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Neurogenic Bladders

Mark W. Christopherson, M.D.

Neurogenic Bladder

- Who cares about the bladder?
- Medical School
  - Bladder is ignored
  - Last in anatomy, physiology, and pathology

Bladder Functions

Storing urine

Emptying urine

Socially Acceptable

“Oh that life could be so simple”

Bladder Function
‘a priori’

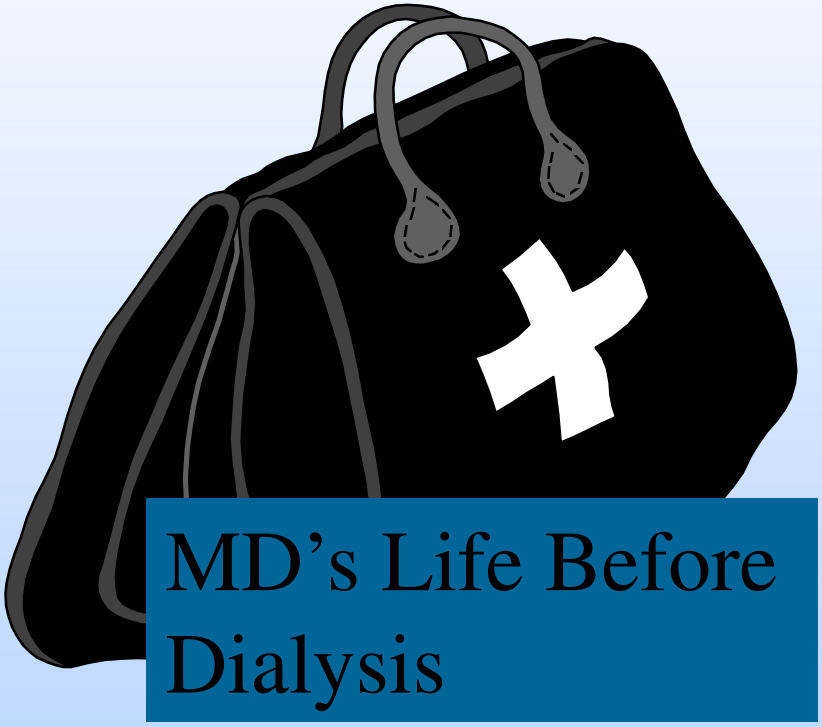
- Protect the **KIDNEYS**
- Preserve **RENAL FUNCTION**

Why is this important for MD's to know?

- Lessons learned in neurogenic bladders can save patients morbidity and mortality**!**
- **NOT JUST SCI**
  - Most of your pts will have bladders

History of the World (In Brief And Sharp Focus)

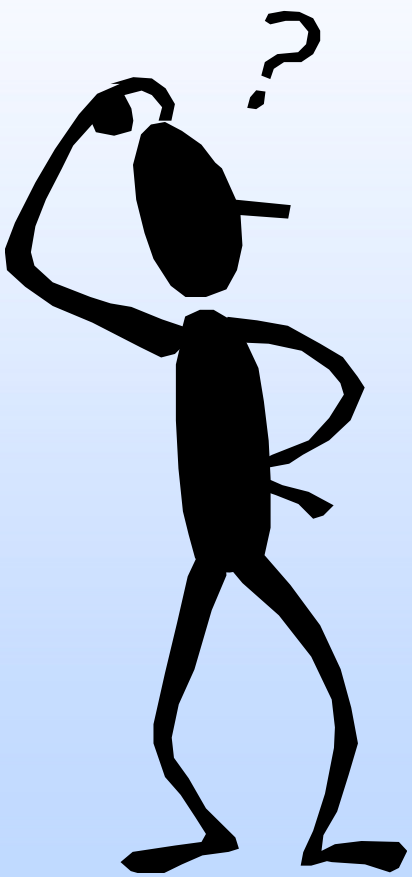
- SCI cause of DEATH
  - Early DRG'S work
    - Papyrus of E. Smith
  - Civil War
    - Dances with Wolves
  - WWI
    - PCN
    - Aminoglycosides
  - WWII
    - Patients died of chronic renal failure



History of the World (Brief And Focused)

- 1960-1970's
  - Maguire
    - University of Michigan
    - Morbidity ~ bladder storage pressure
  - Neurogenic bladders with > 36 cm H2O "storage pressures"
    - Upper track failure
    - SCI death predialysis days

What Does This Mean?



- Another ‘stinkin’ bladder question!
  - “What is your bladder pressure?”
- Does it really Matter?
  - Life expectancy
    - days/weeks: pre-civil war - pulmonary
    - months - PCN
    - < year(s) - Aminoglycoside
    - NOW?

‘YES’
Life Expectancy SCI With Neurogenic Bladders

- Normal 20-year-old
  - +55 years
- Paraplegic 20-year-old
  - +45 years
- Tetraplegic 20-year-old
  - +35 years
- *Days>>>>>Decades
  - managed pressures

So What? Who Cares?

- You do or should

Life off Dialysis is even better

- **Life is good**

ZING!!!

- SCI life is worth living?
- Pre SCI >80% NO
- Post SCI ~40% NO
- 2yrs s/p SCI < 5% NO
- SCI life is “GOOD”
  - How can this be?

Neurogenic Bladder
‘A Little Physiology Please’

- All diagnosis groups can benefit from physiology-based bladder management

Neurological Regulation of Normal Micturition

- Specifics are not universally agreed upon
- Will present a clinically useful, somewhat simplified neurourological architecture

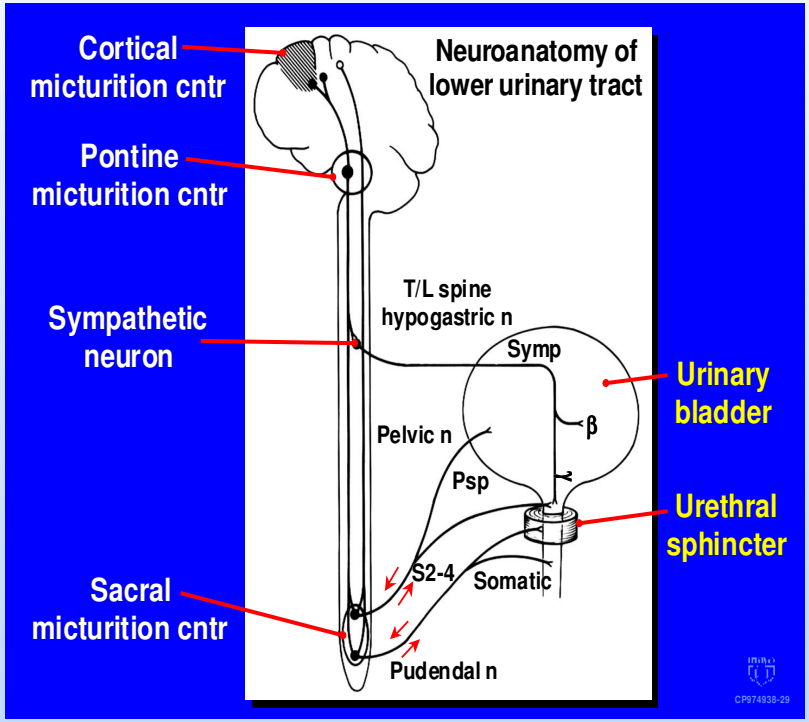
Central Regulation of Normal Micturition "Neurologic Control"

- 3 functional micturition centers within central nervous system
- We will look from "bottom up"

Sacral Micturition Center

REFLEX CENTER

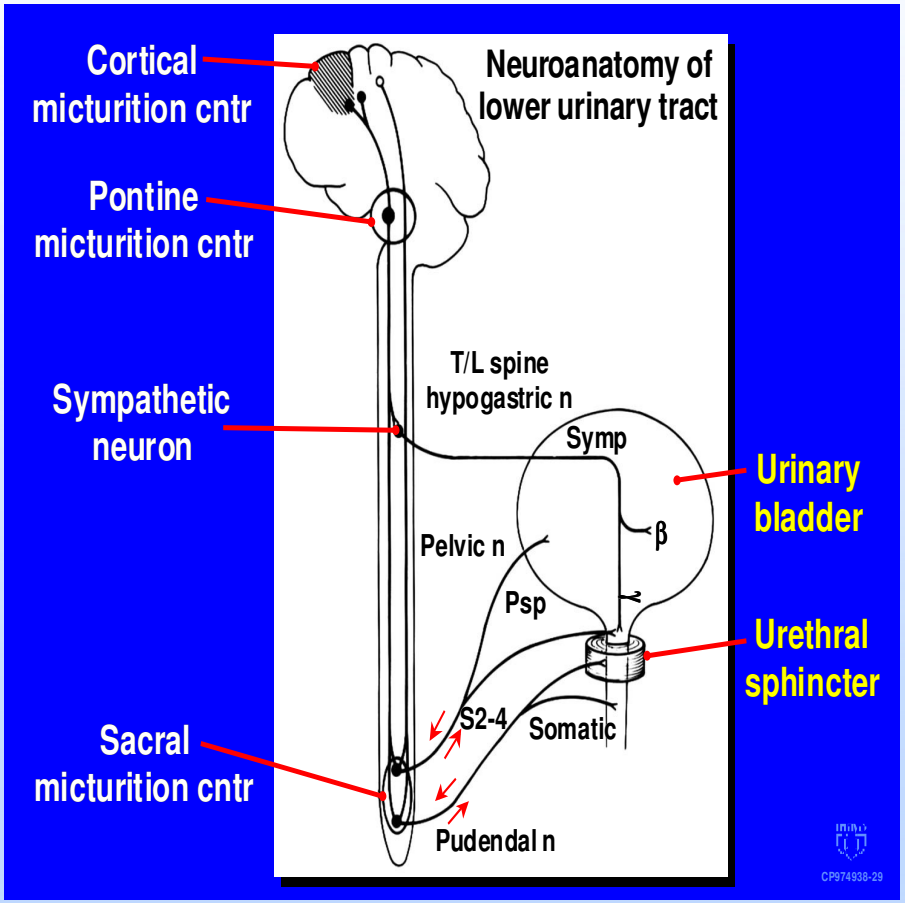
- Local reflex Arc's
  - stretch the detrusor
    - it contracts
  - stretch the sphincter
    - it contracts
- How do you stretch the sphincter?
  - Fluid is non-compressible +/-



Pontine Micturition Center

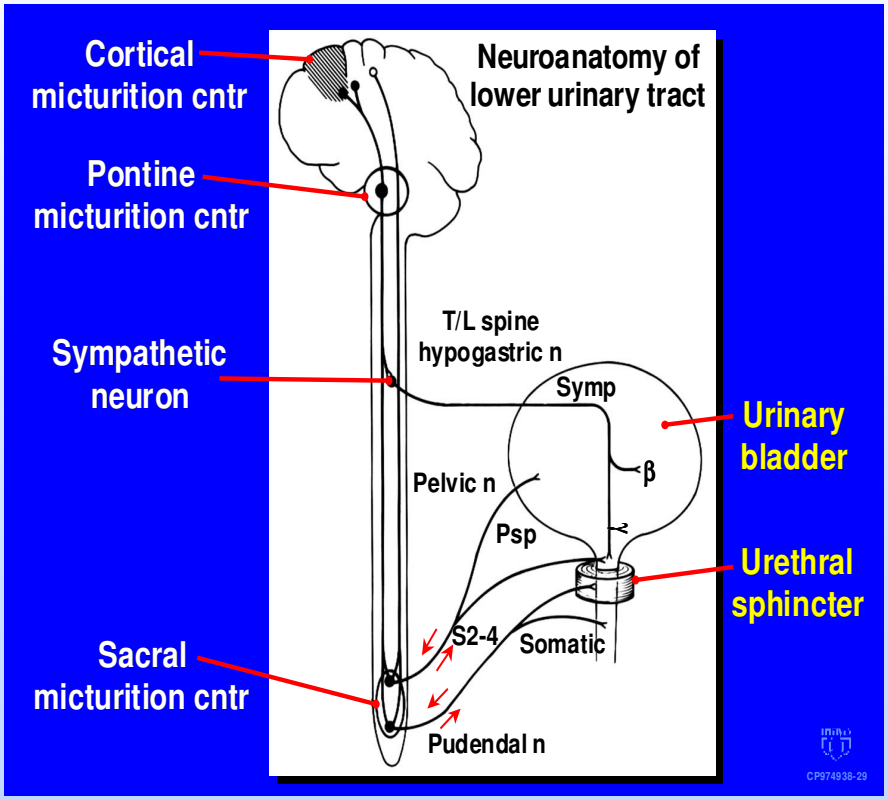
- Coordinate
  Sphincter & Detrusor
- Dyssynergia
  - Dys = 'BAD'
  - Synergia = 'working together'
- Gumby Story

COORDINATION CENTER

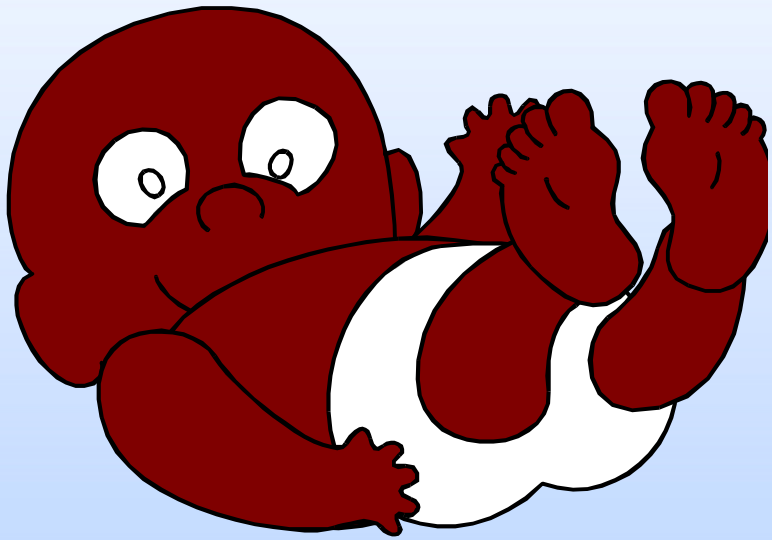


Cortical Micturition Center

- **Knowledge Center**
  - need to void
  - voiding
  - inhibit voiding
- Note Bilateral Cortical representation

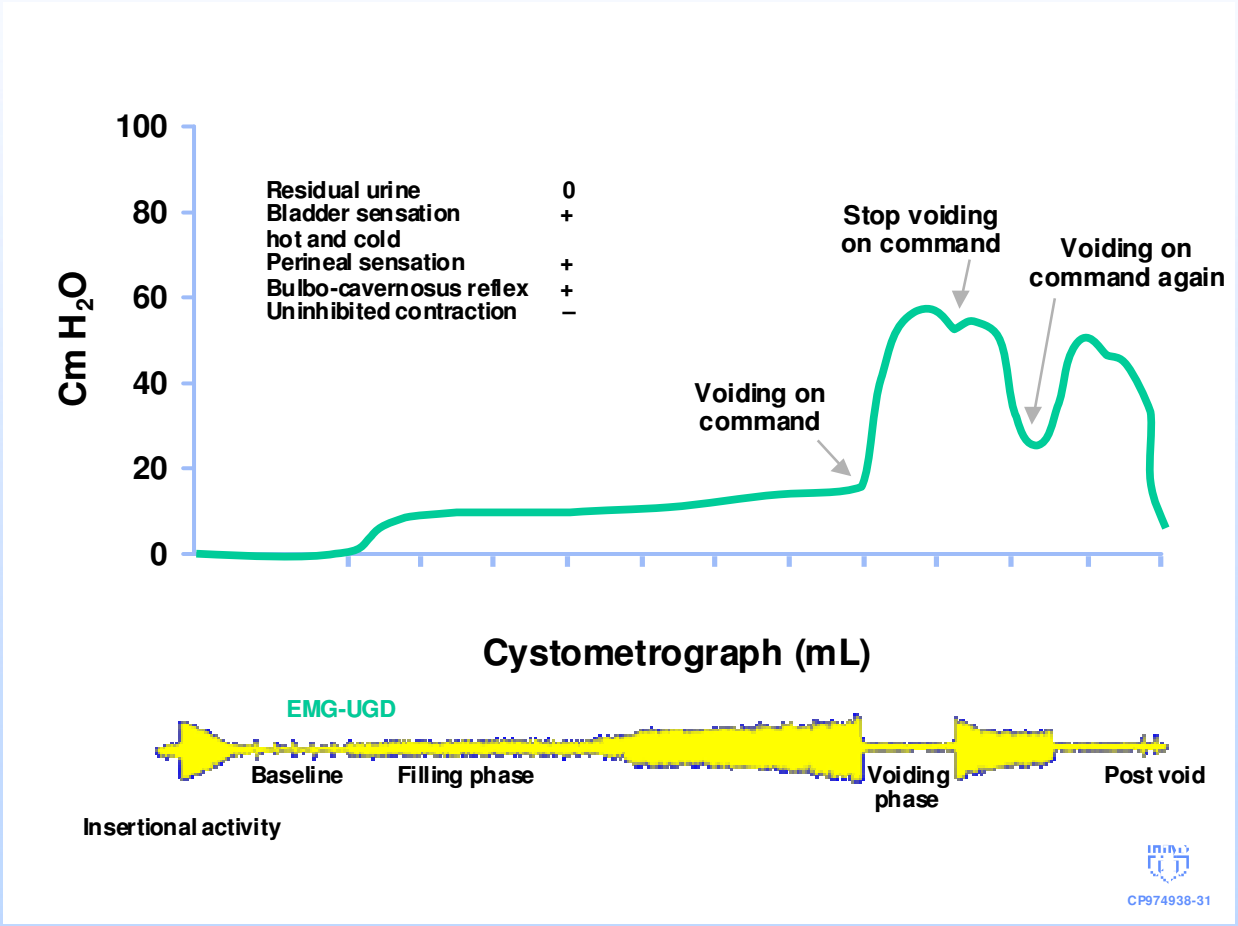


How Do We Study Bladder Function?



- Diaries ?
- **Urodynamic Study**
- Real time neuro-muscular physiology
- Are we having fun yet?
  - UDS Study

UDS


100
80
60
40
20
0
Cm H_2O
Residual urine 0
Bladder sensation +
hot and cold
Perineal sensation +
Bulbo-cavernosus reflex +
Uninhibited contraction –
Stop voiding on command
Voiding on command again
Voiding on command
Cystometrograph (mL)
EMG-UGD
Baseline
Filling phase
Voiding phase
Post void
Insertional activity
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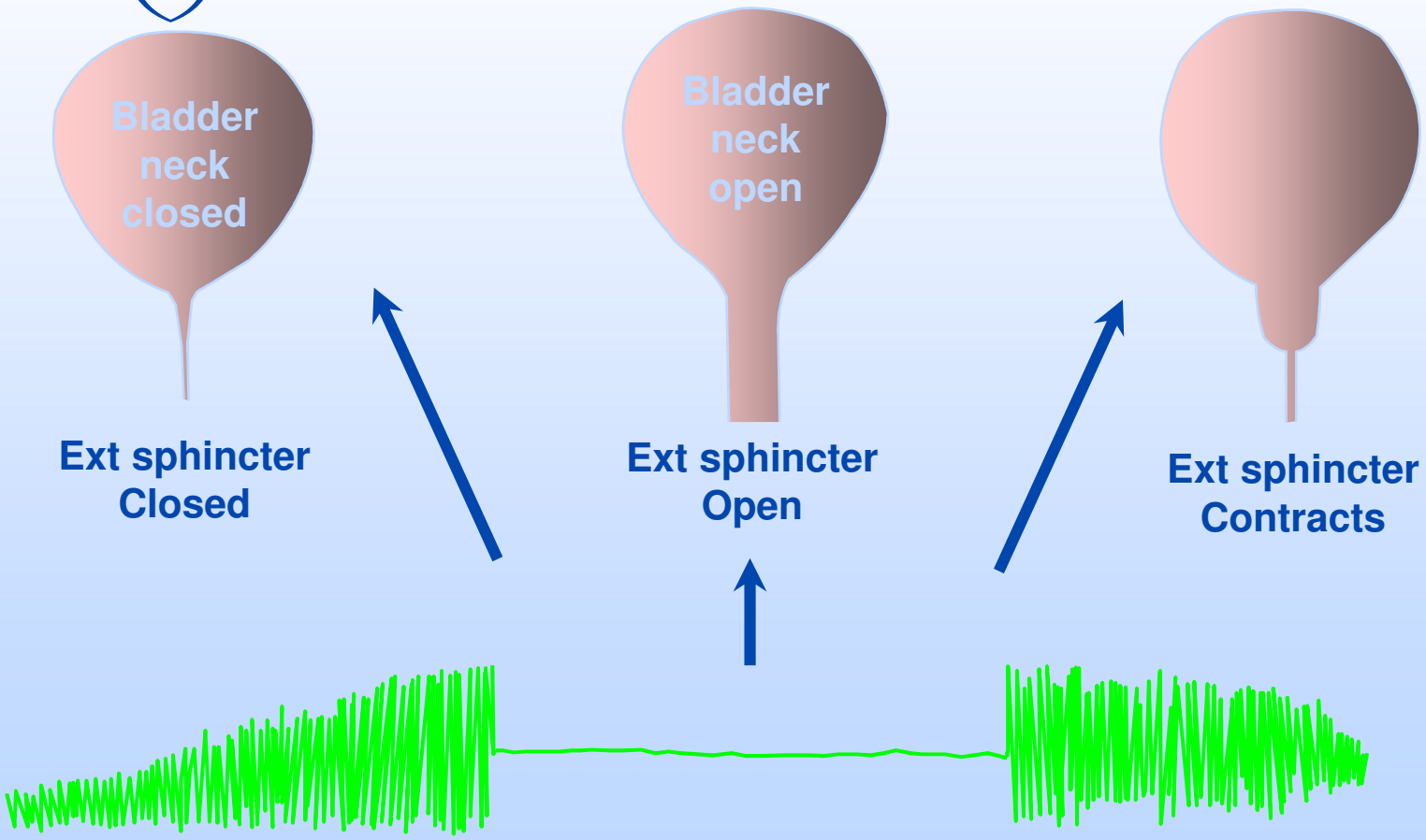
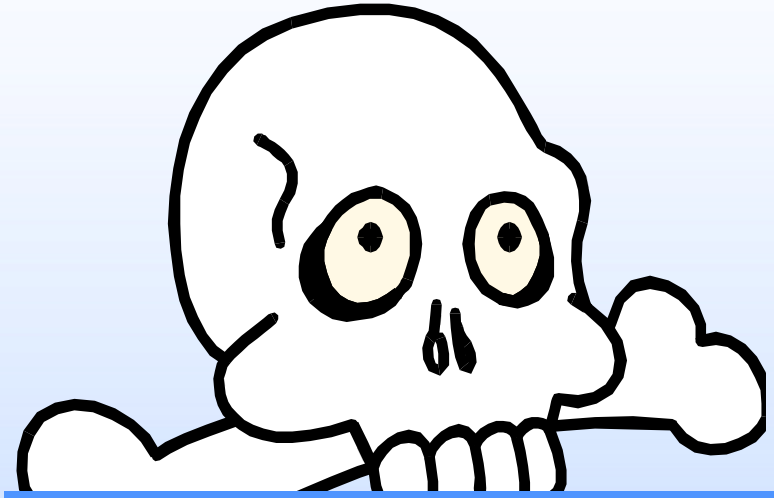
Urodynamic Study



Vesicular PRESSURE



Vesicular pressure

Ureteral pressure

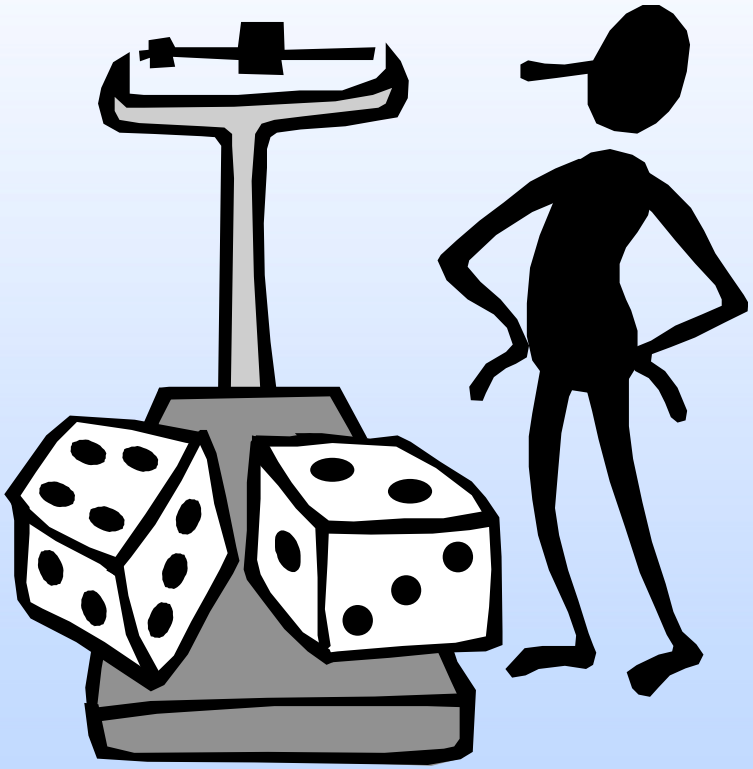
Glomerular capillary pressure

- Renal function & parenchyma loss
  - exceed glomerular filtration capillary pressures
  - Ischemia ….Cell death
- Infection
  - WBC migration into bladder

?
Bladder Storage Pressure < Capillary Pressure

Does it Matter?

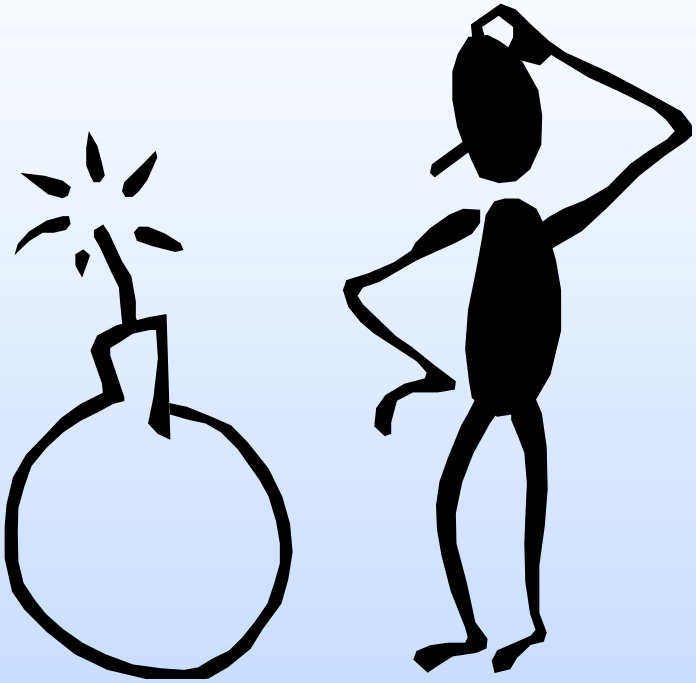
Neurogenic Bladder Rx Options



- UCI/Suprapubic Tube
- I/O Catheterization
- Sphincterotomy
  - condom catheter
- Continent Catheterizable Stoma
- Ileal Conduit
  - ostomies
- Catheter-Free Void
  - alpha block / rectal stretch

Urinary Catheter In UCI /SPT

- Fluids
  - >2.5 liters/d
- Change q 2-4 wks
- Evaluate Q year ***?life expectancy**
  - Renal US/KUB/VCUG
    - Renal parenchyma, stones / hydro / reflux
  - Cysto
    - **squamous metaplasia**
      - 10% in 10 yrs
- UDS
- **No** prophylactic ABX



***Anticholinergics**

Vesicular compliance protection

Mucosal <~>Connective tissue

Intermittent Catheterization

- Fluids
  - 1800 ml/day
  - 400 meals
  - 200 10am,2&4pm
  - Non evening…Legs
- Q I D Cathing
  - goal < 500 cc / cath
- Anticholinergics
  - ?ALL versus storage @ >36 cm/H2O
- ABX Prophylaxis
  - ‘Maybe’
- Clean technique

- Evaluation Q year
  - *Cysto
    - r/o stones
  - *UDS - ? high pressure storage
  - VCUG
    - r/o reflux
  - KUB / Renal US
  - Cr cl baseline
  - Cr, Cystatin C, UA/UC
  - *periodic ~ risk

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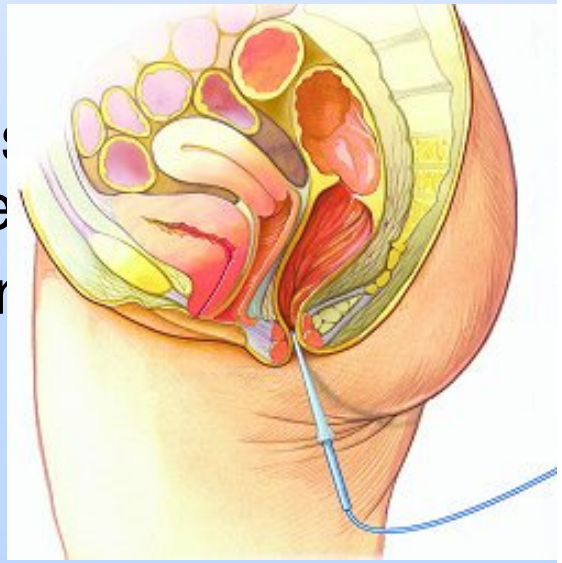
Sphincterotomy & Condom Catheterization

- Fluids
  - minimum 1800 ml prefer >2.5 L
  - training schedule
- Post Void Residual 'PVR'
  - <100cc (150)
  - supine or seated
- Evaluation
  - 1-3 years if low-pressure storage
  - PVR, VCUG, Renal US, KUB, Cr, UA/UC

Continent Catheterizable Stoma

- Females
  - CIC is difficult
    - transfer
    - undress / dress
    - clean perineum
    - urethral location
  - Continuous drainage
    - undesirable
- 'PEE HOLE BELLY BUTTON'

- Umbilical Area
  - Mitrofanoff technique
- Fluid
  - 1800 ml
  - Cath QID
  - Flush early on
- Bowel
  - loose, ri
    incontine
  - cholestyr



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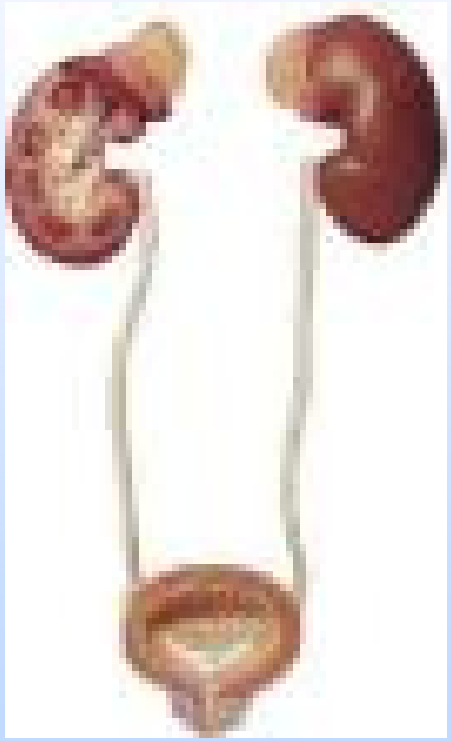
Neurogenic Bladder Evaluation

- Upper Tract (kidney / renal pelvis / ureter)
  - define anatomy
  - define function
- Lower Tract (bladder / urethra)
  - define anatomy
  - define function

Upper Tract (kidney / renal pelvis / ureter)



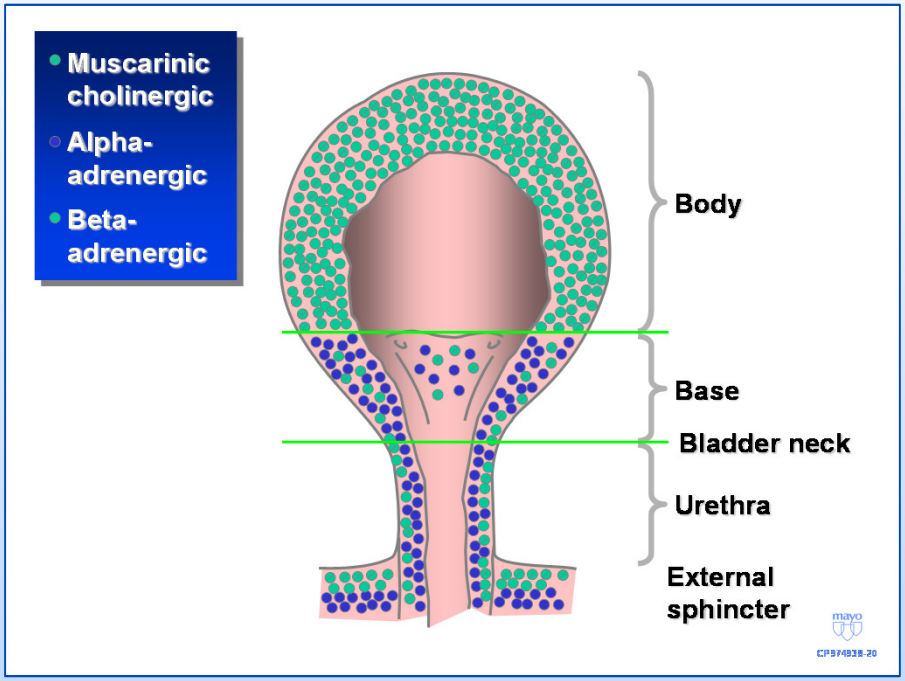
- Anatomy
  - KUB / EXU
  - Renal US
  - CT
- Function
  - Cr (reduced muscle)
  - Cystatin C
  - CrcI
    - Iothalamate or 24hr

Lower Tract

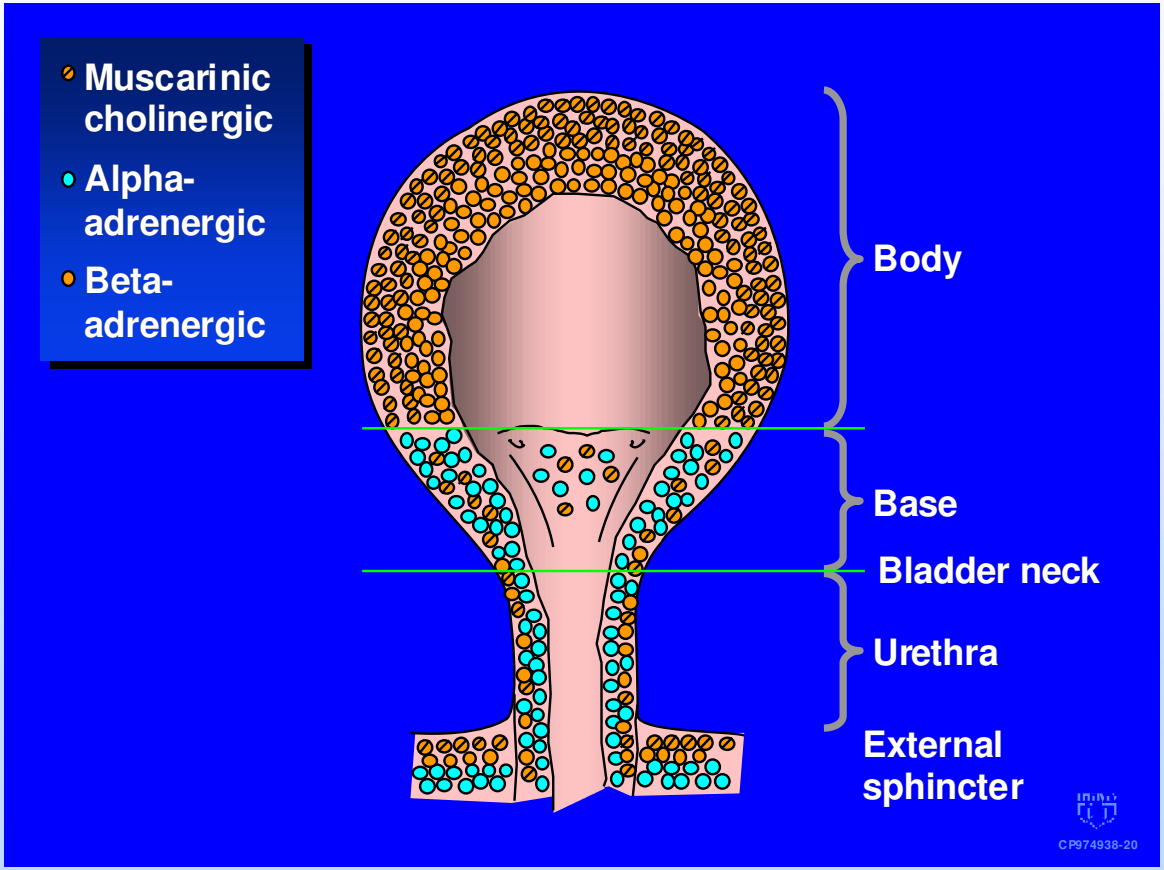
- Anatomy
  - Cystogram
  - Cystoscope
- Function
  - UDS
  - Voiding Diary or HX

Common Bladder Medications What Do They Really Do?

- Anticholinergic
  - decrease detrusor activity
  - mucosal/adventitial interface
    - Dec fibrosis
- Alpha blockers
  - decrease internal sphincter tone



Bladder Neurologic Receptors



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Who Do I See Who May Have A Neurogenic Bladder?

- Multiple sclerosis
- Strokes
- NPH
- SCI

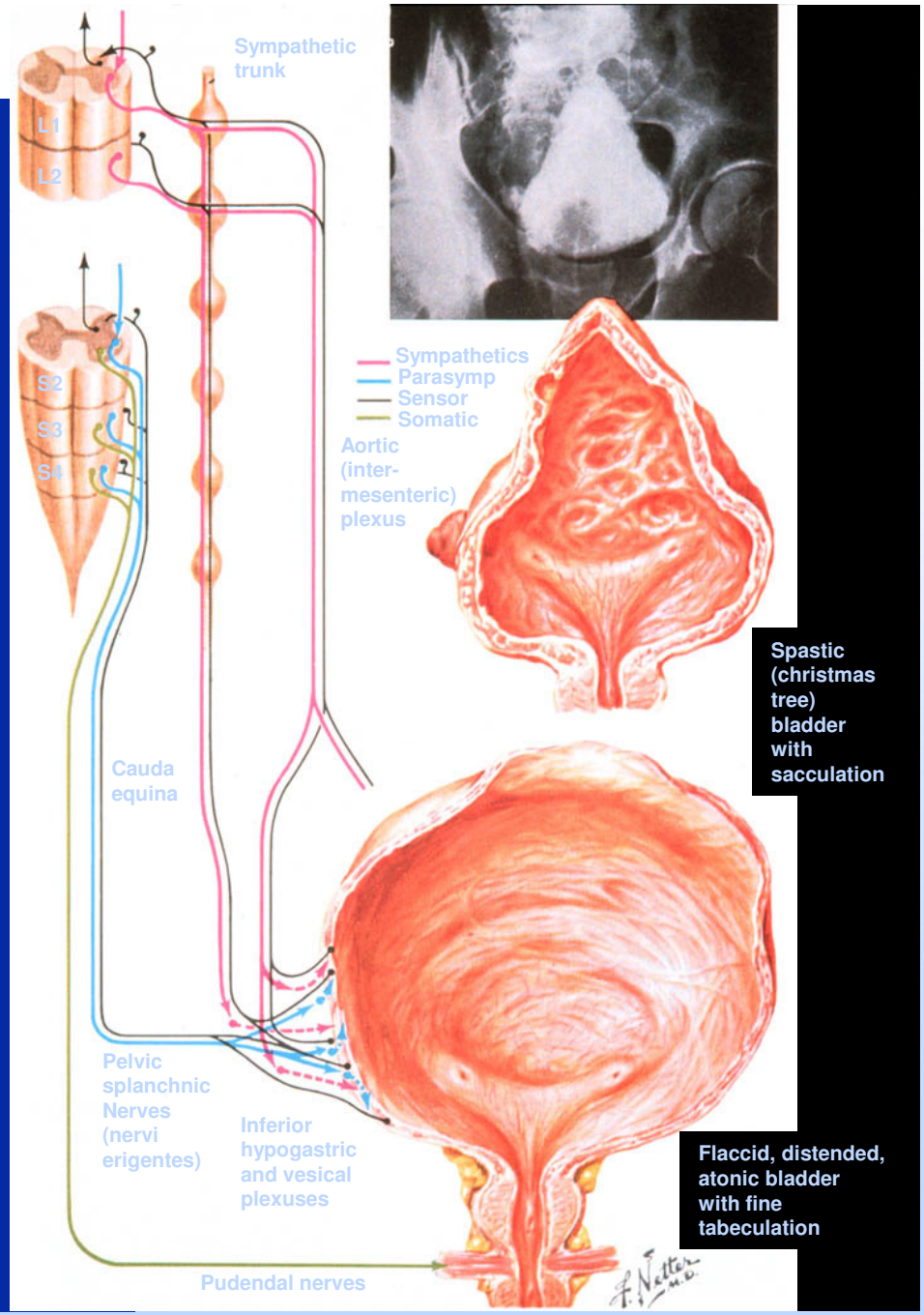
Neurogenic Disorders of the Urinary Bladder

Etiology

Spinal cord
- Syphilis (tabes dorsalis)
- Pernicious anemia (subacute combined sclerosis)
- Tumors
- Trauma (transection)
- Hematoma
- Syringomvelia
- Multiple sclerosis
- Arteriosclerosis
- Poliomyelitis
- Transverse myelitis
- Paralysis agitans
- Disc herniation

Cauda equina
- Tumors
- Trauma
- Spina bifida

Nerves and/or nerve plexuses
- Trauma
  - Accidental
  - Surgical
- Diabetes
  - Neuropathy
- Infections
  - Scarlet fever, ETC
- External pressure
  - Fetal head
  - Neoplasm



Spastic (christmas tree) bladder with sacculation

Flaccid, distended, atonic bladder with fine tabeculation

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Questions & Discussion