Common Pediatric Urologic Emergencies: Presentation, Diagnosis, and Management

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Disclosures

- None

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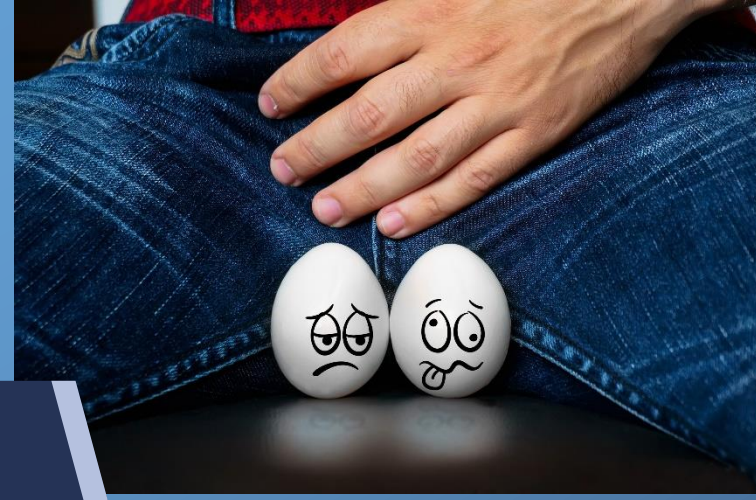
Objectives

- Evaluate the acute pediatric urologic condition, including the role of appropriate imaging
- Discuss the evaluation including the management of the acute scrotum and acute penile conditions
- Discuss the management of acute pediatric urologic conditions including renal, pelvic, and genital trauma
- Discuss the management and treatment of renal calculi and nephrolithiasis ED protocols for pediatric patients

Acute Scrotum



1. TESTICULAR TORSION
2. EPIDIDYMITIS/ORCHITIS
3. SCROTAL ABSCESS
4. TORSED APPENDAGE

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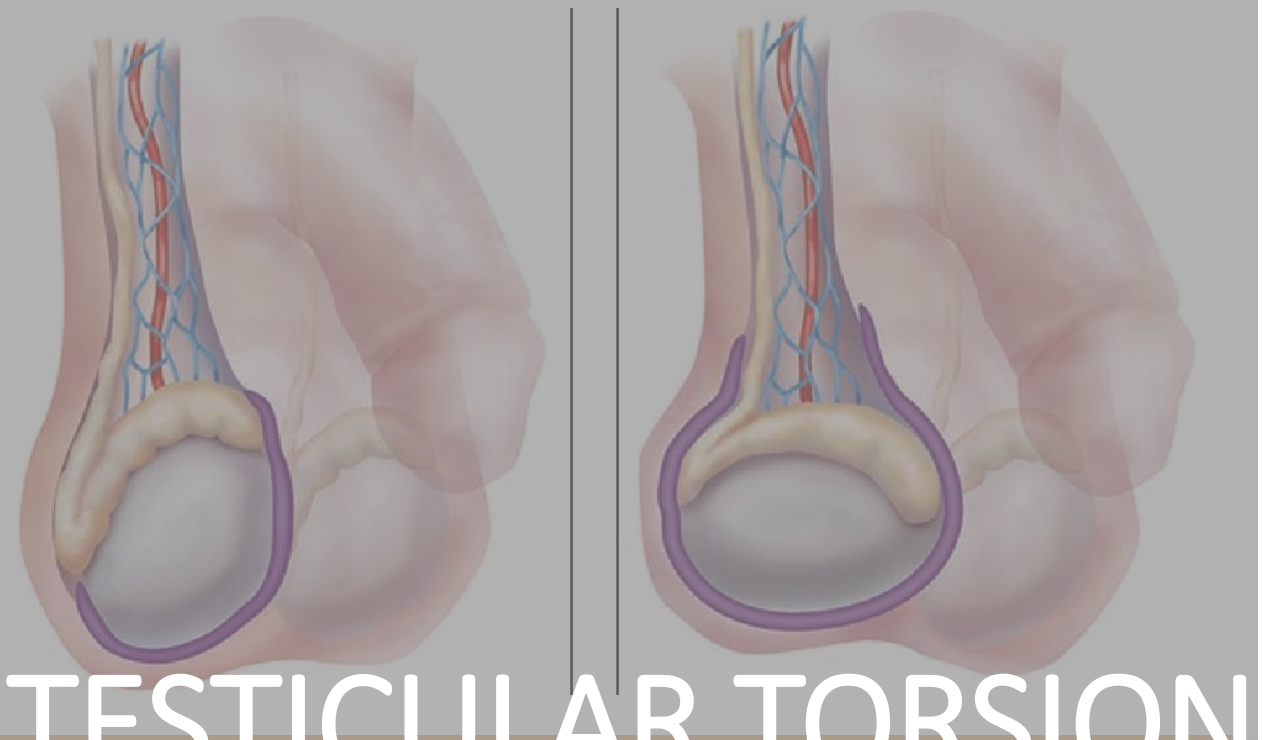
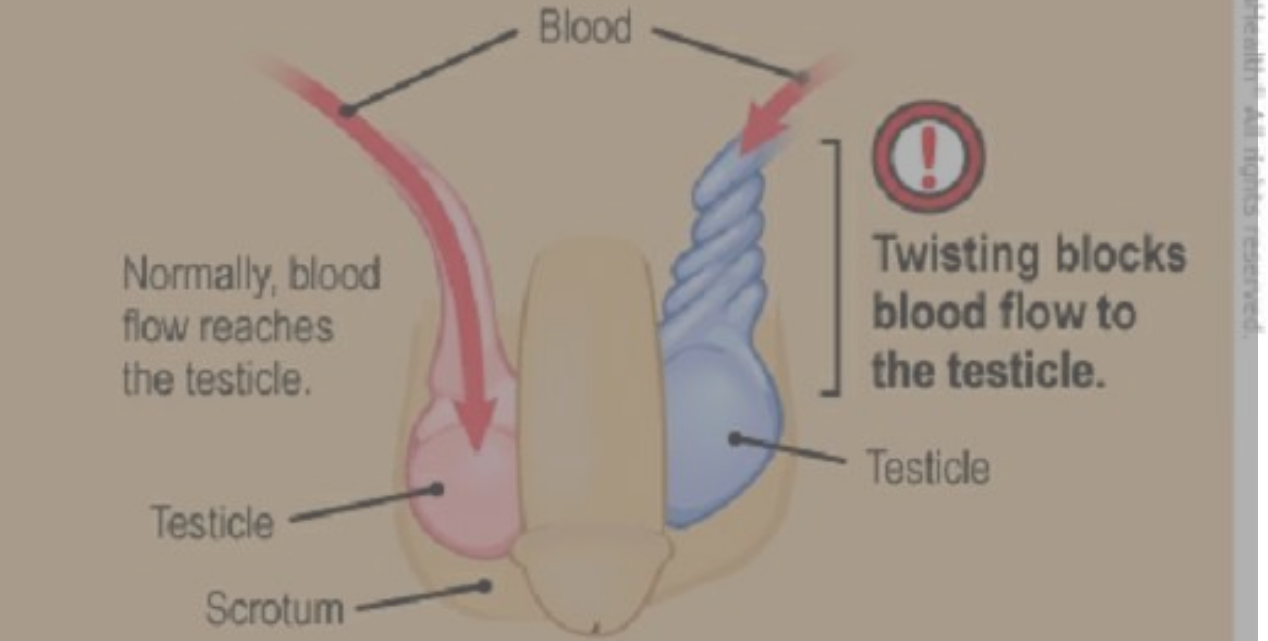


TESTICULAR TORSION



01 Accounts for 50-60% of acute scrotum case

02 Must be distinguished from epididymitis

03 Associated with Bell Clapper’s deformity

04 Rare cases mass/cyst causing lead point for torsion

Testicular Torsion

1. Acute sudden scrotal pain/swelling
2. Mostly occurs in Adolescents
3. Associated with Nausea/Vomiting
4. Testicular pain can radiate to the groin/abdomen
5. Urethral discharge not present
6. No associated voiding complaints

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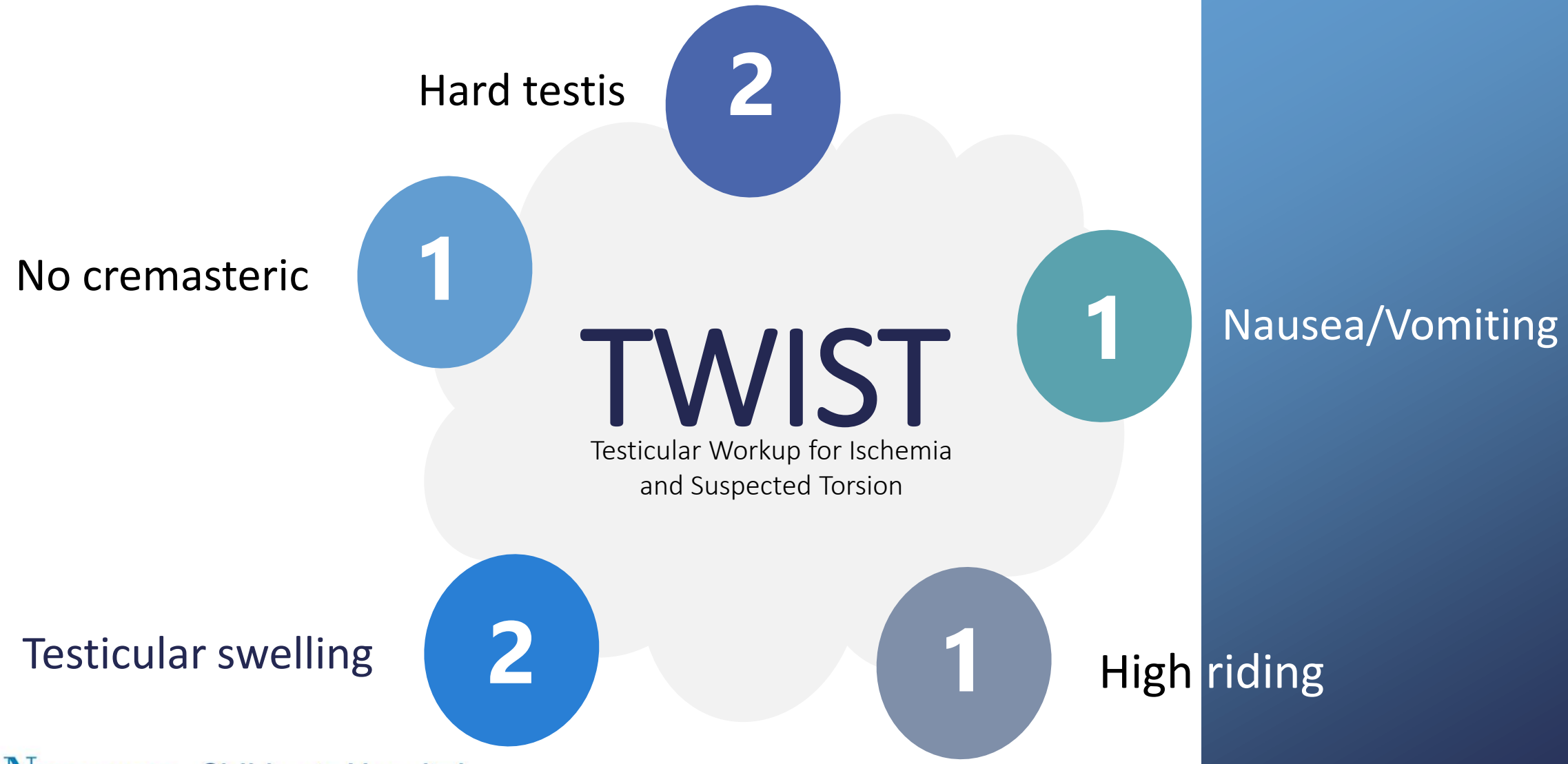
Testicular Torsion

- Physical Exam
  - Patient uncomfortable/restless
  - Scrotal edema
  - High riding testicle, sometimes lays horizontal
  - Lack of cremasteric reflex
  - Abdominal pain
- UA – negative
- Imaging
  - TUS
    - Demonstrates lack of blood flow to the testicle

Testicular Torsion



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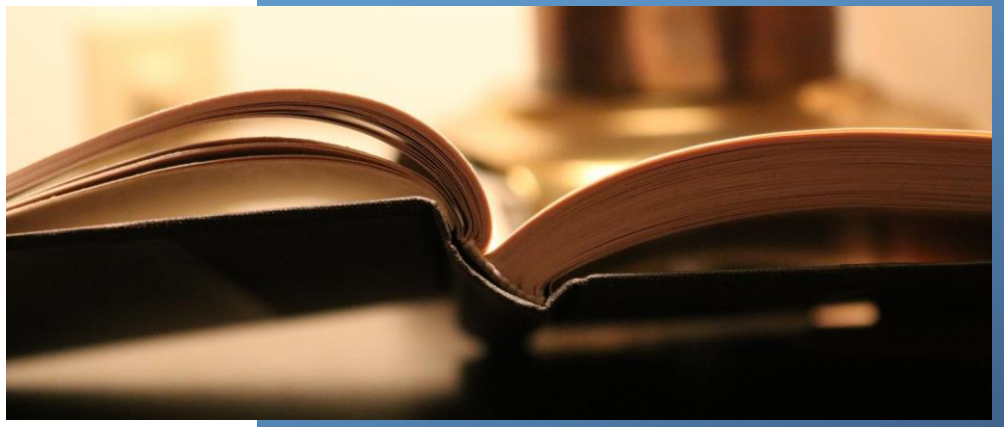
Testicular Torsion

- Manual Detorsion
  - Does not replace surgery
  - May help relieve some ischemia
  - Grabbing effected testicle and going from medial to lateral (open book)
- Immediate Surgery
- Time Sensitive
  - After 4 to 6 hours from **onset**, the testicle can be saved 90% of the time
  - After 12 hours, this drops to 50%
  - After 24 hours, the testicle can be saved only 10% of the time.



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Testicular Torsion

- Scrotal exploration, detorsion and **bilateral** orchidopexy
  - 30-40%risk of bell clapper's deformity in the contralateral testicle
- No straddling activity for two weeks postop

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EPIDIDMYTIS

Prepubertal Males, associated with adolescents

<1%

ONSET

Gradual
Testicular pain

Scrotal pain

20%

PAIN

With movement

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Epididymitis

Chemical

- Voiding Dysfunction
- Hold urine
- Urine irritates testicles

Bacterial

- Patient sexually active
- Urethral discharge may be present
  - Thin and watery – Chlamydia
  - Thick and creamy – Neisseria gonorrhea

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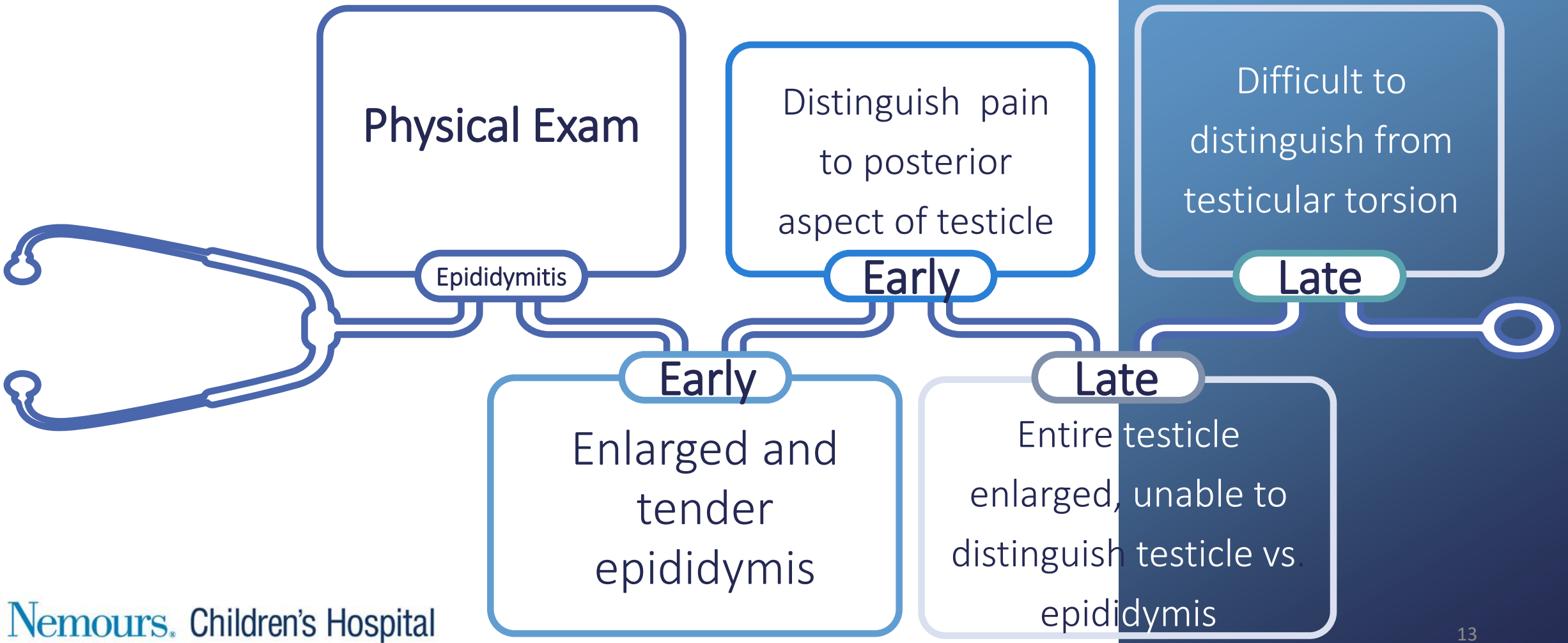
Epididymitis



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Epididymitis

- Imaging
  - TUS
- Urinalysis
  - Usually reveals leukocytes
  - Culture swab may reveal infectious agent
  - Negative in chemical epididymitis

Epididymitis

NSAIDS

For Pain

Decreases inflammation

ABX

Treat bacterial infection

Chlamydia

Gonorrhea

NO INFX

Frequent voiding

Increase water intake

Void prior to physical activity

FOLLOW UP

Scrotal support

Follow up with Pediatric Urology in 7-10 days

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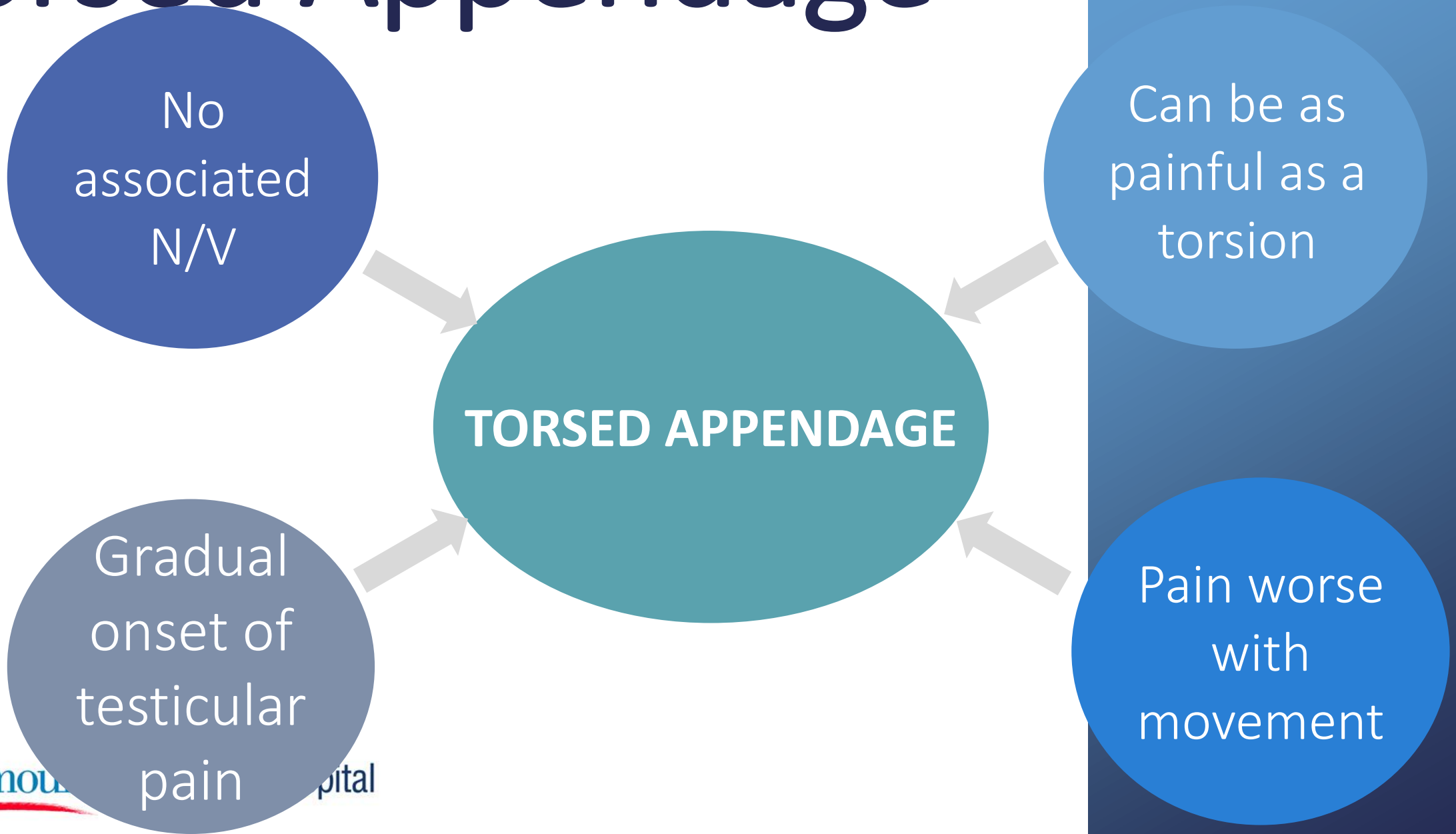
Torsed Appendage



Torsed Appendage

- Physical Examination
  - Patient is uncomfortable
  - Ambulating with legs straddled
  - Scrotal swelling and tenderness
    - Associated with length of pain onset
  - Cremasteric reflex is present
  - “Blue Dot” sign can be present
- Imaging
  - TUS

Torsed Appendage

- Rest
- NSAIDS
- Will improve over time

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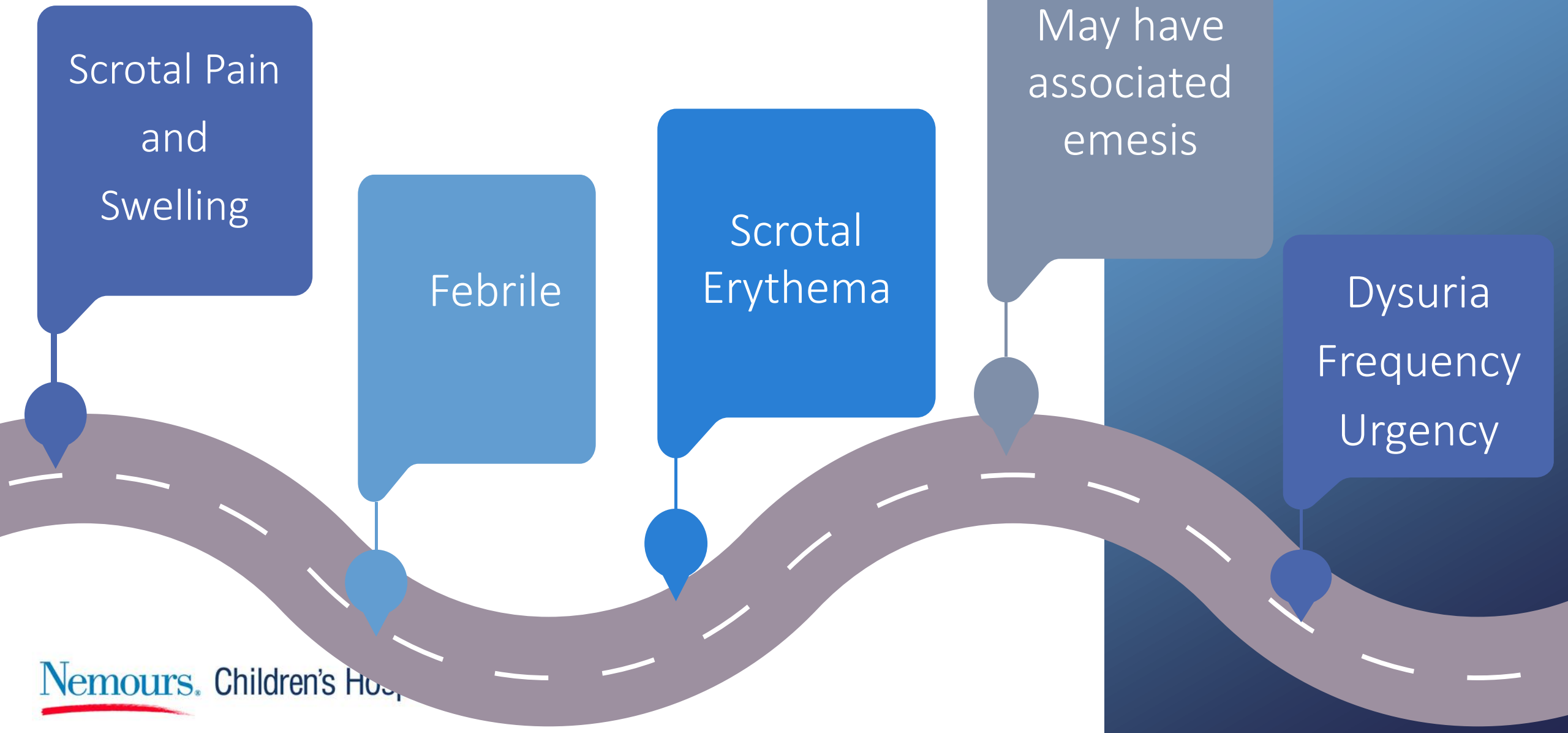
Scrotal Abscess

- Rare
- Secondary to underlying issue
  - Appendicitis
  - Infectious epididymitis
  - Extravasation of infected urine in patient with urethral stricture in patients with neurogenic bladder with external collection device

Scrotal abscess



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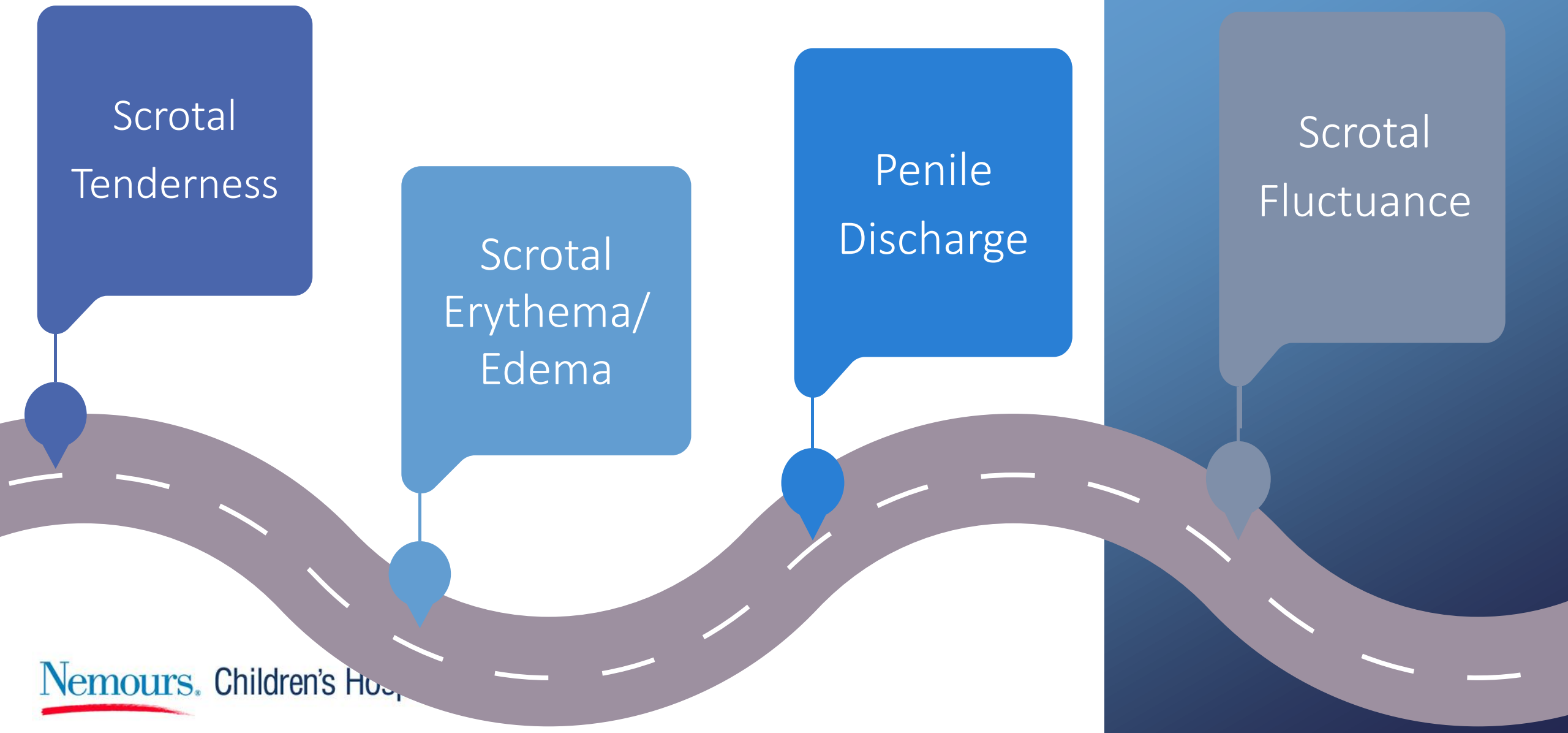
Scrotal Abscess



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Scrotal abscess

- Imaging
  - TUS
    - Delineates location and extent of abscess
- Treatment
  - I&D
    - May need multiple
  - Risks
    - Injury to vas/vessels
    - Injury to epididymitis

GU Trauma

RENAL TRAUMA 01

PELVIC TRAUMA 02

TESTICULAR RUPTURE 03

GENITAL TRAUMA 04

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Renal Trauma

- Most commonly injured GU organ
- Blunt trauma represents 80-90% of renal trauma
- Of all abdominal traumas (blunt or penetrating) 8-12% have renal trauma
- Kidney more susceptible in children due to it's larger proportional size compared to the adult organ.

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RENAL TRAUMA

BLUNT

- Presence of associated injury
  - Flank Bruising
  - Lower rib and vertebral fx
  - Multi-system injury
- Gross hematuria >50RBC/HPF

PENETRATING

- Penetrating injury to flank, abdomen, or chest
- Hematuria

F.A.S.T. VS CT

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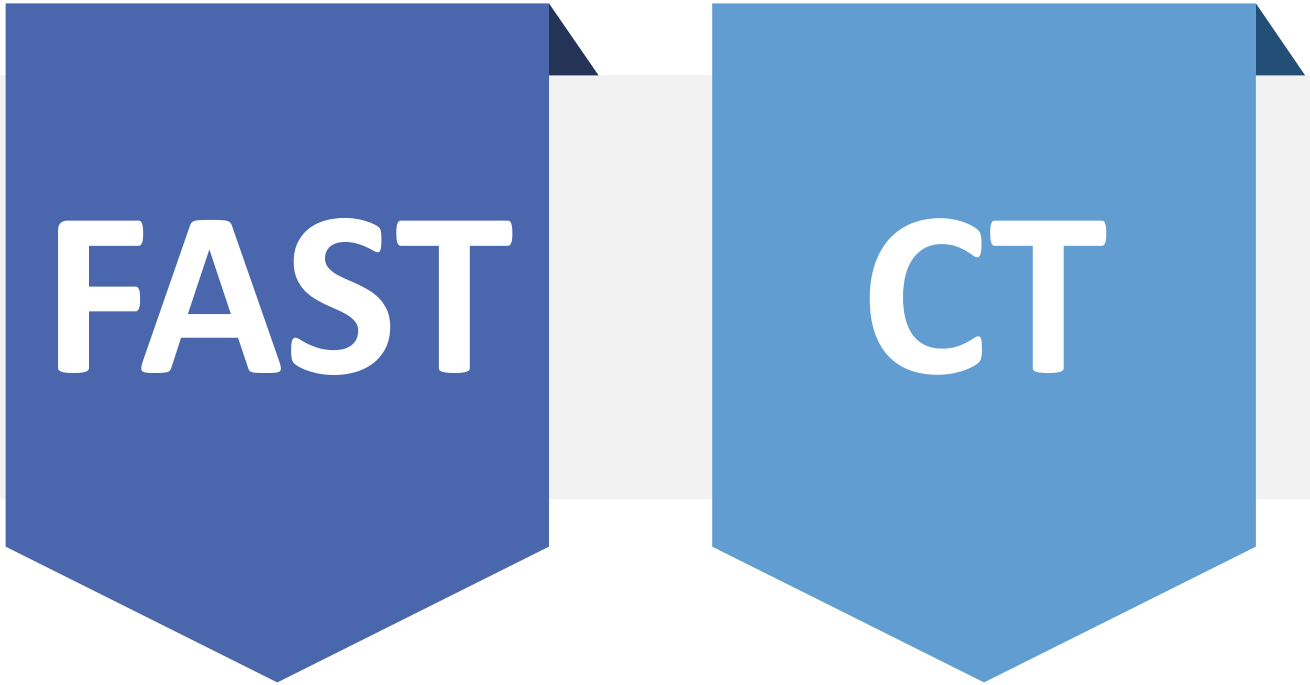
Renal Trauma



Focused Assessment w/Sonography for Trauma

W/WO Contrast

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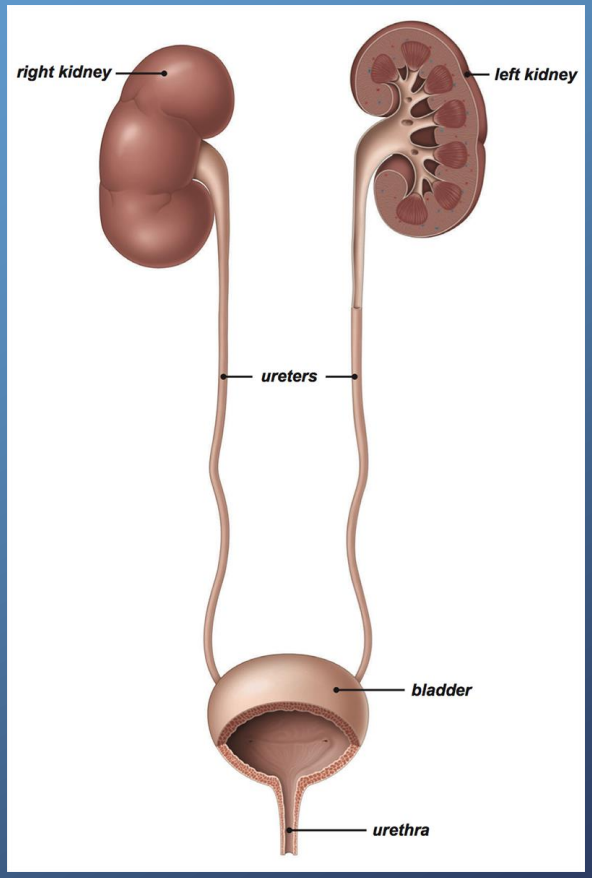
Renal Trauma

- Non operative
  - 90% of blunt renal trauma can be treated this way
  - Bed rest until urine clears up
  - Prophylactic ABX in case of urine extravasation
  - Light activity for 2 weeks

Renal Trauma

- Ureteral in jury rare
  - Frequently missed
  - Typically associated with gunshot wounds or stabbings
  - UPJ typically involved
  - Hematuria in 20-40% of patients



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Pelvic Trauma

- Bladder and Ureteral injury
  - Typically associated with blunt abdominal trauma sustained in a MVA
  - Patients with bladder rupture 89% have associated pelvic fracture
  - Posterior urethral injuries also associated with pelvic fracture
  - Blood at meatus good indicator of urethral injury

Pelvic Trauma

- Blood at urethral meatus
  - RUG (retrograde urethrography) should be performed
- No blood noted or ureteral injury identified
  - Can pass a well lubricated catheter
  - If hematuria noted, then cystogram
  - Complete imaging including lower abdominal scout film, film of distended bladder and post drainage should included
  - Important to know pediatric bladder capacity
    - (age+2) x 30

Pelvic Trauma

- If ureteral extravasation or bladder rupture- immediate urology consult

Testicular Rupture

- Associated with Blunt Trauma to the testicle
- Immediate swelling and pain that does not improve
- TUS
  - Reveal disruption in tunica and should describe the visualization of tubules
- Requires Surgery

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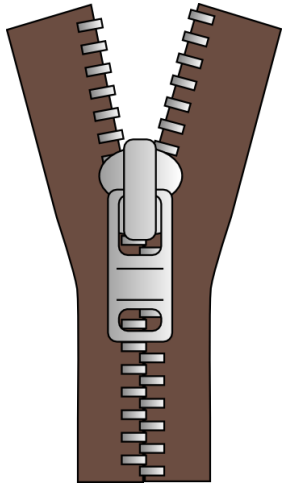
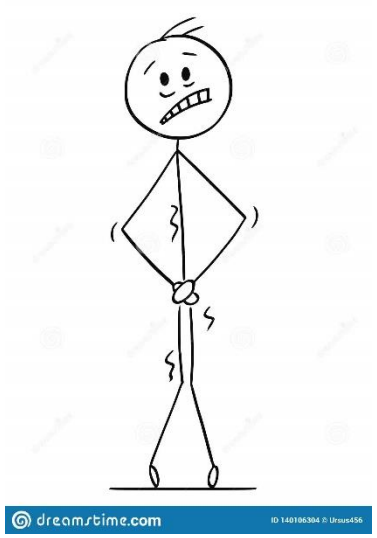
Genital Trauma

- Scrotal and penile injuries
  - Blunt trauma, straddle injury, bicycle falls
  - Depending on the extent of injury evaluation of urethra and corporal bodies should be done
    - If injured needs urologic evaluation
  - Penile fractures can occur after blunt trauma to an erect penis
    - Extremely rare in prepubertal boys

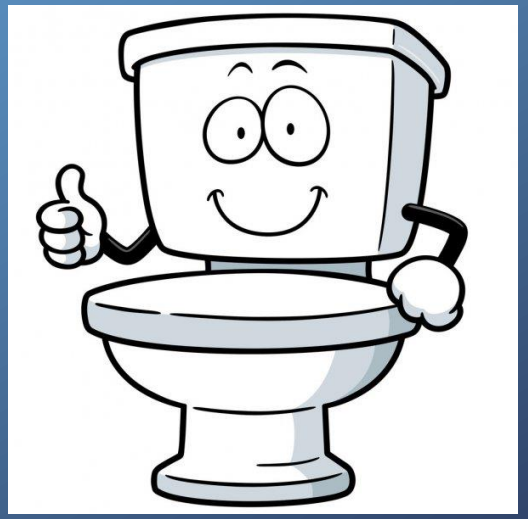
Genital trauma

- Post NC complication
  - Wound dehiscence
    - Wet to dry
    - BACITRACIN
- Penile Hair/thread tourniquet
  - Accident versus intentional
  - Edematous glans
- Domestic animal attack
  - Tissue destruction
  - ABX oral and topical
  - Wound debridement





- Toilet seat trauma
- Entrapment in zipper
- Power tools



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Genital trauma

- Vaginal Trauma
  - May be associated with sexual abuse
  - Foreign body insertion
  - Blunt pelvic forces
    - Bladder and pelvic injuries
  - Vaginal lacerations may require repair
  - Vaginoscopy, cystoscopy and rectal examinations may necessary to ensure bladder, urethra, or anorectal injuries aren't overlooked

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Acute Penile Conditions

PARAPHIMOSIS	01
BALANITIS/BALANOPOSTHITIS	02
PRIAPISM	03

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PARAPHIMOSIS

- Foreskin remains retracted behind the glans
  - Causes lymphedema to the glans and the mucosal collar of the penis
- Occurs in uncircumcised males
- Associated with a phimotic ring
- Painful
- Can lead to glanular ischemia leading to necrosis
- Medical emergency

PARAPHIMOSIS

- Reduce the foreskin over the glans
- Early in presentation may use sucralose/mannitol
- Manual reduction most successful
  - Squeeze the glans to reduce to lymphedema while simultaneous pulling on the foreskin
- Penile block may be needed
- Refer to Urology for circumcision after edema has resolved

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BALANITIS

- Infection of the glans
- May include the foreskin – balanoposthitis
- Effects 3-11% of males
- Signs/symptoms
  - Glanular erythema
  - Skin excoriation
  - Scarring of the glans/foreskin
    - Balinitis Xerotica Obliterans (lichens sclerosis)
  - Dysuria
  - Meatal Stenosis (rare)

BALANITIS

- Causes
  - Poor hygiene
  - Soaps/Skin irritants
  - DM
  - Candida infection
  - STI

BALANITIS

- Treat the underlying cause
  - Fungal infection
    - Nystatin topical(first line)
    - Clotrimazole
  - Bacterial
    - Mupiricin ointment - pediatric
    - Bacitracin/neomycin
    - Neosporin
  - STI
    - Treat the STI
  - Recurrent Infections
    - Consider circumcision

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PRIAPISM

- Prolonged painful erection greater than 4 hours
- Not associated with sexual arousal/desire
- Idiopathic in 60% of patients
- Three types
  - Ischemic (low flow)
    - Painful
    - Most of penis is hard, glans is not
    - Most common
  - Non-Ischemic
    - Non painful
    - Most of the entire penis is hard
  - Recurrent Ischmeic (intermittent)
    - Uncommon
    - Usually associated with sickle cell anemia

PRIAPISM

Ischemic

- Physiologic obstruction of venous drainage
- Build up of highly viscous poorly oxygenated blood within the corpora
  - Injures penile tissue causing ED or penile necrosis

Non-Ischemic

- Thought to be caused by unregulated cavernous arterial flow
- Blood is neither hypoxic or acidotic

PRIAPISM

- Ischemic Priapism causes
  - Sickle Cell Disease
  - Leukemia
  - Pelvic Tumors/infections
  - Penile trauma
  - Spinal cord trauma
  - Medications
    - PDE 5 Inhibitors
      - Sildenafil, Vardenafil, Tadalafil
    - Vasoactive prostaglandins with or without papavarine or phentolamine
      - Aloprostadil
    - Tricyclic Antidepressants
- Non-Ischemic Priapism Causes
  - Blunt trauma to penis, pelvic/perineum

PRIAPISM

- Ischemic
  - Step wise fashion
  - Sickle Cell patients should be treated with fluids, pain medication and oxygen, but this should not be the only treatment for the priapism
  - Initial intervention may utilize therapeutic aspiration
    - With/without irrigation or intracavernous injection
  - Priapism persists injection of sympathomimetic
    - Phenylephrine – drug of choice due to decrease risk of CV side effects
      - 100-500 mcg/ml and 1 ml injections every 3-5 min for one hour before deciding treatment will not be successful

PRIAPISM

- Ischemic
  - Surgical shunts should be considered if intracavernous injections have failed
  - Oral systemic therapy is not indicated for treatment of ischemic priapism

PRIAPISM

- Non-Ischemic
  - 62% of untreated patients have spontaneous resolution
  - Corporal aspiration has only a diagnostic role
  - Injections of sympathomimetic agents is not recommended
  - Initial treatment should be observation
  - Immediate invasive interventions (embolization/surgery)
    - Risks of ED, chances of spontaneous resolution should be discussed

RENAL STONES

- Increase incidence among pediatric population
- USA 1:685 hospital admissions
  - Varies by region
  - Incidence higher in warmer climates
  - Attributed to diet
- Metabolic abnormalities – 50%
  - Recurrence more common in children with metabolic, genetic, and urinary tract abnormalities
- Girls and boys equally affected.
- Most common stones
  - Calcium Oxalate – 45%
  - Calcium Phosphate – 24%
  - Magnesium ammonium nitrate (struvite) – 17%

RENAL STONES

- Back pain
  - Radiates downward and centrally towards lower abdomen or groin
  - Variable, depending on age
  - Flank pain less common in children, particularly those under 5y/o
  - Severe colicky abdominal pain common in adolescents and school-aged children
  - Nonspecific symptoms –abdominal pain, nausea, vomiting, irritability in younger children
- Dysuria
- Family history of renal stones
- Fever
- Urinary frequency/urgency
- Asymptomatic
  - Found incidentally

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RENAL STONES

- Physical Examination
  - HTN
  - Tachycardia
  - Abdominal pain – younger children
  - CVA tenderness – older children

RENAL STONES

- UA/UCx
  - Hematuria
  - WBC
- BUN/CR
  - Normal, to slightly elevated
- RUS
  - Helps asses for hydronephrosis
  - Gives location of stone
  - No radiation
  - Children – US first line imaging, then NCCT if high suspicion of stone but US negative
- CT
  - Should be use if RUS is inconclusive

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RENAL STONES

- Patient comfortable?
- Obstructed vs Non obstructed?
- Location, Location, Location!!!
  - Renal stones pass spontaneously in 32-50% of children
  - Ureteral stones pass spontaneously in 41-63% children
- What is the Stone size
  - Less than 4mm pass spontaneously
  - Greater than 4mm may need some endourologic treatment
- Is there an Infection?

***Stone passage can take 4-6 week and confirmation of passage by imaging or visualization of passed stone mandatory

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RENAL STONES

- Conservative Management
  - Medication expulsion Treatment (MET)
  - Tamsulosin use in children increases stone passage 3-fold
    - 0.4mg/kg
  - Fluids
  - Pain control
  - Strain urine
    - Send stone for analysis
  - Follow up with urology in 2 weeks with repeat imaging

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RENAL STONES

- Acute surgical intervention
  - Intractable pain, nausea and vomiting
  - Failure to pass stone
  - Obstructing stone in the presence of infection
    - Goal is decompression, by stent or nephrostomy tube
    - Delay definitive treatment until sepsis resolved and infection cleared
- Ureteroscopy and ESWL used for smaller stones in ureter or kidney
- PCNL and pyelolithotomy for larger renal stones

RENAL STONES

- ESWL
  - Treatment of choice for Upper tract renal calculi less than or equal to 15mm
  - 5% of patients need repeat ESWL or additional procedure
    - Usually associated with increased stone burden
- Ureteroscopy and Laser Lithotripsy

RENAL STONES

- Use of Renal stone Algorithm

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NCH ED Nephrolithiasis

Inclusion Criteria: Patient with concern for nephrolithiasis (symptoms including but not limited to hematuria, flank pain and dysuria)

Exclusion Criteria: None

TARGETS:
- Use of ultrasound over CT
- Use of Tamsulosin at discharge

Concern for nephrolithiasis?

Assessment
Complete vital signs including BP

Laboratory Studies
Urinanalysis and urine culture (consider pregnancy)
BMP, phosphate, CBC

Treatment
Normal saline bolus 20 ml/kg
Analgesia, recommend toradol and morphine as needed (Avoid ketorolac if severely dehydrated)
Strain urine while in ER
Tamsulosin in ER once stone presence confirmed

Renal ultrasound
- Initial imaging in all patients
- Ensure hydration prior to imaging if possible

Positive | **Negative**

Positive ultrasound
- Stone visible on US

US positive for secondary signs only without stone seen (hydronephrosis/hydrouretur/increase in renal size/uroepithelial thickening)
OR
US negative for any findings or inconclusive and high clinical suspicion (includes substantial pain, hematuria and history of nephrolithiasis, hypercalciuria/hyperoxaluria/hyperuricosuria/cystinuria/multiple UTI)

Negative ultrasound or inconclusive and low clinical suspicion (neg UA)

Non-contrast CT stone protocol

Positive for nephrolithias ?
- YES → Fever or concern for infection?
- No → Further evaluation of presenting symptoms

Fever or concern for infection?
- YES → Call urology and Admit to Hospitalist
- NO → Pain controlled and hydrated? (start oral narcotics in ER if tolerated)

Pain controlled and hydrated? (start oral narcotics in ER if tolerated)
- YES → **Discharge**
- NO → **Admission**
  - Unable to tolerate PO
  - Pain requiring continued IV analgesia
  - Systemic concern for sepsis
  - Presence of risk factor(solitary kidney, renal transplant, bilateral renal obstruction, obstructive pyelonephritis, renal insufficiency)
  - If presence of risk factor or septic, immediate urology call and admit to OR or hospitalist

DISCHARGE CRITERIA
- Pain controlled while in ER
- Maintaining hydration
- No concern for systemic infection
- No risk factors(solitary kidney, renal transplant, bilateral renal obstruction, obstructive pyelonephritis, renal insufficiency)

HOME CARE
- Discharge with outpatient Urology follow-up
- Send EPIC staff message to urology on call
- Send with strainer for urine
- Tamsulosin (use patient discharge instructions .flomax)
- Give first dose of Flowmax and oral narcotic (narcotic > 2y/o) while in the ER
- Do not use if stone >/= 8mm in the proximal ureter

Medication	Dose	Max Dose
Ceftriaxone	75 mg/kg IV	2000 mg

References-(Pathway name here) (Examples below)

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Authors: List authors in alphabetical order
Questions about this pathway should be directed to (email process owner here).
Questions about creation of a new (location such as ED or inpatient) pathway should be directed to (email Site and location specific lead here).
Legal Disclaimer: These clinical practice guidelines are based upon the opinions of staff members of Nemours Children's Health System. Treatment should be individualized and based upon the clinical conditions of each patient.

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