Pediatric Urodynamics 101
PUNS 2019
Shelly J. King RN MSN CPNP

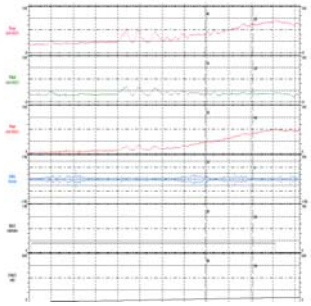
A how to guide for a very challenging pediatric evaluation!

Urodynamic Testing Goals

- Reproduce symptoms of lower urinary tract dysfunction while obtaining precise measurements of the filling and emptying phases of the lower urinary tract.
- Create an objective evaluation of lower urinary tract to identify the pathology of symptoms and guide clinical management

* if study does not reflect patient history
likely related to error in study

Multichannel Urodynamic Evaluation



- A part of a thorough evaluation of lower urinary tract
- Clinical context is important
- Performed poorly worse than not doing at all
- Used in combination with other studies to diagnose and treat

Urodynamic Background

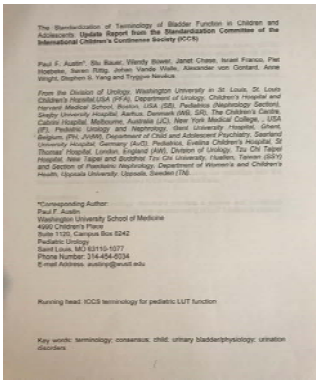
If you've seen one urodynamic study you've seen one urodynamic study

- Clinicians play central role performing approx. 75% of all studies
- Value well established
- Few have formal training
- (Gray, M. (2010). Urologic Nursing)

- Technically dependent
- Invasive and costly
- Training does matter
- Significant learning curve
- Done by MA, LPN, RN, NP, PA, MD

STOP BY THE VENDORS

ICCS Standard doc



The Standardization of Terminology of Bladder Function in Children and Adolescents: Update Report from the Standardization Committee of the International Children's Continence Society (ICCS)

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Running head: ICCS terminology for pediatric LUT function

Key words: terminology; consensus; child; urinary bladder/physiology; urination disorders

Equipment

- Promethius
- Laborie
- SRS Medical
- Cooper Surgical

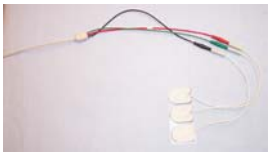
Tables

Flouro-Video Urdynamics

Uroflow Seats and Measures

- Think about positioning
- Adjustable arms for larger patients

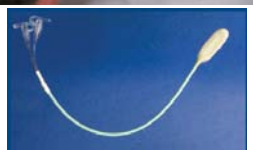
Surface EMG Electrodes



All equipment uses surface electrodes-evaluates the coordination of sphincter activity

Needle electrodes –less common, more accurate, discomfort (used with less sensate patient)

Rectal Catheters



Infusion Pumps

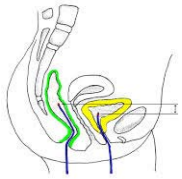
- Prime tubing
- Carefully place into pump
- Warmed to 36C, room temp
- Fill rates: not physiologic slower more accurate assessment of compliance
- EBC/10 or Wt./Kg/4 in ml/min. When in doubt decrease fill rate by 50% and repeat study
- Filling mediums:

  Sterile water, NS, contrast,

  neomycin 1ml (can be added)

***Multiple formulas for bladder capacity based on age, wt, and dx

Air Charged Transducers/Catheters



- Open position to zero to atmosphere
- Charge position to measure patient's pressure
- Reference level-balloon on the catheter
- Artifact: connections, defective catheter

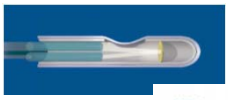
Disposable

Easiest to use

Fluid Filled Transducers/Catheters

- Reference level at the upper edge of the pubis symphysis
- Fluid transmits measured pressure to external transducer
- Water filled
- Disposable
- More options, foley, 5fr, 7fr, 10fr, coude
- Kinks, air bubbles cause artifact

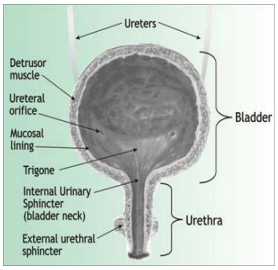
Fiber Optic Technology Micro-Transducer Tip



- Reference level on the catheter
- Electronic transducers mirrors, relies on light and pressure
- Cant bend, fragile more maintenance/time
- Zero outside the body can balance or equalize during the study if needed
- Reusable (high level disinfectant)

Urodynamic Study Questions

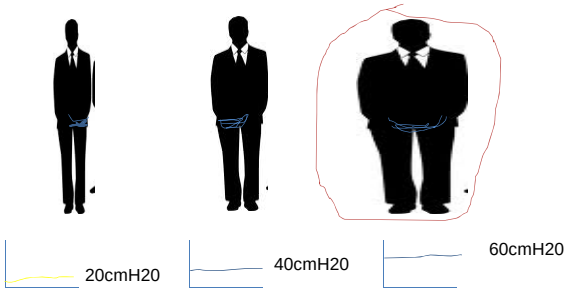
- Cystometric **capacity** - How much fluid will the bladder hold?
- Bladder wall **compliance** - How does the bladder wall distend?
- Urethral sphincter **competence** - How the sphincter holds fluid during filling and how does it relax during emptying?
- Bladder filling **sensation** – How are bladder filling sensations affected by volume, pressure, and environment?
- Filling/storage **stability** - Is the detrusor response to filling stable?



Pressure Relationships
Why are they so important?

MOU1

Who has the most abdominal pressure on the pelvic floor?



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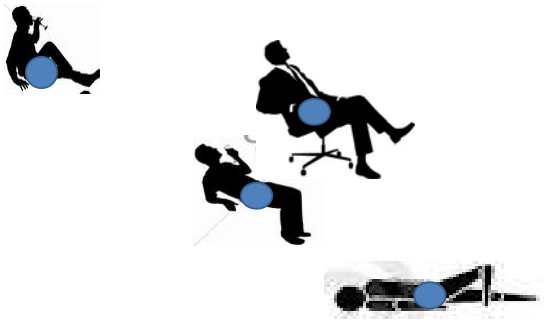
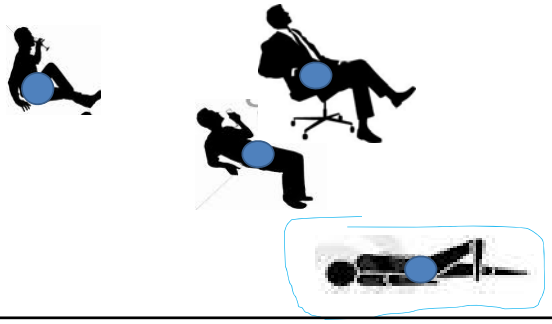


Slide 19

MOU1 Microsoft Office User, 8/26/2018

Who has the least abdominal pressure on the pelvic floor?



Test Positions

5 -20cmH20 supine
15-40cmH20 sitting
30-50cmH20 standing
Position to best visualize urethra for leakage

Patient Positioning

- Supine- CP, Spinal cord injury, myelomeningocele, neuromuscular disease
- Seated- can be done in safe environment, more likely to reproduce symptoms if patients primary position
- Seat adapter for female flow rates
- Standing-risk of falls and catheter dislodgement (more common in adults)
- Ambulatory-less practical in children but technology is improving

Patient Prep

- Provide patient with accurate information (what is going to be done and how *(remember uroflow instruction)
- Comprehensive history of LUTS/diaries

- NO LATEX
- Anesthesia rare – can use local (lidocaine 2%gel), midazolam, nitrous/general rarely needed (pyscho-social indications)
- Pre-procedure urine culture in clinically relevant patients-VUR maybe unknown
- Antibiotic treatment or prophylaxis in select patient

Patient Preparation
Urinary Tract Infection

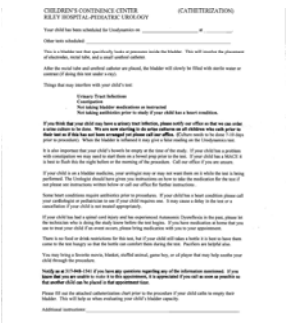
- Specific to patient, does patient have a history of symptomatic UTI (will it alter test results)
- Urine culture prior to exam/ treated
- Check urine prior to urodynamic study-VUR maybe unknown
- Small risk of UTI with good technique
- Prophylaxis rarely needed
- Some patients may have asymptomatic bacteruria

Procedure Order

- Demographics
- Diagnosis/Indication ICD10
- Flouro or non-flouro
- Additional tests
- Time frame (? urgent)
- Where (OR, Xray, clinic)
- Anesthesia (rare)
- Off day/same day
- Interpreter
- Special precautions (AD,SBE)
- Urine culture
- Bowel prep

Call to Family/Patient

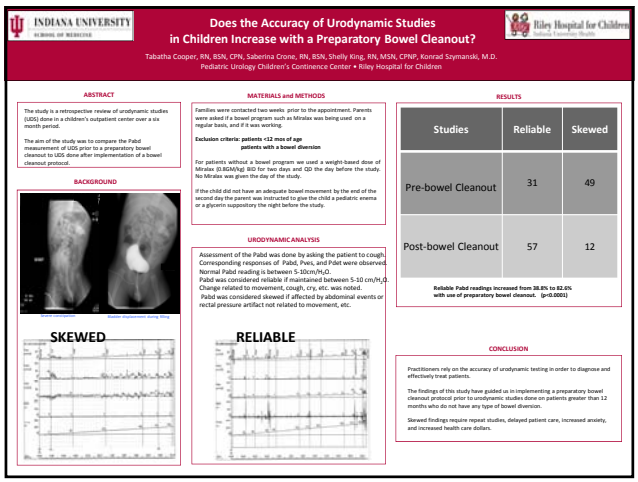
1. Date, time
2. Bowel Prep
3. Urine Culture
4. Medications antibiotics, anticholinergics
5. SBE prep
6. Autonomic dysreflexia medication (Nifedipine)
7. Feeding instruction
8. Favorite distraction
9. Voiding/cath diary



Bowel Preparation

- Neurogenic bowel-continue routine program/if recent history of poor success may add additional therapy
- If rectal vault full may have to disimpact manually to get accurate measurement of abdominal pressure
- 0.8mg/kg polyethylene glycol 3350 bidx3d,add glycerin suppository/enema if not effective. Dramatically decreased abdominal events in our series of 149pt.
- Do not treat on day of study as may result in bowel irritability or spasm that make interpretation difficult
- Limited research

*J Urol. 2010 Oct;184,**Effect of rectal distention on lower urinary tract function in children. Burgers et al.**



INDIANA UNIVERSITY SCHOOL OF MEDICINE

Does the Accuracy of Urodynamic Studies in Children Increase with a Preparatory Bowel Cleanout?

Riley Hospital for Children

Tabatha Cooper, RN, BSN, CPN, Saberina Crone, RN, BSN, Shelly King, RN, MSN, CPNP, Konrad Szymanski, M.D.
Pediatric Urology Children's Continence Center • Riley Hospital for Children

ABSTRACT

The study is a retrospective review of urodynamic studies (UDS) done in a children's outpatient center over a six month period.

The aim of the study was to compare the Pabd measurement of UDS prior to a preparatory bowel cleanout to UDS done after implementation of a bowel cleanout protocol.

BACKGROUND

MATERIALS and METHODS

Families were contacted two weeks prior to the appointment. Parents were asked if a bowel program such as Miralax was being used on a regular basis, and if it was working.

Exclusion criteria: patients <12 mos of age
patients with a bowel diversion

For patients without a bowel program we used a weight-based dose of Miralax (0.8GM/kg) BID for two days and QD the day before the study. No Miralax was given the day of the study.

If the child did not have an adequate bowel movement by the end of the second day the parent was instructed to give the child a pediatric enema or a glycerin suppository the night before the study.

URODYNAMIC ANALYSIS

Assessment of the Pabd was done by asking the patient to cough. Corresponding responses of Pabd, Pves, and Pdet were observed. Normal Pabd reading is between 5-10cm/H_2O.
Pabd was considered reliable if maintained between 5-10 cm/H_2O. Change related to movement, cough, cry, etc. was noted.
Pabd was considered skewed if affected by abdominal events or rectal pressure artifact not related to movement, etc.

RESULTS

Studies	Reliable	Skewed
Pre-bowel Cleanout	31	49
Post-bowel Cleanout	57	12

Reliable Pabd readings increased from 38.8% to 82.6% with use of preparatory bowel cleanout. (p<0.0001)

SKEWED

RELIABLE

CONCLUSION

Practitioners rely on the accuracy of urodynamic testing in order to diagnose and effectively treat patients.

The findings of this study have guided us in implementing a preparatory bowel cleanout protocol prior to urodynamic studies done on patients greater than 12 months who do not have any type of bowel diversion.

Skewed findings require repeat studies, delayed patient care, increased anxiety, and increased health care dollars.

Medications
To Give Or Not To Give

- Up to MD (individualized to patient)
- UDS maybe first or baseline study (no meds)
- UDS used to determine response to treatment
- Should be determined prior to study, stopped 3-7 days prior if indicated. Make patient aware to avoid rescheduling
- Tricyclic antidepressants: beware of discontinuation syndrome (may need to be weaned)
- Antimuscarincs (anticholinergics)- oxybutynin, tolterodine, diphenhydramine, glycopyrrolate, hyoscyamine
- Alpha-adrenergic antagonists- tamsulosin, doxazosin
- Tri-cyclic antidepressants- imipramine, amitriptyline
- Caffeine (stimulant)
- Diuretics - (Lasix with Mag 3)
- Sphincter stimulants- pseudophedrine
- Sedatives

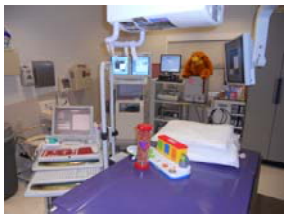
Table Set Up

Patient Education

Techniques
- One to one discussion
- Educational brochures
- Educational videos
- Child-Life
- Family/friend support

Approach – NEVER RUSHED!

- Be prepared, review chart before patient arrives
- Adopt a calm organized and systematic approach, avoid chaos - alleviate anxiety
- Be honest and reassuring - speak directly to patient, position parents directly next to child
- Distraction-Ipad, Ipod, movies, electronic games,bubbles, toys, blanket pacifier, bottle, CHILD LIFE
- Rewards – stickers, prizes, gift cards



Make lab as pleasing as possible
Children may be frightened by technology

Environment

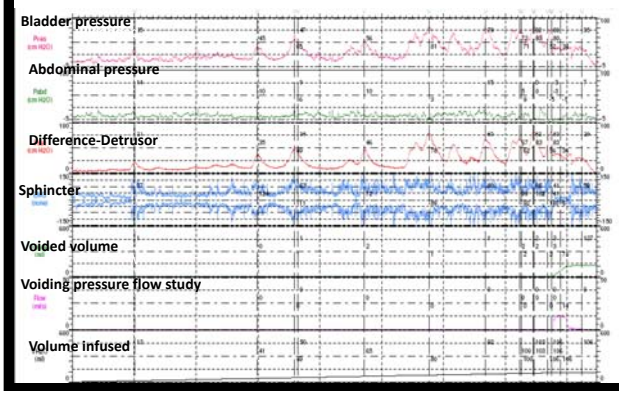
- Provide privacy to reduce embarrassment
- Discuss expectations: LUTS symptoms will be managed promoting dignity and understanding
- EX; we expect you to have the same type of accident (incontinence) you experience at home its ok we have the area prepared

- **Anxiety** may produce LUTS, we want to avoid it as much as we can
- **Fear** is primarily related to fear of pain
- **Embarrassment** from exposure of genitalia or occurrence of LUTS

Multichannel Urodynamics What do they measure?

- **Uroflow (Qura)** volume of urine expelled in a unit of time, measured in ml/sec
- **Intravesical pressure (Pves)** combination of of abdominal and bladder forces acting upon the bladder measure in cm/h2o
- **Abdominal Pressure (Pabd)** the abdominal forces acting upon the bladder measured in cm/h2o by rectal or vaginal catheter (talking, laughing, crying)
- **Detrusor pressure (Pdet)** true pressure of the detrusor contraction derived by Pves-Pabd=Pdet
- **Voiding Pressure flow** assesses bladder and sphincter function during micturition
- **EMG** assess sphincter function during filling and voiding

Understanding the Graph

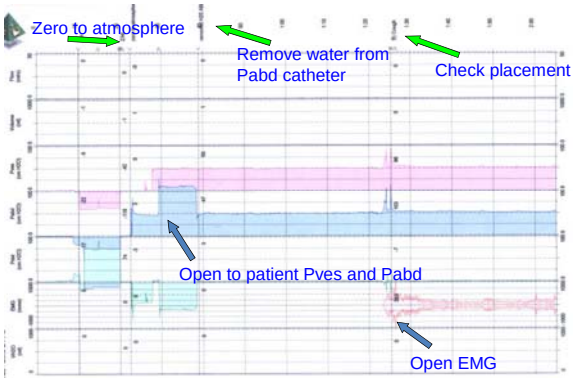


Zero Pressure

- Surrounding atmospheric pressure is zero
- Pressure is recorded when transducer is open to environment (air or water)
- Open to patient to measure patients pressure
  - 5 -20cmH20 supine
  - 15-40cmH20 sitting
  - 30-50cmH20 standing

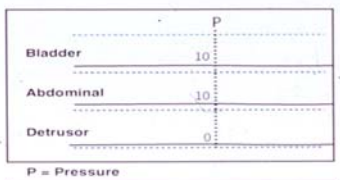
Setting Zero
Everyone starts out even
Then its every man for himself

ZEROING TO ATMOSPHERE



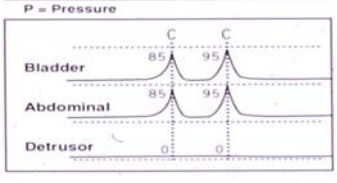
Pressure Relationships
(Filling Phase/Cough)

Filling Phase –
Bladder at rest
Measure baseline

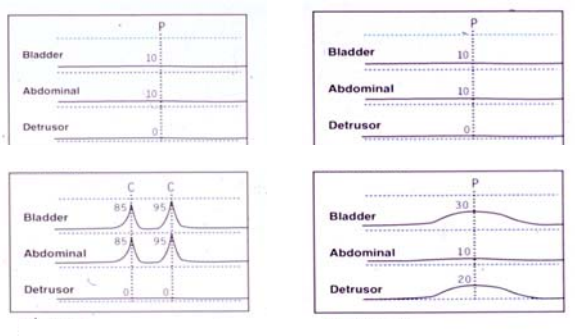


P = Pressure

Filling Phase-
ABD/Vesical pressure
with cough

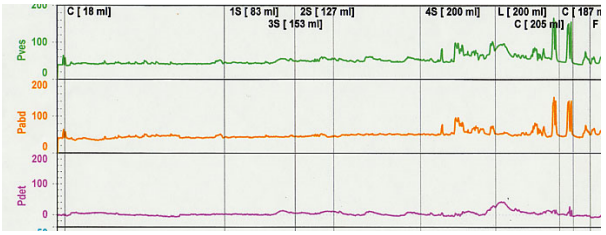


Fill Void



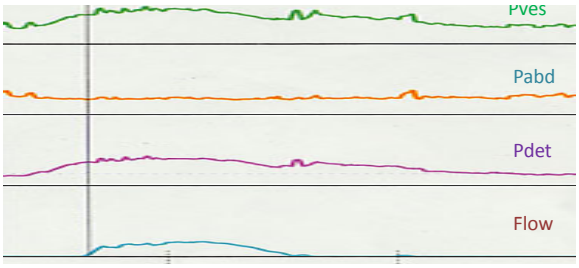
Pressure Relationships

(Filling - Pves-Pabd=Pdet)

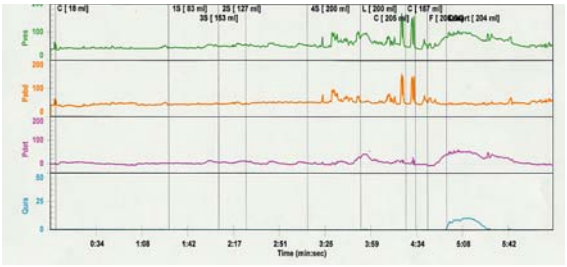


Pressure Relationships

(Voiding Study)

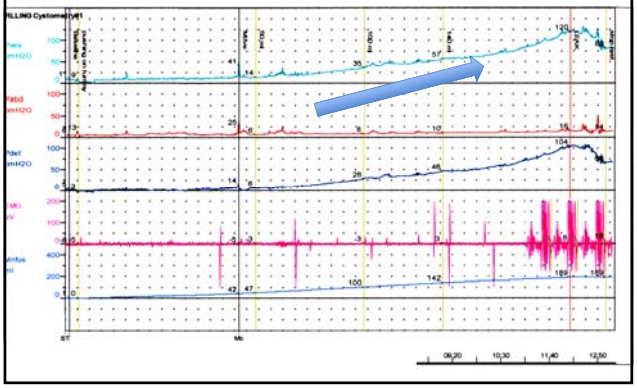


Completed CMG/Pressure Flow Study



Patient voided 220ml
in 30 sec
with a flow max of 10ml/sec
Max detrusor pressure is close to 60cm/h20

What is the relationship? Pabd and Pves and Pdet



Equipment Set Up-Step by Step

- Gather all supplies
- Turn on machine: computer, printer, screen ect
- Prepare the uroflow,
- Turn screen on
- Enter patient info
- Prime pump
- Prepare transducers water or air
- Set zeros to atmosphere check set zeros
- **Discuss testing with patient/family**
- Have patient void into uroflow
- Measure opening pressures. (specific to institution)
- Drain bladder
- Place rectal tube
- Choose appropriate exam (pressure flow study, CMG, ect.,)

Cont. Set - Up

- Connect the catheters, air charged catheters should be in the open position when inserting
- Set zero while transducer in open position, once placed charge.
- Water filled will need to be flushed to be sure full column of water without air before starting, turn transducer off to patient and zero to atmosphere (if needed)
- Click Run
- Have patient cough to make sure all transducers working
- Mark events (first urge, strong desire, cough VLPP, DLPP, reflux, pain, laughing, crying, end fill, capacity)
- Pressure flow study - when patient feels full, mark event and allow them to void , mark voiding pressure peak
- Stop test
- Save test
- Add any events needed and save again
- Print test
- Review with provider

Video Advantges

Bladder shape during filling and voiding,
Moment reflux occurs, voiding influence on reflux, Configuration of urethra and pelvic floor with voiding

Capacity

- Difference between functional and cystometric capacity
- Allow patient time to relax before starting to fill
- Affected by filling medium, rate, temperature, and anxiety level
- May be difficult to determine with sphincter incompetence, may have to inflate Foley to prevent continuous leakage and assess capacity
- Functional-derived from voiding diary (first AM void maybe helpful) or genuine desire to void

Capacity

Male/adult		Female/adult	Pediatric
functional	382ml	330ml	?
cystometric	617ml	570ml	?

Pediatric formulas for calculating bladder capacity
Koff (age in years + 2) x 30= capacity in ml (widely used)
2x(age in years) + 2 = capacity in ounces for < 2 yrs
Age in years + 2 + 6 = capacity in > 2 yrs

Koff SA., 1983 Urology 21(3) : 248
Kaefer M., J. of Urology, 1997 168:2261

Capacity

- Key points
- Volume needed to reproduce patients LUTS during urodynamic filling
- Highly variable; esp in children (also in adults)
- Measured voided volume (uroflow) plus cath residual is most accurate measurement of capacity (compare to filling volume +residual)
- Pediatric studies may take >30min and urine will be made.

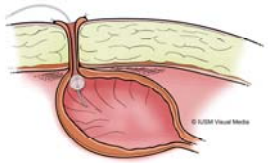
Capacity

- **Large**
- Chronic distention: polyuria, behavioral, denervation
- Large bladder may not be associated with diminished contractility
- Does not diminish with age

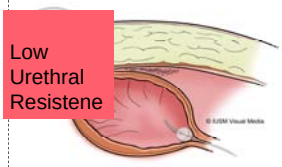
- **Small**
- Detrusor over-activity
- Urgency (decreased functional capacity but not cystometric capacity-patient may have triggers)
- Low bladder wall compliance
- Low urethral resistance

Capacity - Incontinence

Vesicosotmy-high outlet resistance
Occluded with a foley UDS catheter

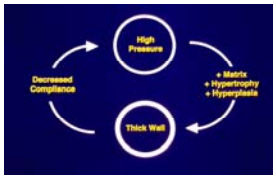


Low Urethral Resistene



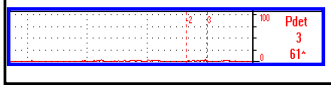
Compliance

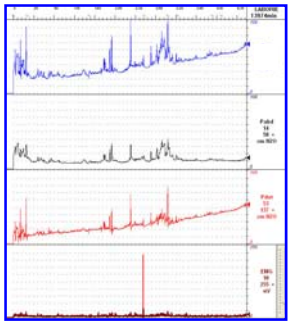
- Cause: change in smooth muscle tone or viscoelastic properties (fibrosis of bladder wall) – decreased blood flow
- Can change over time with some conditions
  Myelodysplasia, PUV, BOO, radiation Dyssynergia, MS, Diversions, Tethered Cord, ect



Compliance

- Relationship between changing bladder volume and detrusor pressure (ml/cmH2O) Elasticity = ability of the bladder wall to distend
- Affected by fill rate, configuration of bladder, thickness of bladder wall, detrusor contractility
- Normal to see little or no change in pressure during filling - High compliance maintain low detrusor pressure during filling

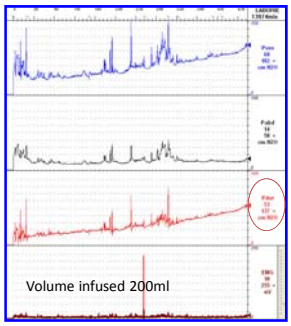




Low Compliance
rapid upsweep to graph slope

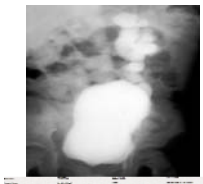
Compliance

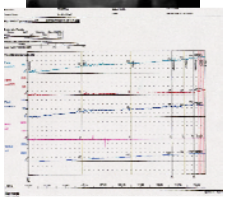
- Over-activity/low compliance
- Compliance/calculation $C = \Delta V / \Delta P_{det}$,
- C=vol in ml/pdet cm/H2O 200/53=3.8ml/cm H2O
- Normal compliance >20ml/cm H2O
- Low compliance <10ml/cm H2O



Compliance

- Measure at specific volume events based on expected capacity (events every 25ml or 50ml)
- Slope of curve critical (flat=normal) (ski slope=low compliance)
- Specific pressure measurements 20-30cm/H2O small risk upper tract damage (UTD)
  30-40cm/H2O moderate risk(UTD)
  >40cm/H2O high risk (UTD)needs upper tract evaluation

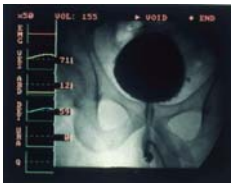




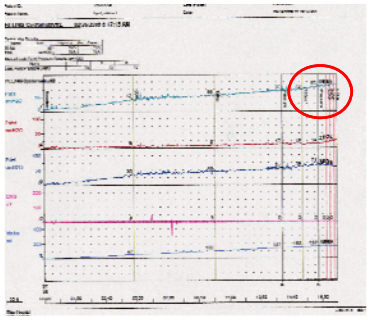
Detrusor Leak Point Pressure

(DLPP)

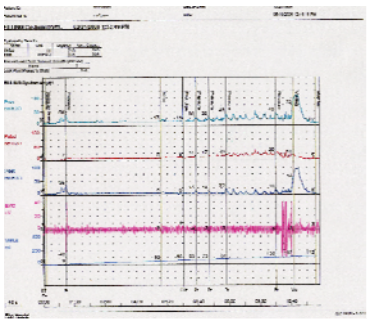
- The lowest detrusor pressure at which urine leakage occurs in the absence of either a detrusor contraction or increased abdominal pressure
- Performed by observing the pressure on the UD graph (mark event)
  - The DLPP is noted when urine leaves the bladder involuntarily.



Compliance
High DLPP – Low Compliance



Compliance
Overactivity with High Compliance



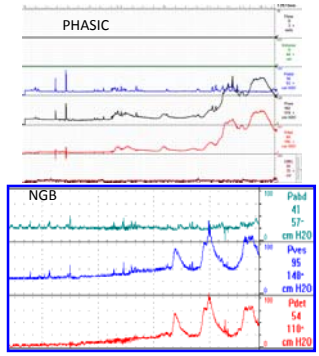
Stability

- Normal detrusor function
  - allows bladder filling with little or no change in pressure
  - Contraction may occur normally during first 1/3 of filling, not assoc. with leaking or urge to void
  - no involuntary phasic contractions occur despite provocation
- Detrusor overactivity
  - a urodynamic observation characterized by involuntary detrusor contractions during the filling phase which may be spontaneous or provoked
  - there is no lower limit for the amplitude of an involuntary detrusor contraction
  - Subclinical detrusor contractions can be seen in patients without incontinence

Stability

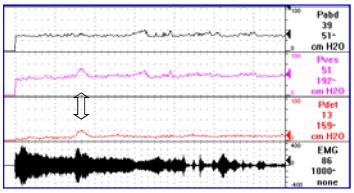
(Detrusor function during filling)

- Idiopathic Detrusor Overactivity
- Phasic Detrusor Overactivity
  -wave form +/- incontinence
- Terminal Overactivity
  -single contraction at the end of fill cant be suppressed UI, void.
- Detrusor Overactivity Incontinence
  -incontinence due to an involuntary detrusor contraction
  -- Neuropathic detrusor overactivity when there is a relevant neurological condition
- Provocative Maneuvers
  --techniques used during urodynamics in an effort to provoke detrusor overactivity
  --rapid fill, cool mediums, postural changes, hand washing, cough, laugh

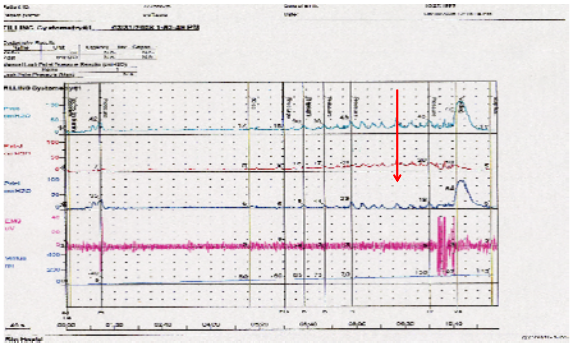


Stability

- Filling contractions occur during first 1/3 of fill
- Produce minimal to negligible urge
- Not associated with leakage



Detrusor Overactivity



Sensations

- **Normal** – no real awareness of filling and increasing sensation up to a strong desire to void
- **Increased** - an early and persistent desire to void
- **Reduced** - aware of filling-does not feel a definite desire to void
- **Absent** - no sensation of bladder filling/desire to void
- **Non-specific** - perceive bladder filling as abdominal fullness
- **Bladder pain** - abnormal feeling during filling, (detail pain location, intensity, what makes it better or worse, sensed at urinary meatus)
- **Urgency** - sudden compelling desire to void

Sensations

- Sensations of patient affected by volume, pressure, and psychosocial environment
- Sensory points include:
  - **first sensation** of bladder filling:
    - becomes aware of the bladder filling
  - **first desire to void**: would void next convenient time, but could hold
  - **strong desire to void** or capacity: (300-600ml)ADULT
    - persistent desire to void without fear of leak
  - Imminent desire to void/bladder fullness
- Use pressure not volume to determine cystometric capacity patient may have delayed sensation vs true retention

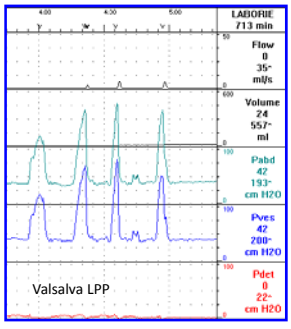
Sensation-Pediatric

- Use phrases kids recognize, may not respond to first urge, ect.
- Children >age 4 may be able to identify first urge
- Looks for signs of wiggling toes, increased movement or fussiness
- First fill typically low
- Always complete 2 runs, unless first study is completely normal

Get your big girl boots on

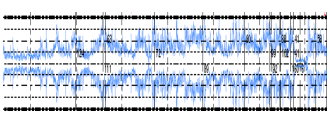
Competence

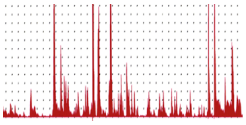
- Ability of the external striated muscle to hold urine and relax to release urine
- Evaluated using Abdominal Leak Point Pressure (ALPP or Valsalva Leak Point Pressure (VLPP)



EMG-Electromyography

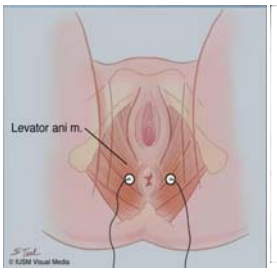
- Graphic representation of the electrical activity of one or more motor units within a given muscle group
- Mimics striated external urethral sphincter-pelvic floor activity

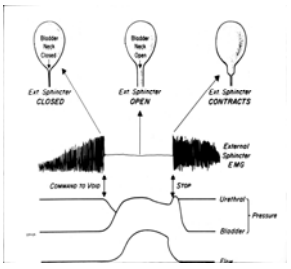




Gray, M. (2011). Traces- Making sense of the urodynamics testing- Part 3: Electromyography of the pelvic floor muscles. *Urologic Nursing*, *31*(1), 31- 38.

Sphincter Evaluation



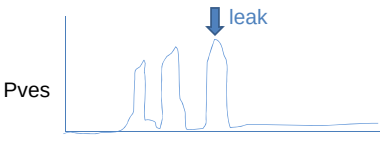


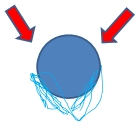
EMG electrode placement on each side of anal sphincter
Mimics striated external urethral sphincter /pelvic floor activity

Abdominal/Valsalva Leak Point Pressure

ALPP, VLPP

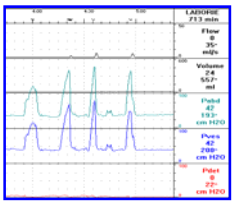
- Performed by instructing patient to bear down, blow on their arm or cough
  - Stop blowing when there is a leak
  - The ALPP or VLPP is noted when urine leaves the bladder involuntarily.



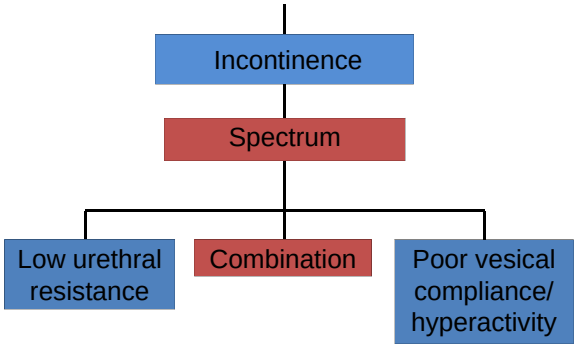


Competence - Sphincter

- Assess at one half of the expected capacity in children
- Valsalva preferred /cough difficult to elicit. May gently press on abdomen.
- Detrusor overactivity may see increased sphincter activity
- Obstructive urethral function (valves, stricture,neuropathic)
- Guarding reflex-increased urethral pressure shortly before voiding/increased EMG
- Stress Urinary Incontinence (SUI)
- Functional obstruction can be intermittent or constant



Competence and Compliance
Gathering Information- Marking Events



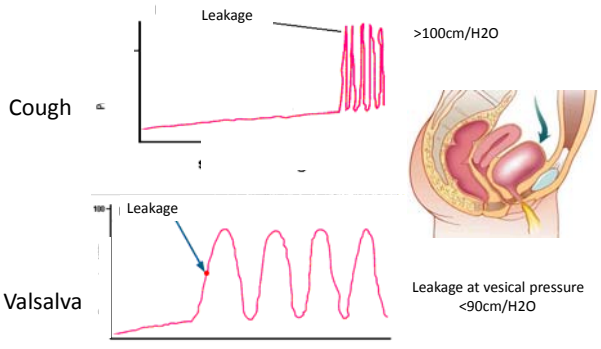
Competence
Urinary Incontinence/UI

- Stress: leaks with cough, sneeze, activity
- Urge: leaks with urgent desire to void, some describe the leak just prior to urge
- Mixed: combination of leak with stress and urge
- Enuresis: not physiologic/ delayed voiding, behavioral,functional obstruction intermittent/constant
- Giggle: only with laughter full loss of urine

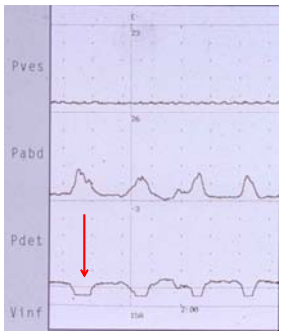
Sphincter Competence

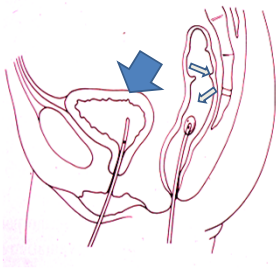
- Abd LPP (abdominal force it takes to push urine across the sphincter) implies SUI
- Abdominal leak point pressure < 90cm H_20
- May occur in (MMC, lower segment SCI), or if pelvic floor support has been surgically altered
- Be provocative if necessary

Performing ALPP/VLPP



Rectal Peristalsis

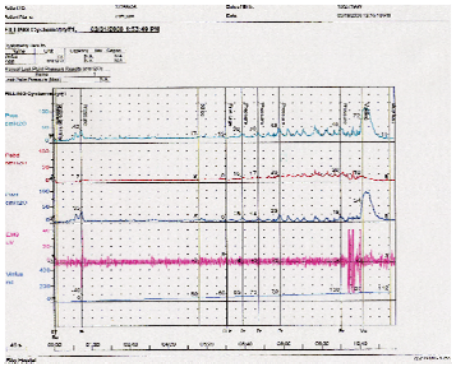




Artifact

- Can be significant particularly in peds
- Kinked or poorly placed catheter
  Female infants and children 2-3 cm
  Male infants and children up to age 6 (7.5-10cm)
  Males >6 through adolescence 12.5 cm
- Air in line
- Over inflated rectal balloon
- Water temperature, or fill rate
- Anxiety, lack of understanding

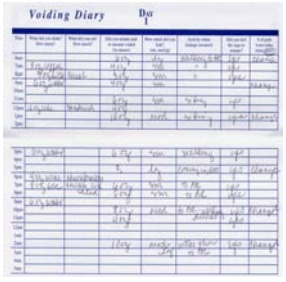
Moving On



Filling/Storage Symptoms Sample

Voiding Dairies very important!
Forces patient or parent to document symptoms as lived not remembered
Connects symptoms to the study

- Voiding frequency (>8 voids day, >q2hr,↑intake)
- Urgency-extreme desire to go cant be delayed)
- Incontinence-involuntary leakage of urine
- Painful bladder symptoms
- Nocturia-awakening to void at night (not typical in children)



Emptying/Voiding Symptoms

Connect symptoms to the study

- Hesitancy- difficulty initiating stream
- Intermittent-stop/start stream
- Straining- using abdominal muscles to force or sustain voiding (kids use it to rush void)
- Slow stream-weak
- Spraying or splitting- loss of single stream
- Terminal or post void dribble-prolongs voiding

Abrams et al., 2002 Standardization of lower urinary tract function/ICS

Post-Micturition/Voiding Symptoms

- Sensation of incomplete emptying, may or may not be an accurate perception
- Post-void dribble- involuntary loss of urine post void
- Post void bladder contraction

Abrams et al., 2002 Standardization of lower urinary tract function/ICS

Uroflowmetry - Devices

- Oldest Urodynamic test
- Great screening test, identifies patients that need further evaluation
- Also called Uroflow or flowrate
- Supports suspected diagnosis (BOO, poor voiding contraction)
- Measures force of the urinary stream, flow pattern and bladders ability to completely empty

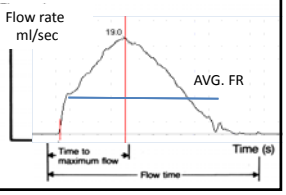
Gravity metric meter- Beaker placed on transducer, weight of collected fluid is measured

Spinning disc – measures passing of urine across a spinning disc transducer, change in the spin rate is converted to a tracing

Uroflowmetry / Flow rate

- Measures volume of urine (ml) expelled from the bladder in unit of time (ml/sec)
- Flow time - the time over which measurable flow actually occurs
- Voiding time-total duration of micturition including interruptions
- Time to max flow - the elapsed time from onset of flow to maximum flow
- Qmax flow- max flow sustain for one sec.

  Avg flow rate-50% of max



Tips for a Successful Uroflow

- Arrive with comfortably full bladder, peds patients may need to drink in waiting room close to the uroflow
- Ultrasound bladder prevoid if necessary
- Patient should have strong urge to urinate
- Privacy (can stop test, provide toiletries)
- Foot rest
- Usual voiding position (standing, sitting)
- Review results with patients
- Are results representative of patient history, repeat as necessary

Uroflow vs Voiding Pressure Flow What's the difference?

- Screening tool
- Non-invasive
- Natural filling study
- Component of a pressure flowstudy

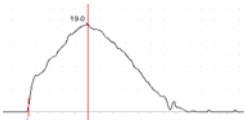
- Invasive
- Measures flow rate and pressure with voiding
- Measures detrusor contractility/urethral resistance
- Unnatural filling of bladder through a catheter

Uroflometry

(Normal Values)

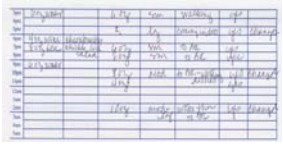
- 5-10yr 222m,122f
  Max 15.76+_4.54ml/s Avg 7.68+_3.26ml/s Male - 17.98+_6.06
  Female 9.19+_4.23ml/s
- 11-15yr 240m,137f
  Max 22.50 +_7.24ml/s
  Avg 10.78+_4.03ml/s
  male 27.16+_9.37 Female 13.48=-5.21

- Females
  - <50 yo >25 ml/sec
- Males
  - <40 yo >22 ml/sec

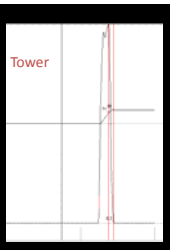


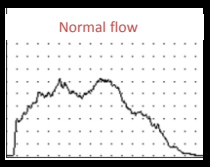
J Urol. 2013 Sep;190(3):1008-13.
Uroflowmetry nomograms for healthy children 5 to 15 years old.

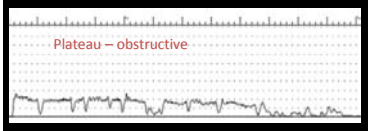
Uroflowmetry Compare to Voiding Diary



ICCS Voiding Patterns
X axis- time seconds
Y axis- flow rate (ml/s)

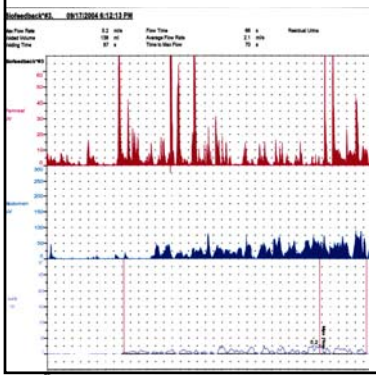


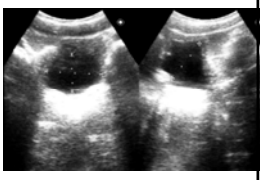




Gray, M. (2010). Traces: Making sense of urodynamics testing- Part 2: Uroflowmetry. *Urologic Nursing*, *30*(6), 321-326.

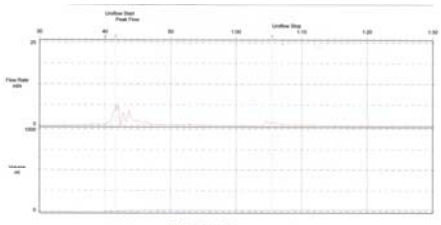
Dual Emg/Flow Rate





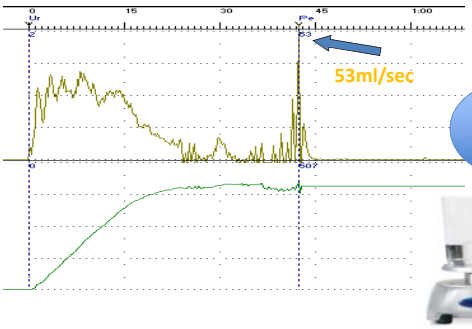
Intermittent stream

Uroflowmetry



Voided small volume (20Ml) what would you do next ?

Artifact



Uroflowmetry Troubleshooting

- Patient instruction come with comfortably full bladder
- Make sure staff available for flow rate
- Make sure beaker is securely placed on uroflow transducer, cord out of the way
- Make sure patient comfortably seated, feet on stool (remind not to kick the beaker)
- Can be done after mechanical fill

REFERENCES

- Urodynamics Made Easy 3rd edition by Christopher Chapple, Anand Patel and Scott MacDiarmid
- SUNA Core Curriculum for Urologic Nursing 1st edition
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- Special Series on Urodynamics – Traces: Making Sense of Urodynamics (SUNA)
- A Practical Guide to Performing Urodynamics (SUNA)

References

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- Mikel Gray, Special Series on Urodynamics Traces: Making sense of Urodynamics (SUNA)
- A Practical Guide to Performing Urodynamics (SUNA)
- The Standardization of Bladder Function: Children and Adolescents: Update Report for the Standardization Committee of the International Children's Continence Society

Conclusion

- Requires time and patience
- Requires creativity and strong trouble shooting skills
- Cath and voiding dairies customize results
- Study done well recreates real life symptoms and is critical to the diagnosis and treatment of urologic disorders

Summary

- Respect the patient: be professional and compassionate, provide privacy
- Be prepared: don't un-necessarily delay testing (increases anxiety)
- Urodynamic studies are critical to diagnosis and treatment of urologic disorders. Results should correlate with clinical symptoms
- Find a mentor, join a special interest group (SIG) at PUNS, SUNA

May The Force Be With You!!!!!

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THANK YOU