Genitourinary

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Anatomy and Physiology

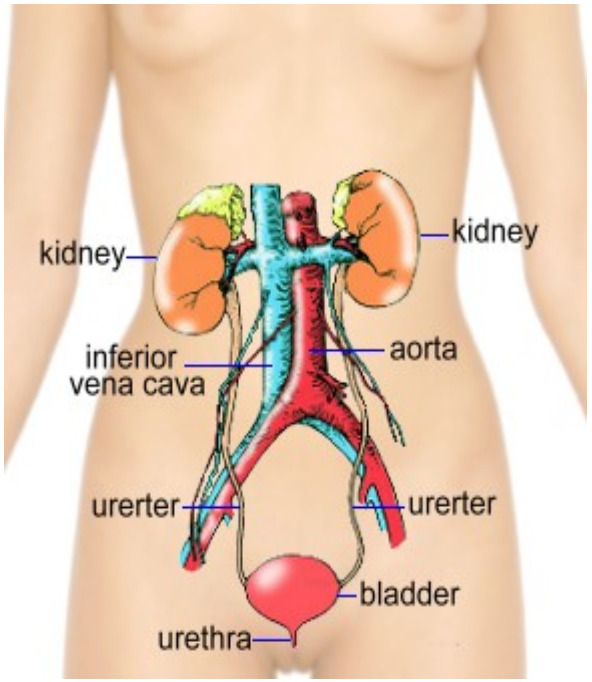
- The urinary system consists of:
  - 2 kidneys
  - 2 ureters
  - 1 urinary bladder
  - 1 urethra.

Other functions of the urinary system

- Regulation of blood volume
- Regulation of electrolyte imbalance
- Regulation of acid-base balance
- Regulation of the above in tissue fluid
- Production of erythropoietin
  - Which stimulates erythrocyte production in the bone marrow

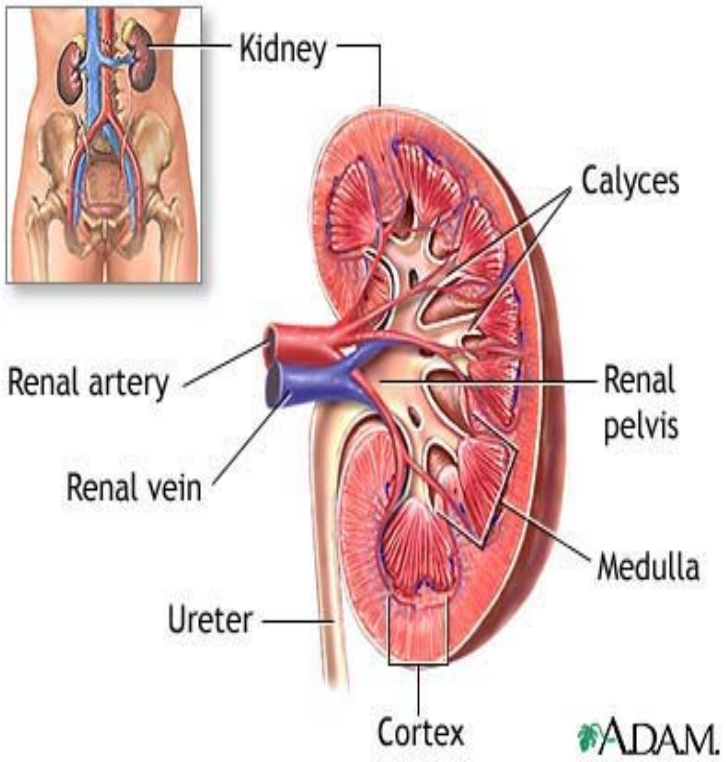
Anatomy of kidney

- Located in the upper abdominal cavity behind the peritoneum on each side of the vertebral column.
- Covered by fibrous connective membrane called **renal fascia** which holds the kidneys in place.
- Cushioned by adipose tissue.



Anatomy of kidney

- Medial side of kidney has indentation called **hilus**
- Renal artery is a branch of abdominal aorta
- Renal vein returns blood to the inferior vena cava



Internal structures of the kidney

- Renal cortex: outermost area
  - Renal corpuscles; convoluted tubules
- Renal medulla: middle area
  - Renal pyramids
- Renal pelvis:
  - Expansion of ureter

Nephron

- Is the structural and functional unit of the kidney
- Urine is formed in the approx. 1 M nephrons in each kidney
- 2 major parts of a nephron are the renal corpuscle and the renal tubule

Nephron

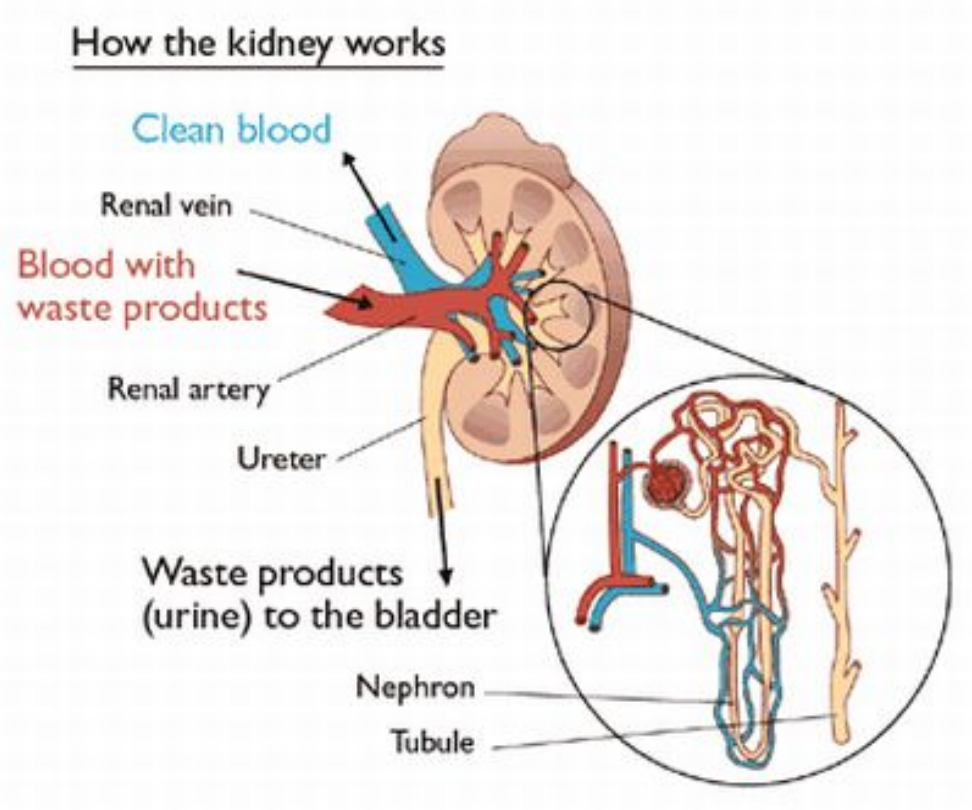
- Renal corpuscle consists of glomerulus surrrounded by a Bowman's capsule
- Renal tubule continues from Bowman's capsule and consists of the proximal convoluted tubule, the Loop of Henle and the distal convoluted tubule

- Renal filtrate
  - The space between the inner and outer layer contains renal filtrate the fluid that is formed from the blood in the glomerulus and will eventually become urine

Blood Vessels of the Kidney

- The pathway of blood flow through the kidney is an essential part of the process of urine formation

Blood Flow of Kidneys



Blood vessels of the kidney

- Blood from abdominal aorta enters the renal artery which leads to smaller arteries.
- The arteries give rise to afferent arterioles in the renal cortex flows into glomeruli to efferent arterioles, to peritubular capillaries, to veins in the kidney , to the renal vein to the inferior vena cava

- Formation of urine involves three processes:
  - Glomerular filtration in the renal corpuscles
  - Tubular reabsorption
  - Tubular secretion

- Glomerular Filtration the process by which blood pressure forces plasma and dissolved material out of capillaries (all this) along with small proteins are pushed out of the glomeruli into Bowman's capsule
- This fluid is called renal filtrate
- Glomerular filtration rate (GFR)= amount of renal filtrate formed in 1 min.

- Tubular reabsorption
  - Is the recovery of useful materials from the renal filtrate and their return to the blood in the peritubular capillaries
    - Approx. 99% of the renal filtrate formed is reabsorbed and urinary output is 1000 to 2000ml/24 hours

Mechanisms of Reabsorption

- Active transport
- Osmosis diffusion
- Facilitated diffusion
- Pinocytosis

Tubular Secretion

- Substances are secreted into the filtrate.
  - E.g., ammonia, creatinine, excess vitamins and medications

The Kidneys and Acid-Balance

– Other than exhalation of carbon dioxide by the respiratory system, the kidneys are the organs most responsible for maintaining the normal pH of blood and tissue fluid.

Other Functions of Kidneys

- Secretion of renin
- Activation of Vit. D
- Production of erythropoietin

Ureters

- Extend from the hilus of a kidney to the lower, posterior side of the urinary bladder
  - As the bladder fills it expands and compresses the lower ends of the ureters to prevent the backflow of urine.

Urinary Bladder

- Muscular sac below the peritoneum and behind the pubic bones
  - Function
    - Temporary storage of urine and its elimination
      - Women bladder is inferior to the uterus
      - Men bladder is superior to the prostrate gland

Urethra

- Carries urine from the bladder to the exterior
  - Internal sphincter – involuntary control
  - External sphincter – voluntary control
  - Women
    - 1 to 1.5 inches long; anterior to the vagina
  - Men
    - 7-8 inches long, extends through the prostrate gland and penis
    - Carries semen as well as urine

Urination Reflex (micturition)

- A spinal cord reflex over which voluntary control can be exerted
- If you choose to relax the external urethral sphincter urine flows into the urethra and the bladder is emptied

Definition of terms

- Hematuria
- Dysuria
- Oliguria
- Enuresis
- Anuria
- Nocturia
- Polyuria
- Pyuria

Characteristics of Urine

- Amount
  - 1000- 2000ml. /24 hours
- Color
  - Freshly voided clear; cloudy=infection
- Specific Gravity- is a measure of the concentrating ability of the kidneys. 1.010 to 1.025.
- pH- normal 4.6 to 8.0 (Avg. 6.0)

Charateristics of Urine

- Constituents
  - 95% water
  - Nitrogenous waste which includes:
    - Urea
    - Creatinine
    - Uric acid

Aging and the Urinary System

- Renal flow decreases by 50%
- Function and Exchange of substances decreases
- Bladder muscles weaken, capacity decreases leading to frequency and nocturia
- The voiding reflex is delayed

Nursing Assessment

- P. 755 - 760

Diagnostic Tests of the Renal System

- P. 762 - 768

Therapeutic Interventions

- Management of Urinary Incontinence
  - Definition – involuntary leakage of urine
    - Very common
    - Affects 17 M adults
    - Types
      - Stress
      - Urge
      - Functional
      - Overflow
      - Total

Management of Urinary Retention

- Definition- inabiltity to empty the bladder completely
  - Acute or chronic
    - Acute- caused by surgery, due to anesthesia ;
    - Can be medical emergency causing
      - Extreme pain
      - Large bladder
      - Possible bladder rupture
      - Acute renal failure

Management of Urinary Retention

- s/s
  - Urinary frequency
  - Absent or decreased urinary output
  - Enlarged bladder can be palpated
    - Bladder Scan- painless, noninvasive, requires no prep
    - Urinary catheter
    - Intermittent Catherization
    - Suprapubic Catheter

Mangement of Urinary Retention

- Nursing Care Of Suprapubic
  - Keep it clean and dry
  - Prevent tension (keep taped)
  - Skin barrier – prevent urine leakage (Stomahesive)
  - Care same as indwelling catheter