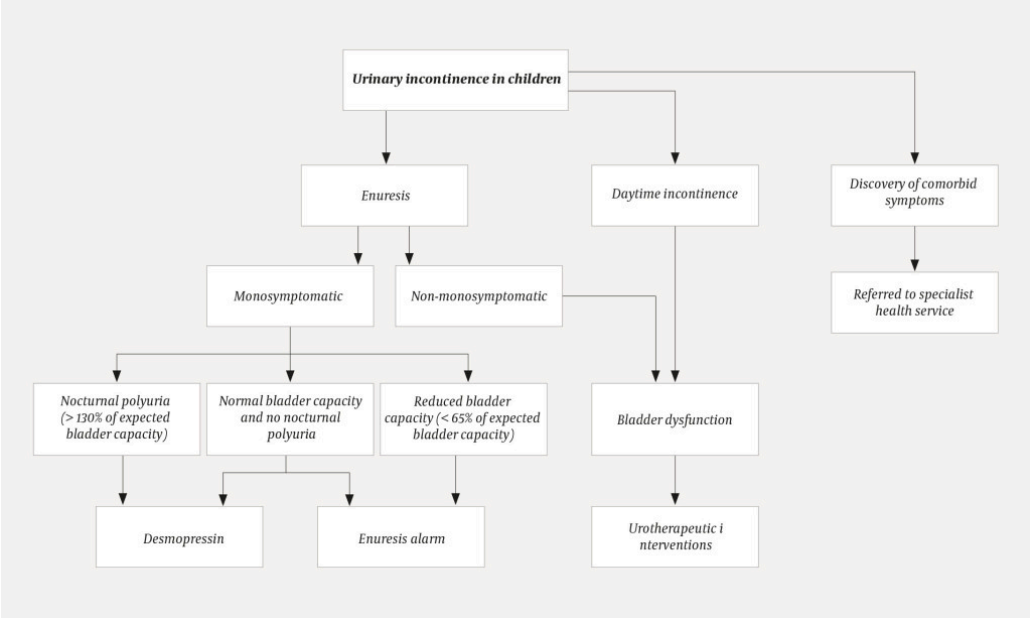

Figure 1 Treatment of urinary incontinence in children (6–8).

Daytime incontinence and non-monosymptomatic

enuresis

Causes

Most lower urinary tract symptoms in children have a functional origin, and few children have anatomical or neurological malformations. Some children postpone voiding because they do not want or do not have time to go to the toilet, and develop a 'lazy bladder'. They typically urinate less than four times a day, cross their legs or stand/sit still to avoid accidents, 'squirt' urine into their underwear and then discover that it is suddenly 'overflowing'. Some drink little to limit these accidents.

Constipation is a frequently overlooked diagnosis in children and increases the risk of urinary tract infections and leakage. There is an extensive overlap between lower urinary tract symptoms and bowel disorders, typically referred to as bladder–bowel dysfunction. Children who postpone voiding often also suppress the urge to defecate and are, or become, constipated.

Some children have an overactive bladder, as revealed by the fact that they urinate frequently but in small volumes, experience a sudden strong urge to urinate and often have to urinate at night. Some, but not all, have incontinence. An overactive bladder may be the result of a urinary tract infection.

In a few children, incontinence may be caused by other disorders of the bladder and urinary tract. These can include an underactive bladder, voiding dysfunction, stress incontinence, bladder outlet obstruction due to urinary tract malformations or neurogenic bladder, vaginal reflux and so-called giggle incontinence (1). Secondary incontinence usually has a functional basis, but other causes must be considered.

Treatment

Treatment of daytime incontinence and non-monosymptomatic enuresis involves urotherapeutic interventions to train the bladder, as well as the treatment of constipation and urinary tract infections (6). In cases of non-monosymptomatic enuresis, treatment of daytime symptoms and constipation should begin before any specific interventions are started against enuresis, as many children become dry at night once they are symptom-free during the day. For daytime incontinence, nappies, panty liners and barrier creams are reimbursable in Norway for children over five years of age.

Urotherapy is a conservative intervention to restore normal function of the lower urinary tract. This should be done in active collaboration with the child Box 1 ((1)). Urotherapy can often be started at six years of age, but which measures to use must be decided based on the maturity of each child. It is important that the child can accomplish the steps required. Urotherapeutic interventions should be initiated by general practitioners, community public health nurses and specialists in paediatrics, paediatric surgery and urology. Some paediatric wards have their own urotherapists.

Box 1 Urotherapeutic interventions for daytime incontinence and non-monosymptomatic enuresis in children (1).

INFORMATION AND DEMYSTIFICATION

Age-appropriate review of normal physiology/anatomy and how the child deviates from this

INSTRUCTION ON BEHAVIOURAL MODIFICATION

Always urinate morning and evening

Take your time on the toilet

Full emptying of the bladder

- Support for the legs, clothing below knees
- Boys can sit

Regular urination, possibly 'by the clock'

- Every three hours for those who postpone voiding
- More often initially for those with frequent voiding

Avoid 'holding manoeuvres'

Regular defecation, treat any constipation

LIFESTYLE ADVICE

Optimise fluid intake for bladder training, see Table 2

2/3 of fluid intake should be before 4 pm

Dietary advice in the event of constipation

RECORD-KEEPING

Keep a diary of relevant symptoms

SUPPORT AND ENCOURAGEMENT

Close follow-up recommended (1–2 times a month)

In cases of constipation, stool softeners must be started at the same time as toilet training. Macrogol is currently the first-choice treatment according to the NICE guidelines and Up-to-date. The drug is effective, has few adverse effects and is considered safe for children aged two years and above. Treatment should be continued for at least three months, and sometimes for several years.

In children with an overactive bladder who do not respond to urotherapy, referral to a specialist may be indicated. The child can then be assessed for treatment with a urinary antispasmodic or muscarinic receptor antagonist.

Monosymptomatic enuresis

Causes

Enuresis is the result of a mismatch between nocturnal urine volume and bladder capacity, as well as an insufficient ability to awaken or to suppress urination in response to signals from the bladder during sleep. In three out of

four cases, the cause is nocturnal polyuria, i.e. nocturnal urine production > 130 % of expected bladder capacity (10). Many children with enuresis have been shown to have a lower nocturnal increase in antidiuretic hormone (ADH, also known as arginine vasopressin) than children without enuresis (11). Since this hormone both reduces urine production and increases bladder distention, insufficient ADH production can lead to a mismatch between urine volume and bladder capacity. Disturbed sleep has also been shown to increase nocturnal urine production (12). Some children have a small bladder capacity, often as a result of an overactive bladder. A number of children with enuresis have insufficient brain activation during sleep by signals that should lead to an activating response, such as the urge to void. This is often referred to as incomplete arousal. Monosymptomatic enuresis is also associated with an increased incidence of constipation. Enuresis is more common in boys (2:1), and over a third of affected children have a family history of the condition (13).

Treatment

In cases of monosymptomatic enuresis, the child's bladder capacity and nocturnal urine production will determine which treatment should be attempted first (4) (Figure 1): desmopressin or an enuresis alarm. Alarm therapy requires greater effort on the part of the family than desmopressin and, in our experience, requires the child to have a certain level of maturity. Treatment choice should therefore be based on an overall assessment of motivation, the wishes of the family and the maturity of the child. The child's urination pattern should be optimised, but bladder training alone has not been shown to have an effect (14). Waking the child at night to urinate can limit bedwetting, but the child will not become dry as a result of this approach, and nocturnal sleep may be impaired. The need for nappies should be assessed for each individual. Nappies and incontinence bed pads are reimbursable in Norway for children over eight years of age with isolated enuresis; see the Norwegian Health Economics Administration, Helfo, for a full list of items (15).

Desmopressin

Desmopressin is a synthetic analogue of ADH and reduces nocturnal urine production. It is the recommended first-line treatment for children with nocturnal polyuria and normal bladder capacity. Desmopressin is partially effective in just under half of children (reduced urine production, fewer wet nights), while approximately 30 % of children become completely dry (7). An orodispersible tablet is placed underneath the tongue at bedtime; fluid intake is limited one hour beforehand to maximise effectiveness and avoid hyponatraemia (9). The recommended starting dose is 120 µg, increasing to 240 µg if there is an incomplete effect after two weeks. If no effect is seen after two weeks with the highest dose, the drug can be discontinued. If an effect is seen, attempts at discontinuation are recommended every 3 months to see whether the child has become dry. Long-term treatment is well-tolerated. Treatment with desmopressin can be repeated even if previous attempts have been unsuccessful, as efficacy in children has been shown to increase with age (9). Desmopressin can also be used sporadically for overnight stays, etc.

Enuresis alarm

Enuresis alarms have better and longer-lasting effects than desmopressin if used as recommended (8). Two-thirds of children become dry with the aid of an alarm, but many relapse. After six months, approximately 50 % will still be dry (7). The best results are achieved when children (often over eight years of age) and their parents are motivated, when there are numerous wet nights, the alarm is used regularly and the family has received good quality information and training.

The alarm is a sensor that is attached to the underwear and is triggered by moisture. The alarm must wake the child without delay as soon as the bladder starts to empty. One of the parents must sleep in the child's room to wake the child until he or she starts to awaken as a result of the alarm. When the alarm goes off, the child must wake up and go to the toilet regardless of whether the bladder has fully or partially emptied. After regular use, the child will awaken *before* the alarm goes off whenever the bladder is full and will manage to get to the toilet. The training probably results in the development of a conditioned reflex to wake up whenever the bladder needs emptying. This usually happens after 3–6 weeks of use, and treatment should be attempted for at least 2–3 months before giving up (7). Treatment is considered successful when fourteen consecutive dry nights are achieved. Use of the alarm should then be continued for a few more weeks; the child can even 'overtrain' by increasing their fluid intake in the evenings for four weeks prior to discontinuing the therapy. In the event of a relapse, restarting the therapy immediately is recommended. Sleep can be impaired if the alarm goes off more than once a night, however, and treatment should be reconsidered in such cases. Alarm therapy can be reattempted when the child is older and mentally more mature. In Norway, families must purchase enuresis alarms themselves, and the costs are not covered by the state. The alarms can be bought from private online stores (search for 'enuresis alarm'). Wireless alarms attached to the underwear are the easiest to use.

Other treatments

A quarter of children will fail to benefit from either desmopressin or an alarm and are said to be treatment-resistant. In such cases, it is important to ensure that there are no daytime symptoms from the urinary tract and that the proposed interventions have been followed. Children with nocturnal polyuria and reduced bladder capacity may benefit from combination therapy with an alarm and desmopressin (9). Centrally-acting drugs may be an alternative for some children, but must be prescribed by a specialist. Children with comorbid conditions, especially behavioural disorders, may benefit from treatment by the child and adolescent psychiatry services. As of yet, studies of alternative therapies such as hypnotherapy, psychotherapy, acupuncture and chiropractic are too few and too small to allow any of these to be recommended (16).

Follow-up

Close follow-up is important for the successful treatment of urinary incontinence in children. Children should be followed up once or twice a month in the primary healthcare service to ensure that the family has understood the treatment, and to maintain motivation levels. A diary should be used to record relevant information (e.g. wet/dry nights, daytime leakage, frequency of bowel movements) to allow the treatment to be evaluated. If treatment does not lead to improvement over time, the child may be referred to a specialist in accordance with the Directorate of Health's priority-setting guidelines (17).

Summary

The primary healthcare service should offer assessment and treatment of lower urinary tract dysfunction in children. The assessment should include an anamnesis, clinical examination and use of a daily fluid intake/voiding diary, as well as a nocturnal bladder diary if appropriate. Daytime incontinence and non-monosymptomatic enuresis should be treated with urotherapy. In cases of monosymptomatic enuresis, treatment with an alarm or desmopressin should be offered. If another underlying cause is suspected, the child should be referred to the specialist healthcare service.

This article has been peer-reviewed.

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