

A female doctor with curly brown hair, wearing a white lab coat over a grey sweater, is sitting and talking to a patient. The patient is seen from the back, wearing a blue shirt. They are in a clinical setting with a computer monitor and some charts visible in the background.

Kidney cancer

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This information was produced by the European Association of Urology.

This leaflet contains general information about kidney cancer. If you have any specific questions about an individual medical situation you should consult your doctor or other professional healthcare provider. No leaflet can replace a personal conversation with your doctor.

For detailed information about kidney cancer, diagnosis and treatment, please visit www.patients.uroweb.org.

The content of this leaflet is in line with the EAU Guidelines on Renal Cell Carcinoma 2017

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Kidney cancer

What is kidney cancer?

Kidney cancer is a malignant cell growth (a tumour) in the kidneys. Its medical name is renal cell carcinoma. A tumour in the kidney can also be benign (non-cancerous).

Kidney cancer is a general term. There are many variations of tumours in the kidney and stages of the disease. Your treatment and experience depend on the specific characteristics of the tumour and the expertise of your medical team.

Kidney cancer represents around 2% of all cancer diagnoses worldwide. In the last twenty years, the number of cases of kidney cancer worldwide has increased slightly, but the survival rate has also gone up in most of the region. Because of the more frequent use and improvements in ultrasound and CT imaging technology, more kidney cancers are now diagnosed at an earlier stage.

Men are more likely to be diagnosed with kidney cancer than women. Most people are diagnosed between the ages of 60 and 70.

Stages of kidney cancer

There are different stages of kidney cancer. If the tumour is limited to the kidney and has not spread, this is called localised kidney cancer. In locally advanced kidney cancer, the tumour has grown out of the kidney into surrounding tissue and invaded veins, the adrenal gland, or lymph nodes. Doctors speak of metastatic disease if the cancer has spread either to distant lymph nodes or other organs.

Risk factors for kidney cancer

The causes of kidney cancer are often difficult to determine. General risk factors are smoking and obesity.

Having a first-degree relative with kidney cancer or high blood pressure are also potential risk factors. Certain lifestyle changes, most importantly quitting smoking and keeping a healthy weight, may reduce the risk of developing kidney cancer.

What is the function of the kidneys?

The kidneys are two bean-shaped organs in the back of the abdomen which filter your blood and produce urine. They are important for various processes in the body, including regulating your blood pressure, the production of blood cells, and keeping your bones healthy (**Fig. 1**).

Symptoms

In most cases kidney cancer is asymptomatic, which means that there are no clear symptoms to indicate it. Most kidney tumours are found during a routine ultrasound or a similar imaging procedure for other conditions such as back pain.

About 1 in 10 people do experience symptoms like pain in the side of the body, abdominal mass or blood in the urine. This could be a sign that the disease has advanced. Some people can also experience so-called paraneoplastic syndromes. These are reactions the body can have to any type of cancer and may include high blood pressure, weight loss, fever, anaemia, muscle mass loss, and loss of appetite. Syndromes more commonly associated with kidney cancer include changes in liver enzymes and blood platelets. These changes

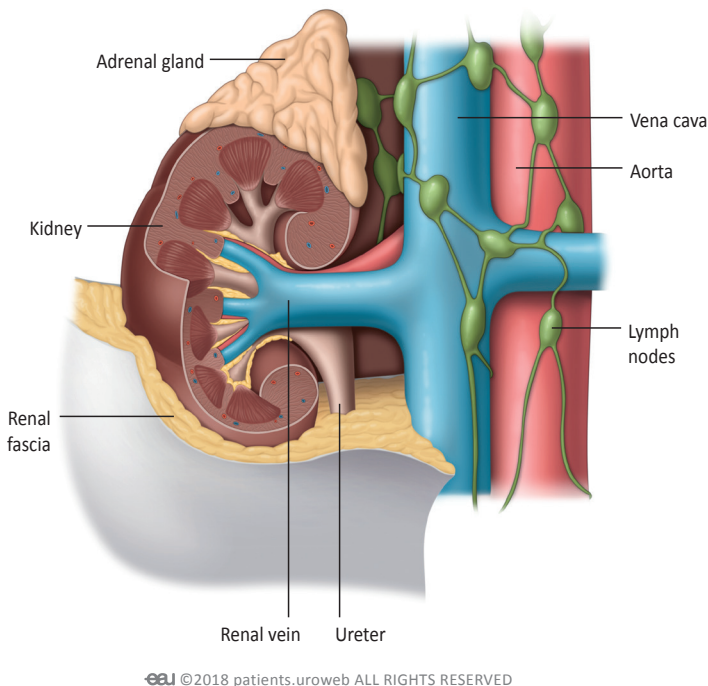


Fig. 1: A kidney and its surrounding tissue, veins, and arteries.

are usually discovered during tests and normally do not cause any symptoms.

Bone pain or a persistent cough could be signs that the cancer has spread through the body. This is known as metastatic disease.

Diagnosis

Because there are several types of kidney tumours, the doctor does a series of tests to better understand your specific situation. These tests include a medical history, laboratory tests and scans. Sometimes a family history is also taken. A CT scan or MRI scan will reveal the size of the tumour and if it has invaded local veins, lymph nodes, or surrounding organs. This is important to determine further treatment. The doctor may also perform a physical examination and take blood and urine for testing.

With the results of your scan, the urologist can define the stage of the disease. By analysing tumour tissue, received either during surgery or biopsy, the pathologist determines the subtype of the tumour and whether or not it is an aggressive form. Together, the stage, subtype, and aggressiveness of the tumour form the classification.

Classification of the kidney tumour is used to estimate your individual prognosis. Based on this individual prognosis your doctor will discuss the best treatment pathway for you.

In some cases you may need additional tests to check your kidney function. This is important if you only have one kidney or if you are at risk of kidney failure because you have diabetes, high blood pressure, chronic infections, or a kidney disease.

Imaging is important for the diagnosis and classification of kidney tumours. Most common imaging techniques are ultrasound, CT scans, and MRI. In some cases a biopsy is done to get more insight into the specific characteristics of the tumour.

Contrast-enhanced scan

After a tumour is detected, the doctor first needs to know whether it is malignant. A contrast-enhanced ultrasound, CT, or MRI scan of the abdomen and pelvis provides information about this. CT and MRI scans also show:

- The location and size of the tumour
- Whether or not you have enlarged lymph nodes

- Whether or not the tumour has spread to neighbouring organs, such as the adrenal gland, liver, spleen or pancreas
- Whether the urinary tract is affected by the tumour

For a contrast-enhanced scan, a contrast medium is administered through an IV, usually in your arm. The contrast medium highlights your veins and arteries by giving them a different colour in the pictures taken during the scan. This type of scan allows the radiologist to analyse the tumour. The results will guide the treatment you receive.

If you are allergic to contrast medium, you will receive an MRI or CT scan without contrast-enhancement.

If your doctor thinks the cancer may have spread to the lungs, you will get further tests, like a CT scan. You may need a bone or brain scan if you have symptoms such as bone pain or epileptic seizures. These scans are done to see whether the cancer has spread to bones or the brain.

Renal tumour biopsy

During a renal tumour biopsy, one or more samples of tumour tissue are taken. First, you receive local anaesthesia. Then the doctor inserts a needle through your skin and uses ultrasound or CT imaging to locate the tumour. The tissue samples are analysed by the pathologist in order to help determine future treatment.

Renal biopsy is not standard procedure in the diagnosis of kidney cancer. You may need a biopsy in case:

- The results of your scan are not clear enough
- You have a small tumour which could be treated with active surveillance
- You have a small tumour which could be treated with radiofrequency ablation or cryotherapy

Biopsies may cause blood in the urine. In rare cases, they can cause more severe bleeding. A renal tumour biopsy is generally a harmless procedure.

Classification

Kidney tumours are classified according to their stage, subtype, and the grade of aggressiveness of the tumour cells. These three elements are the basis for your possible treatment pathway.

Staging system

Tumour stage indicates how advanced the tumour is and whether or not there are metastases in the lymph nodes or other organs.

Kidney tumour stage is based on the Tumour Node Metastasis (TNM) classification. The urologist looks at the size and invasiveness of the tumour (T) and determines how advanced it is, based on 4 stages. Whether any lymph nodes are affected (N) or if the cancer has spread to any other parts of your body (M) is also checked. If kidney tumours metastasise they generally spread to the lungs, or to the bones or brain. Figures 1 to 5 illustrate the different stages.

Tumour subtype

Next to staging, the subtype of kidney tumours is important. The subtype is determined by a pathologist and the procedure is known as histopathological analysis. The specialist examines the tumour tissue either taken during a biopsy or after it has been removed during surgery. Renal biopsy is not a standard procedure in the diagnosis of kidney cancer. In most cases, the subtype of your tumour will not be known until after you have surgery.

There are various subtypes of kidney tumours. Most kidney tumours are renal cell carcinomas. Of these, the most common subtype is clear cell renal cell carcinoma.

If you are diagnosed with a rare kidney tumour your doctor will give you detailed information about different treatment possibilities. These may differ from therapy for the more common kidney cancer subtypes. Treatment options are discussed by a multidisciplinary team of doctors, to find the best approach for you (See: The medical team).

Benign tumours

Some tumours in the kidney are non-cancerous. These are known as benign kidney tumours. The most common benign tumours of the kidney are oncocytomas and angiomyolipomas.

Oncocytomas are generally diagnosed after histopathological analysis, because scans cannot always identify them clearly. The most common treatment options for these tumours are partial nephrectomy and active surveillance. Read more about these treatment options in the section Localised Kidney Cancer.

An angiomyolipomas (AML) is a benign tumour and more likely to occur in women. It is generally diagnosed after ultrasound, CT or MRI scans, or if the tumour bleeds and causes symptoms. Although AML is a benign tumour, the risk of spontaneous bleeding in the kidney increases if it continues to grow.

Surgery to remove the tumour is recommended if:

- You have a large AML (a tumour larger than 4 cm)
- You are a woman under the age of 45
- The tumour causes symptoms
- It is difficult for you to visit your doctor in case of emergency, because you live far away from a hospital or you have limited mobility.

Generally, an AML is removed with partial nephrectomy but in some cases it may be necessary to remove the whole kidney.

Radical nephrectomy is recommended in case of severe bleeding of the tumour.

Renal cysts

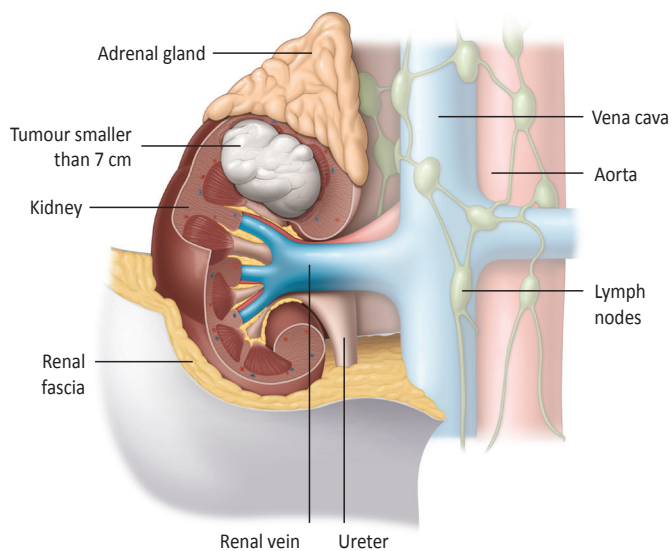
Some masses in the kidney are not tumours but renal cysts. These are sacs filled with fluid located on the kidney and are easily recognised on a CT scan. Cysts can be malignant. If this is the case they need to be removed by surgery.

Grading system

The third component of the classification is an evaluation of how aggressive the tumour cells are. The Fuhrman nuclear grade is the most commonly used system to determine this. The pathologist classifies your tumour in 1 of 4 grades.

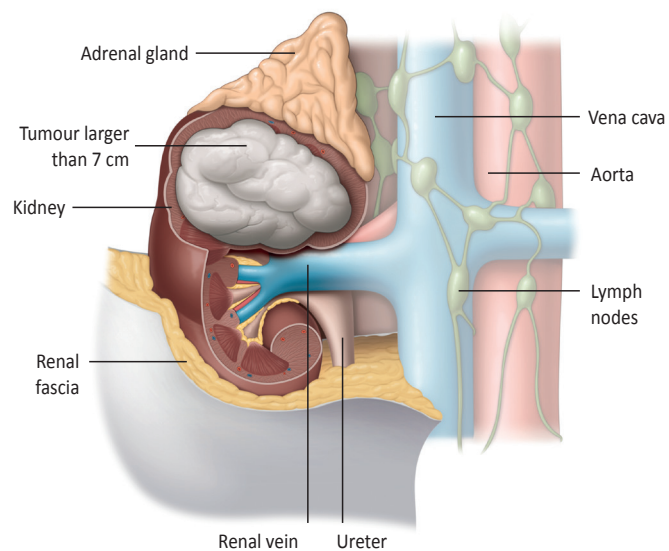
Individual prognosis

After diagnosis and classification, your doctor will discuss different treatment and follow-up options with you. The recommended treatment pathway is based on the TNM staging, the Fuhrman grade, and the subtype of the tumour. Your individual prognosis can also be estimated after classification. However, keep in mind that this is a prediction which does not take into account any unexpected developments.



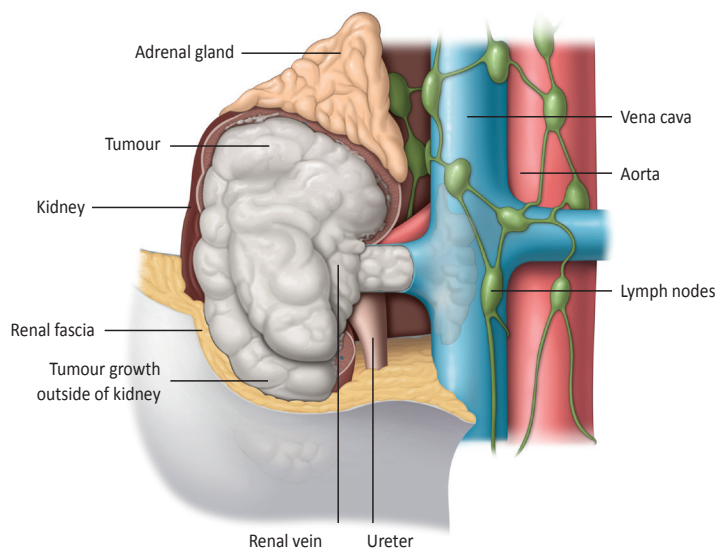
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Fig. 2: A stage I kidney tumour is a tumour up to 7 cm, limited to the kidney.



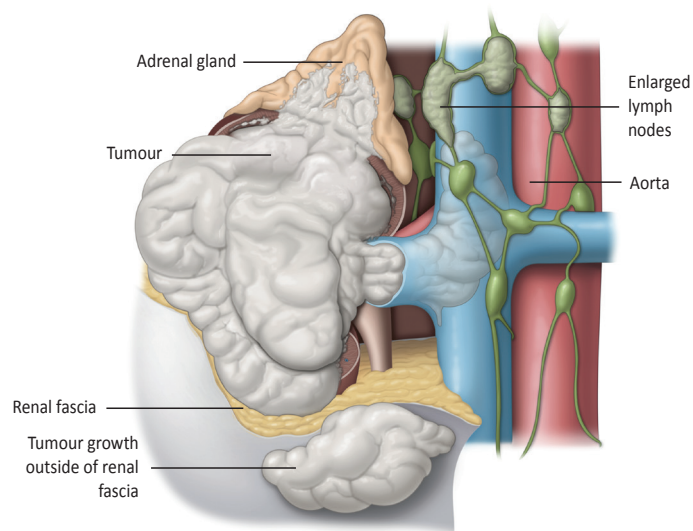
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Fig. 3: Stage II tumours are still limited to the kidney, but are larger than 7 cm.



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Fig. 4: Stage III tumours have spread into the renal vein, the fatty tissue next to the kidney (perirenal fat), or the vena cava.



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Fig. 5: Stage IV tumours have spread further outside of the kidney, beyond the renal fascia and into the adrenal gland. Sometimes, one or more lymph nodes are enlarged in this stage.

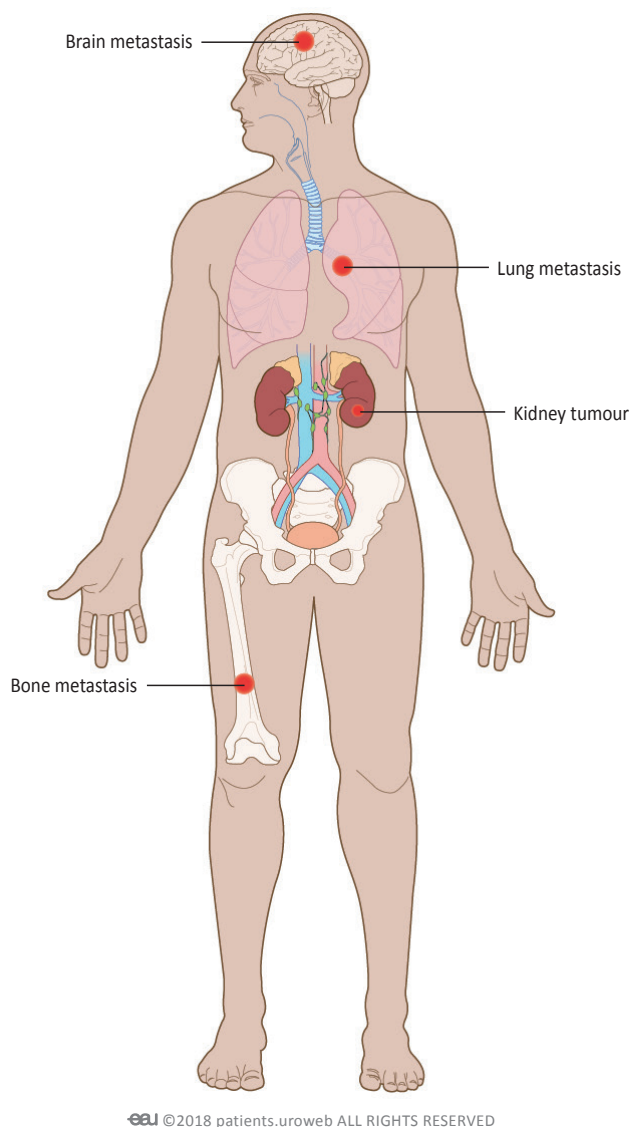


Fig. 5: Metastatic kidney cancer can spread to the lungs, bones, or brain.

The medical team

- Urologist: a urologist specialises in health and diseases of the urinary tract
- Oncologist: an oncologist specialises in all types of cancer
- Onco-urologist: an onco-urologist specialises in urological cancers of, for instance, the bladder, kidney, prostate, or testicles
- Pathologist: a pathologist studies tissue, blood, or urine to understand the specific characteristics of diseases. In cancer treatment, the pathologist helps with the classification of tumours
- Radiologist: a radiologist specialises in imaging techniques and analyses ultrasound, T, MRI, or other scans done to diagnose or monitor a tumour

Treatment

If you are diagnosed with localised kidney cancer, your doctor can recommend treating the cancer with partial nephrectomy, radical nephrectomy, active surveillance, radiofrequency ablation, or cryotherapy. Each procedure has its own advantages and disadvantages. The choice of treatment depends on your individual situation.

If you are diagnosed with locally-advanced kidney cancer, your doctor can recommend to treat the cancer with radical nephrectomy or embolisation. Each procedure has its own advantages and disadvantages. The choice of treatment depends on your individual situation.

Kidney tumours can spread to other organs or distant lymph nodes. This is called metastatic disease. In metastatic disease, the kidney tumour is referred to as the primary tumour and the tumours in other organs are called metastases. Your doctor may recommend to treat metastatic disease with surgery, usually in combination with antiangiogenic therapy, also known as targeted therapy. In rare cases, immunotherapy is also used. For the treatment of metastases, radiotherapy may be recommended.

Generally, metastatic disease cannot be cured. The treatment of metastatic disease aims to reduce the size of the primary tumour and the metastases. This will give you the chance to live longer and have fewer symptoms.

Palliative care

Sometimes recovery from kidney cancer is not possible. When treatment is no longer successful you may be offered palliative care to make you more comfortable. Palliative care is a concept of care with the goal to optimise your quality of life if you cannot recover from your illness.

Glossary of terms

Active surveillance

A form of treatment in which the doctor actively monitors the tumour or tumours and their growth, based on a strict visiting schedule. For each visit, CT, ultrasound or x-rays are taken, and other appropriate exams may be performed.

Adrenal gland

The adrenal glands are organs that sit at the top of the kidneys. They are responsible for releasing hormones.

Anaemia

A lowered level of red blood cells. It is the most common disorder of the blood. It causes fatigue, weakness and poor concentration, among others.

Anaesthesia

Before a procedure you will get medication to make sure that you don't feel pain. Under general anaesthesia you are unconscious and unaware of what is happening to you. Under spinal or local anaesthesia you will not feel pain in the part of your body where the procedure is done. Anaesthesia wears off gradually after the procedure.

Antiangiogenic therapy

Therapy with drugs which prevent the formation of new blood vessels that feed a tumour and allow it to grow.

Asymptomatic

Any condition which does not cause symptoms and is discovered incidentally.

Benign tumour

A non-cancerous growth which will not spread to other organs.

Biopsy

A medical procedure in which a small piece of tissue is removed from the body to examine it. This is done to get information for diagnosing, monitoring, and treatment.

Clear cell renal cell carcinoma

A type of kidney tumour with a high content of fat.

Cryotherapy

Is the use of low temperatures in medical therapy, to treat either benign or malignant cell growth.

Computed tomography (CT)

Imaging technique that makes a series of x-ray images of the body.

Diagnosis

The doctor and nurses do a series of tests to understand what causes your symptoms.

Embolisation

A non-surgical, minimally-invasive procedure in which a blood vessel is blocked to prevent the blood flow from reaching a tumour.

Enzyme

Large biological molecules that are responsible for the processes of the metabolism.

Fatty tissue

A type of connective tissue made of cells which store fat. Also called adipose tissue.

Fuhrman nuclear grade

Analysing the aggressiveness of a tumour based on the structure of its cells.

Histopathological analysis

The examination of tissue under a microscope, to study the presence and characteristics of diseases such as cancer.

Imaging

Taking images of the body with ultrasound, x-ray or other scanning techniques.

Immunotherapy

A type of cancer treatment which boosts the immune system to fight tumour cells.

Kidneys

Two bean-shaped organs in the back of the abdomen that filter the blood and produce urine.

Localised kidney cancer

A kidney cancer where the tumour is limited to the kidney and has not spread.

Glossary of terms

Locally-advanced kidney cancer

A cancer where the tumour has grown out of the kidneys into surrounding tissue and invaded veins, the adrenal gland, or lymph nodes.

Lymph nodes

Small oval-shaped organs that play a role in regulating how the immune system responds.

Metastatic disease

When a tumour has spread to other organs or lymph nodes.

MRI scan

Magnetic Resonance Imaging is a technique in which strong magnetic fields and radio waves are used to make images of the body.

Multidisciplinary

A combination of different branches of expertise. In medicine, it means that for instance urologists, oncologists, psychologists or other medical specialists work together.

Palliative care

A concept of care with the goal to optimise your quality of life if you cannot recover from your illness. It involves physical, psychological, social, and spiritual issues.

Paraneoplastic syndromes

Reactions that the body can have to any type of cancer and may include high blood pressure, weight loss, fever, anaemia, muscle mass loss, and loss of appetite.

Partial nephrectomy

A surgical procedure in which a part of the kidney is removed.

Pathologist

A medical professional who studies tissue, blood, or urine to understand the specific characteristics of diseases. In cancer treatment, the pathologist helps with the diagnosis and classification of tumours.

Perirenal fat

The fat that surrounds the kidney.

Primary tumour

The malignant cell growth located where the tumour first began to develop.

Prognosis

The medical term for predicting the likely outcome of health after treatment.

Radical nephrectomy

A surgical procedure in which the entire kidney is removed.

Radiofrequency ablation

A medical procedure which uses the heat generated from high-frequency currents to treat kidney tumours.

Radiologist

A medical professional who specialises in imaging techniques. In cancer, the radiologist analyses x-ray, ultrasound, CT, MRI, or other scans to diagnose or monitor the tumour.

Renal

Related to the kidneys.

Renal cell carcinoma

Medical name of kidney cancer.

Renal cyst

Fluid-filled sacs located on the kidney. Cysts can be malignant.

Renal fascia

Also called Gerota's fascia, it is a layer of connective tissue that surrounds the kidneys.

Renal vein

This is the vein that carries the blood filtered by the kidney back into the body.

Targeted therapy

These are drugs that target the mechanisms that cancer cells use to grow.

TNM classification

The Tumour Node Metastasis (TNM) classification is an international classification used to classify tumours according to the size and invasiveness of the tumour (T), whether any lymph nodes are affected (N) and if the cancer has spread to any other parts of your body (M).

Glossary of terms

Treatment pathway

One of the main management tools for doctors. The different tasks or interventions are defined, optimized and set in a specific order. With this the medical team can work on the health of a patient together.

Tumour stage

This refers to how extended a cancer is in the body. It is usually based on the size of the tumour and whether the tumour has spread to the lymph nodes or other organs.

Ultrasound

Imaging technique that uses high-frequency sounds to make an image of the inside of the body.

Urologist

A medical professional specialized in health and diseases of the urinary tract and the genitals.

Vena Cava

The large vein that returns blood with low oxygen from the body into the heart.

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