Learning Objectives

- Discuss the anatomy and physiology of urogenital organs and structures
- Describe the questioning technique, specific questions paramedic should use when gathering a focused history in a patient with abdominal pain

Learning Objectives (Cont'd)

- Describe techniques used in performing a comprehensive physical examination of the patient reporting abdominal pain associated with the urological system
- Describe the incidence, morbidity, mortality rates, risk factors predisposing to urological emergencies
Learning Objectives (Cont'd)

- Describe the etiology, history, physical findings of acute renal failure
- With the patient history and physical examination findings, develop a treatment plan for acute renal failure
- Describe the etiology, history, physical findings of chronic renal failure

- With the patient history and physical examination findings, develop a treatment plan for chronic renal failure
- Define renal dialysis
- Discuss common complications of renal dialysis

- Describe the etiology, history, and physical findings of renal calculi
- With the patient history and physical examination findings, develop a treatment plan for renal calculi
- Describe the etiology, history, physical findings of urinary retention
Learning Objectives (Cont'd)

- With the patient history and physical examination findings, develop a treatment plan for urinary retention
- Describe the etiology, history, and physical findings of urinary tract infection

- With the patient history and physical examination findings, develop a treatment plan for urinary tract infection
- Describe the internal and external male anatomy

Learning Objectives (Cont'd)

- Describe the incidence, signs, and symptoms associated with genital lesions, including:
  - Genital herpes
  - Syphilis
  - Chancroid lesions
  - Granuloma inguinale
  - Lymphadenoma
  - Genital warts
  - Molluscum contagiosum
Learning Objectives (Cont’d)

- Discuss the signs and symptoms associated with blunt genital trauma in a male patient
- Describe the prehospital care for blunt genital trauma in a male patient

Learning Objectives (Cont’d)

- Discuss male genitourinary infections, including:
  - Epididymitis
  - Orchitis
  - Fournier’s gangrene
  - Prostatitis
  - Urethritis

Learning Objectives (Cont’d)

- Describe the signs and symptoms of male genitourinary infections, including epididymitis, orchitis, and Fournier’s gangrene
- Describe the etiology, history, and physical findings of phimosis, paraphimosis
Learning Objectives (Cont’d)

- With the patient history and physical examination findings, develop a treatment plan for the patient with paraphimosis
- Describe the etiology, history, and physical findings of priapism

Learning Objectives (Cont’d)

- With the patient history and physical examination findings, develop a treatment plan for priapism
- Discuss the epidemiology of benign prostate hypertrophy

Learning Objectives (Cont’d)

- Discuss the effects of an enlarged prostate gland, including urinary retention, increased risk of urinary tract infections, and renal failure
- Discuss the etiology of testicular masses
- Describe the etiology, history, and physical findings of testicular torsion
Learning Objectives (Cont’d)

- With the patient history and physical examination findings, develop a treatment plan for testicular torsion

Urinary System Anatomy

- Structure of the kidneys
  - Located on either side of the spine
  - Between the twelfth thoracic vertebra and the third lumbar vertebra
  - Right lower than left, room for liver
  - Between back muscles, peritoneum
  - Retroperitoneal space
  - Bean-shaped

Urinary System Anatomy (Cont’d)
Urinary System Anatomy (Cont’d)

• Structure of the kidneys
  ➢ Medial indentation
  ➢ Renal cortex
  ➢ Renal medulla
  ➢ Renal pelvis

Urinary System Anatomy (Cont’d)

• Nephrons
  ➢ Function units of kidney
  ➢ Filter blood
  ➢ Collect excreted water/waste products

Urinary System Anatomy (Cont’d)

• Nephrons
  ➢ Reabsorb water, nutrients, electrolytes
    ➢ Glomerulus
    ➢ Reabsorb useful organic materials, 90% of water from filtrate
    ➢ Assess kidney function, urine amount produced/hour
Urinary System Anatomy (Cont’d)

Glomerulus and Tubules

Urinary System Anatomy (Cont’d)

- Nephrons
  - Reabsorb water, nutrients, electrolytes
  - Urine production
  - Diuretic effects on filtration, reabsorption, urine formation

Urinary System Anatomy (Cont’d)

Blood Supply to Nephron

Copyright © 2013 by Jones & Bartlett Learning, LLC, an Ascend Learning Company
Ureters and urinary bladder
- Ureters
  - Thin-walled muscular tubes, urine drained
  - Peristaltic contractions begin inside the kidney and minor/major calyces, urine moved out
Urinary System Anatomy (Cont’d)

- Ureters and urinary bladder
  - Urinary bladder
    - Stores urine before elimination
  - Males
  - Females
Urinary System Anatomy (Cont’d)

- Urethra
  - Short tube, transports urine from urinary bladder outside body
  - Passes through band of skeletal muscle, external urethral sphincter, helps control urine flow

Functions of the Urinary System

- Water and electrolyte regulation
  - Excretion must match intake for homeostasis
  - Kidneys alter filtration and excretion rates to match body’s intake

Functions of the Urinary System (Cont’d)

- Acid-base balance
  - Kidneys help regulate acid-base balance by excreting acids, regulating body’s stores of buffers
Functions of the Urinary System (Cont’d)

- Excreting waste products and foreign chemicals
  - Kidneys eliminate waste products generated by metabolism, including urea, creatinine, uric acid, bilirubin
  - Toxins, food additives, medications

- Hormone secretion
  - Erythropoietin (EPO)
  - Calcitrol
  - Renin

- Arterial BP regulation
  - Excrete large amounts of sodium, water
  - Control over arterial BP by rennin-angiotensin-aldosterone mechanism
Functions of the Urinary System (Cont’d)

Arterial Blood Pressure Regulation

Erythrocyte production
- EPO production
- Renal failure, other kidney disease, severe anemia

Gluconeogenesis
- Prolonged fasting, kidneys produce new glucose from amino acids, other chemicals

General Assessment Considerations

- Detailed physical examination
  - Recent medical history
  - History of present complaint
  - Bladder, bowel habit changes
  - Urination frequency, changes
General Assessment Considerations (Cont'd)

- Detailed physical examination
  - Pain/burning with urination
  - Unusual color/odor
  - Blood in urine
  - Unusual discharge

- Unusual lumps, recent swelling
- Evaluate presenting pain with OPQRST
- Visceral or somatic pain

General Assessment Considerations (Cont'd)

- Inspection
  - Abdomen
    - Size
    - Flat, concave, round
    - Scars, wounds
    - Abdominal movement, pulsation
    - Edema, symmetry
General Assessment Considerations (Cont'd)

- Auscultation
  - Listen to abdomen with stethoscope diaphragm
    - Bowel sounds, gurgling, 5-35 times per minute
    - Hypoactive, heard <5 times per minute
    - Hyperactive, heard >35 times per minute
    - Absence of bowel sounds

General Assessment Considerations (Cont'd)

- Palpation
  - Palpate the abdomen
  - Note temperature, skin moisture
  - Tenderness, swelling, pulsations

General Assessment Considerations (Cont'd)

- Percussion
  - Place palm and fingers of flattened hand over each abdominal quadrant
  - With two fingers of the other hand, tap on the index and middle fingers of the hand on the abdomen
General Assessment Considerations (Cont’d)

- Percussion
  - Kidney
    - Patient on side, place flattened hand over the kidney, with fist of other hand, strike the flattened hand

General Assessment Considerations (Cont’d)

- Percussion
  - Acute urological emergency treatment
    - ABCs
    - IV therapy
    - Pain medication
    - Transport while monitoring vital signs

Kidney Diseases

- Acute renal failure
  - Etiology and epidemiology
    - Kidneys suddenly stop functioning
    - Major insult to body
    - Reversible
Kidney Diseases (Cont’d)

- Acute renal failure
  - Etiology and epidemiology
    - Prerenal acute renal failure
      - Reduction of blood supply to kidneys
      - Most common cause
      - Hypovolemia from blood loss
    - Cardiac problems
    - Abnormalities in kidney hemodynamics
    - Hypotension caused by peripheral vasodilation

- Acute renal failure
  - Etiology and epidemiology
    - Intrarenal acute renal failure
      - Develops within kidney
      - Small blood vessel/glomerulus injury
      - Tubule structure injury
      - Interstitial kidney injury from acute pyelonephritis
Kidney Diseases (Cont’d)

- Acute renal failure
  - Etiology and epidemiology
    - Intrarenal acute renal failure
    - Causative substances

Kidney Diseases (Cont’d)

- Acute renal failure
  - Postrenal acute renal failure
    - Blocks flow of urine
    - One kidney affected, other assume increase
    - Must resolve within a few hours to reverse

Kidney Diseases (Cont’d)

- Acute renal failure
  - History and physical examination findings
    - Azotemia
      - Nitrogen-containing waste product buildup
      - Causes metabolic acidosis, hyperkalemia
Kidney Diseases (Cont’d)

- Acute renal failure
  - History and physical examination findings
    - Signs/symptoms
      - Decreased or absent urine output
      - Increased urination at night
      - Swelling to feet, ankles, and legs
      - Neuropathies of hands and legs
      - Anosmia
      - Altered mental status
      - Seizures
    - Metallic taste in mouth
    - Hand tremors
    - Easy bruising
    - Prolonged bleeding
    - Flank pain
    - Tinnitus
    - Hypertension

- Medical history questions
  - Kidney stones
  - Prostate enlargement
  - Gout
  - Medication use causing crystal formation

Kidney Diseases (Cont’d)

- Acute renal failure
  - History and physical examination findings
    - Signs/symptoms
      - Decreased or absent urine output
      - Increased urination at night
      - Swelling to feet, ankles, and legs
      - Neuropathies of hands and legs
      - Anosmia
      - Altered mental status
      - Seizures
    - Metallic taste in mouth
    - Hand tremors
    - Easy bruising
    - Prolonged bleeding
    - Flank pain
    - Tinnitus
    - Hypertension

- Therapeutic interventions
  - Airway, ventilatory support
  - IV access
  - Vital signs, ECG
  - Treat for shock
Kidney Diseases (Cont’d)

- Acute renal failure
  - Therapeutic interventions
    - Ingested toxin treatment
    - Transport
    - Prevention, correction pathology leading to ARF

Kidney Diseases (Cont’d)

- Chronic renal failure
  - Etiology and epidemiology
    - Structural/functional abnormality of kidneys present
    - Irreversible loss of nephrons
    - Progresses to end-stage renal disease (ESRD)

Kidney Diseases (Cont’d)

- Chronic renal failure
  - Causes
    - Glomerulonephritis
    - Polyarteritis nodosa
    - Lupus erythematosus
    - Diabetes mellitus
    - Hypertension
    - Atherosclerosis
    - Toxins
    - Renal calculi
    - Prostate enlargement
    - Constriction of the urethra
    - Polycystic disease
Kidney Diseases (Cont’d)

- Chronic renal failure
  - Risk factors
    - Diabetes
    - Hypertension
    - High cholesterol
    - Autoimmune disease
    - Chronic system infection
    - Urinary tract infection
    - Urinary tract obstructions
    - Cancer
    - Chronic kidney disease, family history
    - Reduced renal mass
    - Low birth weight
    - Drug exposure
    - Recovery after ARF

Kidney Diseases (Cont’d)

- Chronic renal failure
  - Uremia
  - Signs/symptoms
    - Headache
    - Weakness
    - Mental status changes
    - Loss of appetite
    - Nausea/vomiting
    - Diarrhea
    - Weight loss
    - Increased urination
    - Rusty brown-colored urine
    - Increased thirst
    - Hypertension
    - Puffiness around eyes
    - Uremic frost
    - Itching

Kidney Diseases (Cont’d)

- Chronic renal failure
  - Therapeutic interventions
    - Airway, ventilatory support
    - IV access
    - Vital signs, ECG
    - Transport
Kidney Diseases (Cont’d)

- Chronic renal failure
  - Therapeutic interventions
    - Treatment options
      - Hemodialysis
      - Home hemodialysis
      - Peritoneal dialysis
      - Transplantation
      - Diet monitoring

Kidney Diseases (Cont’d)

- End-stage renal disease
  - Etiology and epidemiology
    - Functioning nephrons total loss
    - Causes
      - Diabetes mellitus
      - Hypertension
      - Glomerulonephritis
      - Polycystic kidney disease

Kidney Diseases (Cont’d)

- End-stage renal disease
  - Signs/symptoms
    - Confusion
    - Decreased levels of consciousness
    - Dyspnea
    - Peripheral edema
    - Chest pain
    - Bone pain
    - Itching skin
    - Nausea/vomiting
    - Diarrhea
    - Anemia
    - Easy bruising
    - Muscle twitching
    - Anxiety
    - Delirium
    - Hallucinations
    - Seizures
Kidney Diseases (Cont’d)

• End-stage renal disease
  ➢ Therapeutic interventions
    • Dialysis
      ➢ Diffuses blood across semipermeable membrane, removes substances kidney normally eliminates
      ➢ Until transplant
      • Hemodialysis
      • Peritoneal

Kidney Diseases (Cont’d)

• End-stage renal disease
  ➢ Therapeutic interventions
    • Do not take BP on extremity with access device
    • Do not apply firm, direct pressure on arm with site
    • Loosen tight, restrictive clothing on extremity of access site
    • Do not use access device to give drugs, fluids
    • If tubing of external shunt becomes disconnected, profuse bleeding
Kidney Diseases (Cont’d)

- Complications of dialysis
  - Hypotension
  - Muscle cramps
  - Nausea/vomiting
  - Disequilibrium syndrome
  - Hemorrhage
  - Air embolism
  - Chest pain

Kidney Diseases (Cont’d)

- Complications of dialysis
  - Bleeding at catheterization site
  - Fluid overload signs/symptoms
    - Acute pulmonary edema
    - Hypotensive crisis
    - Elevated blood potassium level
    - Uremic frost

Kidney Diseases (Cont’d)

- Complications of dialysis
  - Hyperkalemia signs/symptoms
    - Slow, irregular pulse
    - Muscular weakness
    - Hands, feet, tongue tingling
    - ECG changes, depressed P waves, widened QRS complex, peaked T waves
    - Uremic frost
Kidney Diseases (Cont’d)

• Therapeutic interventions
  ➢ Monitor airway, high-flow O₂
  ➢ Prepare to intubate, assist ventilation
  ➢ CPR
  ➢ Transport

Urinary System Conditions

• Renal calculi
  ➢ Etiology and epidemiology
    • Kidney stones
    • Men
    • Urine becomes highly concentrated with calcium salts, uric acid, cystine
    • Renal blood flow alteration

Urinary System Conditions (Cont’d)

• Renal calculi
  ➢ Etiology and epidemiology
    • Renal infection
    • Ureter blockage
    • <5 mm, pass spontaneously within 4 weeks
    • ≥5 mm, require surgery, lithotripsy
Urinary System Conditions  
(Cont’d)
• Renal calculi
  ➢ History and physical examination findings
  • Risk factors
    ➢ Renal calculi family history
    ➢ Sedentary lifestyle
    ➢ Crohn’s disease
    ➢ Hyperparathyroidism
    ➢ Recurrent urinary tract infections
    ➢ Hot, dry climate
    ➢ Prior calculi formation history

Urinary System Conditions  
(Cont’d)
• Renal calculi
  ➢ Signs/symptoms
    • Flank/back pain
    • Abdominal pain
    • Radiating pain to groin/genitals
    • Nausea/vomiting
    • Increased urination frequency
    • Painful urination
    • Hematuria
    • Fever, chills

Urinary System Conditions  
(Cont’d)
• Renal Calculi
  ➢ Therapeutic interventions
    • Airway, ventilatory support
    • IV administration
    • Narcotic analgesics, nonsteroidal drugs
    • Antiemetics
    • Transport in position of comfort
Urinary System Conditions (Cont'd)

● Urinary retention
  ➢ Etiology and epidemiology
    • Unable to completely empty bladder when urinating
    • Advancing age
    • Moderate/severe lower urinary tract symptoms
    • Benign prostatic hypertrophy
    • Specific drug therapies

Urinary System Conditions (Cont'd)

● Urinary retention
  ➢ Etiology and epidemiology
    • Causes
      ➢ Urinary bladder muscle failure
      ➢ Nerve damage
      ➢ Urethra blockage
      ➢ Enlarged prostate gland

Urinary System Conditions (Cont'd)

● Urinary retention
  ➢ History and physical examination findings
    • Sudden inability to urinate
    • Distention of urinary bladder
    • Acute lower abdominal pain
    • Delirium in the elderly
Urinary System Conditions
(Cont'd)

- Urinary Retention
  - Therapeutic intervention
    - Primarily supportive
    - Transport in position of comfort

-- Urinary system infections
  - Etiology and epidemiology
    - Cystitis
    - Pyelonephritis
    - Women
    - Escherichia coli
    - Gonorrhea/chlamydia

- Urinary system infections
  - History and physical examination findings
    - Cystitis signs/symptoms
      - Burning/pain during urination
      - Increased urgency of urination
      - More frequent urination
      - Cloudy urine
      - Rust-colored urine
      - Foul-smelling urine
      - Low-grade fever
      - Untreated, spread to kidneys
Urinary System Conditions (Cont'd)

- Urinary system infections
  - History and physical examination findings
    - Pyelonephritis signs/symptoms
      - Flank or back pain
      - Fever <102 F
      - Chills
      - Flushes
      - Diaphoresis
    - Headache
    - Urinary frequency
    - Dysuria
    - Hematuria

Urinary System Conditions (Cont'd)

- Urinary system infections
  - Therapeutic interventions
    - Prompt transport
    - Septicemia, septic shock treatment

Urinary System Conditions (Cont'd)

- Urinary system conditions limited to males
  - Male genitourinary structures
    - Penis
      - Root, body, glans penis/head
      - Root connects to penis by ligaments
      - Body
Urinary System Conditions (Cont'd)

- Urinary system conditions limited to males
  - Male genitourinary structures
    - Scrotum
      - Left larger than right, spermatic cord on left longer
      - Skin bleeds heavily
      - Contracts, expands
      - Contains testes

Anatomy of Testis and Surrounding Structures

Copyright © 2013 by Jones & Bartlett Learning, LLC, an Ascend Learning Company
Urinary System Conditions (Cont'd)

- Urinary system conditions limited to males
  - Genital Lesions
    - Causes
      - Genital herpes
      - Syphilis
      - Chancroid lesions
      - Granuloma inguinale
      - Lymphadenoma
      - Genital warts
      - Molluscum contagiosum
      - Allergic reactions

Urinary System Condition (Cont'd)

- Urinary system conditions limited to males
  - Blunt trauma
    - Signs/symptoms
      - Swelling of scrotum
      - Severe pain
      - Peritonitis
      - Pelvic fracture
      - Spinal injury

Urinary System Conditions (Cont'd)

- Urinary system conditions limited to males
  - Therapeutic interventions
    - Airway, ventilatory support
    - IV fluids
    - Cold compresses
    - Pelvic stabilization
    - Spinal immobilization
Urinary System Conditions (Cont'd)

- Urinary system conditions limited to males
  - Genitourinary infection
    - Epididymitis and orchitis
    - Swelling, pain to scrotum
    - Swollen testicles
    - Swollen testicle on affected side
    - Swollen groin on affected side
    - Testicular pain, worsens during bowel movement
    - Fever
    - Urethral discharge

Urinary System Conditions (Cont'd)

- Genitourinary infection
  - Fournier's gangrene
    - Bacterial infection of genitals
    - Skin crepitus
    - Gray-black discolored tissues
    - Pus draining from tissues
    - Fever
    - Odor
    - Severe genital pain, swelling of penis, scrotum
    - Sepsis, septicemia, heart failure, death
    - Prompt transport
    - Risk factors

Urinary System Conditions (Cont'd)

- Fournier's gangrene
  - Bacterial infection of genitals
  - Skin crepitus
  - Gray-black discolored tissues
  - Pus draining from tissues
  - Fever
  - Odor
  - Severe genital pain, swelling of penis, scrotum
  - Sepsis, septicemia, heart failure, death
  - Prompt transport
  - Risk factors
Urinary System Conditions (Cont'd)

- Urinary system conditions limited to males
  - Genitourinary infection
    - Prostatitis
    - Prostate inflammation
  - Urethritis
    - Urethra inflammation

- Structural conditions
  - Phimosis and paraphimosis
    - Inability to retract foreskin over penis glans
    - Infection under foreskin, discharge
    - Tight ring around glans, acts as tourniquet, glans swelling

Glans and Foreskin
Urinary System Conditions (Cont'd)

- Structural conditions
  - Phimosis and paraphimosis
    - Squeeze glans firmly for 10+ minutes, reduce swelling
    - Per medical direction, wrap glans in gauze, apply elastic wrap from distal end of penis onto shaft to produce constant, gentle compression
    - Transport

Urinary System Conditions (Cont'd)

- Structural conditions
  - Priapism
    - Prolonged, painful erection
    - Causes
      - Blood disorders
      - Accidental, surgical trauma
      - Nervous system damage from MS/diabetes
      - Erectile dysfunction drugs
      - Drugs injected to enhance sexual performance
      - Psychotropic medications
      - Spinal trauma

Urinary System Conditions (Cont'd)

- Structural conditions
  - Benign prostatic hypertrophy
    - Noncancerous enlargement of prostate gland
    - Pressure on urethra, restrict urine flow out of urinary bladder
    - Complications
      - Urinary retention
      - NAs
      - Renal calculi
      - Renal failure from obstruction
Urinary System Conditions (Cont'd)

Benign Prostatic Hypertrophy

Structural conditions

- Painless lump on testicle/pain in scrotum
- Benign causes
  - Hydrocele
  - Varicocele
  - Spermatocele

Urinary System Conditions (Cont'd)

- Testicular masses
  - Painless lump on testicle/pain in scrotum
  - Benign causes
    - Hydrocele
    - Varicocele
    - Spermatocele

- Testicular torsion
  - Spermatic cord twisting inside scrotum
  - Signs/symptoms
    - Sudden onset of severe pain in one testis
    - Swelling on one side of scrotum
    - Lump on testis
    - Blood in semen
    - Nausea, vomiting
    - Lightheadedness
Patients complaining of abdominal pain pose a challenge; one source of patient's primary complaint is the urinary system.

Functions of the urinary system:
- Water, electrolyte regulation
- Acid-base balance
- Excretion of waste products
- Foreign chemicals
- Hormone excretion
- Arterial blood pressure regulation
- Erythrocyte production
- Gluconeogenesis

Conditions can contribute to acute abdominal discomfort:
- Renal failure (acute or chronic plus ESRD)
- Renal calculi
- Urinary retention
- Urinary system infections
- Male genital urinary problems (including structural problems)
Chapter Summary (Cont’d)

• A thorough assessment with an understanding of the urinary system helps identify the nature of the patient’s condition and leads to the best course of treatment

Questions?