

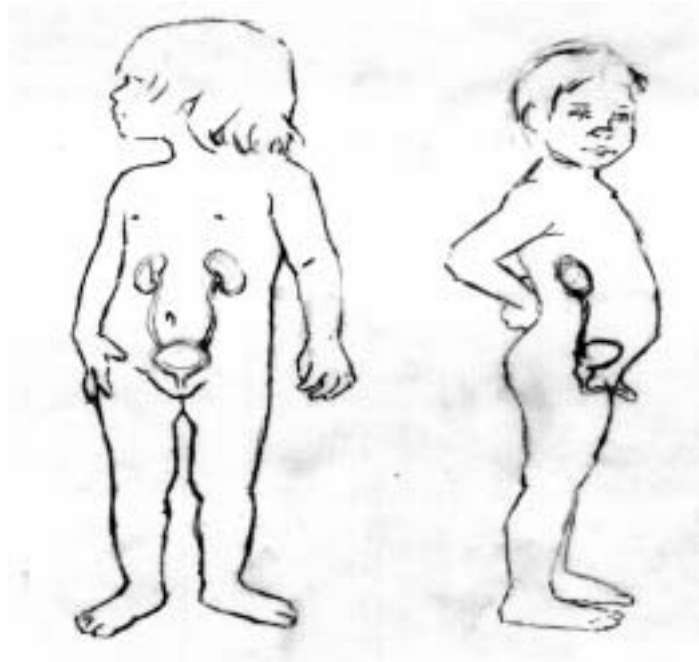
Child and Family Information Material **Children's Continence Clinic**

Introduction

Few things are more distressing to a family than having a child who is continuously wet. The child suffers the ridicule of his or her classmates, the odors are offensive, the laundry mounts, and the parents agonize over their helplessness in bringing an end to the seemingly intractable problem. The family can only take comfort in the realization that the problem is common and children generally outgrow it. Meanwhile, the agony continues and occasionally immature or dysfunctional voiding leads to medical problems such as urinary tract infections, decreased self-esteem, behavioral issues, constipation and, rarely, some of these children will actually damage their urinary tract. So, there are legitimate reasons to want to get to the bottom of this and bring it under control quickly.

In most cases childhood incontinence is associated with other conditions which may include one or more of the following; wetting during the day (diurnal enuresis), wetting during sleep (nocturnal enuresis), constipation and/or encopresis (stool incontinence) and urinary tract infections. All of these conditions have different patterns and etiologies, therefore, may require different treatment plans.

While there are some children who are wet due to the structure of their urinary tract, most of those afflicted are wet because they have acquired an abnormal pattern of urination. The purpose of this handout is to give children and their families a better understanding of normal and abnormal urination, how we determine the cause of abnormal urination, and, finally, how normal urination is resumed. We hope to empower you to take part in your training program in an informed way. The information contained in the following pages is rather complex information that has been simplified as much as possible. Pictures and diagrams have been included in order to further explain and illustrate certain points. After all, a good understanding of the problem your child is facing will only help the treatment to be that much more effective.

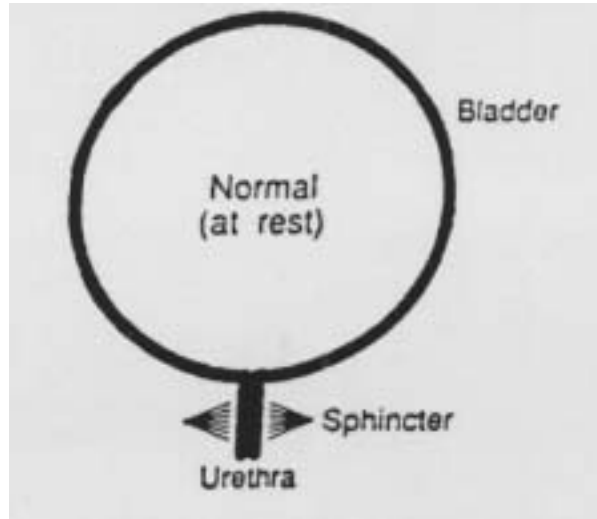


THE PHYSIOLOGY OF NORMAL URINATION

Urination may seem like a straightforward event, but it is actually a complex phenomenon which, even today, is poorly understood. Urination involves the coordination of two completely separate systems: 1) the **bladder**, composed of smooth muscle like the intestine, over which we have no direct control, and 2) the **sphincter**, composed of a type of muscle like the muscles in our arms and legs, over which we have full control (*Figure 1*).

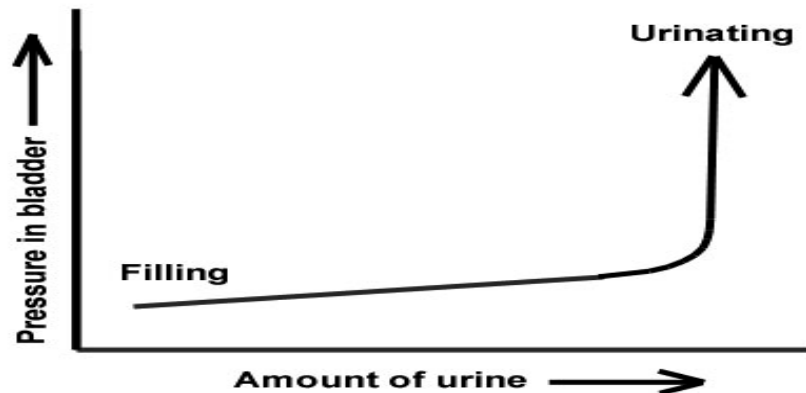
(*Figure 1*) The normal anatomy showing the bladder through which the urine sphincter surrounds the contraction, can shut

The bladder is large amounts of 500-600 ml's or adult) with very Ideally, the bladder in size while filling



anatomy of the urinary tract connected to the urethra passes to the outside. The urethra and, by its off the flow completely.

remarkable in that it holds urine (up to 15-20 ounces, about a pint in the normal little rise in pressure. muscle relaxes to increase up with urine. Ultimately,



a state of filling is reached, at which point the bladder muscle begins to contract and signal its desire to empty itself (*Figure 2*). It does not do so immediately, however, in part because the sphincter muscle is in a constant state of contraction that holds the urine in. The sphincter muscle is in this constant state of contraction except when the individual is ready to start urinating.

(*Figure 2*) The pressure-volume relationship seen in the normal bladder. As the bladder fills, the pressure rises very little until the stretch limit had been reached, at which time contraction of the bladder stimulates urination.

NORMAL INFANTILE URINATION

The bladder of an infant empties by reflex. Once the bladder reaches a certain level of fullness, a contraction begins. While the brain is aware of this contraction, it does not interfere with this

sustained contraction of the bladder. This results in good bladder emptying – bladder emptying until there is no more urine to empty. This is called **reflex voiding**.

NORMAL ADULT URINATION

Just how very different the infant's voiding pattern is from that of a normal adult can be drawn from the following explanation. First of all, if the normal adult feels the beginning of a bladder contraction at an inconvenient time or place, a message is sent from their brain to the bladder that tells it to stop contracting. Once this message is received and the bladder stops contracting, this results in a loss of the urge to void. This is called a successful "inhibition of the detrusor," meaning to stop the bladder muscle from contracting.

Secondly, again in the normal adult, when a socially convenient point is reached for emptying a full bladder, one sits at the toilet and makes a conscious effort to initiate voiding. The brain then sends a message to the bladder to begin contracting. A normal adult will also relax the muscles of the pelvic floor and smoothly empty the bladder to completion.



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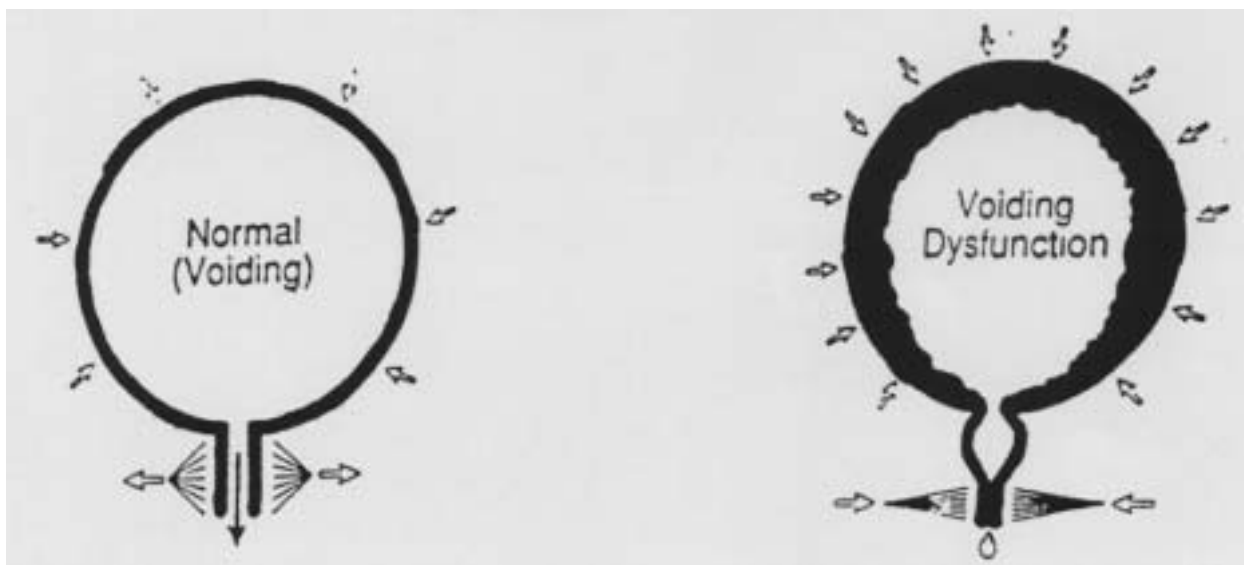
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of a full bladder or they simply have not developed the ability to interpret the signs of a full bladder. For unknown reasons, it is a more common problem in girls. Once the child's bladder has exceeded its capacity, a powerful bladder contraction will occur which may be especially hard to inhibit. In order to try to avoid this problem, these children should be encouraged to completely empty their bladder 4-6 times a day.

2. **Difficulty in Inhibiting a Bladder Contraction:**

Because the child is unable to send a message to their brain to stop the bladder contraction, the child "hangs on" with the sphincter. As this is imperfect, damp pants result. This can be seen in the child who fidgets, the girl who squats and sits on her heel, or the little boy who grabs his genitalia. Often, these children, if asked if they need to go to the bathroom, state 'no', reflecting that they don't understand what is happening in their body at that time. Clearly,

they are attempting to use various means to overcome a bladder contraction. This is called **voiding dysfunction**. The tendency to carry out such “hang-on” activities helps to account for the difficulty many children experience relaxing their pelvic muscles to facilitate complete bladder emptying during normal voiding. In other words, they are contracting their pelvic floor muscles so often that when they finally do attempt to urinate they can not relax their pelvic floor muscles. When listening to these children urinate, you will notice that the flow is interrupted, rather than smooth and flowing. Because these children have problems relaxing the appropriate muscles during urination, they often fail to empty their bladder completely and are prone to infections. Also, the frequent contraction of the pelvic floor muscles can lead to constipation.



(Figure 3a) During normal urination, the bladder contracts and the sphincter relaxes to allow the free escape of urine from the bladder. (Figure 3b) Children suffering from voiding dysfunction tend to contract their sphincters as their bladders contract and urinary flow is interrupted.

3. **Failure to Empty the Bladder:**

This is usually a result of the unintentional interruption of bladder emptying. This tends to be a problem relating to a difficulty that many children have stopping a bladder contraction. The problem is aggravated in the child who does not understand the concept of voluntary initiation of a bladder contraction. The failure of urinating to completion can be confirmed by listening to the child void. If the urinary stream does not have a gradual diminution in force at the end of urination (suggesting complete emptying), but rather stops abruptly, then one is likely to have a child who has unintentionally tightened up the sphincter and not voided completely. This can be remedied by having the child remain on the toilet and encourage relaxation in order to empty the bladder completely.

4. **Constipation and Incontinence:**

A child who has trouble relaxing the perineal muscles (the muscles between the anus and the opening of the urethra) frequently has problems producing both good bladder and bowel

emptying. Children who are unable to relax during bowel movements often are not emptying their bowels completely. This can lead to distention of the intestines, chronic constipation and stool incontinence (encopresis). While both constipation and voiding problems often are the result of poor perineal muscle relaxation, constipation is also presented as being the cause of some voiding problems. Many children who come to the Continence Clinic for urinary incontinence (day, night, or both) present with a history of regular bowel movements. While regular, even daily, bowel movements seem to suggest that a child is not constipated, xrays done on the intestines of these children frequently show stool retention (a back up of stool). When the stool backs up in the intestines, the intestines expand or get larger. Now that the intestines are taking up more space, the bladder is forced into a different shape, and a smaller space. Not only may this interfere with the signals that the bladder sends to the brain, but also it may keep the bladder from being able to hold its normal amount of urine. In addition, this can lead to very large stools and stool incontinence. It is important to address this problem *before* attempting to deal with urinary incontinence. For further information on the diagnosis and treatment of constipation please see separate handout titled “Constipation”.

5. **The Hyperactive or Uninhibited Bladder:**

Some children who experience problems with continence have what is considered a **hyperactive or uninhibited bladder**. The uninhibited bladder contracts after holding less urine than a normal bladder holds and it does so without necessarily sending a message to the brain. As this often occurs without warning, these children have many accidents. Some children will simply void much more frequently (every 30-60 minutes), but remain dry. This may be related to infection, emotional stress, or other conditions. More often, there is no specific cause. Your child may be prescribed *Ditropan (oxybutinin)* or *Detrol* to help the bladder to relax. This problem can be difficult to distinguish between a developmental delay in the micturation cycle as it resembles reflex voiding.

OTHER PROBLEMS THAT MAY LEAD TO OR COMPLICATE INCONTINENCE

A. Urinary tract infections:

Normally, bacteria routinely enter the bladder via the urethra (hole where the urine comes out); however, our body has many defense mechanisms to keep the bacteria from multiplying and causing infection. The various types of voiding dysfunction can disrupt these defense mechanisms and lead to urinary tract infections. Two important defense mechanisms are a low pressure bladder and emptying the bladder to completion. When a child is attempting to control a bladder contraction by contracting the perineal muscles (potty dance) the pressure in the bladder is increased (*see figure 3b*). This increased bladder pressure decreases the bladder's ability to resist bacterial infection. Also, when the child doesn't empty the bladder

to completion, bacteria may remain in the bladder and have time to multiply to quantities large enough to cause an infection. There are also congenital anomalies that can contribute to infection as well as the severity of infections, please see separate hand out titled “Urinary Tract Infections”.

B. Hypercalciuria:

Hypercalciuria refers to an excess of calcium in the urine. It accounts for 30% of all isolated hematuria (blood in urine) in childhood. Hypercalciuria without any identifiable cause accounts for the majority of cases. Why exactly this condition causes blood to be present in the urine is unknown. In addition to hematuria, other symptoms of hypercalciuria include recurrent abdominal pain, urinary frequency and bed wetting. The treatment of this condition includes an increase in fluid intake and reduction of dietary sodium and calcium. If these implementations do not reduce the calciuria to normal within six to eight months, thiazide diuretic therapy may be necessary to prevent kidney stones.

C. Polyuria:

Polyuria is the term for the passage of a large amount of urine within a given time. It can be related to too much fluid intake, particularly fluids containing caffeine. Polyuria can also be a classic symptom of diabetes.

D. Benign Urinary Frequency:

Benign urinary frequency is suspected when a previously toilet-trained child suddenly develops daytime urinary frequency. Daytime urinary frequency might mean that every 5-20 minutes your child feels the need to urinate a small amount. Benign urinary frequency is usually found in school age children, and presents with no evidence of lower tract infection or any other physical cause. In some cases of benign urinary frequency, a stressor or trigger factor can be identified; for example, a death in the family, or a school-related stress, but often no trigger is identified. This condition is self-limiting, and can last anywhere from six weeks to six months. In most cases, providing assurance to the parent and child is the only intervention necessary, after a urinalysis, careful history and physical exam.

UROLOGIC TESTS

While these tests are not always necessary, your child may need one or more of the following special diagnostic tests to rule out congenital causes of incontinence and to decide the best course of treatment.

- Urinalysis: Your child may be asked to urinate into a cup when he/she arrives at their appointment. This urine is then analyzed in several different categories. It may be used to

check for early signs of disease, such as diabetes, kidney disease, urinary tract infections, or to detect blood in the urine. Though a rather simple exam, the urinalysis provides a wealth of information.

- Urine Culture: If it is suspected that your child has a urinary tract infection (UTI) either by symptoms or by a positive urinalysis, a urine culture will be necessary (this can be done using the same urine as the urinalysis). The urine culture tells us what organism is causing the infection so we may determine the appropriate therapy. The culture results take 2 days.
- Kidney/Ureter/Bladder Radiography (KUB): This test uses standard x-ray technology to obtain pictures of internal organs. A KUB can show kidney stones, tumors, and stool retention. It can also help us, to a limited extent, evaluate spinal anomalies. For this test, your child will be asked hold still as the x-ray machine takes a picture. There is no discomfort involved.
- Renal/Bladder Ultrasound (RBUS): This is a test used to look at the kidneys, ureters and bladder. It can be used to detect congenital anomalies, dilation, obstruction, stones, and other urinary tract problems. For this test, a small lubricated probe is placed on the skin over the area to be examined (“jelly on the belly”). Ultrasounds involve no radiation and are painless.
- Voiding Cystourethrogram (VCUG): This study gives us important information regarding the shape and size of the bladder, the bladder neck (or opening) and the tubes that drain the urine from the kidneys into the bladder called ureters. It allows us to diagnosis reflux (the abnormal back-flow of urine from the bladder into the ureter and up to the kidney). It also allows additional anatomic information of the urethra (urine tube which brings urine from the bladder outside the body) to make sure no blockage is present (posterior urethral valves). This test is often used to evaluate a child after a urinary tract infection. During this exam, a small tube or “catheter” is passed through the urethra (the hole where the urine comes out) and then advanced into the bladder. The insertion may cause some discomfort or the urge to urinate. A typical five-year-old will describe the pain as “less than a shot”. The bladder is then filled (via the catheter) with “liquid contrast” (looks like water) that can be seen on an x-ray monitor. Then x-rays are taken during filling of the bladder and while the child urinates. This test is typically done by the pediatric urologist or pediatric urology nurse practitioner.
- Nuclear Cystogram: The nuclear cystogram is similar to the VCUG, however, the nuclear cystogram should only be used for subsequent cystograms. The standard “contrast” VCUG should always done for initial cystogram as it outlines the anatomy more clearly. The benefit of the nuclear cystogram is that it uses much less radiation, however, it will only give you

information with regards to reflux and not other congenital anomalies. This test is done in the nuclear medicine department.

- Urodynamics: Urodynamics may be done for children with dysfunctional voiding, incontinence, urinary tract infections, neurological disorders, or other problems. For this exam, a special catheter is passed through the urethra into the bladder, just like in the VCUG, and electrodes (similar to those used for an EKG) are painlessly placed on the perineum (near the buttocks). The electrodes and the catheter are connected to a computer and as the bladder is slowly filled with liquid contrast measurements of bladder pressure and pelvic floor activity are taken. Often, x-ray pictures for a VUUG are taken at the same time. This test will give us a better idea whether or not the bladder is working together with the external sphincter in a coordinated fashion and whether there are possible nerve problems. In addition, your child may be asked to urinate in a special toilet that measures urinary flow rate. By looking at the rate at which urine comes out when your child urinates, we can get a better idea as to whether he/she is voiding completely and correctly. Ideally, urinary flow rate resembles a bell curve, with the flow rate peaking mid-urination, and ending gradually, not abruptly.
- Kidney (Renal) Scan: This test is not done for incontinence alone, but may be requested if there is a history of urinary tract infections or after a positive finding on an ultrasound or VCUG. It is used to better demonstrate the actual function and/or drainage of the kidneys. A kidney scan can also show if there is kidney damage and/or scarring that may have resulted from a previous urinary tract infection. Two types of renal scans are typically performed depending on the diagnosis.
 - ▼ Lasix Renogram or MAG-III diuretic renogram to test for significant blockage in the urinary tract
 - ▼ DMSA renal scan to test for scarring or damage to the renal tissue
- Magnetic Resonance Imaging (MRI): An MRI provides detailed pictures of soft tissues without the obstruction of overlying bone. It allows us to see if organs are normal in size and position, if there are any growths or lesions, and sometimes if the organ is functioning normally. MRI of the spine may reveal a neurologic disorder called “tethered spinal cord”. During this exam, it will be asked that your child lie flat on their back on a table. This table will slide into a tunnel where the pictures are taken. While this may be difficult, or scary for some kids, it is lying still that will be of highest importance. Younger children will be put to sleep (given general anesthesia) for this test.

TREATMENT

Unfortunately, most bladder training programs are ineffective without the cooperation of the child. Positive reinforcement, such as a gold star on a calendar rewarding appropriate voiding efforts, may work for some children. However, in many cases, the process of bringing the bladder under control may not happen until the child has sufficient maturity or embarrassment from peer pressure to wish to be cooperative.

1. **Timed Urination:** The purpose of timed urination is to have the child empty their bladder before it fills to the point where a “hard-to-stop” bladder contraction is triggered. Therefore, the child should urinate prior to any “urge” to urinate and this will vary in different children. The frequency of urination is influenced by the amount of fluid being taken in, as well as whether or not the bladder is completely emptied with each urination. As a general rule, a child should empty their bladder completely 4-6 times a day, or roughly every three hours. Some children need to urinate as often as every two hours. Any child who has a sudden urge to rush to the toilet has already waited too long.
2. **Urination with Relaxation:**
Without good relaxation of the perineum, children are unable to empty their bladder completely. When teaching a child to relax while urinating, it may help to have them “sigh” during urination. Not only is a sigh a normal relaxation trigger, but also makes it impossible for the child to strain while doing so. In this way, proper perineal relaxation can be achieved. You can also have your child count or sing.
3. **Learning to Empty the Bladder Completely:**
If it is recognized from an abrupt interruption of the urinary stream or from a voiding diary that a child has failed to maintain the relaxation needed to produce complete emptying, then the child must be persuaded to re-initiate a second effort to urinate with relaxation (double voiding). Again, by listening to the stream, one can determine whether the bladder is being completely emptied or not. The important point here is to make the child realize that he or she controls the bladder – the bladder does not control them.
4. **Work on Constipation:**
To deal with constipation, bulking of the stool with a high fiber diet will help your child’s bowels move more regularly. Some good fiber sources include fruits and vegetables or breads and cereals containing bran. Stool closer in consistency to toothpaste, rather than pellets that rabbits leave behind is preferred. After a meal, the intestine begins to contract as it does its part to move food through the digestive system while it is being broken down. This process can be taken advantage of by having your child sit on the toilet after a meal with instructions to stay there and relax until a bowel movement occurs. If a child fails to have a substantial bowel movement daily or the KUB reveals retention of stool, then medications and/ or fiber supplement will most likely be necessary (*see constipation handout*).

5. **Medications:**

Antibiotics:

Children who are subject to repeated bladder infections often suffer from urinary urgency, or sometimes burning during urination as a result. The child who is struggling to control their bladder contractions does not need this complicating factor. In addition, voiding dysfunction can cause urinary tract infections. For these reasons, antibiotics may be used in order to keep a child infection free until good voiding patterns have been learned.

Bladder Medications:

The most commonly prescribed pediatric bladder medications are *Ditropan (Oxybutinin)*, *Levsin (Hyoscyamine)*, and *Detrol (Tolterodine)*. The main side effects of these include dry mouth, constipation, and facial flushing. These side effects often resolve over time, and occur significantly less with the controlled-release form. It is of particular importance that good oral hygiene be maintained while on any of these medications. The decrease in saliva that may occur as a result of being on anticholinergics can increase the likelihood of cavities.

- *Ditropan (Oxybutinin)* and *Ditropan XL* – *Ditropan* comes in regular form, as well as controlled-release form, *Ditropan XL*. It has an antispasmodic effect on the smooth muscle of the bladder. It increases the amount of urine that the bladder can hold, and helps lessen urinary urgency and frequency. Both *Ditropan* and *Ditropan XL* may be given with food or milk in order to help prevent an upset stomach. *Ditropan* comes in both pill and liquid form, whereas *Ditropan XL* only comes in pill form. *Ditropan XL* must be swallowed whole – never chewed or crushed! *Ditropan* is approved by the FDA for children over the age of five.
- *Levsin (Hyoscyamine)* – *Levsin*, like *Ditropan*, acts by relaxing the smooth muscle of the bladder. It increases the amount of urine the bladder can hold, and decreases urinary urgency and frequency. *Levsin* must be taken before meals. It also comes as a controlled-release pill that can be cut if needed. *Levsin* comes in tablets, liquid, and drops. It has been approved by the FDA for use in all ages..
- *Detrol (Tolterodine)* – *Detrol* also acts on the smooth muscle of the bladder, allowing it to relax and fill with more urine before the need to urinate approaches. It comes in regular form, as well as controlled-release (*Detrol LA*). *Detrol LA* may be taken with or without food. *Detrol* is currently only available in pill form. It is not yet approved by the FDA for use in children, though it is already widely used for this age group.

**There is another category of medications called “alpha-blockers” (for example, Doxazosin) that have been used to treat voiding dysfunction. The use of these drugs; however, is still investigational.*

1. **Positive reinforcement**

Positive reinforcement may be useful in motivating your child to work on their bladder training program. Many parents have tried a reward system with the goal of the child “being dry,” as opposed to the goal of “urinating properly.” Unfortunately, the child has not yet learned how to be dry; however, the child does have control over following their bladder program. Therefore, the child should receive positive reinforcement for following his/her bladder program and not necessarily for “staying dry”. When the child independently follows their prescribed bladder program they may be rewarded with a sticker or a gold star on a calendar.

2. **Timed Urination Alarms**

For kids who will benefit from a timed urination schedule – meaning that they should attempt urination every two to three hours, for example – we recommend purchasing a watch that will alarm every few hours as a reminder. In order to simplify the process, and make it a viable option for younger children, a watch that will alarm without having to be reset every time is ideal. For this reason, we recommend the Timex Ironman Triathlon (or it’s equivalent). This watch can be purchased for approximately \$30 and contains this “countdown alarm” function. This watch is also water-proof and comes in different colors. Many other watches also have this function but tend to be more expensive.

How to Set the Timex Ironman Triathlon to Alarm Every Two Hours:

- a) Press **mode** (button on the left side) 2 times until it says “TIMER”
- b) Press and hold the **split/reset** button (on watch face). The display will show the word “HOLD”. Hold it for a few seconds until it says “TIMER” again.
- c) You will see “CS” and “CR” in the upper left corner. Press **split/reset** until “CR” is blinking.
- d) Press **set** (button on the right side) to set how often the alarm is to go off. You will see five zeros show up on the face. The third zero from the left is the “hours” digit. Press **start/stop** (on watch face) until this third zero is blinking. Then press **split/reset** two times, until a number two show up in this spot. If you want to set the watch to alarm for a time different than two hours, press the button that amount of times.
- e) Press **set**.
- f) Press **start/stop** to start the alarm.
- g) Press **mode** to return to the time function on the watch. The alarm is now set to beep every two hours without having to be reset!

Where the Timex Ironman Triathlon can be Purchased:

Virtually anywhere that sell watches but Mervyns, Target, and Walmart seem to be the least expensive.

A Silent Option

Also available is a watch that will alarm silently by vibrating. The alarm vibrates against the wrist at the set intervals for 20 seconds, so it is silent and private. These watches are an excellent way to remind your child to use the bathroom at specific times without drawing attention to themselves when at school. This watch requires a very independent child because parents and teachers will not “hear” the alarm.

VibraLite Watch

By Harris Communications \$39.95

(No. GAD-VW)

Voice Mail: 1-800-825-6758

Fax: 612-906-1099

MeDose Vibrating 6 Alarm Reminder Watch.

By e-pill, LLC \$79.95

70 Walnut Street

Wellesley, MA 02481

900-549-0095

Email: www.epill.com

VibraLite Watch

By Harris Communications \$39.95

(No. GAD-VW)

Voice mail: 1-800-825-6758

Fax: 612-906-1099

**It is important that you explain to any adult who may be supervising your child during the day – teachers, coaches, or counselors – that your child must be excused from regular activities and possibly even reminded to use the toilet at the prescribed interval. To facilitate treatment, we have provided you with a letter to inform your child’s teacher and other adults of the treatment plan and ask for assistance.*

WEBSITES

For those of you who want more information about your child's urological condition, here are a few websites that contain some good information. If you happen to come upon any websites not included in our list that you found helpful, please do let us know!

www.keepkidshealthy.com

www.urologyweb.com

www.urologychannel.com/pediatric/index.shtml

...and finally our website at <http://itsa.ucsf.edu/~uroweb/Uro/pediatricurology/index.html>

To Whom It May Concern:

_____ has been diagnosed with a urological condition. This condition requires more frequent urination during the day. In order to remind him/her of the need to urinate, he/she will be wearing a watch that will alarm every two to three hours. At this time, he/she will need to be excused to use the restroom.

Regular student restroom

Needs more private (i.e. staff) restroom

He/she is to go straight to the bathroom, and return directly to class. In order to minimize classroom disturbance, I encourage you to establish a routine (i.e. signal) that will allow the child to be excused from class without causing undue attention.

Thank you so much for your sensitivity and patience. Please let me know if any problems or concerns should arise.

Sincerely,

Angie Hinds, RN, MN, CPNP

Laurence Baskin, MD