Chapter 10
Urinary System

Learning Objectives
1. Recognize or write the functions of the urinary system.
2. Recognize or write the meanings of Chapter 10 word parts and use them to build and analyze terms.
3. Write terms for selected structures of the urinary system or match them with their descriptions.
4. Write the names of the diagnostic terms and pathologies related to the urinary system when given their descriptions or match terms with their meanings.
5. Match surgical and therapeutic interventions for the urinary system or write the names of the interventions when given their descriptions.
6. Spell terms for the urinary system correctly.

Urinary System
The urinary system eliminates waste products through urination.

urination-the act of voiding
urin/o = urine -ation = action or process
urology- the branch of medicine concerned with the male genital tract and the urinary tracts of both genders
urologist-a physician who specializes in the practice of urology.
ur/o=urine, urinary tract
-logy=study of logist=specialist

Kidneys
(Most of the work of the urinary system takes place in the kidneys)
Functions of the kidneys
The kidneys maintain the volume of blood by controlling the amount of urine excreted.

- maintenance of blood volume, pH, and composition
- maintenance of chemical composition of the blood
- excretion of waste products of protein metabolism
- (urea is the final product of protein metabolism)
- regulation of blood pressure
- stimulation of erythrocyte production

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Word Parts: Urinary System

- ur/o urine or urinary tract
- urin/o urine
- -uria urine or urination
- -ation process
- albumin/o albumin
- -esis action, process, or result of
- glycos/o sugar
- olig/o few, scanty


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Fig. 10-1 Organs of the urinary system.


- nephr/o, ren/o kidney
- ureter/o ureter
- cyst/o bladder (sometimes cyst or sac)
- urethr/o urethra
A nephron and surrounding capillaries

A nephron is composed of a glomerulus (ball of capillaries) and tubules.


- **pyel/o**: renal pelvis
  - pyelitis = inflammation of the renal pelvis

- **glomerul/o**: glomerulus
  - glomerulonephritis = inflammation of the glomeruli of the kidney

Diagram of the process of forming and expelling urine.
Diagnostic Terms

- **Urinalysis**: the physical, chemical, and microscopic examination of the urine. It is checked for many substances that are not normally present in urine: bacteria, blood, protein (usually albumin), pus, sugar and ketone bodies.
  - **Glycosuria**: glucose (sugar) in urine
  - **Hematuria**: blood in urine
  - **Proteinuria**: protein in urine
  - **Albuminuria**: albumin (a protein) in the urine
  - **Pus**: pus in urine
  - **Ketonuria**: ketones in urine (ketone=end product of lipid metabolism)

- **Urine Culture, Antibiotic Sensitivity Test**: done to determine which type of bacteria to treat and which drugs would be effective in treatment of UTI

- **Clean-Catch Midstream Technique**: tissues adjacent to the urethral opening must be cleansed before collection to avoid contamination, and only the middle portion of the urine stream is collected

Fig. 10-6 Simple urine tests. **A**, A urinometer is used to determine the specific gravity of a sample of urine. **B**, Glucose test strips screen for the presence of glucose in the urine. **C**, Testing urine with a Multistix, a plastic strip with reagent areas for testing various chemical constituents that may be present in the urine. These reagent strips are considered qualitative tests, and a positive result for an abnormal substance in the urine generally requires further testing.

Diagnostic Terms, cont.

- **Urinary Catheterization**: insertion of a catheter through the urethra and into the bladder for temporary or longer-term drainage of urine

  - **Catheterization can be used for**:
    - Collection of a sterile urine specimen
    - Instillation of medications/contrast media
    - Drainage of bladder during surgery
Kidney Function Tests

blood urea nitrogen (BUN) - test that measures the amount of urea in the blood. It is directly related to the metabolic function of the liver and the excretory function of the kidney.
- elevated BUN can indicate impaired renal function
Creatinine is measured in blood and in urine as an indicator of kidney function. The test is known as creatinine clearance.

Quick Quiz!

The term for the presence of blood in the urine is
A. glycosuria
B. pyuria
C. hematuria
D. ketonuria

Fig 10-8. Renal angiography (renal arteriography) is a radiologic study to assess the arterial blood supply to the kidney. The record produced is a renal arteriogram.
ren/o=kidney, arteri/o=artery, -gram=a record, -graphy=process of recording
stenosis (constricting or narrowing) is shown with the red arrow

Fig. 10-9 Nephrotomogram. The procedure nephrotomography is helpful in assessing various planes of kidney tissue for tumors, cysts, or stones.
neprh/o=kidney, tom/o=to cut, -gram=record
Fig. 10-10 Kidney cancer. Note the large tumor in this adult kidney that has been excised.


Fig. 10-11 Intravenous urogram. The x-ray image (radiograph) was taken as the contrast medium is cleared from the blood by the kidneys. The renal pelvis and ureters are clearly visible and indicate normal findings.

Intravenous urogram provides information about the structure and function of the kidneys, ureters, and bladder. It was formerly called intravenous pyelography (IVP), and the image produced was called a pyelogram.

Fig. 10-12 Cystoscope in place inside the male bladder. In cystoscopy, the cystoscope is passed through the urethra and into the bladder. The mucous membrane is examined by means of light, mirrors, and special lenses.

cyst/o=bladder or cyst -scope=instrument for viewing scopy=process of visually examining

Fig. 10-13 Normal bladder compared with cystocele.

A. Normal position of the bladder in relation to other pelvic structures.

B. A cystocele, herniation of the bladder. Note how the bladder sags and protrudes into the vagina.

cyst/o=bladder or cyst -cele=hernia
Diseases and Disorders

**nephromalacia** - nephro/o=kidney, malacia=softening

**nephrolithiasis, nephrolith**
nephro/o=kidney, -lith=stone, -iasis=condition

**nephritis, glomerulonephritis**
nephro/o=kidney, -itis = inflammation, glomerul/o=glomerulus

**renal failure (ARF or CRF)** – kidney failure may be acute or chronic

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Diseases and Disorders

**dysuria** (dys-)= bad / difficult, (-uria)=urine/urination

- difficult or painful urination

**oliguria** (olig/o)= few or scanty, (-uria) =urine/urination

**anuria** (an-) = no, not, without , (-uria)=urine/urination

**polyuria** (poly-)  many, (-uria)=urine or urination

- abnormally large quantities of urine- also called diuresis (dia-) through, (ur/o) urine, (-esis) action

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Diseases and Disorders, cont.

**uremia** – toxic condition associated with renal insufficiency or renal failure

- urea is a waste product of protein metabolism, it is found in the urine if not removed properly from blood by the kidneys

**nephrotoxic** – (nephro/o)=kidney, (tox/o)= poison

- destructive to kidney tissue

**polyp** – tumor found on a mucosal surface, such as the inner lining of the bladder

**renal failure** – failure of the kidneys to function properly

**renal insufficiency** – reduced ability of kidney to function properly (in-)= not

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Fig. 10-14 Normal kidney compared with polycystic kidney. The kidney on the left side is of normal size. The kidney on the right is from a patient with adult-onset polycystic kidney disease. The diseased kidney is greatly enlarged because of the replacement of normal kidney tissue by cysts of varying sizes.

poly=many , cyst/o=cyst or bladder, -ic=pertaining to
Diseases and Disorders, cont.

urinary tract infection (UTI) – infection of the urinary tract

urinary incontinence – inability to hold urine in the bladder (in-) = not

urinary retention – inability to empty the bladder

Quick Quiz!

Dysuria is
A. excretion of an abnormally large quantity of urine
B. painful urination
C. absence of urination
D. diminished capacity to form urine

Surgical and Therapeutic Interventions

nephrostomy - creation of a new opening into the renal pelvis (the opening into the renal pelvis is implied in nephrostomy)

nephrectomy – surgical removal (excision) of a kidney

laparoscopic nephrectomy – removal of a kidney through several small incisions in the abdominal wall

cystectomy - the surgical removal of the bladder, which may be performed because of bladder cancer.

cystostomy is the surgical creation of a new opening into the bladder.

Fig. 10-16 Removal of a kidney stone. This radiograph shows a renal calculus that has been caught in a stone basket and is ready for removal. After percutaneous nephrostomy, the stone basket was maneuvered to engage the renal calculus, then both are removed through the cannula.
Surgical and Therapeutic Interventions, cont.

**Hemodialysis (kidney dialysis)**—process of diffusing blood through a membrane to remove toxic materials and maintain proper chemical balance. It is required if the kidneys fail to remove waste products from blood.

**Renal transplant**—is the donation of a kidney from a suitable donor (often a sibling or close relative) to another person.

**Immunosuppressive therapy**—agents that interfere with the normal immune response of the recipient is provided after a transplant to prevent rejection of the donor kidney.

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**Lithotripsy**—surgical crushing of a stone

**(lith/o)**=stone, **(-tripsy)**=surgical crushing

**Extracorporeal shock wave lithotripsy (ESWL)**—lithotripsy using shock waves

**Lithotrite**—instrument used for surgical crushing a stone

**Nephrolithotomy**—incision of kidney (nephrotomy) for removal of a kidney stone

**Nephropexy**—surgical attachment of a prolapsed kidney

**(nephro/o)**=kidney, **(-pexy)**=surgical fixation

**Ureteroplasty**—surgical repair of the ureter

**(ureter/o)**=ureter, **(-plasty)**=surgical repair

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**Quick Quiz!**

A *nephrectomy* is the
A. surgical removal of a kidney
B. creation of a surgical opening into the renal pelvis
C. surgical removal of the bladder
D. surgical attachment of a prolapsed kidney