

Chronic Kidney Disease

Chronic kidney disease (CKD) means that your kidneys are not working as well as they once did. Various conditions can cause CKD. Severity can vary but most cases are: mild or moderate, occur in older people, do not cause symptoms and do not progress to kidney failure. People with any stage of CKD have an increased risk of developing heart disease or a stroke. This is why it is important to detect even mild CKD, as treatment may not only slow down the progression of the disease, but also reduces the risk of developing heart disease or stroke.

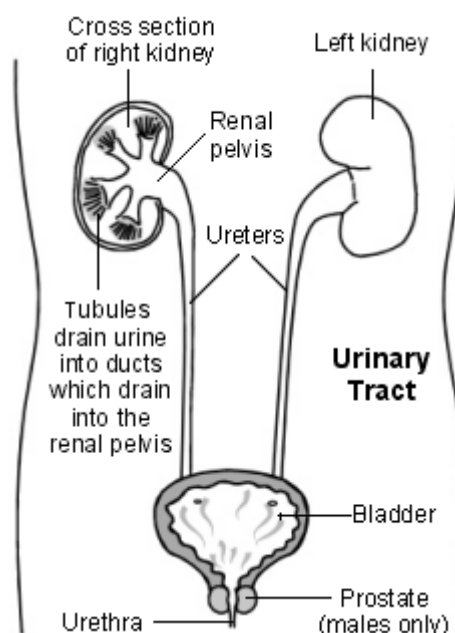
A separate leaflet in this series, called '*Mild-to-moderate Chronic Kidney Disease*', is more appropriate if you have mild or moderate CKD (stage 1, 2 or 3 CKD).

Understanding the kidneys and urine

The two kidneys lie to the sides of the upper abdomen (the loins), behind the intestines, and either side of the spine. Each kidney is about the size of a large orange, but bean-shaped.

A large artery - the renal artery - takes blood to each kidney. The artery divides into many tiny blood vessels (capillaries) throughout the kidney. In the outer part of the kidneys tiny blood vessels cluster together to form structures called glomeruli.

Each glomerulus is like a filter. The structure of the glomerulus allows waste products and some water and salt to pass from the blood into a tiny channel called a tubule. The liquid that remains at the end of each tubule is called urine. The urine then passes down a tube called a ureter which goes from each kidney to the bladder. Urine is stored in the bladder until it is passed out when we go to the toilet.



The main functions of the kidneys are to:

- Filter out waste products from the bloodstream, to be passed out in the urine.
- Help control blood pressure - partly by the amount of water passed out of the body as urine and partly by making hormones which are involved in blood pressure control.
- Make a hormone called erythropoietin (epo) which stimulates the bone marrow to make red blood cells. This is needed to prevent anaemia.
- Help keep various salts and chemicals in the blood at the right level.

What is chronic kidney disease?

CKD means that your kidneys are diseased or damaged in some way, or are ageing. As a result, your kidneys may not work as well as they used to. So, the various functions of the kidney, as described in the previous section, can be affected. A whole range of conditions can cause CKD (see later).

Some terms explained:

- **Chronic** means ongoing (persistent or long-term). It does not mean severe as some people think. You can have a mild chronic disease. Many people have mild CKD.

- **Renal** means relating to the kidney.
- **Chronic renal failure** is a term that is sometimes used but means much the same as CKD. CKD is a better term as the word failure implies that the kidneys have totally stopped working. In most cases of CKD this is not so. In most people who have CKD there is only a mild or moderate reduction in kidney function, which usually does not cause symptoms, and the kidneys have not 'failed'.
- **Acute renal failure** means that the function of the kidneys is rapidly affected - over hours or days. For example, the kidneys may go into acute renal failure if you have a serious blood infection which can affect the kidneys. This is in contrast to CKD where the decline in function of the kidneys is very gradual - over months or years. Acute renal failure is not dealt with further in this article.

How is chronic kidney disease diagnosed?

A simple blood test can estimate the volume of blood that is filtered by the glomeruli in your kidneys over a given period of time. This test is called the estimated glomerular filtration rate (eGFR). A normal eGFR is 90 ml/min/1.73 m or more. If some of the glomeruli (the tiny filters in the kidneys) do not filter as much as normal, then the kidney is said to have reduced or impaired kidney function.

The eGFR test involves a blood test which measures a chemical called creatinine. Creatinine is a breakdown product of muscle. Creatinine is normally cleared from the blood by the kidneys. If your kidneys are not working so well and the glomeruli are not filtering as much blood as normal, the level of creatinine in the blood goes up.

The eGFR is calculated from your age, sex and blood creatinine level. An adjustment to the calculation is needed for people with African-Caribbean origin.

CKD is diagnosed by the eGFR and other factors, and is divided into five stages:

Stage of Chronic Kidney Disease	eGFR ml/min/1.73 m
Stage 1: the eGFR shows normal kidney <i>function</i> but you are already known to have some kidney damage or disease. For example, you may have some protein or blood in your urine, an abnormality of your kidney, kidney inflammation, etc.	90 or more
Stage 2: mildly reduced kidney function AND you are already known to have some kidney damage or disease. People with an eGFR of 60-89 without any known kidney damage or disease are not considered to have CKD.	60 to 89
Stage 3: moderately reduced kidney function. (With or without a known kidney disease. For example, an elderly person with ageing kidneys may have reduced kidney function without a specific known kidney disease.)	45 to 59 (3A) 30 to 44 (3B)
Stage 4: severely reduced kidney function. (With or without known kidney disease.)	15 to 29
Stage 5: very severely reduced kidney function. This is sometimes called end-stage kidney failure or established renal failure.	Less than 15

Note: it is normal for your eGFR to change slightly from one measurement to the next. In some cases these changes may actually be large enough to move you from one stage of CKD to another and then back again. However, as long as your eGFR is not getting progressively worse, it is the average value that is most important.

Who has the estimated glomerular filtration rate test?

The eGFR blood test is commonly done as a routine part of monitoring people with kidney diseases or with conditions that can affect the kidneys, such as diabetes or high blood pressure. It is also often done as a routine test in many medical situations. If you are found to have CKD then the eGFR test is usually done at regular intervals to monitor your kidney function.

How common is chronic kidney disease?

About 1 in 10 people has some degree of CKD. It can develop at any age and various conditions can lead to CKD. It becomes more common with increasing age and is more common in women.

Although about half of people aged 75 or more have some degree of CKD, most of these people do not actually have diseases of their kidneys; they have normal ageing of their kidneys.

Most cases of CKD are mild or moderate.

What causes chronic kidney disease?

A number of conditions can cause permanent damage to the kidneys and/or affect the function of the kidneys and lead to CKD. Three common causes in the UK, which probably account for about 3 in 4 cases of CKD in adults, are:

- **Diabetes.** Diabetic kidney disease is a common complication of diabetes.
- **High blood pressure.** Untreated or poorly treated high blood pressure is a major cause of CKD. However, CKD can also *cause* high blood pressure, as the kidney has a role in blood pressure regulation. About nine out of ten people with CKD stages 3-5 have high blood pressure.
- **Ageing kidneys.** There appears to be an age-related decline in kidney function. About half of people aged 75 or more have some degree of CKD. In most of these cases the CKD does not progress beyond the moderate stage unless other problems of the kidney develop, such as diabetic kidney disease.

Other less common conditions that can cause CKD include: diseases of the glomeruli, such as glomerulonephritis (inflammation of the glomeruli in the kidneys); renal artery stenosis (narrowing), haemolytic-uraemic syndrome, polycystic kidney disease, blockages to the flow of urine, drug-induced and toxin-induced kidney damage, and repeated kidney infections. However, this list is not complete and there are many other uncommon causes.

What are the symptoms of chronic kidney disease?

You are unlikely to feel unwell or have symptoms with mild-to-moderate CKD - that is, stages 1 to 3. (However, there may be symptoms of an underlying condition such as kidney pain with certain kidney conditions.) CKD is usually diagnosed by the eGFR test before any symptoms develop.

Symptoms tend to develop when CKD becomes severe (stage 4) or worse. The symptoms at first tend to be vague and nonspecific, such as feeling tired, having less energy than usual, and just not feeling well. With more severe CKD, symptoms that may develop include:

- Difficulty thinking clearly.
- A poor appetite.
- Weight loss.
- Dry, itchy skin.
- Muscle cramps.

- Fluid retention which causes swollen feet and ankles.
- Puffiness around the eyes.
- Need to pass urine more often than usual.
- Being pale due to anaemia.
- Feeling sick.

If the kidney function declines to stage 4 or 5 then various other problems may develop. For example, anaemia and an imbalance of calcium, phosphate and other chemicals in the bloodstream. These can cause various symptoms, such as tiredness due to anaemia, and bone thinning or fractures due to calcium and phosphate imbalance. End-stage renal failure (stage 5) is eventually fatal unless treated.

Do I need any further tests?

As mentioned, the eGFR test is done to diagnose and monitor the progression and severity of CKD. For example, it should be done routinely at least once a year in people with stages 1 and 2 CKD, and more frequently if you have stage 3, 4 or 5 CKD.

You are likely to have routine urine dipstick tests from time to time to check for blood and protein in the urine. Also, blood tests may be done from time to time to check on your blood level of chemicals such as sodium, potassium, calcium and phosphate. The need for other tests then depends on various factors and your doctor will advise. For example:

- An ultrasound scan of the kidneys or a kidney biopsy may be advised if certain kidney conditions are suspected. For example, if you have a lot of protein or blood in your urine, if you have pain that seems to be coming from a kidney, etc.
- A scan or a biopsy is not needed in most cases. This is because most people with CKD have a known cause for the impaired kidney function, such as a complication of diabetes, high blood pressure or ageing.
- If the CKD progresses to stage 3 or worse then various other tests may be done. For example, blood tests to check for anaemia and an altered level of parathyroid hormone (PTH). PTH is involved in the control of the blood level of calcium and phosphate.

What is the treatment for chronic kidney disease?

Treatment for most cases of CKD is usually done by GPs. This is because most cases are mild-to-moderate (stages 1-3) and do not require any specialist treatment. Your GP may refer you to a specialist if you develop stage 4 or 5 CKD, or at any stage if you have problems or symptoms that require specialist investigation.

Research studies have shown that, in many people, treatment at early stages of CKD can prevent or slow down progression through to eventual kidney failure.

The aims of treatment include:

- If possible, treat any underlying kidney condition.
- Prevent or slow down the progression of CKD.
- Reduce the risk of developing cardiovascular disease.
- Relieve symptoms and problems caused by CKD.

Treating any underlying kidney condition

There are various conditions that can cause CKD. For some of these there may be specific treatments for that particular condition. For example, good glucose control for people with diabetes, blood pressure control for people with high blood pressure, antibiotics for people with recurring kidney infections, surgery for people with a blockage to urine flow, etc.

Preventing or slowing down the progression of chronic kidney disease

Once CKD has developed, in many cases it tends gradually to become worse over months

or years. This can occur even if an underlying cause has been treated. You should have checks every now and then by your GP or practice nurse to monitor your kidney function (eGFR). They will also give you treatment and advice on how to prevent or slow down the progression of CKD. This usually includes:

- **Blood pressure control.** The most important treatment to prevent or delay the progression of CKD, whatever the underlying cause, is to keep your blood pressure well controlled. Most people with CKD will require medication to control their blood pressure. Your doctor will give you a target blood pressure level to aim for. This is usually below 130/80 mm Hg, and even lower in some circumstances.
- **Review of your medication.** Certain medicines can affect the kidneys as a side-effect which can make CKD worse. For example, if you have CKD you should not take anti-inflammatory medicines unless advised to by a doctor. You may also need to adjust the dose of certain medicines that you may take if your CKD gets worse.

Reducing the risk of developing cardiovascular disease

People with CKD have an increased risk of developing cardiovascular diseases, such as heart disease, stroke, and peripheral vascular disease. People with CKD are actually twenty times more likely to die from cardiovascular-related problems than from kidney failure. This is why reducing any other cardiovascular risk factors is so important. See separate leaflet called '*Preventing Cardiovascular Diseases*' for details. Briefly, this typically includes:

- Good control of blood pressure (and blood glucose level if you have diabetes).
- Medication to lower your cholesterol level - needed in many cases.
- Where relevant, to tackle lifestyle risk factors. This means to:
 - Stop smoking if you smoke and cut back if you drink a lot of alcohol.
 - Eat a healthy diet which includes a low salt intake.
 - Keep your weight and waist in check.
 - Take regular physical activity.

If you have high levels of protein in your urine then you may be advised to take medication even if your blood pressure is normal. A type of medication called an angiotensin-converting enzyme (ACE) inhibitor (for example, captopril, enalapril, ramipril, lisinopril) has been shown to be beneficial for some people with CKD, as it reduces the risk of cardiovascular disease and can prevent further worsening of the function of your kidneys.

Relieving symptoms and problems caused by chronic kidney disease

If CKD becomes severe you may need treatment to combat various problems caused by the poor kidney function. For example:

- Anaemia may develop which may need treatment with iron or erythropoietin ('epo') - a hormone normally made by the kidneys.
- Imbalances of calcium or phosphate in the blood may need treatment.
- You may be advised about how much fluid to drink, and how much salt to take.
- Other dietary advice may be given which can help to control factors such as the level of calcium and potassium in your body.

If end-stage kidney failure develops, you are likely to need kidney dialysis or a kidney transplant to survive.

People with stage 3 CKD or worse should be immunised against influenza each year, and have a one-off immunisation against pneumococcus. People with stage 4 CKD should be immunised against hepatitis B.

What is the outlook (prognosis)?

Stages 1-3 CKD (mild-to-moderate) are common, with most cases occurring in older people. It tends to get gradually worse over months or years. However, the rate of progression

varies from case to case, and often depends on the severity of any underlying condition. For example, some kidney conditions may cause your kidney function to get worse relatively quickly. However, in most cases CKD progresses only very slowly. Only a small number of people with CKD progresses to end-stage kidney failure (stage 5 CKD) that requires kidney dialysis or kidney transplant.

For many people with CKD there is a much higher risk of developing serious cardiovascular disease than of developing end-stage kidney failure.

In short ...

- attention to blood pressure control
- careful review of medications to make sure that the only ones used are those which put least strain on kidneys
- tackling factors that reduce your risk of developing cardiovascular diseases

can make a big difference to your outlook.

Further help and information

National Kidney Federation

The Point, Coach Road, Shireoaks, Worksop, Nottinghamshire S81 8BW
Helpline: 0845 601 0209 Web: www.kidney.org.uk

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Comprehensive patient resources are available at www.patient.co.uk

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