

WEBINAR #2

APRIL 24, 2020



BEFORE WE BEGIN...



All participants will be muted throughout the duration of the presentation to ensure the best audio quality



During the presentation, if you should encounter any audio issues, please refresh your browser and check your computer's audio settings



Please submit your questions anytime during the webinar by clicking on the 'chat' box and typing your questions



We are recording today's webinar and we'll share a link with you in our follow-up. That way, you can listen to it again and even share with colleagues who may be interested

COMPONENTS OF URODYNAMICS

JILL WISNIEWSKI, LPN

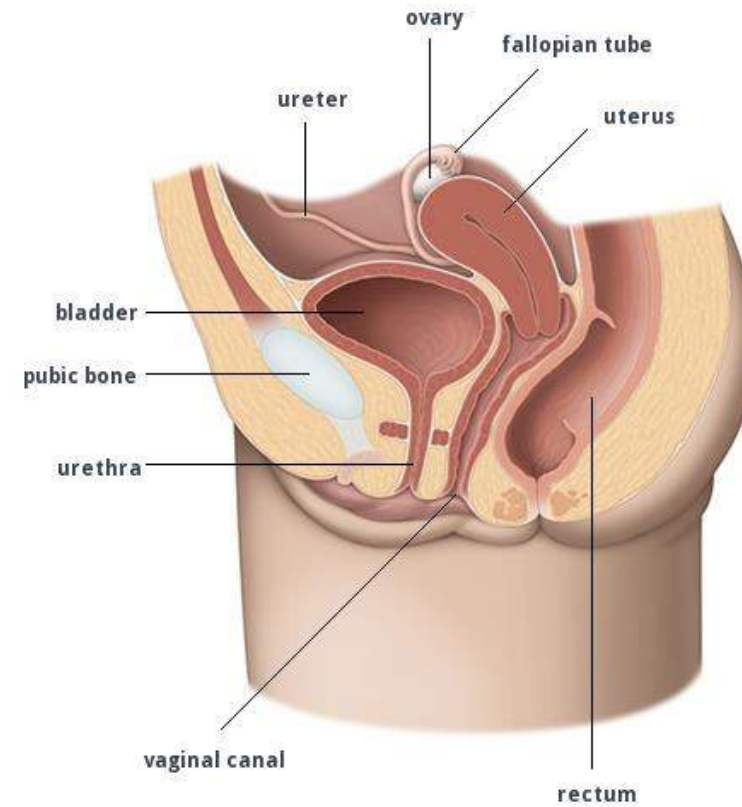
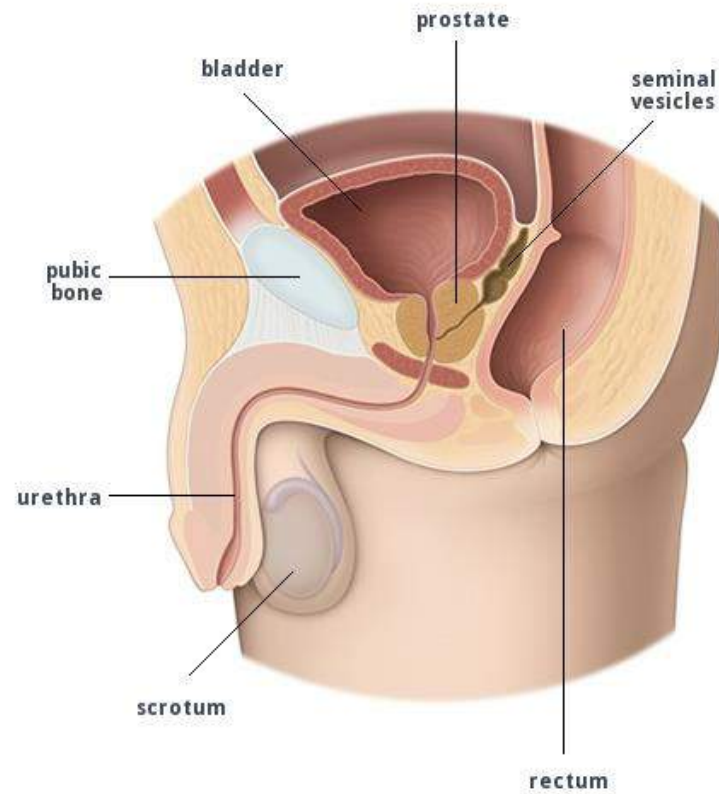
Nurse for 23 years | Resides in Cleveland, OH
Attended Marymount School of Nursing | Holds a BA in fashion merchandising
Experience in urology/urogynecology and family practice
Wrote and Instructed Medical Assisting Program at Kaplan Institute | Wrote medical textbook
reviews for Elsevier | 2005 ACTE Instructor of the Year

OBJECTIVES

-  Understand A & P of the lower urinary tract
-  Understand normal micturition physiology
-  Identify components of a Urodynamics study



ANATOMY OF PELVIC FLOOR



ANATOMY OF THE LOWER URINARY TRACT

Detrusor Muscle

- Muscle component of the bladder (smooth muscle)

Pelvic Floor Musculature

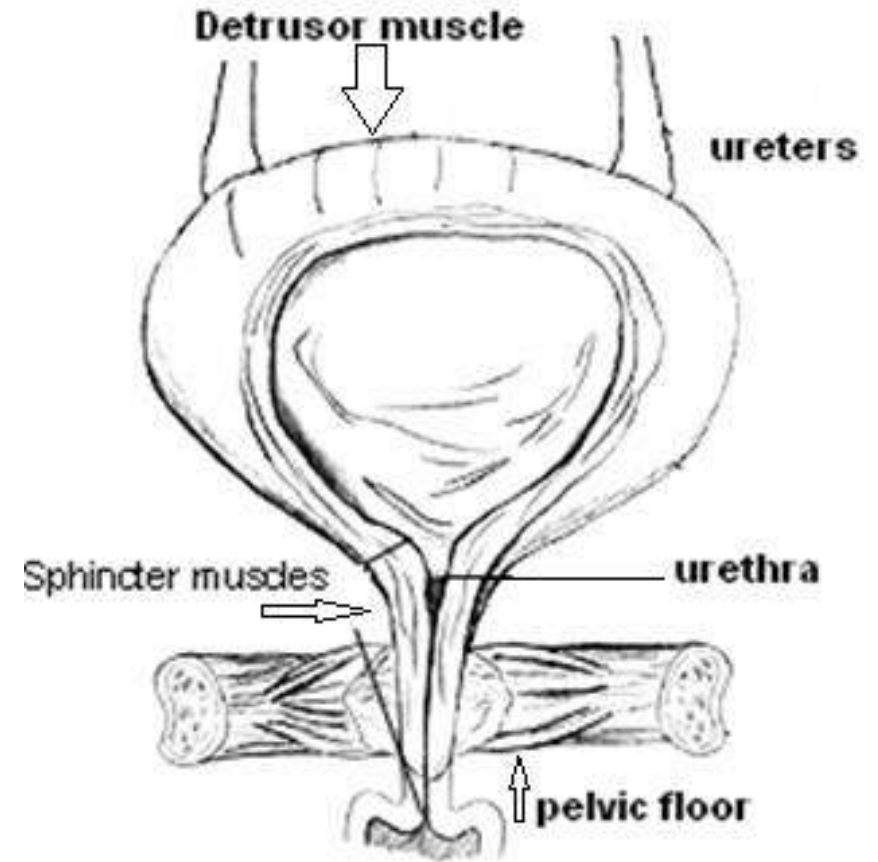
- Supports the bladder; provides passive pressure on the outlet

Intrinsic Sphincter

- Involuntary, long-term control

Extrinsic Sphincter

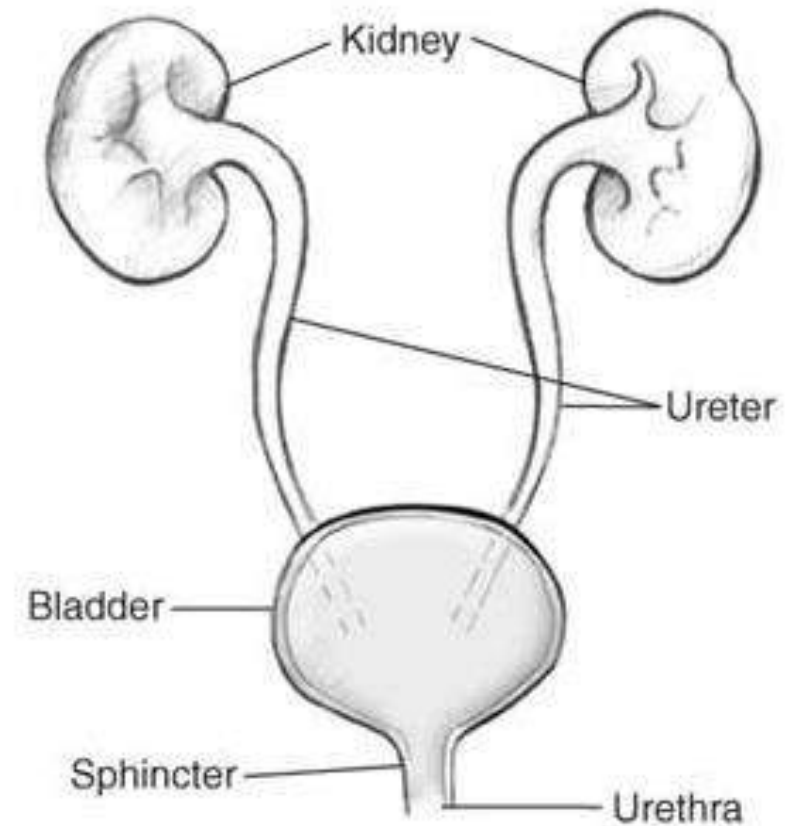
- Quick response; able to respond to voluntary commands



FUNCTION OF THE BLADDER

The most important function of the bladder is to store urine

The bladder should store and eliminate urine at lower pressures to avoid upper urinary tract damage

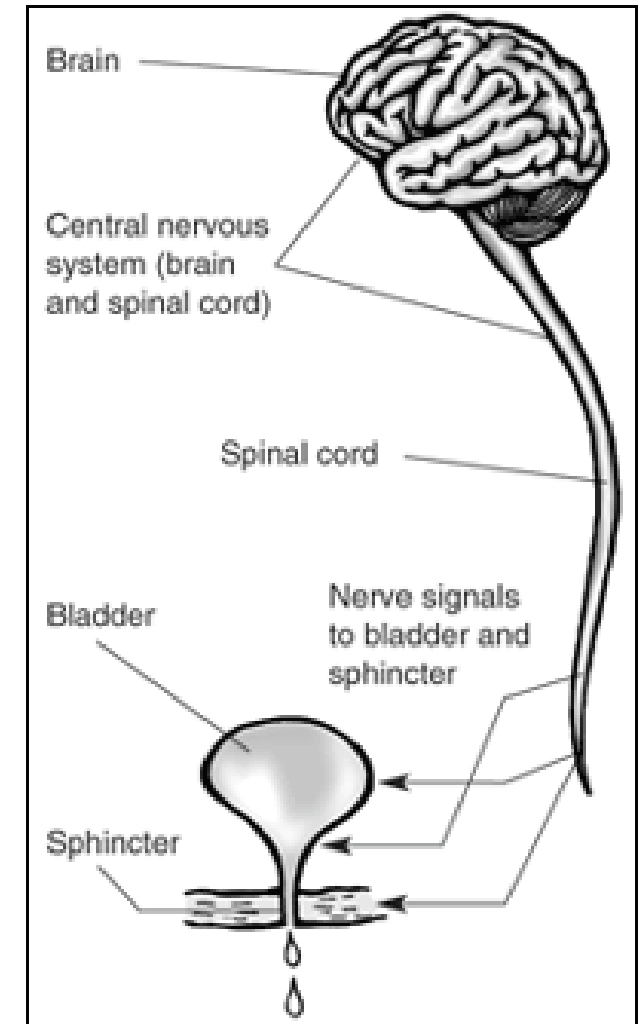


BRAIN/BLADDER CONNECTION

Brain/Bladder Connection

- Brain
- Spinal Cord
 - Sympathetic Nervous System T11-L2
 - Parasympathetic Nervous System S2-S4

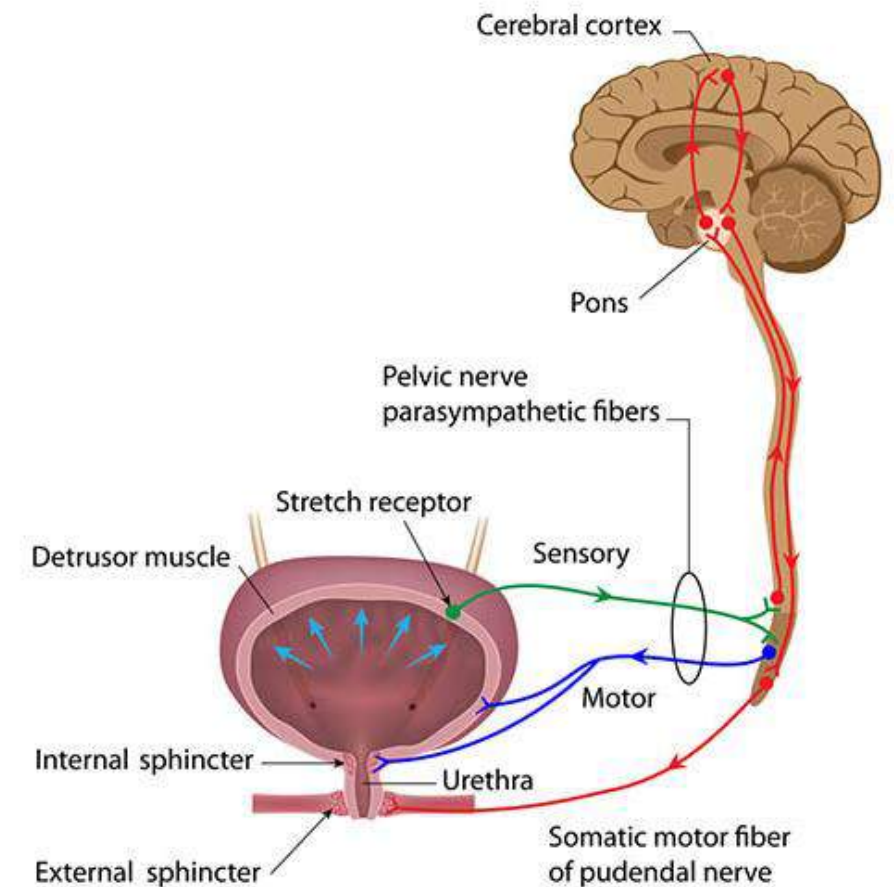
“Normal” bladder function requires anatomic integrity, intact neurological pathways and competence of the outlet



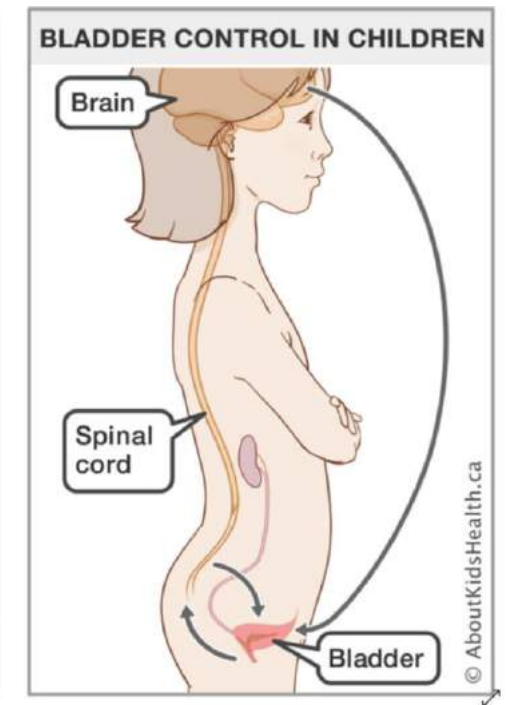
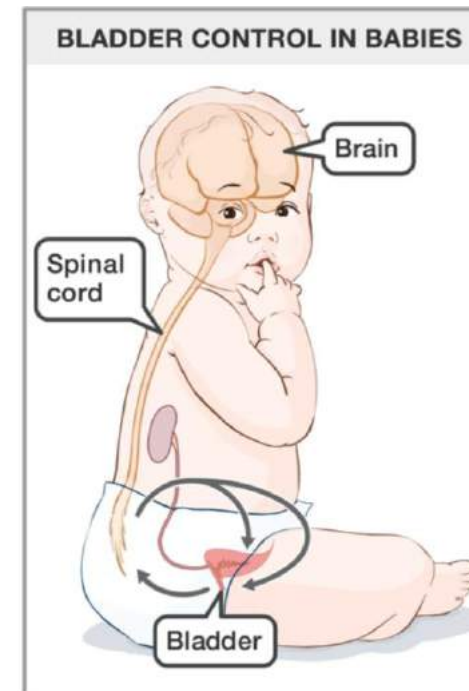
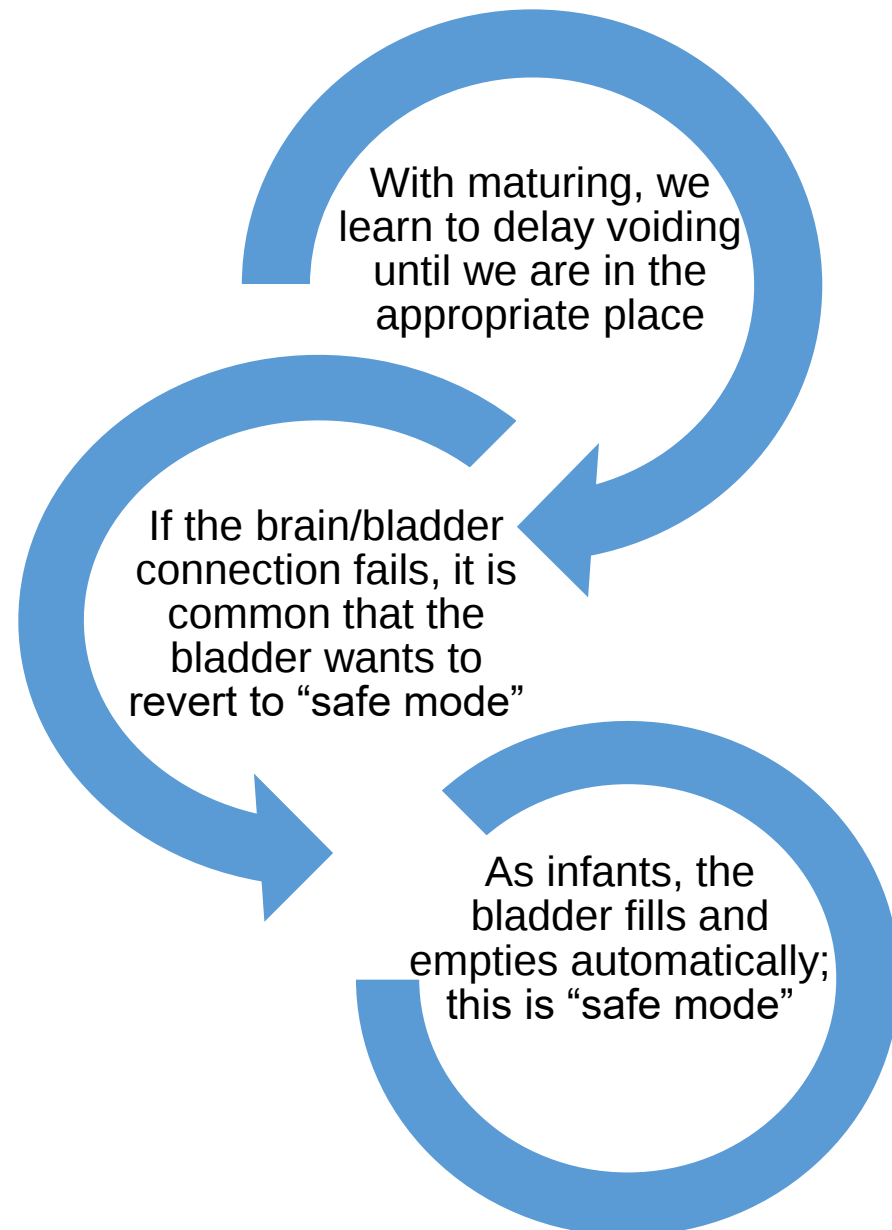
BRAIN/BLADDER CONNECTION

As the bladder fills, it stretches, sending afferent messages to the brain, thus, telling it how full the bladder is.

The brain, acting through the autonomic nervous system, sends back messages to the bladder, to relax the sphincter mechanism, contract the detrusor muscle, thus, creating urination.



DEVELOPMENT OF VOLUNTARY CONTROL

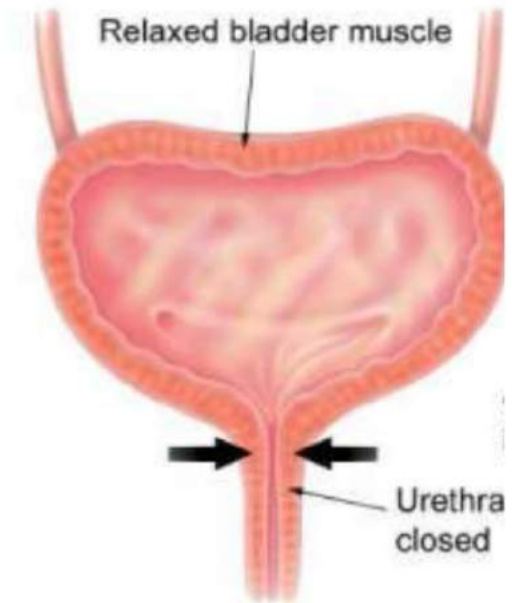


FILLING PHASE

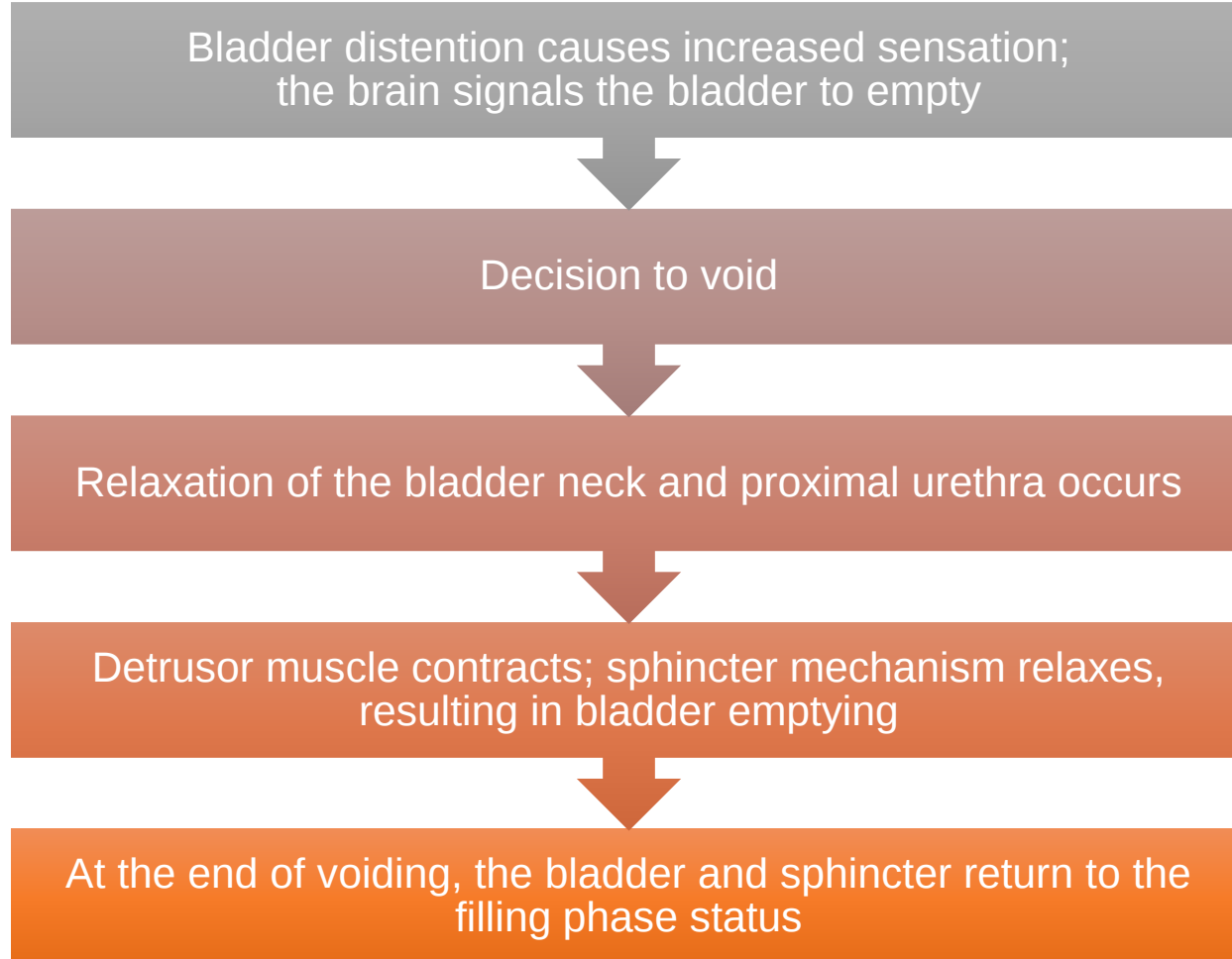
- Bladder pressure remains consistently low
 - Detrusor muscle should be relaxed and the bladder walls should stretch with filling
- Detrusor pressure does NOT rise proportional to filling
- Contraction of the sphincter mechanism

1) Filling and storage of urine

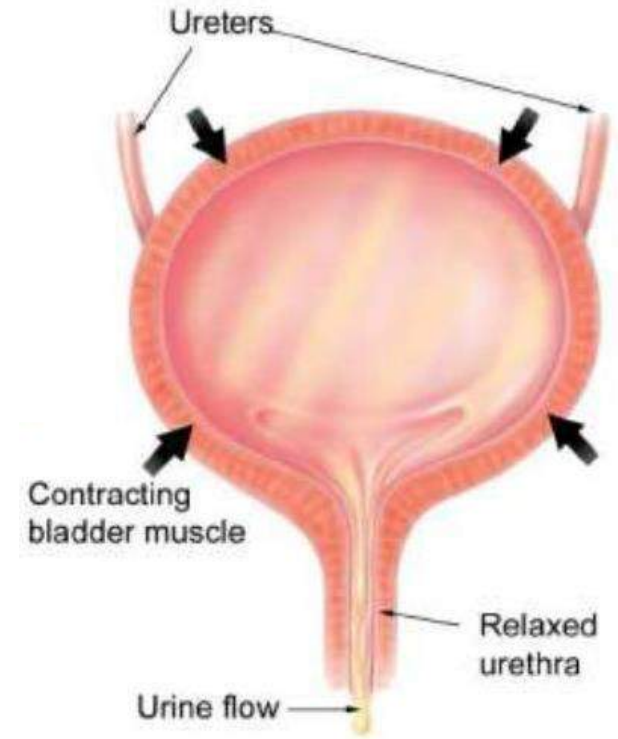
Bladder fills through the ureters from the kidneys



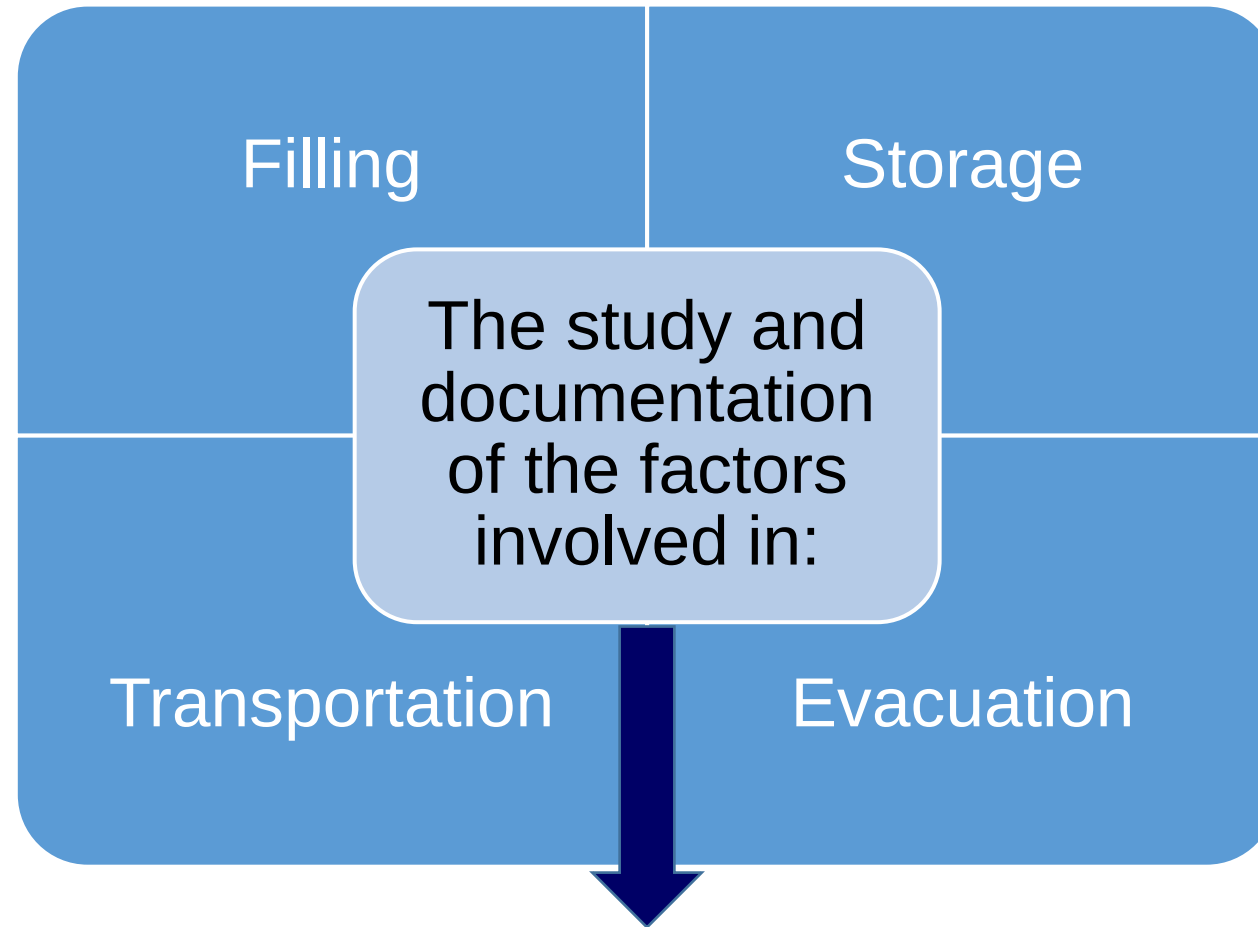
VOIDING PHASE



2) Emptying (voiding) of bladder



WHAT IS URODYNAMICS?



The goal is the diagnosis of disorders of the lower urinary tract

INTERNATIONAL CONTINENCE SOCIETY (ICS)



- Has recommended a standardized terminology of the lower urinary tract (LUT)
- Setting recommendations regarding catheter size, and standardization of calibration, and reference points for measurement of certain parameters
- ICS provides guidelines on Good Urodynamic Practices
- LABORIE teaches according to ICS standards

Rosier et al - ICS Good Urodynamic Practice and Terms 2016: Urodynamics, uroflowmetry, and pressure-flow study - Neurourol Urodyn 2016

NATIONAL ASSOCIATION OF CONTINENCE



Survey conducted in North America in 2004, found:

Both men and women waited a number of years to seek HCP support after developing bladder control problems

Women waited 6.5 years

Men waited 4.2 years

Newman DK et al Promotion, education and organization for continence care. In: Abrams P Incontinence 3rd Edition

FACTORS THAT CONTRIBUTE TO LUTS

Anything that affects the body, as a whole,
can impact the urinary system:

Diabetes

Neurologic disease or trauma

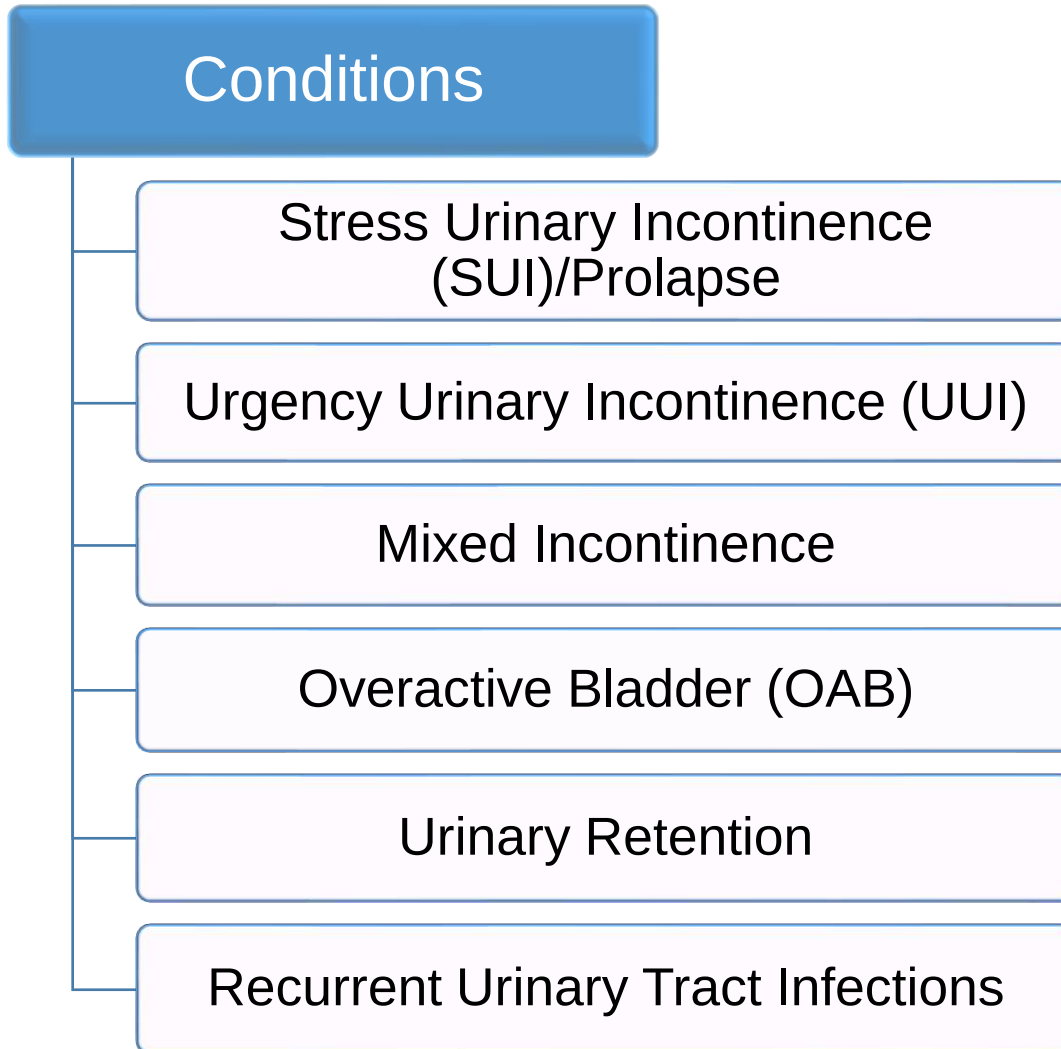
Surgery

Pregnancy/childbirth

Medications

Aging related disorders

PATIENTS WHO CAN BE IMPACTED



PATIENTS WHO CAN BE IMPACTED

Neurogenic Bladder is the name given to urinary conditions in people who lack bladder control due to brain, spinal cord injury or nerve problems, including:

Vertebral disc disease

Spina bifida

Multiple Sclerosis (MS)

Dementia (e.g. Alzheimer's)

Parkinson's disease

LOWER URINARY TRACT SYMPTOMS (LUTS)



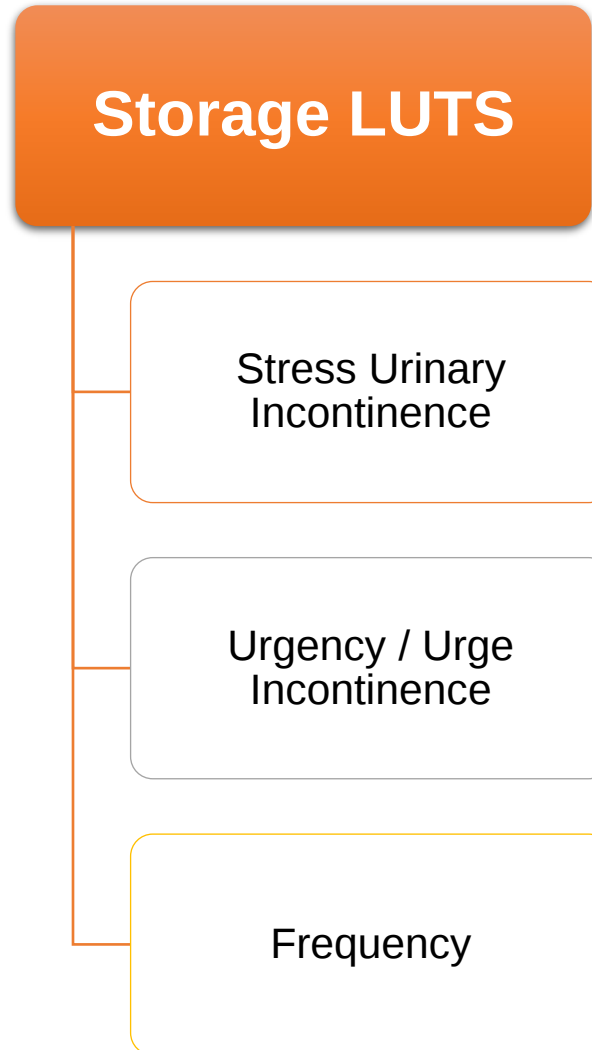
Voiding Frequency: normally 8 voids or less per 24 hours

Symptoms Include:

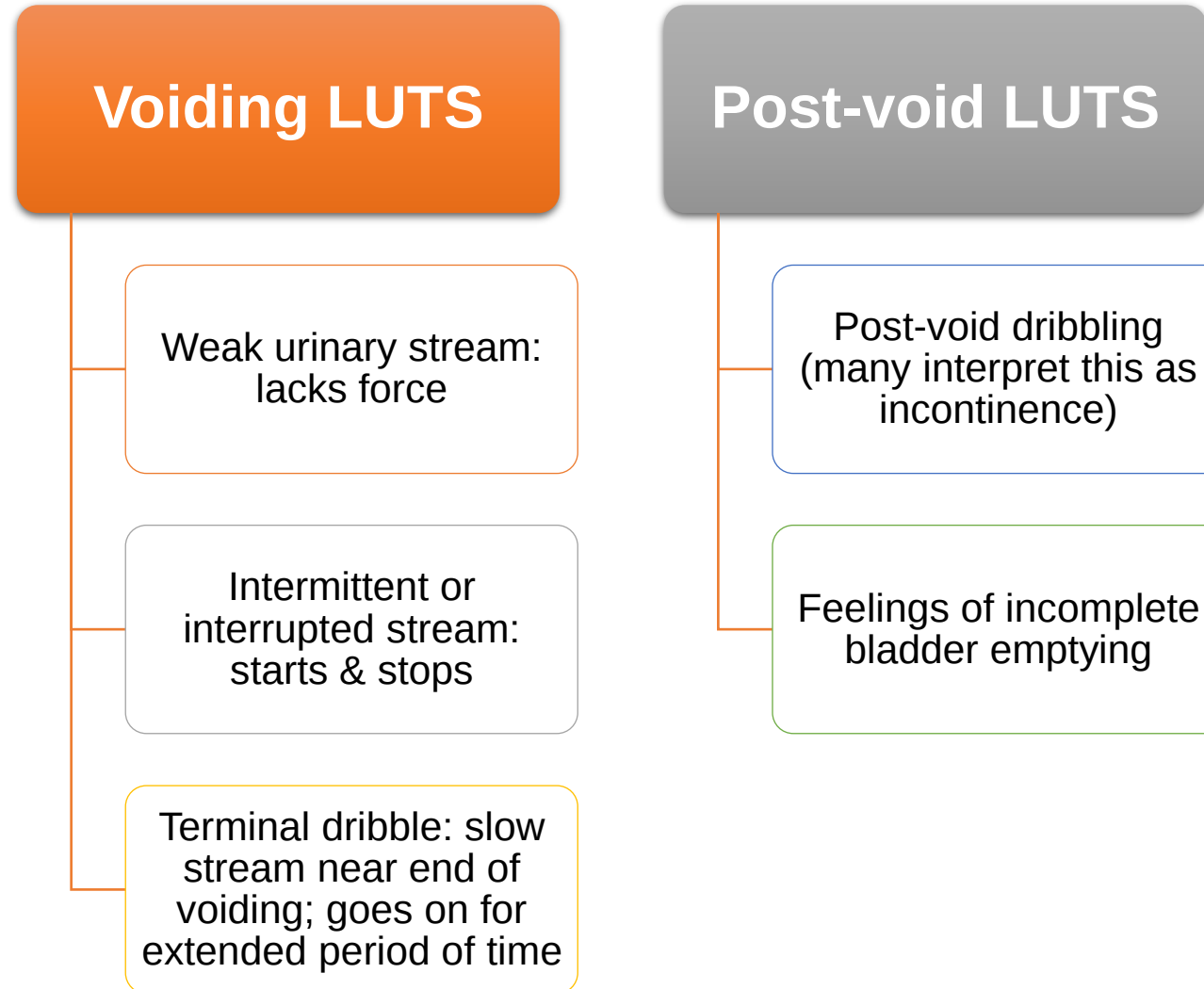
Nocturia: complaint of awakening 1 or more times per night to urinate

Urgency: strong desire to urinate that cannot be deferred

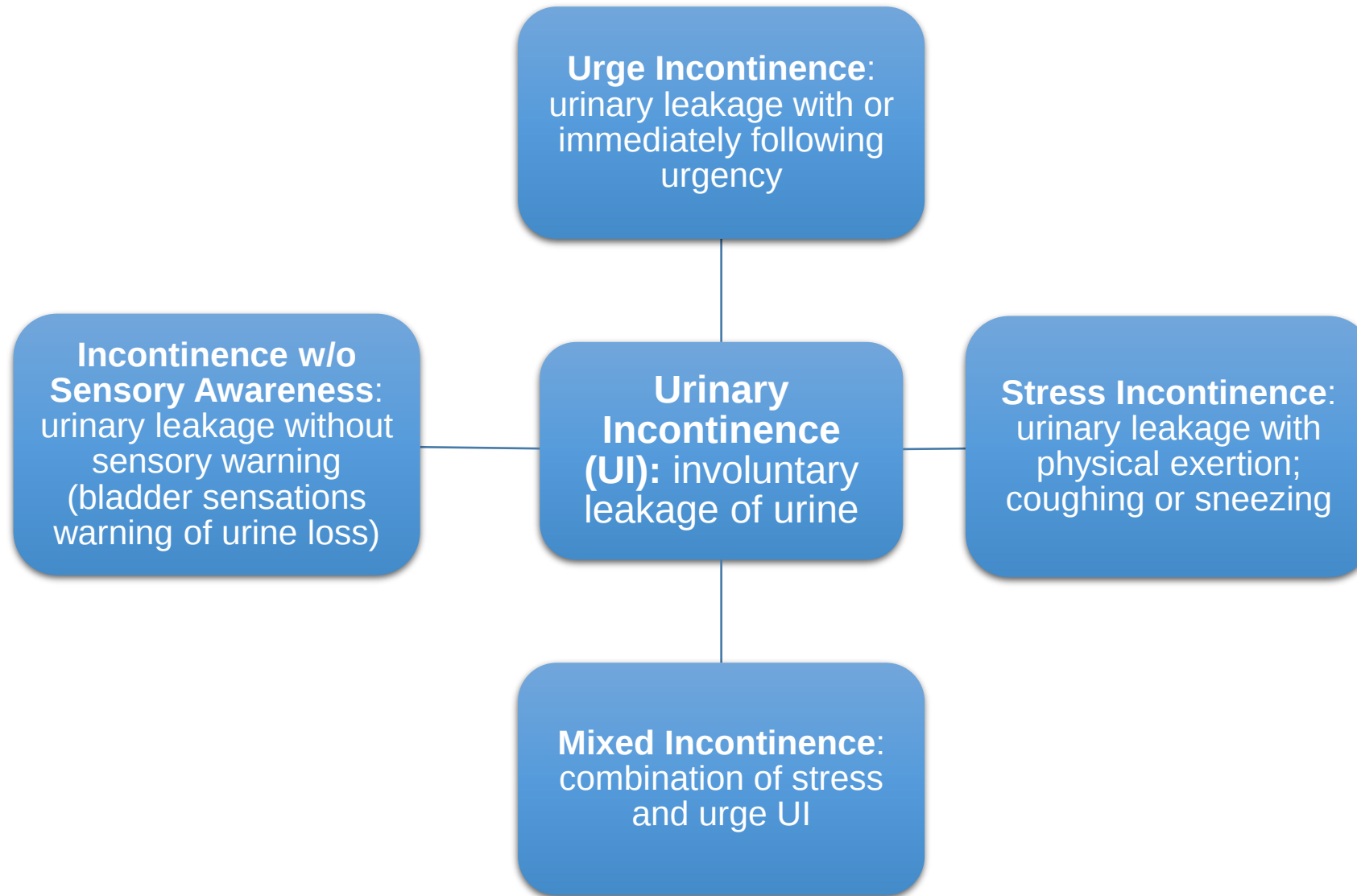
LUTS –STORAGE (FILLING)



LUTS – EMPTYING/VOIDING



TYPES OF URINARY INCONTINENCE



COMPONENTS OF URODYNAMICS



START URODYNAMICS WITH A QUESTION



DURING THE PROCEDURE

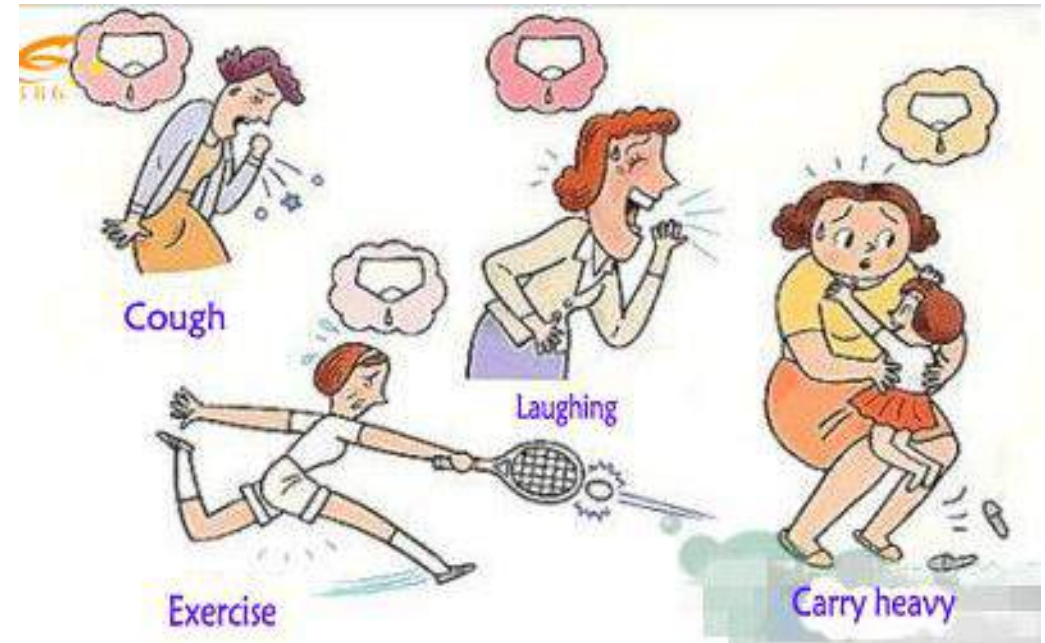
Reproduce the patient's symptoms

Check sensations (urgency? fear of leaking?)

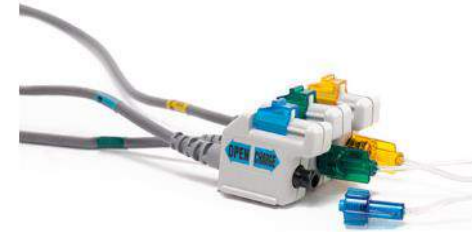
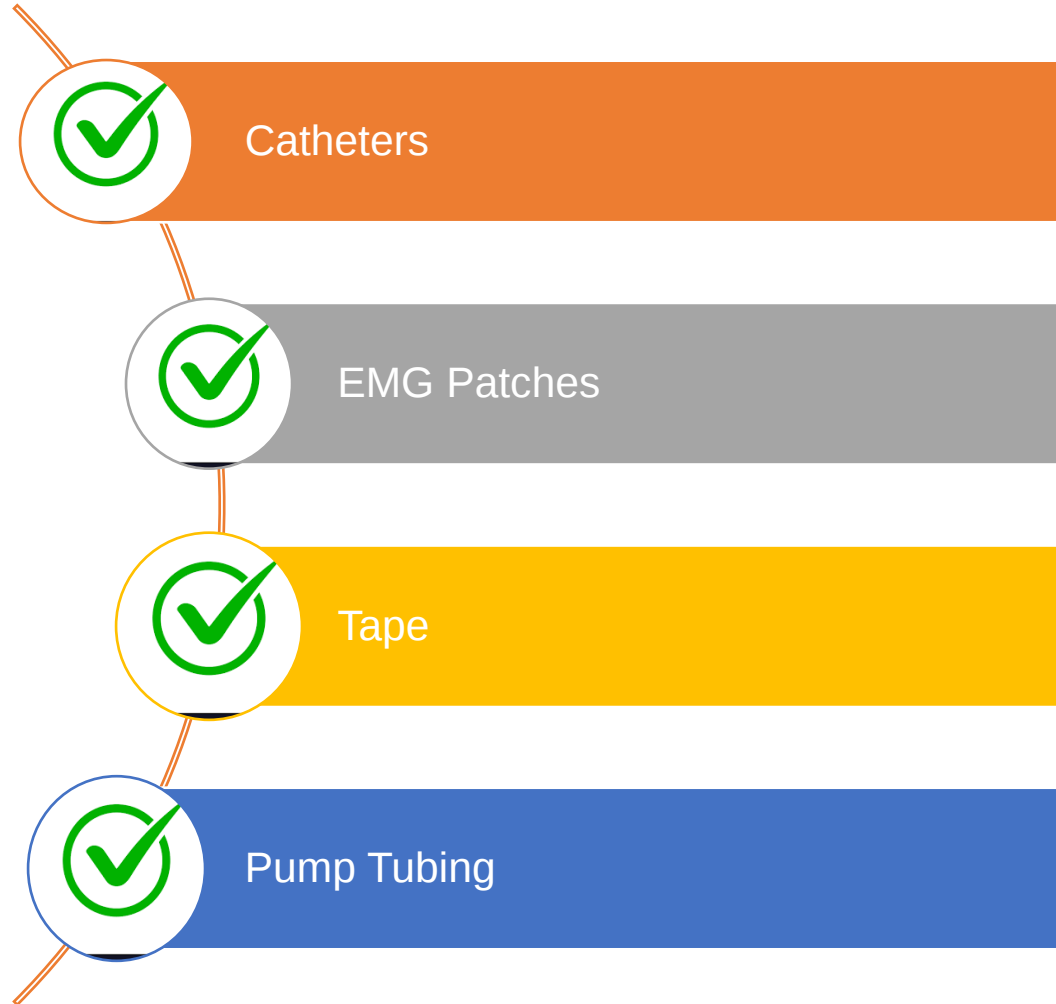
Provoke incontinence (cough, strain, ask to delay voiding)

Fill to point of patient's sensation of capacity

Allow voiding with as much privacy as possible



MATERIALS AND EQUIPMENT



MULTI-CHANNEL URODYNAMICS CONSISTS OF...

Uroflowmetry (Uroflow): The measurement of the rate of urine flow over time

Cystometrogram (CMG)/ Cystometry: Evaluates the bladder's function during filling

Pressure flow (P/F): Uroflow/CMG in same voiding event; shows direct relationship between bladder muscle strength and resulting flow

Urethral Pressure Profile (UPP): To evaluate urethral length and competence; measures continence zone

Electromyography (EMG): Is the recording of electrical potentials generated by the depolarization of muscle fibers; it assesses pelvic muscle activity

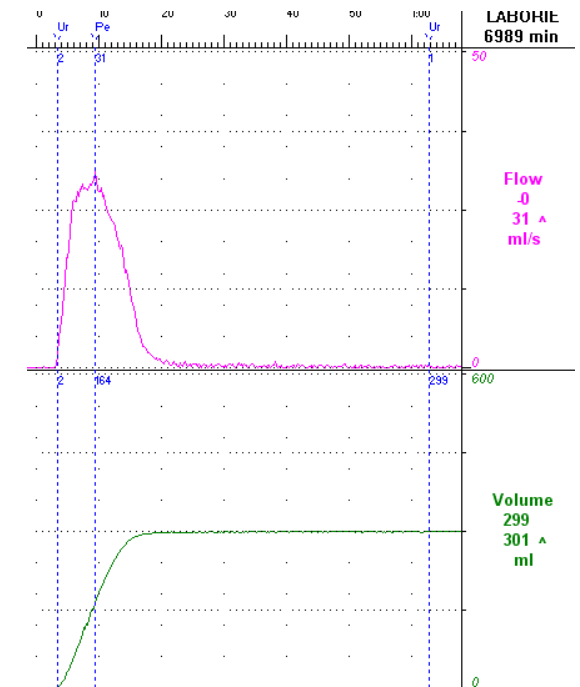
UROFLOW

Have patient arrive to the exam room with a “comfortably” full bladder

Ask the patient to empty their bladder

Provide as much privacy as possible

Result: document the volume voided and the rate of flow, displayed in ml/sec



CLUES FROM THE UROFLOW

What volume did they void?

Relates to capacity

What volume is left behind?

Relates to efficiency
of emptying

The pattern of voiding
is a big clue.

Relates to
competence, detrusor
response, obstruction

EMPTY THE BLADDER

Emptying the bladder

After the Uroflow, do a straight cath (in-and-out cath) to empty the bladder

To learn how well the bladder empties:
Post Void Residual (PVR)

This also ensures that when we start filling the bladder, we start from zero (empty)

CYSTOMETROGRAM (CMG)

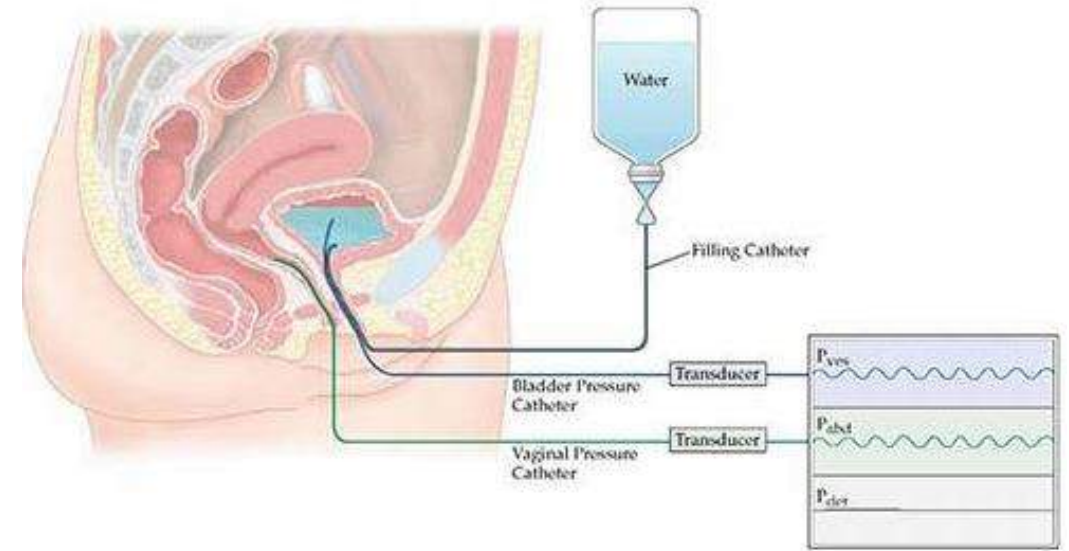
Place a urodynamic catheter into the bladder (measures as P_{ves})

- **OR** you may use a catheter that is capable of measuring both bladder and urethral pressure (P_{ura}) simultaneously

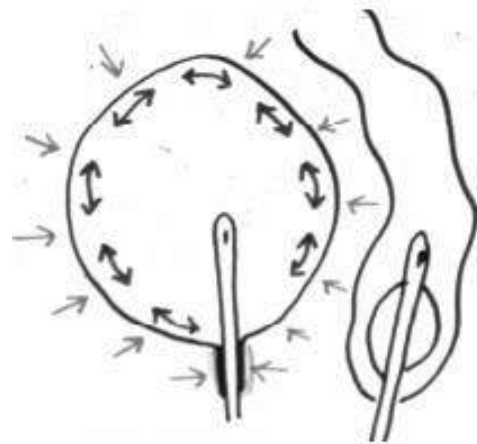
Place an abdominal catheter into the rectum or vagina (measures as P_{abd})

Attach EMG patches or wires on perineal striated muscles

Connect all these components to recording device

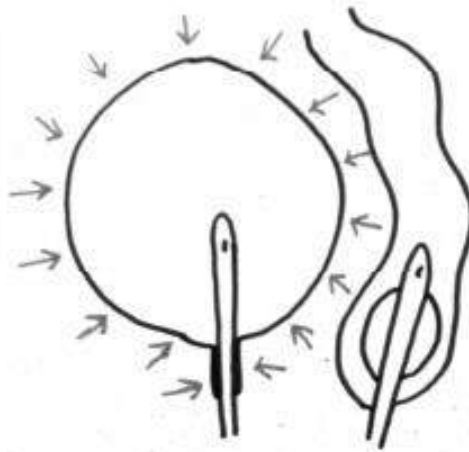


DETRUSOR PRESSURE



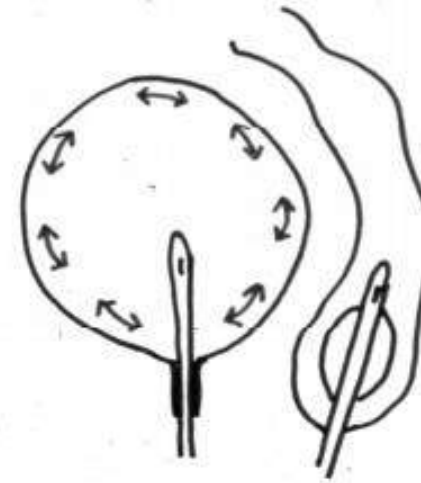
Pves

-



Pabd

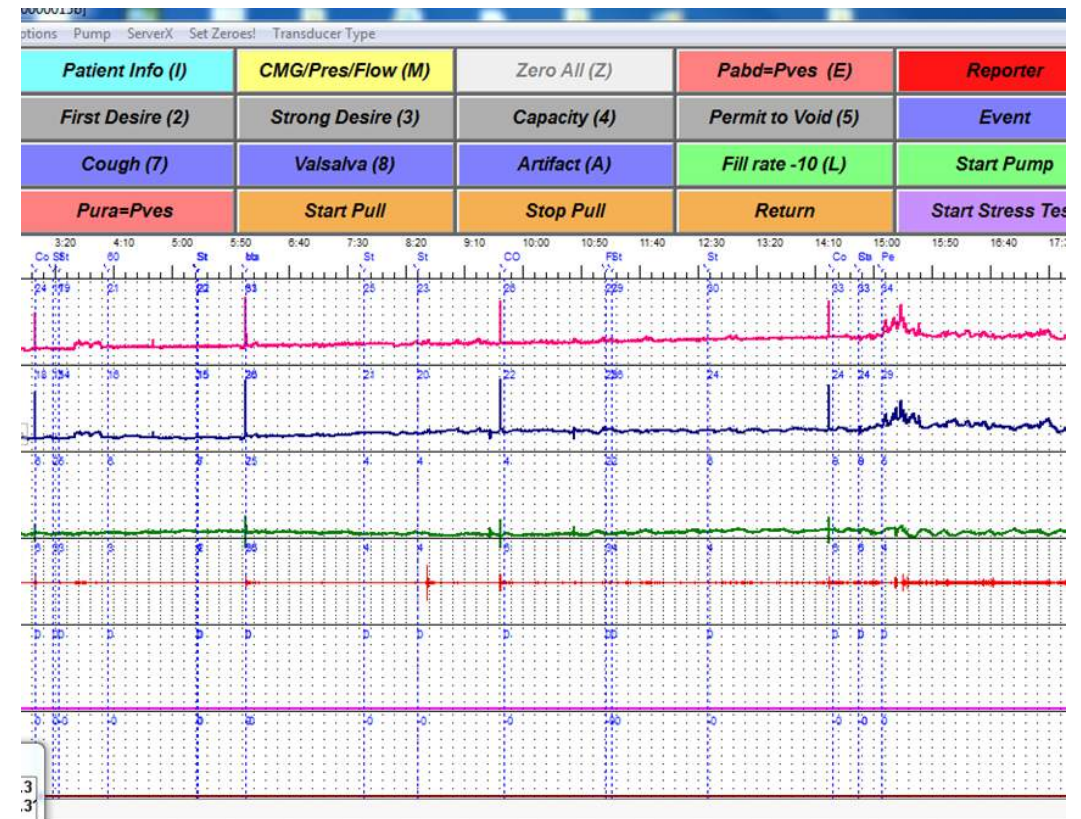
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Pdet

CMG FILLING PHASE

- A continuous measurement of pressure recorded within the bladder as it is filled at a variable rate
- A dynamic examination of function, both motor and sensory, during bladder filling



WHAT WE ARE LOOKING FOR...

Sensations

- do they occur at the appropriate time? Are they delayed, early, absent?

Detrusor response (was called stability)

- Any overactive contractions?

Compliance

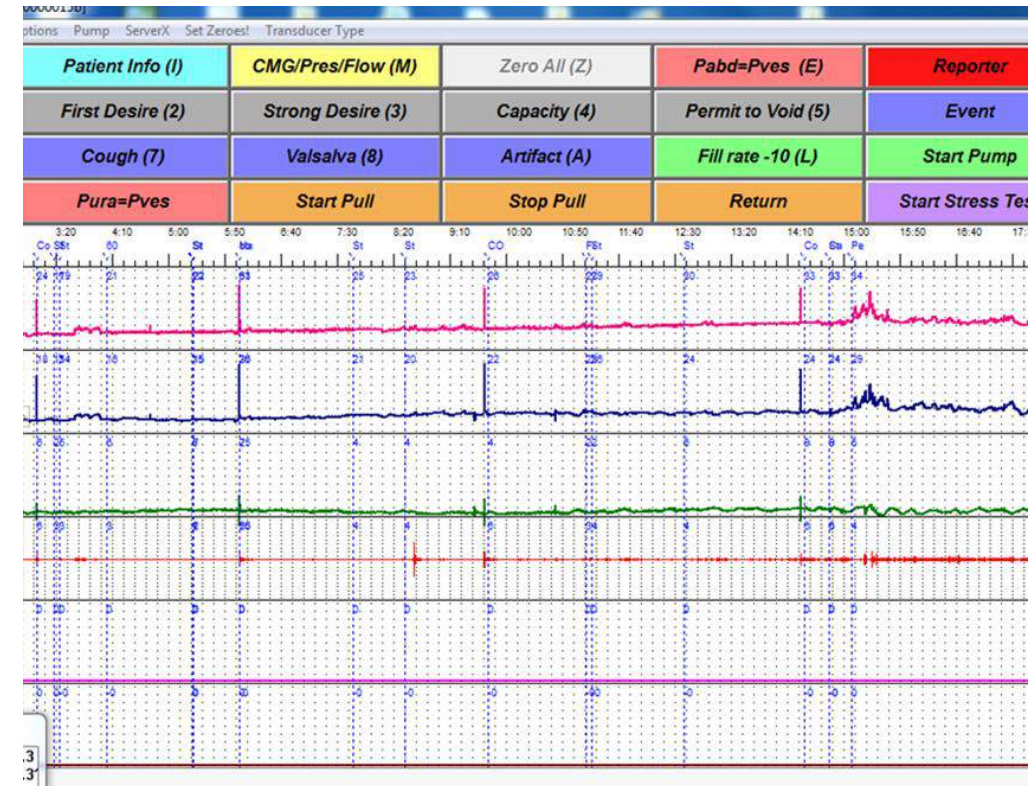
- does Pdet remain low during filling?

Competence

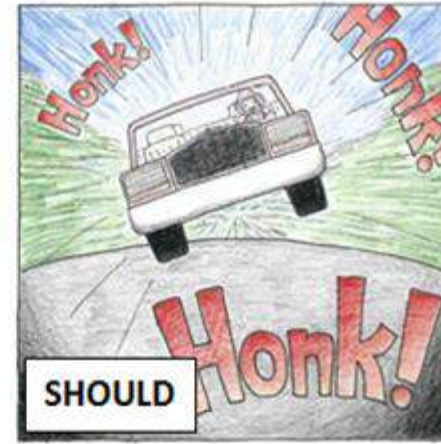
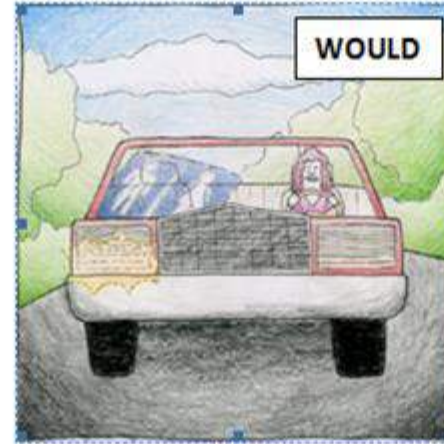
- any incontinence?

Capacity

- What is the volume when they feel full?



SENSATIONS OF BLADDER FILLING



Could = First Sensation

When you are first aware of bladder filling

Example:

"Before you get in the car for a long trip, you empty your bladder – but otherwise you wouldn't have needed to void"

WOULD = First Desire

When you would void at the next convenient moment – but you can still postpone it

Example:

"While on that car trip, now you would start wondering how far is it to the next rest stop"

SHOULD = Strong Desire

The Persistent Desire to Urinate

Example:

"You feel the need to hurry to the very next exit to urinate"

MUST = Capacity

You can no longer delay voiding

Example:

"You would stop at the side of the road and run to hide behind bushes to empty your bladder"

WARNINGS ABOUT RECORDING SENSATION

First sensation is NOT the sensation of cold fluid going in

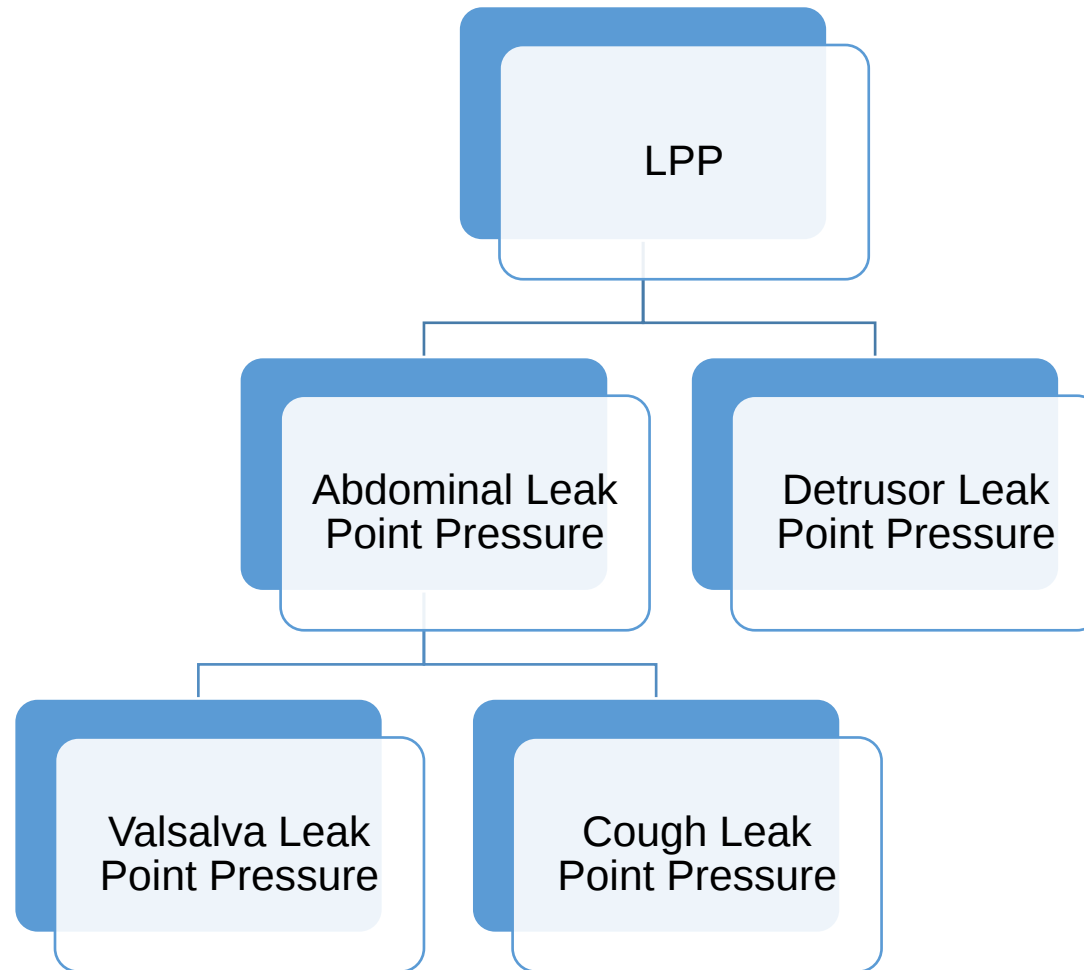
It is good to know that they have temperature sensation but we are looking for a sense of the bladder beginning to fill

Capacity is NOT associated with pain

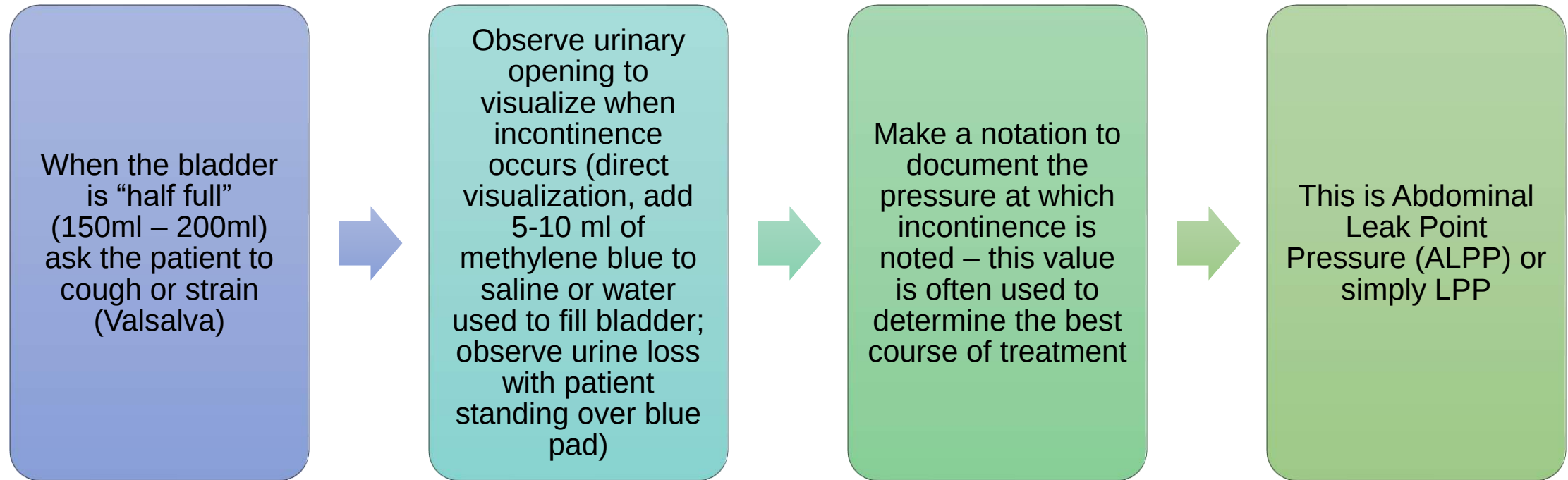
Capacity should be recorded and then fluid infusion stopped when they feel they're as full as they could let themselves be at home

We don't want to push them to the point of pain

LEAK POINT PRESSURE (LPP)



LEAK POINT PRESSURE

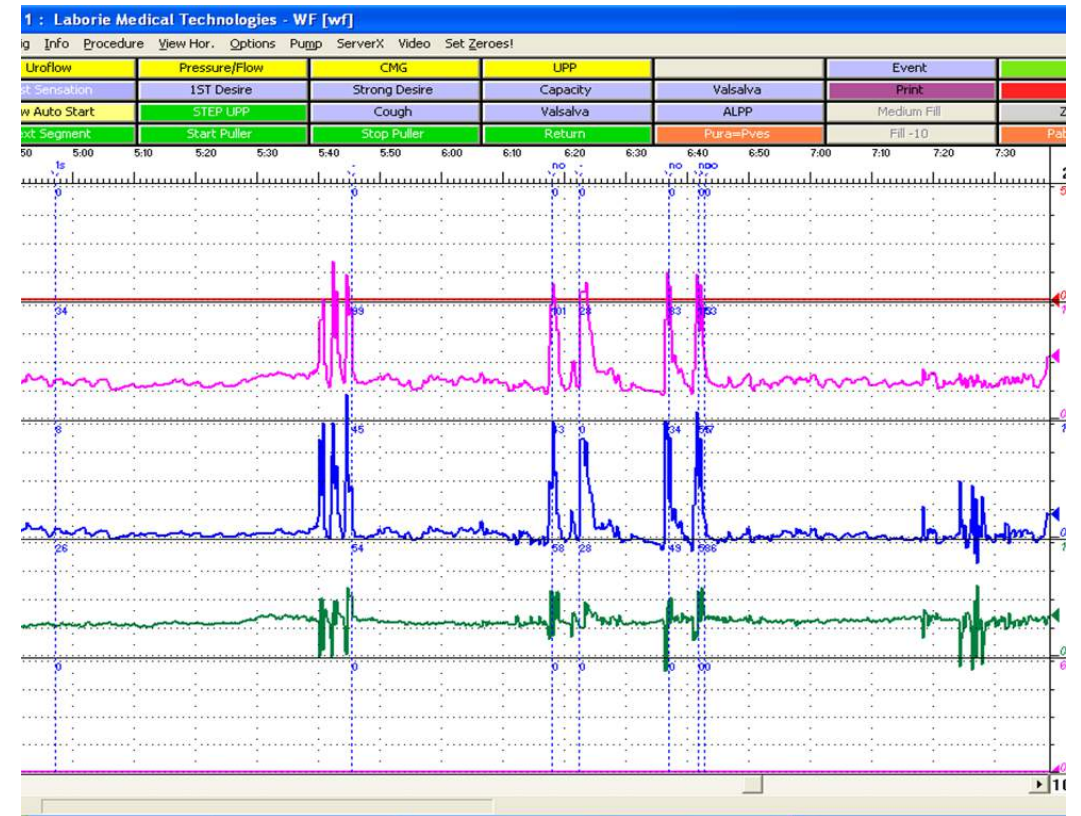


DURING THE LPP

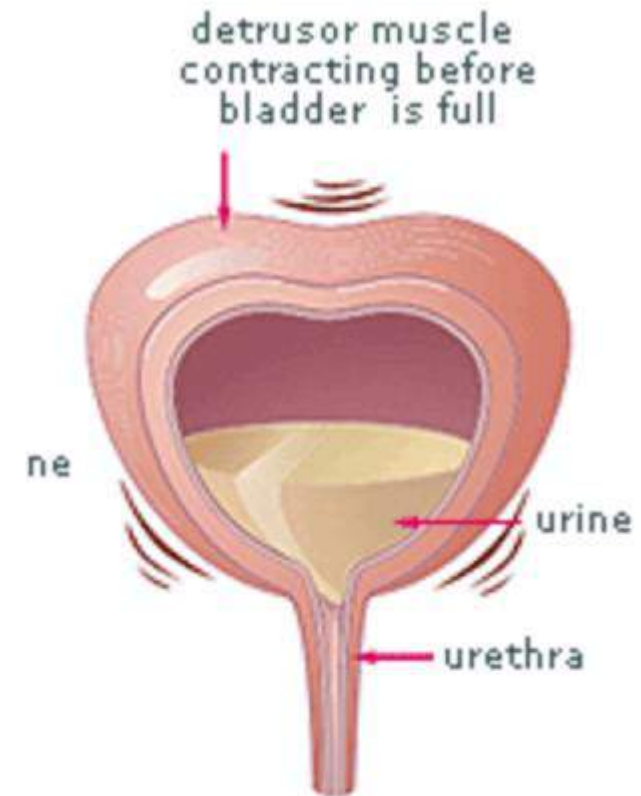
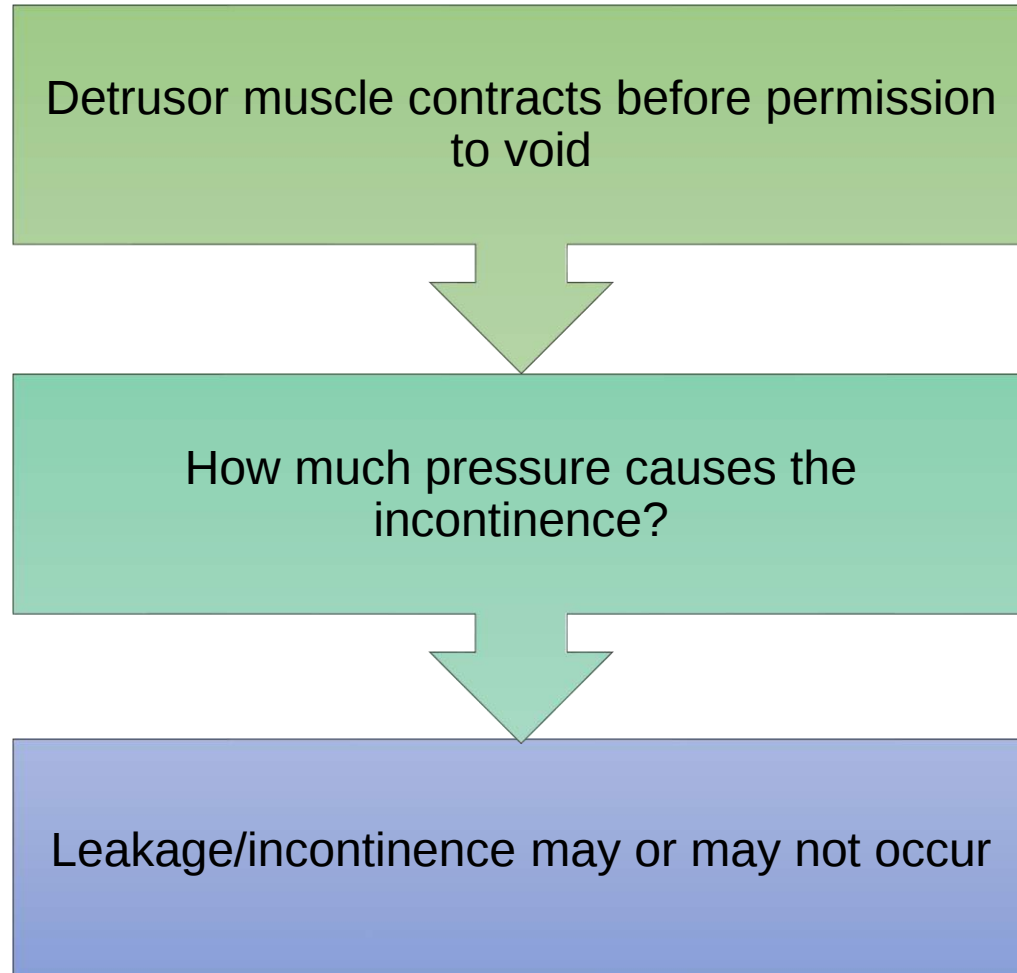
Is there incontinence with cough?
With Valsalva?

How much pressure causes the
incontinence?

What is the bladder volume when the
incontinence happens?



DETRUSOR OVERACTIVITY



URETHRAL PRESSURE PROFILE

- A dual sensor catheter is used that can simultaneously measure both bladder and urethral pressure
- Catheter is withdrawn from bladder at a very slow rate*
 - **ICS recommends 1 mm/sec*



1. Bourcier A, McGuire EJ, Abrams P. Pelvic Floor Disorders, 2004, Elsevier, p.206.
2. Sand P et al Obstetrics & Gynecology 1987; 69:399-402.
3. Griffiths DJ et al. in Abrams P, Cardozo L, Khoury S, Wein AJ (eds). Incontinence 2005 ed., Health Pub Ltd, p. 585.
4. Gammie A, et al International Continence Society Guidelines on Urodynamic Equipment Performance, 2014 Neurology and Urodynamics p. 3, 5

URETHRAL PRESSURE PROFILE

Urethral closure pressure:

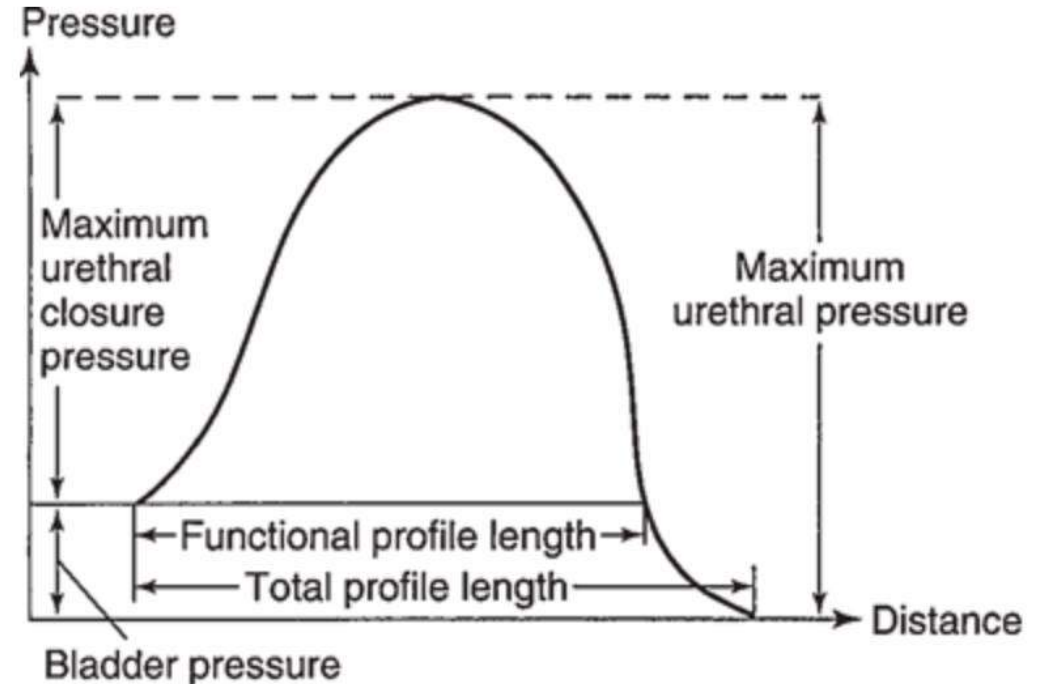
- The difference between urethral and vesical pressure

Maximum urethral pressure (MUP):

- The greatest pressure measured along the profile length

Maximum urethral closure pressure (MUCP):

- The point along the urethra at which the urethral pressure most exceeds the bladder pressure



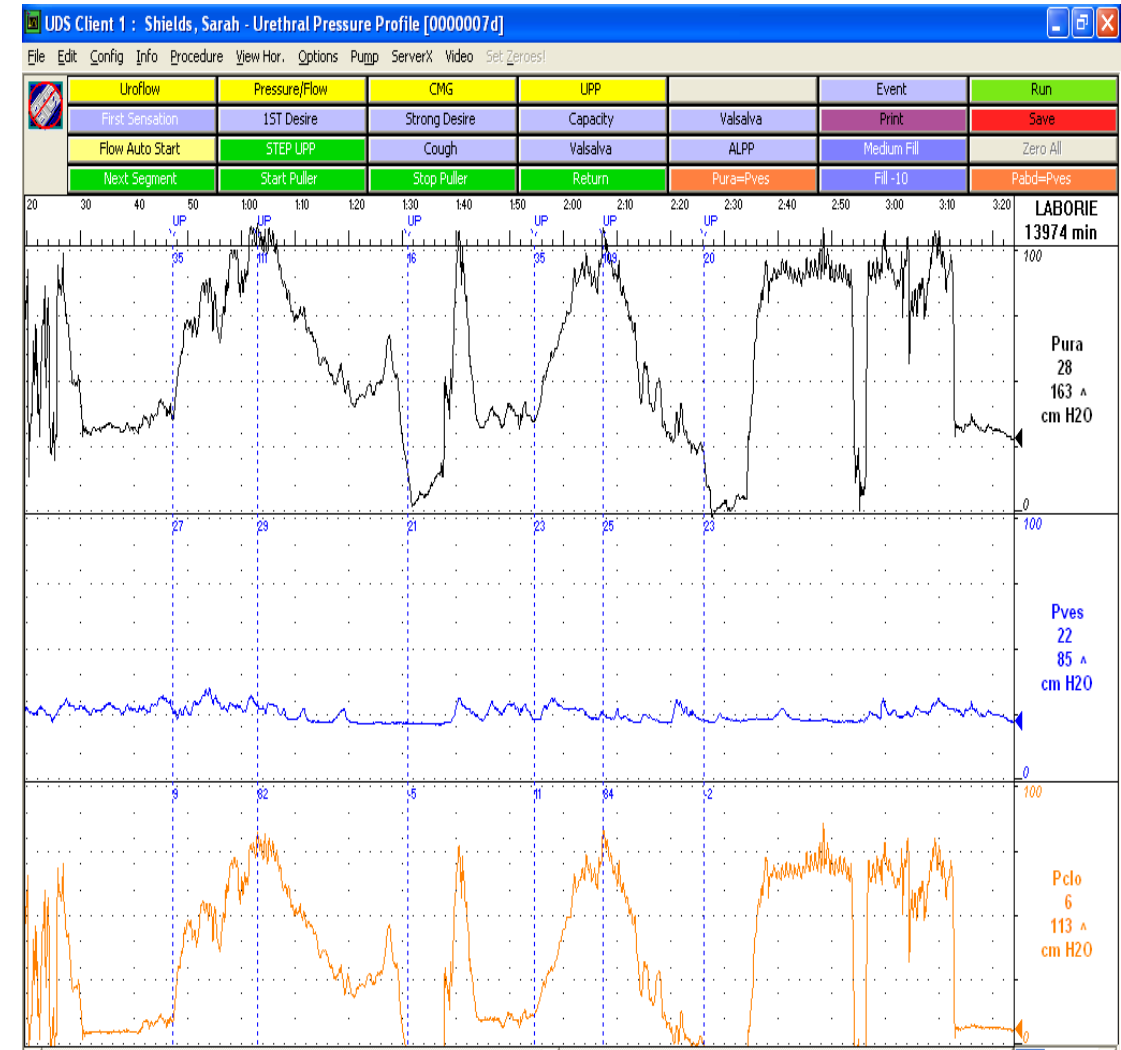
$$P_{ura} - P_{ves} = P_{clo}$$

DURING THE UPP

Does the urethral pressure exceed resting bladder pressure?

How much higher is the pressure? What is the difference between the two?

For what length is this higher pressure maintained?

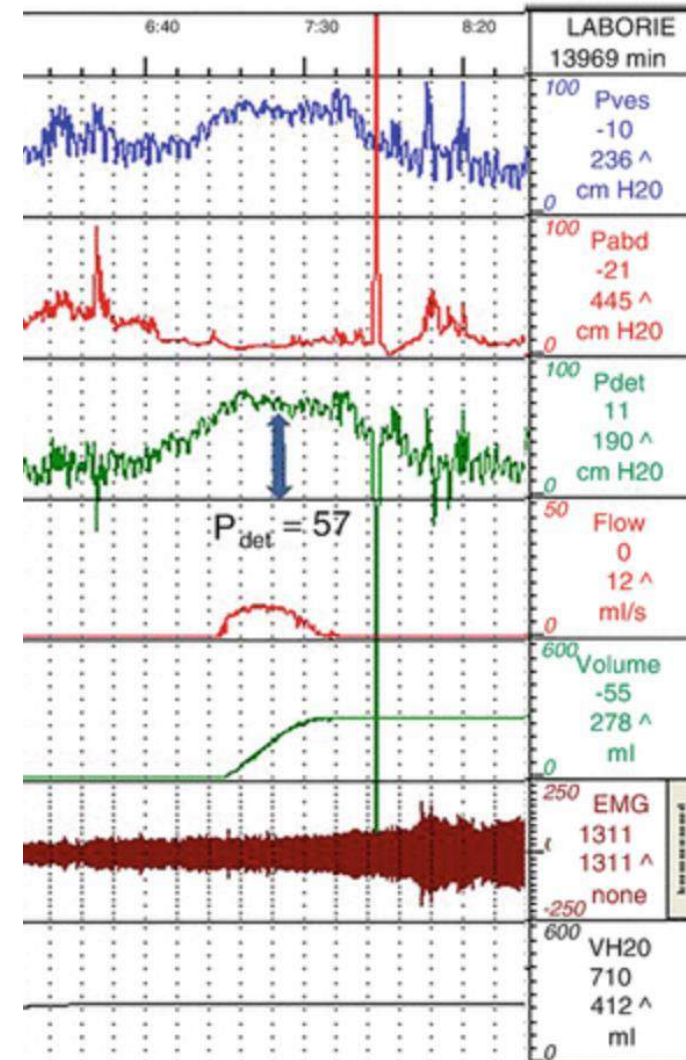


VOIDING PRESSURE STUDY

- When patient feels they have reached maximum bladder capacity, it is time to ask them to void and empty their bladder as completely as possible
- Verify that catheters are still in place
- Patient is positioned on commode
- Provide as much privacy as possible

PRESSURE FLOW

- P_{ves} = vesical pressure
- P_{abd} = abdominal pressure
- P_{det} = detrusor pressure
- $P_{ves} - P_{abd} = P_{det}$
- Flow = rate of fluid voided
- Volume = amount voided



VOIDING PRESSURE STUDY CLUES

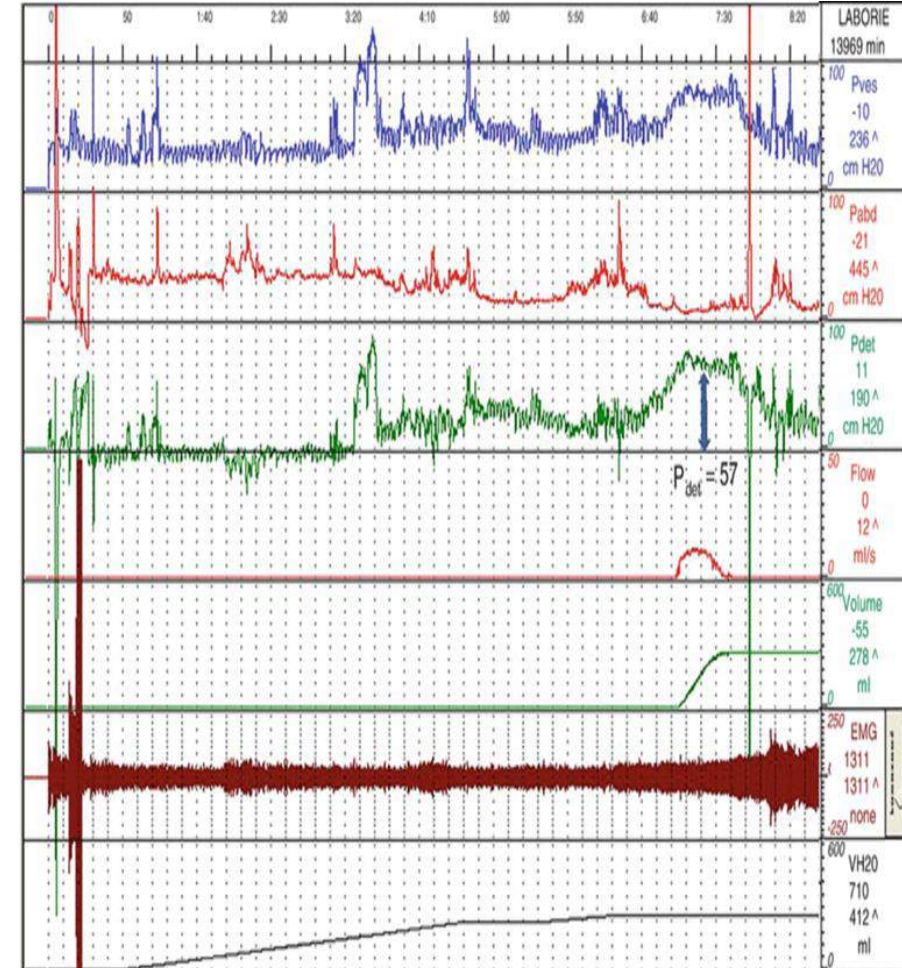
Detrusor response

When given permission to void, does the detrusor contract?

Do the sphincter and pelvic floor relax?
(EMG)

How does the strength of contraction compare to the strength/pattern of the resulting flow?

Does the bladder empty completely?



CONCLUSION OF URODYNAMIC TESTING

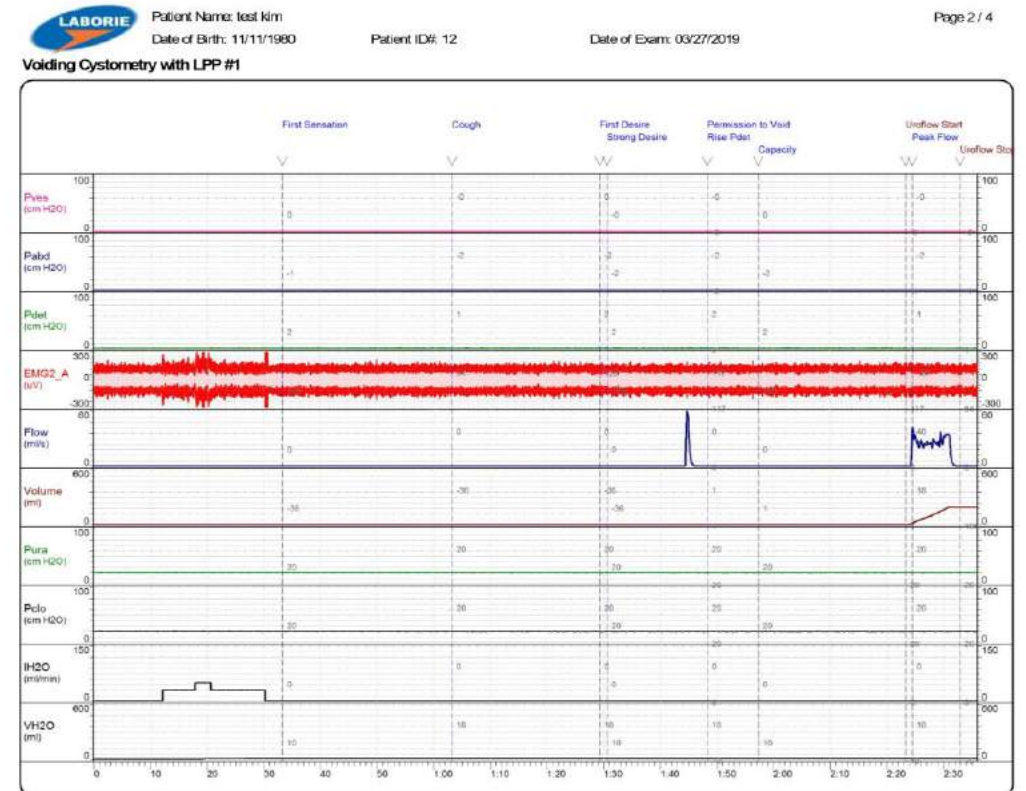
Graphs are stopped

'Save' the report

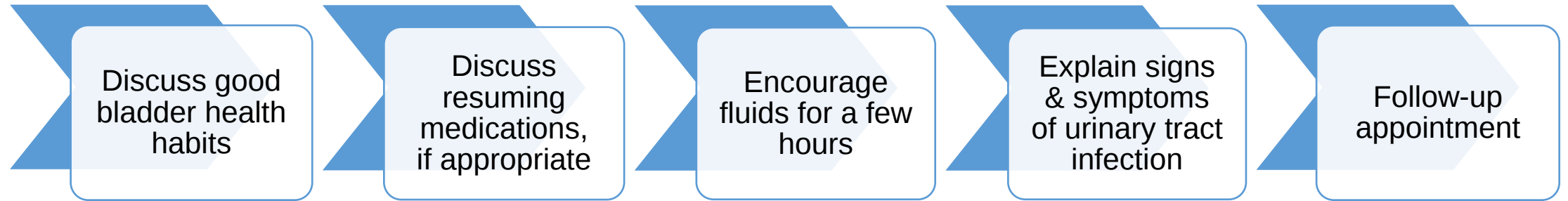
Remove catheters for disposal

Edit report if desired

Print report



POST UDS TEACHING

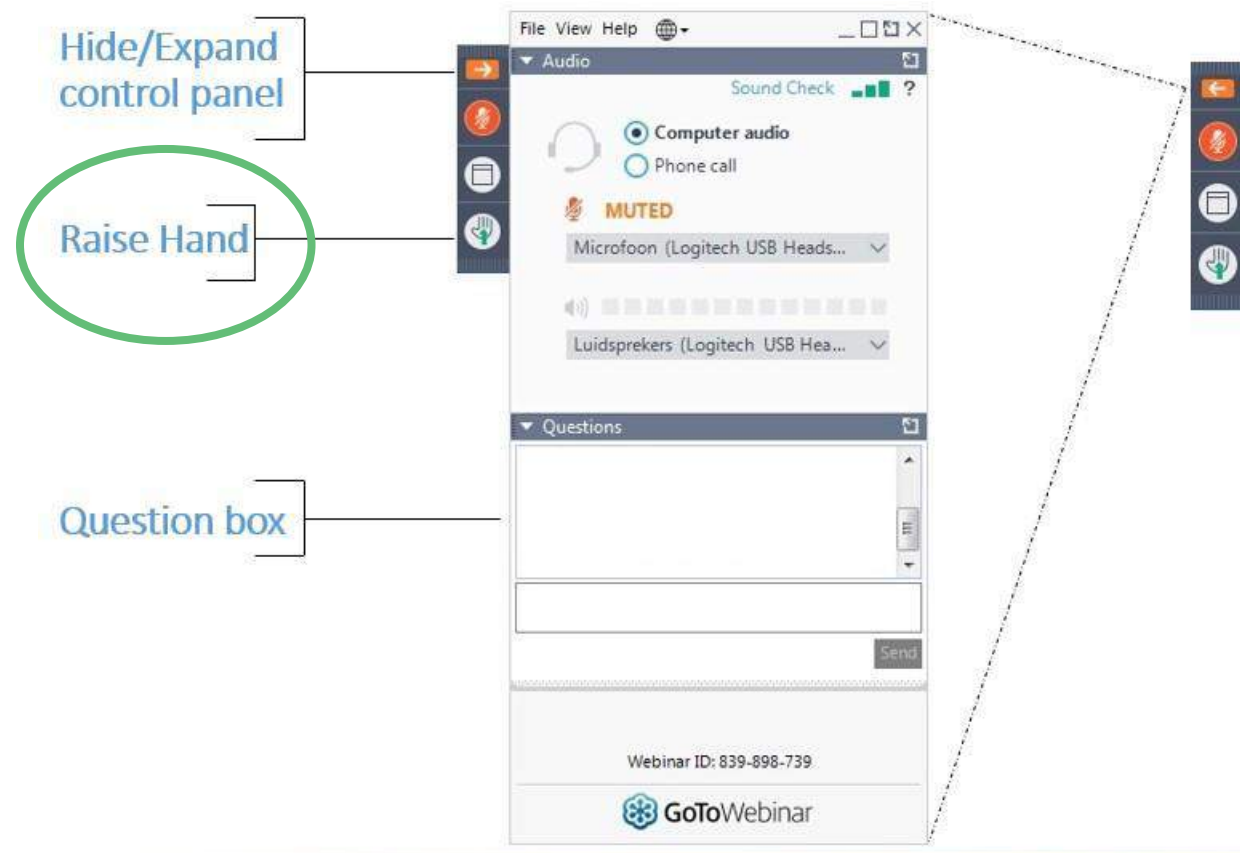


IN CONCLUSION

Urodynamic testing, when done accurately and completely, offers the clinician valuable information about the functional abilities of the lower urinary tract, as one part of a thorough urologic evaluation.

THANK YOU FOR JOINING

Q&A PERIOD – PLEASE RAISE YOUR HAND



CONTACT INFO

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