



Management of Primary Nocturnal Enuresis

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Primarily nocturnal enuresis is a health problem that can have adverse consequences. Bedwetting can result in poor self-esteem for the child as well as frustration and anger for the parents. Children with a bedwetting problem often suffer from shame and guilt, and may have feelings of failure and view themselves as different from others. Children with a bedwetting problem are afraid of being discovered by their peers, and often fear teasing and humiliation by their own siblings and relatives. An understanding of the occurrence, etiology, and treatments available to families with bedwetters will assist health care providers in diagnosing and managing nocturnal enuresis. The purpose of this article is to define nocturnal enuresis, discuss inorganic causes of bedwetting, and review management options.

Definition

Nocturnal enuresis, commonly known as bedwetting, is the involuntary passage of urine during sleep in children 5 years and above. Nocturnal enuresis is

Most parents believe that their child should not be wetting the bed by age 5. Statistics show that 10% to 20% of 5 year olds continue with at least one episode of nocturnal enuresis per month. There is evidence that successful treatment leads to improved self-concept in children (Moffatt, Kato, & Pless, 1987). Treatment consists of various behavior modifications or pharmacologic regimes. Nurses and nurse practitioners in family practice, pediatric practice, school health, and urologic practice are in ideal roles to seek out and manage children with primary nocturnal enuresis.

Objectives

This educational activity is designed for nurses and other health care professionals who care for and educate patients regarding nocturnal enuresis. The multiple choice examination that follows is designed to test your achievement of the following educational objectives. After studying this offering, you will be able to:

1. Address parental concerns regarding children's bedwetting behaviors.
2. Assist parents to choose the best treatment plan.

typically divided into two categories: primary and secondary. Primary nocturnal enuresis (PNE) is nighttime bedwetting since birth in a child with a normal physical examination, a negative urine analysis, and without a history of any significant periods of dryness. Secondary enuresis is the return of incontinence after at least 6 months without bedwetting (Moffatt, 1997).

Prevalence

The National Enuresis Society estimates that 5 to 7 million American children have enuresis. By age 5, 85% of children will have complete bladder control. Nocturnal enuresis, of at least one episode per month, is found in 10% to 20% of 5-year-old children, 5% to 7% of 10-

year-old children, and 2% to 4% of 12 to 14-year-old children (Ullom-Minnich, 1996). One to two percent of children will continue with nocturnal enuresis into their teens and adult life (Norgaard & Anderson, 1994). The annual spontaneous remission of primary nocturnal enuresis is about 15% per year into adulthood (Forsythe & Redmond, 1974). Nocturnal enuresis is twice as prevalent among boys as girls (Ullom-Minnich, 1996).

Etiology

The etiology of nocturnal enuresis is varied and not completely clear. Primary nocturnal enuresis is generally viewed as a developmental disorder or maturational delay (Reiner, 1995). Yet it is important for primary care

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providers to be knowledgeable of the various hypotheses of nocturnal enuresis (Ullom-Minnich, 1996). Other possible etiologies include genetic factors, reduced bladder capacity, sleep disorders, nocturnal diuresis, attention-deficit hyperactive disorder, and diet (Johnson, 1998).

Genetic factors. If one parent was a bedwetter, the probability of his/her children also being bedwetters is about 40%. If both parents were bedwetters the probability rises to 77%, so when the child is informed of the family history of bedwetting some of the self-blame and shame can be alleviated (Schmitt, 1997). Parents who have a history of bedwetting are usually more tolerant of their child's bedwetting (Rogers, 1998).

Reduced bladder capacity. Recent studies reveal that almost all bedwetters with monosymptomatic nocturnal enuresis have a normal functioning bladder and bladder capacity (Sorenson, Rittig & Djurhuus, 1989). Monosymptomatic refers to nocturnal enuresis that occurs with normal daytime urination. Children who daytime void frequently in small amounts and are unable to delay voiding may have a small functional bladder capacity. The average bladder capacity may be estimated by taking the child's age and adding two, yielding the amount of urine in ounces (Rogers, 1998). Another method for calculating bladder volume in ml is to take the child's age, add two, then multiply by 30.

Sleep disorders. Parents often describe their child with PNE as a "deep sleeper" and "difficult to arouse." Studies have shown that enuresis can occur at any stage of sleep (Sorenson et al., 1989). Other studies have not shown a consistent relationship between a deep sleeper and PNE (Ilyas & Jerkins, 1996). In most children arousal from sleep improves with central nervous system maturation (Schmitt,

1997). An immature sleep pattern may allow an uninhibited reflex contraction of the bladder during sleep (Ilyas & Jerkins, 1996).

Nocturnal diuresis. The etiology of nocturnal diuresis due to a lower nocturnal secretion of serum antidiuretic hormone (ADH) is controversial. Results of studies regarding children with PNE have shown both a low nocturnal secretion of serum ADH and normal nocturnal ADH levels (Johnson, 1998). In the nonenuretic child, the water reabsorption is increased due to ADH thereby resulting in a smaller volume of urine production at night.

Psychological factors. Most enuretic children are well adjusted and have a loving family (Ilyas & Jerkins, 1996). However, some enuretic children display more conduct problems and immature behavior than nonenuretic children (Couchells, Johnson, Carter, & Walker, 1981). Bedwetting after the age of 10 years is associated with an increased risk of conduct problems, attention deficit behaviors, and anxiety/withdrawal in early adolescence (Fergusson & Horwood, 1994). Enuresis by itself can result in psychological and individual distress (Ilyas & Jerkins, 1996).

Diet. There is a belief that some cases of nocturnal and daytime enuresis may be due to food allergies. A study by Esperanca and Gerrard (1969) suggested that children with food-provoked enuresis may have a local intravascular allergic mechanism as the etiology of their urinary incontinence. Among foods commonly indicated were dairy products, chocolate, artificially colored foods and drinks, citrus fruits and juices, and those high in artificial sweeteners and caffeine (Johnson, 1998). Some children might benefit from avoiding these foods but more research is needed on dietary risk factors (Moffatt, 1997).

Differential Diagnoses

Other suggested causes of PNE are constipation, urinary tract infection, and lumbosacral disorders (Ullom-Minnich, 1996). Differential diagnoses of PNE include diabetes mellitus, diabetes insipidus, renal tubular acidosis, sickle cell disease, or chronic renal failure. Conditions with abnormalities of the bladder and outflow tracts such as urinary tract infections, obstructive abnormalities of the lower urinary tract, pinworms, and vulvovaginitis should be included in the differential diagnoses of nocturnal enuresis (Moffatt, 1997). The majority of children with PNE do not have an anatomic abnormality as the etiology of their enuresis (Kass, Diokno, & Montealegre, 1979). Nocturnal enuresis has a true organic cause in only 2% to 3% of cases (Schmitt, 1997).

Assessment

Assessment of the child with nocturnal enuresis begins with a complete history, including social and family history. The health care provider often discovers during the history and physical that the child and parents have misconceptions as to the etiology and treatment of enuresis. One of these misconceptions include parents who think the child is lazy or wets the bed deliberately. Throughout the history interview, the primary care provider should be aware of the attitudes of the parent toward the child and the problem of bedwetting. Include the child's input in the history.

The history should include the onset and severity of enuresis plus daytime voiding problems. If nocturnal enuresis is associated with daytime voiding problems such as urinary frequency, urgency, intermittent or weak stream, or urge incontinence, then other significant organic conditions should be considered in the differential diagnosis. It is



important to know the onset of enuresis in order to determine the etiology and clarify if the nocturnal wetting is primary or secondary. Information regarding previous urinary tract infections and bouts with constipation may be helpful (Schmitt, 1997). A prenatal and birth history including gestational age and birth weight should also be obtained.

Developmental milestones should be assessed. The health care provider should inquire about the child's toilet training experience. The frequency of occurrence of enuresis and previous treatment attempts should be assessed (Garber, 1996). A complete review of systems with emphasis on genitourinary and neurologic systems is necessary to rule out any possible organic causes. Possible organic causes of PNE may include caliectasis, ureterectasis, vesicoureteral reflux, posterior urethral valves, ectopic ureter, ectopic or solitary kidney, obstructive uropathy, or spinal abnormalities (Kass & Lundak, 1997). A history of dysuria, intermittent daytime wetness, polydipsia, polyuria, or constipation may indicate treatable conditions (Schmitt, 1997).

A complete physical examination is essential and should include blood pressure, weight and height measurement, and plotting on a growth chart. The physical examination should include a careful assessment for abdominal masses or genital abnormalities. The most common abnormalities found during a physical examination are a distended bladder due to incomplete voiding, hydronephrosis, and fecal impaction. Genital abnormalities may include bifid clitoris, meatitis, vulvitis, labial adhesions, or signs of sexual abuse (Schmitt, 1997). If the history has revealed a weak urine stream, the health care provider should observe the patient's stream (Ullom-Minnich, 1996). The lumbosacral area should be

examined for midline defect. The neurologic examination should include gait, muscular strength and tone, deep tendon reflexes, sensation, and rectal sphincter tone (Schmitt, 1997).

In most cases of nocturnal enuresis, the physical examination will be normal. If so, the only laboratory tests required are urinalysis and urine culture (Ullom-Minnich, 1996). Patients with complicated enuresis due to a positive urine culture, history of urinary tract infection, abnormal neurologic examination, or history of voiding dysfunction will require referral for to a pediatric urologist for a renal or bladder ultrasound, voiding cystourethrogram, urodynamic testing, or radiologic tests (Schmitt, 1997). The presence of coexisting emotional disorders or poor family relationships suggests need for referral for counseling (Uphold & Graham, 1994).

Management

Taking the time to explain epidemiology, etiology, and anatomy to the parent and the child is the first step in developing a therapeutic relationship in

Table 1.
Practical Interventions in Managing PNE

1. Positive reinforcement by praising the child for any dry nights. Keep a star chart for encouragement and to monitor progress.
2. Avoid criticism or punishment for wetting. Preserve self-esteem.
3. Avoid bladder irritants such as caffeine and chocolate.
4. Encourage avoidance of drinking more than a couple of ounces within 2 hours of bedtime.
5. Void before going to bed. Awaken the child at night to urinate after 1 or 2 hours of sleep.
6. Keep a light on in the bathroom and provide easy access to the bathroom.
7. Use bed liners and disposable pads to make cleanup after "accidents" easier.
8. Include the child in morning cleanup. Make it a team effort not a punishment.
9. Parents and children should be encouraged to read *Dry All Night: The Picture Book Technique That Stops Bedwetting* (1989) by Alison Mack (Boston: Little, Brown).

managing PNE. Management begins with having the parents and child keep a voiding diary to determine the extent of the problem. The voiding diary should include the number of bedwetting episodes per night. Conservative practical interventions should be attempted before initiating pharmacologic therapy or behavioral modification with a bedwetting alarm system. Table 1 lists practical interventions in managing PNE.

Treatment

Deciding when and how to treat PNE should be the result of a collaborative agreement between the health care provider, the parents, and the child. Age appropriate interventions for nocturnal enuresis must be considered. There is less need to treat a 5 year old with PNE than a 12 year old. It is essential to inform parents that 15% of children spontaneously "outgrow" PNE each year. Four to five year olds can use modified self-awakening techniques, good bedtime habits, limiting fluids at bedtime, emptying bladder at bedtime, and receiving praise for dry



mornings. Six and seven year olds can use self-awakening programs and motivational techniques. Eight to ten year olds can use an enuresis alarm and intermittent drug therapy. Twelve year olds and up can use an enuresis alarm and drugs continuously at 6-month intervals (Kass & Lundak, 1997). No single treatment option has proven consistently effective (Ullom-Minnich, 1996).

Current treatment for nocturnal enuresis consists of behavior modification and pharmacologic therapy. The treatment options, success rates, and relapse rates should be made available to families. Behavior modification techniques include positive reinforcement, bladder control training, night waking, and conditioning therapy. Pharmacotherapy consists of an antidiuretic hormone and tricyclic antidepressants (Hodge-Gray & Caldamone, 1998).

Bladder control training consists of bladder stretching exercises and bladder awareness. Bladder stretching is about 40% effective. The child drinks a large amount of water and informs the parent when the urge to urinate occurs. The child needs to withhold urination for increasing amounts of time, usually at 3 minute increments each day. When it is time to void, the child should try to stop and start the stream. This works well with older children and requires strong motivation by child and parent. Duration of treatment is until the child is able to inhibit urination for 30 to 45 minutes after first desire to void. This teaches children that they have control over their bladder (Ullom-Minnich, 1996).

Bladder control training can also include positive practice exercises. The child lies down in a darkened room, pretends it is the middle of the night, and then gets up and partially empties the bladder. The child returns to bed

and repeats the process, and completely empties the bladder before going to bed at night (Garber, 1996). These exercises promote self-awakening (Schmitt, 1997).

Night waking includes self-awakening, parent-awakening, and dry-bed training. Parent awakening is an approach when self-awakening fails. Parent awakening must be at the child's request. The child is wakened each night at the parents' bedtime and sent to the bathroom. The child must awaken and locate the bathroom. Carrying a sleeping child to the bathroom is not the approach. This is continued until the child awakens quickly to sound for 7 consecutive nights and uses the bathroom (Schmitt, 1997).

Dry-bed training or night waking is another behavioral modification option. The child is awakened every hour until midnight or 1:00 am during the first night of training. If the child is dry ask him or her, "Do you need to go to the toilet, or can you wait another hour?" The child must walk to the toilet alone. If wet, change clothing and bedding. At 1:00 am, the child must try voiding even if dry. On subsequent nights, the child is awakened once a night, and the awakening time is shortened from approximately 3 hours after bedtime to 2.5 hours, 1.5 hours, and then 1 hour after bedtime, assuming the child remains dry for the rest of each night. If the child wets twice in 1 week, the cycle of once-a-night awakening starts over at 3 hours after bedtime. At each awakening the child is praised for a dry bed and encouraged to void in the toilet (Scharf, Pravda, Jennings, Kauffman, & Ringel, 1987). In one study the average length of time to achieve cure, 14 consecutive dry nights, was 4 weeks. Cure rate was 92% with a 20% relapse rate (Schmitt, 1997).

Conditioning therapy with

the use of an enuresis alarm system is a treatment for PNE. Current evidence suggests that conditioning gives the best long-term outcomes for bedwetters (Moffatt, 1997). Enuresis alarm systems have a urine-sensitive pad attached to the child's underwear and when the urine comes in contact with the pad, a bell, buzzer, or light is activated and awakens the child. Parents must be able to awaken the child to sound for an alarm to be effective. The child and parent must be motivated to use alarms. The child must be able to operate the alarm. The health care provider should assist with teaching application and usage. When the child begins to wet the alarm is set off and awakens the child. This stimulates the child to contract pelvic muscles and stop urination (Moffatt, 1997). The alarm is a form of conditioning that must be used consecutively for 3 months. The cost varies from \$50 to \$80. Treatment is continued until the child has been dry from 21 to 28 consecutive nights. Success rate is approximately 70% with approximately a 30% relapse rate (Ullom-Minnich, 1996).

Pharmacotherapy is usually used for children who have not responded to other modalities of therapy and are age 10 and older. Behavioral and motivational therapy should be the first form of therapy. Pharmacotherapy is a treatment option either by itself or in combination with an enuresis alarm.

Desmopressin acetate (DDAVP) is an antidiuretic hormone that reabsorbs water from the renal tubules thereby decreasing urine production. DDAVP is available in nasal spray or oral tablets and can be administered to children age 6 and older. DDAVP has been promoted as a therapy for nocturnal enuresis for 20 years. The nasal spray delivers a dose of 10 mcg of DDAVP per spray and is rapidly absorbed by the nasal



mucosa. Most studies reported in the literature start with a dose of 20 mcg, 10 mcg per nostril at bedtime. Moffatt (1997) suggests starting with 10 mcg and if not effective, increase by 10 mcg weekly up to a maximum dose of 40 mcg. The dosage of DDAVP tablets must be determined for each individual patient and adjusted according to response. The recommended initial dose is 0.2 mg at bedtime. The dose may be titrated up to 0.6 mg to achieve the desired response. Moffatt (1997) found that children older than 9 years and with fewer wet nights have a better response to desmopressin. DDAVP is a symptomatic treatment. It is not curative and adequately controlled studies with intranasal DDAVP in primary nocturnal enuresis have not been conducted beyond 4 to 8 weeks. The initial positive response to treatment has been documented for up to 70%. The long-term cure rate after discontinuation varies from 4% to 21% (Ilyas & Jerkins, 1996). Combination of desmopressin and an enuresis alarm is successful for short-term treatment of PNE (Garber, 1996).

In children who achieve immediate results with DDAVP, its use can be selectively reserved for overnight stays away from home (Johnson, 1998). The drug should be avoided in children with possible brain injury or metabolic disorders (Ilyas & Jerkins, 1996). The most common side effects with the use of nasal spray are nasal congestion, rhinitis, epistaxis, and headache (Moffatt, 1997).

It is important that the patient and family understand the action of DDAVP, the importance of avoiding drinking fluids after DDAVP is taken, and the early signs of water intoxication. Patients and families also must be warned that DDAVP should not be used when the child has a fever, viral illness, vomiting, or diarrhea (Johnson, 1998).

Imipramine, a tricyclic antidepressant, is also used for treating PNE, although the mechanism of action is not completely known. It is believed to reduce irritability of the bladder and increase involuntary control of the urethral sphincter, or that it may act as a stimulant that lightens the level of sleep, making arousal to a full bladder more possible (Moffatt, 1997). The starting dose is 10 to 25 mg per day. The maximum dose is 50 mg per day for children from 8 to 12 years of age and 75 mg per day for children older than 12. Imipramine is taken 1 hour before bedtime (Schmitt, 1997). Imipramine is usually prescribed for 3 to 6 months, increasing the dose until the maximal result is achieved or the maximal dose is reached. It is then slowly tapered and withdrawn (Moffatt, 1997). Initial cure rates range from 10% to 60% with relapse rates after discontinuation greater than 90% (Schmitt, 1997).

The side effects of imipramine should be reviewed with both parents and the child. The most common side effects are dry mouth, constipation, blurred vision, mood changes, and sleep disturbances (Ilyas & Jerkins, 1996). A concern with prescribing imipramine is the potential toxic and fatal reactions that have occurred in children who have taken the drug accidentally. Overdosage is extremely dangerous. Only small quantities should be dispensed each time. A responsible adult should be in charge of the medication (Moffatt, 1997). As with all medications, parents should be instructed to keep the container out of reach of children or mentally unstable adults.

Other therapies for PNE include psychotherapy and hypnotherapy. Psychotherapy is rarely indicated in children with enuresis (Shapiro, 1985). Psychotherapy is a technique that may be useful only when underlying

psychopathology is present. Hypnotherapy involves explaining the bladder-brain connection to children and then using self-hypnosis and visual imaging to assist the child in responding to a full bladder while asleep (Moffatt, 1997). Length of treatment and success rates vary with psychotherapy and hypnotherapy.

Conclusion

Primary nocturnal enuresis is a common problem seen by health care providers. Bedwetting can be a very sensitive family issue and must be approached in a professional, caring manner. The goal of treatment for primary nocturnal enuresis is self-awakening and urinating in the toilet. It is important to keep in mind that 15% of bedwetters become dry each year with or without treatment. Also 1% of children with PNE continue bedwetting into adulthood. A thorough assessment, education about PNE, and implementing practical interventions are the first steps in managing PNE. Implementing practical interventions may result in a cure for PNE for some children. For other children, further treatment regimes may be needed. An open discussion of the various treatment options, including success and failure rates, should be presented to the patient and family. A collaborative approach by the health care provider, parents, and child can result in a positive outcome to the challenge of primary nocturnal enuresis. ■

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