Urinary System performs:

- Maintains blood volume and proper balance of water, electrolytes and pH.
- Ensures that key substances like glucose remain in the bloodstream. But allows for elimination of toxic waste to be removed.
- Major role in arterial blood pressure regulations.
- Controls development of red blood cells (erythrocytes).

Body eliminates urine to maintain homeostasis. The liver produces large amounts of ammonia when amino acids are broken down in gluconeogenesis. Ammonia is highly toxic to body cells (the brain). Liver cells convert ammonia to urea. Kidneys remove urea from the blood to make urine.

Genitourinary system refers to men because both reproductive organs/structures and urinary organs/structures share. In females the urinary and reproductive systems are completely separate.

Nephrons - Greek for kidney

Renal - Latin for kidneys

Kidney/Urinary conditions:

250,000 Americans suffer from end-stage renal failure that require dialysis awaiting a kidney transfusion if possible.

Renal Calculi - kidney stones. 500,000 Americans treated yearly.

Infections - females complain of pain with urination is mostly urinary. Men on the other hand with the same complaint may be urinary or sexually transmitted disease (most commonly gonorrhea). (remember that men have genitourinary system)
Prostate enlargement (hypertrophy) - affects 60% of men aged 50 and 80% of men aged 80. Obstructs urine flow.

Because GI and urologic emergencies share similar presentation so history is important.

Pain:

Epithelial lining of the organ exposed underlying tissue exposing nerve endings. Other nerves respond to stretching forces generated with inflammation. Bacterial infections damage the epithelial tissue which results from pain with urination. Visceral pain comes from hollow structures causing aching or cramping pain felt deep within. Visceral pain can also be referred pain. Pyelonephritis (kidney infection) pain in flank, shoulder and neck.

Assessment:

- Pain with urination with or without fever - UTI.
- Inability to urinate - Elderly men prostate enlargement.
- Improvement with knees drawn to chest - Kidney stones.
- In post pubertal women ask for last menstrual cycle.
- Acute abdominal/pelvis pain in women - tubal pregnancy and shock.
- Constant pain longer than 6 hours considered surgical.
- Kidney stones can cause nausea/vomiting due to pain.
- Skin color - chronic renal failure causes anemia (pale skin)
- Temperature suggest infection.
- Hematocrit may detect bleeding.
- History of hypertension and diabetes most commonly damages the kidneys.

Acute renal failure (ARF)

- Sudden drop of urine (less than 400-500mL per day). Very ill patients or terminally ill.

Types of ARF

2. Renal ARF - With kidney tissue. Injury to small blood vessels, inflammation or infection if kidney.

3. Interstitial ARF - Toxic chronic state caused by chronic antibiotics, nonsteroidal anti-inflammatory, drugs, diuretics.


- Signs - Fluid retention. Swelling in feet, face, weight gain.

Chronic Renal Failure (CRF)

- Inadequate kidney function due to permanent loss of nephrons. Typically 70% of nephrons must be lost before significant clinical problems.

- Prepare for metabolic instability.

- Diabetes and hypertension cause more than 1/2 of all cases.

- The same causes for CRF are the same as in ARF. (prerenal, renal, postrenal, etc)

- Long term damage dilated the capillaries and nephrons build scare tissue and do not work secondary to hypertrophy.

Results - Active transport in the tubules decrease. Retention of potassium and sodium. High levels of calcium. Lack of renal production of vitamin D.

Glucose lost in urine when it should be reabsorbed into the body.

Loss of control of arterial pressure. Hypertension is common due to high levels of sodium and water.
Erythrocyte development decreases. Anemia develops.

Assessment:

- Anorexia, Nausea, vomiting. CNS impairments. Mood swings. Seizures possible. Anemia, jaundice may be present as urea eliminated through sweat - uremic frost. Fluid retention, hyper or hypotension possible. Edema present.

Care: Small IV bolus if hypertensive. Sodium Bicarb if metabolic acidosis. Long term care: Renal Dialysis.

Dialysis: Two Types (5 questions on exam)

1. Hemodialysis - osmosis takes place as blood passed by a semipermeable membrane that acts as an artificial nephron. The patient has "shunts" placed in a variety of body locations. "Shunts" are most commonly located on the inner part of the forearm. If a "shunt" becomes obstructed usually it needs surgical intervention. DO NOT TRY TO REMOVE THE OBSTRUCTION." Transport to the hospital for evamuation.

2. Peritoneal - Use the abdominal peritoneal membrane as the semipermeable material. Dialysis fluid is introduced into the abdominal cavity. Take a little bit longer than hemodialysis but does not require the chronic vascular (IV) access. Also can be done at home by a trained family member.
• Dialysis Emergencies: If IV access is needed it is preferred to find a peripheral site other than the stunt. Also avoid doing a BP or tourniquet on the same arm as a shunt.

• Disequilibrium Syndrome are signs and symptoms right after dialysis is completed. The patient may feel restless, nauseated, fatigue, and headache.

Kidney Stones (Renal Calculi) (2 questions on exam)

• Brief hospitalization is required.

• Care may include shock-wave lithotripsy - a procedure that uses sound waves to break the stones.

• Stones form more commonly in men. Also heredity plays a role.

• Risk factors: Long periods of immobilization, anesthetics, opiates, psychotropic drugs.

• Summer more common to have stones.

• "Too much insoluble stuff" and urine "too concentrated."

• Calcium salt are most common formation. Also chronic infections, catheterization can lead to struvite stones.

Signs: Vague visceral pain in flank. Most commonly the pain is described as sharp excruciating pain, migration down to groin. Pt in pain.
Care: POC, watch for vomiting due to pain, consider analgesia, IV, fluid to promote urine production.

- Avoid: food that increase uric acid like anchovies and sardines. Limit salt intake. Avoid foods containing calcium like chocolate, celery, grapes, beans, asparagus.
- Diet change: Eat a low protein diet to reduce uric acid.

Urinary Track Infection (UTI) (1 question on exam)

- Affects the urethra (most common develop first), bladder or kidneys as well as prostate in men.
- Most common cause: Gram-negative bacteria from bowels enter the urethra and bladder.
- Three symptoms - painful urination, frequent urge to urinate, and difficulty starting and stopping when urinating. Fell ill or feverish. Flank or lower back pain referred to neck/shoulders. Kidney urinary infection patient looks more ill than a bladder infection.

Care: IV, fluid to dilute urine, POC.

Epididymitis (1 question on exam)
• Inflammation of the epididymis. It carries sperm from the testes. Most commonly cause by infections secondary to sexually transmitted diseases.

• Sign - Unilateral scrotum pain. Tenderness of testicles.

• Care: Antibiotics, elevate scrotum, rest, pain meds.

Testicular Torsion (1 question on exam)

• True urological emergency.

• Testicle twist on its spermatic cord. Disrupts blood flow. Most common in first year of life and puberty years.

• Unlike epididymitis, testicular torsion causes painful swelling of the scrotum with no fever.

• Care: Emergency surgery with 4 hours.