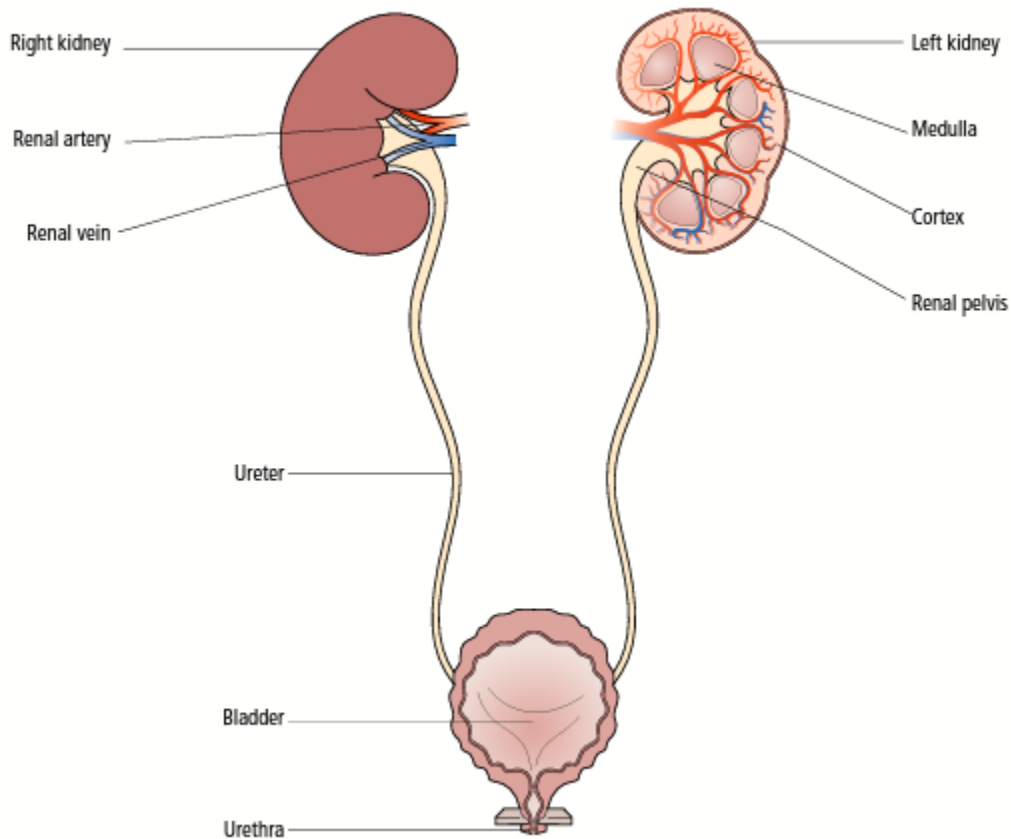


Excretory/urinary system



△ Structures of the urinary system

The organs of the urinary system form part of the body's excretory system, the others being the skin and the respiratory system. The urinary system is involved with the regulation and balance of water levels within the body and the elimination of water soluble waste products. Its functions are to:

- filter the blood, removing waste products
- balance fluid intake with the elimination of excess fluid in the form of urine
- distribute tissue fluid throughout the body
- balance the body's salts needed for cellular function
- maintain safe levels of pH within the body's fluids and therefore assist in cellular processes such as osmosis
- regulate blood pressure.

Structure of the urinary system

The urinary system includes the following organs:

- kidneys
- ureters
- bladder
- urethra.

Kidneys

The kidneys are two bean-shaped organs fixed to the inner back wall of the abdominal cavity behind the liver and the stomach. They are supplied with blood by the renal arteries which have branched off the descending aorta as it travels down the body and before it splits to form the femoral arteries. Blood is filtered as it is taken through the intricate structure of the kidney, removing the toxic nitrogen-enriched waste from the blood plasma to produce urine. This process occurs within millions of tiny structures within the kidney called nephrons and can be explained as follows:

- 1 The increase in pressure of the blood entering the fine blood capillaries within the kidney forces the blood plasma out of the capillaries and is captured by the nephrons – a process called filtration.
- 2 The captured fluid is taken through a series of winding tubes where substances such as body salts, vitamins, amino acids and glucose within the fluid are reabsorbed by osmosis back into the blood stream and are taken away from the kidney by the renal vein, leaving the harmful substances and excess water. This process is called selective reabsorption.

This excess water and waste product is now called urine and is collected at the core of the kidney and passed into the ureters.

Ureters

The ureters are two tubes, one from each kidney, that run down the back wall of the abdomen and curve forward to the bladder, situated in the pelvis.

Bladder

The bladder is a flexible, sac-like structure with muscular walls into which the urine is passed and stored. The walls are able to stretch as the bladder fills with urine until, in the average adult, 200ml of urine is collected. Stretch receptors in the bladder walls then stimulate the desire to pass urine. The bladder can hold as much as 800ml of urine if this desire is ignored voluntarily but eventually the urine will be forced into the urethra by the contraction of the muscular walls of the bladder, the relaxation of a sphincter muscle at the neck of the urethra and the action of the abdominal muscles including the diaphragm.

Urethra

The urethra carries the urine from the bladder to the outside of the body. In women it is about 4cm long and opens out to the external body in front of the vagina. In men it is about 20cm long and is shared by the reproductive system, opening at the tip of the penis.

Disorders of the urinary system

Disease/ disorder	Cause	Description
Cystitis	Commonly caused by a bacterial infection	Symptoms include pain when passing urine, increased desire to urinate, lower abdominal pain and possibly blood in the urine
Nephritis	Caused by infections or toxins, either in the blood or being passed from the bladder up the ureters to the kidney	Inflammation of the kidney; pain in the lower back and trouble passing urine. Can be life threatening if very severe
Urinary tract infection (UTI)	Bacterial infection	Any part of the urinary tract can be affected; has similar symptoms to cystitis (which is also a type of UTI)
Renal colic	Abdominal pain caused by kidney stones	Severe abdominal pain depending on the size of the stone
Kidney stones	Solid mass of nitrogen-based crystals found in the kidney or ureters	Symptoms include severe pain in the abdomen or side of the back that may move to groin area. Other symptoms can include abnormal urine colour, fever, and nausea