

Post-infectious glomerulonephritis (PIGN)

This infoKID topic is for parents and carers about children's kidney conditions. Visit 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

Post-infectious glomerulonephritis (PIGN) or post-streptococcal glomerulonephritis (PSGN) causes inflammation (swelling) in the kidneys. Children with PIGN have blood and protein in their urine, and may have swelling in their body, especially around their face and legs. PIGN may lead to other complications, including high blood pressure (hypertension).

This condition happens in a few children, after they have an infection – usually in the throat, nose or sinuses, or occasionally the skin.

Many children with PIGN get better after a few weeks, without treatment. A few need to take medicines or have more intensive treatment.



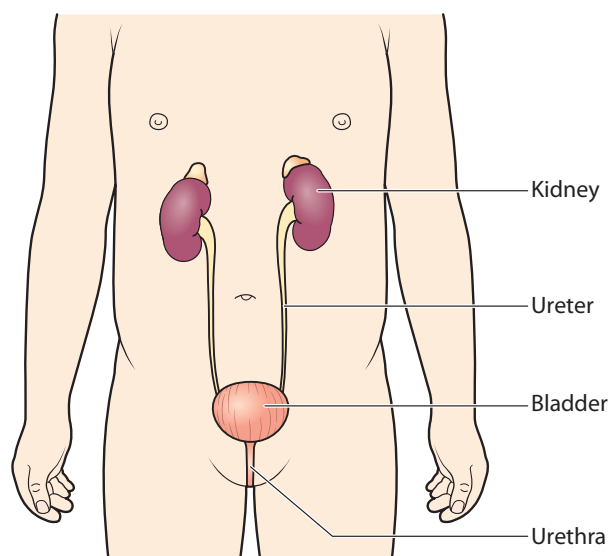
Overview

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, salt 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 (have a wee).
- The **urethra** is a tube that carries urine from the bladder to the outside of the body.

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



Symptoms and complications

Symptoms and signs

Some children with PIGN do not have any symptoms and signs, especially in the early stages of the disease. Common symptoms and signs 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)
- protein in the urine (**proteinuria**) – you cannot usually see the protein, but it can be found on a simple urine test
- urinating less often or smaller amounts
- swelling or puffiness in different parts of the body, especially around the eyes, legs and feet (**oedema**)
- rarely, swelling in the abdomen (tummy), or breathlessness

Complications

Some children have complications – health problems that happen because of the condition – including those below.

- PIGN may lead to blood pressure that is too high (**hypertension**).
- Occasionally, the condition gets worse quickly and the kidneys work less well than normal – this is called **rapidly progressive glomerulonephritis (RPGN)**.
- RPGN is one cause of **acute kidney injury (AKI)** – when the kidneys quickly stop working as well as they should, over a short time.

» [More about symptoms and complications](#)

Causes

About glomerulonephritis

Post-infectious glomerulonephritis (PIGN) is a type of **glomerulonephritis**, a group of conditions that affect the kidneys.

Inside the kidneys, there are many tiny filters called **glomeruli**. They help to remove extra water, salt and waste, which are passed out of the body as urine. They also make sure the body keeps what it needs, such as blood cells, protein and other important chemicals.

In glomerulonephritis, the glomeruli become inflamed (swollen) or damaged. This causes both blood and protein to leak into the urine.

About PIGN

PIGN happens in a few children after they have an infection – usually in the throat, nose or sinuses, or occasionally the skin. Most children get better from these infections, but a small number get glomerulonephritis about 4–6 weeks later.

These infections are often, though not always, caused by a type of **bacteria** (germ) called *Streptococcus*.

When glomerulonephritis appears after an infection from

Streptococcus, the condition is called **post-streptococcal glomerulonephritis (PSGN)**. We will refer to the condition as PIGN throughout this topic.

PIGN is an **acute** condition, which means that it starts suddenly.

PIGN can happen in people of all ages, including children. It is not always clear why a few people get this condition after an infection. Doctors think it is caused by problems with the immune system, which normally protects the body against disease and infection.

» [More about causes](#)

Tests and diagnosis

Your child's doctor can diagnose (identify) PIGN by doing some tests. If your child has certain symptoms or signs, 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 an **ultrasound scan**.

Your doctor may recommend a **kidney biopsy**. A tiny piece of one kidney is removed from the body with a needle. This is examined under special microscopes. Special medicines are used so your child does not feel any pain or can sleep through the procedure.

» [More about tests and diagnosis](#)

Treatment

Where will my child be treated?

Your child will probably be admitted to hospital for a few days. Some children are referred to a **paediatric renal unit**, a special unit for children with kidney problems, which may be in a hospital different from your own. Your child will be looked after by a **paediatric nephrologist**, a doctor who treats children with kidney problems.

About treatment

The healthcare team will check how your child's kidneys are working, test how much he or she is weeing, and measure his or her **blood pressure**. They will support you and your family throughout the treatment. Your child can go home when the doctor thinks that their health is stable. Your child will need to go back to the hospital clinic for treatment or follow-up.

Many children do not need special treatment, but may need to make temporary changes to what they eat and drink. Some children need medicines to get rid of the infection that caused PIGN, or to treat complications.

If another health condition is causing PIGN, this may need special treatment.

What happens if my child does not get better?

If your child's kidneys stop working properly, 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 information about treatment

About the future

All children with PIGN need to go back to the hospital or clinic for follow-up appointments, to check for any health problems.

Long-term effects

Most children with PIGN get better after a few weeks without any treatment, and there are no long-term problems with their kidneys.

A few children will have long-term problems with their kidneys. These children may need further care. They will need to go back to the hospital or clinic for regular appointments.

» More information about the future

Symptoms and complications

Symptoms and signs

Blood in the urine

When **red blood cells** leak through the kidney's filters into the urine, this causes **haematuria** (blood in the urine). Sometimes you cannot see the blood, but if there is a lot, the urine may be coloured red or dark brown (like blackcurrant squash or a cola drink).

Protein in the urine

When **proteins** leak through the kidney's filters into the urine, this causes **proteinuria** (more protein in the urine than normal). You cannot usually see the protein, but occasionally it can make the urine look frothy.

Protein is an important part of our diet and is in most foods. When we eat protein, it is digested (broken down) in the stomach and gut and taken into the blood.

Problems urinating

Some children urinate less often or pass smaller amounts.

Swelling

Some children have swelling or puffiness in different parts of their body, especially around their eyes, legs and feet. This is called **oedema**.

The swelling happens because there is too much fluid (liquid) in the body's soft tissues.

In PIGN, the damaged kidney filters (**glomeruli**) cannot filter enough water and salt out of the blood into urine. After a while, there is too much salt and water in the body, which causes the swelling.

Swelling in the tummy and breathlessness

- A few children get a large swelling around their tummy (ascites). It happens when fluid builds up in the peritoneal cavity, which is the area around the organs in the abdomen (tummy).
- A very small number of children feel breathless. This happens when fluid builds up around their lungs.

→ If your child has PIGN and a very swollen tummy or feels breathless, contact your doctor as soon as possible.

Other symptoms and signs

The below symptoms and signs are occasionally found in children with PIGN:

- feeling tired, low energy or difficulty concentrating
- decreased appetite (not wanting to eat)
- nausea (feeling sick) or vomiting (being sick), or diarrhoea
- pain in the tummy
- headaches that keep coming back or that do not go away
- pain, stiffness or swelling of the joints.

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

PIGN can cause hypertension, blood pressure that is too high. In some children, this causes headaches, vomiting or blurred (fuzzy) vision. Hypertension that lasts a long time can also increase the risk of getting heart disease in adulthood.

Rapidly progressive glomerulonephritis

Occasionally, PIGN gets worse quickly – this is called **rapidly progressive glomerulonephritis (RPGN)** or **crescentic glomerulonephritis**.

If this happens, your child will need to take medicines and may need more intensive treatment, such as dialysis.

Many children with RPGN will get better, but a few will need long-term dialysis and a kidney transplant.

This is one cause of **acute kidney injury (AKI)** – when the kidneys quickly stop working as well as they should, over a short time.

Causes

PIGN is the most common type of glomerulonephritis affecting children.

What happens in the kidneys

In PIGN, the tiny kidney filters (glomeruli) become inflamed (swollen) or damaged. They leak blood cells and protein into the urine.

» [Read more about how the kidneys work below](#)

After infection

PIGN is called post-infectious because it usually happens after an infection. The infection is not in the kidney, but rather a different part of the body, such as the throat, nose or sinuses (this may be called strep throat), or the skin (this may include **impetigo**).

The infection is often caused by a type of **bacteria** (germ) called *Streptococcus*. When glomerulonephritis appears after an infection from *Streptococcus*, the condition is often called **post-streptococcal glomerulonephritis (PSGN)**.

Most children recover from these infections. However, a very small number of children get glomerulonephritis after about two weeks from the start of the infection.

It is not always clear why a few children get this condition after an infection, though it may be because of problems with their immune system.

The immune system

Many germs – including bacteria and viruses – can make us sick if they get into the body. The immune system can kill these germs. However, if the immune system is not working properly, it can start to cause problems.

» [Read more about how the immune system on the next page](#)

Will it affect other family members?

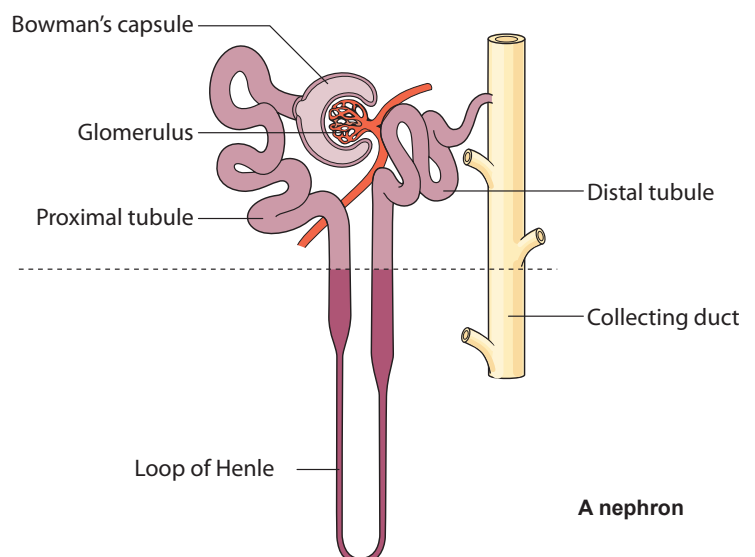
Doctors do not think that PIGN runs in families. If one of your children has this type of glomerulonephritis, it is unlikely that another of your children or another family member will get it.

Read more how the kidneys work and PIGN

Inside each kidney, there are about one million **nephrons**.

Each nephron is made up of a **glomerulus** (when we talk about more than one glomerulus, we say glomeruli), and a **renal tubule**.

- The glomerulus acts like a sieve, helping to remove extra water and waste from the body, and holding on to blood cells and protein, which the body needs.
- Blood flows into the kidneys and to each glomerulus.
- Most of the water and some other substances in the blood pass through the glomeruli.
- This liquid flows into the renal tubule. Most of this liquid moves back into the bloodstream. The rest of it becomes urine.
- The urine leaves the kidney by the ureters and goes into the bladder, where it is stored until we are ready to go to the toilet.



What happens in PIGN

In PIGN and other types of glomerulonephritis, the glomeruli become inflamed (swollen) or damaged. The damaged glomeruli can let blood cells and protein through, which means they go into the urine.

About the name

Nephritis means inflammation, or swelling, in the kidneys. **Glomerulonephritis** means inflammation of the glomeruli.

Causes: Read more about the immune system

Germ

The immune system protects the body against germs such as bacteria and viruses that can cause illness. These germs can enter the body in lots of ways, such as by the nose and throat or the urinary system. If we get a cold or flu, this means that a virus germ has got into the body and started to infect some of our body's cells.

Germs have special 'markers' that are different from the markers on our own body's cells. This means that the immune system can recognise that they are germs and kill them. We often feel sick for a few days or a few weeks while this is happening.

Parts of the immune system

The immune system has many different ways to protect the body against disease. Some of the parts include those listed below.

- **White blood cells** are living cells in the blood. Often, the number of white blood cells found in a blood test can give information about someone's immune system. The two main types of white blood cells in the immune system are neutrophils and lymphocytes.
- **Antibodies** or **immunoglobulins** recognise the germs that have come into the body, and can bind (stick) to them. There are five types: immunoglobulin A (IgA), immunoglobulin D (IgD), immunoglobulin E (IgE), immunoglobulin G (IgG) and immunoglobulin M (IgM).
- The **complement system** is made up of other proteins that float in the blood. These proteins work with (complement) other parts of the immune system to help kill germs or cells infected by germs. Normally, the body controls when complement is activated, so it does not attack the body itself.

When the immune system does not work properly

Sometimes the immune system does not work as expected and can cause problems. For example, sometimes the immune system cannot recognise the body's own cells and may attack them as if they were invaders like germs.

Tests and diagnosis

Your child will need some tests to diagnose (identify) PIGN, find out more about how it is affecting him or her and whether any treatment is needed. Your child may need an examination, urine tests, blood tests, imaging tests and a kidney biopsy.

Your doctor will talk to you or your child about his or her symptoms and any medicines that he or she takes. The doctor will examine your child – for example, to see whether there is **oedema** (swelling in the body).

Your doctor or nurse will check your child's **blood pressure**. This is because PIGN may cause high blood pressure (**hypertension**).

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**.

A **dipstick** will be dipped into the urine – this is a strip with chemical pads that change colour depending on what substances are in the urine. This shows whether there are blood cells and/or protein, which are signs of PIGN. 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**. A special gel or cream can be used to prevent your child from feeling any pain. The blood test results can give the doctor more information, including:

- about the immune system, and whether there has been a recent infection
- how well his or her kidneys are working – this is called the **kidney function**
- the amount of protein in your child's blood – in PIGN, the kidneys leak protein into urine but this is not normally enough to affect how much is in the blood
- the amount of types of blood cells and other chemicals

» **Read more about blood tests on the next page**

Imaging tests

Some children need **imaging tests** (scans). These use special equipment to get images (pictures) of the inside of the body.

- **Ultrasound scan** – looks at the shape and size of 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
- **Chest x-ray** – for children with breathing problems, a chest x-ray checks for any fluid (liquid) around the lungs. Your child sits or lies still for a few seconds while a machine takes x-ray images.

Occasionally, other imaging tests are needed.

Kidney biopsy

Your doctor may recommend a **kidney biopsy** to find out how PIGN is affecting the kidneys or whether your child has another type of glomerulonephritis. A tiny piece of one kidney is removed from the body with a needle and examined under microscopes.

Medicines are used so your child does not feel any pain or can sleep through the procedure. It can take a few weeks to get the results.

Tests: Read more about blood tests

What blood tests measure

- A blood test can check whether there are any **antibodies**, which the body's immune system makes to identify and kill specific germs. This gives information about whether there has been an infection, and sometimes which germ caused it.
- Children with PIGN may have low levels of a protein called complement C3, which is also part of the immune system. This complement works with antibodies to help kill cells infected by germs.
- The amount of **urea** and **creatinine** can be measured. These are waste products made in the body, which are normally removed by the kidneys into urine.
- The kidney function can be measured by the **glomerular filtration rate (GFR)**. The GFR is the amount of fluid the kidneys filter each minute. It can be estimated by measuring the amount of creatinine in the blood.
- The amounts of different types of blood cells can be measured in a **full blood count**.

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.

Treatment

Most children do not need special treatment but need lots of rest. Some children need treatments – for pain, complications or kidney problems – which are explained below. If another health condition is causing PIGN, this may need special treatment, too.

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

Where will my child be treated?

Hospital stay

Your child will probably need to be admitted to hospital for a few days. He or she will be looked after by a **paediatrician**, a children's doctor.

Outpatient

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 clinic during the day – as an **outpatient** – for check ups or more treatment.

Referral to specialist services

Some children are referred to a **paediatric renal unit**, a specialised unit that treats babies, children and young people with kidney conditions and may be in a different hospital to your own. These children will be looked after by a **paediatric nephrologist**, a doctor who treats children with kidney problems.

This is usually if children have complications from the PIGN, such as:

- severe **oedema** (swelling in the body), especially if it is around the lungs or causing breathlessness
- very high blood pressure (**hypertension**)
- kidneys that are not working well – in serious cases, the kidneys stop working; this is called **acute kidney injury**

Changes to eating and drinking

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

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

Treating the infection

Most children do not need special treatment. To relieve pain, your child may take medicines such as paracetamol (e.g. Calpol).

→ **Do not give your child ibuprofen (e.g. Brufen) as it can cause further damage to his or her kidneys.**

Treatment: Read more about your child's hospital stay and healthcare team

What happens in hospital

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
- weigh your child to help find out if he or she has too much or too little fluid in their body.

Healthcare team

Your child's healthcare team may include a:

- **paediatric nephrologist** – a doctor who treats children with kidney problems
- **radiologist** – a healthcare professional who uses imaging tests to help identify a condition
- **renal nurse** – a nurse who cares for children with kidney problems
- **paediatric dietitian** – a 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 or 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.

Antibiotics are medicines that kill harmful bacteria in order to get rid of or prevent an infection that is caused by bacteria. Your child may need to take antibiotics to treat the infection that caused the PIGN.

→ If your child is prescribed an antibiotic, it is vital that he or she completes the course. Your child must take the medicine for the number of days that the doctor has told you, or until all the medicine has been taken.

» More information about antibiotics at www.medicinesforchildren.org.uk

Controlling blood pressure

If your child has high blood pressure (**hypertension**), he or she may need to eat a no-added salt diet, and may need medicines, to control the blood pressure.

Reducing swelling in the body

Some children with PIGN need to take **diuretics**, medicines that help reduce **oedema** (swelling in the body). Diuretics work on the kidneys to increase the amount of water and salt they remove from the body in urine.

If your child is taking diuretics, he or she will need to go to follow-up appointments. Your doctor will examine your child for oedema and measure his or her weight. This helps find out how well the medicine is working.

Common diuretics are: furosemide, spironolactone and metolazone. Some of the other diuretics that may be used are: amiloride, bendroflumethiazide and chlorothiazide.

Reduced kidney function

Some children with PIGN develop **reduced kidney function** – their kidneys do not work as well as they should. Most do not need any special treatment, and their kidney function will return to normal.

A very small number will have more serious kidney problems and will need further treatment. **Dialysis** uses special equipment or a machine to ‘clean’ the blood, removing waste products and extra water and salts.

Your child’s healthcare team will give you information to help make sure your child has the best type of dialysis.

Questions to ask

- What treatment does my child need?
- How will the treatment help my child?
- 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 PIGN come back? How will I know?

About the future

Your doctor will speak with you about how PIGN might affect your child in the future.

Most children fully recover from this disease, and it does not come back. Although some children will need to take medicines when they first develop PIGN, most will not need to continue taking medicines. A very small number of children will have long-term kidney problems.

Follow up

All children with PIGN need follow-up appointments at the hospital or clinic, to check for any health problems. These may continue for a while, depending on the severity of the illness.

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 his or her kidney function
- his or her **blood pressure** measured.

Long-term effects

Recovery

Most children fully recover from this disease, and it does not come back. Though some children will need to take medicines when they first develop PIGN, most will not need to continue taking medicines.

Long-term problems

A very small number of children will have long-term kidney problems, but this is rare.

If your child needed dialysis, or if his or her kidney function does not return to normal, he or she will need long-term follow up to check for any health problems. Your doctor will give you more information.

Impact on your child and family

Children who have been successfully treated for PIGN can do all the things that other children their age do. They can continue going to school or nursery, play with other children and stay active.

Living healthily

Your child can help protect his or her kidneys by leading a healthy lifestyle through his or her child and adult years.

- eating a healthy diet – with at least five servings of fruit and vegetables a day, taking care not to eat too much salt, sugar and fats (especially saturated fats)
- getting plenty of exercise
- not smoking.

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 PIGN. 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.

Your notes and contact information

www.infoKID.org.uk



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For details on any sources of information used in this topic, please contact us through our website www.infoKID.org.uk.

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