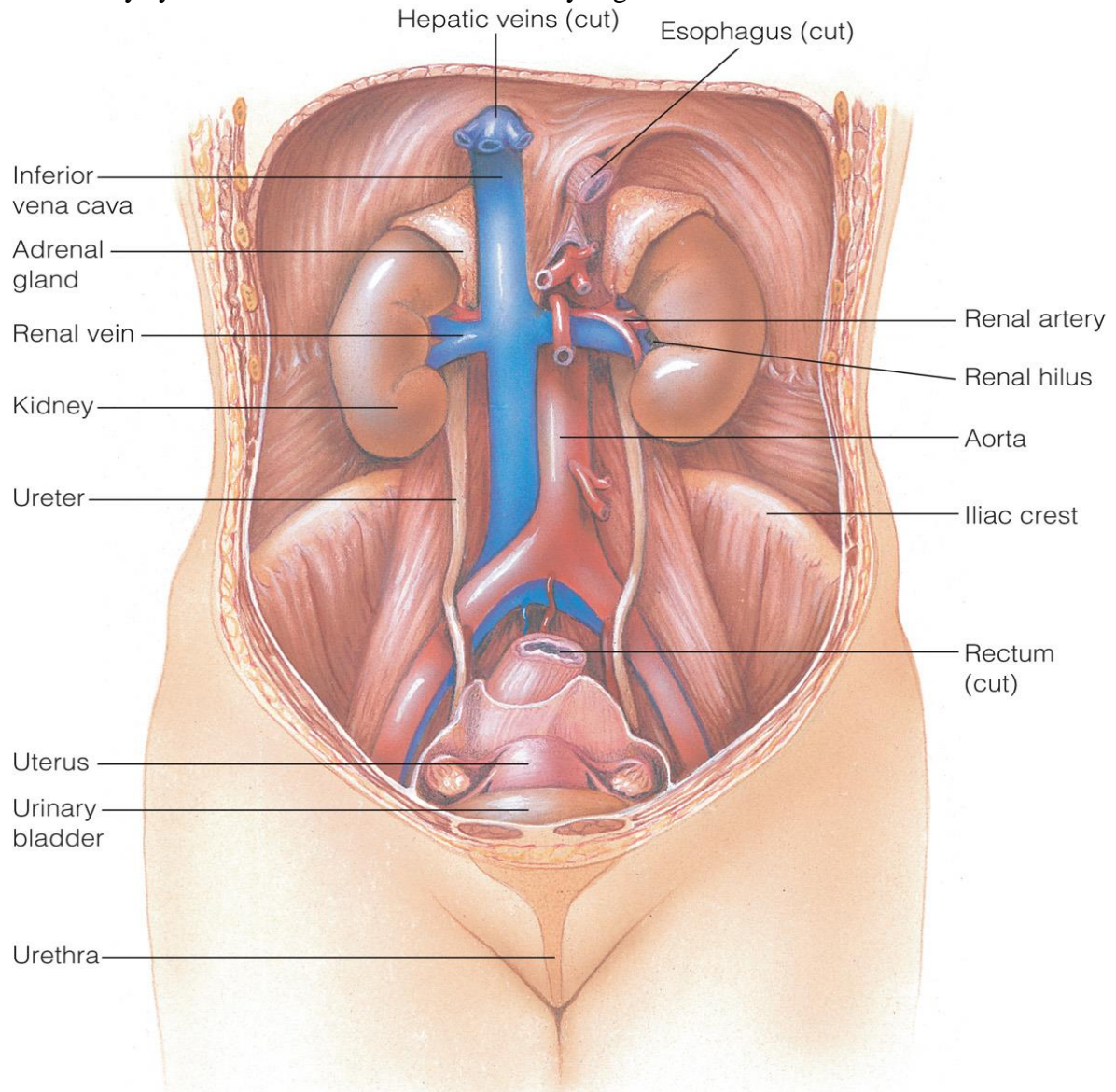


Urinary System

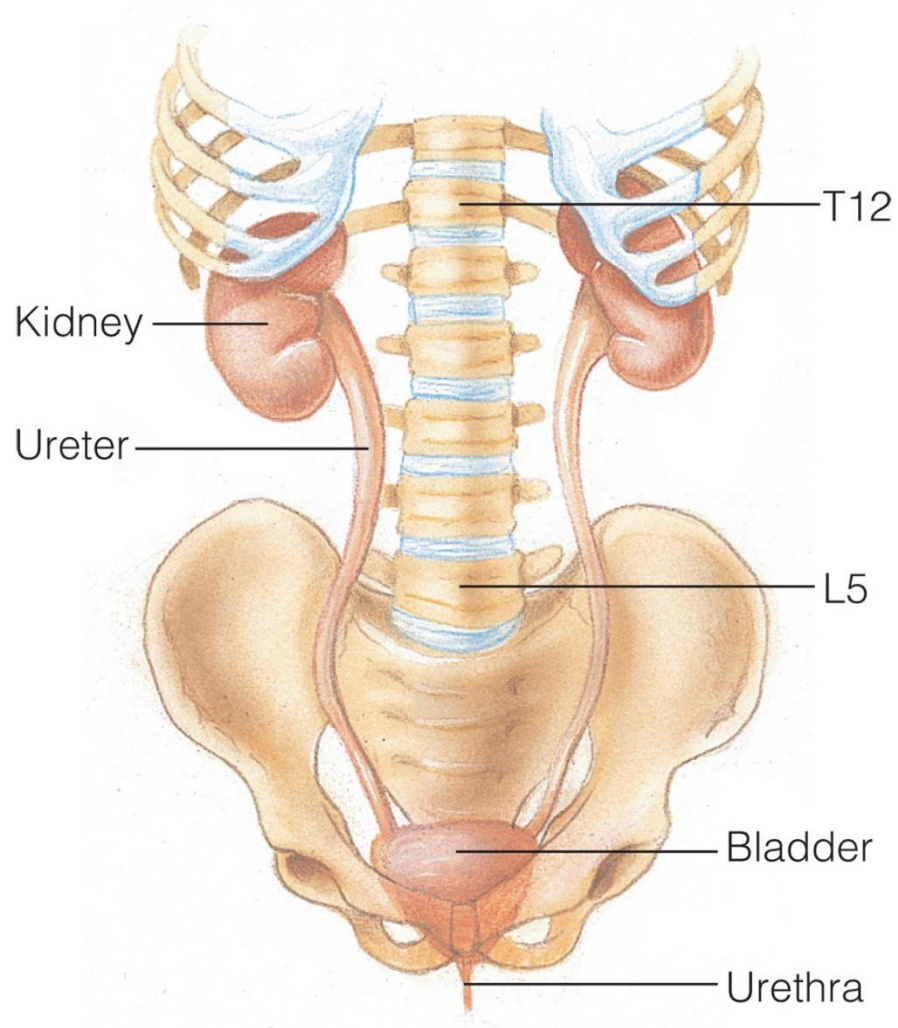
Anatomy and Physiology Review

1. Kidneys
2. Ureters
3. Bladder
4. Urethra
5. Renal vasculature

The urinary system. Anterior view of the urinary organs of a female.



The urinary system. Relationship of the kidneys to the vertebrae.



Kidneys

- Located in retroperitoneal space with upper portion protected by lower rib cage
- Renal arteries
- Renal capsule
- Hilus
 - Opens to renal sinus
- Medulla
 - Pyramids
 - Calyces
 - Collecting tubules
- Renal pelvis
- Renal cortex
 - Composed of over 1 million nephrons
- Nephrons
- Glomeruli
 - Tufts of capillaries that filter more than 1 liter of fluid each minute

Major functions

1. Removes wastes, toxins, and foreign matter from the blood
2. Promotes fluid and electrolyte balance
3. Assists in maintenance of blood pressure
4. Contributes to erythropoiesis and the metabolism of vitamin D

Renal Arteries

- Require oxygen, nutrients and receive about 25% of cardiac output
- Renal network consists of renal arteries, arcuate arteries, interlobular arteries, afferent arteries, and efferent arteries.
- Vasa recta
Help to concentrate urine

Ureters

- Mucus-lined narrow tubes
- Function to transport urine from the kidney to the urinary bladder
- Middle layer contains smooth muscle with peristaltic action that propels urine to the urinary bladder.

Urinary Bladder

- Detrusor muscle
 - Expands and contracts, acting as reservoir
- Functions
 - Temporarily store urine
 - Contract for urine release

Urethra

In females

- Short, about 1.5 inches
- More easily contaminated with bacteria

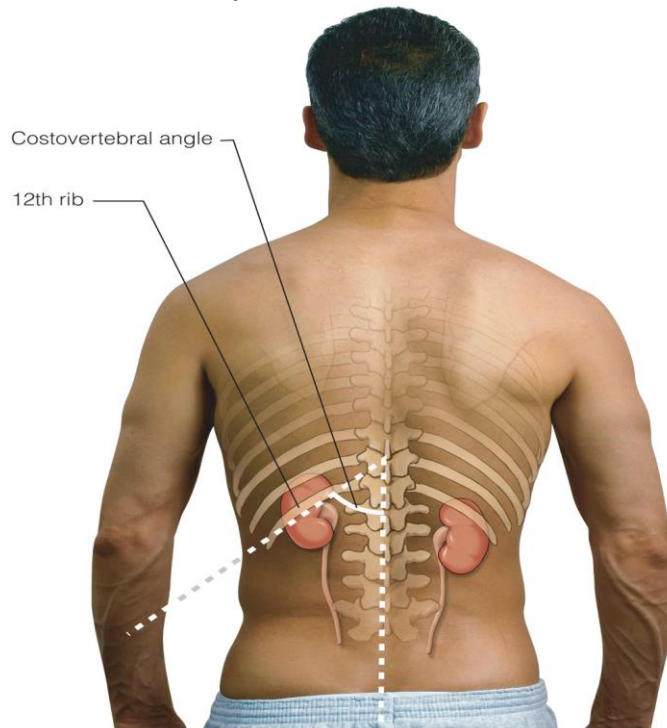
In males

- About 8 inches long
- Also carries semen outside the body

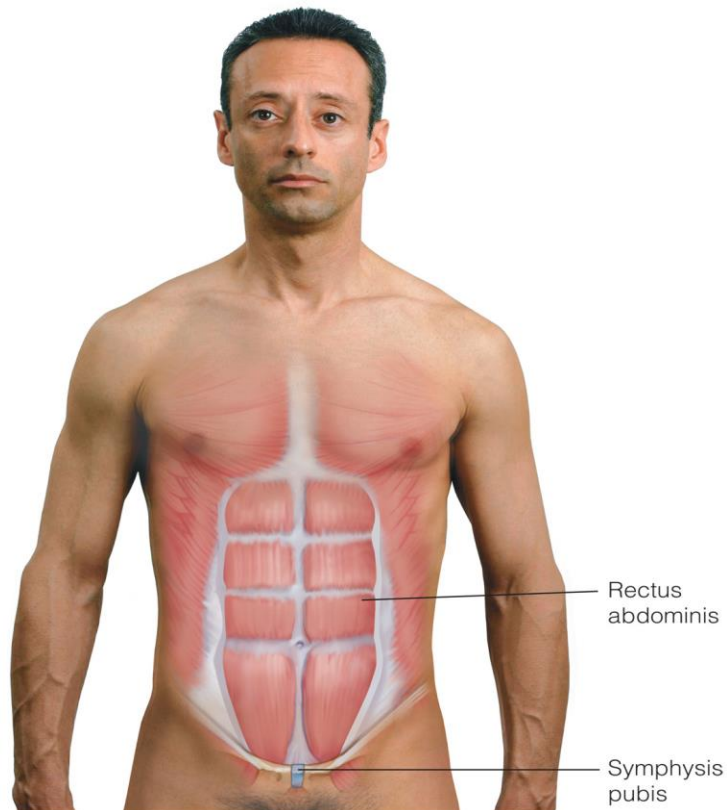
Landmarks

- Costovertebral angle (CVA)
 - Area on the lower back formed by the vertebral column and downward curve of the last posterior rib
 - Anatomic location of the kidneys and ureters
- Rectus abdominis muscles
 - Longitudinal muscles extending from the pubis to the ribs on either side of the midline
 - Guides the location for kidney palpation
- Symphysis pubis
 - Joint formed by the union of two pubic bones at the midline
 - Bladder is cradled under this structure.

Landmarks for urinary assessment. The costovertebral angle.



Landmarks for urinary assessment. The rectus abdominis muscles and the symphysis pubis.



Infants and children

- Renal blood flow and glomerular filtration rate increasing at birth
- Fragile fluid and electrolyte balance
- Illnesses involving dehydration, leading to acidosis and fluid imbalance
- Do not have adult bladder capacities until adolescence
- Bed-wetting
- Tanner stages of development in puberty
- Examine for anomalies such as scrotal edema, cryptorchidism, undescended testes, and labial adhesions
- Consider health and hygiene practices of the family

The pregnant female

- Pressure of the enlarging uterus
- Postpartum edema and hyperemia of the bladder mucosa

The older adult

- Decrease in renal blood flow and perfusion
- Decrease in ability to concentrate and dilute urine
- Reduction in ability to clear medications and acids
- Reduction in ability to reabsorb bicarbonate and glucose
- Effects of respiratory or metabolic acidosis
- Increased glycosuria
- Fluid loss
- Incontinence
- Lifespan Considerations
- Urinary retention
- Nocturia
- Benign prostatic hypertrophy
- Postmenopausal women and decreased estrogen

Psychosocial Considerations

- Incontinence may alter self-image.
- Urinary tract infections may result from sexual trauma.
- Hesitation to discuss urinary system function

Assessment Techniques

1. Assessment of hydration status and skin color
2. Inspection of the abdomen
3. Inspection of the costovertebral angles
4. Inspection of the flanks
5. Palpation of the costovertebral angles
6. Percussion of the costovertebral angles
7. Palpation of the kidneys
8. Palpation of the bladder
9. Percussion of the bladder

Abnormal Findings

1. Bladder cancer
2. Seen later in life and linked to smoking
3. Glomerulonephritis
4. Inflammation of the glomerulus

5. Renal calculi
6. Stones that block the urinary tract
7. Composed of calcium; struvite; or magnesium, ammonium, phosphate, and uric acid
8. Renal tumor
9. Benign
10. More commonly malignant
11. Linked to smoking
12. Renal failure
13. Acute or chronic
 - If acute and non-progressing to chronic, occurs in stages of oliguria, diuresis, and recovery
14. Urinary tract infection
15. Bladder most common site but may include kidneys
16. Common with catheter use for urinary retention or incontinence

Changes in urinary elimination

- Dysreflexia
- Incontinence
- Functional
- Reflex
- Stress
- Urge
- Total
- Urinary retention