

# Dialysis – an introduction

This infoKID topic is for parents and carers about children's kidney conditions. Visit [www.infoKID.org.uk](http://www.infoKID.org.uk) to find more topics about conditions, tests & diagnosis, treatments and supporting information.

Each topic starts with an overview followed by several sections with more information.

[Links to sections](#) in topic | [Other topics](#) available on website

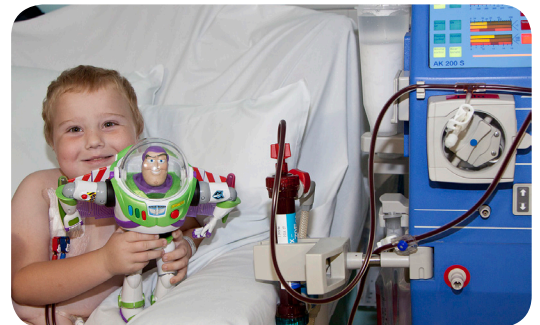
Dialysis is an important treatment for kidney failure – when the kidneys stop working properly. Dialysis uses special equipment to remove extra water and waste products from the blood. This partly replaces the work of healthy kidneys.

Your child may need dialysis if he or she is in kidney failure – this may happen suddenly or over time. There are two main types of dialysis – haemodialysis and peritoneal dialysis. Both of these require surgery before the dialysis can start. In many cases, families can decide the best type of dialysis for their child, in discussion with their healthcare team.

→ Dialysis is a life-saving treatment for children in kidney failure. Dialysis is a complex and time consuming treatment which will impact your family life. Your child's healthcare team will give you more information and support you and your child throughout treatment.

This topic covers:

- why and when your child may need dialysis
- how dialysis works
- the benefits, risks and alternatives
- your child's healthcare team
- introduction to two types of dialysis, to help you choose the best type for your child
- how to support your child on dialysis.



## Overview

### About the kidneys

The **urinary system** gets rid of things that the body no longer needs, so that we can grow and stay healthy.

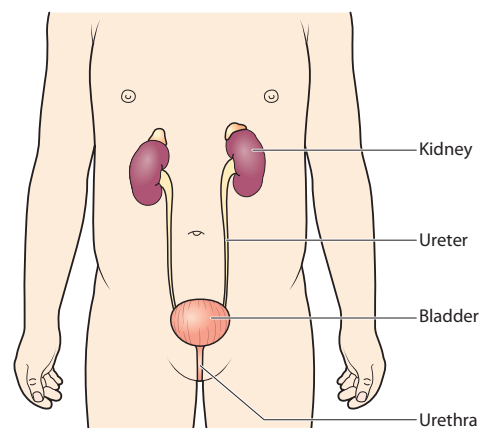
The **kidneys** are bean-shaped organs. They filter blood to remove extra water and waste in urine (wee). Most of us have two kidneys. They are on either side of our spine (backbone), near the bottom edge of our ribs at the back.

The two **ureters** are long tubes that carry urine from the kidneys to the bladder.

The **bladder** is a bag that stores urine until we are ready to urinate. It sits low down in the tummy area.

The urethra is a tube that carries urine from the bladder to the **outside** of the body.

» [More about the urinary system and kidneys](#)



## Why dialysis is needed

Your child may need dialysis if he or she is in kidney failure.

### About kidney failure

The term **kidney function** is used to describe how well the kidneys are working – especially how they filter blood and make urine. In kidney failure, the level of kidney function is too low to support the body. This may happen suddenly or over a long time.

- **Acute kidney injury (AKI)**: in AKI, the kidney function gets worse over a short period of time. Some children with severe AKI need dialysis for a few weeks or longer until their kidneys start working again.
- **Chronic kidney disease (CKD)**: in some children with CKD, the kidney function gets worse over a long period of time. CKD has five stages, and kidney failure happens in stage 5. It is also called **end stage renal failure (ESRF)** or **established renal failure**. Most children with stage 5 CKD need dialysis and/or a kidney transplant.

### About dialysis

Dialysis is one type of **renal replacement therapy**. This means it partly replaces the work of kidneys (“renal” means to do with the kidneys).

### What dialysis can do

The two main types of dialysis work in different ways, but their job is the same – to clean the blood. Dialysis removes extra water and waste products from the blood. If these are not removed, they might build up in the body and cause illness and **fluid overload** (too much water in the body). Dialysis also makes sure there is a balance of chemicals in the blood – especially **potassium**, which can be dangerous in large amounts – and that the blood is not too acidic.

Dialysis does about 10–15% of the work of healthy kidneys. However, this is enough to make sure the body keeps working.

Some children feel better after starting dialysis and/or have a better appetite. Your child will be assessed while he or she is on dialysis, and may need to continue restricting what he or she eats and drinks.

### What dialysis cannot do

Dialysis does not do *everything* that kidneys do – such as help keep bones healthy and make red blood cells. Your child will take medicines to help with this.

### Dialysis for your child

Your child’s healthcare team will work out the most suitable dialysis treatment for your child, after talking to you about your preferences, and working out your child’s individual health needs.

## Types of dialysis

There are two main types of dialysis.

- **Haemodialysis (HD)** – using a machine with an ‘artificial kidney’. Blood is pumped out of the body and into the artificial kidney, and the cleaned blood is returned to the body. Each dialysis session takes 3–4 hours, and is done three or more times a week. Haemodialysis usually takes place in the hospital, but some children are able to use haemodialysis at home.
- **Peritoneal dialysis (PD)** – using the **peritoneum**, which is the lining of the abdomen (tummy). A special fluid is put into the abdomen, where it sits for a few hours or longer while the peritoneum filters the blood. The used fluid is drained out of the body. This can take place overnight or several times a day.

For most children, all types of dialysis work equally well at removing waste and water from the blood. They differ in a few ways:

- where dialysis takes place – in the hospital or at home
- how often a dialysis session is required
- how long each dialysis session lasts
- surgery needed before the dialysis can start
- the risks and side-effects.

Your child’s healthcare team will give you information so you understand the benefits and risks of each type. In many cases, families can decide the best type of dialysis. However, a few children need a particular type.

» [More information about types of dialysis](#)

## Preparing for dialysis

Before dialysis can start, your child will need a procedure to get access to his or her body. This depends on the type of dialysis and how quickly it is needed.

### Haemodialysis

- A **central venous line** (or **line**) is a long, thin tube (**catheter**) that is placed into one of the large blood vessels in the body. This is usually in the neck or chest, or occasionally the groin.
- For short-term use, a temporary line can be placed. For long-term use, a **permanent line** can be placed in theatre, under general anaesthetic.
- Another option for long-term use is a **fistula** – two blood vessels are joined up to make one larger, stronger blood vessel. This is done several weeks before dialysis starts.

### Peritoneal dialysis

A **catheter** is placed through the tummy wall.

» [More about preparing for types of dialysis](#)

## Risks

Dialysis is a crucial, life-saving treatment for children in kidney failure. The vast majority of children with kidney failure are able to have this treatment. However it has side-effects, has an impact on your child's and family's lifestyle, and carries risks.

- The **catheter** – a long, thin tube that is inserted for some types of dialysis – may become infected. Your child's healthcare team will show you how to care for the catheter and the skin around it (**exit site**) to reduce this risk and check for signs of infection so it can be treated quickly.
- Some children feel more tired than usual after being on dialysis. There may be other side-effects and risks, depending on the type of dialysis.
- Dialysis is a complicated treatment, and it will have a large impact on your child's and family's lives. If your child has dialysis at home, you will be trained to use the equipment. If your child has dialysis at the hospital, he or she will need to travel to the dialysis unit three or more times a week.
- Dialysis, and living with kidney failure, can also have a huge emotional impact on a child and his or her family.

There are also some specific risks of each type of dialysis.

» [More about risks of each type of dialysis](#)

## Alternatives

### Kidney transplant

For children with **renal failure** (stage 5 CKD), the best treatment for kidney failure is a **kidney transplant**. However, having a kidney transplant depends on a suitable kidney donor – deceased or live – being available and the child being ready to have a kidney transplant. After a successful kidney transplant, and by taking medicines to protect their new kidney, children can live full and healthy lives.

The timing of kidney transplantation depends on many factors, including the availability of suitable donors. Some children need to have dialysis while they wait for this procedure. Babies and younger children under 2 years may need to wait until they grow large enough to have a kidney transplant.

## Conservative treatment

If children with kidney failure do not have dialysis or a kidney transplant, their kidneys will eventually stop working until they can no longer support the body, and these children will eventually die. This is called **conservative treatment** or **palliative treatment**. Children are made as comfortable as possible – but may continue taking medicines and restricting their diet and fluid intake to manage symptoms.

A very small number of babies and children with kidney failure may not benefit from dialysis. Choosing not to start or continue with dialysis is a very difficult and personal decision. Your child's healthcare team will support you and your family throughout this time.

## Paediatric renal unit and dialysis team

Your child's **paediatric renal unit** – a specialised unit for children with kidney conditions – will manage your child's dialysis. If your child is having haemodialysis at the hospital, it will take place here.

You will be introduced to a team of healthcare professionals who will support your child and family throughout his or her dialysis. Your child will continue to be looked after by a **paediatric nephrologist**, as well as **renal nurses**, who specialise in looking after children on dialysis and will check that your child is growing and they are as healthy as possible.

» [Read more on the next page](#)

## Supporting your child

Dialysis can be a difficult and stressful experience for your child and the whole family. You and your child will learn more over time about how to help live with dialysis.

Your child's healthcare team is there to help you. They can provide support with your child's education, accessing financial benefits and planning holidays around dialysis.

Speaking with other families of children on dialysis can also be a huge support.

→ [If you have any concerns or need additional support, speak with your doctor or nurse.](#)

» [More information about supporting your child and the future](#)

### Hospital visits

A team of healthcare professionals may:

- check your child's **kidney function** (how well his or her kidneys are working)
- measure how much your child is drinking and how much urine he or she is passing
- test your child's **urine** with a dipstick
- check your child's **blood pressure**.

### Healthcare team

Your child's healthcare team may include a:

- **paediatrician** – a doctor who treats babies, children and young people
- **paediatric nephrologist** – a doctor who treats children with kidney problems
- **paediatric surgeon** – a healthcare professional who treats children using surgery (operations)

- **radiologist** – a healthcare professional who uses **imaging tests** (scans) to help identify a condition
- **renal nurse** – a nurse who cares for children with kidney problems
- **renal dietitian** – a healthcare professional who advises what your child should eat and drink during different stages of a kidney condition
- **renal social worker** – a professional who supports you and your family, especially with any concerns about money, travel and housing related to looking after your child with kidney disease
- **renal psychologist** – a healthcare professional who supports your child and family, especially with emotional stresses and strains from having to look after a child with kidney disease
- **play specialist** – a professional who uses dolls and other toys to help your child prepare for procedures, such as blood tests and dialysis

## Types of dialysis

There are two main types of dialysis – haemodialysis and peritoneal dialysis. (These are also called different modalities.) Both types remove waste and water from the blood.

This section gives an introduction to these two types of dialysis, so you understand the benefits and risks of each type, and the surgery that is needed. In many cases, you will be able to decide the best type of dialysis for your child.

### What to consider

The types of dialysis differ in important ways, and there are many things to consider as you and your child decide on the most suitable type. These include:

- where the dialysis takes place – in the hospital or at home
- whether you and/or other family members or carers are able to carry out the dialysis
- whether your house or flat is suited for dialysis at home, and whether any modifications are needed
- how often your child needs a dialysis session
- how long each dialysis session lasts
- your child's age
- how near you are to your dialysis unit
- the risks and side-effects.

» **More about risks and side-effects**

### Haemodialysis

In **haemodialysis**, a machine with an 'artificial kidney' filters the blood. Blood is pumped out of the body through tubes and into the artificial kidney, and the cleaned blood is returned to the body. This form of dialysis is often shortened to **HD**.

#### What happens in haemodialysis?

For each dialysis session, the patient is connected to the haemodialysis machine, either through a long plastic tube that has been inserted into his or her body (the **central venous line**, or **line**) or using a needle or needles placed into blood vessels that have been joined up (a **fistula**).

- The machine pumps blood out of the body through tubes and into a **dialyser** or artificial kidney. This sits outside the machine.
- The machine pumps special fluid called **dialysate** into the dialyser.
- Waste products and excess water are filtered out of the blood and into the dialysate.
- The cleaned blood is then pumped back into the body.



A haemodialysis machine

## How often is haemodialysis needed and how long does it take?

Each dialysis session usually lasts 3–4 hours and is normally done during the day. Most children have sessions three times a week, though they may need it more often. Although children are connected to the machine, they can read, play and, importantly, spend time doing school work with a teacher.

## Where does haemodialysis take place?

- **Hospital haemodialysis** – most of the time haemodialysis takes place in a special area in the paediatric renal unit in a hospital. This means your child may need to travel some distance.
- **Home haemodialysis** – some children have haemodialysis in their home. This depends on many factors, including the availability of this service, whether your home can accommodate the equipment, how far you live from the unit, the time needed to train you to run haemodialysis, the time your child is likely to be on dialysis, and his or her age and size.



Boy undergoing haemodialysis, with his brother keeping him company.

» [More about haemodialysis](#)

## Peritoneal dialysis

In **peritoneal dialysis**, the **peritoneum**, which is the lining of the abdomen (tummy), filters the blood.

## What happens in peritoneal dialysis?

For each dialysis session, the patient is connected to the peritoneal dialysis equipment and special fluid called **dialysate** is passed into and out of the body. Each time the dialysate is passed into and then removed from the body is called an **exchange**.

Each exchange consists of three phases; a fill, a dwell and a drain.

- During the fill phase, the **dialysate** flows from a bag through a **catheter** (a long, thin tube that has been placed before dialysis starts) in the abdomen. It passes into the **peritoneal cavity**, the area inside the abdomen (tummy).



An example of a Homechoice machine

- The dialysate stays in the abdomen for a set period of time. This is called the **dwell**.
- During the dwell, the waste products, extra water and salt filter out of the blood and into the dialysate. This happens because of a process called **diffusion**.
- At the end of the dialysis session, the fluid with the waste products, extra water and salt is drained out of the abdomen into another bag, and then thrown away. This is the drain phase.

## Types of peritoneal dialysis

There are two types of peritoneal dialysis, which affect how long and how often the exchanges take place.

- **Continuous ambulatory peritoneal dialysis (CAPD)**. Exchanges usually take place four times a day. The dialysate is in the abdomen for about 4 hours each time. Each exchange needs to be done by you or another parent/carer who is trained.
- **Automated peritoneal dialysis (APD) or continuous cycling peritoneal dialysis (CCPD)**. Exchanges take place overnight – usually for about 9–12 hours. A machine, which can sit next to the bed, drains fluid into and out of the abdomen. The machine works automatically and you do not need to monitor it once it is up and running.

## Where does peritoneal dialysis take place?

Most of the time, peritoneal dialysis is done at home. It can also be done in other places, such as school, other family members' homes, or while on holiday.

» [More about peritoneal dialysis](#)

## Changing dialysis

It may be possible – or sometimes necessary – to change the type of dialysis your child has. This may depend on your child's health and complications of dialysis, how he or she is responding to dialysis, or your family's situation. Speak with your child's healthcare team for more information.

# Preparing for dialysis

Before dialysis can start, your child will need to have a catheter or line put into his or her body. The type of catheter or line will depend on the type of dialysis and how quickly dialysis is needed.

Your child will have an anaesthetic, special medicine, so he or she can sleep through the procedure and not feel any pain.

## Haemodialysis

There are different ways to get access to your child's body for dialysis.

### Central venous line (or 'line')

A **central venous line** (or 'line') is a **catheter**, a long, thin tube that is placed into one of the large blood vessels in the body. This is usually in the neck or chest, or occasionally the groin. There are two **ports** at the ends of the catheter, which connect to tubes for each dialysis session.

Part of the catheter is inside the body, and part outside. The part of the body where the catheter comes out is called the **exit site**.

A line can be inserted shortly before the first dialysis session starts. There are two types of lines.

- **Temporary line** – for short-term dialysis,
- **Permanent line** – for long-term dialysis. The catheter is inserted in the vein and then tunnelled under the skin to exit at a different site. For example, if the catheter is inserted in the neck, it will exit on the front of the chest. This means that the exit site cannot be seen when your child wears a shirt or blouse.

### Fistula

An **arteriovenous fistula**, or **fistula**, is a connection between two types of blood vessels, a vein and an artery. This creates a larger, stronger blood vessel. For each dialysis session, one or two needles are inserted into the fistula – because it is a larger, strong blood vessel, it is easier to access. A special gel or cream can be used to stop your child feeling any pain.



Fistula in a child's arm

The fistula is usually made in an arm (the arm that your child does not draw or write with). It needs to be made at least 8–12 weeks before the first dialysis session, to allow time for it to develop and get strong enough. Patients feel a 'buzzing' in the area around the fistula, and are shown how to take care of it.

For most children who will be on dialysis long term, a fistula is the best option for haemodialysis – it usually lasts longer and has lower risks of infection.

» [More about haemodialysis](#)

## Peritoneal dialysis

### Catheter

A **peritoneal catheter**, a soft plastic tube, is inserted through the abdomen (tummy).

A small cut is made in the abdomen to make a small hole. A catheter is inserted through the hole into peritoneal cavity. Children usually stay in the hospital overnight or longer to give time to heal.

The place where the catheter comes out of the skin is called the **exit site**. It needs to be kept clean to avoid infection.

» [More about peritoneal dialysis](#)

## Paediatric renal unit and dialysis team

### Where will my child be treated?

Dialysis takes place in a paediatric renal unit, a specialised unit that treats babies, children and young people with kidney conditions, or at home. Your child will be looked after by a paediatric nephrologist, a doctor who treats babies, children and young people with kidney problems.

If for any reason your child needs to be admitted to hospital, he or she will probably need to go to the paediatric renal unit rather than to your local hospital.

## Haemodialysis

Your child's healthcare team will show you how to care for your child's exit site and catheter to reduce any risks and watch out for signs so any complications can be treated quickly.

### Risks from creating access

- Inserting a central venous line (or line): common risks include bleeding, bruising and formation of a blood clots around the end of the catheter.
- Creating a fistula: risks include bleeding, or failure to develop, which may mean that a repeat operation or a graft needs to be made instead.

### Other risks

- 'Steal syndrome' in a fistula – where there is less blood flow to the hand, which may cause a feeling of tingling, numbness or cold in the hand, and may require surgery.
- Infections due to germs entering the body – this is more likely in a line than in a fistula. Keeping the exit site clean will reduce the risk. Most infections can be treated with antibiotic medicines, which kill germs. If they are more serious, surgery and/or a new line may be needed.
- Blood clots (**thrombosis**) – when the blood clumps together. If this happens in a line, fistula or graft, it may stop working.
- Narrowing of blood vessels (**stenosis**) – this usually happens slowly and your child's dialysis team can look for early warning signs.

### Side-effects of haemodialysis

Most side-effects are caused by changes in the amount of water and chemicals in your child's blood. Your child should follow the treatment plan set out by your doctor, including diet, fluids and medicines to avoid these side-effects. Side-effects your child may get include:

- feeling tired during or after the dialysis session
- muscle cramps
- low blood pressure (**hypotension**), which may be sudden – children may feel weak, dizzy or light-headed, or sick.

» [More about haemodialysis](#)

## Peritoneal dialysis

Your child's healthcare team will teach you how to manage peritoneal dialysis and care for your child at home. They will also give you information about what to look for, so any complications can be treated quickly.

### Poor drainage

One common complication is when fluid (liquid) does not properly drain out of the peritoneal cavity. This may happen for different reasons.

- The catheter may become kinked or blocked, such as when a child lies on it (for example, rolling over at night) – this can usually be easily corrected.
- Blood or **fibrin** (a protein) from the body can get stuck in or around the catheter. A medicine called **heparin** can be added to the dialysate (dialysis fluid) to help prevent this.
- Occasionally, the poor drainage keeps happening. This may be because the catheter gets displaced, or **omentum** (a fold of tissue in the abdomen) gets wrapped around the catheter. The catheter will usually need to be replaced if this occurs. Some children who have previously had surgery in the abdomen may have adhesions. If this happens, peritoneal dialysis may need to be stopped and haemodialysis considered as an alternative.

### Other risks

- Infections due to germs entering the body – especially **peritonitis**, which is an infection of the peritoneum. Keeping the exit site clean will reduce the risk. Most infections can be treated with **antibiotic medicines**, which kill the germs. If the infection is more serious, the catheter will need to be removed, and a new catheter placed after the infection is gone.
- Hernias – happen when an internal part of the body pushes through the wall around it and a lump in the tummy or groin can be seen.

» [More about peritoneal dialysis](#)

# Supporting your child

Dialysis can be a difficult and stressful experience for your child and the whole family, including other children. You and your child will learn more over time about how to live with dialysis.

Your child's healthcare team is there to help you. They can provide support with your child's education, accessing financial benefits and planning holidays around dialysis.

Speaking with other families of children on dialysis can also be a huge support.

→ If you have any concerns or need additional support, speak with your doctor or nurse.

## Support from the dialysis team

Your child's dialysis team is there to help you. Some of the ways you and your child can get further support include the following.

- Education: your child's schooling may be interrupted, especially if he or she has to go to the hospital frequently. Teachers are available to spend time with all school-age children as soon as they are well enough. The teachers make contact with the individual schools and take an active role in continuing each child's education.
- Money: sometimes helping to looking after a child on dialysis can put a strain on household finances, especially if one parent or carer gives up work or works fewer hours. A renal social worker can help you access financial benefits from the government.
- Holidays: dialysis may make it more difficult to plan family time such as holidays or visiting other family members. Speak with your team about how to plan this time away so that it fits around your child's healthcare needs.
- Speaking with other families: ask your hospital about meeting with other families of children on dialysis. Talking with parents and carers who have gone through similar issues can be a huge source of support.

→ If you have any concerns or need additional support, speak with your doctor or nurse.

## Transition to adult services

When your child reaches adolescence, he or she will prepare to transfer from paediatric services (for children) to adult services. The timing is different for each person – though most will start being looked after by an adult nephrology unit by the time they are 18 years old.

Many units have a transition programme, which starts some years before the transfer, to help adolescents to prepare.

## Further information

This is the end of the information on dialysis. If you would like to read more about haemodialysis, peritoneal dialysis, kidney conditions, tests and diagnosis, other treatment or supporting information, you can find a list of topics covered on the infoKID website at [www.infoKID.org.uk](http://www.infoKID.org.uk).



## Your notes and contact information

[www.infoKID.org.uk](http://www.infoKID.org.uk)



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