Let It Flow! Voiding Dysfunction and UTIs: Pearls for the Primary Care Provider

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Learning Objectives
• Discuss the management of voiding dysfunction and UTIs
• Identify contributing risk factors
• Describe appropriate management of voiding dysfunction and UTIs in a primary care setting and understand when referrals are indicated

Disclosures
• I have no financial disclosures

Outline
• Voiding Dysfunction
• Constipation
• Urinary Tract Infections
• Case Studies
• Questions

Voiding Dysfunction
Voiding Dysfunction

• Definition: Abnormal voiding pattern as a consequence of a lack of coordination between the detrusor and external sphincter during voiding, after the normal age of daytime toilet training.

• On average occurs in 20% of school-aged children
  – Peak prevalence at 5-6 years of age

Pathophysiology

• Neurophysiology
  – 3 main components of the bladder
    • Detrusor smooth muscle
    • Connective tissue
    • Urothelium

• Urethral Sphincters
  – Key component to continence
    • Internal
    • External

Pathophysiology

• Depends heavily on normal anatomy
  – Maintenance of a low bladder pressure
  – A good urethral closure mechanism
  – Gradual increase in tone of external sphincter and pelvic floor

Bladder/Sphincter Function- Dual Role

Storage
  – Detrusor Relaxation
  – Sphincter Contraction

Micturition
  – Detrusor Contraction
  – Sphincter Relaxation

Micturition System

Pathophysiology

• Maturation of bladder control
  – Infants and Toddlers
    • Reflexive
  – Children (typically by age 5)
    • Increased capacity
    • Awareness
    • Impending detrusor contraction
    • Voiding on command
    • Decreased nocturnal urine volume
    • Awareness of fullness when asleep
### Voiding Dysfunction

- **Classifications:**
  - Mild
  - Moderate
  - Severe

### Voiding Dysfunction - Daytime Enuresis

- **Definition:** Involuntary leakage of urine during the daytime, occurring more than once per month in a six month time period.

- **Prevalence:** Equally affecting males and females

### Voiding Dysfunction - Giggle Incontinence

- **Definition:** Involuntary and complete bladder emptying triggered by laughter.

- **Etiology:** Poorly understood, possibly centrally mediated with spontaneous activation of the micturition center

- **Treatment:**
  - Methylphenidate

### Voiding Dysfunction - Stress Incontinence

- **Sphincteric incontinence**
  - Rare in children

- **Predisposition:**
  - Obesity
  - Female athletes
  - Gymnasts

- **Difficult to treat**
  - Pelvic floor PT
**Voiding Dysfunction- Post void Dribbling**

- A few drops of urine immediately after voiding
- Boys:
  - Uncircumcised
- Girls:
  - More common
  - Vaginal pooling
  - Labial Adhesions

**Voiding Dysfunction- Post void Dribbling**

- Treatments
  - Abduct the legs widely
  - Lean forward at end of void
  - Double void

**Voiding Dysfunction**

- Moderate Voiding Dysfunction:
  - Overactive bladder
  - Underactive bladder

**Voiding Dysfunction- Overactive Bladder**

- **Definition:** A bladder prone to reflex detrusor contractions that occur at less than full bladder capacity and are not inhibited by the cerebral cortex.
- **Etiology:** Delay in the acquisition of cortical inhibitions of uninhibited detrusor contractions
  - Neurogenic and Non-neurogenic causes

**Voiding Dysfunction- Overactive Bladder**

- **Prevalence:**
  - Peak incidence between 5-7 years of age
  - 15% of Adolescents
  - Cerebral Palsy
  - Learning delays
  - ADHD

**Voiding Dysfunction- Overactive Bladder**

- **Key words from parents:**
  - Females squatting on their heels
  - Leg crossing
  - Penile grabbing

- Children classically deny need to void when maneuvers seen
  - Perception of bladder contraction was inappropriately integrated
Voiding Dysfunction - Overactive Bladder

- Increased risk of:
  - UTI
  - Secondary Vesicoureteral Reflux (VUR)
  - Decompensated detrusor with decreased contractility

Voiding Dysfunction - Overactive Bladder

- Evaluation
  - Voiding & Stooling history
  - Urinalysis
    - Rule out UTI
    - Specific gravity 1.016 or higher in random urine may indicate a concentration defect

Voiding Dysfunction - Overactive Bladder

- Non Pharmacologic Treatment
  - Aimed at preventing reflex detrusor contractions and retraining
  - Education on a normal voiding pattern
  - Avoiding pelvic withholding behaviors
  - Avoiding dietary stimulants

Voiding Dysfunction - Overactive Bladder

- Pharmacologic Treatment - Anticholinergic Therapy
  - Used as an adjunct to the behavioral treatment
  - Agents increase the threshold for reflex detrusor contractions
  - Agents decrease the contractions amplitude and frequency
Voiding Dysfunction - Underactive Bladder

- Underactive bladder
  - 8-12 hour voiding intervals
  - Overflow incontinence between voids
  - UTIs, constipation, straining to void
  - Large capacity bladder

- 7% of school aged children meet the voiding (in)frequency criteria

- Overstretching has potential harmful effects
  - Loss of bladder elasticity
  - Overtime can lose ability to empty to completion
  - Increased risk of UTIs

- Treatment
  - Alpha-blocker
  - Retraining with timed voiding
  - May meet resistance
  - Catheter program if severe

Management

Evaluation

- Obtain a detailed history:
  - Timing of developmental milestones
  - Mental status
    - History of ADHD, Academic performance
  - Toilet training experience
  - Family issues
  - History of physical or sexual abuse
  - Medications
Evaluation

- Voiding pattern
  - Interval
  - Urgency
  - Timing of leakage
  - Obtain voiding diary if unclear
  - Description of urine stream

Bowel Pattern

- Frequency
- Consistency
- Size
- Encopresis

Focused Physical Examination

- Neuro
  - Lumbosacral refluxes
    - Standing on toes, anal reflex
- Abdomen
  - Bowel sounds
  - Palpable stool
  - Bladder distention

Focused Physical Examination

- Back
  - Spine (scoliosis/kyphosis)
  - Lumbosacral region
    - Gluteal cleft, sacral dimple
- Genital examination
  - With Stress Maneuvers
  - Labial adhesions

Diet

- Dietary Modification:
  - Elimination Diet
    - Caffeine, high sugar drinks
    - Citrus fruits and drinks
    - Artificial coloring
    - Excessive dairy intake
Timed Voiding

• Every 2-3 hours by the clock
• Allow several minutes to void
• Sitting with feet supported is helpful
• Books or toys allowed
• Positive incentive chart
• Vibrating watch

Medication

• Anticholinergic agents: Detrol, Ditropan
  – Limited studies showing efficacy in children
  – Goal in overactive bladder is to increase bladder capacity and decrease detrusor over activity
  – Results in increased interval between voids, increased voided volume, and dryness between voids

Medication

• Anticholinergic agents
  – Side Effects:
    • Dry mouth
    • Facial flushing
    • Constipation

Medication

• Alpha-blockers: Flomax, Hytrin, Cardura
  – Rational is based on the presence of alpha-adrenergic receptors in the bladder outlet and proximal urethra
  – Stimulation of receptors leads to smooth muscle contraction and increased outlet resistance
  – Results in relaxation of bladder outlet and proximal urethra
  – Not FDA approved*
  – Recent studies are highly supportive

Constipation
**Constipation**

- Large correlation between the lower urinary system and lower gastrointestinal tract
- Stool impacts bladder's ability to store and empty properly
- Most commonly seen in overactive bladder
- Increased risk of:
  - UTI
  - VUR
  - Incontinence

- Varying definitions

- Indicators:
  - Large stools
  - Painful stools
  - Infrequent stools
  - Less than one stool daily or less than three times a week

- Vicious cycle of holding begins
  - Delay defecation due to memory of painful bowel movements or busyness with another activity
  - Constipation prevents full relaxation of pelvic floor muscles
    - Increasing risk for incomplete bladder emptying

- Some researchers hypothesize constipation can cause overgrowth of uropathogens by changing the GI flora
  - Increases UTI risk

- Control of Constipation
  - Increase Dietary Fiber
    - Fruits, veggies, fiber gummies
  - Stool Softeners
    - Miralax
    - Benefiber
    - Lactulose
  - Daily bowel attempts
    - Same time daily
    - Support feet with stool
    - Books and toys allowed

- Initial bowel clean out
  - Miralax

- Increase fiber
  - Fiber gummies, Benefiber

- Goal is to maintain regular, soft, and complete bowel movements
  - #4 on Bristol stool scale
Constipation - Management

• Miralax should be taken daily. 1 capful mixed with 8oz of water or juice.
  – Weight in kilograms x 0.8 / 17 = number of capfuls daily
    • Example: 51 lbs (23kg) x 0.8/17 = 1.08 (1 capful)
    • Should not exceed adult dose of 2 capfuls daily unless doing cleanout for short amount of time
    • Light diet on clean out days
      – NO RED drinks!

Urinary Tract Infections

• Caused by 3 main origins:
  1. Retrograde ascent from enteral bacteria colonizing urethral and vaginal tissue
  2. Nosocomial caused by catheterization
  3. Hematogenous spread through systemic infection
Urinary Tract Infections

• Most common pathogens:
  – *Escherichia coli*
  – Klebsiella
  – Proteus
  – Enterococcus
  – Citrobacter
  – Serratia
  – Pseudomonas

Urinary Tract Infections

• Relationship to Voiding Dysfunction:
  – Research supports strong link between the two
  – Most are ascending infections
  – Poor voiding habits inhibits bladder defense mechanisms

Urinary Tract Infections

• Behavioral Risk Factors and Habits:
  – Underactive bladder
  – Incomplete bladder emptying
  – Constipation
  – Suboptimal water intake
  – Potty-training
  – Sexual activity

Urinary Tract Infections

• 2015 study showed 60% of children with UTIs had underlying voiding dysfunction and or constipation
  • Identifying and treating voiding dysfunction is key to prevention

Symptoms

- Dysuria
- Gross hematuria
- Urgency
- Frequency
- Fever
- Urinary Incontinence
- Difficulty voiding
- Nausea
- Vomiting
- Lethargy
- Oliguria
- Polyuria
- Abdominal Pain
- Flank Pain

Work Up

• Urinalysis *with microscopy*
  – Nitrites
    • E. Coli, Klebsiella, and Proteus produce nitrites
    • Enterococcus does not
  – Leukocyte Esterase
  – White blood cells
Work Up

• Urine Culture
  – GOLD STANDARD
  – Guides diagnoses and treatment
  – Always send for culture and sensitivities

Collection Method

• Catheterized specimen is most accurate

• Clean catch method
  – Preferred method of parents and practitioners
  – Goal is to minimize contamination from surrounding skin
  – Avoid hat collection
  – Always use aseptic wipes

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Colony Count

• Controversy surrounding CFU:
  – >100,000 CFU
  – >50,000 CFU from catheterized specimen
  – >50,000 CFU from any collection method

• Low CFU and symptomatic patient = recollect and treat

• Multiple organisms is likely a contaminated specimen

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Treatment

• Child’s age
• Prior urine cultures
• Local antibiotic sensitivities

Treatment

• Go to drugs:
  – Trimethoprim/Sulfamethoxazole (Bactrim)
  – Cephalexin (Keflex)
  – Amoxicillin
  – Amoxicillin/Clavulanate (Augmentin)
  – Nitrofurantoin
  – Avoid in patients with high fevers

Length of therapy

• Normal urinary system
  – 3-5 days

• Congenital abnormality (such as VUR)
  – 7-10 days
**Treatment**

- Prompt treatment to prevent:
  - Ascending infection
  - Pyelonephritis
  - Renal abscess
  - Renal scarring
  - Urosepsis

**Treatment**

- Prevention:
  - Address bladder and bowel dysfunction
  - Antibiotic prophylaxis
    - Short term 1-3 months while working on voiding dysfunction
  - Cranberry extract
  - D-Mannose
  - Probiotics

**Routine Screening**

- Not recommended
- Do not treat an asymptomatic child
  - Risk potential development of resistant organism

**Follow up**

- Febrile UTI:
  - Renal Bladder Ultrasound (RBUS) 1-2 weeks after treatment
    - Normal RBUS: no need for further imaging
    - Abnormal RBUS: consider VCUG

**VUR**

[Image of VUR diagram]
When to Refer

- Prolonged or severe daytime voiding dysfunction
- Abnormal radiology study
  - Hydrenephrosis on renal ultrasound
    - Thick bladder likely means voiding dysfunction
  - VUR
  - Multiple culture positive urinary tract infections

Referral Tips

- Encopresis typically does not go to Urology. Refer to GI
- Know when your local group will see nighttime only enuresis
  - Example: Children’s Mercy starts seeing patients at 7 years of age
- Try interventions first!

Case Study #1

- 9 year old female
- Presenting with new onset of daytime urinary leakage
- 21 kg

History

- Developmentally appropriate
- No history of ADHD
- Daytime potty-trained by age 3, nighttime age 4
- No recent changes to social situation
- No history or suspicion of physical or sexual abuse
- No new medications

Case Studies

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Diet

• Orange juice in the morning
• Occasional soda at home or for special occasion
• Otherwise water and milk

Voiding Pattern

• Voids 3 times per day when at school
  – Only allowed 2 bathroom breaks at school
  – Reports she “sometimes goes”, likes to socialize with friends instead
  – Feels embarrassed to raise hand to ask to use bathroom
  – Gets “points” taken away if she goes over 2 allotted breaks per day
• 4-5 times when at home on weekends

Voiding Pattern

• Positive for urgency
  – Sits on foot in desk at school
  – Mom confirms seeing Vincent's Curtsy at home
• Positive for leakage, but no full bladder
• Mom reports damp underwear and staining when doing laundry

Stooling Pattern

• Mother insistent child stools daily
• Child points to Bristol stool scale Type 1, but won't talk about stooling pattern
• Mother and child deny any stooling accidents

Focused Physical Examination

• Overall normal with exception of abdominal examination
• Positive for palpable stool in ascending, descending, and transverse colon
• Bladder palpable
• Normal lumbosacral spine examination
• Tanner stage 1-2
• Negative for leaking with cough

Urinalysis

<table>
<thead>
<tr>
<th>Color</th>
<th>YELLOW</th>
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<tbody>
<tr>
<td>Clarity</td>
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<tr>
<td>Glucose</td>
<td>NEGATIVE</td>
</tr>
<tr>
<td>Ketones</td>
<td>NEGATIVE</td>
</tr>
<tr>
<td>Protein</td>
<td>NEGATIVE</td>
</tr>
<tr>
<td>Blood</td>
<td>NEGATIVE</td>
</tr>
<tr>
<td>Bili</td>
<td>NEGATIVE</td>
</tr>
<tr>
<td>Nitrite</td>
<td>NEGATIVE</td>
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<tr>
<td>Leuk Est</td>
<td>TRACE</td>
</tr>
<tr>
<td>Volume</td>
<td>35 mL</td>
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</tbody>
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Urine Culture: No Growth on Day 2
Interventions

- What problems do you see in history?
- Radiology testing?
- Does she need any medications?
- What would we do?

Problems

- School voiding pattern
- Orange Juice and soda
- Stooling pattern

Radiology

- Yes, No, Maybe so...
  - Could argue that a KUB would prove constipation if parent is resistant
  - Down side is radiation to child and cost

Medication

- Miralax cleanout
  - Can do 1 capful every hour for 4-6 hours
- 1 capful daily after cleanout until follow up appointment
- Fiber gummies 1-2 per day

Education

- Discuss healthy voiding and stooling habits
- Give note to teacher allowing her to use restroom more than 2 times per day without penalty
- Encourage her to use restroom when they get a break
- Increase water intake
- Follow up in 1 month

Case Study #2

- 5 year old female presenting with dysuria, enuresis and fever
- 16 kg
<table>
<thead>
<tr>
<th>History</th>
<th>Diet</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Developmentally appropriate</td>
<td>• Water or milk</td>
</tr>
<tr>
<td>• No history of ADHD</td>
<td>• Occasional soda for special occasions</td>
</tr>
<tr>
<td>• Daytime potty-trained by age 3, nighttime age 4</td>
<td></td>
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<tr>
<td>• Recently started Kindergarten</td>
<td></td>
</tr>
<tr>
<td>• No history or suspicion of physical or sexual abuse</td>
<td></td>
</tr>
<tr>
<td>• No new medications</td>
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<table>
<thead>
<tr>
<th>Voiding Pattern</th>
<th>Stooling Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Typically 5-6 times per day at home</td>
<td>• Stooling daily</td>
</tr>
<tr>
<td>• Unsure how often she goes at school</td>
<td>• Mother and child point to Type 3-4 on Bristol Stool Scale</td>
</tr>
<tr>
<td>– Classroom has bathroom with unlimited access</td>
<td></td>
</tr>
<tr>
<td>• Since starting school has noticed damp underwear when she comes home</td>
<td></td>
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</table>

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<thead>
<tr>
<th>Focused Physical Examination</th>
<th>Urinalysis</th>
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<tbody>
<tr>
<td>• Positive for palpable stool in transverse colon</td>
<td>Color: AMBER</td>
</tr>
<tr>
<td>• Bladder palpable- tender to palpation</td>
<td>Clarity: CLOUDY</td>
</tr>
<tr>
<td>• Normal lumbosacral spine examination</td>
<td>Glucose: NEGATIVE</td>
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<td>• Tanner stage 1</td>
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<td>Leuk Est: 3+</td>
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<tr>
<td></td>
<td><strong>Urine Culture:</strong> &gt;100,000 E. Coli, pan sensitive</td>
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Interventions

- What problems do you see in history?
- Radiology testing?
- Does she need any medications?
- What would we do?

Problems

- Recently started Kindergarten
- School voiding pattern is unknown

Radiology

- Renal Bladder Ultrasound
  – Normal
  – Post void residual 20 ml

Medication

- Given symptoms and positive in-house UA, starting treatment with antibiotics is appropriate

Education

- Discuss healthy voiding and stooling habits
- Allow water bottle at school
- Invest in reminder watch
- No further radiology testing indicated with normal RBUS
- No follow up UA indicated if symptoms resolve
- No referral to urology unless further UTIs

References

Chandra, M. Voiding Disorders. In Adolescent Health Care (p. 1201).