Chapter 31

Alterations in Genitourinary Function
Urinary System

- Maintains balance
- Removal of waste products
- Functionally immature until puberty
The urinary system is comprised of the kidneys, ureters, bladder, and urethra. The kidneys are located between the twelfth thoracic (T12) and third lumbar (L3) vertebrae.
Ureters

- Carry waste fluid from kidneys to bladder
Bladder

- Stores urine
- Bladder capacity in ounces estimated by adding 2 to child’s age
- Muscular organ
Kidneys

- Function through filtration, reabsorption, and secretion
- Nephrons
- Filtration occurs at the glomerulus, Bowman’s capsule, and the basement membrane
- As child grows, concentration of urine becomes more efficient
- Under 2 years old, kidneys less efficient
The nephrons are the structural and functional unit of the kidneys. They filter water and wastes across the glomerular capillaries to maintain the body fluid level, electrolyte composition, and pH. A nephron holds six glomeruli, Bowman’s capsule, proximal tubule, loop of Henle, distal tubule, and the collecting duct.
Kidneys are immature at birth: Filtration less effective at concentrating urine... improves with age.

<table>
<thead>
<tr>
<th>BOX 31–1 Expected Urine Output According to Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinary output per kilogram of body weight decreases as the child ages because the kidney becomes more efficient at concentrating urine. Expected output is:</td>
</tr>
<tr>
<td>Infants 2 mL/kg/hr</td>
</tr>
<tr>
<td>Children 0.5–1 mL/kg/hr</td>
</tr>
<tr>
<td>Adolescents 40–80 mL/hr</td>
</tr>
</tbody>
</table>
### Table 31-2  Diagnostic Tests for Urinary System Conditions

<table>
<thead>
<tr>
<th>DIAGNOSTIC TEST</th>
<th>INDICATION</th>
<th>NURSING INTERVENTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urinalysis</td>
<td>Detects the specific gravity and presence of glucose, ketones, protein, blood cells, casts, crystals, and microorganisms</td>
<td>Use a urine collection bag for infants and children who are not toilet trained. Give older children fluids if unable to void.</td>
</tr>
<tr>
<td>Urine culture</td>
<td>Indicates the presence of an infection in the urinary system</td>
<td>Explain the process for cleaning the peritoneum and collecting the urine in a sterile cup midstream. Clean the peritoneum and collect a catheter specimen midstream in a sterile container. Suprapubic tap may be performed in infants.</td>
</tr>
<tr>
<td>Voiding cystourethrogram or radionuclide cystography</td>
<td>Shows bladder structure and function, urethral anatomy, bladder masses; detects vesicoureteral reflux</td>
<td>Explain catheterization to child and that the bladder will be filled. Provide coaching strategies for parents accompanying the child to help the child cope. Assess for allergies as contrast media is used.</td>
</tr>
<tr>
<td>Renal and/or bladder ultrasound</td>
<td>Identifies large renal scars, renal anomalies, obstruction, abscesses, masses, and hydronephrosis</td>
<td>Noninvasive procedure. Fluids are administered as prescribed.</td>
</tr>
<tr>
<td>Intravenous pyelogram (intravenous urography)</td>
<td>Visualize kidney's collecting system, distal ureters, and bladder</td>
<td>Assess for allergies as contrast medium is used. Infants and children are NPO prior to the study. An IV is started for injection of contrast.</td>
</tr>
<tr>
<td>Diuretic renography</td>
<td>Helps distinguish between obstructive and nonobstructive hydronephrosis</td>
<td>Hydrate the child before the exam. An IV is started and diuretic is infused. The child is catheterized to drain urine during the procedure.</td>
</tr>
<tr>
<td>Radionuclide renal scan with DMSA</td>
<td>Detects renal parenchymal lesions, renal atrophy, scars, or pyelonephritis. Differs between hydronephrosis caused by obstructive lesions, reflux, or a cyst</td>
<td>Explain catheterization to child.</td>
</tr>
<tr>
<td>Renal biopsy</td>
<td>To determine presence and/or extent of renal involvement in specific disorders</td>
<td>NPO 6 hours (or as prescribed) before biopsy. Prep site and administer preprocedural sedation as prescribed. May require bowel evacuation before test.</td>
</tr>
<tr>
<td>Cystoscopy</td>
<td>To visualize interior urethra and bladder</td>
<td>Infants and children are NPO prior to the study. Sedation is administered. Children with cardiac anomalies need antibiotic prophylaxis. Fluids are forced after the procedure to detect problems with voiding.</td>
</tr>
<tr>
<td>CT (computed tomography)</td>
<td>Provides detailed visualization of structures of the urinary tract and major renal blood vessels</td>
<td>Infant or child may be NPO and require bowel evacuation prior to study. Prepare child for size of equipment. Assess for allergies if contrast medium is used. Sedation may be needed.</td>
</tr>
<tr>
<td>MRI (magnetic resonance imaging)</td>
<td>Provides detailed visualization of urinary structures</td>
<td>Prepare child for sounds, size of equipment, and tunnel. Ensure that the child has no metallic implants. Sedation may be needed.</td>
</tr>
</tbody>
</table>

Table 31-3  Normal Freshly Voided Urinalysis Results

<table>
<thead>
<tr>
<th>MACROSCOPIC EXAMINATION</th>
<th>NORMAL RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Pale yellow, clear</td>
</tr>
<tr>
<td>Odor</td>
<td>Ammonia-like smell</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>≤1.010 in well hydrated child</td>
</tr>
<tr>
<td>pH</td>
<td>4.5–8</td>
</tr>
<tr>
<td>Protein</td>
<td>Negative; &lt;150 mg/24 hr</td>
</tr>
<tr>
<td>Glucose</td>
<td>&lt;130 mg/24 hr</td>
</tr>
<tr>
<td>Ketones</td>
<td>Negative</td>
</tr>
<tr>
<td>Bilirubin</td>
<td>Negative</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MICROSCOPIC EXAMINATION</th>
<th>NORMAL RESULTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red blood cells</td>
<td>0–5 per high-powered field (HPF)</td>
</tr>
<tr>
<td>White blood cells</td>
<td>&lt;2 per HPF</td>
</tr>
<tr>
<td>Casts (hyaline)</td>
<td>1 per every 10–20 low-powered fields (LPF)</td>
</tr>
<tr>
<td>Crystals</td>
<td>None</td>
</tr>
</tbody>
</table>

Structural Defects of Urinary System

• Bladder Exstrophy pp. 1177
• Hypospadias and epispadias
• Obstructive Uropathy
• Congenital Hydronephrosis
• Vesicoureteral Reflux
• Prune Belly Syndrome
Structural Defects of Urinary System

- Hypospadias and epispadias
  - Nursing management
  - Education
  - Postoperative care
- Obstructive uropathy and posterior urethral valves
  - Nursing management
  - Pre- and postoperative care
- Vesicoureteral reflux
  - Postoperative care
  - Family teaching
Hypospadius and Epispadius

- Congenital anomalies involving an abnormal location of the urethral meatus.
- Result from failure of the urethra folds to fuse completely over the urethral groove.
- Familial tendency but exact mechanism unknown.
- Hypospadius often occurs in conjunction with congenital inguinal hernias, undescended testicles, chordee.
- Epispadius often occurs with bladder extrophy.
FIGURE 31–4  Hypospadias and epispadias. A, In hypospadias, the urethral canal is open on the ventral surface of the penis. B, In epispadias the urethral canal is open on the dorsal surface.
Hypospadius

- Can occur anywhere along the ventral surface of the penile shaft.

- Diagnostic tests
  - Can be made prenatally by ultrasound
  - Physical exam in newborn
  - Chromosomal analysis to determine co-existing genetic disorders
Hypospadius treatment

• Surgical correction is the treatment of choice
• Corrected usually during the first year of life
• DO NOT CIRCUMCIZE as foreskin tissue may be used in reconstruction
• Goals of surgery
  – Placement of the urethral meatus at the end of the glans penis allowing for good urine stream
  – Release of chordee to straighten penis
  – Cosmetic appearance
Hypospadius/Epispadius nursing responsibilities

• Assist in the identification of defects in complete newborn exam
• Prevent potential complications
• Promote parental understanding and attachment
• Promote normal voiding pattern
Care for the Child After Hypospadias and Epispadias Repair

Guidelines for the care of children at home following hypospadias or epispadias repair include the following:

- Use the double-diapering technique shown in Figure 31-5 to protect the stent (the small tube that drains the urine).
- Do not bathe the child in the tub until the stent or catheter is removed.
- Restrict the infant or toddler from activities (e.g., playing on riding toys) that put pressure on the surgical site. Avoid holding the infant or child straddled on the hip. Limit the child’s activity for 2 weeks.
- Encourage the infant or toddler to drink fluids to ensure adequate hydration. Provide fluids in a pleasant environment or use a special cup. Offer fruit juice, fruit-flavored ice pops, fruit-flavored juices, flavored ice cubes, and gelatin.
- Administer the complete course of prescribed antibiotics to avoid infection.
- Observe for signs of infection: fever, swelling, redness, pain, strong-smelling urine, or change in flow of the urinary stream.
- The urine will be blood tinged for several days. Call the physician if urine is seen leaking from any area other than the penis.
Structural Defects of Urinary System (continued)

• Obstructive uropathy and posterior urethral valves
  – Structural or functional abnormalities of the urinary system that interfere with urine flow and results in urine backflow into the kidneys.

• Pressure caused by urine backup often causes HYDRONEPHROSIS, an accumulation of urine in the renal pelvis as a result of obstructed outflow, and compromises kidney function.
Obstruction may occur in either the upper or lower urinary tract. Common sites of obstruction occur at the ureteropelvic valve, the ureterovesicular junction, or the posterior urethral valve. Why would damage from posterior urethral valves potentially be worse than other obstructions? Renal failure is most likely to occur when both kidneys are affected by hydronephrosis.
Pathophysiology of hydronephrosis

• When pressure in the kidney pelvis equals the filtration pressure in the glomerular capillary, glomerular filtration stops. In response, BLOOD PRESSURE INCREASES as the body attempts to increase the glomerular filtration pressure, however increasing pressure usually leads to cell death.

• Metabolic acidosis results when the distal nephrons are impaired in their ability to secrete hydrogen ions

• Impaired ability to concentrate urine results in polydypsia and polyuria

• Obstruction results in urinary stasis, promoting bacterial growth.

• Chronic renal failure eventually results when the hydronephrosis damages the renal parenchyma causing obstructive nephropathy
Posterior Urethral Valve

• Spectrum of obstruction severity
• Morbidity is not limited to transient urethral obstruction; the congenital obstruction of the urinary tract has a profound effect on the kidney, urethral and bladder function.
• 10-15% of children undergoing renal transplant have PUV as the cause of renal insufficiency, and 1/3 of patients born with PUV progress to end-stage renal disease.
PUV treatment

• PUV initially represents a surgical condition. However, long-term treatment often comprises a combination of medical and surgical treatment, primarily directed at the bladder. The primary medications that may be needed include prophylactic antibiotics, and medications for the management of renal insufficiency.
Vesicoureteral reflux

• Results in backflow of urine from the bladder into the kidneys. Prevents complete emptying of the bladder and creates a reservoir for bacterial growth.

• Results from incomplete development of the ureterovesical junction, or from a structural anomaly in which the ureters insert in an abnormal position into the bladder.
VUR

• 50% of children with PUV have VUR
• 70% of children with symptomatic urinary tract infections have VUR.

• Diagnosis
  – Renal ultrasound
  – VCUG

• Complications
  – Reflux of infected urine can cause pyelonephritis
Structural Defects of the Reproductive System

- Phimosis
- Cryptorchidism
- Inguinal Hernia
- Hydrocele
- Testicular Torsion
Disorders Affecting Urinary Elimination

• Urinary tract infection
• Enuresis (nocturnal and diurnal)
## Clinical Manifestations of Urinary Tract Infection

<table>
<thead>
<tr>
<th>TYPE OF UTI</th>
<th>CLINICAL MANIFESTATIONS</th>
<th>CLINICAL THERAPY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower UTI—Cystitis</td>
<td>Poor feeding, vomiting, failure to gain weight, jaundice, abdominal distention, lethargy, fever may be present</td>
<td>Five- to 7-day course of trimethoprim or sulfamethoxazole or antibiotic matching organism sensitivity</td>
</tr>
<tr>
<td>Neonates</td>
<td></td>
<td>Encourage fluids</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Analgesic such as acetaminophen or pyridium</td>
</tr>
<tr>
<td>Infants</td>
<td>Fever, diarrhea, vomiting, irritability, lethargy, foul-smelling diapers, poor feeding, failure to gain weight</td>
<td>Review voiding habits and establish a schedule for voiding if needed to increase voiding frequency</td>
</tr>
<tr>
<td>Preschooler</td>
<td>Fever, hematuria, urgency, dysuria, frequency, cloudy urine, foul-smelling urine, dehydration, abdominal pain, enuresis</td>
<td></td>
</tr>
<tr>
<td>School-age</td>
<td>Dysuria, enuresis, hematuria, strong smelling urine, diarrhea, frequency or hesitancy, mood changes, abdominal pain, suprapubic or flank pain, dehydration</td>
<td></td>
</tr>
<tr>
<td>Upper UTI—Pyelonephritis</td>
<td>High fever, chills, abdominal pain, nausea, vomiting, flank pain, costovertebral angle tenderness, moderate to severe dehydration</td>
<td>IV antibiotics initially then transitioned to oral antibiotics matching organism sensitivity for a total of 7–10 days</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rehydration</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Antipyretics</td>
</tr>
</tbody>
</table>
Urinary Tract Infections in Children

What is the difference between these 3 conditions?

• Cystitis
• Urethritis
• Pyelonephritis

• Most common disorder of the GU tract in children 3% of females, and 1% of males
Urinary Tract Infections in Children

What is the difference between these 3 conditions?

- **Cystitis:** Infection in the bladder
- **Urethritis:** Infection in the urethra
- **Pyelonephritis:** Upper UTI which involves ureters, renal pelvis and renal parenchyma

- Most common disorder of the GU tract in children 3% of females, and 1% of males
UTI’s organisms

- E coli gram-negative
- Klebsiella
- Proteus
- Pseudomonas aeruginosa
- Enterococcus
- Enterobacter
- staphylococcus
Urinary Tract Infections complications

• Renal scarring results from hydronephrosis or pyelonephritis
• Associated with
  – Hypertension
  – Proteinuria
  – Renal failure
• Risk of renal failure
  – UTI under age 1
  – Delay in diagnosis
  – Anatomic or neurologic obstruction
  – Recurrent episodes of upper UTI
UTI case study

• 4 month old presents to the pediatrician’s office with a chief complaint of fever X 3 days, vomiting and loose stools.
• Went to ER on day 2, where she was diagnosed with gastroenteritis. No labs or x-rays were done.
• Less active, poor eating, small weight loss.
Urinalysis is done via transurethral catheter.

What would it show?

- Color?
- Odor?
- Specific gravity?
- pH?
- Protein?
- Glucose?
- Ketones?
- Bilirubin?
- RBC?
- WBC?
- Casts?
- Crystals?
Urinalysis is done via transurethral catheter.

<table>
<thead>
<tr>
<th>What would it show?</th>
<th>UTI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Dark</td>
</tr>
<tr>
<td>Odor</td>
<td>Pungent</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>&gt; 1.020</td>
</tr>
<tr>
<td>pH</td>
<td>Alkaline</td>
</tr>
<tr>
<td>Protein</td>
<td>Neg</td>
</tr>
<tr>
<td>Glucose</td>
<td>Neg</td>
</tr>
<tr>
<td>Ketones</td>
<td>Neg-small</td>
</tr>
<tr>
<td>Bilirubin</td>
<td>neg</td>
</tr>
</tbody>
</table>
Urinalysis is done via transurethral catheter.

<table>
<thead>
<tr>
<th>What would it show?</th>
<th>UTI</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBC</td>
<td>0-1</td>
</tr>
<tr>
<td>leukocyte</td>
<td>&gt; 5 per high power field</td>
</tr>
<tr>
<td>Nitrite</td>
<td>positive</td>
</tr>
</tbody>
</table>
Urine Culture
what would it show?

Gram negative organisms
• E coli
• Klebsiella
• Proteus
• Enterobacter

Gram positive organisms
• Staphylococcus
• Enterococcus
UTI goals of treatment

• Eradication of acute infection
• Symptom resolution
• Prevention of progression of disease
• Reduction of risk of renal scarring
UTI management

• Management of UTI does not end with the successful treatment of acute infection
• MUST include evaluation for renal anomalies or VUR

VUR is present in 30-50% of children with UTI.
Preventive Strategies for Urinary Tract Infections

Provide education to parents about strategies to reduce the risk for future urinary tract infections, including the following:

- Teach proper perineal hygiene. Girls should always wipe the perineum from front to back after voiding.
- Encourage the child to drink plenty of fluids and avoid long periods of “holding urine.”
- Caution against tight underwear; children should wear cotton rather than nylon underwear.
- Encourage the child to void more frequently and to fully empty the bladder.
- Discourage bubble baths and hot tubs, which can irritate the urethra.
- Encourage abstinence of sexual activity. However, if girls are sexually active, instruct them to void before and after sexual intercourse to prevent urinary stasis and flush out bacteria introduced during intercourse.
What is the most common clinical presentation of UTI in the child under 2?

- The most common presentation of UTI in the child under two years of age is fever with associated signs and symptoms including:
  - Vomiting
  - Diarrhea
  - Irritability
  - Poor feeding
  - Malodorous urine,
  - Oliguria
  - Constipation
Disorders Affecting Urinary Elimination (continued)

• Enuresis (nocturnal and diurnal)
  – Nursing Management
  – Teaching
<table>
<thead>
<tr>
<th>APPROACH</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluid intake program</td>
<td>The child’s daily fluid requirements are calculated, then the fluid requirements are met by providing 40% of the fluid requirements in the morning (7 A.M. to 12 P.M.), 40% in the afternoon (12 P.M. to 5 P.M.), and 20% in the evening (after 5 P.M.). The benefits of this program include the promotion of adequate fluid intake and the decrease in urine production at nighttime.</td>
</tr>
<tr>
<td>Timed voiding</td>
<td>The child with diurnal enuresis is instructed to void every 2 hours and to use a double voiding pattern; this trains the bladder to empty completely and avoid overdistention.</td>
</tr>
<tr>
<td>Enuresis alarms</td>
<td>A detector strip is attached to the child’s pants. The alarm sounds a buzzer that alerts the child when wetting occurs, so the child can get up and finish voiding in the bathroom. This works best for children over 7 years old.</td>
</tr>
<tr>
<td>Reward system/positive reinforcement</td>
<td>Set realistic goals for the child, offer praise, and reward the dry days or nights with stars and stickers on a calendar.</td>
</tr>
</tbody>
</table>
Guidelines for Using an Enuresis Alarm

The success of achieving urinary control at night by using an alarm is dependent on the family and child's understanding of the appropriate use of the alarm. Partner with parents to provide the following tips to help ensure their understanding.

- It takes 10 to 12 weeks for the average child to be consistently dry.
- Attach the alarm to close-fitting cloth underwear (not boxers or pajama bottoms) instead of disposable pants.
- Parents should respond to the alarm by going to the child's room and noting the child's response. Tell the child to put the feet on the floor and walk to the bathroom. Help the child if necessary. Turn the alarm off only after the child's feet are on the floor.
- Initially, the child will have emptied his or her bladder by the time he or she hears the alarm (or parent responds). Progress can be measured by recording the frequency of wetting episodes per night, the time of the wetting, and the size of the wet spot before the child responds.
- Many children wet more than one time per night initially. Reattach the alarm to clean underwear after each wetting episode. As they make progress, the nightly wetting episodes decrease.
- Use positive reinforcement by keeping charts to allow the child to track progress. Consider giving rewards (stickers, time for favorite activities, etc.) in recognition of cooperation, wearing the alarm and walking to the bathroom when parents arrive, as well as dry nights.
- Use the alarm until the child has had 2 weeks of consecutive dry nights, and then use the alarm every other night for 2 or more consecutive weeks of dryness. If wetting occurs during this process, start the 2-week weaning over again.
- Discontinuing the alarm prematurely can lead to a relapse of the wetting.

Kidney Disorders

• Nephrotic syndrome
• Renal Failure
• Renal Replacement Therapy
  – Hemodialysis
  – Continuous Renal Replacement Therapy
  – Kidney Transplant
• Acute Post infectious Glomerulonephritis
• Hemolytic Uremic Syndrome
• Polycystic Kidney Disease
Nephrotic Syndrome

• One of the most frequent reasons for referral to a pediatric nephrologist
• Alteration in kidney function secondary to increased glomerular basement membrane permeability to plasma protein.
• Not a specific disease but a clinical state characterized by specific symptoms.

What symptoms characterize nephrotic syndrome??
If nephron allows increased protein to escape from the blood, what else happens?
Massive Proteinuria

Hypoalbuminemia

- Decreased plasma oncotic pressure
- Stimulation of liver synthesis

  - Intravascular hypovolemia
  - Excessive clotting factors
  - Increased renin-angiotensin-aldosterone activation

  - Increased antidiuretic hormone secretion

  - Salt and water retention

    - Generalized edema
    - Low serum sodium

- hyperlipidemia
Nephrotic Syndrome

- Excessive clotting factors
- Hyperlipidemia
- Generalized edema
- Low serum sodium

85% of children with Nephrotic syndrome have MINIMAL CHANGE NEPHROTIC SYNDROME
Minimal Change Nephrotic Syndrome

- The glomeruli appear normal or have a minimal increase in the mesangial cells or matrix.
- EDEMA: initially noted around the eyes, and in lower extremities. Over the course of the day, the edema distributes from the eyes to dependent areas.
<table>
<thead>
<tr>
<th>System</th>
<th>Signs and Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Renal</strong></td>
<td>• Decreased urine output</td>
</tr>
<tr>
<td></td>
<td>• Dark frothy urine</td>
</tr>
<tr>
<td><strong>Cardiovascular</strong></td>
<td>• Mild hypertension</td>
</tr>
<tr>
<td></td>
<td>• Tachycardia</td>
</tr>
<tr>
<td><strong>Vascular</strong></td>
<td>• Thrombosis</td>
</tr>
<tr>
<td><strong>Gastrointestinal</strong></td>
<td>• Anorexia</td>
</tr>
<tr>
<td></td>
<td>• Abdominal pain, nausea, vomiting, diarrhea</td>
</tr>
<tr>
<td><strong>Skin</strong></td>
<td>• Pallor, edema, skin breakdown</td>
</tr>
<tr>
<td></td>
<td>• Shiny skin with prominent veins</td>
</tr>
<tr>
<td><strong>Pulmonary</strong></td>
<td>• Respiratory distress</td>
</tr>
<tr>
<td></td>
<td>• Pulmonary congestion</td>
</tr>
</tbody>
</table>
PRACTICE ALERT

• Children with nephrotic syndrome who have not been immunized with varivax or who have not previously had chickenpox should have a varicella zoster titer drawn. If the child is exposed to chickenpox, varicella-zoster immune globulin should be administered within 72 hours of exposure to prevent or lessen the severity of the illness. These children should not receive vaccines containing live viruses because of the risk of disease from the vaccine.
Nursing Care of the Child with Nephrotic Syndrome

- Physiologic Assessment
- Psychosocial Assessment
- Administer Medications
- Prevent Infections
- Prevent skin breakdown
- Meet Nutritional/fluid needs
- Promote rest
- Provide emotional support
Nephrotic Syndrome Medications p. 1196-97

• Corticosteroid Therapy
• Alylating/Cytotoxic Agents
• Cylosporine Therapy (immunosuppressants)
• Diuretics
• ACE inhibitor
• Antithrombolic Therapy
• NSAIDS
Corticosteroid Therapy

• Prednisone or prednisolone
  – Stimulates remission by reducing the excretion of protein in the urine.

Children who respond successfully to therapy continue to take corticosteroids for 6 weeks, and then taper.
Education and discharge planning

- Parents will need to monitor protein in urine daily using dipstick
- Understand that relapses do occur
- No added salt diet
- Monitor weight
Let’s review

The most common cause of primary idiopathic nephrotic syndrome is:

MINIMAL CHANGE NEPHROTIC SYNDROME ACCOUNTS FOR 80-85% OF NEPHROTIC SYNDROME
Let’s review

COMMON CAUSES OF MORTALITY IN NEPHROTIC SYNDROME ARE:

A. Acute renal failure
B. Thromboembolism
C. Congestive heart failure
D. Peritonitis
E. Seizures
Let’s review

COMMON CAUSES OF MORTALITY IN NEPHROTIC SYNDROME ARE:

B. Thromboembolism  
D. Peritonitis
Acute and chronic kidney failure

- Occurs when the kidney is unable to excrete wastes and concentrate urine.
  - *Acute* occurs suddenly and may be reversible
  - *Chronic* occurs gradually and permanently

- **Azotemia** accumulation of nitrogenous wastes in the blood
- **Oliguria:** urine output 0.5-1ml/kg/hour
- **Anuria:** absent urine output
**Clinical Manifestations of Electrolyte Imbalances in Acute Renal Failure**

<table>
<thead>
<tr>
<th>ELECTROLYTE IMBALANCE</th>
<th>CLINICAL MANIFESTATIONS</th>
<th>CLINICAL THERAPY</th>
</tr>
</thead>
</table>
| **Hyperkalemia**      | • Peaked T waves, widening of QRS on ECG.  
                         • Dysrhythmias: ventricular dysrhythmias, heart block, ventricular fibrillation, cardiac arrest  
                         • Diarrhea  
                         • Muscle weakness | • Eliminate all intake of potassium  
                         • Administration of alkalinizing agents  
                         • Kayexalate orally or in retention enema  
                         • Dialysis if other methods to reduce the potassium level are ineffective |
| **Hyponatremia**      | • Change in level of consciousness  
                         • Muscle cramps  
                         • Anorexia  
                         • Abdominal reflexes, depressed deep tendon reflexes  
                         • Cheyne-Stokes respirations  
                         • Seizures | • Electrolyte replacement, sodium bicarbonate  
                         • Dialysis to correct severe electrolyte disturbance |
| **Hypocalcemia**      | • Muscle tingling  
                         • Changes in muscle tone  
                         • Seizures  
                         • Muscle cramps and twitching  
                         • Positive Chvostek sign (contraction of facial muscles after tapping facial nerve just anterior to parotid gland) | • Calcium gluconate  
                         • Dialysis to correct severe electrolyte disturbance |

Hemolytic-uremic syndrome

– Definition
  • over half is caused by e-coli in contaminated beef

– Pathophysiology
  • Acute renal disease that is the most common cause of renal failure.
    – Hemolytic anemia
    – Thrombocytopenia
    – Acute renal failure
  • Verotoxin causes damage to the lining of the glomerular arterioles resulting in swelling of the endothelial cells.
  • An episode of gastroenteritis with diarrhea, URI, or UTI precedes the development of HUS by 1-2 weeks
## Clinical Manifestations of Hemolytic Uremic Syndrome

<table>
<thead>
<tr>
<th>Stage</th>
<th>Clinical Manifestation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prodromal stage</td>
<td>Upper respiratory illness</td>
</tr>
<tr>
<td></td>
<td>Fever and irritability</td>
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<tr>
<td></td>
<td>Lymphadenopathy</td>
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<tr>
<td></td>
<td>Skin rash</td>
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<tr>
<td></td>
<td>Abdominal pain with N/V/D diarrhea</td>
</tr>
<tr>
<td></td>
<td>Acute stage</td>
</tr>
<tr>
<td></td>
<td>Hemolytic anemia</td>
</tr>
<tr>
<td></td>
<td>Hypertension</td>
</tr>
<tr>
<td></td>
<td>Pallor and purpura</td>
</tr>
<tr>
<td></td>
<td>Neurologic involvement (irritability, altered LOC, hallucinations)</td>
</tr>
<tr>
<td></td>
<td>Renal failure (hematuria, proteinuria, oliguria or anuria, and ascites)</td>
</tr>
</tbody>
</table>
Kidney Disorders (continued)

• Hemolytic-uremic syndrome
  – Nursing management
    • Same as with acute kidney failure
    • Dialysis
    • Diet of small, high-calorie, high-carbohydrate
    • Diet of low sodium, potassium, phosphorus
  – Education and prevention
    • Reduce risk of consumption of contaminated beef
    • Cook ground beef to 155 degrees (no rare hamburgers)
    • Wash hands when handling raw ground meed
    • Keep utensils used for prep separate from those used to serve
    • Use meat thermometer
Food Preparation

Hemolytic uremic syndrome can be largely prevented by cooking of ground beef to 155°F throughout, meaning no more rare hamburgers. Teach the family to wash hands carefully when handling raw ground meats, and make sure utensils touching raw meat do not come into contact with cooked meats. Encourage the use of a meat thermometer since the absence of pink in the center of the meat does not ensure that the appropriate temperature has been achieved.
Acute Postinfectious Glomerulonephritis

- Most common inflammation of the glomeruli of the kidneys. In children it is in response to group A Beta-hemolytic Streptococcus infection (strep throat)
- Symptoms appear 1-2 weeks after strep throat
- Glomerular damage occurs as a result of an immune complex reaction that localizes on the glomerular capillary wall.
Acute Postinfectious Glomerulonephritis clinical manifestations

- ½ of children are asymptomatic
- Abrupt onset of abdominal pain
- Irritability
- Malaise
- Fever
- Microscopic hematuria (most all cases)
- Gross hematuria (50% of cases)
- Dysuria
- Mild periorbital and dependent edema
- Acute hypertension
Acute Postinfectious Glomerulonephritis lab findings

- Hematuria
- Proteinuria
- Leukocytes
- Decreased serum protein
- Anemia
- ESR increased
- Serum IgG antibodies against strep +
- Circulatory overload causing EKG changes
Acute Postinfectious Glomerulonephritis
Nursing diagnoses

• _______ fluid volume related to decrease glomerular filtration and increased sodium ____________
• Risk for ___________ related to renal impairment and corticosteroid therapy
• Risk for impaired skin integrity related to tissue ______
• Imbalanced nutrition: _____ than body requirements related to ___________appetite
• Activity intolerance related to fluid and electrolyte imbalance, infectious process, and altered ___________
• Effective therapeutic regimen management related to parent’s ability to manage child’s medication schedule and treatment regimen at home.
Acute Postinfectious Glomerulonephritis
Nursing diagnoses

• Excess fluid volume related to decrease glomerular filtration and increased sodium retention
• Risk for infection related to renal impairment and corticosteroid therapy
• Risk for impaired skin integrity related to tissue edema
• Imbalanced nutrition: less than body requirements related to loss of appetite
• Activity intolerance related to fluid and electrolyte imbalance, infectious process, and altered nutrition
• Effective therapeutic regimen management related to parent’s ability to manage child’s medication schedule and treatment regimen at home.
Acute Postinfectious Glomerulonephritis Nursing Care

• Assessment
  – Vital signs especially blood pressure
  – Fluids and electrolytes with strict I&O, specific gravity
  – Daily weights
  – Urine dipstick for + hematuria, + proteinuria
  – Assess edema (periorbital, dependent)
  – Measure abdominal girth
  – Auscultate heart and lung sounds, note resp effort
  – Monitor neurologic signs secondary to hypertension (level of consciousness, confusion, headache, vomiting, seizures)
NCLEX REVIEW QUESTION

• Which intervention would be appropriate when a nurse is caring for a child with acute postinfectious glomerulonephritis?
  a) Maintain strict fluid restriction
  b) Screen family members for strep throat
  c) Monitor child for hyperactivity
  d) Offer high-protein diet.
Answer

B. Screen family members for strep throat
Table 31-8  Nutritional Information for the Child with Kidney Disease

Children with kidney disease have restricted diets, generally low in sodium, potassium, and phosphorus. A renal dietitian works with families of children with chronic renal failure to develop meal plans that fit a restricted diet. The nurse can help families remember that certain foods must be avoided or eaten in very small quantities by reviewing this table.

<table>
<thead>
<tr>
<th>HIGH-SODIUM CONTENT FOODS</th>
<th>HIGH-POTASSIUM CONTENT FOODS</th>
<th>HIGH-PHOSPHORUS CONTENT FOODS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soups and sauces: e.g., gravy, spaghetti and tomato sauce, barbeque sauce, steak sauce Processed lunchmeats: e.g., bologna, ham, salami, hot dogs Smoked meat and fish: bacon, chipped beef, corned beef, ham, lox Sauerkraut, pickles, and other pickled foods Seasonings: horseradish, soy sauce, Worcestershire sauce, meat tenderizer, and monosodium glutamate (MSG)</td>
<td>Fruit: apricots, avocados, bananas, citrus fruits, fresh pears, nectarines, dates, figs, cantaloupe and other melons, prunes, and raisins Vegetables: celery, dried beans, lime beans, potatoes, leafy greens, spinach, tomatoes, winter squash Whole grains: especially those containing bran Sardines, clams Peanuts Dairy products: milk, ice cream, pudding, yogurt</td>
<td>Dairy products: milk, cheese, yogurt, custard, pudding, ice cream Dried beans, peas Nuts, peanut butter Chocolate Dark cola Sausage, hot dogs</td>
</tr>
</tbody>
</table>
Sexually Transmitted Infections

- Chlamydia
- Genital Herpes
- Gonorrhea
- Human Papillomavirus
- Trichomoniasis
- Syphilis
- Pelvic Inflammatory Disease
Sexually Transmitted Infections (STIs)

- Symptoms
- Pathophysiology
Sexually Transmitted Infections (STIs)

- Nursing management
- Education and prevention
Preventing STIs and Their Consequences

It is important when talking with adolescents to give them information about the risks of STIs and strategies to protect themselves. One important strategy is to encourage the adolescent to talk with his/her partner about STI protection, even when the partner is perceived to be at no or little risk of having an STI. Important information to share includes the following:

- Abstinence is the best method to prevent STIs.
- Limit the number of sexual contacts; practice mutual monogamy.
- Always use condoms and spermicidal gels or foams for vaginal and anal intercourse.
- Refrain from oral sex if the partner has active sores in mouth, vagina, or anus or on the penis.
- Reduce high-risk sexual behaviors. Use of recreational drugs and alcohol can increase sexual risk taking.
- Seek care as soon as symptoms are noticed; make sure the partner gets treatment; and avoid sexual intercourse until the STI is cured.
- Seek annual screening for STIs as some can be present without symptoms.