

Chapter 36

Urinary System Function, Assessment, and Therapeutic Measures

Learning Outcomes

- Identify the normal anatomy of the urinary system.
- Describe the normal function of the urinary system.
- Discuss the effects of aging on the urinary system.
- Explain data to collect when caring for a patient with a disorder of the urinary system.

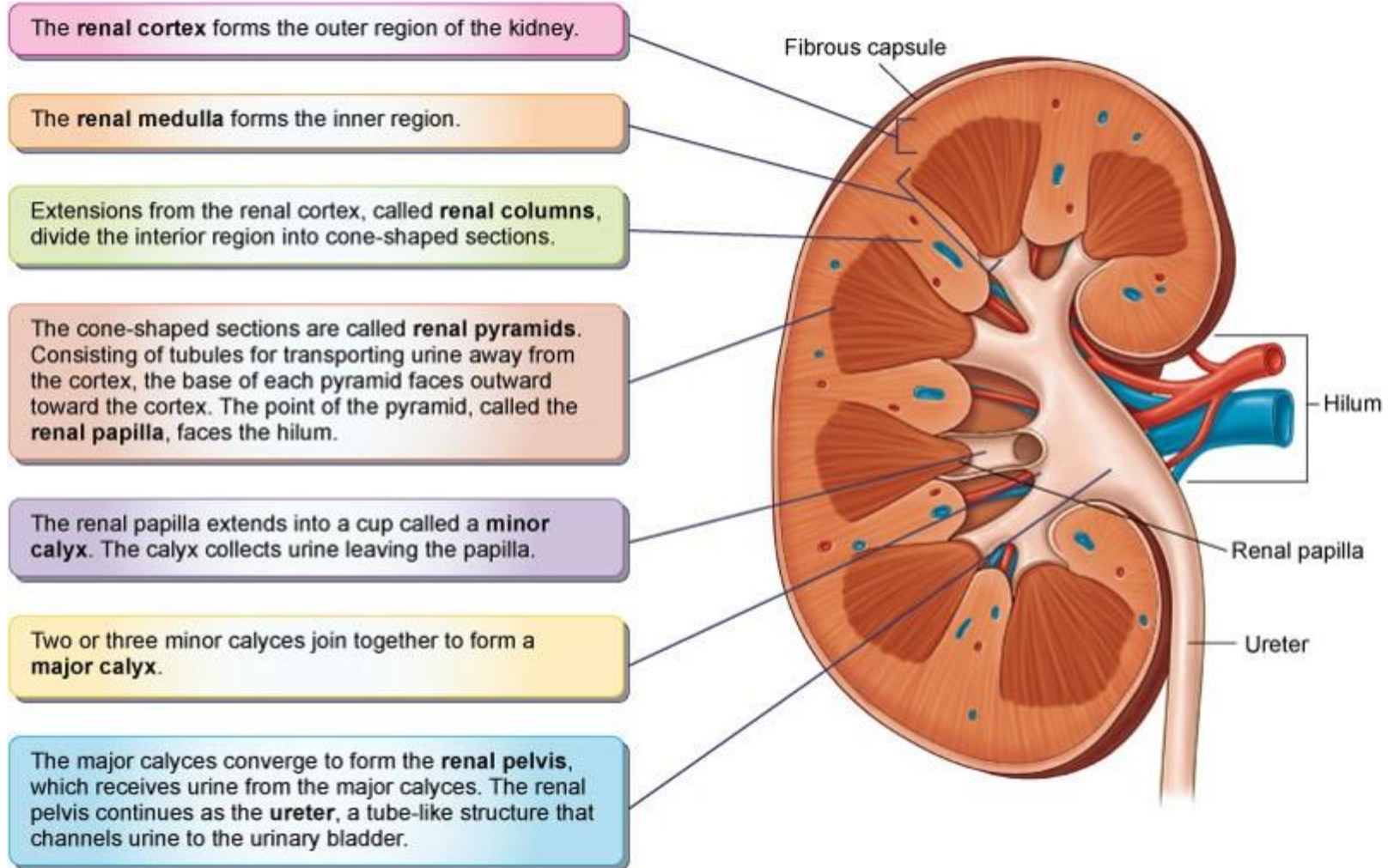
Learning Outcomes (continued)

- Plan preparation and postprocedure care for patients undergoing diagnostic tests of the urinary system.
- Plan nursing care for patients with incontinence.
- Discuss nursing actions to decrease the risk of infection in urinary catheterized patients.

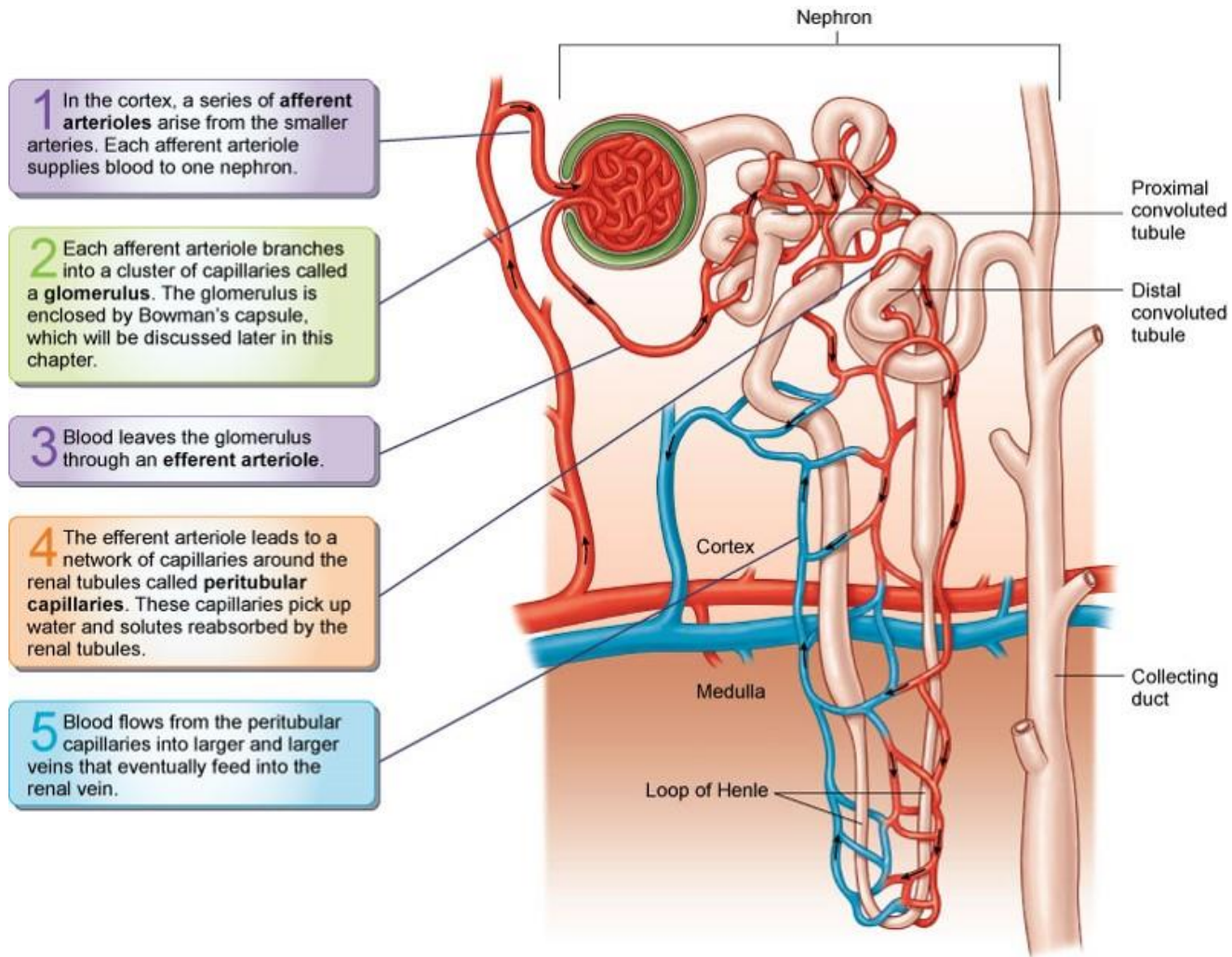
Urinary Anatomy and Physiology

- Two kidneys
- Two ureters
- Urinary bladder
- Urethra

Interior of the Kidney



Nephron



Kidney Function

- Formation of urine
- Excretion or conservation of water
- Electrolyte balance
- Acid–base balance
- Activation of vitamin D
- Production of erythropoietin
- Production of renin

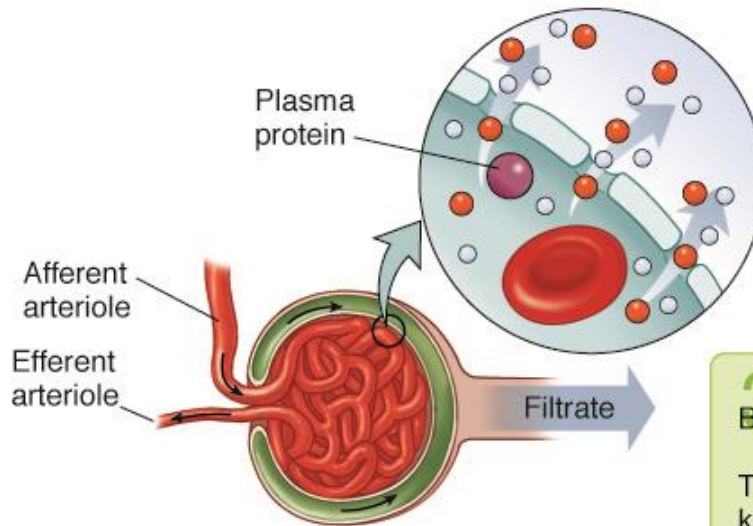
Glomerular Filtration Rate

- Renal filtrate the kidneys form in 1 minute
- Averages 100 to 125 milliliter per minute

Glomerular Filtration

1 Blood flows into the glomerulus through the afferent arteriole, which is much larger than the efferent arteriole. Consequently, blood flows in faster than it can leave, which contributes to higher pressure within the glomerular capillaries.

2 The walls of glomerular capillaries are dotted with pores, allowing water and small solutes (such as electrolytes, glucose, amino acids, vitamins, and nitrogenous wastes) to filter out of the blood and into Bowman's capsule. Blood cells and most plasma proteins, however, are too large to pass through the pores.



3 The fluid that has filtered into Bowman's capsule flows into the renal tubules. The amount of fluid filtered by both kidneys—called the **glomerular filtration rate (GFR)**—equals about 180 liters each day, which is 60 times more than the body's total blood volume. The body reabsorbs about 99% of this filtrate, leaving 1 to 2

Ureters, Urinary Bladder, and Urethra

- Ureters

- Carry urine from kidneys to bladder

- Bladder

- Temporary storage of urine and its elimination

- Urethra

- Carries urine from bladder to exterior

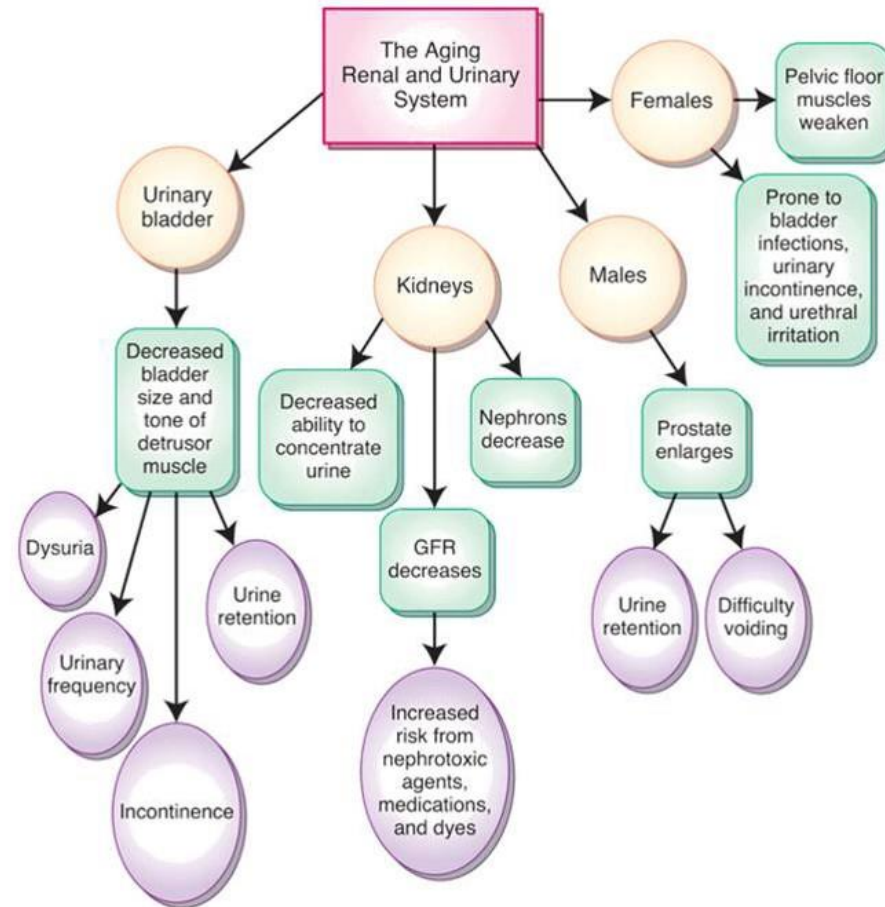
Normal Urine Characteristics

- Amount
 - 1,000 to 2,000 milliliter per 24 hours
- Color
 - Pale yellow to amber
- Appearance
 - Clear
- Specific gravity: 1.005 to 1.030
 - Lower = dilute
 - Higher = concentrated

Normal Urine Characteristics (continued)

- p H
 - 4.5 to 8.0
- Constituents
 - 95% water
 - Waste products: Urea, creatinine, uric acid

Aging and the Urinary System



Aging and the Urinary System (continued)

- Renal mass smaller
- Renal flow decreased 50%
- Decreased tubular function
- Bladder muscles weaken
- Bladder capacity decreases
- Voiding reflex delayed

Nursing Assessment

- Kidney disease can affect every body system.
- Health history
- Pain in the flank area
- Burning with voiding
- New onset edema, shortness of breath, weight gain
- Fluid intake
- Functional ability

Physical Assessment

- Vital signs
 - High blood pressure occurs with kidney disease
- Lung sounds
 - Crackles indicate fluid overload
- Edema
 - Indicates fluid overload

Physical Assessment (continued)

- Daily weights
 - Best indicator of fluid balance
- Intake and output
 - Medication and fluid orders depend upon accuracy of measurement
- Skin
 - Yellow or gray cast
 - Uremic frost

Laboratory Tests

■ Urinalysis

- First morning specimen best (unless for cytology)
- Voided or sterile catheter specimen
- 10 milliliter of urine collected
- Examine within 1 hour or refrigerate
- Random specimens collected for cytology

Laboratory Tests (continued_1)

- Composite urine specimen: 24-hour urine
 - Patient instructed to void and discard urine
 - Time recorded as the start time of test
 - Exactly at 24 hours, patient instructed to void
 - Urine added to collection device and test ends
 - Incomplete urine collection cause inaccurate results

Laboratory Tests (continued_2)

■ Urine culture

- Identifies organisms present
 - Often bacteria
- Urine specimen collected before antibiotic given
- Sensitivity test identifies antibiotic that will destroy bacteria

Laboratory Tests (continued_3)

- Renal function tests
 - Serum creatinine
 - Blood urea nitrogen
 - Serum uric acid
 - Creatinine clearance test
 - Glomerular filtration rate

Contrast-Induced Nephropathy

- Contrast nephrotoxic
 - Can result in acute kidney injury
 - See rise in serum creatinine
 - Patient asymptomatic
- Risk factors
 - Azotemia
 - Low G F R
 - Diabetes mellitus
 - Renal impairment
 - Nephrotoxic drugs

Renal Biopsy

- Provides information about kidney disease
- Small section of renal cortex obtained for analysis through flank incision
- Contraindications
 - Bleeding tendencies
 - Uncontrolled hypertension
 - Solitary kidney

Radiological Studies

- Kidneys-ureter-bladder x-ray
 - Tumors
 - Swollen kidneys
 - Kidney stones

Radiological Studies (continued_1)

■ Pyelogram

- Imaging of renal pelvis, calyces, ureter
- Types
 - I V: Contrast-injected I V, serial x-rays show contrast as it is cleared from blood by kidneys
 - Retrograde: Introduction of contrast through ureter
 - Antegrade: Contrast introduced by percutaneous needle puncture into renal pelvis

Radiological Studies (continued_2)

■ I V pyelogram

- Check allergies prior to test.
- Check creatinine levels prior to contrast media.
- Hydration before and after
- I V contrast media injected
- Contrast media outlines renal structures.

I V Pyelogram



Radiological Studies (continued_3)

■ Renal angiography

- Check allergies prior to testing.
- Check creatinine, G F R prior to contrast media.
- Dye visualizes renal arteries.
- Post-test check distal pulses and dressings.

Endoscopic Procedures

- Cystoscopy and pyelogram
 - Surgery
 - Cystoscope inserted in bladder through urethra
 - Retrograde pyelogram
 - Contrast media injected into kidney pelvis
 - X-rays taken
 - Monitor urine output postprocedure

Renal Ultrasound

- Noninvasive sound waves examine anatomy of urinary tract
- No special preparation needed
- Shows kidney enlargement, kidney stones, chronic infection, tumors

Renal Biopsy

- Percutaneous or small incision (open)
- Precare
 - Nothing by mouth (N P O)
 - Mild sedative
- Postcare
 - Monitor vital signs frequently.
 - Observe for bleeding.
 - Biopsy site, urine first voidings
 - Apply pressure dressing.

Nursing Diagnoses for Diagnostic Tests

- *Anxiety*
- *Deficient Knowledge*
- *Acute Pain*
- *Impaired Urinary Elimination*

Urinary Incontinence

- Stress incontinence

- Involuntary urine loss from increasing abdominal pressure
- Associated with coughing, laughing, sneezing, or other activities

- Urge incontinence

- Involuntary urine loss with abrupt/strong desire to void
- Patient reports “unable to make it to bathroom”

Urinary Incontinence (continued)

- Functional incontinence
 - Inability to get to toilet due to environmental barriers, physical/mental limitations
- Overflow incontinence
 - Involuntary loss of urine associated with bladder overdistention
- Total incontinence
 - Continuous, unpredictable loss of urine

Nursing Diagnoses

- *Stress Urinary Incontinence*
- *Urge Urinary Incontinence*
- *Functional Urinary Incontinence*

Urinary Retention

- Acute causes
 - Anesthesia
 - Medications
 - Local trauma to urinary structures
- Chronic causes
 - Enlarged prostate
 - Medications
 - Strictures
 - Tumors

Urinary Retention (continued)

■ Monitor

- Urine output
- Bladder distention
- Bladder scan
 - Residual volume of 150 to 200 milliliter urine
 - Indicates need for treatment

Urinary Catheters

- Indwelling catheters
 - Justifiable reasons
 - Burns
 - Neurogenic bladder
 - Shock
 - Urinary tract obstruction
 - Urinary incontinence is NOT justification.
- Urinary catheters increase risk for infection.

Urinary Catheters (continued)

- Intermittent catheterization
 - Best
 - Reduces risk of infection
 - Patients may self-catheterize
- Suprapubic catheter
 - Indwelling catheter inserted through incision in lower abdomen into bladder

Review Question

The nurse is to administer an antibiotic and collect a urine for culture and sensitivity. When should the nurse administer the antibiotic?

1. Before collecting the urine specimen
2. After collecting the urine specimen
3. After obtaining the culture results
4. After reviewing the sensitivity report

Review Question Answer

Correct Answer: **2**

Review Question (continued_1)

Which of the following are postprocedure care for a renal biopsy? *Select all that apply.*

1. Monitor vital signs.
2. Observe for bleeding.
3. Monitor biopsy site.
4. Monitor urine output.
5. Maintain nothing by mouth (N P O).

Review Question Answer (continued_1)

Correct Answer: **1, 2, 3, 4**

Review Question (continued_2)

Which of the following defines stress incontinence?

1. Occurs from impairment of physical/mental function
2. Involuntary loss of urine associated with bladder overdistention
3. Involuntary urine loss from increasing abdominal pressure
4. Involuntary urine loss with abrupt/strong desire to void

Review Question Answer (continued_2)

Correct Answer: **3**

Review Question (continued_3)

Which of these are justifiable reasons for urinary catheterization? *Select all that apply.*

1. Shock
2. Urinary tract obstruction
3. Neurogenic bladder
4. Urinary incontinence
5. Immobility

Review Question Answer (continued_3)

Correct Answer: **1, 2, 3**

Review Question (continued_4)

What type of urinary catheter is inserted through an incision in the lower abdomen and into the bladder?

1. Condom catheter
2. Indwelling urethral catheter
3. Straight urethral catheter
4. Suprapubic catheter

Review Question Answer (continued_4)

Correct Answer: **4**