REVIEW ARTICLE

Urinary Incontinence in Children

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SUMMARY

Background: Urinary incontinence (bedwetting, enuresis) is the commonest urinary symptom in children and adolescents and can lead to major distress for the affected children and their parents. Physiological and non-physiological types of urinary incontinence are sometimes hard to tell apart in this age group.

Methods: This article is based on selected literature retrieved by a PubMed search and on an interdisciplinary expert consensus.

Results and conclusion: Nocturnal enuresis has a variety of causes. The main causative factors in monosymptomatic enuresis nocturna (MEN) are an impaired ability to wake up when the bladder is full, due to impaired or absent perception of fullness during sleep, and an imbalance between bladder capacity and nocturnal urine production. On the other hand, non-monosymptomatic enuresis nocturna (non-MEN) is usually traceable to bladder dysfunction, which is also the main cause of diurnal incontinence. A basic battery of non-invasive diagnostic tests usually suffices to determine which type of incontinence is present. Further and more specific testing is indicated if an organic cause is suspected or if the treatment fails. The mainstay of treatment is urotherapy (all non-surgical and non-pharmacological therapeutic modalities). Some patients, however, will need supportive medication in addition. Urinary incontinence has different causes in children and adults and must therefore be diagnosed and treated differently as well. All physicians who treat the affected children (not just pediatricians and family doctors, but also pediatric nephrologists, urologists, pediatric surgeons, and child psychiatrists) must be aware of the specific features of urinary incontinence in childhood.

► Cite this as:
Schultz-Lampel D, Steuber C, Hoyer PF, Bachmann CJ, Marschall-Kehrel D, Bachmann H: Urinary incontinence in children. Dtsch Arztebl Int 2011; 108(37): 613–20. DOI: 10.3238/arztebl.2011.0613

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Urinary incontinence (bedwetting, enuresis) is a multidisciplinary and interdisciplinary problem that often presents a long-term source of distress for the affected children and their parents.

Method

This review article is the result of interdisciplinary collaboration between urologists, pediatricians, and child and adolescent psychiatrists. It is based on selective literature retrieved from PubMed, consensus papers of the International Children´s Continence Society (ICCS) (1–4), the guideline of the European Association of Urology (e1), the S1 guideline of the German Society of Child and Adolescent Psychiatry (5), and the manual of the consensus group for continence training in children and adolescents (KgKS) (6).

On the basis of definitions of different types of enuresis we present guidelines for a stepwise diagnostic approach and explain indication-specific, evidence-based therapeutic interventions.

Definitions

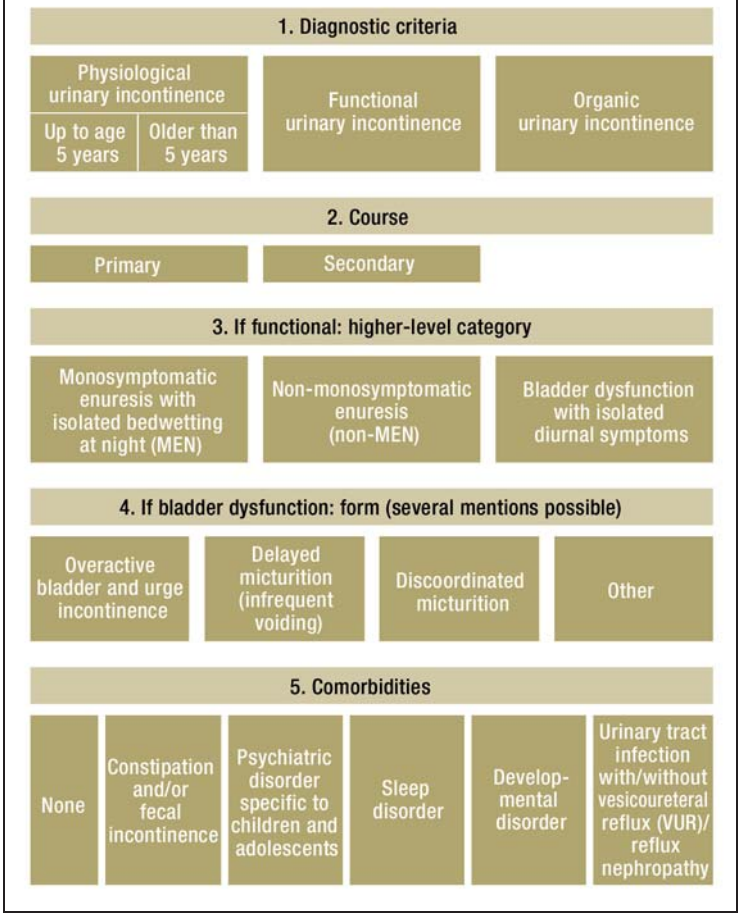
The symptom of involuntary urine loss is termed urinary incontinence (enuresis, bedwetting). For nocturnal urinary incontinence, the terms enuresis and enuresis nocturna are used synonymously (*Figure*). Up to the 5th year of life, urinary incontinence is regarded as physiological.

The basis of successful therapy is the distinction between bedwetting only at night (monosymptomatic enuresis nocturna, MEN) and nocturnal bedwetting with additional diurnal symptoms (non-monosymptomatic enuresis nocturna, non-MEN) and isolated day-time incontinence (mostly combined with other symptoms of bladder dysfunction) (*Box 1*).

In Germany, the ICCS definitions of 2006 pertaining to urinary incontinence in children (1) have become established (*Figure, eFigure 2*). Non-MEN and isolated enuresis during the day are still often combined under the term pediatric urinary incontinence. Primary enuresis is the term used for nocturnal enuresis persisting since birth; secondary enuresis describes enuresis that develops de novo after a dry phase of at least six months.

The causes of urinary incontinence are mostly functional impairments; rarely, they are underlying anatomical or neurological diseases.

FIGURE



Diagnostic categories in urinary incontinence

Prevalence

Children develop stable bladder control in the 3rd to 6th year of life—initially during the day and later also during the night (e2). At age 7, 10% still have nocturnal enuresis, 2% to 9% are affected during the day (7, e3). The spontaneous remission rate is about 15% per year (8, e4). Only a third of those affected seek out health-care services, which provides a clear indication of how the symptoms are rated very differently in different families (e5).

Etiology and pathophysiology

Urinary incontinence is a heterogeneous entity that has multifactorial causes and is affected by comorbidities (*Figure*, *eBox*).

Physiological urinary incontinence

This term clarifies urinary incontinence as a symptom that is regarded as normal in the first few years of life and classed as pathological only after the 5th year of life has been completed (e2). The range of normal continence development is, however, very wide, so that we can assume that many children experience "physiological" urinary incontinence beyond the completed 5th year of life ("late developers"). The clinical and apparative findings in such children are normal.

Pathological urinary incontinence

Organic and functional (or psychosomatic) forms of urinary incontinence need to be differentiated (*Figure*).

Functional urinary incontinence

This includes all forms of enuresis without any structural anatomical or neurological deficit (1). Another term that is applied to this group is "functional urinary incontinence," but this has not been uniformly defined (*Figure*, *eBox*).

Organic urinary incontinence

This form of incontinence is rare. Especially in treatment-refractory cases, special efforts have to go into the detection of possible organic causes. The permanent leaking of small amounts of urine during the day and at night is typical for girls with duplex kidney and ectopic ureter (an abnormally located terminal portion of the ureter). Malformations of the urethra may also be the cause of organic urinary incontinence (*Figure*).

Polyuric renal disease—such as tubulopathies, chronic renal failure, or diabetes insipidus—can also manifest as enuresis. Typically, children awake at night owing to a pronounced sensation of thirst.

Neurogenic disorders: In congenital (for example, myelomeningocele/spina bifida) or acquired neoplastic or inflammatory disorders of the nervous system, the innervation of the bladder is often affected. Occult spinal dysraphisms (for example, spina bifida occulta, tethered cord syndrome, sacral agenesis) often remain undetected for a long time. The clinical features of a neurogenic bladder depend on the location of the lesion and is heterogeneous (for example, pathological residual urine, recurrent urinary tract infections, urinary incontinence, lacking perception of the need to urinate, abnormal uroflowmetry, thickened and trabeculated bladder wall). In the rare "non-neurogenic neurogenic bladder," (Hinman syndrome), the symptoms resemble those of neurogenic bladder, but no neurological lesion is identified.

Manifestations of the symptoms of functional urinary incontinence

Monosymptomatic enuresis (MEN)

The causes of MEN are not fully explained. It may be assumed that a combination of developmental delays in neurological bladder control and the regulation of urine production play the crucial part (2) (*eBox*).

Non-monosymptomatic enuresis nocturna and bladder dysfunction with isolated day-time incontinence

These forms are subcategorized into clinical subgroups according to their day-time symptoms: overactive bladder, discoordinated micturition, and infrequent voiding (*Figure*).

BOX 1

Clinical signs of bladder dysfunction

- Day-time incontinence
- Pollakisuria
- Imperative urge to urinate
- Holding maneuvers
- Infrequent voiding
- Staccato micturition
- Dysuria

Overactive bladder

The main pathophysiological concept is that a child's command over his/her bladder control has not fully matured so that physiological urinary incontinence of early childhood persists. The European Bladder Dysfunction Study (EBDS) did not find any correlation between clinical urge symptoms and cystomanometric detrusor overactivity (9). It is likely that the overactive bladder in children is pathophysiologically not identical to the overactive bladder in adults. The cardinal symptom of overactive bladder is an imperative urinary urge. By intentionally restricting fluid intake and paying frequent visits to the toilet many children remain continent during the day, but once these control mechanisms are absent—for example, during sleep—such children start wetting themselves.

Discoordinated micturition

Discoordinated micturition is characterized by continued tightening of the pelvic floor during micturition and resulting bladder voiding problems (9). Mostly, this is due to acquired malfunction (for example, an incorrect sitting posture, or as a reaction to painful micturition during urinary tract infections/Lichen sclerosus). The cardinal symptoms are a weak urine stream and staccato micturition. Urinary tract infections and bowel voiding disorders are common comorbidities.

Infrequent voiding

Wetting can also be the consequence of habitual delays to micturition, with holding maneuvers being the cardinal clinical symptom (e3). Since healthy children may also delay voiding, the degree at which this behavior becomes pathological is not clearly defined. In extreme cases, the result may be an underactive bladder (in the past referred to as "lazy bladder syndrome," hypotonic or atonic bladder). In this scenario, the perception of a full bladder disappears first and then, as a result of permanent overstretching, the bladder muscles lose their power to contract. The diagnostic categorization into one of the above mentioned three subgroups (*Figure*) is often not clear-cut; overlaps between the different entities exist, the cardinal symptoms are subjective, and they may change over time. The recommendation is to document the objectifiable parameters descriptively on the basis of protocols (*eFigure 1a and 1b*) (*Box 4*) (1).

BOX 2

Diagnostic evaluation in urinary incontinence in children

Basic diagnostics

- Detailed medical history (standardized questionnaire, consultation)
- Bladder diary (diary detailing fluid intake and micturition for 48 h) and 14-day excretion diary
- Physical examination (urological and orientational neurological examination)
- Urinalysis

Further diagnostics

- Sonography (if medical history clearly identifies MEN this is not required):
  - Residual urine (normal: 0–5 mL, threshold value: 6–20 mL, pathological: > 20 mL)
  - Bladder wall thickness (>3–5 mm in >50% bladder fullness)
  - Kidneys (wide pelvicocaliceal system, duplex kidneys, reduced renal parenchyma)
  - Rectal diameter (>30–40 mm)
- Observed micturition
- Uroflowmetry/flow-electromyography (EMG)

Special diagnostics

- In organic urinary incontinence
- In functional urinary incontinence with risk to the kidneys
- In comorbidities

Comorbidities in functional urinary incontinence

Defecation problems

Fecal incontinence with or without constipation is one of the most common comorbidities in non-MEN/isolated day-time wetting (10, e11). This affects about one-third of children (e12). The causal associations have not been uniformly defined (11).

Recurring urinary tract infections

These are an indication of an underlying bladder dysfunction and usually take an afebrile course. In febrile urinary tract infections, referral to a pediatric nephrologist or urologist is indicated (bladder voiding disorder, reflux).

BOX 3

Important questions to ask during history taking

- When does your child wet itself: only at night or also during the day time?
- How often does this occur (for example, every night or several times every month)?
- Where does it occur (only at home, only outside the home)?
- How often does your child go to the toilet every day; does he/she have to get up at night?
- Do your child's underpants have yellow staining during the day?
- Have you observed so-called holding maneuvers?
- How does your child urinate?
- Is the urine stream intermittent; does your child have to strain or squeeze?
- Has your child had urinary tract infections in the past (febrile/afebrile)?
- Does your child suffer from constipation, soiling, encopresis?
- What are your child's drinking habits (how much, what, when)?
- Does your child drink large volumes of fluids, especially in the evening?
- Have you observed signs of a general developmental delay?
- Have you observed psychological or behavioral abnormalities?
- Does your child have comorbidities or has he/she had surgery?
- What has already been done to treat the child's urinary incontinence?
- Does your child encounter stressful situations within the family or at school?

BOX 4

Evaluation of the bladder diary and 14-day excretion diary

- Frequency of micturition
- Micturition volumes
  - First morning urine
  - Maximum micturition volume (exluding the first morning urine)
  - Mean micturition volume (exluding the first morning urine)
  - Nocturnal urine volume (first morning urine + nocturnal urine volume)
- Amount of fluids taken/24 h
- Urinary incontinence events over 14 days (diurnal/nocturnal)
- Fecal incontinence events over 14 days

Psychiatric comorbidities in children and adolescents

Up to 40% of children with urinary incontinence present with clinically relevant behavioral disorders (for example, social behavior disorders, ADHD, anxieties, depressive disorders) (12). These can arise subsequent to wetting and may persist (e13). However, they can also precede the enuresis (for example, secondary enuresis after a change of school, parental divorce, moving house) (e3). It is possible that there are common neurobiological factors—for example, in the association of enuresis and ADHD (e14). Psychiatric comorbidities are more common in children with day-time incontinence and secondary enuresis. In children with primary MEN, they are no more common than in the normal population (10% to 20%). They are most common in children with infrequent voiding (40% to 50%) (12).

Sleep disorders (for example, sleep apnea syndrome, parasomnias) (1, e15) and developmental disorders (for example, specific developmental disorders of speech and language, specific developmental disorder of motor function) (e16) are further relevant comorbidities.

The quality of life of children with enuresis is comparable to that in other chronic diseases, such as bronchial asthma or diabetes mellitus (13).

Diagnostic evaluation

Basic diagnostics

The diagnostic evaluation aims to exclude organic disorder, to categorize the problem as one of the forms of functional urinary incontinence, if applicable, and to identify comorbidities (*Box 2*). The necessary information can be aquired using non-invasive procedures (6).

The medical history (*Box 3*) and the documentation in questionnaires and protocols often differ substantially; an in-depth consultation with the child and his/her parents is required to establish a detailed history.

For two consecutive days, the frequency of micturition events, the volume of urine, the sensation of urinary urge, wetting events, drinking times, ingested fluid volumes, and volumes of urine from nocturnal bedwetting are documented (1, 6). A diary of incontinence events (urinary/fecal incontinence) should be completed over two weeks (*eFigure 1a and 1b*, *Box 4*).

In the physical examination the focus is on signs of a organic cause for enuresis and comorbidities. Spinal dysraphism may manifest in the lumbosacral region

(lipoma, atypical hairiness, hemangioma, asymmetric gluteal folds) or the lower extremity (muscular atrophy, reflex differences, foot deformity). Palpation of the abdomen may identify fecal impactation. The genitals (leaking urine, vulvitis, synechiae of the labia, phimosis) and the anal region (soiling) should be carefully examined if the child agrees. Developmental status and behavioral abnormalities are assessed.

Urinalysis is obligatory so as to rule out urinary tract infection.

Because of the substantial rate of comorbid child and adolescent psychiatric disorders, children should be screened for such disorders, for example by using the KgKS (German consensus group for continence training) questionnaire (6) (12, 14).

The basic diagnostic evaluation described above can be done in any medical practice. Pediatricians and physicians specializing in adolescents are the most common primary point of contact. After the basic diagnostic evaluation is completed, (consiliary) referral to other specialties may be required (*Box 5*).

Further diagnostics

Sonography is used to investigate renal abnormalities (wide pelvicocaliceal system, duplex kidney, reduced renal parenchyma), bladder, and rectum. Pathological amounts of residual urine (reproducible) (1) and relevant thickening of the bladder wall are indications of a bladder voiding disorder. A retrovesically extended rectum indicates constipation (10).

Observing micturition is simple and informative, but it takes a lot of time. The variables to be analyzed on the basis of several micturition events are urinary urge, holding maneuvers, incontinence events, and micturition behavior. The observation can be combined with serial measurements of residual urine and uroflowmetry (6).

Uroflowmetry

Uroflowmetry documents the individual bladder voiding pattern in a reproducible fashion. Pathological uroflowmetry patterns require confirmation (1). In cases of suspected discoordinated micturition, the activities of the pelvic floor also need to be documented (uroflow-electromyography).

Special diagnostics

Special diagnostic evaluation is done in a targeted fashion; this affects about 10% of children with urinary incontinence (15).

Treatment

Several Cochrane reviews have focused on the therapy of urinary incontinence in children (19–22, e17). Randomized controlled studies are available for very few therapeutic interventions (behavioral alarm treatment, desmopressin, propiverine).

The therapy for urinary incontinence has to be decided on a case by case basis.

The therapeutic principles are:

- crucially, child and parents have to be motivated to undergo treatment,
- in non-MEN, diurnal symptoms should be treated before nocturnal symptoms (5),
- if fecal incontinence is present this should be treated first (e11),
- pediatric psychiatric comorbidities are usually treated in parallel; in severe disorders, primary therapy administered by a child psychiatrist may be more effective (e13), and
- combined therapies increase therapeutic success rates.

Any treatment should be re-evaluated on a regular basis and often takes a long time (several months) (9). The *Table* provides an overview of commonly used therapeutic approaches and their evidence levels (14).

Urotherapy

The term urotherapy is used for all non-surgical and non-pharmacological treatment modalities in urinary incontinence (1). The concept of urotherapy has been established for many years in Sweden, the Netherlands, and Belgium (16) and is increasingly also being employed in Germany, including interdisciplinary advanced specialist training leading to certification in urotherapy (6, 17).

BOX 5

Symptoms/comorbidities that may necessitate referral to/co-treatment from other specialties

- Fecal incontinence and/or constipation: pediatric gastroenterology
- Urinary tract infection, polyuria, polydipsia: pediatric nephrology/pediatric urology
- internalizing/externalizing disorders: child and adolescent psychiatry
- Midline defects (esp. "tethered cord"), developmental disorders: neuropediatrics
- Sleep apnea syndrome: pediatric pneumology
- Continual urinary incontinence, neurogenic bladder, other forms of organic urinary incontinence: pediatric urology, pediatric surgery

TABLE

Pharmacological and non-pharmacological interventions in urinary incontinence in children, with evidence levels

Monosymptomatic enuresis		Overactive bladder/discoordinated micturition	
Intervention	**Evidence level**	**Intervention**	**Evidence level**
Non-pharmacological interventions		Non-pharmacological interventions	
Behavioral alarm treatment	1	Behavioral alarm treatment	3
Dry bed training	2	Urotherapy	3
Arousal training	3	Biofeedback	3
Acupuncture	4	Self-catheterization	4
		Neuromodulation	4
Pharmacotherapy		Pharmacotherapy	
Desmopressin	1	Propiverine	1
Oxybutinin	2	Oxybutinin	3
Tricyclic antidepressants	1	Trospium chloride	3
		Botulinum toxin A	3

BOX 6

Elements of urotherapy (1)

Elements of standard urotherapy

- Information and "demystification": physiology, maturation, pathophysiology, therapeutic approaches, comorbidities
- Micturition behavior: for example, toileting schedules, micturition schedules, micturition by the clock
- Drinking behavior and nutrition: for example, drinking schedules,"7-glass rule," diet in case of constipation
- Documentation of the course: diary systems, serial non-invasive investigations (for example, measuring residual urine, uroflowmetry)
- Support and help: regular contact, keeping a success diary, availability of the therapeutic team, motivation

Specific interventions (selection)

- Behavioral modification
- Anti-stress program
- Alarm systems (behavioral alarm treatement)
- Physiotherapy
- Pelvic floor exercises
- Biofeedback training, electrostimulation
- Self-catheterization

Distinction is made between standard urotherapy and specific interventions (Box 6).

Standard urotherapy is the basic treatment in functional urinary incontinence. Specific interventions may also be indicated (behavioral alarm treatment, biofeedback). Urotherapeutic methods are tailored to a patient's individual problems and differ in terms of duration, intensity, and consultation setting.

Urotherapy is targeted at children and parents. It is based on the principle of empowerment. Its aims are improved bladder control and improved quality of life by strengthening patients' own responsibility for excretion functions and reduce intrafamilial tensions. A structured, interdisciplinary training program has just become available in Germany (6). The effectiveness of urotherapy in functional urinary incontinence has recently been confirmed in a randomized controlled study (8, 9, 16, 18). Urotherapy also provides a useful adjuvant approach in organic urinary incontinence.

Drinking and micturition schedules

Modifications to a child's drinking and micturition habits are the basic element of treatment. The toilet should be sought out when urinary urge develops, as well as in the morning and in the evening and preceding lengthy excursions. In children with enuresis, a reduction in the evening's fluid intake is sensible (last amount 2 hours before bedtime). This can be implemented without the child getting thirsty only if the child has taken enough fluids during the day. The "7-glass rule" is a tried and tested rule, meaning that age-appropriate volumes of fluids should be ingested in 7 portions over the day (6).

Micturition/toilet training

In children with urinary incontinence due to infrequent voiding the child should visit the toilet at regular intervals. He/she can learn to be independently responsible for this by means of programming the times (every 2 to 4 hours) as alarms into a digital watch or a mobile telephone and the child seeks out the toilet independently. Micturition schedules and diaries have a positive enhancing effect.

Biofeedback

In cases of discoordinated micturition, biofeedback measures (with visual or acoustic signals) can be used to train children successfully to relax and void their bladder (e18).

Neuromodulation

Initial reports (case series) have been published of the successful use of transcutaneous/percutaneous neurostimulation in children with overactive bladder (e19).

Behavioral alarm treatment (alarm therapy/pants fitted with moisture sensor and alarm)

Behavioral alarm treatment using alarm systems/devices to rouse children from sleep is the first-line treatment in MEN (14, 19). Before starting the treatment it

should be established whether the therapy-associated strains and stresses can be integrated into the family's everyday life. A detailed explanation of the therapeutic methods, which necessitates waking up the child fully, is essential for the success of the treatment. Some 30 to 50 nights of therapy are usually needed before any signs of success become obvious. The response rates are 50% to 70%, long-term success rates after stopping treatment are 40% to 50%.

Dry-bed training/arousal training

These approaches are based on behavioral therapeutic principles and are sometimes combined with behavioral alarm treatment. A Cochrane review indicates better effectiveness for a combination of methods versus individual methods used alone (21, e3).

Pharmacotherapy

To deal with high nocturnal urine volumes, oral hormone therapy using the ADH analogue desmopressin holds promise (22). In 70% of children this helps reduce bedwetting; 25% achieve complete dryness. After stopping taking the drug most children relapse (22). Structured stepping down increases the chances of success and reduces the relapse rate (23). Owing to its rapid onset of effectiveness, desmopressin is suitable as a medication taken when the need arises, in order to fill in in critical situations (holidays, school trips). Severe adverse effects are rare; in 20 documented cases, water intoxication developed (24).

If the functional bladder capacity is small and/or in case of overactive bladder, anticholinergics are sometimes used (10% to 12% of children) (e20). Urotherapy should always precede this approach (6, 25). Substances licensed for use in children include oxybutynin, propiverine, and trospium chloride (from the 12th year of life). Because of its lower side effect profile, propiverine is the preferred drug in Germany (25). Response rates are between 65% and 87%, relapse rates are up to 50%. In the EBDS, verum and placebo medications were efficacious to a comparable degree (9)—an indication that overactive bladder in children fundamentally differs from adult overactive bladder. Anticholinergics are relatively well tolerated by children (side effects occur in 20%, mostly in the form of constipation, and, more rarely, dizziness or lack of concentration). The risks associated with long-term use in children is not known.

Few selected indications exist for botulinum toxin A (e21) and alpha blockers (e22). Because of potentially fatal cardiac side effects, tricyclic antidepressants are rarely used nowadays (5).

Scarce data exist for the complementary therapies acupuncture, hypnosis, or chirotherapy; published studies are few and far between, based on small case numbers, and methodologically often unsound (e17).

Treating comorbidities

Children with urinary incontinence and clinically relevant comorbidities need a comprehensive therapeutic strategy that considers the patient's and their families' individual situation (14, e3).

Expendable therapeutic measures

Methods that are still being practiced, such as fluid restriction, nocturnal rousing, punishment, behavioral therapies without behavioral alarm treatment or general, non-behaviorally based psychotherapies are not effective and should not be used (5, e3). In case of psychiatric comorbidities, however, psychotherapy may be indicated as an adjuvant approach.

Compliance

A robust therapeutic relationship and regular follow-up, with motivation of children and parents, are vital prerequisites for success in this setting (6, e23).

KEY MESSAGES

- Urinary incontinence in children is a heterogeneous phenomenon.
- Functional forms are much more common than organic ones.
- The main prerequisite for successful treatment is the distinction between enuresis and enuresis with diurnal symptoms.
- Diagnosis and initiation of therapy are based on comprehensive, non-invasive basic diagnostic evaluation.
- Urotherapy is the most important therapeutic cornerstone.

Conflict of Interest Statement

Dr Marschall-Kehrel has acted as an adviser to Apogepha Arzneimittel, Pharm Allergan, Astellas Pharma, Bayer HealthCare, Ferring Arzneimittel, Lilly Deutschland, and Pfizer Deutschland. He has received research funding from Ferring Arzneimittel and honoraria for speaking from Apogepha Arzneimittel, Bayer HealthCare, Ferring Arzneimittel, Lilly Deutschland, and Pfizer Deutschland.

Dr Steuber has received honoraria for speaking from Apogepha Arzneimittel.

Professor Schultz-Lampel has received honoraria for speaking from Apogepha Arzneimittel, Ferring Arzneimittel, Astellas Pharma, Bayer HealthCare, Pharm Allergan, and Lilly.

The other authors declare that no conflict of interest exists according to the guidelines of the International Committee of Medical Journal Editors.

Manuscript

received on 16 February 2010, revised version accepted on 26 June 2010.

Translated from the original German by Kersti Wagstaff, MA.

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REVIEW ARTICLE

Urinary Incontinence in Children

Daniela Schultz-Lampel, Christian Steuber, Peter F. Hoyer, Christian J. Bachmann, Daniela Marschall-Kehrel, Hannsjörg Bachmann

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eBOX

Pathophysiological factors of monosymptomatic enuresis nocturna (MEN) (e6–e10)

- Delayed maturation at different levels of bladder control
- Familial trait/genetic disposition
- Difficult to rouse from sleep
- Small bladder capacity
- Circadian ADH secretion is impaired
- Drinking habits that may contribute to the problem
- Psychological triggers (only in secondary MEN)
- Sleep disorders

Drinking and bladder diary

of the German Continence Society

Deutsche Kontinenz Gesellschaft

By Professor Dr Daniela Schulz-Lampe and Professor Dr Klaus-Peter Jünemann

Name:	Date:
Age:	
Height:	Weight:

Time of day	Urine volume measured	Visit to toilet	Sudden urge to urinate	Pants were Dry	Pants were Wet	I drank

Age-appropriate bladder capacity			Age × 30 + 30 =		mL
Mean urine volume:					mL
Small bladder capacity, if <65% of			mL	Yes	No
Nocturnal diuresis volume	Wet –	Dry –	1. morning urine –		mL
Nappy wet – nappy dry + 1. morning urine	mL –	mL +	mL =		mL
Nocturnal polyuria if >than age-appropriate capacity				Yes	No

German Continence Society reg. assoc. Friedrich-Ebert-Str. 124 34119, Kassel, Germany Hotline +49 1805-2 33 44 0

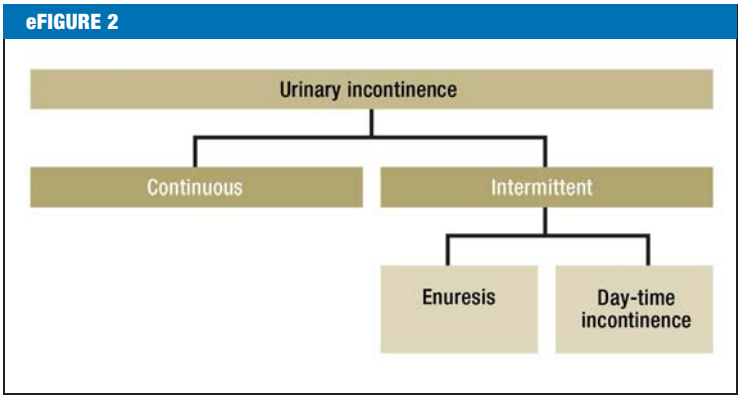
eFigure 1a: Bladder diary

Name:_____, _____ Date:_____

	Weekday, date	Day-time incontinence	Enuresis bed/nappy	Nocturnal bladder voiding on the toilet	Defecation	Fecal soiling	Encopresis
1							
2							
3							
...							

eFigure 1b: 14-day excretion diary

eFIGURE 2



Symptoms of urinary incontinence in children (1)