

Kidney cancer – Renal cell carcinoma (RCC)



What is kidney cancer?

Kidney cancer starts growing in the cells in the small tubes in the cortex of the kidney (see the *Essential guide: The kidneys*). These cells are called renal cells. Around 88% of tumours found in the kidneys are cancer and are called 'malignant'. There are three main types of kidney cancer:

- Renal cell carcinoma (RCC) (80-90%)
- Renal transitional cell carcinoma (TCC) (12%)
- Renal squamous cell carcinoma (RSCC) (less than 1%)

The remaining 12% of tumours found in the kidneys are not cancerous and are called 'benign'. Examples of benign tumours are:

- Oncocytoma (61%)
- Angiomyolipoma (29%)
- Adenoma (3%)
- Other (7%)

This essential guide is about the most common form of kidney cancer, called renal cell carcinoma (RCC). Please see *Essential guide: Kidney cancer - Transitional cell carcinoma (TCC)* and *Essential guide: Kidney cancer - Renal squamous cell carcinoma (RSCC)* for more information about the other forms of kidney cancer.

What is renal cell carcinoma (RCC)?

Renal cell carcinoma (RCC) is the most common form of kidney cancer and accounts for about 82% of all cases².

Kidney tissue is made up of very small tubes (called tubules) that filter and clean the blood. These tubules are lined with a tissue called epithelium. Epithelium lines the cavities and surfaces of all organs and structures throughout the body, and also forms many glands, such as salivary glands. Renal cell carcinoma starts in cells that make up the epithelium lining the renal tubules.

There are several different subtypes of RCC. The naming of these subtypes refers to the type of epithelial cell where the cancer starts to grow (clear cell, papillary cell, medullary cell, chromophobe cell):

- Clear cell (65-70%)
- Papillary type 1 and 2 (15%)
- Chromophobe (5-7%)
- Collecting duct carcinoma
- Renal medullary carcinoma
- Mucinous tubular and spindle cell carcinoma
- Renal translocation carcinoma
- Unclassified RCC (the latter five are very rare subtypes and make up about 5% of RCC tumours)
- Hereditary kidney cancer (less than 5%)

The epithelial cells are named according to how they look under the microscope. For example, the cells of a clear cell RCC tumour appear full of a clear substance when looked at under the microscope. Papillary RCC tumours look like long thin finger-like growths (or papillae) under a microscope. Cells from a chromophobe RCC tumour do not stain easily and appear pale under the microscope.

Usually only one kidney is affected by RCC. However, tumours in both kidneys (bilateral kidney cancer) can occur, especially if there is a genetic cause.

What is sarcomatoid kidney cancer?

Some kidney cancers are diagnosed as sarcomatoid kidney cancer. Sarcomatoid is a name given to a particular type of cell and can affect different subtypes of kidney cancer. Between 1 and 15% of kidney cancers have sarcomatoid cells.

Most kidney cancers start growing in cells called clear cells, but they can also grow in other cells too, such as papillary cells, collecting duct cells and medullary cells. Any type of cancerous kidney cell can become sarcomatoid.

Sarcomatoid means that the cells of the cancer look like sarcoma cells. Sarcoma is cancer of the body's supporting tissues, such as muscle, nerves, fat, blood vessels and fibrous tissues.

Sarcomatoid kidney cancers can be more aggressive and tend to grow more quickly than other types of kidney cancer and are more likely to spread to other parts of the body. This makes them more difficult to treat. They are treated in the same way as RCC. However, some people may be given a particular type of chemotherapy not usually used to treat kidney cancer to help control the cancer and try to stop it growing.

What is bilateral kidney cancer?

Bilateral kidney cancer is when you have kidney cancer in both kidneys. It is rare and is about 1-5% of kidney cancer cases. Bilateral kidney cancer is more common in people with a family history of kidney cancer or people with certain genetic conditions, such as von Hippel-Lindau (VHL) disease or hereditary papillary renal cell carcinoma (HPRCC). Bilateral kidney cancer can also happen in people with no known family history of kidney cancer. This is called sporadic bilateral kidney cancer. Kidney cancer can spread to the remaining healthy kidney, but this is extremely rare.

Occurrence

There has been an increase in the number of people being diagnosed with RCC in many western countries. In the UK there has been a 36% increase in the number of people diagnosed with RCC in the last 10 years². In the USA a 50% increase has been recorded over the last 50 years. This maybe because of an increase in some of the lifestyle risk factors for RCC, such as smoking and obesity³, but could also be due to improvements in scanning technology leading to the diagnosis of kidney tumours that don't have any symptoms (asymptomatic).



Kidney cancer is the seventh most common cancer in UK adults, with around 13,300 new cases diagnosed per year between 2016-2018, and 4,700 deaths per year between 2015-2017. Kidney cancer accounts for 4% of all new cancer cases in the UK².

In men, kidney cancer is the fifth most common cancer, with around 8,400 new cases a year (2016-2018), and in women it ranks tenth with around 4,900 new cases a year (2016-2018²). Kidney cancer is, therefore, classified as a less common cancer.

It has been estimated that the lifetime risk of developing kidney cancer is 1 in 34 for men and 1 in 61 for women².

About a third (34%) of all kidney cancers are diagnosed in people aged over 75 years (2016-2018)².

Risk factors

A risk factor is anything that increases the chance of developing cancer. Some people with several risk factors never get cancer, while others with no known risk factors do. However, knowing your risk factors and talking about them with your doctor may help you make more informed lifestyle and health care choices. A cause is a factor that has been proven to give rise to kidney cancer, for example obesity³.

- **Increasing age.** The risk increases in people over 40 and the highest numbers of cases of kidney cancer are found in those aged 85-89²
- **Weight.** People who are overweight (BMI 25-30) increase their risk of developing kidney cancer by about one third. If a person is obese (BMI over 30) their risk of kidney cancer is double that of a person who is a healthy weight (BMI less than 25). Around 24% of all kidney cancers result from being overweight or obese². (BMI=body mass index)
- **Cigarette smoking** can double the risk for some people and is found to be the cause of around 13% of kidney cancers². The higher the number of cigarettes smoked per day the greater the risk. It is thought that chemicals from tobacco in the blood stream damage the kidney tubules before being filtered out of the body in the urine
- **Gender.** Men who already have certain health conditions e.g., high blood pressure (hypertension) or advanced kidney disease (especially for those on long term dialysis) are more at risk of developing kidney cancer
- **Workplace exposure to some chemicals, materials, or industrial processes** e.g., cadmium, lead, asbestos, trichloroethylene, blast furnaces or coke-ovens in the steel and coal industries
- **Certain medical conditions** such as kidney disease, kidney stones, high blood pressure and diabetes can increase your risk of developing kidney cancer²
- **Pain-relief medication**, such as paracetamol and non-steroidal anti-inflammatory drugs (NSAIDs), e.g., ibuprofen, may increase your risk of kidney cancer compared to

people who have never or rarely used these medications

- **Genetics** (passed down in your family) are a risk factor for some renal cancers, e.g., von Hippel-Lindau syndrome, Birt-Hogg-Dube syndrome, familial clear cell carcinoma, tuberous sclerosis, hereditary papillary RCC. It is thought that 2-4% of RCC is hereditary²
- Having a **congenital (born with) defect** of your kidney, e.g., horseshoe kidney - when both kidneys are fused at one pole
- Having a **genetic disorder of the kidney** e.g., polycystic kidney - a disorder in which multiple cysts grow usually in both kidneys²

Symptoms

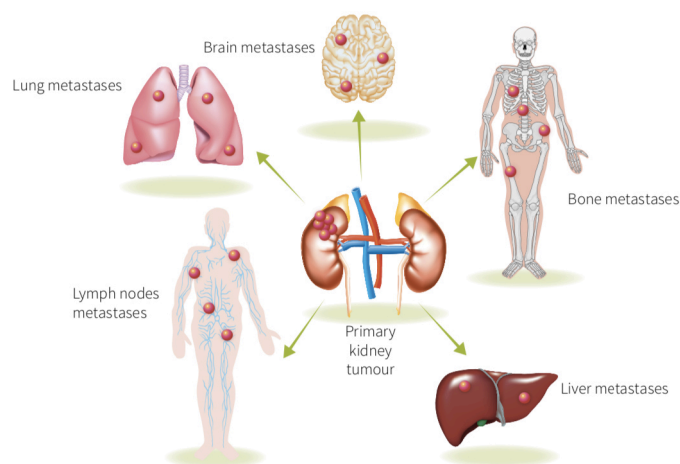
Symptoms of RCC are often similar to those caused by urinary tract infections or stones in the bladder or kidneys. However, it is important to have any of the symptoms mentioned below checked by your doctor, because the earlier RCC is diagnosed, the more likely it is to be treated. Some people do not show any of these symptoms, while others may experience a number of them. Symptoms of RCC include:

- The most common symptom is blood in the urine (haematuria), which may appear suddenly and may come and go. The urine may look pink, red or brown and you may see streaks of blood or blood clots. It is important to have blood in the urine checked by your doctor immediately. Sometimes the blood cannot be seen (microscopic haematuria) and is picked up when you have your urine tested
- A lump in the tummy (abdomen) or the side of the body between the ribs and hips (also called the flank)
- Pain or cramps in the flank/mid back
- Painful spasms in the area around the bladder caused by blood clots
- Raised temperature for an unknown reason that doesn't go away
- Night sweats

- Extreme tiredness (fatigue) and lack of energy
- Unexplained weight loss
- High blood pressure
- Swollen arms or legs
- Persistent cough
- Swelling of the veins around the testicle (varicocele) can be a sign of kidney cancer in men.

Often kidney cancer in its early stages has no signs or symptoms. In these cases, kidney cancer is found by accident on an ultrasound or CT scan carried out for other reasons or to investigate symptoms, such as high blood pressure, weight loss, high temperature, problems with muscles or nerves in the body, or abnormal blood tests.

Around 20% of patients don't find out they have RCC until their cancer has already spread beyond the kidney capsule (metastatic disease) and they have symptoms such as shortness of breath, coughing up blood (haemoptysis), bone pain, or bone fracture⁴. RCC most commonly spreads to the lymph nodes, lungs, bone and brain.



For information about the kidneys, diagnosis of kidney cancer, staging and grading, surgery and treatment for kidney cancer, please see the relevant *Essential guides*.

Further reading

- **Action Kidney Cancer:**
<https://actionkidneycancer.org>
- **Cancer Research UK:**
<https://www.cancerresearchuk.org/about-cancer/kidney-cancer>
- **Macmillan:**
<https://www.cancerresearchuk.org/about-cancer/kidney-cancer>
- **NHS:**
<https://uroweb.org/guideline/renal-cell-carcinoma/#3>
- **European Association of Urology (EAU)**
Renal Cell Carcinoma guidelines, 7. Disease management. <https://uroweb.org/guideline/renal-cell-carcinoma/#3>

¹Thompson RH, Kurta JM, Kaag M, et al. Tumour size is associated with malignant potential in renal cell carcinoma. J Urol 2009; 181 (5): 2033-2036. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2734327/>

²Cancer Research UK, kidney cancer statistics 2014. <http://www.cancerresearchuk.org/cancer-info/cancerstats/types/kidney/uk-kidney-cancer-statistics>

³Bergstrom A, Pisani P, Tenet V et al. Overweight as an avoidable cause of cancer in Europe. Int J Cancer 2001; 91: 421-30.

⁴Cancer survival in England – [Office for National Statistics](https://www.gov.uk/government/statistics/cancer-survival-in-england).



Please see the Action Kidney Cancer glossary for definitions of the medical and scientific terms used in this Action Kidney Cancer Essential Guide:

<https://actionkidneycancer.org/glossary/>

Acknowledgements

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