



Certified Pediatric Nurse Review Course: Musculoskeletal Disorders & Renal, Genitourinary Disorders

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NEMOURS
CHILDREN'S HEALTH

Objectives

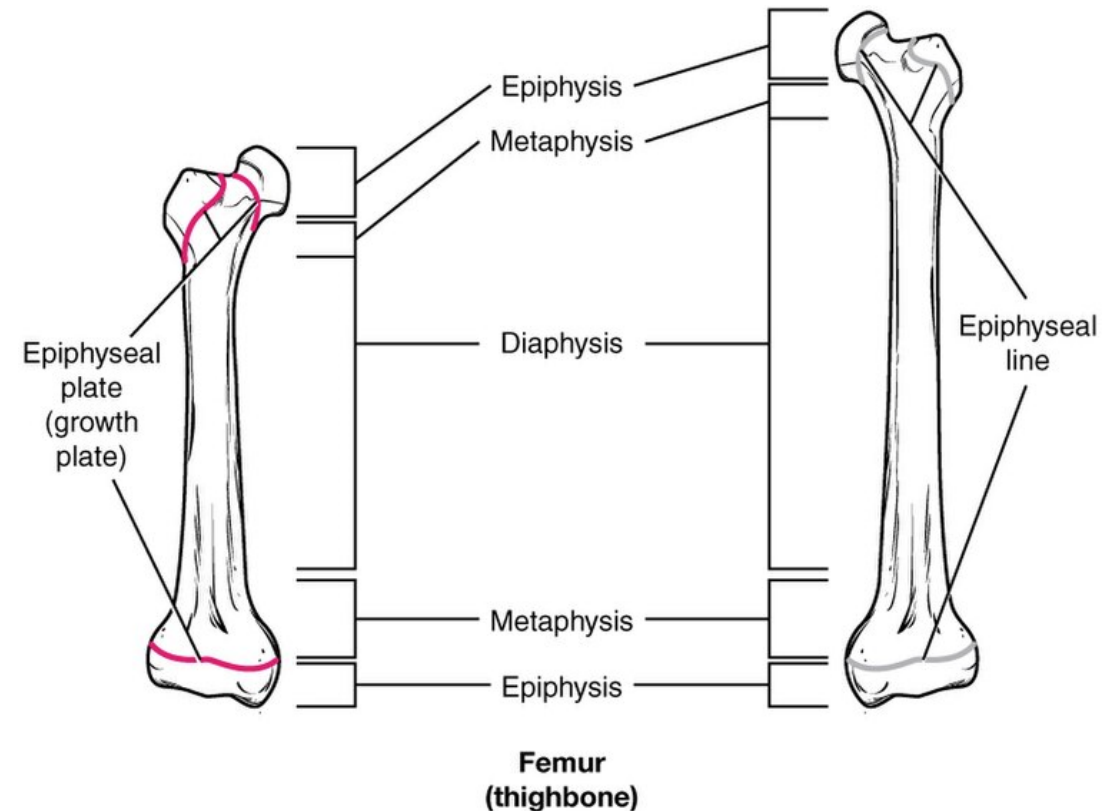
- Determine the nursing interventions for a child in a cast, traction, or brace.
- Assess and plan care for a child with a musculoskeletal, renal, or genitourinary defect.
- Describe how a child's fluid and electrolyte status differs from that of an adult.
- Plan nursing interventions for a dehydrated child.
- Discuss congenital anomalies of the genitourinary tract.



Musculoskeletal Conditions

Musculoskeletal Conditions

- Bone and muscles grow and develop through childhood
- Bone length occurs in the epiphyseal plates at the ends of bones
 - When the epiphyseal plates close, growth stops
 - Damage to the epiphyseal plate can disrupt bone growth
- Bone healing occurs much faster in children than adults



Types of Fractures

- **Greenstick fracture**
 - Long bone fractures related to the increased flexibility of young child's bones
 - The compressed side of the bone bends and the tension side fractures
- **Spiral fractures**
 - Break travels around the bone
 - Possibly a sign of child abuse, especially in non-ambulatory patients
- **Compound fracture**
 - Skin is broken by bone
- **Comminuted fracture**
 - Bone breaks in several pieces

Common Orthopedic Interventions

- General cast care
 - Ensure all rough edges are covered or softened
 - Prevent small objects from falling into cast
 - Assess circulation
 - Color, pulses, sensation, movement, temperature, swelling
 - Check for any inability to wiggle the extremities without tingling or numbness
 - Drainage or foul odor from cast

Common Orthopedic Interventions

- Hip Spica Cast
 - Legs are casted in abduction
 - Cast extends mid-chest/abdomen to the legs
 - Perform general cast care, but also take into consideration the following measures
 - Place disposable diaper under the edges to prevent cast from getting wet and soiled
 - May use additional diapers/pads for added protection
 - Keep cast level, but on a slant, HOB should be raised
 - Reposition child frequently to avoid pressure on skin and bony prominences



Common Orthopedic Interventions

- Traction
 - Purpose is to decrease muscle spasms, realign and position bone ends
 - Skeletal traction- pulls directly on bones through pins or tongs
 - Skin traction- pulls indirectly on bones by pulling on the skin via moleskin or elastic bandage
 - Keeping alignment can be difficult use toe increased mobility and lack of understand of treatment
 - Weights should hang freely
 - Assess neurovascular response, skin irritation, infection at pin sites
 - Prevent constipation by increasing fluids and fiber
 - Bryant's Traction
 - Designed specifically for children under 2. Their body provides countertraction.
 - Legs are to be kept straight and extend 90 degrees toward the ceiling from the trunk
 - Both legs are suspended even if only one is affected
 - Buttocks is kept slightly off the bed to ensure continuous traction on the legs
 - Often followed by application of a hip spica cast

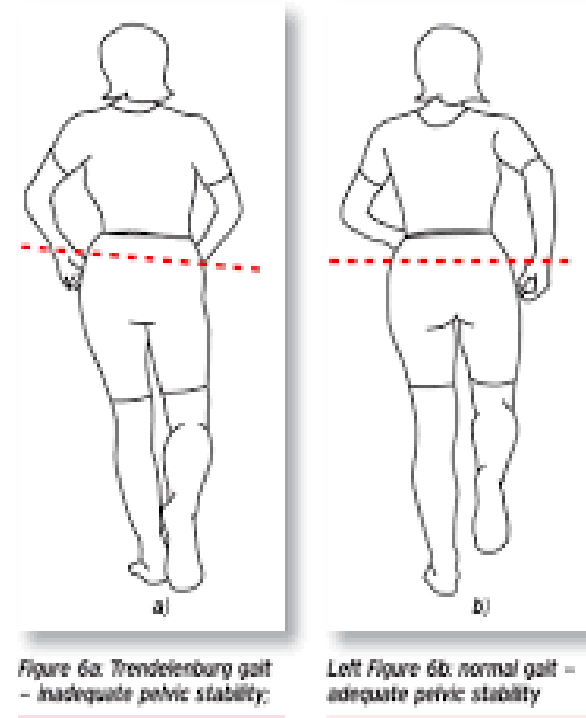
Clubfoot

- Congenital Disorder
- Assessment
 - Assess for talipes equinus (plantar flexion, like pointing their toes)
 - Assess for taipes varus (inversion of ankles, soles of feet facing each other)
- Interventions
 - Series of plaster boot casts that gradually stretch and realign angle of foot
 - Surgery



Hip Dysplasia

- Abnormal development of the head of the femur and acetabulum. It is present at birth.
- **Assessment**
 - Assess for restricted abduction of the hips
 - **Barlow Maneuver**
 - Bring thighs midline with knees flexed at 90 degrees. Press on knees to feel femur dislocated from acetabulum and Ortolani's click
 - **Note appearance of a shortened limb on the affected side (telescoping) when the child is supine**
 - **Note asymmetrical skinfolds in gluteus from telescoping and dislocation**
 - **Trendelenburg's sign in older children**
 - When child stands on affected leg, the opposite pelvis dips to maintain erect posture



Hip Dysplasia

- Interventions
 - Goal of treatment is to enlarge and deepen the socket by pressure
 - Gently stretch and maintain the legs in an abducted position for at least 3 months
 - Pavlik harness
 - Keeps knees flexed and hips abducted
 - May need surgery or hip-spica if harness is not effective



Legg-Calve-Perthes Disease

- Self-limited idiopathic ischemic avascular necrosis of the femoral head, resulting in degenerative changes from a disturbance of circulation to the femoral cap. This can result in multiple fractures.
- Assessment
 - Review the child's history for a limp and hip pain, or pain referred to the knee
 - Assess for limited hip motion
- Interventions
 - Treatment lasts 2-3 years as revascularization occurs
 - The younger the child, the better the prognosis for recovery and natural remodeling of the joint
 - Child must avoid weight bearing until reossification occurs
 - Little to no pressure from the head of the femur
 - Increases blood flow to the area

Scoliosis

- An abnormal lateral curvature of the spine
- Can be idiopathic, neuromuscular or congenital
- Assessment
 - Progressive S curve with a primary and compensatory curvature that can be seen when the child is standing
 - Can result in spinal and rib changes on x-ray
 - Adams-Bend test
 - When bending forward with knees straight and arms hanging to feet, the spinal curve does not straighten
 - Hips, shoulder, and shoulder blades are asymmetrical



Scoliosis

- Intervention
 - Bracing for mild to moderate curve that are less than 40%
 - Surgery for more severe curves more than 45% - Spinal Fusion
 - Post-op
 - Measures should be taken to maintain spinal alignment to support healing of the fusion, including preventing lifting, twisting, and bending

Osteogenesis Imperfecta

- An autosomal dominant disorder of the connective tissue, involving bones, ligaments, and sclera, with different degrees of presentation
- Absence of normal adult collagen results in brittle bones which are easily fractured
- Assessment
 - Impaired growth and development
 - Blue-tinged sclera and thin skin
 - Bluish-gray teeth from hypoplasia of dentin
 - Deafness from otosclerosis
- Interventions
 - Gentle handling in all child-care activities
 - Provided a padded and soft environment

Juvenile Idiopathic Arthritis (JIA)

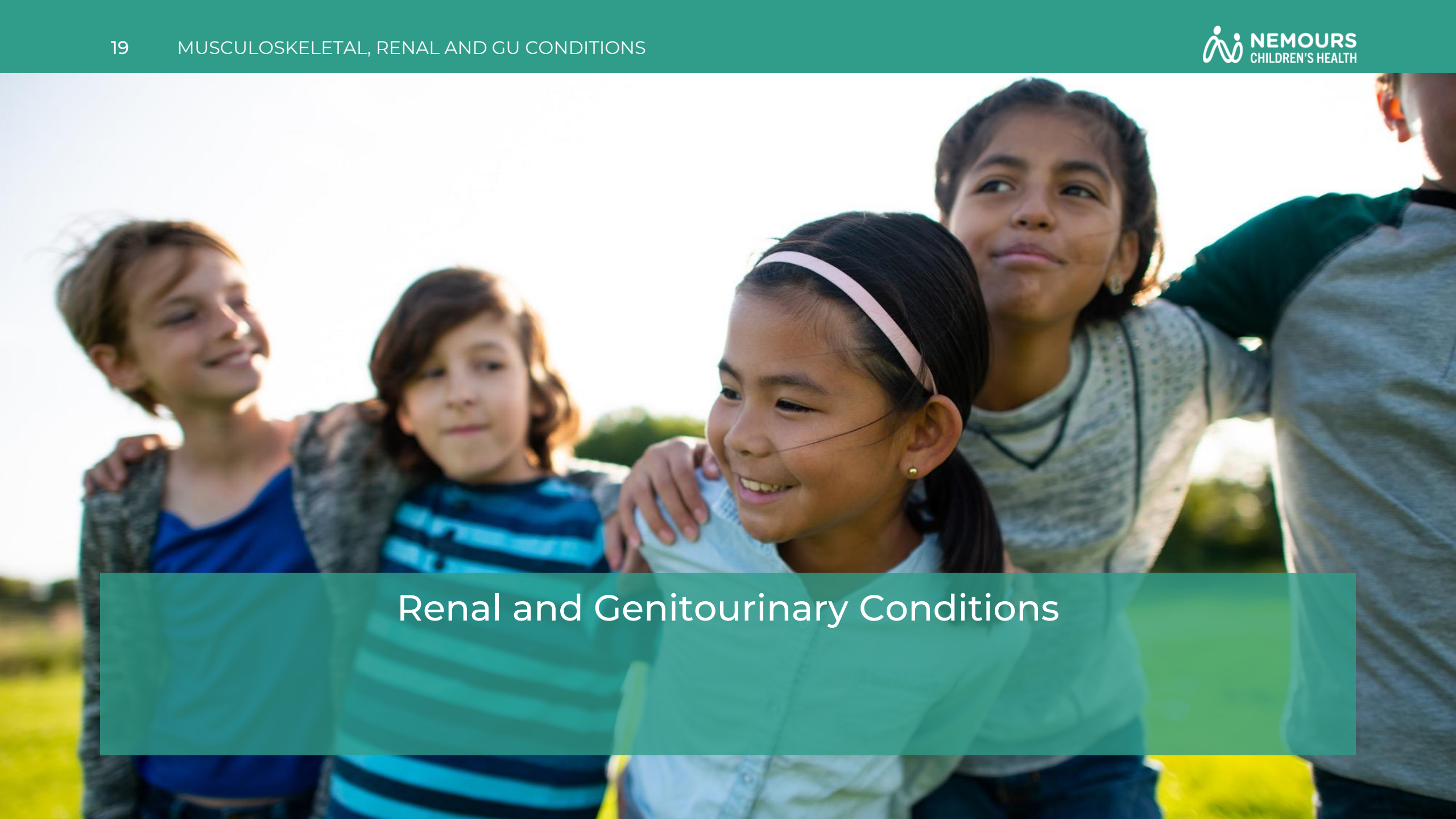
- An autoimmune disease of the connective tissue characterized by chronic inflammation of the synovia and possible joint destruction
- Pauciarticular JIA
 - Asymmetrical involvement of fewer than 5 joints, usually affecting knees, ankles, elbows
 - May lead to iridocyclitis (scarring and adhesions of the iris and ciliary body), resulting in vision loss

Duchenne's Muscular Dystrophy

- Progressive muscular deterioration disorder
- Absence of protein in the muscles
- Assessment
 - Disorders progression- begins with pelvic girdle weakness, indication by a waddling gait and falling. Proceeds to muscle weakness and wasting- progresses to shoulder girdle; lordosis may occur
 - Gower's sign
 - Use of hands to push self up from floor to standing up by 'walking' up legs with hands due to lack of hip and thigh muscle strength
- Intervention
 - Encourage activity and independence as much as possible
 - Provide emotional support to families and caregivers

Hernias and Hydroceles

- Hernia- Muscle weakness causing the protrusion of an organ through the abnormal musculature
- Hydrocele- Collection of peritoneal fluid in the scrotal sac
- Assessment
 - Note any increase in the size of hernia as the child strains, coughs, or cries
- Intervention
 - Abdominal muscle often strengthens as the child grows and hernia/hydrocele may resolve without treatment
 - Some do require surgery



Renal and Genitourinary Conditions

Key Concepts



Children have increased fluid requirements compared to adults and infants have very little fluid reserve



Increased fluid requirements and smaller body surface area make dehydration and electrolyte imbalances in infants and children a serious and potentially life-threatening issue

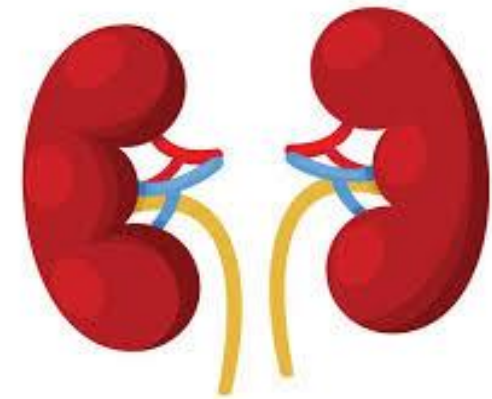
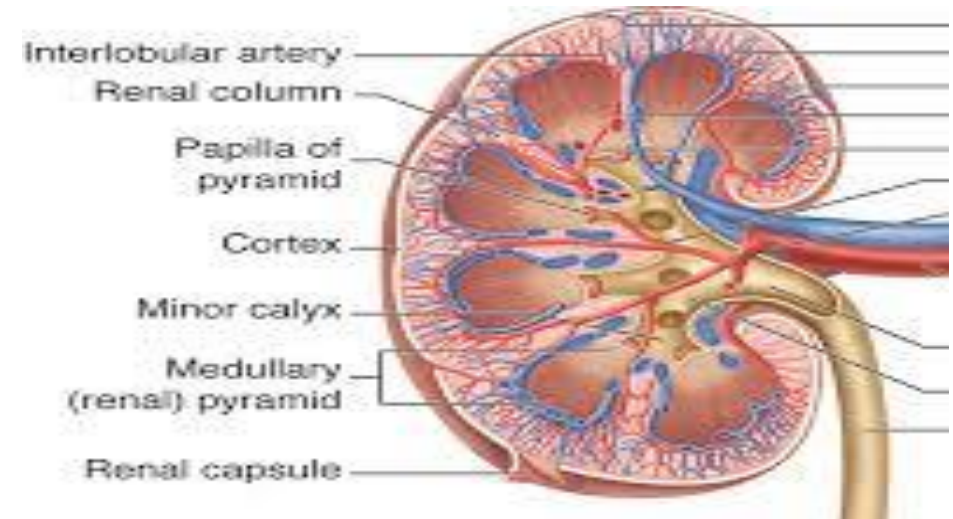


Common illnesses such as respiratory and gastrointestinal viral illnesses can quickly cause infants/children to become dehydrated

The Kidney

Functions

- Detoxify blood
- Eliminate waste
- Produce erythropoietin
- Regulate blood pressure
- Control fluid and electrolyte balance
- Regulate acid/base balance





Fluid & Electrolyte Balance

Normal Values for Electrolytes:

Sodium: 135-145 mEq/L

Potassium: 3.5-5 mEq/L

Calcium: 8.5-10.2 mg/dL

Phosphorous: 3.5-5.6 mg/dL

Magnesium: 1.3-2.1 mEq/L

Fluid Maintenance Requirements

4-2-1 Formula

4mL/kg/hr for the first 10kg

2 mL/kg/hr for the second 10kg

1 mL/kg/hr for the remainder

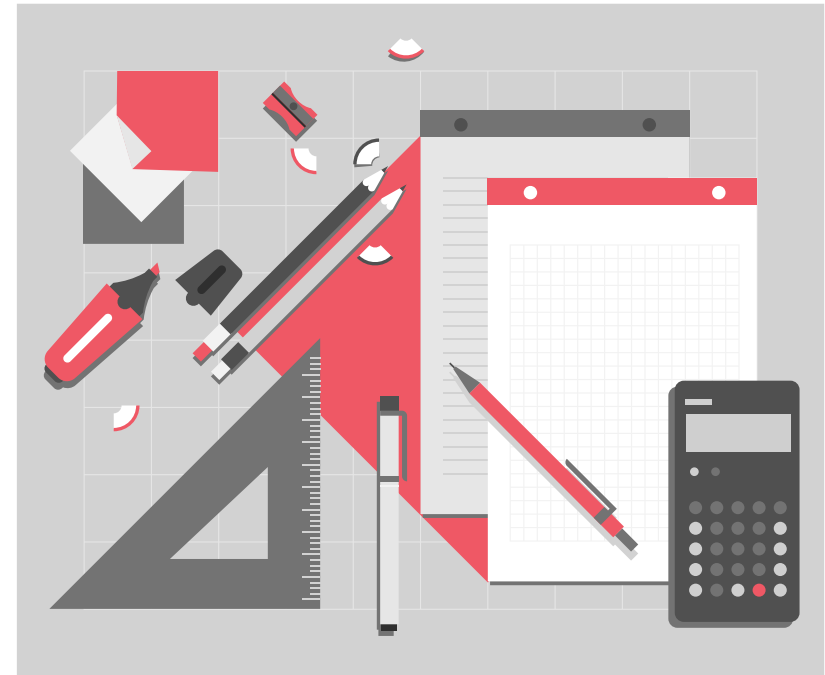
Example: patient weight is 44kg

$4\text{mL} \times 10\text{kg} = 40\text{mL}$

$2\text{mL}/10\text{kg} = 20\text{mL}$

$1\text{mL}/24\text{kg} = 24\text{mL}$

Maintenance fluid rate = 84mL/hr



Urinary Function Studies

- Urine analysis
- Specific gravity
- Pyelogram (x-ray)
- Cystourethrogram



Dehydration

- Occurs when there is significant decrease in fluid intake or insensible loss of water and electrolytes
- Isotonic dehydration- fluid loss with normal serum sodium
- Hypotonic dehydration- **electrolyte loss > fluid loss** and decreased serum sodium
- Hypertonic dehydration- **fluid loss > electrolyte loss** and serum sodium high

Assessment & Intervention

- Assess urine output and fluid intake in amount and note concentration of urine (color)
- Assess for dry skin, poor turgor, dry mucosa, or sunken fontanelle in infants
- Note lethargy or irritability
- Promote fluid intake, oral care
- Measure intake and output
- Measure weights
- Use IV replacement fluids if necessary

Normal pH 7.35 to 7.45

pH <7.35 = acidosis

pH > 7.45 = alkalosis

Urinary Tract Infection (UTI)

- A microbial invasion into the urinary tract which is more common in females due to the location and size of their urethra.
- UTI can also be a result of reflux, inadequate fluid intake, poor perineal hygiene, and urinary stasis



Assessment & Intervention

- Assess urine for cloudiness or foul smell
- Assess for fever, lethargy or poor feeding in infants
- Assess bathing and toileting habits
- Antibiotic administration
- Fluid encouragement with a goal of 100mL/kg/day
- Encourage frequent voiding
- Monitor urine output
- Provide analgesic pain management as necessary

Enuresis

- Repeated involuntary urination after the age of 5
- Can be caused by stress, incomplete bladder muscle maturation, or irritable bladder
- Enuresis is more common in boys

Assessment & Intervention

- Review child's history of toilet training
- Assess for history of UTI or senses of urgency when voiding
- Assess for nocturnal bed-wetting
- Encourage frequent toileting
- Provide emotional support to child and parent
- Utilize positive reinforcement



Nephrotic Syndrome

- Manifestation of different glomerular diseases resulting in protein loss through the kidneys
- May be autoimmune, idiopathic, or congenital in nature
- Marked by increased glomerular permeability to protein, most commonly, albumin.

Assessment & Intervention

- Clinical findings include fatigue, pallor, diarrhea, abdominal pain, decreased urine output or frothy urine, shiny skin, increased blood pressure
- Assess for periorbital edema (first sign) as well as generalized edema and weight gain
- Administer prescribed medications
- Protect skin by not using adhesives or administering IM injections
- Warm compresses to decrease edema
- Small, frequent, high calorie meals with low salt and saturated fat are recommended
- Monitor daily weight

Acute Glomerulonephritis (AGN)

- Autoimmune complex disorder that happens 1-2 weeks after a group A strep infection
- Typically occurs in school aged children 4-7 years old.
- Renal damage is caused by antigen-antibody complexes that affect the glomeruli.



Assessment & Intervention

- Assess for history of infection 1-2 weeks prior to symptoms
- Assess for irritability, fatigue, pallor, high blood pressure, edema and weight gain
- Assess for electrolyte imbalance
- Urine test for hematuria and cola (smoky) color
- Administer medications
- Monitor intake, output and daily weight
- Implement a sodium restricted and potassium restricted diet

Hemolytic Uremic Syndrome

- Associated with a bacterial or viral infection that is recent especially ingestion of E. Coli
- This is the most common cause of renal failure in children under 3 years old
- Recent visits to petting zoos common



Assessment & Intervention

- Assess for triad of symptoms: acute renal failure, hemolytic anemia and thrombocytopenia
- Health history with vomiting or diarrhea and 5-10 days later pallor, bruising, hematuria, oliguria
- Daily weights
- Fluid, electrolyte, and nutritional needs/replacement indicated
- Manage skin integrity and avoid any further bruising

Hypospadias

- Condition characterized by the urethral opening being somewhere along the ventral side of the penis
- Congenital anomaly
- Condition causes a shorter distance to the bladder which can make it easier for bacterial access

Assessment & Intervention

- Prenatal ultrasound may be able to diagnose this in utero
- Intervention is mostly supportive and includes family education

Acute Kidney Injury/Renal Failure

- Prerenal causes: Dehydration, hypovolemia
- Intrarenal causes: Kidney infections, kidney damage or nephrotoxicity
- Postrenal causes: Obstruction

Assessment & Intervention

- Buildup of toxins can cause neurologic symptoms- assess for seizures
- Assess for edema and signs of CHF
- Limit fluid intake and monitor IVF administration to prevent fluid overload
- Administer electrolyte riders for repletion/correction
- Prepare the child and family for dialysis, if indicated

Vesicoureteral Reflux (VUR)

- Backward flow of urine in the urinary tract during voiding
- This is found in 15-70% of children following UTIs and is the most common radiographic finding in children related to UTIs

Assessment & Intervention

- Assess for dysuria, urgency and frequency, urine retention, discolored urine
- Standard imaging is used for diagnosis- VCUG
- Administer medications as ordered, such as low dose antibiotic (continuous)
- Encourage frequent voiding
- Encourage high fiber diet for muscular relaxation

Undescended Testes

Intro/Etiology

If the testes remain in the abdominal cavity after age 5, seminiferous tubules can be damaged and result in sterility

Assessment

Palpate the scrotum to feel for undescended testes which are unilateral usually and visually inspect the scrotum

Intervention

Diagnostic tests check for kidney function. Post op, prevent pulling on the sutures to prevent the testes from re-ascending into the abdomen

Testicular Torsion

Intro/Etiology

The testicle rotates and interferes with blood supply to the spermatic cord. This is most common in adolescents

Assessment

Assess for sudden, severe pain and swelling of the scrotum as well as nausea/vomiting and abdominal pain

Intervention

This is a surgical emergency due to the need to save the blood supply to the testes.



Practice Questions

Knowledge Check

The nurse is taking care of a 3-month-old with developmental hip dysplasia and is to be placed in a Pavlik harness. The parents ask the nurse what the goal of the harness is. What is the nurse's best response?

- A. "The Pavlik harness will help reduce the hip socket by keeping the legs in an adducted position."
- B. "The Pavlik harness will help enlarge the hip socket by keeping the legs in an adducted position."
- C. "The Pavlik harness will help enlarge the hip socket by keeping the legs in an abducted position."
- D. "The Pavlik harness will help reduce the hip socket by keeping the legs in an abducted position."

Knowledge Check

The nurse is caring for a 7-month-old who has a diagnosis of severe osteogenesis imperfecta. Which of the following are expected assessment findings?

- A. Increased whitening of the teeth
- B. Cognitive impairment
- C. Polycythemia
- D. Blue-tinted sclera

Knowledge Check

While caring for a 4-year-old that is in skeletal traction until her femur fracture can be surgically corrected, the nurse should include the following in her plan of care:

- A. Limited fluids so that the patient does not have to toilet as much
- B. Rearrange traction weights every 2 hours
- C. Administer pain medication and sedatives to help her stay asleep more before surgery
- D. Provide bubbles for her to blow

Knowledge Check

You are caring for a 4-year-old with UTI. To prevent subsequent UTIs, you should teach the parents to do which of the following?

- a. Encourage large amount of fluid intake such as ginger ale
- b. Encourage the mother to wipe her child after toileting
- c. Encourage a low fiber diet
- d. Offer rewards for the child using the toilet every 2-3 hours

Answer: D

- Rationale: A reward is an age-appropriate tactic for helping to decrease UTIs in the future.

We would not want to offer carbonated beverages as it can irritate the bladder.

The family is encouraged to help with perineal hygiene but should be encouraged to teach the child to do their perineal hygiene independently .

In order to decrease the likelihood of another UTI, we would want to encourage a high fiber diet.

You are caring for a 3-year-old who was just diagnosed with nephrotic syndrome. Which would you expect to find on laboratory studies?

- a. Ketones
- b. Gross Hematuria
- c. Proteinuria
- d. Hyperalbuminemia

Answer: C

Rationale: Children with nephrotic syndrome have a increased glomerular permeability to protein therefore it would be normal to see proteinuria.

Other lab findings would include hypoalbuminemia.

References

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