Childhood enuresis

Anne J Wright

Abstract

Bedwetting occurs across all cultures and throughout childhood but is abnormal after 5 years of age with little spontaneous resolution after 10 years of age. Bedwetting nightly at any age is uncommon and only occurred in 1% of seven and a half year olds in a large British population study. The underlying pathophysiology is a mismatch between the amount of urine produced during the night, the bladder capacity and the inability of the child to wake to the need to void. Evidence-based assessment and management are directed at these causes in order to maximize treatment success. This is important for the child/young person and their family in order to improve quality of life.

Keywords Alarm; assessment; desmopressin; management; nocturnal enuresis

Introduction

Childhood incontinence is the second most common chronic condition of childhood. Unfortunately, most health professionals have had very little in the way of formal education regarding bladder and bowel dysfunction in children and these conditions thus present as distressing for children, parents and professionals alike. Enuresis or bedwetting, whilst being the least pathological condition in the spectrum, nevertheless can be very challenging to treat requiring a combination of clinical, communication, motivational and common sense skills.

Definition

There are a number of bodies that define enuresis including the International Children's Continence Society (ICCS), Diagnostic and Statistical Manual of Mental Disorders (DSM) and the National Institute of Clinical Excellence (NICE); See Table 1. Recently the ICCS has further defined enuresis as occurring frequently (4 or more times per week) or infrequently (less than 4 times per week), whereas previously DSM III gave a frequency of at least once/month and DSM IV/V updated this to at least twice/week. Further subclassifications include *primary* and *secondary* enuresis as well as *monosymptomatic* (MNE) which is enuresis in children without any other lower urinary tract symptoms (LUTS) or bladder dysfunction (excluding nocturia) and *non-monosymptomatic* (NMNE) where enuresis is accompanied by LUTS including increased/decreased voiding frequency, daytime incontinence, urgency, hesitancy, straining, a weak stream, intermittency, holding manoeuvres, a feeling of incomplete emptying, post-micturition dribble and genital or LUT pain. These subclassifications have consequences for prognosis and treatment.

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Epidemiology and long-term prognosis of nocturnal enuresis

There are numerous (at least 44) large epidemiological studies from around the world with regards to the prevalence of enuresis in childhood; Italy has the lowest prevalence (3.8%) and Australia the highest (18.9%) with a frequency of at least once/month and less than once/month, respectively. For enuresis at least twice/week Italy is again the lowest (1.7%) and Turkey the highest (6.4%). A meta-analysis shows a rate of 10% at 7 years (one or more episodes/1−3 months), 3.1% at 11−12 years (one or more/month) and 0.5−1.7% at 16−17 years giving a combined overall prevalence of 1.3%.

Only four studies were longitudinal cohorts; three from the United Kingdom; (Medical Research Council 1946, the National Child Development Study 1958 and the Avon Longitudinal Study (ALSPAC) 1991/1992) and one from New Zealand (Christchurch Child Development study 1977). Longitudinal studies allow the recording of an individual's variable pathway through life with estimates of incidence, remission and the course of the condition together with identification of factors associated with different trajectories. Recent powerful new statistical methods have been formulated for modelling longitudinal pathways known as trajectories and these can identify similar groups of individuals following similar pathways towards a given end. Croudace and colleagues used these methods for night-time bladder control in the 1946 MRC Health and Development cohort (n = 4755, age 4−15 years) revealing four trajectories:

- normal (84%);
- delayed attainment of night-time control with two subgroups;
  - transient group (8.7%) low probability of enuresis after 8 years
  - persistent group (1.8%) low probability of enuresis after 15 years
- chronic group who were still bedwetting at 15 years (2.6%)
- relapsing group who relapsed after initial success representing secondary enuresis (2.9%).

In the MRC cohort approximately half of the children wetting at 4 years of age would have a good probability of wetting at 9 years of age and a third at 15 years of age.

Longitudinal trajectories of the ALSPAC cohort (n = 10,818 age 4.5−9.5 years) born in 1991/1992 reveal very similar trajectories to the MRC cohort and of children bedwetting at 4.5 years of age approximately 40% will continue to have a high probability of bedwetting at 9.5 years of age. The relapsing groups in both studies (equivalent to secondary enuresis) contributed significantly to the persistence of wetting at older age groups. Interestingly, the prevalence of bedwetting at 7 years of age in the MRC cohort (1946) is approximately half of that of the ALSPAC cohort (1991/1992) suggesting an increase in bedwetting over the 45 year period that may relate to a change in toilet-training practices or other unidentified factors.

A large cross-sectional study from Hong Kong demonstrates little spontaneous resolution of enuresis with age if it occurs every night of the week and ALSPAC demonstrates that at 7.5 years of age only 1% wet nearly every night whereas twice/week occurs in 2.4% and once a week is common (12.8%). Nightly wetting is not common at any age.

Definitions and classification of enuresis

Definitions of nocturnal enuresis

Source	Definition
DSM[a] III	The involuntary voiding of urine for children at least twice a month for children between the ages of five and six and once a month for older children.
DSM IV	Involuntary or voluntary repeated voiding into the bed or clothes in the absence of medical conditions or substance effect in a child of at least 5 years of age (or equivalent developmental level) at least twice a week for 3 consecutive months or causing clinically significant distress or impairment in social academic or other important areas of function.
DSM-V	As DSM-IV. Subtype: nocturnal only: passage of urine only during night-time sleep.
ICD[b]-10	Involuntary urine voiding at night for at least 3 months at a mental age where wetting is unacceptable at least twice a month in patients younger than 7 years and at least monthly in those older than 7 not a consequence of a neurological disorder, seizures, or structural urinary tract abnormalities.
ICCS[c] 2006	Intermittent incontinence (urinary leakage in discrete amounts) while or during sleeping.
NICE 2010	The symptom of involuntary wetting during sleep without any inherent suggestion of frequency or pathophysiology.
ICCS-2014	Intermittent incontinence (leakage of urine that occurs in discrete amounts) exclusively during sleeping periods that is significant at a frequency consistent with ICD-10 and DSM-V i.e. requiring a minimum age of 5 years, a minimum of once a month and a minimum period of 3 months. Frequent enuresis is $\geq$4/week; infrequent is $<$4x/week.
Primary	The child has never achieved continence or has been dry for less than 6 months.
Secondary	The child has relapsed and started wetting after a dry period of at least 6 months.
Monosymptomatic	Enuresis in children without any other lower urinary tract symptoms or bladder dysfunction (excluding nocturia).
Non-monosymptomatic	Enuresis in children with any lower urinary tract symptoms including increased/decreased voiding frequency, daytime incontinence, urgency, hesitancy, straining, a weak stream, intermittency, holding manoeuvres, a feeling of incomplete emptying, post-micturition dribble and genital or LUT pain.

[a] DSM American Psychiatric Association. Diagnostic and Statistical Manual of Mental Disorders.
[b] The ICD-10 Classification of Mental and Behavioural Disorders: Diagnostic Criteria for Research. Geneva.
[c] International Children's Continence Society.

Table 1

Other factors associated with enuresis include gender (boys more than girls particularly at the younger ages), family history and genetic factors, high stressor levels and daytime wetting. Thus, whilst the probability of enuresis diminishes with age it is by no means guaranteed to resolve and factors such as secondary onset, wetting every night from an early age and daytime wetting (LUTS) are poor prognostic factors.

Pathophysiology of nocturnal enuresis

In 1989, following the groundbreaking discovery that lack of the normal circadian release of vasopressin at night-time was associated with nocturnal polyuria and enuresis in children, significant research has been conducted in this area making it the most studied condition in childhood incontinence. It is established that the fundamental underlying cause of enuresis is sleep-disordered arousal in response to the need to void, in other words, children who wet the bed need to pass urine during the night but are unable to wake in response to the signalling from their bladder. The need to pass urine occurs because of a mismatch between the volume of nocturnal urine produced and the bladder storage capacity, assuming that the child has not drunk excessively before bed and has voided before going to bed (neither of which should be taken for granted). These three factors underpin enuresis and should be elicited during history taking (see Figure 1).

Sleep-disordered arousal

It is generally held that children who wet the bed sleep deeply and many parents will report their inability to wake the child during the night and the child's inability to wake to external and/or internal stimuli such as attempts to wake them, alarm clocks or household noises. It is often reported that a child can be dry in circumstances away from home e.g. holidays or staying with relatives, when it is assumed that the child is less comfortable in his/her overnight environment and sleeping less deeply and thereby able to control their bladder. Observations of babies in African and Vietnamese cultures have shown that babies are aware of the need to eliminate and indicate this with movement and arousal even from sleep; this has enabled the mothers in these cultures to use infant assisted toilet training starting at 6 months of age with evidence in Vietnamese children that their urodynamic parameters are improved in comparison to a control group from Sweden toilet trained at a much later age. Other studies have shown that full term neonates consistently arouse to bladder emptying from sleep whereas there is only partial arousal in pre-term infants suggesting a delay in maturation of this system. Increasingly, sleep studies are demonstrating that enuretic children have frequent partial cortical arousals (with raised cortical activity that does not result in full conscious awakening) with a resetting of the arousal mechanism to a higher threshold and their sleep is in fact associated with