

## The Kidneys



The kidneys can be found below the ribcage towards the back of the body, one on each side of the backbone. They are shaped like a bean and are roughly the size of a clenched fist. Each kidney has a curved outer surface (convex) and a curved inner surface (concave).

The renal hilum is found on the concave surface of the kidney. The renal hilum is the point at which the artery supplying blood to the kidney (renal artery) enters the kidney and the vein taking blood from the kidney (renal vein) leaves. It is also the point at which a small tube called the ureter leaves the kidney. The ureter takes urine from the kidney to the bladder. The renal vein takes blood from the kidney back into the circulation. The kidney is surrounded by a layer of fat and a tough fibrous

membrane, called Gerota's fascia. Most people have two kidneys but can live a normal life with one healthy kidney.

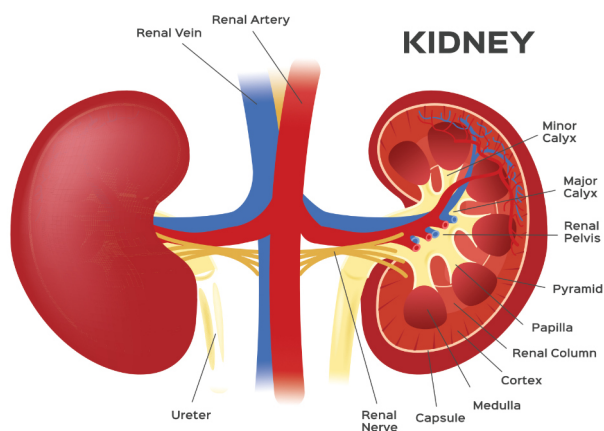
The kidneys filter and clean blood by removing excess water, waste products and toxins, which are eliminated from the body in urine. Urine is produced in tiny blood filters called nephrons in the kidney; there are about 1.2 million nephrons in each kidney. The

nephrons are found in the renal cortex, which forms the outer (convex) part of the kidney. The urine is then carried through a tube called the ureter into the bladder, where it is stored until it is ready to be passed out of the body through another tube, called the urethra, during urination.

The main waste products in urine are urea (from protein metabolism), creatinine (from muscle), acid (from metabolism of nucleic acids), and the broken-down products of hormones. Some of these waste products are measured to test kidney function.

The kidneys also balance the pH of body fluids, salt and potassium levels in the blood. They produce hormones to regulate blood pressure and aid in other important body functions, such as absorption of calcium in the gut and manufacture of red blood cells by the bone marrow.

If a kidney is removed as a result of cancer or for transplantation, there will not be any significant loss of kidney function in the remaining kidney. A person can live a perfectly healthy life with one kidney.



fluid and waste out of the blood. Dialysis can help treat chronic kidney disease, but it can't cure it.

Diabetes is also a major cause of chronic kidney disease. Diabetes causes high blood sugar. The increased level of sugar in the blood damages the blood vessels in the kidneys over time. This means the kidneys can't clean the blood properly. Kidney failure can occur when your body becomes overloaded with toxins.

## Kidney stones

Kidney stones occur when minerals and other substances in the urine crystallise in the kidneys, forming solid masses (stones). Kidney stones usually come out of the body during urination. Passing kidney stones can be extremely painful, but they rarely cause significant problems.

## Diseases of the kidney

Kidney disease occurs when your kidneys become damaged and can't perform their function. Damage may be caused by diabetes, high blood pressure, and various other chronic (long-term) conditions. Kidney disease can lead to other health problems, including weak bones, nerve damage, and malnutrition. If the disease gets worse over time, your kidneys may stop working completely. This means that dialysis will be required to perform the function of the kidneys. Dialysis is a treatment that filters and purifies the blood using a machine. It can't cure kidney disease, but it can prolong your life.

Kidney cancer is different to chronic kidney disease (CKD) and having one kidney does not necessarily mean that you have kidney disease in your remaining kidney. Your remaining kidney can work perfectly normally and there will not be any loss of kidney function; your remaining healthy kidney will compensate for the loss of kidney function resulting from removal of your cancerous kidney. However, you will need to look after your remaining kidney by eating a healthy diet, drinking alcohol in moderation, not smoking and keeping active to prevent the onset of chronic kidney disease.

## Chronic kidney disease

The most common form of kidney disease is chronic kidney disease (CKD). Chronic kidney disease is a long-term condition that doesn't improve over time. It's commonly caused by high blood pressure. High blood pressure can increase the pressure on the tiny blood vessels in the kidneys (called glomeruli) where blood is cleaned. Over time, the increased pressure damages these vessels and kidney function begins to decline.

Kidney function will eventually deteriorate to the point where the kidneys can no longer perform their job properly. In this case, a person would need to go on dialysis to filter extra





### Glomerulonephritis

Glomerulonephritis is inflammation of the glomeruli (the tiny blood vessels in the kidneys that filter the blood). Glomerulonephritis can be caused by infections, drugs, or congenital abnormalities (disorders that occur during or shortly after birth). It often gets better on its own.

### Polycystic kidney disease

Polycystic kidney disease is a genetic disorder that causes numerous cysts (small sacs of fluid) to grow in the kidneys. These cysts can interfere with kidney function and cause kidney failure. Individual kidney cysts are fairly common and almost always harmless. However, some cysts may be seen to grow on CT scans and may need to be removed, despite the fact they are most likely not malignant. Polycystic kidney disease is a separate, more serious condition.

### Urinary tract infections

Urinary tract infections (UTIs) are bacterial infections of any part of the urinary system. Infections in the bladder and urethra are the most common. They are easily treatable and rarely lead to more health problems. Some patients may have numerous courses of treatment for UTIs using different antibiotics before the infection is fully resolved. However, if left untreated, these infections can spread to the kidneys and cause kidney failure.

### Kidney cancer

Kidney cancer (or renal cancer) is one of the less common cancers in the UK. It usually affects adults in their 60s or 70s and is rare in people under 50. It can often be cured if found early. However, if kidney cancer is diagnosed after it has spread beyond the kidney, a cure will probably not be possible. There are several different types of kidney cancer. Please see the Essential guide: Kidney cancer – Renal cell carcinoma, Essential guide: Kidney cancer - Transitional cell carcinoma or the Essential guide: Kidney cancer - Renal squamous cell carcinoma for more information.

### Further reading

- **Action Kidney Cancer:**  
<https://www.actionkidneycancer.org/>
- **Cancer Research UK:**  
<https://www.cancerresearchuk.org/about-cancer/kidney-cancer/about>
- **NHS:**  
<https://www.nhs.uk/Livewell/Kidneyhealth/Documents/kidney%20guide.pdf>  
<https://www.nhs.uk/conditions/kidney-disease/>
- **Kidney ReUK:**  
<https://kidneyresearchuk.org/kidney-health-information/kidney-conditions-symptoms/>

### Acknowledgements

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**Factsheet Updated:** April 2021

**Next Review:** April 2023