Urinary System

Overview of Anatomy and Physiology

• Functions of the urinary system
  – Excretion of waste products
  – Regulation of water, electrolytes, and acid-base balance

• Nephron: functional unit of kidneys
The nephron unit.

Physiology

• Urine composition and characteristics
  – 95% water; remainder is nitrogenous wastes and salts
• Urine abnormalities
  – Albumin; glucose; erythrocytes; ketones; leukocytes

Urinary System
Overview of Anatomy and Physiology

- Ureters (two)
  - Passageway for urine from the kidneys to the urinary bladder
- Urinary bladder (one)
  - Temporary storage pouch for urine
- Urethra (one)
  - Carries urine by peristalsis from the urinary bladder out to its external opening

Laboratory and Diagnostic Examinations

- Urinalysis
- Blood urea nitrogen (BUN)
- Blood creatinine
- Creatinine clearance
- Prostate-specific antigen (PSA)
- Osmolality
- Kidney-ureter-bladder radiography (KUB)
- Intravenous pyelogram (IVP)
- Retrograde pyelography
- Voiding cystourethrography

Laboratory and Diagnostic Examinations

- Endoscopic procedures
- Renal angiography
- Renal venogram
- Computed tomography (CT)
- Magnetic resonance imaging (MRI)
- Renal scan
- Ultrasonography
- Transrectal ultrasound
- Renal biopsy
- Urodynamic studies
Medication Considerations

• Diuretics to enhance urinary output
  – Thiazide diuretics
  – Loop (or high-ceiling) diuretics
  – Potassium-sparing diuretics
  – Osmotic diuretics
  – Carbonic anhydrase inhibitor diuretics

• Medications for urinary tract infections
  – Quinolone
  – Nitrofurantoin
  – Methenamine
  – Fluoroquinolone

Maintaining Adequate Urinary Drainage

• Types of catheters
  – Coudé catheter
  – Foley catheter
  – Malecot, Pezzer, or mushroom catheters
  – Robinson catheter
  – Ureteral catheters
  – Whistle-tip catheter
  – Cystostomy, vesicostomy, or suprapubic catheter
  – External (Texas or condom) catheter
Disorders of the Urinary System

• Urinary retention
  – Etiology/pathophysiology
    • The inability to void despite an urge to void
  – Clinical manifestations/assessment
    • Distended bladder
    • Discomfort in pelvic region
    • Voiding frequent, small amounts

Disorders of the Urinary System (continued)

• Urinary retention
  – Medical management/nursing interventions
    • Warm shower or sitz bath
    • Natural voiding position if possible
    • Urinary catheter
    • Surgical removal of obstruction
    • Analgesics
Disorders of the Urinary System

• Urinary incontinence
  – Etiology/pathophysiology
    • Involuntary loss of urine from the bladder
      – Total incontinence; dribbling; stress incontinence
    • Secondary
      – Infection; loss of sphincter control; sudden change in pressure in the abdomen
    • Permanent or temporary

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Disorders of the Urinary System

• Urinary incontinence (continued)
  – Clinical manifestations/assessment
    • Involuntary loss of urine
      – Leaking with coughing, sneezing, or lifting
  – Medical management/nursing interventions
    • Treat underlying cause
    • Surgical repair of bladder
    • Temporary or permanent catheter
    • Bladder training
    • Kegel exercises

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Some common types of incontinence

- Overflow
  - Urethral blockage
  - Bladder unable to empty properly
- Stress
  - Relaxed pelvic floor
  - Increased abdominal pressure
- Urgency
  - Bladder overactivity from infection
  - Neurological disorders
Disorders of the Urinary System

• Neurogenic bladder
  – Etiology/pathophysiology
    • Loss of voluntary voiding control
    • Results in urinary retention or incontinence
    • Lesion of the nervous system that interferes with normal nerve conduction to the urinary bladder
    • Two types
      – Spastic
      – Flaccid

Disorders of the Urinary System (continued)

• Neurogenic bladder
  – Clinical manifestations/assessment
    • Infrequent voiding
    • Incontinence
    • Diaphoresis, flushing, nausea prior to reflex incontinence
  – Medical management/nursing interventions
    • Antibiotics; urecholine
    • Intermittent catheterization
    • Bladder training

Disorders of the Urinary System

• Urinary tract infections
  – Etiology/pathophysiology
    • Type depends on location
    • Pathogens enter the urinary tract
      – Nosocomial infection
      – Bladder obstruction
      – Insufficient bladder emptying
      – Decreased bactericidal secretions of the prostate
      – Perineal soiling in females
      – Sexual intercourse
Disorders of the Urinary System

- Urinary tract infections (continued)
  - Clinical manifestations/assessment
    - Urgency; frequency; burning on urination
    - Nocturia
    - Abdominal discomfort; perineal or back pain
    - Cloudy or blood-tinged urine
  - Medical management/nursing interventions
    - Antibiotics; urinary antiseptics/analgesics
    - Encourage fluids
    - Perineal care

Obstructive Disorders of the Urinary System

- Urinary obstruction
  - Etiology/pathophysiology
    - Strictures; kinks
    - Cysts; tumors
    - Calculi
    - Prostatic hypertrophy
  - Clinical manifestations/assessment
    - Continuous need to void
    - Voiding small amounts frequently
    - Pain
    - Nausea

Obstructive Disorders of the Urinary System

- Urinary obstruction (continued)
  - Medical management/nursing interventions
    - Establish urinary drainage
      - Indwelling catheter
      - Suprapubic cystostomy
      - Ureterostomy
      - Nephrostomy
    - Relieve pain
      - Narcotics
      - Anticholinergics
Obstructive Disorders of the Urinary System

• Hydronephrosis
  – Etiology/pathophysiology
    • Dilation of the renal pelvis and calyces
    • Unilateral or bilateral
    • Obstruction of the urinary tract
  – Clinical manifestations/assessment
    • Dull flank pain (slow onset)
    • Severe stabbing pain (sudden onset)
    • Nausea and vomiting
    • Frequency, dribbling, burning, and difficulty starting urination

Obstructive Disorders of the Urinary System

• Hydronephrosis (continued)
  – Medical management/nursing interventions
    • Surgery to relieve obstruction
    • Nephrectomy
      – Severely damaged kidney
    • Antibiotics
    • Narcotics

Obstructive Disorders of the Urinary System

• Urolithiasis
  – Etiology/pathophysiology
    • Formation of urinary calculi (stones)
    • Develops from minerals
    • Identified according to location
      – Nephrolithiasis; ureterolithiasis; cystolithiasis
  – Clinical manifestations/assessment
    • Flank or pelvic pain
    • Nausea and vomiting
    • Hematuria
Obstructive Disorders of the Urinary System

• Urolithiasis (continued)
  – Medical management/nursing interventions
    • Antibiotics
    • Encourage fluids
    • Ambulate
    • STRAIN ALL URINE
    • Surgical procedures
      – Cystoscopy; ureterolithotomy; pyelolithotomy; nephrolithotomy
    • Lithotripsy

Figure 50-7

Location and methods of removing renal calculi from upper urinary tract.

Renal Tumors

• Etiology/pathophysiology
  – Adenocarcinomas that develop unilaterally
  – Renal cell carcinomas arise from cells of the proximal convoluted tubules
• Clinical manifestations/assessment
  – Early: intermittent painless hematuria
  – Late
    • Weight loss
    • Dull flank pain
    • Palpable mass in flank area
    • Gross hematuria

Renal Tumors

- Medical management/nursing interventions
  - Radical nephrectomy
  - Radiation
  - Chemotherapy

Renal Cysts

- Etiology/pathophysiology
  - Cysts form in the kidneys
  - Polycystic kidney disease
    - Cysts cause pressure on the kidney structures and compromise function

- Clinical manifestations/assessment
  - Abdominal and flank pain
  - Voiding disturbances
  - Recurrent UTIs
  - Hematuria
  - Hypertension

Renal Cysts

- Medical management/nursing interventions
  - No specific treatment
  - Relieve pain
  - Heat (unless bleeding)
  - Analgesics
  - Antibiotics
  - Antihypertensives
  - Dialysis
  - Renal transplant
## Tumors of the Urinary Bladder

- **Etiology/pathophysiology**
  - Most common site of cancer in the urinary tract
  - Range from benign papillomas to invasive carcinoma

- **Clinical manifestations/assessment**
  - Painless intermittent hematuria
  - Changes in voiding patterns

- **Medical management/nursing interventions**
  - Localized—remove tissue by burning
  - Invasive lesions—partial or total cystectomy