Incontinence

- Incontinence or loss of voluntary control of the bladder has many causes:
  - Stress incontinence can occur with:
    - Coughing
    - Laughing
    - Women whose urogenital diaphragm has weakened from several pregnancies
    - Age
  - Spinal cord injuries can interfere with voluntary neurologic control of the bladder

Retention

- Retention is inability to empty bladder
  - Micturition reflex is located in the sacral spinal cord and can be blocked by spinal cord injuries
  - Retention may be caused by anesthesia, either general or spinal
Urinalysis
- Constituents may vary with diet and drugs
- Urine is usually clear and straw-colored with a mild odor
- pH usually 4.5-8.0
- Volume 1.0-1.5 liters/day but varies with intake, sweating, etc

Abnormalities in Urine
- Cloudy- may indicate the presence of large amounts of protein, blood cells, bacteria or pus
- Dark color- may indicate blood, excessive bilirubin content, or highly concentrated urine
- Unpleasant or unusual odor- may indicate infection

Abnormal Constituents
- Blood (hematuria)
  - Small amounts associated with infection, inflammation or tumors of urinary tract
  - Large amounts of red blood cells indicate increased glomerular permeability or hemorrhage in the tract
- Protein (proteinuria, albuminuria)- indicates the leakage of albumin or mixed plasma proteins into the filtrate indicating inflammation or increased permeability of glomeruli
- Bacteria (bacteriuria) or pus (pyuria)- indicate infection in the urinary tract
- Urinary casts- may indicate inflammation of the kidney tubules
- Specific gravity- indicates the ability of the tubules to concentrate the urine; a very low gravity (dilute urine) usually related to renal failure

**Dialysis**

- Dialysis provides an “artificial kidney” which can be used to sustain life after kidneys fail.
- Dialysis is used to treat someone who has acute renal failure (can function normally on half of one kidney)
- Two forms of dialysis:
  - Hemodialysis- in hospital or dialysis center
  - Peritoneal dialysis- can be done at home
Hemodialysis required 3-4 times per week for 3-4 hour sessions
Anticoagulant required to prevent clotting
Peritoneal dialysis may be done at night while patient sleeps
Takes more time than hemodialysis
Continuous ambulatory peritoneal dialysis (CAPD)

Urinary Tract Infections
- Very common
- Urine excellent medium for growth of microorganisms
  - Cystitis and urethritis are considered lower urinary tract infections
  - Pyelonephritis is an upper urinary tract infection
- Most infections are ascending from outside of body traveling up the mucous membrane to bladder and then up the ureters to the kidney, often caused by E. coli
- Occasionally, pyelonephritis results from blood-borne infection

Etiology of Urinary Infections
- Women are anatomically more vulnerable to urinary tract infections than men because of:
  - Shortness and width of urethra
  - Proximity of urethra to anus
  - Frequent irritation to the tissues from tampons, bubble bath, deodorants and sexual activity
Older men with prostatic hypertrophy and retention of urine frequently develop infection. Because of the shared structures with the reproductive system, any infection of the reproductive organs is likely to extend to the urinary tract.

**Common Causative Factors in Men and Women**

- Bladder retention of urine
- Any obstruction of urine flow
- All these conditions tend to result in incomplete flushing of bacteria from the bladder and urethra by voiding
- Congenital abnormalities in children are a common cause of UTI

- Pregnancy
- Scar tissue
- Renal calculi
- Vesicoureteral reflux all contribute to infection because the urine and any contaminants do not flow freely through and out of the system.
Infection may result from decreased host resistance from immunosuppression
Impaired blood supply to the bladder from aging
Diabetes mellitus (vascular impairment and glycosuria)
Catheters or instruments introduced into the bladder may introduce bacteria into the bladder or traumatize bladder wall

Several Sources of UTI

Inflammatory Disorders
- Glomerulonephritis may have several causes
- Acute poststreptococcal glomerulonephritis is one example
It typically follows streptococcal infection with certain types of group A beta-hemolytic *Streptococcus*. It usually begins as an upper respiratory infection, middle ear infection, skin infection, or "strep throat." The glomerulonephritis develops about 7-10 days after the original infection. Primarily affects children between 3-7 years old, especially boys.

**Pathophysiology of APSGN**

- Antistreptococcal antibodies formed from the earlier infection create an antigen-antibody complex that:
  - Lodges in the glomerular capillaries
  - Activates complement
  - Causes an inflammatory response in both kidneys
In most cases, recovery takes place with minimal residual damage. Some cases, particularly in adults, are not easily resolved:
- Acute renal failure occurs in about 2% of cases.
- Chronic glomerulonephritis persists in about 10% of cases which gradually destroys the kidneys.

Urinary Tract Obstructions
- In older men, benign prostatic hypertrophy or prostatic cancer frequently obstructs the urinary tract.
- Renal calculi (kidney stones) are a common cause of obstruction in both men and women.

Kidney Stones
Urolithiasis (Calculi or Kidney Stones)

- Calculi may develop anywhere in the urinary tract
- Stones may be small or very large (e.g. staghorn calculus)
- Any solid material may act as a nidus around which other material may accumulate
- Immobility may result in calculi because of the stasis of urine

Calculi may form when:
- There are excessive amounts of relatively insoluble salts in the filtrate
- Insufficient fluid intake creates a highly concentrated filtrate
- About 75% of calculi are composed of calcium salts, especially calcium oxalate
- The remainder consisting primarily of uric acid, struvite (magnesium ammonium phosphate), or other oxalates

Foods high in oxalate include:
- Dark green vegetables, such as spinach.
- Rhubarb.
- Chocolate.
- Tea and cola.
- Wheat bran.
- Nuts.
- Cranberries.
- Beans.
- Coffee.
Stones usually only cause problems when they obstruct the flow of urine, e.g. in the ureter.
Calculi may cause infection because they cause stasis of urine in the area and may also irritate tissues.
When located in the kidney or ureter, calculi may cause the development of hydronephrosis, with dilation of calyces and atrophy of renal tissue.

Adult Polycystic Kidney
- The most common form of this genetic disease is transmitted as an autosomal dominant gene on chromosome 16.
- No indications in the child or young adult; first manifestations appear around age 40.
- At this time renal failure occurs and dialysis is required.
Wilm’s Tumor

- This is the most common tumor of the urinary tract occurring in children
- Both a sporadic (most common) and inherited form
- The inherited form is associated with genes (WT1 & WT2) on chromosome 11 and may occur in conjunction with other congenital disorders including aniridia, hemihyperplasia, horseshoe kidneys, hypospadias, polycystic kidneys, ureteral duplication and uterine abnormalities

- It is usually unilateral
- Usually diagnosed at about ages 2-5 when a large abdominal mass presents
- With treatment of surgery, radiation and chemotherapy, survival rate about 90%
Renal Failure

- Acute renal failure
- Sudden kidney failure
- May be reversible if primary problem is treated successfully
- Dialysis may be needed during treatment period
- In some cases, some permanent damage to the kidneys may occur

Acute Kidney Failure Etiology

- Numerous causes:
  - Acute bilateral kidney disease such as glomerulonephritis
  - Severe and prolonged circulatory shock or heart failure
  - Shock associated with burns or crush injuries (hemoglobin from hemolysis of RBC’s causes obstruction of kidney tubules
  - Nephrotoxins such as drugs, chemicals or toxins
Chronic Renal Failure

Chronic renal failure is the gradual irreversible destruction of the kidneys over a long period of time. It may occur as a result of:

- Chronic kidney disease
  - Bilateral pyelonephritis
  - Congenital polycystic kidney disease
- Systemic disorders
  - Hypertension
  - Diabetes mellitus

Stages of Renal Failure

- Decreased renal reserve (around 60% nephron loss)
  - GFR reduced but no clinical signs
- Renal insufficiency (around 75% nephron loss; 25-30 ml/min GFR)
  - Changes in blood chemistry
- End-stage renal failure or uremia (around 90% nephron loss)
  - Regular dialysis or kidney transplant required to maintain patient's life
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<td>Nephrotoxicity, chronic bilateral kidney inflammation or infection, polycystic disease</td>
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