

Nursing Management of Patients with Renal Disorders & Cardinal signs and symptoms& Urinary Tract Infection (UTI)

Anatomic and Physiologic Overview of

Urinary System

- The urinary system comprises the (2) kidneys, (2) ureters, (1) bladder, and (1) urethra.

Kidneys

- located (behind and outside the peritoneal cavity) on the posterior wall of the abdomen from the 12th thoracic vertebra to the 3rd lumbar vertebra in the adult.
- An adult kidney weighs 120 to 170 g, and is 12 cm (about 4.5 inches) long, 6 cm wide, and 2.5 cm thick.
- Each kidney contains about 1 million nephrons, the functional units of the kidney.
- Kidney function begins to decrease at a rate of approximately 1% each year beginning at approximately age 30.

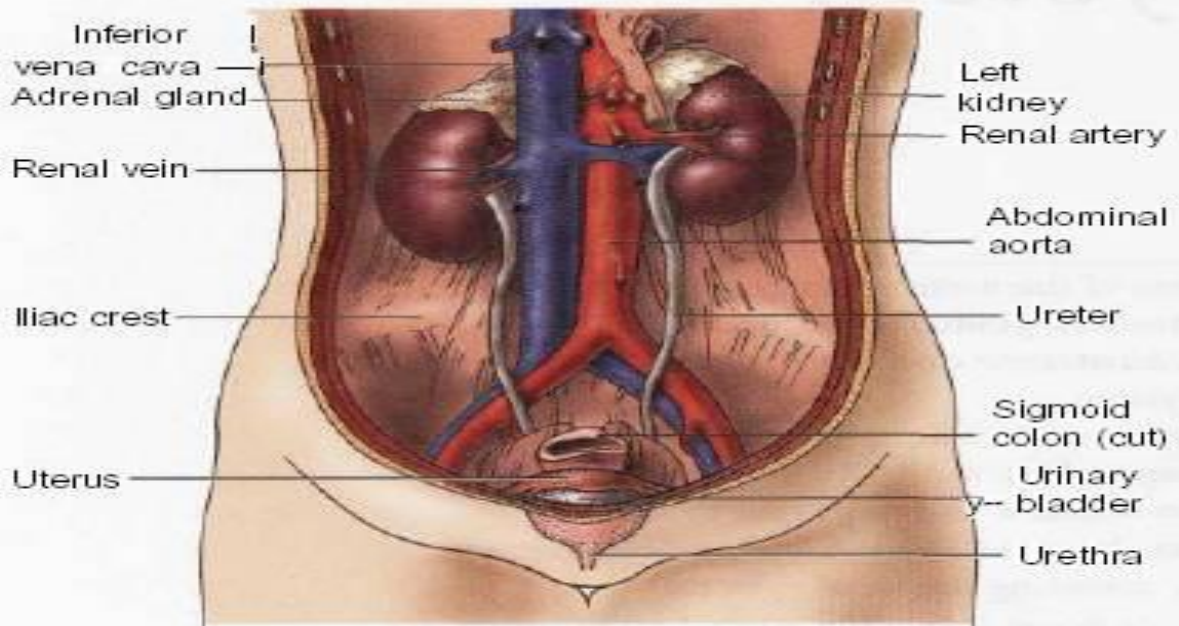


Figure 69-1 • Anatomic location of organs of the renal/urinary system.

Anatomic and Physiologic Overview of Urinary System

Ureters, Bladder, and Urethra

- **Urine**, which is formed within the nephrons, flows into the ureter, a long fibromuscular tube that connects each kidney to the bladder.
- The **ureters** are narrow, muscular tubes, each 24 to 30 cm long, that originate at the lower portion of the renal pelvis and terminate to urinary bladder.
- The **urinary bladder** is a muscular, hollow sac located just behind the pubic bone. Adult bladder capacity is about 300 to 600 mL of urine. The Urinary Bladder has one outlet (the urethrovesical junction), which is surrounded by the bladder neck.

- The **urethra** arises from the base of the bladder: In the male, it passes through the penis; in the female, it opens just anterior to the vagina. In the male, the prostate gland, which lies just below the bladder neck, surrounds the urethra posteriorly and laterally.

Functions of the Kidney

- ✓ Urine formation
- ✓ Excretion of waste products
- ✓ Regulation of electrolytes
- ✓ Regulation of acid–base balance
- ✓ Control of water balance
- ✓ Control of blood pressure
- ✓ Renal clearance
- ✓ Regulation of red blood cell production
- ✓ Synthesis of vitamin D to active form

Important terms

Aldosterone: hormone synthesized and released by the adrenal cortex; causes the kidneys to reabsorb sodium

Antidiuretic hormone (ADH): hormone secreted by the posterior pituitary gland; causes the kidneys to reabsorb more water; also called vasopressin

Anuria: decreased urine output of less than 50 mL in 24 hours
bacteriuria: bacteria in the urine

Creatinine: endogenous waste product of muscle energy metabolism
diuresis: increased urine volume

Dysuria: painful or difficult urination

Frequency: voiding more frequently than every 3 hours
glomerular filtration rate (GFR): amount of plasma filtered through the glomeruli per unit of time

Glomerulus: tuft of capillaries forming part of the nephron through which filtration occurs

Hematuria: red blood cells in the urine

Micturition: urination or voiding

Nephron: structural and functional unit of the kidney responsible for urine formation

Ncturia: awakening at night to urinate

Oliguria: urine output less than 0.5 mL/kg/hr

proteinuria: protein in the urine

pyuria: white blood cells in the urine

Renal clearance: ability of the kidneys to clear solutes from the plasma

Renal glycosuria: excretion of glucose in the urine

Specific gravity: expression of the degree of concentration of the urine

Urea nitrogen: end product of protein metabolism

•Urine Specific Gravity

Specific gravity is a measurement of the kidney's ability to concentrate urine. It is 1.010 to 1.025 when fluid intake is normal.

• **Renal Clearance** refers to the ability of the kidneys to clear solutes from the plasma in 24-hour collection of urine

• **Glomerular filtration rate (GFR)**. The normal adult GFR is about 100 to 120 mL/min (1.67 to 2.0 mL/sec). Renal stages are based on glomerular filtration rate (GFR) .the normal GFR is 125ml/min

GFR is the amount of plasma filtered through the glomeruli per unit of time

- **Stage 1**(kidney damage with normal or increase GFR) . GFR >90ML/MIN
- **Stage 2**(Mild decrease in GFR) .GFR =60-89ML/MIN
- **Stage 3** (Moderate decrease in GFR) .GFR=30-59ML/MIN
- **Stage4** (severe decrease in GFR) .GFR=15-29ML/MIN
- **Stage5** (kidney failure) .GFR<15ML/MIN

Characteristics of Normal Urine

• **Color:** Typically yellow-amber but varies according to recent diet and the concentration of the urine or drug use or disease condition.

• **Smell:** The smell (or "odour", is similar to that of ammonia.

• **Acidity:** pH is ranged from 4.6 - 8, a typical average being around 6.0. Much of the variation is due to diet.

- **Density:** Density is also known as "specific gravity". Is 1.010 to 1.025
- **Quantity:** 1.5- 2.5 L/day up to 4 L/day.
- **Urine is sterile.** Free from WBCs, RBCs, pathogens, Glucose, protein, and pus cells.

Assessment and Diagnostic Findings:

○ **Assessment**

Health History

- **Elderly women** and persons with **neurologic disorders** such as **diabetic neuropathy, multiple sclerosis, or Parkinson's disease** often have **incomplete emptying** of the **bladder** with **urinary stasis**, which may result in **urinary tract infection** or **increasing bladder pressure** leading to pyelonephritis, or renal insufficiency.
- Any **abnormalities** in **Urination** (frequency, urgency, incontinency, retention, hematuria, nocturia, dysuria,etc)
- **Persons** with a **family history** of urinary tract problems, including **calculi** and **renal failure**
- **Persons** with **diabetes** who have **consistent hypertension**
- **Older men** are at risk for **prostatic enlargement**,
- The **location, character, and duration** of **pain**, if present, and its **relationship** to **voiding**; factors that precipitate pain,

- History of urinary tract infections, including past treatment or hospitalization for urinary tract infection
- Fever or chills, and any genital lesion
- Previous renal or urinary diagnostic tests or use of indwelling urinary catheters.
- Cesarean Section.
- Use of drugs, alcohol, and tobacco.

Diagnostic Tests and Procedure Evaluation

Urinalysis (GUE= general urine exam) and Urine Culture (C&S)

Urine examination includes the following:

➤ Urin test

-Renal concentration. by SP.GR of urine. urine normal value is 300-900 mosm /km/24hrs.

-Creatinine clearance. GFR is about (100-120ml/min).

➤ Blood test :

-Serum Creatinine. sensitive of renal function (0.6-1.2 mg/dl).

-Blood Urea Nitrogen. It serve as index of renal excretory capacity (7-18 mg/dl).

-Blood Urea. 15-45 mg /dL

➤ X-Ray

➤ CT & MRI

➤ Kidney, Ureter, and Bladder Studies (KUB)

- General Ultrasonography
- Bladder Ultrasonography
- Computed Tomography
- Magnetic Resonance Imaging
- Intravenous Urography {intravenous pyelography (IVP)}
- Retrograde Pyelography
- Cystography
- Urologic Endoscopic Procedures (Cystoscopy)
- Biopsy
- Uroflowmetry
- Cystometrography
- Electro Myo Graphy (EMG)
- **Glomerular Filtration Rate**

○ Decreased GFR can be detected by obtaining a 24-hour urinalysis for creatinine clearance which decreased

- serum creatinine and BUN levels increase

- **Sodium And Water Retention**

- The kidney cannot concentrate or dilute the urine normally in ESRD.
- Some patients retain sodium and water, increasing the risk for edema, heart failure, and hypertension

- **Acidosis**

- metabolic acidosis occurs because the kidney cannot excrete increased loads of acid

- Decreased acid secretion primarily results from inability of the kidney tubules to excrete ammonia (NH_3^-) and to reabsorb sodium bicarbonate (HCO_3^-).

- **Anemia**

Anemia develops as a result of inadequate erythropoietin production

- **Calcium And Phosphorus Imbalance**

- Increase in the serum phosphate level and corresponding decrease in the serum calcium level lead to:

- Increased secretion of parathormone from the parathyroid glands, so Calcium leaves the bone which lead to bone changes and bone disease as well as calcification of major blood vessels.

- The active metabolite of vitamin D (1,25-dihydroxycholecalciferol) normally manufactured by the kidney decreases as renal failure progresses.

Cardinal signs and symptoms

1. Pain

- It can be caused by obstructed urine flow or inflammation

2. Changes in Voiding (micturition)

- Frequency, urgency, dysuria, hesitancy, incontinence, enuresis, polyuria, oliguria, hematuria, ...etc.

3. Gastrointestinal Symptoms

- Nausea, vomiting, diarrhea, abdominal discomfort, and abdominal distention. Assess pain and change in voiding

Urinary Tract Infection (UTI)

Urinary tract infections (UTIs) are caused by pathogenic microorganisms in the urinary tract (the normal urinary tract is sterile above the urethra). UTIs are generally classified as infections involving the upper or lower

Urinary tract:

- Lower UTIs include bacterial cystitis (inflammation of the urinary bladder), bacterial prostatitis (inflammation of the prostate gland), and bacterial urethritis (inflammation of the urethra).
- Upper UTIs are much less common and include acute or chronic pyelonephritis (inflammation of the renal pelvis), interstitial nephritis (inflammation of the kidney), Glomerulonephritis, and renal abscesses.

Causes

UTIs are primarily caused by bacteria that have invaded the urinary tract.

- **Inability or failure to empty the bladder completely.** Stasis of urine inside the urinary bladder attracts bacteria into entering the tract.
- **Instrumentation of the urinary tract.** Catheterization or [cystoscopy](#) procedures could introduce bacteria into the urinary tract.

- **Obstructed urinary flow.** Abnormalities in the structure of the urinary tract could obstruct the flow of the urine and result in inability to empty the bladder completely.
- **Decreased natural host defenses.** **Immunosuppression** or inability of the body to produce the body's defenses predisposes the patient to UTI

Routes of Infection

There are three well-recognized routes by which bacteria enter the urinary tract:

- Up the urethra (ascending infection), through the bloodstream, (hematogenous spread), or by means of a fistula from the intestine.
- “Sexually transmitted diseases (STDs)” is also associated with UTI .
- Patients with **indwelling catheters**, however, are more likely to be infected with Proteus, , **Pseudomonas**, or **Staphylococcus species**.

Clinical Manifestations

About half of all patients with bacteriuria have **no symptoms**.

- **Frequent pain** and burning on urination, frequency, urgency, nocturia, incontinence, and suprapubic or pelvic pain.
- **Hematuria** and back pain may also be present.
- Signs and symptoms of upper UTI (**Acute pyelonephritis**) include:

((fever, chills, flank or low back pain, nausea and vomiting, headache, malaise, painful urination, pyuria, bacteriuria, and tenderness in the area of the costovertebral angles (CVA).

- Patients with **chronic pyelonephritis** has fatigue, headache, poor appetite, polyuria, excessive thirst, and weight loss.

Prevention

Luckily. UTI is a preventable disease mainly focusing on the hygienic practices of the individual.

- **Avoid bath tubs.** Shower rather than bathe in a tub because bacteria in the bath water may enter the urethra.
- **Perineal hygiene.** After each bowel movement, clean the perineum and urethral meatus from front to back to reduce concentrations of pathogens at the urethral opening.
- **Increase fluid intake.** Drink liberal amounts of fluids daily to flush out bacteria.
- **Avoid urinary tract irritants.** Beverages such as coffee, tea, colas, alcohol, and others contribute to UTI.
- **Voiding habit.** Void at least every 2 to 3 hours during the day and completely empty the bladder.
- **Medications.** Take medications exactly as prescribed.

Complications

Early recognition of UTI and prompt treatment are essential to prevent recurrent infection and the possibility of complications.

- **Renal failure.** UTIs that are not treated promptly could spread in the entire urinary system and become the cause of renal failure.
- **Urosepsis.** The bacteria may invade the urinary system and result in sepsis.

Assessment and Diagnostic Findings

Results of various tests help confirm the diagnosis of UTI.

- **Urine cultures.** Urine cultures are useful in identifying the organism present and are the definitive diagnostic test for UTI.
- **STD tests.** Tests for STDs may be performed because there are UTIs transmitted sexually.
- **CT scan.** A CT scan may detect pyelonephritis or abscesses.
- **Ultrasonography.** Ultrasound is extremely sensitive for detecting obstruction, abscesses, tumors, and cysts.

Medical Management

Management of UTIs typically involves pharmacologic therapy and patient education.

- **Acute pharmacologic therapy.** The ideal medication for the treatment of UTI is an antibacterial agent that eradicates bacteria from the urinary tract with minimal effects on fecal and vaginal flora.
- **Long-term pharmacologic therapy.** Reinfection with new bacteria is the reason for recurrence, and these patients with recurrence are instructed to begin treatment on their own whenever symptoms occur, to contact their physician only when symptoms persist.

Nursing Assessment

A history of signs and symptoms related to UTI is obtained from the patient with a suspected UTI.

- Assess changes in urinary pattern such as frequency, urgency, or hesitancy.
- Assess the patient's knowledge about antimicrobials and preventive health care measures.
- Assess the characteristics of the patient's urine such as the color, concentration, odor, volume, and cloudiness.

Nursing Diagnosis

Based on the assessment data, the nursing diagnoses may include the following:

- **Acute pain** related to infection within the urinary tract.
- **Deficient knowledge** related to lack of information regarding predisposing factors and prevention of the disease.

Nursing Care Planning & Goals

Major goals for the patient may include:

- Relief of pain and discomfort.
- Increased knowledge of preventive measures and treatment modalities.
- Absence of complications.

Nursing Interventions

Nurses care for patients with urinary tract infection in all settings.

- **Relieve pain.** Antispasmodic agents may relieve bladder irritability and analgesics and application of heat help relieve pain and spasm.

- **Fluids.** The nurse should encourage the patient to drink liberal amounts of fluids to promote renal blood flow and to flush bacteria from the urinary tract.
- **Voiding.** Encourage frequent voiding every 2 to 3 hours to empty the bladder completely because this can significantly lower urine bacterial counts, reduce urinary stasis, and prevent reinfection.
- **Irritants.** Avoid urinary irritants such as coffee, tea, colas, and alcohol.

Discharge and Home Care Guidelines

Care of the patient with UTI must continue until at home because it has a high recurrence rate.

- **Personal hygiene.** The nurse should instruct the female patient to wash the perineal area from front to back and wear only cotton underwear.
- **Fluid intake.** Increase and fluid intake is the number one intervention that could stop UTI from recurring.
- **Therapy.** Strictly adhere to the antibiotic regimen prescribed by the physician.