Haemophilia

HAEMOPHILIA FOUNDATION AUSTRALIA

Haemophilia

This information has been developed for people affected by or with an interest in haemophilia to explain what the health condition haemophilia is, how it is passed on and how it might affect a person over their lifetime.

Key points

- Haemophilia is a genetic bleeding disorder where blood doesn't clot properly
- Haemophilia is usually hereditary and can be passed down from parent to child
- In people with haemophilia bleeding continues for longer but it is not faster than someone else
- There are effective treatments to manage and prevent bleeding
- There is support and advice available at all stages of life if issues arise
- With knowledge and planning most people live well with haemophilia and lead active and independent lives.

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What is haemophilia?

Haemophilia is a genetic bleeding disorder where blood doesn't clot properly. It is caused when blood does not have enough *clotting factor*. A clotting factor is a protein in blood that controls bleeding.

When a person has an injury which causes bleeding, over 20 proteins are involved in the chain reaction to make a clot which stops the bleeding. Two of the key proteins are clotting factor VIII (8) and clotting factor IX (9).

There are two types of haemophilia. Both have the same symptoms.

Haemophilia A is the most common form and is caused by having low levels of **clotting factor VIII (8)**. It is also called *factor VIII deficiency*.

Haemophilia B, also known as Christmas Disease, is caused by having low levels **of clotting factor IX (9)**. It is also called *factor IX deficiency*.

There are different levels of **severity** in haemophilia: mild, moderate and severe. This is linked to the amount of clotting factor in the blood.

Haemophilia occurs when a person is born with a mutation or alteration in their factor VIII or factor IX gene. It is not contagious. It is hereditary and can be passed down from parent to child. Sometimes a person is the first in their family to have haemophilia. This is known as a **spontaneous mutation**.

There is also another bleeding disorder known as **acquired haemophilia,** which is not hereditary like the classical form of haemophilia. See page 7 for more information about acquired haemophilia.

How common is haemophilia?

Haemophilia is rare. It occurs in all races and all socio-economic groups.

In Australia there are more than 3,000 people diagnosed with haemophilia.

Approximately one in 6,000 males has haemophilia A.
Approximately one in 25,000 - 30,000 males has haemophilia B.

Most females who carry the gene alteration causing haemophilia do not have bleeding symptoms. However, around 20-30% of females with the gene alteration have reduced factor levels and bleeding problems. If their factor levels are low enough, they will have haemophilia, usually mild haemophilia. In some rare cases females can have moderate or severe haemophilia.

What happens when you have haemophilia?

Haemophilia is a lifelong condition. As yet it can't be cured, but there are effective treatments to manage and prevent its symptoms.

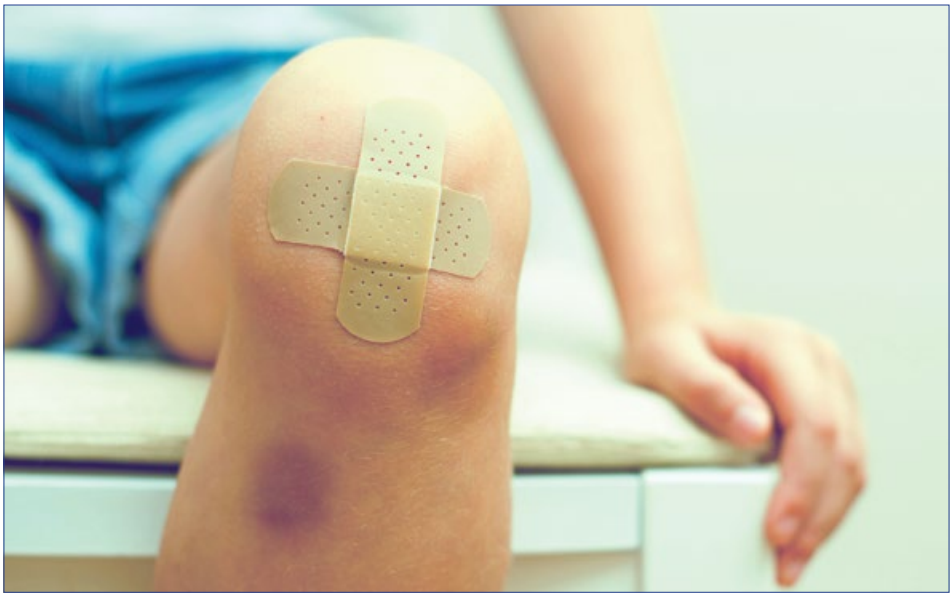
Treatment for haemophilia is provided through a specialist team at a Haemophilia Treatment Centre and is specific to the individual.

In Australia a child born with haemophilia today has a similar life expectancy to other Australians.

If a person has haemophilia, they have lower than normal levels of clotting factor. There are other things that can affect an individual's bleeding patterns, including their particular genetic alteration. This is called the **bleeding phenotype**.

The common belief that people with haemophilia could bleed to death from a cut is a myth. A person with haemophilia does not bleed any faster than anyone else, but bleeding can continue for longer if it is not treated and can result in poor healing. This occurs when blood does not form a tough, adherent clot where the blood vessels have been damaged.

- Minor cuts and scratches on the skin are not usually a problem. They can be treated with normal first aid, such as putting on a Band-Aid® and some pressure at the site of bleeding.
- However, haemophilia can sometimes complicate small injuries and medical procedures. If first aid does not stop the bleeding, bleeding can continue for days.
- If the bleeding does not stop, specialised treatment will be needed so blood can clot normally.



Bleeding episodes or 'bleeds' can occur internally in any part of the body. Bleeds can occur in anyone with haemophilia but occur more often in a person with severe haemophilia who is not having preventive treatment.

Any bleeding episode in a person with haemophilia can be serious no matter whether they have the mild, moderate or severe form and needs medical assessment and treatment.

Without treatment, people with haemophilia can have prolonged bleeding after medical or dental procedures or surgery or with deep cuts or wounds.

Another problem for people with haemophilia is internal bleeding into joints (especially knees, ankles or elbows), muscles or organs.

- This can happen as a result of injury.
- In some cases it can occur without an obvious cause (sometimes called 'spontaneous') - this is more common in severe haemophilia.
- If internal bleeding is not stopped quickly with treatment, it will result in pain and swelling.
- Some internal bleeding may be caused by other health problems, eg blood in urine.
- Over a period of time, repeated bleeding into joints and muscles can cause permanent damage, such as arthritis and chronic pain.

Emergency situations

Bleeds into the head, spine, neck, throat, chest, stomach or abdominal area are much less common but can be life-threatening. If this happens, the person with haemophilia should go to an emergency department immediately and their Haemophilia Treatment Centre should also be contacted.

Both males and females can have haemophilia, but nearly all people with severe haemophilia are male.

Special issues for females

Females with haemophilia usually have the mild rather than the severe form. However, females can experience additional bleeding problems:

- Heavy and/or long menstrual periods.
- This can lead to low iron levels or anaemia (low red blood cells or low haemoglobin) and they can feel tired, faint and short of breath.
- Some women also have heavy bleeding for an extended time after childbirth.

Liaison between a specialist Haemophilia Treatment Centre and a gynaecologist or obstetrics team will be important to manage or prevent excessive bleeding in females.

For more information on treatment and Haemophilia Treatment Centres, see the section on TREATMENT on page 26.

Acquired haemophilia A

Acquired haemophilia A is a very rare condition where a person's immune system (a system that protects your body from diseases) develops antibodies, also known as inhibitors, that mistakenly target the body's own clotting factors, most commonly factor VIII. It is not hereditary.

People with acquired haemophilia A would previously have been well with no history of bleeding and would have had normal blood clotting tests. In some cases, there is an underlying medical condition that can trigger acquired haemophilia A, for example, autoimmune conditions and certain cancers. In other cases, no cause of acquired haemophilia A is found.

There are several differences between acquired and hereditary forms of haemophilia. These include:

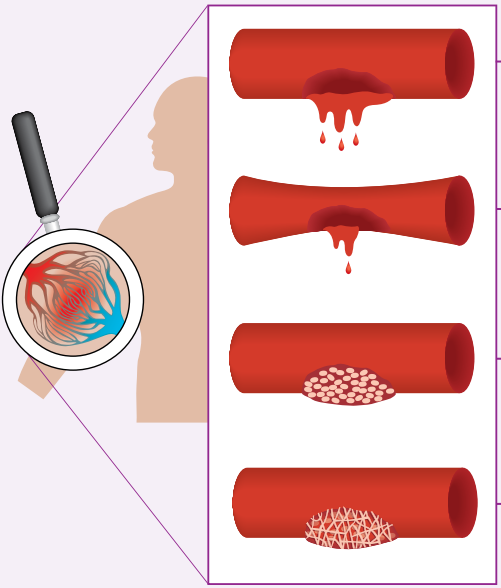
- How **severe the bleeding is** can be variable. Some people with acquired haemophilia A may have very little bleeding while others have significant life-threatening bleeding.
- The **pattern of bleeding** is different. In acquired haemophilia A it often includes skin, gastrointestinal and muscle bleeds rather than joint bleeds. However, bleeding can occur at any site in the body.
- The **age** when people with acquired haemophilia A first seek medical care for their condition is different to hereditary forms of haemophilia. Although acquired haemophilia A can occur at any age, it most often occurs in older people and in some women in late pregnancy or who have recently given birth.
- In acquired haemophilia A both **males and females are affected equally**.

Treatment for acquired haemophilia A is firstly to control the bleeding and then to remove the inhibitor and treat the underlying medical condition (if there is one). A small number of people do not respond to treatment or the inhibitor comes back. Getting rid of the inhibitor involves medications to suppress the immune system.

People with acquired haemophilia should be monitored by a Haemophilia Treatment Centre for specialist care.

How bleeding starts and stops

Normal clotting process



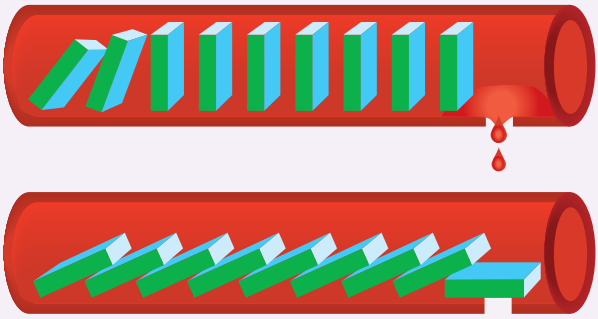
The **capillary** (small blood vessel) is injured and blood leaks out.

The capillary tightens up to slow the bleeding.

Then blood cells called **platelets** make a plug to patch the hole.

Next, many **clotting factors** in **plasma** (part of the blood) knit together to make a clot over the plug. This makes the plug stronger and stops the bleeding.

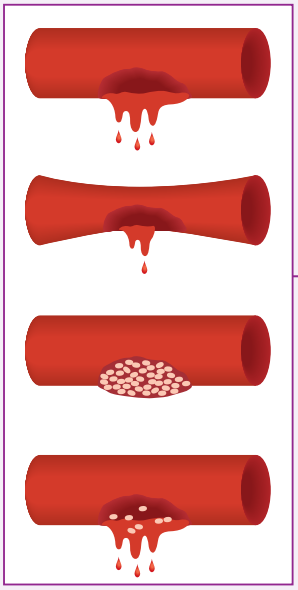
Clotting factors at work to stop bleeding



Source: Hemophilia in Pictures © World Federation of Hemophilia 2005.

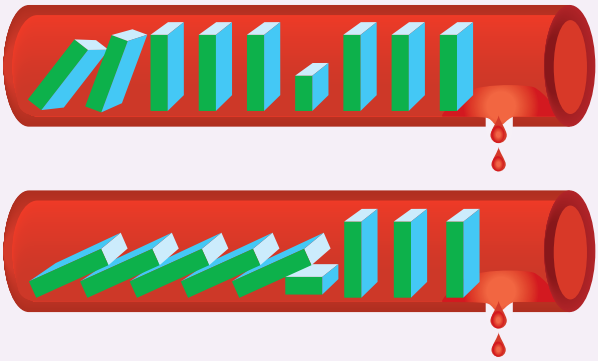
How bleeding starts and stops

Clotting in haemophilia



In haemophilia there is not enough factor for the clot to stay together, so bleeding continues for longer than usual, but not faster.

Clotting factors in haemophilia



Source: Hemophilia in Pictures © World Federation of Hemophilia 2005.

Levels of severity

There are three levels of severity in haemophilia:

- **Mild**
- **Moderate**
- **Severe**

The level of severity depends on the amount of clotting factor in the person's blood.

A person with haemophilia will usually have the same level of severity over their lifetime, eg a person with severe haemophilia will always have severe haemophilia. Within a family, males with haemophilia will also nearly always have the same level of severity, eg if a grandfather has severe haemophilia and his grandson has inherited haemophilia, his grandson will also have severe haemophilia. However, factor levels in females affected by haemophilia are unpredictable and severity can vary between females and other family members.

It may take some time after birth to confirm a child's factor level while their factor levels stabilise. Factor VIII levels can also change for females with pregnancy and hormonal medications such as the contraceptive pill and as they grow older. Factor IX levels rarely change in people with haemophilia B.

The normal range of factor VIII and factor IX in a person's blood is between 50% and 150%.

Some females who carry the gene alteration and have factor levels at the lower end of normal (40-50%) may also experience abnormal bleeding. If further investigation indicates the bleeding is related to haemophilia, they will be treated as having mild haemophilia and diagnosed as **symptomatic haemophilia carriers.**

What to expect if you have haemophilia

Mild haemophilia 5 – 40% of normal clotting factor	• Likely to bruise easily and have prolonged bleeding after minor cuts • Likely to have bleeding problems after having teeth taken out, surgery, medical procedures that cut the skin or a bad injury or accident. • Females may have heavy menstrual bleeding (heavy periods) • Females may have bleeding problems with childbirth • Otherwise might only have bleeding problems requiring medical attention very occasionally.
Moderate haemophilia 1 – 5% of normal clotting factor	• Likely to bruise easily and have prolonged bleeding after minor cuts • May have bleeding problems after minor injuries, such as sporting injuries • Likely to have bleeding problems after surgery, medical or dental procedures that cut the skin or a bad injury or accident • Females likely to have heavy menstrual bleeding (heavy periods) • Females sometimes have bleeding problems with childbirth • Occasionally have a bleed for no obvious reason.
Severe haemophilia Less than 1% of normal clotting factor	• Likely to bruise easily and have prolonged bleeding after minor cuts • Often have bleeds into joints, muscles and soft tissues • Can have bleeds for no obvious reason ('spontaneous bleeds'), as well as after surgery, medical or dental procedures that cut the skin and injuries including minor bumps or knocks. • Females likely to have heavy menstrual bleeding (heavy periods) • Females likely to have bleeding problems with childbirth

Signs and symptoms of haemophilia

How is haemophilia diagnosed?

Haemophilia is usually diagnosed through:

- The physical signs that a person has unusual bleeding problems

And

- Checking the family history for bleeding problems

And

- Laboratory tests on a blood sample for a person's clotting factor levels.

Females may also need genetic testing to see if they have the gene alteration for haemophilia.

The laboratory tests will show whether people have mild, moderate or severe haemophilia.

haemophilia A - low factor VIII (8) levels.
haemophilia B - low factor IX (9) levels

What are the first signs?

Care needs to be taken with childbirth delivery methods and a birth plan put in place if there is a possibility the child might have haemophilia.

If there is a family history of haemophilia, a sample of the baby's blood can be tested after birth to check the factor VIII or IX levels and see whether the baby has haemophilia. Testing should be repeated when the baby is six months of age to confirm the results. Testing can also be done during pregnancy to determine if the baby has haemophilia.

For more information on pregnancy and childbirth, see CARRYING THE GENE ALTERATION on page 20.

Most children with haemophilia do not have bleeding problems at birth. However, some bleeding problems may appear at birth or soon after.

The specialist nurses and physiotherapists at the Haemophilia Treatment Centre can advise on haemophilia issues during the normal childhood stages.

If there is no family history, children with severe haemophilia are usually diagnosed in the first year when their parents or health professionals notice unusual bruising or bleeding problems.

Haemophilia may be suspected if babies:

- have internal bleeding or unusual swelling or bruising after delivery
- continue to bleed after a heel prick or after circumcision
- bruise easily
- have bruising in unusual places, eg in the armpit
- have excessive bruising after immunisation.

When all babies begin to crawl and walk, they can knock into hard objects as well as having twists, falls or sitting down with a bump. Small bruises are common in children with severe haemophilia and are not usually dangerous.

Head injuries

As with anyone, a knock or bang or bruise on the head needs some extra attention. In a child with severe haemophilia, these might become serious and should always be checked by a haemophilia specialist.

Signs and symptoms of a head injury include:

- Not wanting to eat or drink, vomiting
- Headache, unsettled or irritable, very sleepy, unable to wake
- Unsteady, problems with crawling or walking
- Bleeding from ears or nose
- Seizures, fits.

Sometimes toddlers or children may have a bleed into a joint or a muscle.

Signs of a bleed can include:

- Painful swelling
- Reluctance to use an arm or a leg.

As children grow, they learn to recognise that bleeding may be occurring. Even before pain or swelling becomes obvious they may recognise a 'funny feeling' which is one of the earliest signs of a joint bleed.

Immunisations

Children with haemophilia can have all the normal immunisations at the usual ages. Informing the nurse or doctor giving the immunisation that the baby or toddler has haemophilia is important. Injections can be given subcutaneously, into the fatty tissue under the skin, rather than into the muscle, and pressure put on the skin where the child was injected. This reduces the risk of bruising and bleeding. However, changing the way of giving immunisations isn't necessary for all children with haemophilia. If you have a child with haemophilia, contact the Haemophilia Treatment Centre for advice on how your child should be immunised.

Mild and moderate haemophilia

Mild or moderate haemophilia might not be diagnosed until children are older, or sometimes until they are adults. If they have mild haemophilia, minor injuries may heal normally because there is enough clotting factor activity in the blood. The bleeding problem might not be noticed until the person has surgery, a tooth taken out, a major accident or injury or a haemorrhage after childbirth.

Growing up with haemophilia

With treatment and support from their Haemophilia Treatment Centre, children born with haemophilia today can live healthy lives with a normal life expectancy. Haemophilia treatment has changed a great deal in recent years. Unless there are complications, young people can expect to grow up with fewer or no joint problems caused by their haemophilia. With sensible precautions, they can exercise and play most sports and look forward to an active, independent and fulfilling life.

For more information on support, see LIVING WELL WITH HAEMOPHILIA on page 36.

Inheritance, genetics and haemophilia

Haemophilia is an inherited condition and runs in families.

Haemophilia is caused by a mutation or alteration in the gene making factor VIII (8) or factor IX (9).

In genetics:

- these genes are called the ***F8* gene** and ***F9* gene**
- all females with the gene alteration are referred to as '**carriers**', because they 'carry' the gene alteration.

This gene alteration is passed down from parent to child through generations. Men with haemophilia will pass the gene alteration on to their daughters but not their sons. Women who are carriers can pass the gene alteration on to their sons and daughters. Sons with the gene alteration will have haemophilia. Daughters with the gene alteration can have normal or reduced factor VIII or factor IX levels. Some will not have bleeding symptoms, while others can have symptoms and can have haemophilia.

No family history of haemophilia

In about one third of people born with haemophilia, there is no history of the disorder in the family. This happens when a new alteration in the genetic code of the *F8* or *F9* gene occurs by chance in an egg cell or sperm cell. The child who is conceived will have haemophilia or be a carrier and can pass the gene alteration on to their children. It is often called a *new* or *spontaneous mutation*.

Sometimes this gene alteration has occurred a generation or two earlier and the family has not known about it until they are tested.

Once haemophilia appears in a family the gene alteration is then passed on from parents to children following the usual pattern for haemophilia. Family members should seek genetic counselling and testing if there is someone in the family who has haemophilia.

Cells and chromosomes

Every person has millions of cells that make up their body. At the centre of each cell are 46 chromosomes arranged in pairs. The chromosomes are packages in cells that contain the person's genetic information or 'genes' and determine the person's individual characteristics, such as the colour of their eyes or hair.

Sex determination

Everyone is born with 'sex' chromosomes. The **X** and **Y** sex chromosomes help to determine haemophilia inheritance patterns.

How do children inherit **X** and **Y** sex chromosomes from their parents?

- Individuals who are assigned 'female' at birth typically have two **X** chromosomes and receive one from each parent.
- Individuals who are assigned 'male' at birth typically have one **X** chromosome, which they receive from one parent, and one **Y** chromosome, which they receive from the other.

See the diagram on page 19.

Gender diversity

Gender affirming medical care after birth, eg hormones or surgery that some trans or gender diverse people may use to affirm their gender, will not change a person's sex chromosomes or influence haemophilia inheritance patterns.

The Haemophilia Treatment Centre can support gender diverse people with haemophilia with:

- help to understand their individual bleeding and inheritance patterns
- a personalised treatment plan
- clear advice on management of their bleeding episodes, for example, on the ABDR patient card, to make sure they receive appropriate care.

The following sections explain the typical experience of genetic inheritance in haemophilia, but it can be more complex in some individuals. In these cases, the Haemophilia Treatment Centre will provide individualised advice and can refer the person to genetic specialists, if appropriate.

Inheritance

The genes for making factor VIII (8) and IX (9) are located on the X chromosome.

Any male or female with an alteration in their *F8* or *F9* gene can pass it on to their children.

X chromosomes and blood clotting

Because females have two copies of these genes, one inherited from each parent, women with an alteration in their ***F8* or *F9* gene** usually have another copy that is not altered. This helps factor VIII and IX to work properly in the blood clotting process and is often enough to control bleeding.

However, the **Y** chromosome does not have a gene to produce these factors. Males with an ***F8* or *F9* gene** alteration on their **X** chromosome do not have another ***F8* or *F9* gene** to help with blood clotting and will have haemophilia.

Male inheritance pattern

- If a male with haemophilia has children, **all his daughters** will be haemophilia carriers because he will pass the *F8* or *F9* gene alteration on to them on his **X** chromosome.
- None of his sons will have haemophilia as his unaffected **Y** chromosome is passed on to them and they receive their **X** chromosome from their mother.

Female inheritance pattern

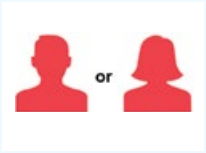
Females can carry the gene alteration causing haemophilia even if they don't have symptoms.

A woman who carries the gene alteration can pass it on to both her sons and her daughters.

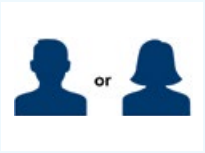
It is helpful to remember that genetics does not have a memory.

With each pregnancy:

- there is a **50% chance her male baby** will have haemophilia
- and a **50% chance her female baby** will be a carrier.

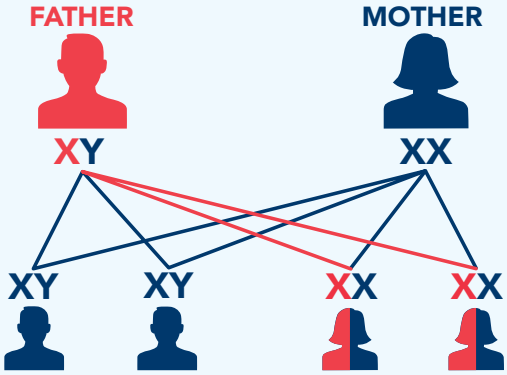


has an **X** chromosome with the 'haemophilia' genetic alteration.



has an unaltered **X** chromosome.

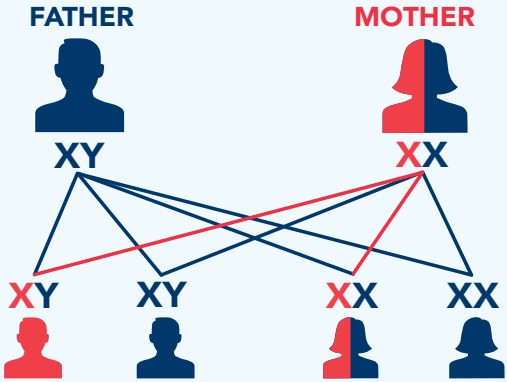
When the father has haemophilia and the mother is unaffected.



None of the sons will have haemophilia.

All the daughters will carry the gene alteration. Some might have symptoms or have haemophilia.

When the mother carries the gene alteration causing haemophilia and the father is unaffected.



There is a 50% chance at each birth that a son will have haemophilia.

There is a 50% chance at each birth that a daughter will carry the gene alteration. Some might have symptoms or have haemophilia.

Carrying the gene alteration

Clotting factor levels and symptoms

Many girls and women who carry the factor VIII or IX gene alteration causing haemophilia do not have signs or symptoms of a bleeding disorder.

However, approximately 20-30% of girls and women who carry this gene alteration have a bleeding tendency.

In the past females with bleeding symptoms were generally described as 'symptomatic carriers'. Now if their factor levels fall in the range for haemophilia (less than 40% of normal clotting factor), they are diagnosed as having the medical condition haemophilia. Usually they will have mild haemophilia. In very rare cases, some girls and women have particularly low factor levels causing them to have moderate or severe haemophilia.

All girls and women who are carriers should have testing for their clotting factor levels. Females with lower factor levels should have them checked periodically, as their factor levels may change with age, pregnancy and hormonal medications. If their factor level is low, they will need a treatment plan to prevent bleeding problems and manage any situations that occur.

Genetic testing

A normal factor VIII or factor IX level test will not tell females whether they carry the gene alteration causing haemophilia. Some females may have normal factor levels, but still carry the gene alteration.

A common time for testing whether a girl or woman is a carrier is when she reaches childbearing age and can understand what will happen with testing and what it means and make the decision for herself. Finding out whether she carries the gene alteration is a process which will take time, sometimes many months. This may involve:

- Discussion with a haemophilia team specialist and/or genetic counsellor
- Weighing up the implications of genetic testing with advice and support from specialists, counsellors and other experts
- Looking at the family tree to identify other family members who may have the gene alteration
- Blood tests for other affected family members (eg, a male with haemophilia) to identify the particular genetic mutation causing haemophilia in her family
- Blood tests for the woman to see if she has the same family genetic mutation.

Many people find that undertaking these tests gives them a lot to think about. The Haemophilia Treatment Centre can help with information and advice about genetic testing and can provide a referral to a genetic counsellor, if needed. Women, their partner, family or parents of girls can talk to the Haemophilia Treatment Centre or genetic counsellor individually or together prior to testing.

If a person starts exploring genetic testing but decides against it, there is no obligation to complete the process and they can revisit it at a later stage, if they wish.

For more information about genetic testing, see

- the Policies and Position Statements on the Human Genetics Society of Australasia web site – www.hgsa.org.au.
- **Haemophilia testing for women and girls** on the Haemophilia Foundation Australia website – www.haemophilia.org.au

Planning a family

For people with haemophilia or women who carry the gene, planning a family can raise a number of questions:

- Will their children have haemophilia or carry the gene alteration?
- If so, how will this affect them?
- How can they find out?
- What are the options for planning a family?
- How can a mother who is a carrier plan for a safe pregnancy and delivery?
- Who will help with all of this?

Who can help?

- The team at the Haemophilia Treatment Centre can help with information and advice about haemophilia, having children, genetics and genetic testing.
- The Haemophilia Treatment Centre can provide a referral to a genetic counsellor or other counselling, if needed.
- The woman, her partner and family can talk to the Haemophilia Treatment Centre or the counsellor individually or together. Many find this helpful.
- A general practitioner (GP) or any other doctor can also provide a referral to a genetic counsellor or other counselling.

It may be useful to review the information about how haemophilia is passed on to children.

For more information inheriting haemophilia, see INHERITANCE, GENETICS AND HAEMOPHILIA, page 16.

Often an understanding of haemophilia is based on memories of a brother, father or grandfather's experience. Treatment for haemophilia has improved a great deal over the years. It can be valuable to speak with a Haemophilia Treatment Centre or other haemophilia families to learn more about current treatments and to see how things have changed.

Pregnancy and childbirth

With good management, women who carry the gene alteration causing haemophilia have no more problems with delivering a healthy baby than other mothers. However, it is very important to plan and prepare as much as possible.

This involves:

- If planning a pregnancy, discussing this with a haemophilia specialist. If discussing family planning, they may refer to a genetic counsellor
- When the pregnancy is confirmed, contacting the Haemophilia Treatment Centre for advice on local obstetric services with experience of haemophilia
- Asking the haemophilia and obstetrics teams to consult with each other to plan for a smooth and safe pregnancy and delivery and care for the newborn
- Checking with the Haemophilia Treatment Centre before having any invasive procedures, such as chorionic villus sampling or amniocentesis
- Discussing suitable choices for anaesthesia, especially an epidural, with the Haemophilia Treatment Centre and obstetrics teams.
- A normal vaginal delivery is usually recommended unless there are obstetric complications.
- Your HTC and your obstetrics team will work together to prepare a birth plan that is specific to you and your baby.

Identifying the sex of the baby

If a pregnant woman knows she carries the gene alteration causing haemophilia, it is advisable to determine the sex of the baby before birth, preferably with a non-invasive test with minimal risk to the fetus, such as ultrasound. A male baby is more likely to be affected by severe haemophilia than a female. The woman and her partner can choose if they want to be told the sex of the baby before delivery even if the haemophilia and obstetric teams are aware. If neither the couple nor the medical staff know the sex of the baby and no other genetic testing of the fetus has been carried out, the pregnancy and birth will be managed as if the baby has haemophilia to ensure the baby is delivered safely.

Testing for haemophilia before birth

For a woman or couples who wish to test for haemophilia before birth, there are two main testing options:

- **Prenatal diagnostic testing:** a test during the pregnancy to check the sex of the baby. If it is male, further testing can check for the family gene mutation or alteration, which will show if the baby has haemophilia
- **IVF with pre-implantation genetic diagnosis (PGD):** using IVF technology to test embryos for the family gene alteration before embryo implantation and pregnancy.

For these options to be available the gene alteration in the family must be known.

Prenatal diagnostic testing to check for the family gene alteration also involves testing with a procedure such as:

- **Amniocentesis:** testing the amniotic fluid that surrounds the fetus in the uterus
- **Chorionic villus sampling (CVS):** testing the placenta that connects the fetus to the mother's uterus.

These tests are invasive and have a small risk for the mother and the fetus.

A genetic counsellor can explore these reproductive options with the woman or the couple in further detail, along with any implications. There can be substantial costs for these tests and procedures, and it is recommended to clarify this and options for support beforehand.

If a pregnant woman has or suspects she has a history of haemophilia in her family and does not know if she carries the gene alteration, it is important to let the obstetrics team know so that they can plan a safe delivery of the baby with the haemophilia team.

Treatment

There is at least one specialist Haemophilia Treatment Centre in every Australian state or territory, located in a major public hospital.

Haemophilia Treatment Centres have a team of health professionals available, including doctors, nurses, physiotherapists, and social workers, counsellors or psychologists with expertise in the treatment and care of people with bleeding disorders. They also have access to specialist laboratory and diagnostic testing and can give referrals to genetic counselling and testing services.

Haemophilia Treatment Centres have a comprehensive care approach and the team can work with other services that might be needed, such as paediatricians (children's health doctors), gynaecologists (women's health specialists), obstetricians (for pregnancy and childbirth), GPs (general practitioners) and other relevant health care services.

Treatment plan

Each person affected by haemophilia will have their own treatment plan, which is developed with them individually and reviewed regularly/as needed with their haematologist (blood diseases specialist doctor) or haemophilia nurse practitioner. It may include a plan for regular treatment and for injuries or surgery.

There are a variety of treatment products used to treat haemophilia. It is important that people with haemophilia discuss these treatment options with their Haemophilia Treatment Centre.

Replacement factor therapy

Clotting factor concentrates replace the missing clotting factor in the blood and are called **replacement factor therapy**.

The treatment is infused (injected) into a vein at home by people trained to treat themselves. When it is difficult to use a vein, the treatment is sometimes infused through a port, a small device implanted under the skin to connect to a big central vein closer to the heart. Parents or carers can be trained for both methods of treatment. The treatment can also be infused at the Haemophilia Treatment Centre, in the emergency department or in the community by an educated general practitioner (GP) or community nurse.

Replacement factor therapy can be given:

- As **prophylaxis** – given regularly to prevent bleeds or reduce bleeding from an injury. How often it is given is tailored to the individual and can be given at different intervals, ranging from daily to fortnightly.
- **On demand** – before surgery, childbirth or dental treatment, or after an injury or accident, or once a bleed has started.

Recombinant factor is the most widely used type of concentrate. This is made by genetic engineering and contains little or no material from human blood or animals. There are several brands available manufactured by different pharmaceutical companies.

Standard vs extended half-life

When clotting factor concentrates are used for replacement factor therapy, they do not stay in the body but are gradually used up. The amount of time it takes for the body to use up half of the clotting factor is called the half-life. The half-life will vary from person to person.

The Haemophilia Treatment Centre will discuss this with the person or parents of a child and may test the person's blood after an infusion to see how long their personal response to the factor is. Understanding the half-life is important for planning when to have infusions, for example, before high risk activities such as competition sport.

Some people will be prescribed recombinant factor which is an **extended half-life concentrate (EHL)**. The effect of an EHL lasts for longer in the body than a standard half-life concentrate and as a result they do not need to be infused as often.

Plasma factor concentrates are also used by some people. These are made from the plasma (pale yellow fluid part) in human blood.

Non-factor therapies

Non-factor therapies work differently to replacement factor therapy. These treatments do not replace factor VIII or factor IX but work to support the body's capacity to clot in other ways.

These treatments are used ONLY as prophylaxis to prevent bleeding episodes and not to treat acute bleeding episodes, for example, after an injury. They are injected under the skin (sub-cutaneousl injection) at regular intervals. How often these treatments are given will vary depending on the type of treatment. The Haemophilia Treatment Centre will train parents or the person with haemophilia so that they can inject their treatment independently.

Types of non-factor therapies

FVIII mimetic: even though it is not the same as factor VIII, this is a molecule that copies the function of factor VIII to hep the body form a clot. This can be used to treat people with haemophilia A both with and without inhibitors.

Other non-factor therapies: other treatments also work differently from factor replacement therapy and use a variety of different approaches to help the body form clots.

Non-factor therapies are still a relatively new treatment option for people with haemophilia and some treatments are still in the clinical trial stage. There is ongoing research and development in this area, which may lead to other new treatments for haemophilia A and haemophlia B in the future. It is very important that people with haemophilia discuss these treatment options with their Haemophilia Treatment Centre to determine which one would best suit them.

Gene therapy

Gene therapy for haemophilia aims to provide the body with a functioning version of the factor VIII (8) or factor IX (9) gene so that the body can produce enough clotting factor for the blood to clot normally.

Gene therapy is still a relatively new treatment for haemophilia and there is a lot of research in this area and new information becoming available. Initial results are promising, with a decrease in the number of bleeding episodes and the need for people to have prophylaxis treatment.

There are a lot of important considerations before undertaking gene therapy, for example, will you be suitable to have gene therapy, how long will the effect of treatment last, side effects, etc. All of these need to be discussed with your Haemophilia Treatment Centre.

Gene therapy has been registered for use in some countries.

In Australia there are currently a number of advanced experimental clinical trials for gene therapy. Some Haemophilia Treatment Centres are participating in the trials. People who are interested can discuss this with their Haemophilia Treatment Centre as this is constantly changing.

Desmopressin (DDAVP)

This is a synthetic hormone which releases the body's stored factor VIII into the bloodstream to help blood clot. It is used for treating some people with mild haemophilia A and some women with bleeding disorder symptoms. DDAVP can be given as a slow infusion into a vein, but may sometimes be given as an injection subcutaneously (into the fatty tissue under the skin), or in special circumstances as a nasal spray. Individuals can discuss these alternatives with their Haemophilia Treatment Centre to see if it is an option for them.

Tranexamic acid

This slows blood clots from breaking down after they have been formed. It can help to treat mouth or nosebleeds, gut bleeding or bleeding after dental work. Most commonly it is taken as tablets, syrup or in a mouthwash.

Hormone therapy

Hormone treatment can help women who have heavy menstrual bleeding. The hormones can increase factor VIII levels. This can include **oral contraceptives (birth control pills)** or the **Mirena®** or **Kyleena® IUD/ intrauterine device**.

How often do people need treatment?

Most people with haemophilia will need treatment for injuries, apart from minor cuts and scratches, or in preparation for surgical and some dental procedures.

Moderate and severe haemophilia

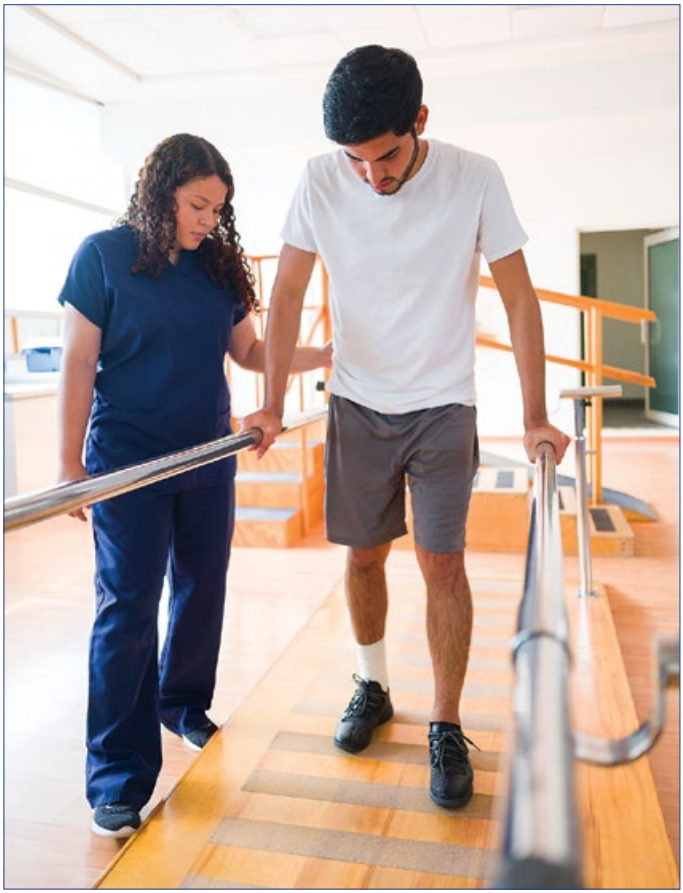
Current treatment for people with moderate or severe haemophilia aims to prevent bleeding, pain and joint damage.

In Australia the usual treatment for most children and young people with severe haemophilia is **prophylaxis**, where a non-factor therapy or factor concentrate is injected regularly to help protect from 'non-traumatic' bleeds, ie the bleeds that are not caused by an obvious injury or a medical procedure like surgery.

Many children and young people have benefited from prophylaxis, which reduces the risk of developing the arthritis and joint problems often experienced by older people who grew up without adequate treatment due to limited supply of product.

Mild haemophilia

In most cases, people with mild haemophilia will not need regular prophylaxis and will only need treatment for a bleed when it occurs, usually after trauma or injury, or when they are preparing for surgery or some dental work. Some women and girls with mild haemophilia may need a treatment plan to manage heavy menstrual bleeding.



Physiotherapy

Treatment also involves **exercise and rehabilitation** guided by a haemophilia physiotherapist. This helps to prevent and recover from bleeds, to improve the health of joints in the long-term and to help maintain a healthy body and mind.

Even when having preventive treatment regularly, bleeding into joints and muscles may still occur.

All bleeding episodes should be treated promptly. Any bleed should be reported to the haemophilia care team.

To recover fully from a bleed, people with haemophilia are advised to apply the **PRICER** principles when they have a bleed and to work with their Haemophilia Treatment Centre team, including their haemophilia physiotherapist, to rehabilitate the joint or muscle back to full function.

PRICER stands for:

P	**Protection**	Protect the injury from further damage. Stop the activity, minimise weight on the affected joint or muscle.
R	**Rest**	Rest the affected joint or muscle.
I	**Ice**	To reduce pain and swelling apply a cold pack (eg, an ice pack or bag of frozen vegetables wrapped in a towel) or a cool relief gel directly on the skin for about 10-15 minutes, then remove and reapply about every two hours.
C	**Compression**	Apply pressure to the affected area to slow bleeding. If using a bandage, do not wrap it too tightly.
E	**Elevation**	Place the affected joint or muscle higher than chest level.
R	**Rehabilitation**	

The Haemophilia Treatment Centre team helps people with haemophilia and parents to learn how to recognise a bleed and deal with it promptly, and how to prevent and rehabilitate injuries and bleeds.

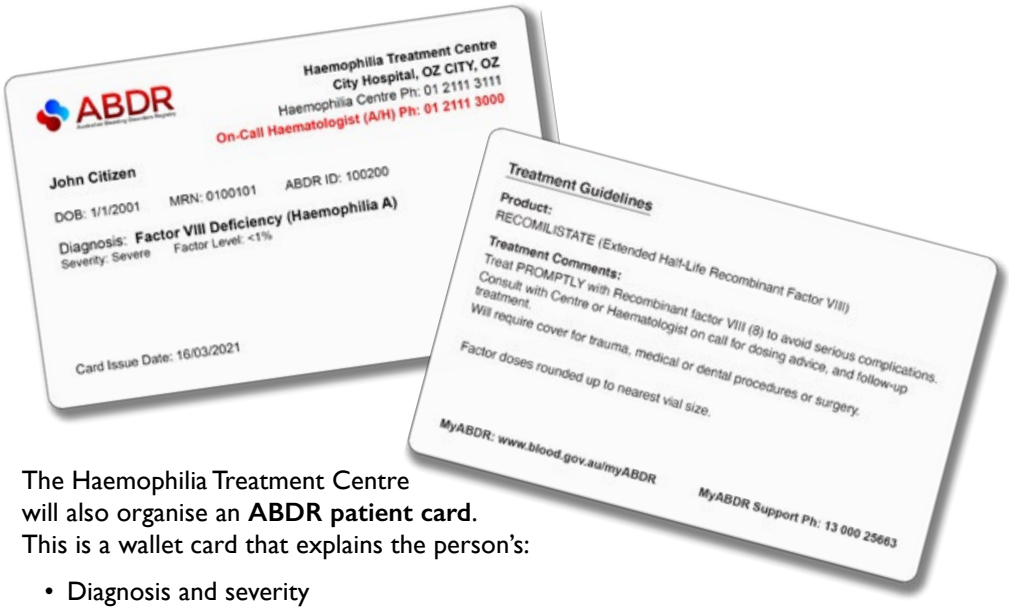
Inhibitors

After treatment with a clotting factor product, some people with haemophilia may develop antibodies – known as 'inhibitors' – which may mean treatment with factor replacement therapy no longer works for them or is less effective.

There are a number of ways to treat inhibitors, including bypassing agents and non-factor therapies. Management will vary depending on the person's individual circumstances and the Haemophilia Treatment Centre will discuss the treatment options with them.

ABDR and MyABDR

If people are diagnosed with haemophilia or as a 'haemophilia carrier', they may be asked by the Haemophilia Treatment Centre to register in the **Australian Bleeding Disorders Registry (ABDR)**. This is the online system used by Treatment Centres across Australia to manage and record the treatment and care of their patients.



The Haemophilia Treatment Centre will also organise an **ABDR patient card**. This is a wallet card that explains the person's:

- Diagnosis and severity
- Treatment plan
- Who to contact for further medical advice.

When people are using haemophilia treatment products at home, they can use the **MyABDR app** and **website** to record their treatments and bleeding episodes and share the information with their HTC.

Tips for people with haemophilia or girls/ women who carry the gene alteration

- Stay in regular contact with your local Haemophilia Treatment Centre team and make sure you keep up-to-date with anything new.
- A regular review may be recommended by your Haemophilia Treatment Centre, depending on the severity of your bleeding disorder and your individual needs.
- Report all joint or muscle bleeding to your Haemophilia Treatment Centre team so that each episode can be properly assessed and rehabilitated.
- Keep a diary of bleeding episodes, for example, using the MyABDR app.
- Track your menstrual periods and seek help from your doctor if they are a problem

Informing other health care professionals

If you have haemophilia:

- Know your diagnosis.

  Do you have haemophilia A or B?

  What is your level of severity?
- If you use treatment product, know which one you use and your usual dose.
- Always carry your ABDR patient card and show it to doctors, nurses, dentists, ambulance officers, emergency departments and other health professionals who provide your care.
- Set up your emergency ID and keep a copy of your ABDR patient card on your phone. You may also wish to wear a medical alert bracelet or necklace.
- Always tell your doctor, dentist, surgeon, gynaecologist or obstetrician you have a bleeding disorder before having any procedures, no matter how minor – and contact your HTC ahead of time to check any medical support required.
- Before you start taking anything prescribed by your doctor, naturopath or other health practitioner, check with them or your pharmacy whether it is safe for someone with a bleeding disorder.

Treatment product safety

Haemophilia treatment product safety is a high priority for Australian blood bank services, manufacturers, the National Blood Authority, regulatory bodies such as the Therapeutic Goods Administration, and the bleeding disorders community. Manufacture of blood products, such as plasma factor concentrates, is carefully regulated and monitored to make sure that blood products are now as safe as possible from infections that can be transmitted by blood, such as Human Immunodeficiency Virus (HIV), hepatitis B and C and variant Creutzfeldt-Jakob Disease (vCJD):

- In Australia blood donors are screened and blood donations are tested for HIV, hepatitis B and C, human T-cell lymphotropic virus (HTLV) and syphilis
- When they are manufactured, factor concentrates made from human plasma are treated with several processes to remove or inactivate HIV and viral hepatitis and, as far as possible, exclude other known infectious agents that are passed on by blood
- Most people in Australia are now treated with recombinant clotting factor or non-factor therapies. They are genetically engineered and contain little or no human or animal material. There have been no reports that viruses have been transmitted by recombinant or non-factor products.

In Australia during the mid-1980s some people with haemophilia acquired HIV from contaminated clotting factor concentrates made from human plasma. During the early 1990s many people with bleeding disorders also found that they had been exposed to hepatitis C through the clotting factor concentrates they used for their treatment.

The risk of new infections from using human blood products is now thought to be extremely low. However, it cannot be entirely excluded, particularly if the risk came from a new or unknown type of blood-borne virus or other micro-organisms causing disease. Because of this, people using these products and patient advocacy organisations such as HFA continue to take a strong and watchful interest in product safety.

Living well with haemophilia

Health and wellbeing are important to keep in mind. This can mean taking the opportunity to enjoy what life has to offer, maintaining a healthy lifestyle and good relationships and participating confidently in all sorts of activities, including play, travel, sports, career and other activities that are sustaining or inspiring.

Your child's Haemophilia Treatment Centre can help your child thrive by keeping their daycare, preschool, school or sporting club updated with useful information about supervising a child with haemophilia. The Haemophilia Team can help put appropriate supports in place so that they can make the most of participating in school excursions and camps.

Maintaining regular health checks with your general practitioner (GP) is important to looking after your health as a whole. GPs can treat a range of illnesses, provide appropriate health screening over your lifetime and refer you to other services, when needed.

Ongoing advances in haemophilia treatment are continuing to make great improvements to the quality of life of people with haemophilia. However, at various stages of life, issues can still arise for a person with haemophilia or their family that impact on their ability to enjoy their life.

It could be as simple as knowing how to arrange the necessary documents and treatment product to travel.

Or for parents, how best to help a child to play and have fun while dealing with the potential for bruises and bleeds. Parents may be looking for ways to manage the fear of injections. Children might be feeling anxious about their haemophilia diagnosis as they grow up and want to explore their world and how they fit in it.

Or it could be dealing with more complicated situations and emotions such as feeling overwhelmed by diagnosis, or that you or your child is somehow 'different' from others or taking the next step in a personal relationship. Parents sometimes feel guilt for passing the gene alteration onto their child and if this is not addressed it can have significant consequences for their relationship or how they feel about the bleeding disorder.

There may be government allowances, extra healthcare support and financial assistance that are available to you or your child.

At any stage you may need some extra information or support.

Haemophilia is part of life but doesn't need to overshadow it.

What do people with bleeding disorders suggest?

You are not alone

- Stay in contact with the Haemophilia Treatment Centre. The Haemophilia Team is there to help and can give you advice or talk over any problems or concerns.
- The Treatment Centre can also refer you to other counselling and support services.
- You will have support to discuss any of your issues, emotions or difficulties.
- Keep in touch with your Haemophilia Foundation. State and territory Haemophilia Foundations have newsletters and social media to keep members updated as well as social activities such as community camps, men and women's groups and grandparents' groups where people can meet, talk about common experiences and enjoy a meal or a day out.
- Take your children with haemophilia to Foundation events, eg camps. It gives them the opportunity to meet other children with bleeding disorders, be around other children who understand what it's like and make lifelong friends.

Be informed and aware

- Know about your or your child's condition and how best to manage it.
- Develop a relationship with the Haemophilia Team to keep in touch about your or your child's wellbeing and any health issues that might arise.
- Keep up with the latest information on treatments and services.
- Learn to advocate for yourself or your child – and don't be afraid to ask questions.

Control and manage risks

- You or your child can live a normal active life, but everyone's experience is different. Know about your limits and plan around them.

With knowledge and planning most people live well with haemophilia and lead active and independent lives – from childhood into their senior years.

Sources and acknowledgements

Sources

Australian Bleeding Disorders Registry (ABDR) Annual Report 2020-2021. Canberra: National Blood Authority, 2021. Accessed 15 June 2023. Available from: https://www.blood.gov.au/data-analysis-reporting

Australian Haemophilia Centre Directors' Organisation. Guidelines for the management of haemophilia in Australia. Melbourne; Canberra: AHCDO; National Blood Authority, 2016. Accessed 15 June 2023. Available from: https://www.blood.gov.au/haemophilia-guidelines.

Srivastava A, Santagostino E, Dougall A, et al. WFH guidelines for the management of hemophilia, 3rd edition. Haemophilia. 2020: 26(Suppl 6): 1-158. Accessed 1 August 2022. Available from: https://doi.org/10.1111/hae.14046.

World Federation of Hemophilia. Hemophilia in pictures. 2015. Accessed 14 August 2023. Available from: http://www1.wfh.org/publications/files/pdf-1311.pdf.

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More information

For more information about haemophilia, talk to your doctor, your local Haemophilia Treatment Centre or contact Haemophilia Foundation Australia (HFA).

How to find out more about:

- Your State/Territory Haemophilia Foundation?
- Your local specialist Haemophilia Treatment Centre?

For up-to-date contact details:

- see the HFA web site **www.haemophilia.org.au**
- or phone HFA on 1800 807 173.

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NB: All photos in this booklet are stock images.

IMPORTANT NOTE

This booklet was developed by Haemophilia Foundation Australia for education and information purposes only and does not replace advice from a treating health professional. Always see your health care provider for assessment and advice about your individual health before taking action or relying on published information.

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