

Bowel and Bladder Dysfunction

Guideline developed and finalized 08/11/16 by Ashay S. Patel, DO, in collaboration with the ANGELS Team.

Key Points

- Use of standard nomenclature improves communication between providers who care for children with bowel and bladder problems.
- Functional urinary incontinence can be multifactorial. Treatment often requires re-education of the child and parents in regards to toileting behaviors.
- Constipation may be underestimated as a cause of functional urinary incontinence. Often prolonged management of constipation resolves incontinence and reduces the incidence of urinary tract infection (UTI).
- Pharmacological therapies are used for those who have not responded to behavior modification techniques.
- Referral to a specialist is appropriate for urinary incontinence in a child >5 years of age who has not responded to behavior modification techniques and/or initial pharmacological therapy.

Epidemiology

- Bladder dysfunction affects 7 million children in the United States with a peak incidence of 5 to 7 years.
- About 40% of visits to pediatric urologists are for bladder dysfunction.
- Wetting accidents are more common in girls than in boys. The incidence of a wetting accident declines with age:
 - 5 to 6 years of age: 10%
 - 6 to 12 years of age: 5%
 - 12 to 18 years of age: 4%

Physiology

Normal Bladder Function

Storage and Emptying

Normal bladder storage and emptying requires a combination of both autonomic and somatic control.

- **Storage.** During the storage phase, the bladder fills without sensation until bladder capacity is reached when bladder pressure rises. This process involves
 - Detrusor relaxation and bladder neck contraction, which requires coordinated stimulation of both sympathetic and parasympathetic nervous systems
 - Contraction of external striated sphincter occurs via stimulation of pudendal nerve
- **Emptying.** Bladder emptying is initiated by mechanoreceptors in the bladder. A signal is transmitted to the pontine micturition center in brainstem then back down the spinal cord. This results in
 - Relaxation of external sphincter; inhibition of pudendal nerve
 - Contraction of detrusor; stimulation of parasympathetic via splanchnic nerve
 - Relaxation of bladder neck; inhibition of sympathetic via hypogastric nerve

Development

There are 3 main events in the development of normal bladder function and micturition control:

- Increase of bladder capacity according to the following formulas:
 - Infants: $38 + [2.5 \times \text{age (months)}]$
 - Older children: $[2 + \text{age(years)}] \times 30$
- Maturation of external striated urethral sphincter voluntary control
- Development of direct voluntary control of bladder-sphincter complex to allow for initiation and inhibition of voiding

Chronology of Voiding Maturation

[Table 1](#) describes voiding maturation by age.

Table 1. Voiding Maturation by Age

To view a larger image on your device, please click or touch the image.

Table 1. Voiding Maturation by Age

Age	Voiding Maturation
Infants	<ul style="list-style-type: none">• Only void when awake• Suggests voluntary urinary control is a learned modification of innate system
1 to 2 years	voids with high pressure and interruption of urinary flow; this is transitory and resolves after toilet training
2 to 3 years	Development of social conscious continence
After 3 to 4 years	<ul style="list-style-type: none">• Child has learned to inhibit micturition reflex and postpone voiding• Voluntarily initiates voiding when socially acceptable
By 4 years	<ul style="list-style-type: none">• Normal daytime bladder control occurs by 4 years• Urinary control occurs after control of bowels both day and night
5 to 7	Nighttime bladder control occurs between 5 to 7 years

Bladder Dysfunction

- Bladder dysfunction is generally defined as disruption of normal voiding. Causes include
 - Anatomic/organic (eg, ectopic ureters, posterior urethral valves)
 - Neurogenic (eg, spina bifida, spinal cord injury)
 - Functional (eg, non-neurogenic causes, such as dysfunctional voiding or overactive bladder)
- Some children may have bowel bladder dysfunction (BBD).

Definitions

The International Children’s Continence Society (ICCS) recommends use of standardized terminology to improve communication and treatment across providers in the care of children with bowel and bladder problems.

Voiding Symptoms

Terms used for voiding symptoms in children >5 years of age are defined in [Table 2](#).

Table 2. Definition of Voiding Symptoms in Children >5 Years of Age*

To view a larger image on your device, please click or touch the image.

Table 2. Definition of Voiding Symptoms in Children >5 Years of Age*

Term	Definition
Increased daytime voiding frequency	Voiding ≥ 8 times per day
Infrequent daytime voiding	Voiding ≤ 3 times per day
Urgency	Sudden desire to void
Hesitancy	Difficulty with initiation of voiding; waiting a long time before voiding
Straining	Using abdominal pressure (Valsalva maneuvers) to void (all ages)
Intermittent stream	Voiding in bursts; not continuous *Normal for children < 3 years of age if no straining is present
Dysuria	Pain or burning during urination
Incontinence	Involuntary loss of urine; continuous or intermittent

Information from Austin P, Bauer SB, Bower W, et al. The standardization of terminology of lower urinary tract function in children and adolescents: Update report from the standardization committee of the International Children's Continence Society [published online ahead of print March 14 2015]. *Neurourol Urodyn*. 2015. doi: 10.1002/nau.22751.

Daytime Urinary Incontinence

- Terminology used for daytime (functional) urinary incontinence in children ≥ 5 years of age is described in [Table 3](#).
- Comorbid or associated conditions that may result in daytime urinary incontinence include VUR, UTIs, and constipation.

Table 3. Terminology of Bladder Disorders due to Daytime Urinary Incontinence in Children ≥ 5 Years of Age

To view a larger image on your device, please click or touch the image.

Table 3. Terminology of Bladder Disorders due to Daytime Urinary Incontinence in Children ≥5 Years of Age

Term	Definition	Signs and Symptoms
Non-neurogenic dysfunctional voiding	<ul style="list-style-type: none"> • Voiding while contracting the external sphincter (discoordination of bladder and sphincter) • Inability to relax external sphincter during voiding with no neurological cause • Precursor to BBD • An estimated 15% of 6-year-old children have some form of bladder-sphincter dysfunction 	<ul style="list-style-type: none"> • Constipation or encopresis (BBD) • Frequency, urgency, straining, incontinence • UTI, VUR, high postvoid residuals
Overactive bladder	<ul style="list-style-type: none"> • Urinary urgency with or without urinary incontinence in the absence of UTI or other pathology • Detrusor contractions during filling • Second most common bladder problem after nocturnal enuresis • Incidence of 21% in girls and 18% in boys reported in a Swedish study 	<ul style="list-style-type: none"> • Urgency • Frequency • Urinary incontinence • Holding behaviors (eg, Vincent's curtsy, squatting with heel in perineum, grabbing in vaginal or penile area) • High voiding pressures and PVR
Underactive bladder, Voiding postponement	<ul style="list-style-type: none"> • Must strain to initiate, maintain, or complete voiding • May have low voiding frequency but also may have frequency due to incomplete bladder emptying • Usually have detrusor underactivity • May postpone micturition using holding maneuvers • Voiding <3 times per day • Can lead to weak detrusor function 	<ul style="list-style-type: none"> • Infrequent voiding • Urgency due to full bladder • Valsalva voiding • Overflow incontinence • Large PVR • UTI • May have behavior or psychological disorder; may not void at school • 40% will have behavior problems; ADHD
Giggle incontinence	Involuntary loss of a large volume during laughter	<ul style="list-style-type: none"> • Occurs during or immediately after laughing • Normal bladder function otherwise
Vaginal voiding	Entrapment of urine in the vagina, resulting in incontinence after standing	<ul style="list-style-type: none"> • Incontinence occurs shortly after voiding • No other symptoms are present
Bladder neck dysfunction	Poor relaxation of the bladder neck resulting in reduced flow	Similar signs and symptoms to non-neurogenic dysfunctional voiding

Abbreviations: ADHD, attention deficit hyperactivity disorder; BBD, bowel and bladder dysfunction; VUR, vesicoureteral reflux; UTI, urinary tract infection; PVR, postvoid residual.

Information from Austin P, Bauer SB, Bower W, et al. The standardization of terminology of lower urinary tract function in children and adolescents: Update report from the standardization committee of the International Children's Continence Society [published online ahead of print March 14 2015]. *Neurourol Urodyn*. 2015. doi: 10.1002/nau.22751.

Nocturnal Enuresis

Nocturnal enuresis is intermittent incontinence that occurs during sleep in children >5 years of age.

- *Monosymptomatic nocturnal enuresis* is enuresis without bladder dysfunction or other lower urinary tract symptoms. It can be subdivided based on onset:
 - *Secondary enuresis* is used to describe children who have previously been dry during periods of sleep for >6 months then begin experiencing enuresis. Behavioral comorbidities may be a contributing factor.
 - *Primary enuresis* is used to describe children who continue to have incontinence during sleep without periods of being dry.
- *Non-monosymptomatic nocturnal enuresis* is enuresis in the presence of any lower urinary tract symptoms.

Bladder and Bowel Dysfunction

Bowel function and bladder function are interrelated although not completely understood. Constipation is reported in 30% to 88% of children with bladder dysfunction.

Terms

- *Bladder and bowel dysfunction (BBD)* is a term used to describe combined bladder and bowel problems. It is not used to explain pathogenesis but rather the existence of both lower urinary tract and bowel dysfunction.
 - Previous BBD was known as dysfunctional elimination syndrome (DES). This term is discouraged because it refers to a specific condition.
- *Hinman syndrome or non-neurogenic dysfunctional voiding* is the most severe form of bowel and bladder dysfunction. It is often the end result of prolonged untreated BBD.

Theories

- Rectal distension of stool causes external compression on the bladder, resulting in bladder dysfunction (eg, overactive bladder, poor bladder emptying).
- External anal and urethral unit function as one. Continued increased tone of external rectal sphincter leads to increased tone of external urethral sphincter. This results in inappropriate pelvic muscle floor contraction and secondary dysfunctional voiding.
- Increased external anal sphincter leads to prolonged contractility of pelvic floor muscles and causes inability to relax the urethral sphincter.

Assessment and Diagnosis of Bladder Dysfunction

Medical History

Urinary

- Obtain the following urinary history:
 - Voiding history: how often voiding, how often incontinent episodes, volume of voids, volume of incontinent episodes
 - Symptoms: urgency, dysuria, straining, hesitancy, intermittent or weak stream, holding behaviors
 - Previous history of urinary tract infections
 - Toilet training history, including age and periods of dryness. Ask if toilet training was stressful or prolonged.
- Use a questionnaire, such as the Dysfunctional Voiding Symptom Survey, to help evaluate the extent of the dysfunction; may also be used to monitor outcomes during treatment. For more information see Farhat W, Bagli DJ, Capolicchio G, et al in [References](#).

Bowel

- Obtain the following bowel history:
 - Frequency of bowel movements, consistency, pain, or holding behaviors
 - Classification of feces according to type using the Bristol Stool Form Scale (see [Resources](#))
 - Constipation
 - Pathological cause or not
 - Cycle of pain: hard stools cause painful bowel movements leading to voluntary

holding.

- Encopresis (ie, nonretentive fecal incontinence)—fecal soiling in a child >4 years of age; may be seen in children with toilet refusal; usually loose stool passing around large retained fecal matter
- Have parent or caregiver complete the Voiding and Stooling Diary (see [Resources](#)) for a week and bring to next visit.

Other History

Obtain other history, such as

- Dietary intake: amount and type of fluid intake
- Neurological or developmental delays or psychological disorders (20% to 50% of children with depression, anxiety, and attention deficit hyperactivity disorder [ADHD] have incontinence)
- Social stress: family conflicts, history of physical abuse; new school

Physical Examination

- **Back exam:** rule out neurological causes of occult spinal dysraphism or sacral agenesis, asymmetrical dimple, tuft of hair, and asymmetrical gluteal crease (see [Resources](#) for a presentation on spinal dysraphism)
- **Neurological exam:** gait, balance, perianal or anal sensation, anocutaneous reflex, bulbocavernosus reflex
- **Urological exam:**
 - In females: labial adhesions, skin excoriation, redness, signs of sexual abuse
 - In males: meatal stenosis
 - Both: perianal exam
- **Abdominal exam:** distension, palpable stool

Laboratory Evaluation

Laboratory evaluation for bladder dysfunction includes the following:

- Urinalysis
 - Presence of white blood cells (WBC) indicates inflammation/infection
 - Presence of red blood cells (RBC) can be seen with WBC inflammation/infection and in isolated cases with bladder dysfunction
 - Specific gravity to rule out diabetes insipidus
 - Glucosuria to rule out diabetes mellitus
 - Serum labs not indicated
- Urine culture if urine analysis is suspicious for UTI

Additional Tests

- Before referral to a specialist, additional tests may include the following:
 - Renal ultrasound to detect presence of hydronephrosis, double collecting system, renal scarring, assessment of postvoid residual, bladder wall thickness, rectal distension
 - Voiding cystourethrogram (VCUG), which uses fluoroscopy to visualize the child's urinary tract and bladder, is not indicated unless
 - The child has a history of febrile UTI
 - In males there is a suspicion of posterior urethral valves
- After referral to a specialist, the following tests may be performed:

- Post Void Residual (PVR) provides a non-invasive manner to assess efficiency of bladder emptying.
- Uroflow electromyography (EMG) provides information about the pattern of urine flow while assessing external sphincter tone prior and during voiding; assesses urinary incontinence due to voiding dysfunction, not storage dysfunction
- Urodynamics provides information about detrusor instability, bladder contractions, compliance, bladder pressure during filling, bladder capacity, sphincter activity during filling and voiding, bladder emptying; may or may not be done with fluoroscopy
- Invasive procedures using urethral catheter, rectal catheter, and EMG electrodes, requires child to be awake; may use sedation during catheter placement
- MRI of spine may be obtained in setting of bladder dysfunction refractory to medical intervention

About 40% of children with normal physical exam and refractory bladder dysfunction have spinal abnormalities.

Assessment and Diagnosis of Bowel and Bladder Dysfunction

The following may be present in children with BBD:

- History of UTI, secondary vesicoureteral reflux (VUR), renal scarring
- Constipation
 - Functional constipation can be seen in children with BBD
 - Encopresis can be seen with children with overactive bladder
- Psychosocial stress: physical abuse
- Inability to relax external sphincter during voiding/staccato curve (diagnosed by uroflow EMG)

Management of Bladder Dysfunction: Stepwise Approach

The management of bladder dysfunction is based on a stepwise approach:

- Initial management should focus on behavior modification (eg, voiding behavior, fluid intake, stooling behavior).
- Subsequent intervention includes initiating medication therapy if adherence to behavior modification has not improved bladder dysfunction.
- Alternate subsequent intervention includes pelvic floor rehabilitation via biofeedback, neuromodulation, Botox bladder injection, or clean intermittent catheterizations.

Behavior Modification

- The goal of behavior modification techniques is to restore normal voiding and bowel habits.
- Behavior modification can reduce symptoms by 40% to 70%.
- The highest success rate is in motivated children with supportive parents.
- Behavior modification techniques include voiding modification strategies, fluid intake modification, voiding/stooling posture education, and management of constipation ([Table 4](#)).

Table 4. Techniques for Behavior Modification in Children With Bladder Dysfunction

To view a larger image on your device, please click or touch the image.

Table 4. Techniques for Behavior Modification in Children With Bladder Dysfunction

Technique	Description	Advantages
Voiding Modification Strategies		
Voiding diary	<ul style="list-style-type: none"> Record child's voiding time, volumes, episodes of urinary incontinence, bowel movements, stool accidents 	<ul style="list-style-type: none"> Enforces compliance with educational initiatives Helps with self assessment of progress
Timed voiding every 2 to 3 hours	<ul style="list-style-type: none"> Have child void every 2 to 3 hours; may use a wobble watch or digital watch as a reminder tool 	<ul style="list-style-type: none"> Reported 60% success rate Especially useful in children with ADHD
Double voiding	Have child void, then count to 10 and attempt to void again	Ensures the child has taken the time to empty the bladder; especially helpful for the child with infrequent voiding or high postvoid residuals
Fluid intake and diet modification		
	<ul style="list-style-type: none"> Encourage fluid consumption throughout the day Reduce caffeine, citrus, carbonation, chocolate, tomatoes, spicy foods 	Avoiding bladder irritants may help decrease urinary urgency, frequency, and dysuria
Voiding/stooling posture education		
	<ul style="list-style-type: none"> Avoid holding behaviors Support feet on a stool Face toilet if postvoid dribbling occurs 	<ul style="list-style-type: none"> Voiding and stooling with feet supported helps relax the pelvic musculature to maximize emptying of bladder and rectum Spreading the legs and labia help decrease the chance urine collects in the vaginal vault
Management of constipation		
Bowel program	<ul style="list-style-type: none"> Removal of stool (ie, disimpaction) Maintenance program (1 to 2 bowel movements/day) Scheduled time for bowel movement using footrest 	Management of constipation alone can reduce incontinence by 60%
Increased fiber in diet	<ul style="list-style-type: none"> Age (yrs) + 5 or 10 = grams/day 7 to 15 grams/day for 2 to 5 years of age recommended 	
Stool softeners/laxatives	<ul style="list-style-type: none"> Glycolax (Miralax) See "Glycolax Dosing" box below. Lactulose <i>For fecal disimpaction:</i> 1.3 g/kg/dose BID for 7 days <i>For chronic constipation:</i> 1 to 2 g/kg/day once/BID 	

Glycolax (Miralax) Dosing

GOAL: Type 4 Stools [See [Bristol Chart](#)]

Take ___ capful daily.

Adjust dose every 2 to 3 days as needed:

Too hard: If your child continues to have type 1 to 2 stools, increase the amount of Miralax by $\frac{1}{4}$ capful.

Too loose: If the child begins to have type 6 to 7 stools, decrease Miralax by $\frac{1}{4}$ capful.

Just right: If the stool is type 4, stay where you are for 6 weeks*.

**After 6 weeks you can gradually decrease the dose as tolerated.*

Mixing guidelines:

1 capful in 8 oz.

$\frac{3}{4}$ capful in 6 oz.

$\frac{1}{2}$ capful in 4 oz.

$\frac{1}{4}$ capful in 2 oz.

Medications

- Several medications are available for the treatment of bladder dysfunction ([Table 5](#)). If oxybutynin does not achieve the desired result, the healthcare provider should refer the child to a pediatric urologist for subsequent pharmacological therapy.
- Classes of medication for the treatment of bladder dysfunction are the following:
 - Anticholinergics help suppress uninhibited detrusor contractions during filling. Each medication in this class is designed with a specific selectivity for the muscarinic receptors and therefore is variable based on medication.
 - β 3-Adrenoreceptor agonists activate β 3 receptors on the bladder to suppress bladder contractions during filling.
 - α -Adrenergic receptor antagonists block receptors at bladder neck to promote bladder neck relaxation.

Table 5. Medications for Bladder Dysfunction

To view a larger image on your device, please click or touch the image.

Table 5. Medications for Bladder Dysfunction

	Medication	Formulation	Indication	Dosing	Side Effects
Anticholinergics	Oxybutynin (Ditropan)	Liquid, immediate release or extended release, transdermal	Urinary urgency, frequency, urge incontinence FDA approved for children	0.2 mg/kg or 1 mg/mL based on age; max dose 30 mg/day Starting dose 5 mg for 4 weeks; may increase to higher dose if tolerated well without side effects	Constipation, dry mouth, flushing, heat intolerance
	Tolterodine (Detrol)	Immediate release and long acting	Urinary urgency, frequency, urge incontinence <i>Note:</i> Off label use in pediatrics	2 mg twice a day; may increase to 4 mg BID	
	Solifenacin (Vesicare)	Long acting pill	Urinary urgency, frequency, urge incontinence <i>Note:</i> Off label use in pediatrics	5 mg a day; may increase to 10 mg a day	
	Trospium (Sanctura)	Long acting pill	Urinary urgency, frequency, urge incontinence <i>Note:</i> Off label use in pediatrics		
β_3-Adrenoreceptor agonists	Mirabegron (Myrbetriq)	Pill	Urinary urgency, frequency, urge incontinence <i>Note:</i> Off label use in pediatrics	Starting dose 25 mg for 8 weeks	Dry mouth, constipation
α-Adrenergic Receptor Antagonists	Doxazosin (Cardura)		Useful in children with history of urinary retention or dysfunctional voiding <i>Note:</i> Off label use in pediatrics	Start at 0.5 mg nightly, titrate up to max dose (2 mg) over several weeks	Hypotension, dizziness
	Tamsulosin (Flomax)			Start at 0.4 mg nightly	Dizziness, nasal congestion

Biofeedback

- The goal of biofeedback is to teach children how to control the pelvic muscles during voiding using auditory or visual cues.

- Similar to uroflow EMG, the machine is attached to a monitor. This monitor shows the child which muscles are contracting and which muscles are relaxing. This helps the child understand which muscles to squeeze if she feels the urge to void to prevent incontinence.
- Kegel exercises strengthen the pelvic floor to help decrease urinary incontinence due to detrusor contractions.
- Although biofeedback can result in improved voiding patterns, observational and meta-analysis studies report poor results in improving urinary incontinence in the long term.
- Biofeedback may be most effective for children with dysfunctional voiding.

Neuromodulation

- Neuromodulation uses electrical stimulation to the S3 region to modulate neural pathways to the bladder. This therapy may reduce symptoms or improve function of the lower urinary tract. The mechanism of modulation of bladder function through electrical stimulus to the S3 region is unknown.
- Two of the most commonly used neuromodulation techniques are percutaneous tibial nerve stimulation (PTNS) and sacral nerve stimulation (SNS).
- PTNS is approved by the FDA for treatment of overactive bladder. The procedure consists of stimulation of the tibial nerve at the ankle. It is performed in the outpatient clinic setting from 1 to 2 times per week for 8 to 12 weeks. No permanent lead or stimulator is implanted.
- SNS consists of a surgically implanted permanent electrode and permanent pulse generator device (InterStim[®]), which transmits electrical impulses to the S3 nerve. Placement is done under general anesthesia.

Botox A Injection

- The use of botulinum toxin may be used for dysfunctional voiding and/or overactive bladder.
- This treatment can improve symptom score, decrease postvoid residuals, and increase bladder capacity.
- The procedure is performed in the operating room via cystoscopy. Botox is injected in the submucosal space.
- Duration of improvement varies from 4 to 6 months.

Clean Intermittent Catheterization

- Clean intermittent catheterization (CIC) is an effective and safe option for bladder emptying in underactive bladders.
- CIC helps reduce postvoid residual urine and reduces the incidence of urinary tract infection (UTI).

Management of Bowel and Bladder Dysfunction

Consider the following for management of BDD:

- Timed voiding + intermittent catheterization (rarely)
- Constipation management
- Disimpaction
- Maintenance
- Voiding diary
- Reduce offending agents, including caffeine, citrus, and carbonation

Summary

The figure below summarizes assessment, diagnosis, and management for bladder dysfunction as discussed in this guideline.

Figure. Algorithm for Bladder Dysfunction

To view a larger image on your device, please click or touch the image.

Resources

Note: Links to third-party sites, including commercial entities, are for informational purposes only and do not constitute an endorsement by the ANGELS program or any of its employees. The ANGELS program is not responsible for the accuracy or content of the information contained in these sites.

For Healthcare Providers

- [Fig. 1. Algorithm of strategy in managing children with daytime incontinence \(Chang, 2015\)](#)
- [Bristol Stool Form Scale](#)
- [American Academy of Pediatrics Section on Urology](#)
- [Dysrhythmism \(Pediatric Physician Learning and Cooperative Education \[Peds PLACE\], March 10, 2016\)](#)

For Patients

- [Increasing Fiber in Your Child's Diet](#) (Handout from Arkansas Children's Hospital)
- [Happy Bladder Prescription](#) (Handout from Arkansas Children's Hospital)
- [Voiding Diary](#) (Handout from Arkansas Children's Hospital)
- [Bristol Stool Chart](#)
- [International children's Continence Society: For Parents & Families \(patient leaflets\)](#)

References

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