

# CHILD WITH A GENITOURINARY CONDITION

Linnard-Palmer & Coats  
Chapter 37

- [https://www.youtube.com/watch?v=FaLTWW\\_yEG4](https://www.youtube.com/watch?v=FaLTWW_yEG4)
- <https://www.youtube.com/watch?v=1PbP7oVHNyw>
- <https://www.youtube.com/watch?v=y5GFnw9AJGs>

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## Learning Outcomes

- Define key terms
- Describe how a child's renal system affects fluid and electrolyte status, as well as acid/base balance
- Discuss the clinical presentation of a dehydrated child
- Analyze etiologies and risk factors associated with UTI
- Differentiate between glomerulonephritis and nephrotic syndrome in relation to assessment, treatments, and nursing care
- Describe various congenital anomalies of the GU tract
- Calculate appropriate fluid maintenance requirements based on bodyweight

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## The Genitourinary (GU) System

- Components
  - Kidneys
  - Bladder
  - Urethra
  - Reproductive organs
- Responsibilities
  - Process and eliminate waste products from the blood
  - Regulate body fluids
  - Regulate acid-base balance
  - Provide a means for reproduction
- Disorders common in childhood

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## Development of the GU System

- Begins in the 11<sup>th</sup> to 12<sup>th</sup> week of fetal development
- Infants are poorly able to regulate fluid, concentrate waste, and eliminate waste byproducts
- The GU system matures and becomes effective throughout childhood
- Disorders common during childhood
  - Some associated with kidney damage
  - Some associated with obstruction/blockages
  - Others specifically associated with the male GU tract




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## Renal Function

- 5 functions of the kidney essential for homeostasis
  - Eliminate liquid waste from the blood
  - Produce erythropoietin during hypoxia
    - Stimulates bone marrow to produce more
  - Produce rennin, which stimulates production of angiotensin I, which stimulates production of angiotensin II, which..
    - Constricts peripheral vasculature
    - Promotes secretion of aldosterone, which promotes reabsorption of water and sodium
- Regulate fluid and electrolytes
- Regulate acid/base balance

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## Infants' increased risk for dehydration

- Infant body water percentage is about 75-80%
  - Premature infant closer to 90%
  - Teenager approximately 55-65%
- Extracellular fluid percentage
  - Child- 42-45%
  - Adult- 20%
- Infants also have an extracellular turnover rate of close to 50% per day (adults 20%), which further increases their risk for dehydration
- Slower glomerular filtration rate

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## Renal Function



- Metabolism
  - Children have a higher metabolic rate
  - Higher rate requires more water to remove increased waste products
  - Higher insensible water loss due to
- Electrolytes play a vital role in maintaining homeostasis
  - Fluid balance
  - Neuromuscular activity
  - Stimulation of bone growth
  - Regulation of acid/base balance

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## Renal Function

- Sodium
  - Greatly influences body water
  - Principal cation of extracellular fluid
- Potassium
  - Principal cation of intracellular fluid
  - Impacts neuromuscular activity and cardiac conduction
  - Regulates skeletal, smooth, and cardiac muscle
  - Abnormal levels can result in cardiac dysrhythmias
- Magnesium
  - Nerve and muscle activity depend on normal serum Mg.
  - Low Mg. associated with tetany, seizures, and tremors

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## Renal Function

- Phosphorus- two major roles
  - Interact with calcium to promote bone growth
  - Aid in the production of energy to support metabolism
- Calcium
  - Cell membrane permeability
  - Clotting cascade
  - Bones and teeth



• Do not infuse any potassium solutions without ensuring adequate urine output.....Why!!

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## Renal Function

- Acid-Base Balance and Renal Regulation
  - With acidosis or alkalosis the respiratory system will respond initially to achieve homeostasis
    - Blowing off excess CO<sub>2</sub> to help correct acidosis
    - Retaining CO<sub>2</sub> to help correct alkalosis



- Renal system also works to correct the balance but takes considerably longer
  - Retain HCO<sub>3</sub> (acidosis) or release HCO<sub>3</sub> (alkalosis)

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## Fluid Maintenance

- Monitoring is an important role of the pediatric nurse
- Why worry about giving fluids?
  - To provide what is needed for a balanced fluid level
  - Child may need fluid to replace a deficit
  - Child may need ongoing replacement for losses due to:
    - Diarrhea
    - Gastric fluid loss
    - Burn-associated losses
- Directly related to child's metabolic rate
  - This can be influenced by medical conditions such as cardiac disease, cancer, or burns

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## Calculating Fluid Maintenance

Weight in kg.	Multiply by mL/day	Subtotal	Divide by hourly need
First 10 kg (0-10 kg)	100 mL	X	Divide X by 24
Second 10 kg (11-20 kg)	1,000 mL + 50 mL per each kg. between 11 and 20	X	Divide X by 24
21-70 kg	1500 mL plus 20 mL per each kg between 21 and 70	X	Divide X by 24

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## Calculating Fluid Maintenance

• Child weighs 7 kg

• Child weighs 14 kg

• 1,000 mL + (4 X 50 mL) = 1,200 mL per day

• Child weighs 35 kg

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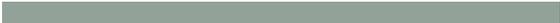
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8 year-old Johnny is brought to the hospital after three days of vomiting and diarrhea. He weighs 55 lbs. and is 50.5 inches tall. He is admitted with severe dehydration.

The provider orders IV fluid to run at 2X maintenance for 4 hours, 1.5X maintenance for the next four hours, then change to maintenance rate continually.

What three rates will you set the pump for? (in whole numbers)

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## Water Intoxication

- Excessive intake of free water leading to over-hydration
- Can lead to death due to:
  - Severe electrolyte imbalance
  - Dilution of body fluids
  - Cardiac arrest
- Closely monitor those with:
  - Severe mental illness
  - Low cognitive function
  - Extreme thirst
- It is especially important with children to:
  - Maintain accurate I&O
  - Document and report any concerning findings




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## Urine Output

- For accurate I&O
  - Weigh diapers
  - One gram of urine = 1 mL of urine
- Average urine output
  - Newborn – approximately 10 mL/hour
  - Infants – 5 to 10 mL/hour
  - Toddler/preschool – 15 to 20 mL/hour
  - School-aged children – 10 to 25 mL/hour
  - Adolescents- 40-80 mL/hour

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## Urine Specimen Collection

- Clean Catch methods – appropriate for SG, pH, and presence of blood and ketones
  - Cotton balls in diaper
  - Uro-bag – bag is placed to catch urine specimen
  - Midstream sample for older children



- Sterile Samples – typically for culture and sensitivity
  - In and out catheterization- catheter inserted, specimen obtained, catheter removed
  - Indwelling catheterization- sterile syringe and needle inserted into cleansed rubber port

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## Labs and Diagnostics

- Urinalysis
  - Checked for blood, glucose, ketones, protein
  - Presence of any of these is abnormal
  - Also detects presence of protein and nitrate markers
  - pH
- Urine C&S
  - Urine held in a tube to check for growth of bacteria/organisms
  - Sensitivity analysis to determine antibiotic
- SG
  - Checks concentration- normal 1.010 – 1.030
  - Lower number means more dilute urine
- IV Pyelogram
  - Renal pelvic structures viewed by x-ray following IV injection of dye

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## Labs and Diagnostics

- Voiding Cystourethrogram (VCUG)
  - Dye instilled into bladder
  - Bladder and surrounding structures viewed during voiding
- BUN
  - Checks index of the glomerular filtration rate
  - BUN is a waste product of protein metabolism (10-20 mg/dl)
- Blood Creatinine
  - Creatinine is a waste product of creatine, which supplies energy to muscles
  - Creatinine removed by kidneys, if kidney function is not normal- blood creatinine will be elevated (0.2-2.0 mg/dl)
- Creatinine Clearance
  - Best measure of kidney function in the child
  - Compares creatinine in a 24 urine sample with amount in blood
- <https://www.youtube.com/watch?v=1128tW1H5a8>
- <https://www.youtube.com/watch?v=DIqyyvTl3k>

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## Structural Disorders

- Hypospadias
  - Abnormal urethral opening
  - Meatus located:
- Epispadias
  - Urethra opens on dorsal surface of penis
  - Surgery during first year
  - Can affect females also when urethra develops too far anteriorly
- Cryptorchidism
  - Testes fail to descend into the scrotum
  - Surgical orchiopexy (ATI says at 6 and 24 months of age)




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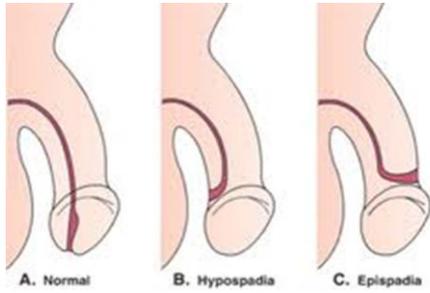
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## Structural Disorders

- Testicular torsion
  - Sudden twisting of testicular structures
  - Intense pain, edema
  - Immediate emergency



- Hydrocele
  - Fluid in the scrotum

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## Treatment of Structural Disorders

- Usually surgical
- Goal is to
  - 
  -
- Nursing actions
  - Emotional support
  - Education
  - NPO
  - Pain management
- Complications
  - Infection
  - Emotional problems

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## Urinary Tract Infections

- Infection can be located in:
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_
- Important to assess for:
  - Frequency, urgency, and pain
  - Odor, color, and clarity
  - Fever
  - Dehydration
  - Hematuria
  - Pain
  - Previous UTIs??
  - Sexual abuse

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## Urinary Tract Infections

### Interventions

- PO or IV fluids
- Treat fever and discomfort
- Education
  - Hand washing
  - Personal hygiene
  - Diaper clean-up
- Urinalysis to ID bacteria
- Administer medications as ordered

### Common antibiotics

- Amoxicillin (Amoxil)
- Ampicillin (Omnipen)
- Cephalexin (Keflex)
- Gentamicin (Garamycin)
- Sulfamethoxazole/trimethoprim, or cotrimoxazole (Bactrim, Septra)

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## Nephrotic Syndrome (Nephrosis)

- Pores develop along the final filtration membrane
- Three cardinal symptoms
  - \_\_\_\_\_
  - \_\_\_\_\_
  - \_\_\_\_\_

Bubbles in your urine?



- Assessment
  - Fatigue
  - Decreased appetite
  - Edema, weight gain, abdominal swelling
  - Golden-yellow, foamy urine

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## Nephrotic Syndrome Interventions

- Daily weights
- Monitor fluid retention
- Long-term corticosteroids
- IV albumin
- Low sodium, high protein diet
- Monitor for skin breakdown
- Parental/family support

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## Acute Glomerulonephritis (AGN)

- AGN primarily affects school-aged children
- Often follows a severe infection (post-infectious)
- Clogged nephrons impair the kidney's ability to filter urine
  
- Common causes
  - Streptococcal infections
  - Inflammatory diseases of the arteries
  - Genetic predispositions

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## AGN Assessment

- Clinical symptoms of renal failure occur:
  - Dark brown urine (tea/cola colored)
  - Low overall output
  - Fatigue, lethargy
  - **HTN**
  - Edema
  - Seizures
  - Rash on buttocks, legs
  - Abdominal pain, headache, joint pain
- Diagnostics
  - Throat, blood, and urine culture
  - Urinalysis
  - CXR
  - Renal US, biopsy

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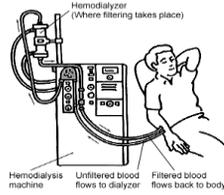
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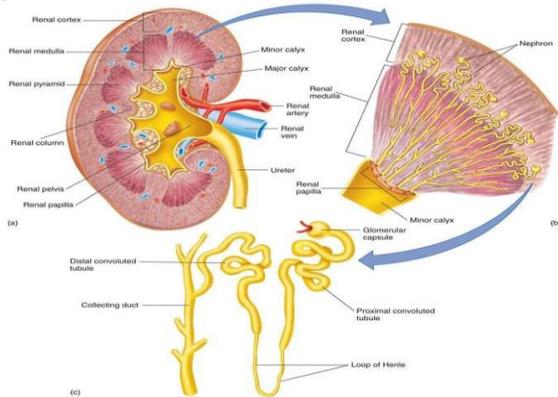
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## AGN Interventions

- Administer diuretics
- Correct electrolyte imbalances
- Antibiotic therapy
- **Manage HTN**
- Phosphate binders
- Possible dialysis
  
- **Monitoring BP** is a priority with acute renal injuries



<https://www.youtube.com/watch?v=9sYcXLY3axA>



## Renal Injury

• Ex.: Trauma

- \_\_\_\_\_
- \_\_\_\_\_
- \_\_\_\_\_?
- \_\_\_\_\_?



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## Hemolytic Uremic Syndrome (HUS)

- Rare and potentially fatal, characterized by:
  - Acute renal failure
  - Hemolytic anemia (lining of small vessels damages RBCs, which die faster than marrow can reproduce them)
  - Thrombocytopenia
- Diarrhea-positive (D+) HUS
  - 90% of cases
  - Most caused by *E coli* infection
- Diarrhea-negative (D-) HUS
  - Non-enteric infections, malignancies, genetic disorders

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## HUS Assessment

- Vomiting
- Abdominal pain
- Diarrhea
- Child will appear very ill, pale, dehydrated
- May have small bruises in the mouth
  
- Damaged RBCs clog the kidneys
- Kidneys no longer eliminate waste effectively
  - Fluid retention...
  - HTN...
  - Edema.....dialysis?

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## HUS Interventions

- Child will be very ill
- Labs
- Treat initial dehydration followed by fluid retention
- Correct electrolyte disturbances
- Treat anemia
- Anti-hypertensives
- Emotional support for families



- Teach importance of adequate food preparation

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## Congenital Reproductive System Disorders

- Intersex Conditions
- Ambiguous Genitalia
  - 1:2,000 live births
  - Maternal or fetal hormonal imbalance
  - Ex. Congenital adrenal hyperplasia
    - Presence of both ovaries and testes, and/or
    - external genitalia varies
- Exstrophy of the Bladder
  - Child born with exposed, or open, bladder
  - More frequent in boys
  - Appears as a red mass with continuous drainage
  - Staged surgical repair

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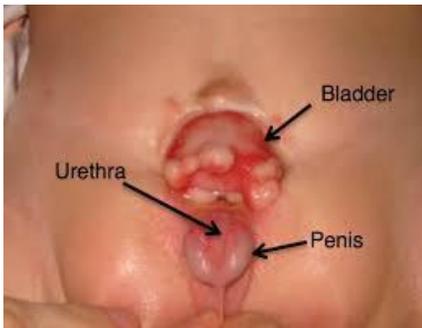
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### Congenital Reproductive System Disorders

- Turner's Syndrome
  - Loss of part or all of the sex hormones
  - Abnormally short stature and underdeveloped gonads
  - Webbed neck, widely spaced nipples, small mandible, epicanthal folds, delayed sexual maturation during adolescence
  - Growth hormone therapy



Epicanthal fold

#ADAM



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### Congenital Reproductive System Disorders

- Klinefelter's Syndrome
  - Males born with an extra X chromosome (XXY)
  - Child will be relatively tall
  - Delayed secondary sex characteristics
  - Most will be infertile, absence of sperm count (azoospermia)
  - Often noted at adolescence
  - Associated with behavior/psychiatric disorders
  - Testosterone therapy



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## Acute Renal Injury (failure)

- Inability of kidneys to:
  - Excrete waste
  - Concentrate urine
  - Conserve/regulate electrolytes
- Eventually affects most body systems
- Physical findings:
  - Oliguria
  - Edema
  - Drowsiness
  - Cardiac arrhythmias:
  - Seizures:
  - CNS manifestations
  - Metabolic acidosis

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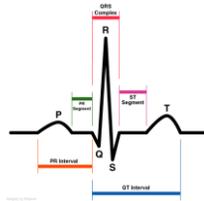
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## Labs/Diagnostic Tests

- Hyperkalemia
- Hyponatremia
- Hypocalcemia
- Anemia
- Azotemia
  - Elevated BUN
  - Elevated creatinine
- ECG for cardiac arrhythmias



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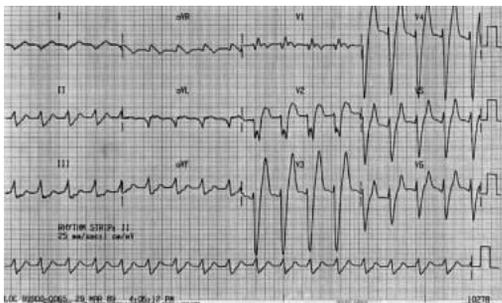
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## K+ 7.8



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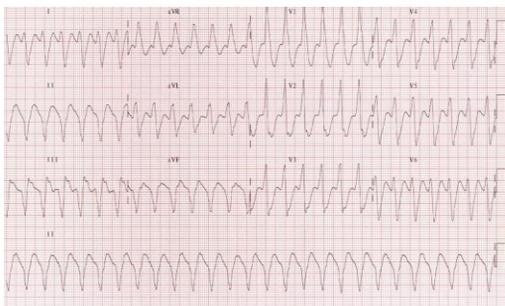
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## Nursing Care

- Treat underlying cause
- Monitor strict I&O, daily weight
- Assess fluid/electrolyte
- Urinary catheter
- Monitor VS, CVP
- Assess LOC
- Assess for seizure activity

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## Medications

- Mannitol and furosemide
  - Provokes the flow of urine
- Calcium gluconate
  - 0.5 ml/kg IV every 2 to 3 minutes with continuous ECG monitoring
  - Reduces serum potassium levels
- Sodium bicarbonate ( $\text{NaHCO}_3$ )
  - 2 to 3 mEq/kg IV every 30 to 60 min
  - Elevates serum pH, fluid shift reduces serum  $\text{K}^+$  level
- Glucose 50% and insulin 1 unit/kg IV
  - Moves glucose and  $\text{K}^+$  into cells

The clinical manifestations of nephrotic syndrome are due to which of the following?

- 1) Obstruction of the capillaries of the glomeruli.
- 2) Chemical changes in the composition of albumin.
- 3) Increased permeability of the glomeruli.
- 4) Loss of the kidney's ability to excrete waste and concentrate urine.

Chronic hypertension in the child who has chronic renal failure (CRF) is due to which of the following?

- 1) Obstruction of the urinary system.
- 2) Retention of sodium and water.
- 3) Accumulation of waste products in the body.
- 4) Generalized metabolic alkalosis.



A child has been diagnosed with acute glomerular nephritis. Which of the following changes would the nurse expect to see in the child's laboratory reports?

- 1) Urine creatinine clearance: increased
- 2) Urine white blood cell count: elevated
- 3) Urine specific gravity: decreased
- 4) Urine red blood cell count: elevated

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Questions??.....



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