



Acute Care  
Pediatric Nurse Practitioner  
Review Course 2020

# Genitourinary/Nephrology

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Evidence Based Practice

- Urinary Tract Infection
- Urosepsis
- Kidney Dysfunction/Failure
- Testicular Torsion
- Ovarian Torsion
- Sexually Transmitted  
Illness



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## Urinary tract infection

- Newest AAP guidelines: treatment, prophylaxis and imaging recommendations. Minimize hospitalization! Current objective is to attempt treatment in outpatient setting.
- \*Urosepsis: presents as febrile illness or nosocomial infection in the ICU – requires immediate evaluation and therapy, fluid resuscitation and management of shock symptoms and/or renal failure. (CAUTI: Catheter-associated urinary tract infection)

## Common Organisms causing UTI and Treatment

\**Escherichia coli*

\**Klebsiella species*

*Proteus species*

*Pseudomonas*

*Enterococcus*

*Enterobacter*

*Staphylococcus*

*Streptococcus*

- TMP/SMX (Bactrim)
- Cephalexin
- Amoxicillin
- Nitrofurantoin
- Augmentin
- Cefixime (Suprax)

## GU: Pyelonephritis

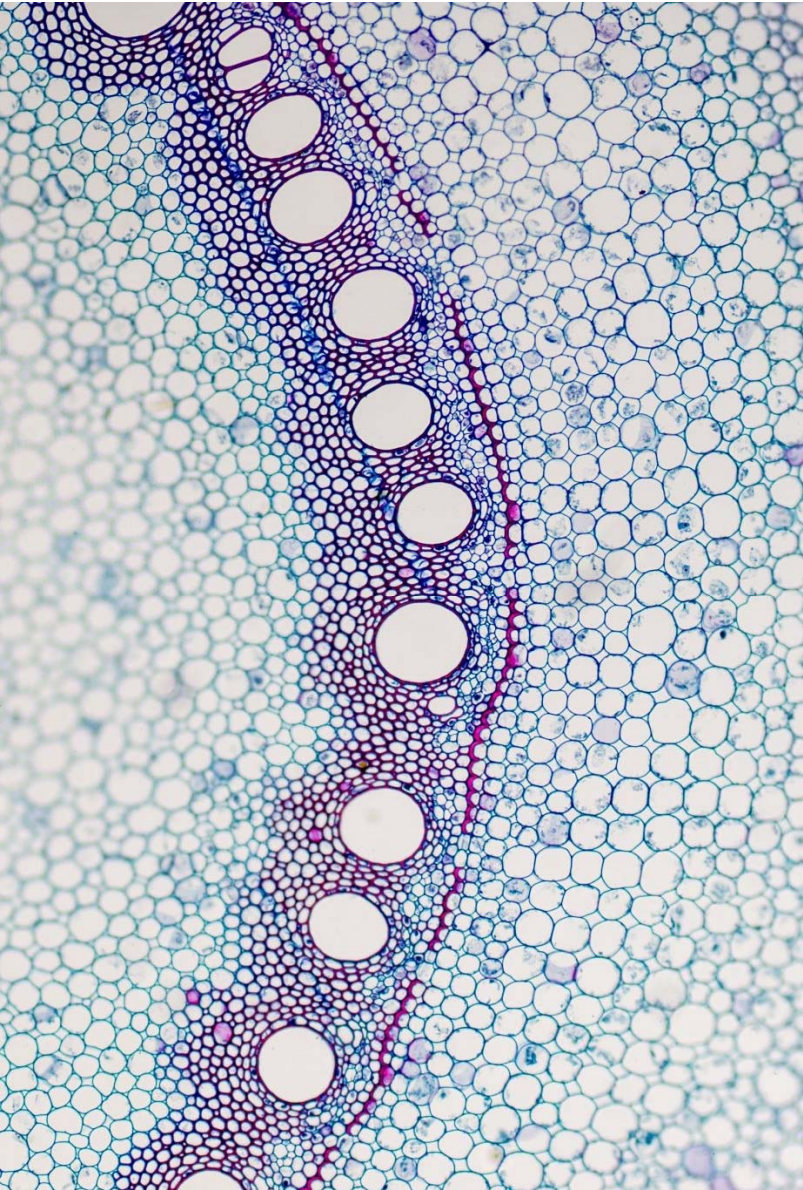
- **Pyelonephritis:**
  - bacterial invasion of the upper parenchyma of the kidney
  - lower infection or bloodstream.
  - Symptoms: very high fever, lethargy, ill appearance, poor feeding, pain, vomiting, irritability and jaundice.
  - Can result in renal scarring.
- **Diagnostics:** Urinalysis and culture, CBC, CRP, ESR, basic chemistry/renal panel, Imaging – renal ultrasound and ? VCUG
- **Management:** inpatient or outpatient antibiotics based on symptoms and severity, hydration status, analgesics for pain.

# Testicular Torsion

Testicular torsion: Acute twisting of the spermatic cord, which disturbs blood supply to the testicle and surrounding structures within the scrotum.

Symptoms: Sudden onset of severe pain in one testicle, with or without a previous predisposing event.

Emergent \*Surgical referral is appropriate management.



# Ovarian Torsion

- Rare occurrence in children
- Occurs when ovary twists around the ligaments supporting it, with resulting obstruction of blood flow and tissue necrosis.
- Surgical Emergency: laparoscopic or open procedure

# Sexually Transmitted Illness

- Pelvic Inflammatory Disease
  - Not typically Acute Care
- Requires hospitalization if:
  - Presenting with pregnancy
  - Shock or hypotension, severe vomiting, high fever
  - Surgical emergency cannot be excluded
  - Unresponsive to oral antibiotics
  - Tubo-ovarian abscess
- IV treatment (CDC): Cefotetan or Cefoxitin + Doxycycline, Clindamycin + Gentamycin



# Renal Problems: Kidney Dysfunction



Pyelonephritis



Renal Failure



Renal Tubular Acidosis (RTA)

# Hydronephrosis

## Causes:

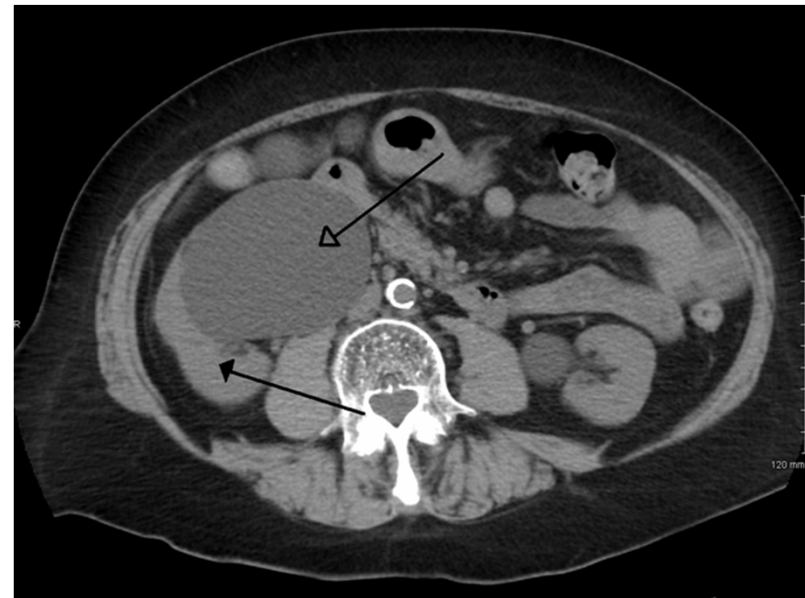
Congenital

Obstructive pathology

Scar Tissue (UTI)

Tumor

Kidney stone



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# Renal Tubular Acidosis

- Renal tubular defect resulting in metabolic acidosis with normal anion gap.
- Four types:
  - \*1. Distal: genetic or acquired; impaired distal acid secretion; results from medications, autoimmune disorders, obstructive uropathy
  - \*2. Proximal: reduction in proximal bicarbonate reabsorptive capacity; decreased plasma bicarbonate; Fanconi syndrome from metabolic disorders or acquired from certain drugs or heavy metals.
  - 3. Mixed: rare autosomal recessive disorder due to carbonic anhydrase deficiency
  - 4. Aldosterone deficiency or impairment, (uncommon in children.)
- Management:
  - Replace bicarbonate, fluid management, prevention of renal failure
  - Referral to nephrology, genetics

**Definition:** Acute, complex, process, occurring when the kidney function ceases to secrete water, regulate electrolyte and acid base balance.

- High Mortality/Morbidity risk
- Pre-renal failure – most common form in children, caused by decreased blood flow to kidney through acute disease-causing hypovolemia and some medications, such as ACE inhibitors
- Intrinsic Renal failure – caused by HUS, pyelonephritis, vasculitis, high levels of calcium, phosphorous and uric acid
- Post-renal failure – usually caused by structural defects: posterior urethral valves, neurogenic bladder, trauma

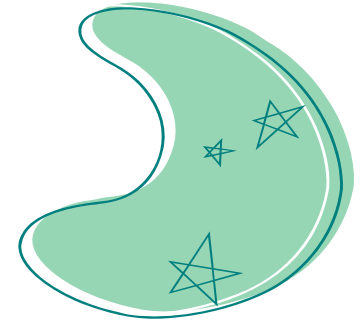
# Prevention of Renal Failure

- Fluid administration when indicated (at risk states)
  - Hemoglobinemia, administration of aminoglycosides, amphotericin B, contrast, Cisplatin, Acyclovir
  - Tumor lysis syndrome
  - Reduced intravascular volume;surgical procedures
- Avoiding hypotension with inotropic support
- Readjustment of nephrotoxic medications based on monitoring kidney function and drug levels.

# Pre-renal Failure

- Decreased blood flow to kidneys
- Causes:
  - Gastroenteritis
  - GI damage
  - Diabetes
  - Ketoacidoses
  - Hypoproteinuria
  - Hemorrhage
  - Impaired Cardiac output
  - Bilateral renal vessel occlusion

- Medications responsible:
  - Prostaglandin
  - ACE Inhibitors
  - Cyclosporine
  - Diuretics
- Findings:
  - Hypotension
  - Urine osmolarity of  $> 500$ , urine Na  $< 20$  meq/L
  - Fractional excretion of Na (FeNa)  $< 1\%$
  - Metabolic acidosis
  - Hyperkalemia
  - Hyperphosphatemia
  - Hypocalcemia
  - Low urine specific gravity



# Intrinsic Renal Failure

- Injury of the renal parenchyma
- Causes:
  - Acute Glomerulonephritis
  - Acute Tubular Necrosis
  - Pyelonephritis
  - Hemolytic Uremic Syndrome
  - Vasculitis
  - Hyper-calcemia, phosphatemia, uricemia
- Findings:
  - Hypertension
  - Metabolic acidosis
  - Hyperkalemia
  - Hyperphosphatemia
  - Hypocalcemia
  - Urine Na > 20 meq/L
  - FeNa > 2-3%
  - Proteinuria - moderate

# Post-Renal Failure

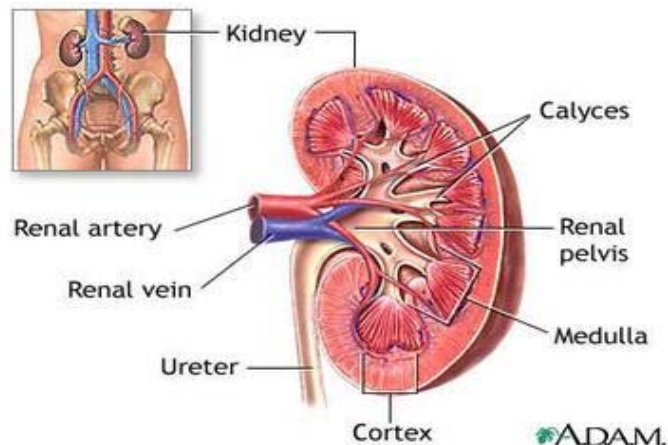
Most often due to obstructed of outflow tract.

Causes:

- Occluded urinary catheter
- Posterior urethral valves
- Neurogenic bladder
- Surgical Accident
- Nephrolithiasis
- Ureterocele
- Tumors
- Trauma

• Findings:

- Anuria
- Systemic effects, azotemia
- Increased BUN and Creatinine level
- Low calcium, high K<sup>+</sup>
- Other electrolyte disorders





### *Diagnosis:*

- Serum electrolytes with Renal function
- Renal ultrasound, other imaging?
- Urine electrolytes, osmolarity
- FENa

### *Treatment:*

- Manage underlying cause, inotropic medications, medications for hypertension, diuretics, electrolyte management, no K in IV fluids, CRRT, strict intake and output
- Indications for dialysis: Hyperkalemia, severe fluid overload, severe metabolic acidosis, BUN >70-100, azotemia, confusion/encephalopathy, bradycardia and tamponade.



# Nephrotic Syndrome

## Glomerular structural changes:

- Damage to the endothelial surface, glomerular basement membrane, or the podocytes.
- Albuminuria and proteinuria (85%) presentation.

- Primary

- Primary kidney disease
- Minimal change disease
- Congenital nephropathies

Symptoms: edema, weight gain with fluid retention, proteinuria, fatigue, loss of appetite

- Secondary:

- Glomerulonephritis
- Lupus erythematosus
- Diabetes mellitus
- Viral and bacterial infections

**Treatment: Corticosteroids!!!**

## Test Question

A 2 year old who has had frequent urinary tract infections has a BP of 136/88. She has not had BP checked on regular intervals. Which work up is most appropriate to complete FIRST?

- a. Cardiac evaluation
- b. Liver function testing
- c. Renal function
- d. Follow BP over the next 2 weeks

## Answer:

A 2 year old who has had frequent urinary tract infections has a BP of 136/88. She has not had BP checked on regular intervals. Which work up is most appropriate to complete FIRST?

c. Renal function

## Test Question

A 4-year-old with significant injuries sustained in a car crash several days ago is oliguric for 15 hours, lethargic, appears mildly edematous, has a BP of 82/34, and HR of 148. Electrolytes: Na 130, Cl 98, K 5.6, BUN 88, HCO<sub>3</sub> 13, and Cr 1.8 and Ca 6.8. Urine specific gravity is 1.030 and FeNa is <1. The most likely explanation for these findings is:

- a. Intrinsic renal failure
- b. Pre-renal failure
- c. Chronic renal failure
- d. Post renal failure

## Answer:

A 4-year-old with significant injuries sustained in a car crash several days ago is oliguric for 15 hours, lethargic, appears mildly edematous, has a BP of 82/34, and HR of 148. Electrolytes: Na 130, Cl 98, K 5.6, BUN 88, HCO<sub>3</sub> 13, and Cr 1.8 and Ca 6.8. Urine specific gravity is 1.030 and FeNa is <1. The most likely explanation for these findings is:

a. Intrinsic renal failure

## Test Question

A 10-year-old had a strep throat 3 weeks ago, treated with amoxicillin for 10 days. He presents today with edematous face and ankles, and complains of a headache and flank pain. BP is 142/86, he has been oliguric for the past 3 hours, and has 3+ proteinuria. His FENa is 2%. What is the first treatment?

- a. Emergent dialysis
- b. Corticosteroids
- c. Fluid bolus of 20ml/kg
- d. Continued antibiotic therapy

## Answer:

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b. Corticosteroids



## Test Question

The most appropriate indications to initiate dialysis for a child with acute renal failure include:

- a. Hypovolemia, hyperkalemia and hypocalcemia
- b. Hypervolemia, hypocalcemia and hypertension
- c. Hypervolemia, hyperkalemia and acidosis
- d. Hypovolemia, hypertension and acidosis

## Answer:

The most appropriate indications to initiate dialysis for a child with acute renal failure include:

c. Hypervolemia, hyperkalemia and acidosis

## Test Question

A 4-year-old who had been potty trained, presents to the ED with fever to 100° F, bedwetting and urinary frequency. A urine dipstick indicates leukocytes, nitrites and a small amount of blood in her urine. She is drinking as usual, appears well and currently does not have a high temperature. Which of the following is the most appropriate management?

- a. Send urine for culture and sensitivity, and wait for results before treatment
- b. Send urine for culture and admit to inpatient unit for IV antibiotics
- c. Treat with Bactrim and observe at home for fever, lethargy and anorexia
- d. Treat with clindamycin and have her return to her PCP for follow up tomorrow

## Answer:

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