

# Acute kidney injury (AKI)

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

Acute kidney injury (AKI) is when the kidneys stop working over a short period of time – a few days or a few weeks. It is sometimes called acute kidney failure (AKF) or acute renal failure (ARF).

Children with AKI have different symptoms, and this depends in part on what has caused AKI. Some children get better after a few weeks, without treatment. Some need to take medicines or have more intensive treatment. In a few children it can be very serious.

This topic covers:

- what AKI is
- what may cause AKI
- tests your child needs to find out whether your child has AKI and what is causing it
- treatment that your child may need
- any long-term effects of AKI

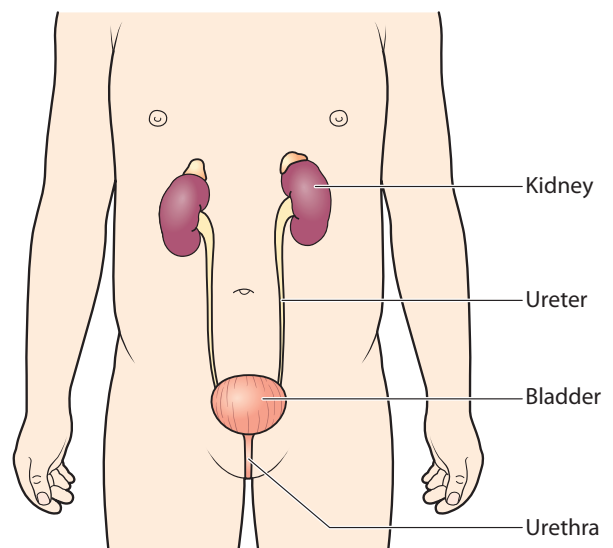


## Overview

### About the urinary system

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 at the back on either side of our spine (backbone), near the bottom edge of our ribs.
- 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.



# Symptoms and complications

## Symptoms

The symptoms and signs in AKI are different in different children, depending on what is causing the AKI and how severe it is, and some children do not notice any symptoms. They include:

- blood in the urine (**haematuria**) – you cannot always see the blood, but if there is a lot, the urine may be coloured red or dark brown (like a cola drink)
- urinating less often or passing smaller amounts
- swelling or puffiness in different parts of the body, especially around the eyes, legs and feet (**oedema**)

## Complications

Some children have complications – health problems that happen because of the condition. These include:

- blood pressure that is too high (**hypertension**)
- too much water in the body (fluid overload)
- rarely, too much fluid in the lungs, which may cause breathlessness (pulmonary oedema)

» **More about symptoms and complications**

## Causes

In AKI, the kidneys suddenly fail, or stop working. They are not able to get rid of extra water and waste from the body. This can happen over a few days or a few weeks. Doctors use the term **acute** for a condition that happens over a short period of time.

AKI can happen in people of all ages. However, it is very rare in children and young people. It is rare in babies.

## Types of AKI

There are three types of AKI, depending on what has caused the kidneys to stop working:

- **pre-renal AKI** – there is not enough blood flow to the kidneys
- **renal AKI** – there is a problem inside the kidneys
- **post-renal AKI** – there is a problem that affects how urine leaves the kidneys

» **More about causes and types of AKI**

## Tests and diagnosis

Your child's doctor can **diagnose** (identify) AKI by doing some tests. If your child has certain symptoms, such as red or brown urine, your doctor may arrange a **urine test**. Your doctor will speak with you and your child about the symptoms and do a physical examination.

Your child may also need other tests, such as **blood tests** and **imaging tests** (scans), to find out more about what has caused AKI.

Some children need a **kidney biopsy** to find out more information. A tiny piece of one kidney is removed from their body with a needle. This is examined under special microscopes in a laboratory. Medicines are used so your child does not feel any pain or can sleep through the procedure.

» **More about tests and diagnosis**

## Treatment

Most children with AKI need treatment and monitoring in hospital.

### Where will my child be treated?

Your child will probably need to stay in a hospital for a few days, while his or her kidneys get better. This is usually in a **paediatric renal unit**, a special unit for children with kidney problems, which may be in a different hospital to your own. He or she will be looked after by a **paediatric nephrologist**, a children's kidney doctor.

Your child can go home when the doctor thinks that his or her health is stable.

### What does treatment do?

- Many children will not need special treatment, but will be monitored to make sure they have the right amount of water and salts in their body, and to measure their **blood pressure**.
- Your child may need to make temporary changes to what they eat and drink, and may need a feeding device to make sure they get the nutrients they need.
- Some children get AKI because of problems with their immune system, which normally protects the body from disease or infection. They may need special medicines or treatment to stop it from harming their kidneys.
- Some children get AKI because of a blockage that affects how they pass urine. They may need a **urinary catheter** to drain urine from their bladder, or an operation.
- Some children need medicines to treat complications – such as swelling in their body (oedema) or high blood pressure (**hypertension**).

### What happens if my child does not get better?

If your child does not get better, or if his or her kidneys stop working as well as they should, he or she may need special treatment. This may include dialysis, which uses special machines to help do the job of healthy kidneys.

➔ **It is important that your child follows any treatment plan outlined by your doctor.**

» **More about treatment**

## About the future

### Recovery

In some children, AKI can be quite mild and uncomplicated. Their kidneys can get better by themselves over a few days or weeks.

In others, it can be very serious (severe) and complicated. Your child's healthcare professionals will let you know how the AKI is affecting your child.

### Long-term problems

After children have had AKI, they usually need to visit the doctor regularly, to check whether their kidneys have got better and are healthy.

A small number of children will have long-term problems with their kidneys. These children may need further care and specialist treatment in the future.

» [More about the future](#)

## Notes

# Symptoms and complications

## Symptoms and signs

The symptoms and signs in AKI are different in different children, depending on what is causing the AKI and how severe it is. Sometimes there are no symptoms.

If your child has any of the below, he or she does not necessarily have AKI or another kidney condition.

→ If your child has any of the below, take them to your doctor as soon as possible.

### Blood in the urine

Normally there is no blood in the urine – if there are any blood cells in the urine, this is called **haematuria**. Sometimes you cannot see the blood, but if there is a lot, the urine may be coloured red (like blackcurrant squash) or dark brown (like a cola drink).

### Problems urinating (weeing)

Your child may urinate a very small amount (this is called **oliguria**) or not at all (**anuria**).

### Oedema (swelling)

**Oedema** is swelling or puffiness in different parts of the body – in children, the swelling is often seen around the eyes and on the legs and feet.

### Other symptoms and signs

Some children may:

- feel tired, have low energy or have difficulty concentrating
- get out of breath easily
- feel nauseous (sick) or vomit (be sick), or have diarrhoea
- feel very thirsty
- get dizzy
- gain weight

Some children may not eat enough food, and some babies may not feed properly.

In serious cases, some children have a **seizure** (also called a fit or convulsion).

## Complications

Some children have more complications – health problems that happen because of the condition or its treatment. These are more rare. Your child's healthcare team will carefully check for these and speak with you about any treatment that your child may need.

### High blood pressure

AKI can cause **hypertension**, blood pressure that is too high. Your doctor or nurse can check your child's blood pressure. In some children, this leads to headaches, vomiting or blurred (fuzzy) vision. Hypertension that lasts a long time can also increase the risk of getting other diseases in adulthood.

Children with hypertension will need to control their blood pressure so it is in healthy range. They may need to reduce the amount of salt they eat, or make other changes to their diet. Some children take medicines to help control their blood pressure.

### Too much fluid in the body

When the kidneys stop working in AKI, this can cause too much fluid (water) in the body – this is called **fluid overload**.

Rarely, fluid can build up in the lungs, which may cause breathlessness – this is called pulmonary oedema.

### Other, rare complications

- Some children get an infection in their blood – this is called septicemia.
- We need the right amounts of important chemicals – such as **potassium** – in our bodies. When the kidneys stop working, this can cause too much potassium in the body – this is called hyperkalaemia.
- Damaged kidneys can also cause acid to build up in the body – this is called **acidosis**. This may cause rapid breathing.

## Symptoms and complications: Read more why oedema happens

This happens in some children who have AKI that is caused by glomerulonephritis, which is a group of conditions affecting the kidney filters, the glomeruli. In some types of glomerulonephritis, the damaged glomeruli are not able to filter enough salt and water out of the bloodstream into the urine. After a while, there is too much salt and water in the body, which causes the swelling.

# Causes

Your doctor will try to find out what has caused your child's kidneys to suddenly stop working. AKI may be related to other health conditions or problems. In some children, there is more than one cause.

There are three types of AKI:

- **pre-renal AKI** – there is not enough blood flow to the kidneys
- **renal AKI** – there is a problem inside the kidneys
- **post-renal AKI** – there is a problem that affects how the urine leaves the kidneys; this is usually caused by a blockage

## Pre-renal AKI and causes

In **pre-renal AKI**, there is not enough blood flow to the kidneys because the blood pressure is too low.

Following are some of the causes of pre-renal AKI in children. Not all children who have these get AKI.

### Dehydration

If there is not enough water in the body, this is called **dehydration**. This can happen in children who have severe vomiting or diarrhoea, because they lose a lot of water.

Some children get AKI because they have dehydration *and* are taking some medicines. If your child has severe vomiting or diarrhoea, your doctor may stop these medicines. These include:

- non-steroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen (eg Brufen)
- medicines that lower blood pressure (ACE inhibitors and ARBs)
- medicines that help flush out extra water (diuretics).

### Other causes

- A large amount of bleeding (**haemorrhage**) – for example, after an accident
- An infection in the blood (**septicaemia**)
- **Nephrotic syndrome** – when the kidneys leak a lot of protein in the urine, causing parts of the body to swell (oedema)
- Other conditions, including **hepatorenal syndrome** (when the liver stops working) and **heart failure** (when the heart cannot pump as much blood around the body)

## Renal AKI and causes

In **renal AKI**, there is a problem inside the kidneys. This is also called **intrinsic AKI** or **intra-renal AKI**.

These are some of the causes of renal AKI in children. Not all children who have these get AKI.

- Conditions that affect the kidneys – these include **haemolytic uraemic syndrome (HUS)**, **glomerulonephritis** and **interstitial nephritis**
- Conditions that affect different parts of the body, including the kidneys – these include **vasculitis**, **liver disease** and **problems associated with treating cancer**
- Pre-renal AKI that is not recognised and successfully treated

### HUS

**Haemolytic uraemic syndrome (HUS)** is the most common cause of renal AKI in children. It usually happens after an infection in the gut, when children also get diarrhoea. Most children recover from these infections, but some get HUS and/or have AKI.

When a part of the body is damaged, the body makes **blood clots**, which are like clumps of blood. These help heal wounds, such as a cut in the skin. In HUS, the body makes blood clots in the wrong places, and these can damage the kidney.

### Glomerulonephritis

**Glomerulonephritis** is a group of diseases that affect the kidneys. The tiny filters of the kidney – the **glomeruli** – are damaged.

Children with glomerulonephritis have blood and protein in their urine, and may get swelling in their body, especially around the face and legs.

### Interstitial nephritis

In **interstitial nephritis** (also known as **tubulo-interstitial nephritis**), some parts of the kidney become inflamed (swollen). These include the **renal tubules**, the long tubes that carry the liquid that will become urine. This causes pressure to rise inside the kidneys. There is less blood flow into the kidney, which leads to AKI.



It is often not possible to know why the inflammation happens. But, in some children, certain medicines can lead to interstitial nephritis. These include:

- some **antibiotic medicines**, which are used to treat infections
- ibuprofen (such as Brufen)

### Other problems affecting the kidneys

- **Acute tubular necrosis (ATN)** - the kidneys do not get enough oxygen from the body. This damages the renal tubules so they stop working.
- **Renal vein thrombosis** - the **renal vein**, the blood vessel that carries blood out of the kidney, is blocked with a blood clot.

### Conditions that affect different parts of the body

- **Vasculitis** – the blood vessels become inflamed or swollen, especially in the skin. Some types of vasculitis also affect the blood vessels in the kidneys.
- **Hepatitis** – the liver becomes inflamed. This causes changes in chemicals in the blood, which can lead to AKI.
- **Tumour lysis syndrome** – this is a problem that happens in some children who are being treated for cancer.
- **Rhabdomyolysis** – this means there is a rapid breakdown in muscle cells. Chemicals are released into the blood, which can damage the kidney.

## Post-renal AKI and causes

Post-renal AKI is caused by an obstruction, or a blockage, in the urinary system. This obstruction affects how urine leaves the body when we go to the toilet.

It is often due to a structural problem. This means that one or more parts of the urinary system have not developed, or been made, normally. Children with structural problems are usually born with them. They are sometimes found out during an ultrasound scan before birth.

These are some of the causes of post-renal AKI in children. Not all children who have these get AKI.

- **Posterior urethral valves (PUV)** – a blockage in the back part of the urethra (nearest the bladder) in some boys
- **Pelviureteric junction (PUJ) dysfunction** – a blockage between the renal pelvis (in the kidney) and the ureter

- **Vesicoureteric junction (VUJ) dysfunction** – a blockage between the ureter and the bladder
- **Kidney stones** – these are like small crystals, or clumps, which may cause pain and block parts of the urinary system

The blockage needs to affect *both* kidneys before it can cause post-renal AKI. If a child has only one working kidney, it would need to affect that kidney.

Some babies are born with structural problems – doctors call these congenital conditions. Occasionally, children get structural problems later in life – these are acquired conditions.

### Posterior urethral valves

A few boys have **posterior urethral valves (PUV)**. In PUV there is a blockage in the **urethra**, the tube that carries urine out of the body. This makes it difficult for a child to pass urine, and can sometimes cause the bladder and kidneys to swell.

### Pelviureteric junction (PUJ) dysfunction

The **renal pelvis** is the part of the kidney that drains urine out of the kidney. This connects with the **ureter**, the tube that carries urine to the bladder. The area that connects the renal pelvis and ureter is called the **pelviureteric junction (PUJ)**.

In some children, the PUJ has a blockage – a PUJ dysfunction or a ureteropelvic (UPJ) dysfunction. This is a very rare cause of AKI, though is more common in children who have only one kidney.

### Kidney stones

**Kidney stones** are small crystals, or clumps, that form in the kidney. They can sometimes block the PUJ or the ureter and cause pain in the flank, the area between the back and the tummy. They are rare in children.

# Tests and diagnosis

Your child's doctor will try to diagnose (or identify) AKI quickly and find out whether your child needs any treatment. Your child may need an examination, including measurement of blood pressure, urine tests, blood tests, imaging tests and a kidney biopsy.

## Examination

Your doctor will talk to you or your child about their symptoms and any medicines that they take. He or she will do an examination of your child – for example, to see whether they have oedema (swelling in the body).

Your doctor or nurse will check your child's blood pressure to see whether it is too high (hypertension) or too low (hypotension).

## Urine tests

You, or a nurse, will need to collect some of your child's urine in a small, clean container for a **urine test**.

Your doctor or nurse will place a dipstick into the urine. The dipstick is a strip with chemical pads that change colour depending on what substances are in the urine. The sample may also be sent to a laboratory for more accurate tests.

## Blood tests

A small amount of blood will be taken from a vein, with a needle and syringe for a **blood test**. The blood test results can give the doctor more information, including:

- how well the kidneys are working – this is called the kidney function
- the amount of some important chemicals
- whether the immune system is working in a different way than usual

## Imaging tests

Some children need imaging tests. These use special scanners that take pictures of the inside of the body. The most common tests are the **ultrasound scan**, **echocardiogram** and **chest x-ray**, but occasionally other tests are used.

If your child needs one or more of these tests, your doctor will talk to you about the procedures, any risks and how to help your child prepare for them.

- **Ultrasound scan** – looks at the shape and size of the kidneys and other parts of the urinary system. A small handheld device is moved around your child's skin and uses sound waves to create an image on a screen.
- **Echocardiogram** – checks the blood flow through the heart. This is a special ultrasound scan for the heart.
- **Chest X-ray** – for children who have breathing problems, checks whether there is fluid around the lungs. A machine takes X-ray images of the chest.

## Kidney biopsy

Some children need a **kidney biopsy** to find out more. A tiny piece of one kidney is removed from the body with a needle. This is examined under special microscopes in a laboratory. Special medicines are used so your child does not feel any pain or can sleep through the procedure.

The results can take a few weeks.

## Tests and diagnosis: Read more about blood tests for AKI

### How well the kidneys are working

**Urea** and **creatinine** are chemicals that are made in the body. They are waste products and normally removed by the kidneys into urine. In AKI, these may build up in the blood.

The kidney function can be measured with the **glomerular filtration rate (GFR)**. The GFR is the amount of fluid (liquid) the kidneys filter each minute. It can be estimated by measuring the amount of creatinine in the blood.

### Other chemicals

**Electrolytes** are important chemicals in the body. We need the right balance of these to stay healthy. Some important electrolytes include the following:

- **sodium** helps balance the amount of water in the body
- **potassium** is needed for the muscles, including the heart muscle, to work properly
- **bicarbonate** balances the amount of acid in our body, or the pH balance (also called the acid–base balance)
- **phosphate** is important for bones, teeth and muscles
- **calcium** is important for bones and teeth, helps blood to clot and also helps the muscles, including the heart muscle, to work.

A blood test can check whether there are any antibodies – the body's immune system makes these special proteins to identify and kill specific germs. This gives information about whether there has been an infection, and sometimes which germ caused it.

# Treatment

- Your child will probably need to stay in a hospital for a few days or longer while his or her kidneys get better.
  - Many children will not need special treatment, but will be monitored to make sure they have the right amount of water and salts in their body.
  - Your child may need to make temporary changes to what they eat and drink, and may need a feeding device to make sure they get the nutrients they need.
  - Some children get AKI because of problems with their immune system, which normally protects their body from disease or infection. They may need special medicines or treatment to stop the immune system from harming their kidneys.
  - Some children get AKI because of a blockage that affects how they pass urine. They may need a urinary catheter to drain urine from their bladder, or an operation.
  - Some children need medicines to treat complications – such as swelling in their body and high blood pressure (hypertension).
  - Children with AKI develop reduced kidney function. In most cases this does not need any special treatment, but a very small number will need further specialist treatment, such as dialysis.
- It is important that your child follows any treatment plan outlined by your doctor.

## Where will my child be treated?

Your child will probably be in a **paediatric unit**. This is an area of a hospital that treats babies, children and young people with different health conditions.

Some children are referred to a **paediatric renal unit**, a special unit for children with kidney problems, which may be in a different hospital to your own. Some are treated in

a paediatric intensive care unit (PICU), which specialises in treating acute and serious illness.

A team of healthcare professionals will look after your child.

Your child can go home when the doctor thinks that his or her health is stable. Often, your child will need to visit the hospital during the day – as an **outpatient** – for more treatment.

## Treatment: Read more about hospital visits and the healthcare team

### Hospital visits

A team of healthcare professionals will:

- 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:

- **paediatrician** – a doctor who treats babies, children and young people
- **paediatric nephrologist** – a doctor who treats children with kidney problems
- **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



## No special treatment

Sometimes the kidneys can heal themselves over a few days or weeks – especially if the AKI is not severe and there are no other complications, such as infection.

Your child's healthcare team will make sure your child has the right amount of water and salts in his or her body while their kidneys get better. They may also need to stop any medicines that your child is taking that could be harming his or her kidneys.

## Changes to eating and drinking

Your child may need to make temporary changes to what they eat – for example, less salt and less of certain foods. Your child may also need to drink less fluid, such as water, squash and soft drinks.

The food we eat gives us nutrients, which we need to grow and stay healthy. Some children with AKI do not get enough nutrients or calories, and need to take nutritional supplements, which may be available as tablets, capsules or liquid.

Your doctor, nurse or a paediatric dietitian will help you and your child make these changes.

## Feeding devices

If your child is unable to eat and drink all he or she needs for his or her growth and development, he or she may need a feeding device. All or some of the nutrition he or she needs, and water and medicines if needed, can be given through a tube or button.

## Suppressing the immune system

Some types of AKI are caused by a problem with the immune system, which normally protects the body against disease and infection. Steroids and other immunosuppressants are medicines that suppress the immune system – they stop it from fully working, so that it stops attacking the body. They are usually taken by mouth, such as tablets, capsules or liquid medicine. Your doctor will work out the amount of medicine (the dose) that is right for your child. The dose will be shown on the medicine label.

→ It is important that you follow your doctor's instructions about when and how much to give. Continue to give the medicine to your child as your doctor has told you, even if he or she is getting better.

» Read more about steroids and immunosuppressants on the next page

## Treatment: Read more about feeding devices

### Nasogastric tubes

**Nasogastric tubes** are normally for short-term use. They are long, thin tubes that are placed through the nostril, down the throat and into the stomach. The feeds are given through the tube to get to the stomach.

Most tubes need replacing about once a month – or more often if they are dislodged or pulled out. After training, some parents and carers choose to replace the nasogastric tubes themselves.

Occasionally, **nasojejunal tubes** are used. These are long, thin tubes that are placed through the nostril, down the throat and into the small intestine (just past the stomach).

### Parenteral feeding

**Parenteral feeding** gets nutrients directly into the blood. This may be used in hospital as well as enteral feeding, or it may be used on its own.



A nasogastric tube

## About steroids

**Steroids** are immunosuppressants that are made naturally in the body. Steroids can also be made artificially as medicines, which can reduce inflammation in the kidney. They may be used in AKI that is caused by **nephrotic syndrome** or **vasculitis**.

A common steroid used is **prednisolone**. Your child may need to take a large dose each day to start with, and then the dose is slowly reduced. Your doctor will usually monitor blood and urine tests to help decide when to change doses.

## About other immunosuppressants

Other **immunosuppressants** also suppress the immune system, but they are not produced by the body. These medicines may be used with steroids.

A common immunosuppressant is cyclophosphamide. Other immunosuppressants are azathioprine, ciclosporin, mycophenolate mofetil (MMF) and tacrolimus.

## Vaccines

Children taking some immunosuppressants are not able to have live **vaccines** (immunisations).

These vaccines include: MMR (for measles, mumps and rubella), varicella (for chicken pox) and BCG (for tuberculosis).

Speak with your child's doctor to check which vaccines your child can have.

## Infections

Children taking these medicines are more likely to get infections. Speak with your child's doctor or nurse, and your child's teacher or daycare manager, about how you can help prevent infection. Contact your doctor straight away if your child:

- has been in contact with someone who has chicken pox (if they have not had this illness before) or measles (if they have not had the MMR vaccine, which protects against measles, mumps and rubella); or
- is unwell and you are worried about an infection

If your child does get an infection, he or she may need to take an antibiotic medicine, which kills the germs that cause infection. Your child must take the medicine for the number of days that the doctor has told you, or until all of the medicine has been taken.

» For more information go to  
[www.medicinesforchildren.org.uk](http://www.medicinesforchildren.org.uk)

## Side-effects you need to do something about

We use medicines to help children get better, but sometimes they have effects we do not want – **side-effects**.

Contact your doctor straight away if your child has any of the following while on steroid medicines:

- fever (temperature above 38°C), with a sore throat or a cough
- a rash or severe bruising
- bad stomach pain or repeated vomiting – sometimes steroids can cause ulcers in the stomach

## Other side-effects

Other side-effects that affect some children are below – speak with your doctor or nurse if you are concerned or need more support:

- nausea, vomiting, stomach pain and/or indigestion (heartburn) due to irritation to the lining of the stomach – your doctor may give your child some medicine to treat this
- behavioural problems – you may find that your child is more likely to have tantrums, be moody, feel depressed, have difficulty sleeping or have nightmares
- weight gain and larger appetite – you can help by making sure your child has lots of physical activity and eats fruits, vegetables and low-calorie food, rather than food that is high in calories (such as cakes, biscuits, sweets and crisps), and by reducing the portion size
- high blood pressure (**hypertension**) – your child's blood pressure will be regularly checked, and if it is too high, will need to be controlled by eating a no-added salt diet or taking medicines

→ There may, sometimes, be other side-effects that are not listed above. If you notice anything unusual and are concerned, contact your doctor.

## Other medicines

If your child has serious side-effects from the medicines, they may be prescribed other drugs. For example, if they feel sick (nausea) or vomit, your doctor may prescribe medicines that help him or her feel better.

## Side-effects with high doses or long courses

When steroids are needed over a long time, or in high doses, they may have other side-effects.

- Steroids can slow growth and affect puberty. They can also cause growth of body hair and irregular periods in girls. Your doctor will check your child's growth and development. If you have any concerns, talk to your doctor.
- All steroid medicines, including prednisolone, may affect the adrenal glands so that they produce less of a hormone called cortisol when the body is stressed (e.g. during illness or injury). This means that your child may have more difficulty fighting off an infection, or may recover less quickly from injury or after surgery.
- Your child's skin may become thinner, and heal more slowly than usual. Acne (spots) may become worse or your child may develop mouth ulcers or thrush (**candidiasis**). If you are concerned, contact your doctor.
- Your child may develop problems with his or her hip bones, or their bones may become weaker (**osteoporosis**). The muscles around his or her hips and shoulders may also become weaker. If your child has any difficulty walking or moving around, contact your doctor.
- Occasionally, steroids cause **diabetes**. If your child seems more thirsty than normal, needs to pass urine (wee) often, or starts wetting the bed at night, contact your doctor.

## Plasma exchange

If your child's kidney function is getting worse in spite of the usual treatments, he or she may need a procedure called **plasma exchange**, which is also called **plasmapheresis**.

**Antibodies** are proteins that are part of the immune system, and in some types of AKI some antibodies are harming the kidneys. Plasma exchange removes antibodies from the blood.

» [Read more on next page](#)

## Treating blockage

Many children with post-renal AKI have an obstruction, or blockage, in their urinary system.

There are different ways that this can be treated. Your doctor will explain what will happen and how to prepare for it.

### Urinary catheterisation

A procedure called **urinary catheterisation** drains urine from the bladder. This is done using a catheter, a thin, flexible tube. There are two types of urinary catheters:

- **urethral catheter** – this is placed through the urethra
- **suprapubic catheter** – this is inserted through the tummy skin, using a needle.

The kidneys usually recover a few weeks after urinary catheterisation.

» [Read more on next page](#)

### Surgery

If your child has a more complicated blockage, they may need to have an operation, or surgery.

Your doctor will explain what will happen and how to prepare for it. The kidneys usually improve a few weeks after surgery. Occasionally, there is an infection, which will be treated, but may delay your child's recovery. Your doctor will give you more information.

## Treating complications

### Controlling blood pressure

Children with AKI may have high blood pressure, or **hypertension**. Their blood pressure will need to be controlled so it is in a healthy range.

If your child has hypertension, he or she may need to change what they eat and drink. Some children need to take medicines.

### Reducing swelling in the body

Very occasionally, children with AKI need to take **diuretics**. These medicines help reduce oedema (swelling in the body) by removing extra water and salt from your child's body and by increasing the amount of urine that is passed.

Your doctor will examine your child for oedema and measure his or her weight while they are taking diuretics, to check how well the medicine is working.

Common diuretics are: furosemide, spironolactone and metolazone. Other diuretics that may be used are: amiloride, bendroflumethiazide and chlorothiazide.

### Managing reduced kidney function

Children with AKI develop **reduced kidney function**, which means that their kidneys do not work as well as they should. The severity of this varies, but most do not need any special treatment.

A very small number will have more serious kidney problems and will need further treatment, such as dialysis.

**Dialysis** uses special equipment or a machine to do what a healthy kidney does – remove waste products and extra water from the body. Dialysis may be needed in some children until their kidneys start working properly again.

There are two main types of dialysis: peritoneal dialysis and haemodialysis. Your child's healthcare team will decide on the best type for your child.

## Questions to ask the doctor or nurse

- What treatment does my child need?
- How will the treatment help my child?
- How long will my child be in hospital?
- How can I help my child prepare for procedures and treatments?
- If the first treatment does not work in my child, what happens next?
- How will I know if we need to go back to the hospital or see the doctor?
- Will the AKI come back? How will I know?

### Plasma exchange

Plasma is the liquid or watery part of blood. It helps carry blood cells, protein and other substances around the body.

Plasma exchange is a procedure that removes antibodies that are harming your child's kidneys from his or her blood. It removes the blood from the body, separates the plasma and harmful antibodies and returns the blood, with a plasma substitute, to the body.

- Each plasma exchange takes about 2–3 hours and is done in hospital. Children will usually need more than one exchange.
- A catheter, which is a large tube, is inserted into one of the large veins in the chest or neck. Your child's blood is taken from his or her body through the catheter.
- Using special equipment, your child's blood is separated into two parts: their plasma and some substances, including the harmful antibodies; and their blood cells.
- Your child's blood cells are added to a plasma substitute – either plasma or a protein called albumin from a donor, another person who has donated blood.
- This is returned to your child's body through the catheter.
- As blood is taken from your child and returned to him or her at the same rate, only a small amount of blood is outside his or her body at any time.

Your child's doctor or nurse will give you more information about plasma exchange and how you and your child can prepare for it.

### Urinary catheterisation

#### Urethral catheter

- Your nurse or doctor cleans your child's genital area, wearing sterile gloves.
- A small catheter is passed through your child's urethra and into his or her bladder. This may feel a little uncomfortable but should not hurt.
- Urine passes through the catheter straight away and is collected in a sterile (completely clean) container.

#### Suprapubic catheter

Your child probably has a **general anaesthetic**, a medicine that helps him or her go to sleep so they do not feel pain.

- A needle is inserted through the tummy's skin into the bladder.
- A catheter is passed down the needle so that one end is in his or her bladder. The needle is removed, leaving the tube in place.
- Urine passes through the catheter and is collected in a sterile container.
- The needle is placed above the genitals – “supra” means above and “pubic” means the genital area.

## About the future

Your healthcare team will speak with you and your child about any long-term effects your child might have.

**Most children fully recover from AKI. Others will need further care. The long-term effects on your child's kidney function (how well the kidneys are working) depend on how severe the AKI is and whether it gets better with treatment.**

### Follow up

Your child may need to have follow-up appointments with your GP (family doctor) or at the hospital. It is important to go to these appointments, even if your child seems well. You will also have the opportunity to ask any questions. At these appointments, your child may have:

- his or her height and weight checked
- a physical examination
- **urine tests** – to check for blood, protein and other substances in his or her urine
- **blood tests** – to check for the amount of protein and other substances in his or her blood, and measure their kidney function
- his or her **blood pressure** measured.

### Recovery

If your child's AKI gets better with treatment, he or she will usually have no higher risk of long-term kidney problems. Your doctor will monitor your child over a long period of time.

### Long-term problems

Children who have had AKI have a slightly higher risk of:

- **proteinuria** – more protein than normal in the urine
- **hypertension** – high blood pressure.

A small number of children will have long-term problems with their kidneys. Their kidneys stop working as well as they should – this happens slowly, often over many years. This is called **chronic kidney disease (CKD)**.

These children will need further, specialist treatment in the future.

If your child has CKD, you and your family will learn more over time about how to help manage the condition, and what to expect.

## Impact on your child and family

Children who have been successfully treated for AKI can usually do the things that other children their age do. They should be able to continue going to school or nursery. They can play with other children and stay active.

## Further support

This can be a difficult and stressful experience for your child and the whole family, including other children.

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

## Further information

This is the end of the information on AKI. If you would like to read more about other kidney conditions, tests and diagnosis, 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)



© BAPN and Kidney Care UK 2013-2022, all rights reserved

For details on any sources of information used in this topic, please contact us through our website [www.infoKID.org.uk](http://www.infoKID.org.uk).

We take great care to make sure that the information in this leaflet is correct and up-to-date. However, it is important that you ask the advice of your child's doctor or nurse if you are not sure about something. This information is intended for use in the United Kingdom, and may not apply to other countries.

The British Association of Paediatric Nephrology (BAPN), Kidney Care UK and the contributors and editors cannot be held responsible for the accuracy of information, omissions of information, or any actions that may be taken as a consequence of reading this information.