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An Introduction to Pediatric Bladder and Bowel Disorders, Part 1

Tiffany Ellsworth Lee, MA, OTR, BCB-PMD, PRPC

- **Presenter Disclosure:** Financial: Tiffany Lee has received an honorarium for presenting this course. Non-financial: Tiffany Lee has no relevant non-financial relationships to disclose.
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Learning Outcomes

1. Describe who is an appropriate candidate for behavioral and biofeedback intervention related to elimination disorders.
2. List at least three diagnoses that are appropriate to refer to a clinician trained in this treatment technique.
3. Explain what biofeedback is and how it is used in elimination disorders.
4. Describe at least three treatment strategies for bedwetting.

Overview of Presentation

- Elimination Disorders
- Anatomy/Physiology of Bladder
- Incontinence symptoms/definitions
- Prevalence, Impact and Risk Factors
- Diagnostic Tests

What is an elimination disorder?

- Incontinence: involuntary loss of urine or feces
- Functional incontinence: no apparent disease, injury or congenital malformation
- Dysfunctional voiding or defecation: incontinence as a result of a voiding or defecatory phase dysfunction
- Urinary retention associated with incomplete bladder emptying
- Constipation due to withholding of feces

Q1

Dysfunctional Elimination

- Many presentations
- Often not recognized by health professionals
- Basically means holding urine or stool or inappropriate elimination
- Both of these functions need to be frequent and regular

How do we control continence and prevent an elimination disorder?

- Use pelvic floor muscles to provide closure of the urethra and anal canal to maintain continence
- Use pelvic floor muscles to signal the bladder, rectum and colon when to void or defecate
- Use pelvic floor muscles to provide opening of the urethra and anal canal by TOTAL relaxation to allow for complete and EFFORTLESS elimination

Q2

Skeletal Muscle vs. Smooth Muscle

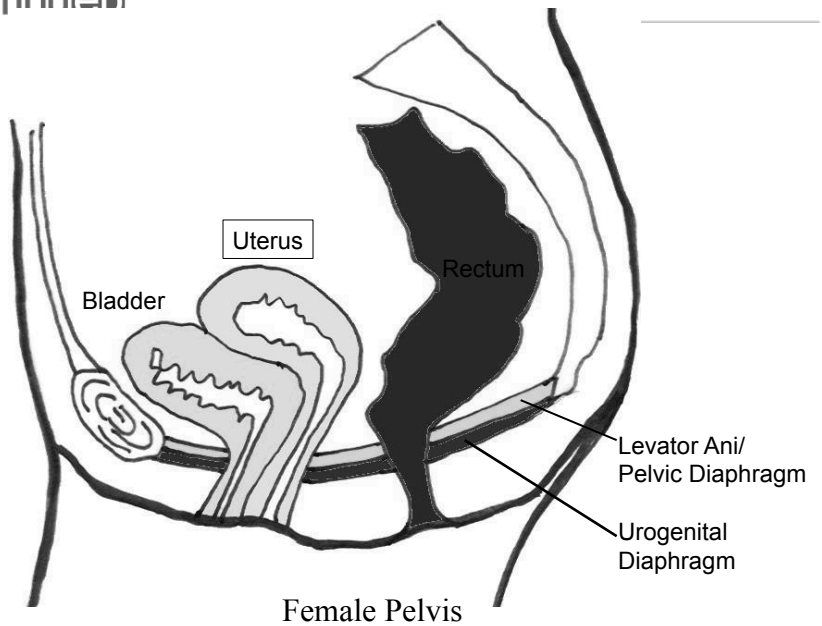
- The pelvic floor muscles are normally under voluntary control (skeletal muscles) and can be contracted at will
- The bladder, colon, and rectum function automatically and are smooth muscles

Q3

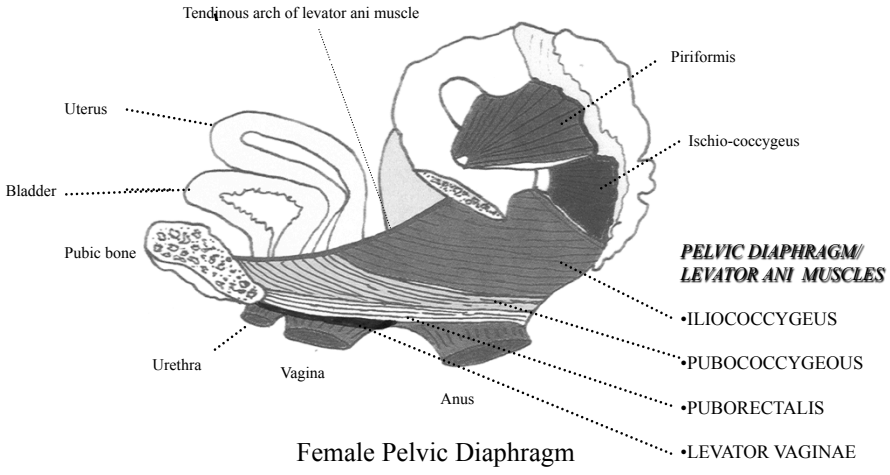
Interaction between smooth and skeletal muscles in the pelvic floor

- Interaction between voluntary and involuntary muscles is complex as we all know!
- Smooth muscle here is inhibited by the contraction of the skeletal muscles of the pelvic floor
- Essentially, the coordinated interaction between smooth and skeletal muscle is essential for normal B and B control

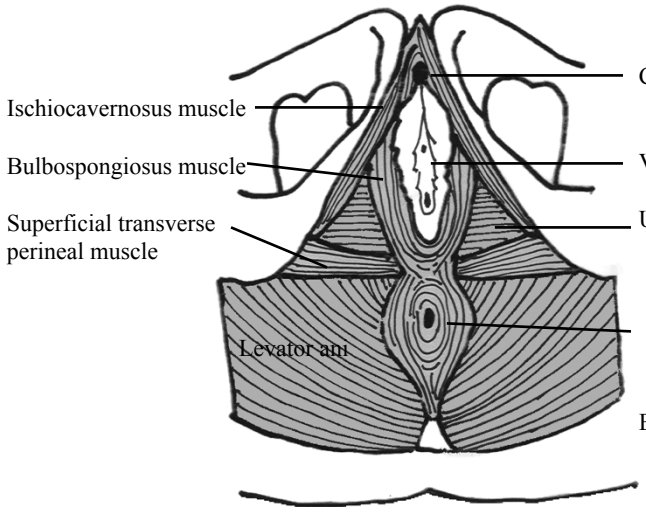
Anatomy And Function Of The Pelvic Floor



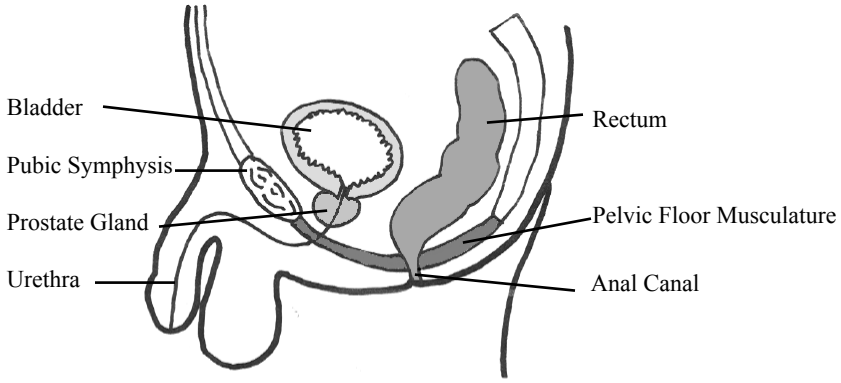
Female Pelvis



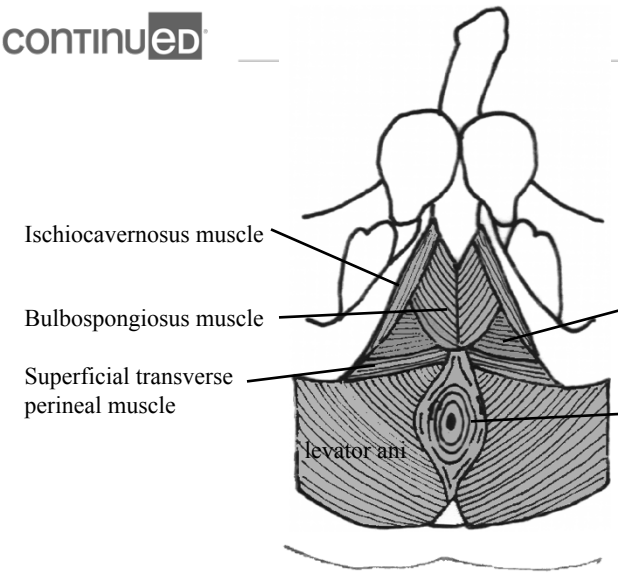
Female Pelvic Diaphragm



Female Superficial Perineal Muscles and Urogenital Diaphragm



Male Pelvis



Male Superficial Perineal Muscles and Urogenital Diaphragm

Pelvic Floor Function

- Support organs
- Maintains storage-anal and urethral closure
- Inhibits or permits contraction of the rectum and bladder (the gatekeeper)
- Full relaxation is needed to empty the rectum and bladder

Q4

Bladder Anatomy And Physiology

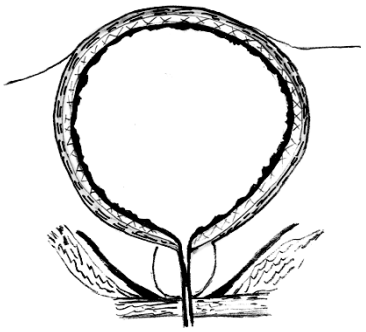
Think of the bladder as a balloon and the sphincter as the knot

The bladder is an elastic muscle that stretches to hold urine being sent from the kidneys via ureters.

The sphincter muscle remains tightly shut, preventing urine from leaking out.

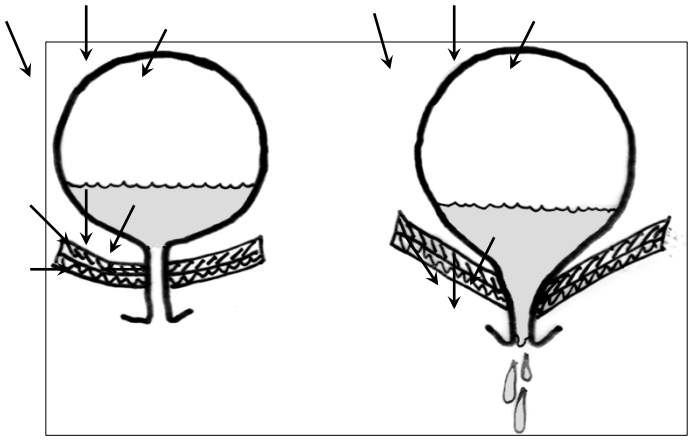
The sphincter and the bladder are perfectly coordinated in a person with good urinary control

When full, the bladder signals the brain, and the brain in turn signals the sphincter to relax and open. The bladder then contracts and squeezes all the urine out. Then the sphincter closes tightly so the refilling can resume. (pic-Louise Marks)



Where do urinary control problems begin?

- In the bladder: failure to store or failure to empty the urine
- In the sphincter: failure to open, to close, or stay closed
- In the spinal cord: absent or incorrect signals
- In the brain: no message or the wrong message



Normal Bladder Capacity

- Age (in years) +2=Ounces of urine in a normal bladder
- For a six year old:
  - 2+6=8 ounces of urine (8x30 = 240cc of urine)
  - Residual: less than one ounce or 30 ml

Q5

Normal

- Normal voiding should be approximately every two to three hours
- Normal fluids: 8-12 ounces at breakfast, lunch and dinner, or 36 ounces
- One half of body weight in pounds = number of fluid ounces per day
  - Example: 60 lbs.. child should drink 30 oz.

Q6

NIGHT TIME

Nocturnal Enuresis Defined

- Commonly called bedwetting
- Frequently associated with a family history:
  - Children whose parents were not bedwetters have a 15% incidence
  - If one or both parents were bedwetters, rates jump to 44% and 77% respectively.

Q7

Nocturnal Enuresis continued

- Can be related to:
- Sleep disorders
- Psychological issues/stress – controversial: is it cause or effect?
- Genetics
- Endocrine dysfunction
- Maturational delay of bladder development.
- Constipation
- OAB UTIs Diabetes

Q8

Nocturnal Enuresis continued

- Can see increase in detrusor contractions with decrease in pelvic floor activity during enuretic episodes (see this in adults with sleep apnea also)
- Sleep studies show enuretic children are deep sleepers and tough to arouse
- High urine production during sleep

Nocturnal Enuresis continued

- Most girls stay dry by age six
- Most boys stay dry by age 7
- By age 10, 95% of children are dry at night.
- Treatments can include bedwetting alarms (bedwetting store.com), medications (hormones or DDAVP known as desmopressin), surgery (urethral dilation), and behavioral treatments with biofeedback.

Enuresis

- 5-7 million children in USA with enuresis
- Most common urologic complaint
- 30% of parents punish
- Children with enuresis often have self esteem and emotional distress
- Parental expectations may be unreasonable
- Females>males
- Daytime leaking: may be anywhere from damp to soaked
- Loss of sensation to void

Q9

Outgrow bedwetting?

- About 15% of affected children outgrow bedwetting on their own each year without medical intervention but inadequate knowledge and lack of support and guidance from family may lead to a child's mental distress and low self-esteem.

Preventing Bedwetting

- Hormone that reduces urine production at night needs to be produced: antidiuretic hormone. This hormone is not present at birth but develops between ages two and six, and sometimes not until end of puberty.
- Patient needs to wake when the bladder is full.

Preventing Bedwetting

- No fluids after 6 pm (tea, coffee, soda)
- Water only with dinner
- No dairy/sugar snacks after dinner
- Void right before bed (double void)
- Use waterproof mattress pad
- Disposable pads when travelling
- Teach child how to clean sheets
  - Sense of responsibility
  - Can lessen embarrassment

Preventing Bedwetting

- Positive reinforcement (sticker chart)
- Kegels (muscle awareness)
- Bedwetting alarm to help the brain-bladder connection
- Drink water throughout the day and not in the evening

Q10

How does an alarm work?

- "When a non-bedwetting child sleeps and pressure builds up in the bladder, a signal is sent to the brain to keep the bladder sphincter muscle closed until they can wake up and walk to the bathroom. In bedwetting children, this signal is not recognized by their subconscious reflex system. Instead of waking to go to the bathroom, the child relaxes the sphincter muscle that keeps his bladder closed and wets during his sleep."

Source www.bedwettingstore.com

Bedwetting Alarms

- To maximize success when using a bedwetting alarm, Dr. Hyun (pediatric urologist) recommends several things.
- "It takes time, around three months, and it requires parental involvement. It's important to make the time commitment.
- The alarm tells you when the wetting happens. It isn't there to prevent the accident from happening.

Bedwetting Alarms

- The child needs to be involved, getting up to the bathroom when reminded and resetting the alarm before going back to sleep.
- You have to be consistent. Your body doesn't learn by just using the alarm a few nights a week.
- Older kids (9 or 10) tend to be more motivated to make changes.
- The bedwetting alarm needs to be loud enough for the parents to hear. It also needs to be one that the child can easily reset by himself during the night." www.bedwettingstore.com

Normal Nighttime Control

- Begins between age 2-3 during the day and 4-5 at night.
- Children with ADHD are 2.7 times more likely to have issues
- Caffeine increases urine production (soda, tea, coffee, vitamin drinks)
- Constipation: full bowels put pressure on the bladder and change nerve signals (the poop drives the pee).

DAYTIME

- "No one ever died from wetting, but some may have wished to…"

From a Child's Perspective

Children rated wetting themselves at school as the third most catastrophic event, behind losing a parent and going blind.

(Ollendick et al., Behavioral Research Therapy, 1998)

Urinary Incontinence

- According to the International Children's Continence Society (ICCS):
- Incontinence is defined as the uncontrollable leaking of urine.
- Two broad categories:

1. Continuous (constant leaking related to congenital abnormalities) and
2. Intermittent (voiding dysfunction).

Daytime Incontinence

- ICCS: Accidents at least every two weeks in children over 5 years of age. Can be related to:
    1. family history
    2. emotional stress
    3. male sibling history

Daytime Statistics

- Some degree of daytime urinary incontinence:
  - 10% < 7 years old
  - 2-9% 7-10 years old
  - 2-6% 10-15 years old
- Urinary incontinence 2x/week or more:
  - .5% 9 years old

(O. Dede, G. Sakellaris, Essentials in Pediatric Urology, 2012; 57-68)

Daytime Statistics

- 20-40% of children with daytime urinary incontinence have behavioral disorders.
- Which came first? Incontinence or behavioral disorders?

O. Dede, G. Sakellaris, Essentials in Pediatric Urology, 2012; 57-68

Definitions

- Intermittent urinary incontinence is a voiding dysfunction
- Dysfunctional voiding is a subset of voiding dysfunction (confusing!!)

Types of Urinary Incontinence

- OAB
- Dysfunctional voiding (not voiding dysfunction)
- Non-neurogenic / neurogenic bladder
- Elimination syndrome
- Voiding postponement
- Lazy bladder: poor bladder emptying due to underactive bladder
- Giggle incontinence
- Vaginal entrapment/vesicovaginal entrapment
- Primary bladder neck dysfunction

Long Term Risks

- Childhood daytime incontinence associated with adult urge incontinence
- Women with childhood daytime frequency more likely to report adult urgency daytime incontinence secondary to OAB and dysfunctional voiding associated with:
  - Decreased quality of life
  - Constipation
  - Increased risk of UTIs

  (Fitzgerald MP et al, J Urol 2006; 175; 989-993)

Urinary Incontinence

- Loss of urine at an inopportune time
- First recorded reference was in 1550 BC
- In 77 AD boiled mice were used as a treatment!!!
- 1472 AD the first book of pediatric diseases was published with an entire chapter on enuresis!

Socio-cultural Factors and Psychopathology

- Stress (i.e. as a result of marital separation) increases incidence of diurnal or mixed UI
- Increased incidence of attention problems and delinquent behavior in voiding postponement syndrome
- Children with ADHD three times more likely to have daytime UI Delayed Maturation or MR – increases risk of daytime wetting (OR 1.9% and 4% respectively)

Other Considerations

- Divorce: How does this impact the child?
- Psychological considerations
- Overwhelming sadness
- Two homes, two lifestyles, two sets of rules, two sets of routines
- Living with “Strangers”
- Communication between parents

Urge Syndrome (OAB)

- Frequent episodes of an urgent need to void caused by bladder over-activity
- Bladder contractions countered by contraction of the pelvic floor muscles (guarding reflex) and holding maneuvers
- Mucosal lining of the bladder may be damaged due to strong bladder contractions and strong pelvic floor contractions. This can increase risk of UTIs
- May also present with constipation and fecal soiling

Vincent Curtsey

- Potty dance
- Perineal pressure applied by heal of the foot during urge to urinate
- Contraction of external urinary sphincter inhibits bladder contractions
- (S.A. Vincent, Lancet, September 1966)

Dysfunctional Voiding

- Inability to fully relax the urinary sphincter or pelvic floor muscles during voiding
- Present with incontinence, UTIs, and constipation
- May be due to OAB
- Staccato voiding – periodic bursts of pelvic floor activity during voiding, prolonged voiding time, and possibly residual urine. Flow is continuous.
- Interrupted voiding – incomplete and infrequent voiding with micturition in separate fractions. Doesn't empty well.

Dysfunctional Voiding continued

- Initial signs reflect detrusor over-activity with poor emptying and may include:
  - Small bladder capacity
  - Increased bladder thickness
  - Decreased bladder contractility
  - Impaired relaxation of the external sphincter during voiding
  - Weak or interrupted stream
  - Increased PVR
  - Fecal soiling and constipation

Underactive Detrusor and Poor Bladder Emptying

- Lazy bladder – former terminology
- Use valsalva maneuver to void
- Most common in girls
- May be the later stage of chronic voiding postponement
- Large capacity and no contraction during voiding – overstretched detrusor
- At risk for UTIs and high residuals
- Need UDS to determine

Giggle Incontinence

- Originally described in 1959 by MacKeith as Enuresis Risoria or Giggle Micturition
- Etiology unknown
- Theories:
  - Laughter causes hypotonic state with urethral relaxation
  - Laughter triggers micturition reflex overriding central inhibitory mechanisms

Voiding Postponement

- Postponement of imminent micturition until overwhelmed by urgency, then rush to toilet, it's too late, UUI occurs.
- Significantly higher frequency of behavioral issues in these children compared to those with OAB
- Children will restrict fluids to increase voiding interval over time

  Proposed by Lettgen et al. (Lettgen B. Acta Pediatr 2002; 41, 978)

Vesicovaginal Entrapment (Vaginal Reflux Voiding)

- May be related to anatomical abnormalities such as labial adhesions, or funnel shaped hymen.
- Improper position on toilet
- Obesity may be a risk factor (large thighs)
- Symptoms include urinary leakage a short time after voiding, and is not associated with urgency.

Vesicoureteral Reflux

- Patients with reflux have a tendency to have dysfunctional elimination
- Goal for treatment:
  - Protect kidneys
  - Prevent UTIs (? Daily antibiotics)
  - Treat dysfunctional elimination

Elimination Syndrome

- Females have greater incidence than males.
- Associated with VUR and UTIs
- Abnormal recruitment of the external anal sphincter during defecation
- There is concomitant urethral sphincter and pelvic floor contraction during micturition.
- Can lead to bladder hypertrophy, detrusor overactivity.

Elimination Syndrome continued

- Symptoms include:
  - Urinary incontinence
  - Nocturnal enuresis
  - Recurrent UTIs
  - Urgency
  - Frequency
  - VUR
  - Constipation
  - No regular bowel routine and fecal soiling

Other Definitions

- Functional Incontinence – Difficulty getting to the restroom in time because of pain, CP, and other musculoskeletal problems.
- Urinary Retention – Lack of ability to urinate.
- Frequency – voiding more than is age appropriate. Often considered a classroom behavioral issue by teachers.

Determining Voiding Dysfunction

Physician Evaluation

- Detailed History: family history, social, age of toilet training, fluid intake, voiding habits, medications, surgeries, psychiatric history, history of UTIs.
- Voiding Diary – time of voids, frequency, amounts, nocturia, stream quality
- Physical exam – rule out any anatomical or neurological causes

Evaluation Process

- History of problem
- Bladder and bowel diary helpful
- Review medical history, physical exam results, family medical history
- Social history – family structure/stressful situations
- Patient motivation
- Previous treatments
- KUB
- Bladder/renal ultrasound
- UDS
- Uroflow/EMG

Diagnostic Testing

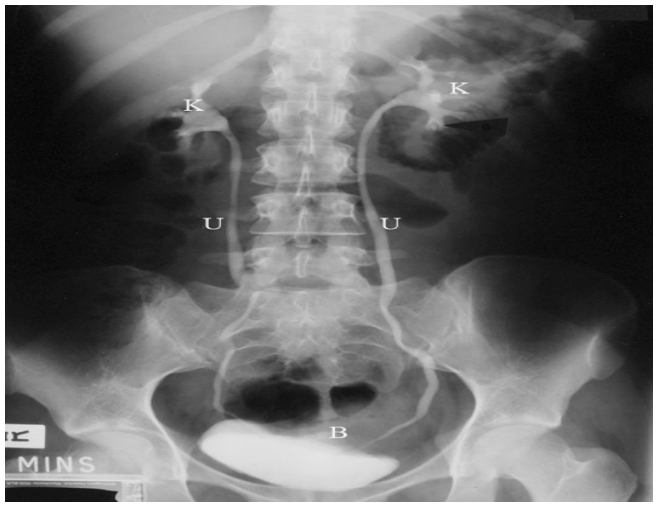
- Urine analysis and culture
- Ultrasound: assess post-void residual, bladder wall thickness, abnormalities
- Voiding cystourethrogram: -(VCUG) used in children with recurrent or febrile UTIs to show reflux, bladder emptying, and abnormalities in bladder size, shape, capacity. Looks at urethra. Uses fluoroscopy for visualization. Contrast agent introduced through catheter into bladder.

VCUG

Diagnostic Testing

- MRI: for children with neurological abnormalities on exam
- Uroflow: hold urine until strong urge to void then void into a collection device that measures flow time, voided volume, and maximum and average flow rate. Generates a flow curve.
- KUB: X-ray of kidneys, ureters and bladder. Used to determine constipation.

KUB (Kidneys, Ureters, Bladder)



Urodynamics

- Gives more information than other tests, but more invasive (just like adult test)
- Shows entire filling and emptying phase of urination
- Can give child medication to keep calm
- Determines: OAB, dysfunctional voiding, underactive bladder

Resources for Training and Certification

- Biofeedback Training & Incontinence Solutions
- Telephone 1-512-557-6310 or www.pelvicfloorbiofeedback.com
- -hosts a 3 day course annually in April and September which fulfills didactic and practicum requirements for certification
- Biofeedback Certification International Alliance
- Telephone 1-866-908-8713 or www.bcia.org

-offers certification in pelvic floor muscle dysfunction biofeedback

How to Get BCIA Board Certified

- Must be licensed as a nurse, PA, MD, OT, PT, or NP
- COTAs and PTAs may be a board-certified technician
- 28 hours of didactic education
- 18 hours of mentoring
- Written certification exam
- Recertified every 3 years with 36 accredited + 20 elective hours of CE in pelvic muscle dysfunction

Favorite Resources

- The M.O.P. Book: Anthology Edition: A Guide to the Only Proven Way to STOP Bedwetting and Accidents 2nd Edition, 2018 by Steve Hodges, MD
- Jane and the Giant Poop by Suzanne Schlosberg and Steve Hodges MD
- It's No Accident: Breakthrough Solutions To Your Child's Wetting, Constipation, Utis, And Other Potty Problems Paperback – 2012 by Steve J. Hodges and Suzanne Schlosberg
- Don't Cry, Stay Dry: Bedwetting Causes Explained and Natural Treatments for Kids to Try Paperback – 2019 by Jeanice Mitchell and Sheri Wall
- The Poo in You – You Tube video
- www.bedwettingstore.com

Resources & Professional Organizations

- National Association For Continence (NAFC) www.nafc.org
- International Continence Society (ICS) www.icsoffice.org
- Society of Urologic Nurses and Associates (SUNA) www.suna.org
- American Urologic Association (AUA) www.auanet.org
- The Simon Foundation for Continence www.simonfoundation.org
- Biofeedback Certification International Alliance (BCIA) www.bcia.org
- International Foundation for Functional Gastrointestinal Disorders (IFFGD) www.iffgd.org
- National Kidney and Urologic Diseases Information Clearinghouse http://kidney.niddk.nih.gov/
- Biofeedback Foundation of Europe (BFE) www.bfe.org

CONTINUED

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