

Diurnal enuresis in childhood

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abstract

OBJECTIVE To review the clinical classification of childhood diurnal enuresis, to describe the evaluation process, and to discuss principles of management.

QUALITY OF EVIDENCE An extensive literature review was performed with a MEDLINE search. Articles were selected according to date of publication, clinical relevance, and availability. Recent articles, cohort studies of at least 50 patients, and randomized clinical trials were preferred. Recent editions of classic textbooks were consulted. Evaluation and management activities discussed in this article are supported by original and relevant literature.

MAIN MESSAGE Most causes of childhood diurnal enuresis can be determined by a thorough history coupled with a complete physical examination and urinalysis and culture. Supplementary investigations include ultrasonography of the kidneys and bladder to screen for neurogenic bladder and urethral obstruction. When obstruction, ectopic ureter, or bladder dysfunction is suspected, voiding cystourethrography and urodynamic studies are needed. Evaluation of neurogenic bladder includes magnetic resonance imaging of the spine. Treatment is aimed at correcting poor toilet habits, preventing or treating urinary tract infections, and using appropriate medication.

CONCLUSIONS In most instances, diurnal enuresis in childhood is a benign condition with an easily identifiable cause and an excellent prognosis with time and appropriate treatment.

résumé

OBJECTIF Revoir la classification clinique de l'énurésie diurne chez l'enfant, décrire le processus d'évaluation et discuter des principes de traitement.

QUALITÉ DES PREUVES Revue exhaustive de la littérature scientifique dans MEDLINE. Les articles ont été sélectionnés selon la date de publication, la pertinence clinique et la disponibilité. On a accordé la préférence aux articles les plus récents, aux études de cohorte d'au moins une cinquantaine de patients et aux essais cliniques randomisés. Les volumes de référence classiques les plus récents ont été consultés. Le plan d'investigation et de traitement discuté dans cet article est appuyé par des ouvrages scientifiques originaux et pertinents.

PRINCIPAUX MESSAGES Les causes les plus fréquentes de l'énurésie diurne chez l'enfant peuvent être déterminées par une anamnèse minutieuse, un examen physique complet et une analyse et culture d'urine. Les investigations complémentaires comprennent l'échographie des reins et de la vessie afin de dépister une vessie neurogène ou une obstruction urétrale. En cas de suspicion d'obstruction, d'uretère ectopique, et de dysfonction vésicale, il faut procéder à une cystographie mictionnelle et à des études urodynamiques. L'évaluation d'une vessie neurogène est complétée par une résonance magnétique de la colonne vertébrale. Le traitement consiste à corriger les mauvaises habitudes de toilette, prévenir ou traiter les infections urinaires et utiliser la médication appropriée.

CONCLUSIONS Dans la plupart des cas, l'énurésie diurne chez l'enfant est une condition bénigne de cause facilement identifiable et d'excellent pronostic avec le temps et un traitement approprié.

This article has been peer reviewed.

Cet article a fait l'objet d'une évaluation externe.

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Diurnal enuresis, or daytime wetting, is defined as an involuntary voiding of urine during waking hours. It is encountered in about 10% of children between 4 and 6 years old, and this figure decreases steadily to reach 5% in 6 to 12-year-olds, 4% in adolescents, and 2% in adults.¹

The condition is common enough that any family physician could come across "daytime dribbler children" and will have to deal with parents' and children's frustration and high expectations for cure. Girls are affected twice as often as boys. Because most children achieve daytime control of their bladders by 4 years,² diurnal enuresis should be considered a problem in any child 4 years and older who wets daily or who was successfully toilet trained and relapses. Whatever the child's age, parental anxiety should be addressed and reasonable expectations should be clearly defined, taking into account the developmental level of the child.

Diurnal enuresis is classified as primary when children continue to wet beyond the usual age of toilet training, and as secondary if children resume wetting after at least 3 consecutive months of urinary continence. Another useful classification, based on etiology,³ considers common functional causes and organic causes, either anatomic or neurogenic (**Table 1**).

Quality of evidence

A MEDLINE search from 1980 to 1998 was conducted using the MeSH headings daytime wetting, urinary incontinence, and childhood. The search was limited to articles published in either English or French. Articles were selected according to their date of publication, clinical relevance, and availability. Recent review articles, cohort studies with at least 50 subjects and a thorough description of the enuresis pattern (including urodynamic studies), and randomized clinical trials were preferred. Bibliographies of the selected articles were screened in order to find additional articles. Several textbooks on pediatric urology were used.

Functional causes of enuresis

Diurnal enuresis is most often functional, and causes are generally easy to find.

Micturition deferral. Holding urine until the last minute is the most frequent cause of intermittent

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diurnal enuresis in preschool children. They have not wet for many months after normal toilet-training and progressively exhibit "holding on" behaviour. Instead of voiding normally five to seven times daily, children do not void until late in the day and might void only two to three times daily. These children squirm while sitting, press their thighs together, and take postures that suppress the need to void, until an involuntary contraction of the detrusor causes an incontinent episode. This pattern of holding on increases the risk for urinary tract infections and the duration of vesicoureteral reflux.⁴

Urinary tract infection. This frequent cause of intermittent urinary incontinence worsens other conditions. Cystitis causes spontaneous contractions of the detrusor. Urinary tract infections are more frequent in children with voiding dysfunction, such as urge syndrome, infrequent voiding, urethral obstruction, neurogenic bladder, and ectopic ureter.⁵

Constipation. Stools exert a pressure in the descending colon and sigmoid that can trigger uninhibited contractions of the detrusor.⁶

Vaginal reflux of urine. Girls who do not open their labia enough upon voiding allow some of the voided urine to reflux into the vagina, then leak down and wet the underwear when they stand up from the toilet seat. This occurs mainly in obese girls and in preschool girls who compress the labia while "falling" through the toilet seat.⁷

Labial fusion. The labia sometimes fuse after an inflammation of the labia minora, starting distally until only a tiny opening remains. The pocket behind the adherent labia minora acts as a reservoir from which urine leaks when the girl is playing.⁴

Daytime frequency syndrome. Sudden onset of frequent voiding every 5 to 10 minutes with urgency in a previously toilet-trained child indicates daytime frequency syndrome. In about 25% of cases, urinary incontinence occurs. Symptoms disappear as suddenly as they appeared, and the mean duration is of 2.5 months. It is more frequent in boys around a mean age of 5 years.⁸ Suggested etiologies include viral or chemical cystourethritis and emotional stress.⁹

Giggle incontinence. This condition occurs in about 8% of girls and is generally sporadic, but can be very embarrassing in public. The bladder empties

Table 1. Causes of diurnal enuresis

FUNCTIONAL CAUSES

Micturition deferral

Urinary tract infection

Constipation

Vaginal reflux of urine

Labial fusion

Daytime frequency syndrome

Giggle incontinence

Stress incontinence

Emotional stress

Urge syndrome

ORGANIC CAUSES

Neurogenic bladder

Urethral obstruction

Ectopic ureter

completely. It seems that laughter or giggling constitutes a specific trigger of the micturition reflex.¹⁰

Stress incontinence. This condition occurs when increased intra-abdominal pressure is not compensated for by the bladder outlet and the proximal urethra. It is generally associated with cough or physical strain.⁴

Emotional stress or excitement. An isolated episode can be related to a specific stressful event, such as a sudden fright, or could persist if the stress continues, as in sexual abuse, for example. The excitement of trips, children's parties, and so forth is a frequent cause of transient diurnal enuresis.⁴

Urge syndrome. Urge syndrome, or unstable bladder, is a frequent cause of diurnal enuresis in preschool- and elementary-school-age girls and in 20% of children with attention deficit and hyperactivity disorder. Children have sudden attacks of an uninhabitable urge to void. To avoid an undesirable loss of urine, they exert maximal compression of the urethra both by forceful contraction of all pelvic floor muscles and by external mechanical compression, generally by assuming a squatting position.¹¹ Symptoms improve with age and are rare after puberty.

Organic causes of diurnal enuresis

Neurogenic bladder. Neurogenic bladder can occur with any neurologic lesion in the cerebral cortex, the spinal cord, or the peripheral nerves. About 75% of children with cerebral palsy and almost all patients with meningomyelocele suffer from daytime wetting. Neurogenic bladder is often present in cases of sacral agenesis (in about 1% of children of mothers with type 2 diabetes) and in about 5% of children with imperforate anus.¹²

Urethral obstruction. Congenital obstruction is caused by the posterior urethral valve, congenital strictures, and urethral diverticula. Acquired urethral obstruction can be secondary to a traumatic stricture, a foreign body in the urethra, a pelvic trauma, or a purulent urethritis due to *Neisseria gonorrhoeae*.¹³

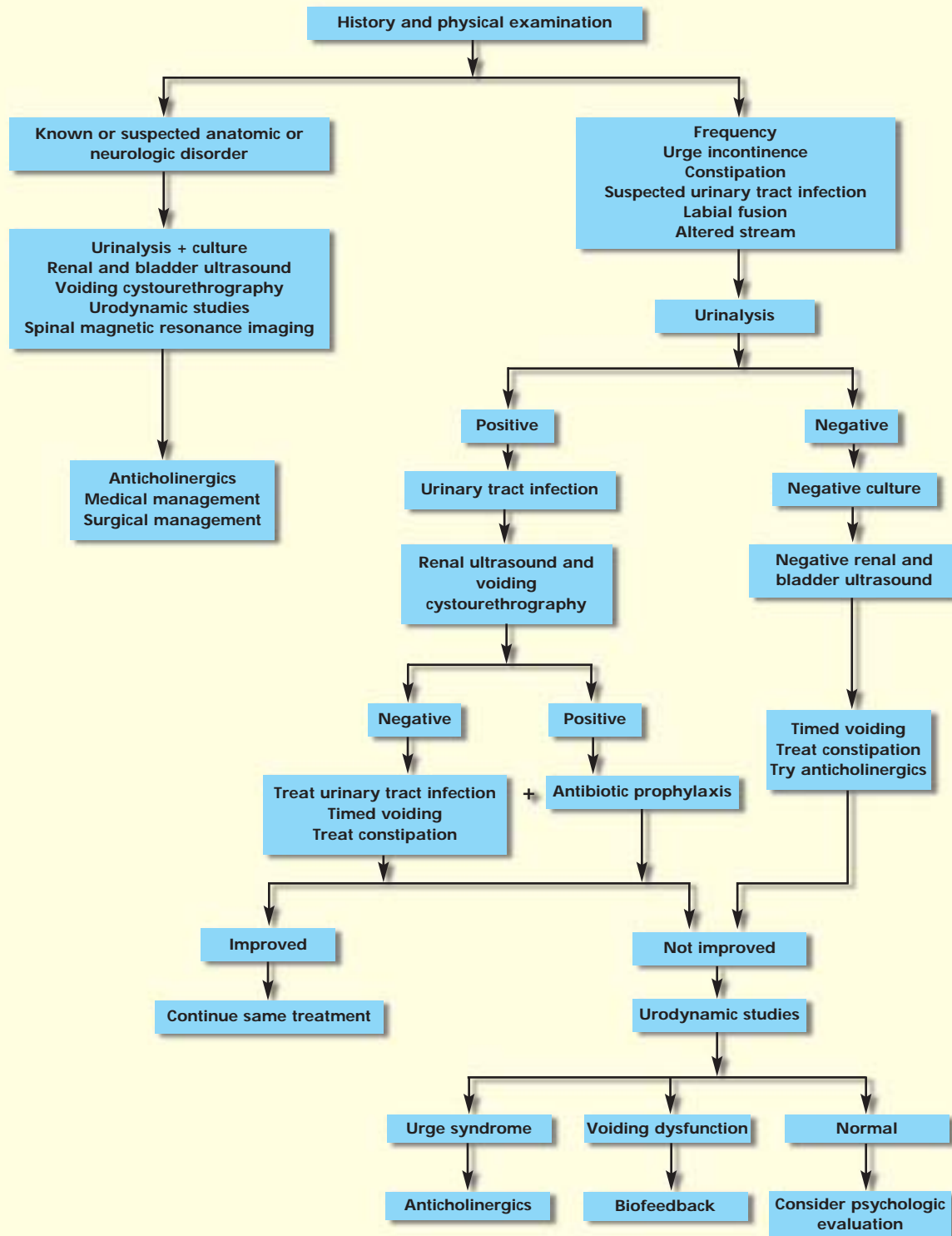
Ectopic ureter. In this rare congenital malformation, the ureter is inserted in a location other than the lateral angle of the bladder trigone. Incontinence occurs when the ureter empties below the urethral sphincter or in the cervix, vagina, or uterus. Ectopic ureter is three to four times more frequent in girls. Boys with ectopic ureter generally do not wet because the ureter connects above the urethral sphincter.¹³

Clinical assessment

History. Family physicians encounter in their practices various presentations of diurnal enuresis with various responses and concerns from children and their parents. On one side, there is the toddler who has not reached his fourth birthday, whose parents are very anxious about day wetting. On the other hand, there is the school-age child who has wet many times daily for many years; no investigation has ever been done; nothing has been tried to solve the problem; and expectations for an immediate cure are very high. Whatever the age and the concerns of children and their parents, a thorough history is the first step and the most important part of the investigation.

It is essential to document the pattern of wetting. Is it new? At which moments do children get wet? Children with urinary vaginal reflux or labial fusion are wet after voiding. Children enuretic for other reasons wet before reaching the toilet. Girls with ectopic ureter are constantly wet. Children with unstable bladder give a history of a sudden urge to void that can be only partially suppressed and, if asked, show the typical posture of squatting. Other elements of the history include the number of mictions per day,

Figure 1. Investigation and management of children with diurnal enuresis



how long children can stay dry, and whether parents have observed any abnormality of the urinary stream. An easy way to obtain this information is to ask parents to keep a voiding diary indicating the number of mictions and voided volumes evaluated with a measuring device.

Other symptoms alert physicians to associated conditions. Dysuria, pollakiuria, urgency, and foul-smelling urine indicate urinary tract infection. Because constipation is frequently associated with enuresis, it is important to inquire about bowel habits and the pattern of stools. Neurogenic bladder is often accompanied by symptoms related to the neurologic problem. Constipation, encopresis, and gait disturbance are often present in children with spinal cord lesions.¹⁴

History-taking is incomplete without asking about the child's feelings because day-wetting in school is considered a very stressful event.¹⁵

Physical examination. A thorough physical examination is performed with an emphasis on the abdomen, genitalia, and back. In girls, one must look for adherence of the labia minora or constant moistness in the introitus, despite regular drying with toilet tissue, suggestive of ectopic ureter. Inspection of the calibre of the urethral meatus could reveal meatal stenosis. It is important to determine whether the urinary stream is weak, interrupted, or of small calibre and to note whether children use their abdominal muscles to push, as these signs should raise suspicion of urethral obstruction. Tenderness of the loin or suprapubic area suggests urinary tract infection; presence of hard stools in the left lower quadrant suggests constipation.

Neurologic examination must evaluate the motor power, muscle tone, sensation, and deep tendon reflexes as well as the Babinski sign and anal reflex. Subtle physical findings, such as high-arched feet or abnormal gait; abnormalities over the lower spine, such as pigmented lesions, dimples, sinuses, masses, or hair tufts; and asymmetry of the gluteal cleft should raise the suspicion of occult spinal dysraphism. Sacral agenesis is associated with flattening of the buttocks and absence of the cephalad portion of the gluteal cleft.^{4,12,14,16}

Investigations. In an algorithm for patient investigation and management (**Figure 1**), urinalysis is the most important test, as it screens for urinary tract infection and urethral obstruction in the presence of hematuria. The examination should be completed by urine culture.

Renal and bladder sonography must be done in all children older than 4 years with persistent diurnal enuresis. Cases of neurogenic bladder show a thick trabeculated wall with a "Christmas tree" or "pine cone" configuration.¹² Patients with urethral obstruction show bladder trabeculae, substantial postvoid residual urine, and vesicoureteral reflux with hydronephrosis and renal cortical scarring.¹⁷

Voiding cystourethrography should be performed in documented cases of urinary tract infections, in order to detect vesicoureteral reflux or urethral obstruction. Vesicoureteral reflux has been associated with uninhibited bladder contractions and daytime wetting.^{18,19} During voiding cystourethrography, it is important to look for sacral agenesis or spinal dysraphism.

Patients with suspected neurogenic bladder, urethral obstruction, or severe vesicoureteral reflux should be referred to a urologist who will perform urodynamic studies. Documentation of a neurogenic bladder without an obvious cause requires magnetic resonance imaging of the spine to detect spinal cord abnormalities.²⁰

Management

General principles. It is essential to abolish the myth that children wet on purpose and to stop punishment for incontinent episodes. A diary of dry days is an important positive reinforcement. Simple measures, such as easy access to the school bathroom and providing a change of clothes, minimize embarrassing situations. It is impossible to overemphasize the importance of alleviating constipation.

Treatment of specific causes. Urinary tract infections should receive appropriate antibiotic treatment and prophylaxis in cases of vesicoureteral reflux. Girls with vaginal reflux should be taught how to spread the labia with each void. Labial fusion is treated by applying estrogen cream to the fused area. Parents of children with micturition deferral should instate a voiding routine upon awakening, every 90 minutes during the day, before leaving the house, after fluid intake, and before bed. When children adopt a posture suggesting the need to void, they should be sent immediately to the bathroom. When a situation leading to stress incontinence or giggle incontinence cannot be avoided, children should restrict their fluid intake, void before the activity, sit down when laughing (because this posture exerts pressure on the perineum and closes the urethra), and wear an absorbent pad in their underwear. Urethral obstruction and ectopic ureter need surgical repair.^{4,14,16}

Key points

- Diurnal enuresis should be considered a problem in children who were successfully toilet trained or who are older than 4 years.
- Evaluation includes a thorough history coupled with a complete physical examination. The noninvasive investigations of urinalysis and culture and kidney and bladder ultrasonography determine the cause of diurnal enuresis in most cases.
- Urge syndrome is managed with timed voiding, prevention and treatment of urinary tract infections, and anticholinergics.
- If a child continues to wet, despite successful treatment of a urinary tract infection, another cause of diurnal enuresis should be suspected.

Points de repère

- L'énurésie diurne devrait être considérée comme un problème chez les enfants qui ont fait l'apprentissage de la propreté ou qui ont plus de 4 ans.
- L'évaluation doit comporter une anamnèse approfondie associée à un examen physique complet. Les investigations non invasives comme l'analyse et la culture des urines, ainsi que l'échographie des reins et de la vessie, permettent de déterminer la cause de l'énurésie diurne dans la majorité des cas.
- Le syndrome de l'envie est pris en charge par une miction régulière, la prévention et le traitement des infections des voies urinaires, et au moyen d'anticholinergiques.
- Si l'enfant persiste dans ce comportement en dépit d'un traitement réussi d'une infection des voies urinaires, il faudrait envisager une autre cause de l'énurésie diurne.

Physiotherapy and biofeedback. Bladder rehabilitation aims to achieve the voluntary start of voiding at a predetermined time, with a voiding schedule constructed according to the daily routine at school and other activities. Children are trained to recognize and make voluntary use of their pelvic floor muscles. Some children need to strengthen the abdominal wall and pelvic floor muscles, while others need to relax the pelvic floor muscles.²¹ If voiding retraining is unsuccessful, biofeedback sessions are a useful complementary treatment. Children practise voiding under supervision while observing the pressure curve during cystometry or uroflowmetry.^{22,23}

Pharmacologic treatment. Anticholinergics are useful for children with urge syndrome and neurogenic bladder, because they reduce detrusor hyperactivity, increase the threshold volume at which an uninhibited contraction occurs, and enlarge the functional capacity of the bladder.

Oxybutynin chloride (eg, Ditropan) is a smooth muscle relaxant that is also a moderately potent anticholinergic, with local anesthetic properties.²⁴ It is given at a dose of 0.2 mg/kg daily in two doses. Side effects are related to the antimuscarinic effect and include dry mouth, heat intolerance, sensitivity to strong light, and mood change. These effects reverse with decreased dosage or cessation of the medication.

When vesicoureteral reflux is associated with a hyperreflexic bladder and voiding dysfunction, bladder function improves as a result of anticholinergic treatment, incidence of recurrent urinary tract infections is reduced, and the rate of reflux resolution increases.^{25,26}

The tricyclic antidepressant imipramine decreases bladder contractility and increases outlet resistance.²⁴ It is rarely used, however, because of its cardiotoxicity and the risk of accidental ingestion by younger siblings leading to severe poisoning and even death.

Because neurogenic bladder generally results from a spinal abnormality, such as spina bifida, or a neurologic disorder, such as cerebral palsy, patients benefit from a multidisciplinary approach when family physicians coordinate treatment with urologists, neurologists, neurosurgeons, orthopedists, and physiotherapists.

Psychotherapy. Psychotherapy is indicated when children's motivation is low. This occurs generally in a broader context of family conflicts or when comorbidity, such as attention deficit or hyperactivity disorder, is present.

Prognosis

Outlook is generally excellent in most cases of diurnal enuresis, except for children who have neurogenic bladder or for some who have urethral obstruction. About one third of children with meningomyelocele will achieve continence. Symptoms of urge syndrome persist until adulthood in about one fifth of cases.

Conclusion

Diurnal enuresis is common in childhood, is generally intermittent or self-limited, and has a benign and easily identifiable etiology. A thorough history is the

mainstay of evaluation. Urinalysis, urine culture, and ultrasonography of the kidneys and bladder are useful noninvasive screening tests. Further investigation is warranted when urethral obstruction, ectopic ureter, or bladder dysfunction is suspected. Time and appropriate treatment ensure an excellent rate of cure in most cases. ♦

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