Objectives

• Provide an introduction to uroflowmetry
• To understand the proper use and application of uroflowmetry
• For learners to understand the basic flow patterns and common etiologies of each

What is Uroflowmetry

• A noninvasive (safe with no side effects for the patient)
  – Uroflow studies consist of measuring the rate, volume voided, voiding time and examining the pattern during urination into an uroflowmeter. (measurement of force and flow)
• Patient must be toilet trained/understand uroflow goals
• Pts. Prevoid volume should be >50% of expected volume for age (EBC= age in years + 2 x 30)
  – *this may require adjustment if patient is known to have a very small for age bladder capacity
  – *special considerations taken in certain diagnosis such as BE
Types of Uroflowmetry

- Uroflowmetry without electromyography (EMG)
- Uroflow with electromyography (EMG) of the perineal muscles
  - Advantage of combined evaluation is the ability to appreciate synergy or dyssynergy between the bladder and pelvic floor
  - Both EMG and non EMG uroflowmetry should include post void residual urine measurement

Flow only-part of initial assessment of LUT

Why do we perform Uroflowmetry?

- A diagnostic tool-to be used in combination with a thorough history
  - Diagnosis based on etiology of symptoms instead of symptoms alone “follow it backwards”
- Noninvasive
- A measure of progress
  - Clinical improvement isn’t enough
  - Compensatory voiding can leave the upper tracts at risk “ignorance is not bliss”

Uroflowmetry/Urodynamic Biofeedback
Uroflowmetry with EMG-insight to function…or dysfunction

Post Void Residual

- Both EMG and non EMG uroflowmetry should include post void residual urine measurement
- Indicator of degree of dysfunction and a quantitative measure the result of that dysfunction: important teaching tool for parental discussions.
- Elevated PVR’s
  - 4-6 year olds: single PVR>30ml or repetitive PVRs >20ml
  - 7-12 year olds: single PVR>20ml or repetitive PVRs >10ml

Chang, Chiang, Hsieh, et al., 2013

Clinical Presentations

- Recurrent UTI’s
- Incomplete Bladder Emptying
- Urinary Incontinence
- Urinary Frequency
- Urinary Urgency

Etiologies

- Detrusor-sphincter dyssinergia
- Urethral obstruction (numerous causes)
- Neurogenic bladder dysfunction
- Non neurogenic bladder (BBD)
Normal vs. Abnormal
Is this adequate?

Uroflowmetry Parameters

- **Voided Volume (mL)**: The total volume collected in the measuring device during the recorded voiding period.
- **Average Flow (mL/sec)**: This is the average of the total flow during the voiding time.
- **Max Flow (mL/sec)**: Maximum value of free flow rate, during the void period. Also referred to as peak flow rate.
- **Computed Max Flow Rate (mL/sec)**: The computed value of the sustained max flow rate as compared to the measured max flow rate.
- **Time to Max Flow Rate (seconds)**: The time at which max flow rate occurs.
- **Voiding Time (seconds)**: The time it takes the person to void. This includes post micturition drops only if the flow rate is greater than 2mL/sec. This is measured in seconds.
- **Flow Time (seconds)**: The time taken by the patient between the start of voiding and the first time the voiding flow rate reaches zero. This is measured in seconds.
- **Delay Time (seconds)**: The time from the directive to void until actual micturition occurs. This can also be the time from the onset of considerable patient urge to void until the beginning of the void.
- **Interval Time (seconds)**: Total time during the voiding when the patient’s flow has paused.
- **Computed Average Flow Rate**: The average flow rate, re-calculated taking into consideration the interval time.

Flow Rate

- Maximum flow rate, Qmax, (Peak Flow): most important quantitative variable in assessment of bladder outflow
  - Sharp peaks typically represent artifact
  - Many factors including “kicking the bucket”
  - Max flow rate should be registered only when peak level has a duration of =>2 seconds
  - If the square root of the max flow rate equals or exceeds the voided volume (mL), the recorded max flow is considered normal.

Flow Curve Shape

- **Paramount** in analyzing flow patterns
- Precise shape is determined by detrusor contractility and is then influenced by factors such as abdominal straining, coordination with the bladder outlet musculature and any distal anatomic obstruction
- Flow patterns are not diagnostic but provide insight and clues to specific conditions that may be at work
- Post void residual measurement and possible RBUS important in determining impact of dysfunction

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Five Flow Patterns

- Bell
- Tower
- Staccato
- Interrupted
- Plateau

Bell shaped curve

Tower shaped curve
Spinning Top Urethra

Staccato shaped curve

Interrupted curve/flow

Interrupted curve/flow with EMG
Abdominal straining

Uroflowmetry in isolation has limited value

- Need an excellent history
  - Urinary history, timing, progression
  - Bowel history both from parent and from any previous radiographs
- The interplay between pelvic floor and abdominal EMG provides important info
- What else is happening with the child
  - Nervousness, anxiety
How do you prepare a child for uroflowmetry?

- Explain the procedure in developmentally appropriate terms—answer their questions
- Have child adequately hydrate—avoiding overhydration
- Desensitize to perirectal sensors
- Provide privacy—child should be empowered to make as many decisions regarding privacy as possible.

Uroflowmetry setup options

Points to Ponder

- Uroflowmetry is a noninvasive diagnostic and monitoring tool
- Critical to know pts expected bladder capacity & functional capacity (true capacity-post void residual)
- Key=adequate bladder filling, avoiding overfill—prep parent
- Non invasive means can often provide adequate information and should be considered before invasive testing
- As comfort with uroflowmetry increases more advanced/complex courses are available
  - ICCS is an excellent resource

Additional learning opportunities—ICCS on line course

https://jotform.com/60534923124147
There's even an App for that!

References


- Yang, SS., Chang, SJ.: Uroflowmetry in children can be simply classified as normal or abnormal pattern. Urol Sci. 2013;21(1):142-44