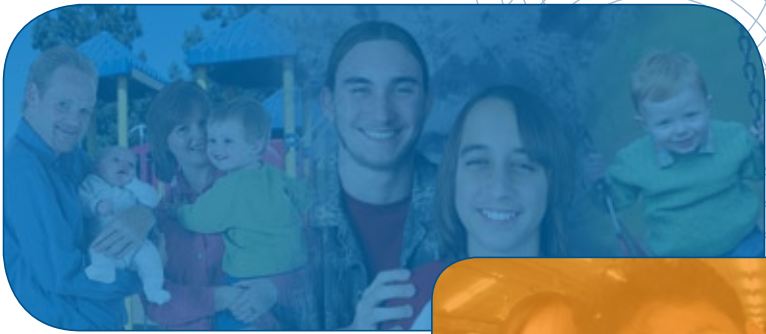


Haemophilia



WHAT IS HAEMOPHILIA?

Haemophilia is an inherited 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.

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

Haemophilia A is the most common form and is caused by having reduced levels of clotting factor VIII (8).

Haemophilia B, also known as Christmas Disease, is caused by having reduced levels of clotting factor IX (9).

Haemophilia is not contagious.

There is also another bleeding disorder known as *acquired haemophilia*, which is not inherited like the classical form of haemophilia. This is a rare condition where a person's immune system develops antibodies against one of their body's own clotting factors and results in a reduced factor level in their blood. Acquired haemophilia usually develops when people are older and can affect both men and women.

How common is haemophilia?

Haemophilia is rare. In Australia there are about 1,800 males who have haemophilia. Approximately one in 7,000 males has haemophilia A. Haemophilia B is less common and approximately one in 30,000-50,000 males is born with it. Haemophilia is found in all races and all socio-economic groups. Haemophilia in females does occur but is very rare. However, some females who carry the haemophilia gene can also have bleeding problems.

What happens when you have haemophilia?

Haemophilia is a lifelong condition. It can't be cured, but with current clotting factor treatments it can be managed effectively.

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 the bleeding continues for longer if it is not treated. Minor cuts and scratches are not a problem and need only a Band-Aid® and some pressure at the site of bleeding. For deeper cuts, bleeding continues for longer



if blood does not form a tough, adherent clot where the blood vessels have been damaged. Treatment with clotting factor will then be needed. Treatment involves injecting the clotting factor into a vein so blood can clot normally.

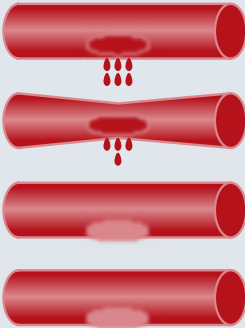
Internal bleeding episodes or 'bleeds' are the main problem for most people with haemophilia. Bleeds are mostly into joints or muscles. They can happen spontaneously, without an obvious cause, or as a result of injury.

If internal bleeding is not stopped quickly with treatment, it will result in pain and swelling. Over a period of time, repeated bleeding into joints and muscles can cause permanent damage, such as arthritis in the joints, and chronic pain.

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 see a doctor immediately and a specialist Haemophilia Centre should also be contacted.

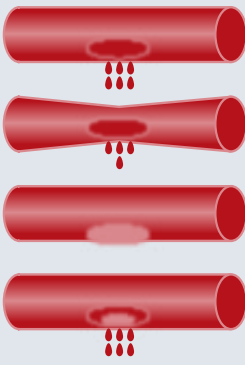
HOW BLEEDING STARTS AND STOPS

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 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.

LEVELS OF SEVERITY

There are three levels of severity in haemophilia: mild, moderate and severe. The level of severity depends on the amount of clotting factor in the person's blood. A person with haemophilia will have the same level of severity over their lifetime, eg someone with severe haemophilia will always have severe haemophilia. Within a family, people will also inherit the same level of severity, eg if a grandfather has severe haemophilia and his grandson has inherited haemophilia from him, his grandson will also have severe haemophilia.

The normal range of factor VIII and factor IX in a person's blood is between 50% and 200%.

Mild haemophilia

5 – 40% of normal clotting factor

- Usually only have bleeding problems after having teeth taken out, surgery or a bad injury or accident
- Might never have a bleeding problem.

Moderate haemophilia

1 – 5% of normal clotting factor

- Might have bleeding problems after having teeth taken out, surgery or a bad injury or accident
- Might have a bleed about once a month
- Rarely have a bleed for no obvious reason.

Severe haemophilia

Less than 1% of normal clotting factor

- Often have bleeds into joints, muscles and soft tissues
- Can have bleeds for no obvious reason, as well as after surgery, dental work or injuries including minor bumps or knocks
- Might have a bleed once or twice a week.

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. If a male has low factor VIII levels, he has haemophilia A. If he has low factor IX levels, he has haemophilia B. The laboratory tests will show whether he has mild, moderate or severe haemophilia.

First signs

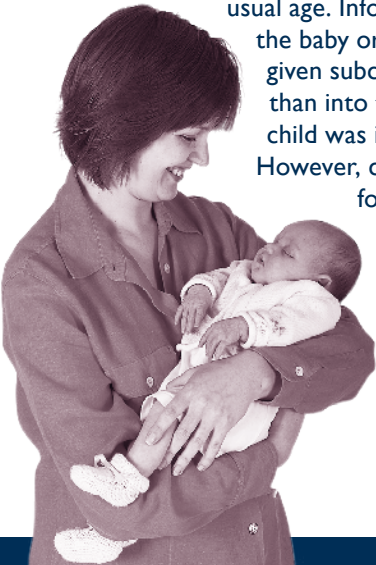
Children with severe haemophilia are usually diagnosed in the first year when their parents or health professionals notice unusual bleeding problems or there is a family history of haemophilia. Most babies with haemophilia do not have bleeding problems at birth. However, some bleeding problems may appear at birth or soon after. Haemophilia may be suspected if babies have internal bleeding or swelling after forceps delivery, continue to bleed after a heel prick or after circumcision, or bruise after immunisation.

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. If a pregnant woman knows she carries the haemophilia gene, there is a possibility that her baby may be affected by haemophilia. Birthing procedures can be managed so that they are as safe as possible for the mother and the baby. It is important for her maternity and haemophilia teams to liaise when they prepare the birth plan with the parents.

When babies begin to crawl and walk, they can run into hard objects as well as having knocks and twists, falls or sitting down with a bump. Small bruises are common in children with severe haemophilia and are not usually dangerous or painful – the padding of “baby fat” is a natural protection. Bruising easily might be the first sign they have a bleeding problem. 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 be checked by a haemophilia nurse or specialist doctor. Sometimes toddlers or children may have a bleed into a joint. Painful swelling or reluctance to use an arm or a leg can be a sign that a bleed has taken place.

Children with haemophilia can have all the normal immunisations at the usual age. 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 Centre for advice on how your child should be immunised.

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



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 or a major accident or injury.

Growing up with haemophilia

With treatment and support from their Haemophilia Centre, most people with haemophilia can live normal healthy lives. 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 and arthritis problems from their haemophilia. With sensible precautions, they can play most sports, exercise and look forward to a full and productive life.

Although the level of haemophilia severity usually doesn't change during a person's lifetime, people tend to have more bleeding episodes as children than as adults. The reasons for this are not clear. Sometimes also the factor VIII level rises in later adult years in people with mild haemophilia A. This rarely occurs in people with haemophilia B.

INHERITANCE AND HAEMOPHILIA

Haemophilia is an inherited condition and occurs in families. The haemophilia gene is passed down from parent to child through generations. Men with haemophilia will pass the gene on to their daughters but not to their sons. Women who carry the haemophilia gene can pass the haemophilia gene on to their sons and daughters. Sons with the gene will have haemophilia.

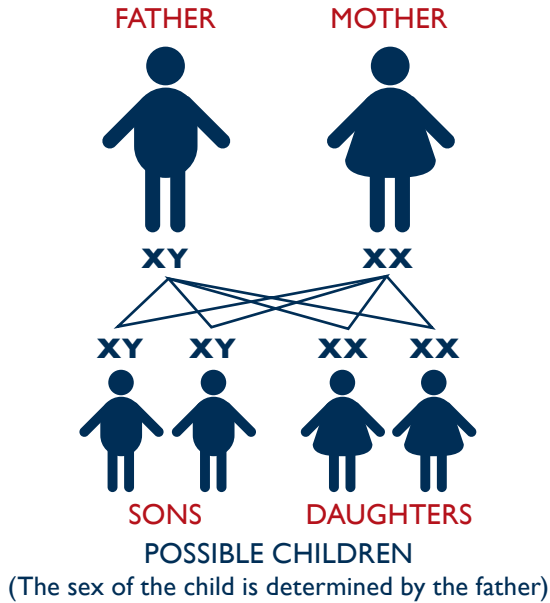
Cells and chromosomes

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 contain the person's genetic information or 'genes', which determine the person's individual characteristics, such as the colour of their hair or their eyes.

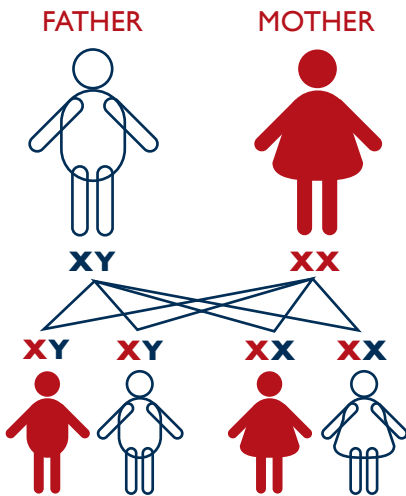
Sex determination

Everyone has a pair of 'sex' chromosomes, which decide what gender they are. Each parent contributes one of these chromosomes to their children. Females have two X chromosomes, and receive one from each parent. Males have one X chromosome, which they receive from their mother, and one Y chromosome, which they receive from their father. There are four possible combinations of sex chromosomes that children can receive from their parents.

How sex is determined

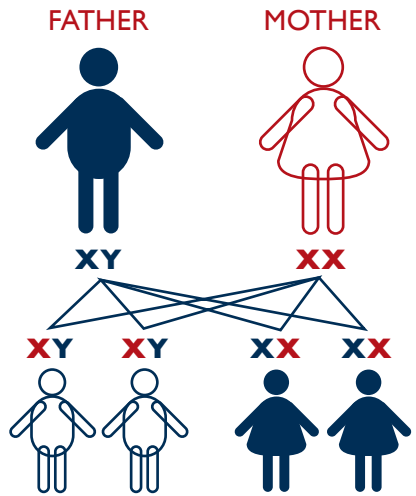


When the mother carries the haemophilia gene and the father is unaffected



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 haemophilia gene

When the father has haemophilia and the mother is unaffected



None of the sons will have haemophilia
All of the daughters will carry the haemophilia gene

The genes for making factor VIII and IX are located on the X chromosome. The Y chromosome does not have a gene to produce these factors. Males with an altered factor VIII or IX gene on their X chromosome will have haemophilia. If a male with haemophilia has children, all his daughters will carry the haemophilia gene because he will pass his altered factor VIII or IX gene on to them. His sons will not have haemophilia as the 'normal' Y gene is passed on to them.

If a female carries the haemophilia gene, with each pregnancy a son has a 50% chance of having haemophilia and a daughter has a 50% chance of carrying the gene.

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 person has a genetic mutation in one chromosome, an alteration of the factor VIII or IX gene on their X chromosome. It is often called a *new* or *spontaneous mutation*. Once haemophilia appears in a family the altered gene 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.

CARRYING THE HAEMOPHILIA GENE

Clotting factor levels, symptoms and treatment

Many girls or women who carry the gene responsible for haemophilia do not have signs or symptoms of a bleeding disorder. As at least one of their X chromosomes has a factor VIII or IX gene that works, their body can produce normal or near normal levels of factor. However, some girls or women who carry this gene have factor levels that are low enough to cause a bleeding tendency.

Many females carrying the haemophilia gene have adequate levels of clotting factor and usually have no bleeding problems. Those who do have symptoms may bruise easily and bleed a lot during dental surgery or extractions or other surgery. They may have heavy menstrual bleeding and sometimes have bleeding problems during and after childbirth. This may lead to low iron levels or anaemia.

All females carrying the gene should have tests for their clotting factor levels to know the level of factor their body is producing. If it is low, they will need a treatment plan to manage situations if they occur, such as heavy menstrual bleeding caused by low factor levels, pregnancy, dental work, surgery or injury.

Females with particularly low clotting factor levels may also have joint or muscle bleeds, although this is rare. In this case, they would need treatment to manage or prevent the bleeds.



If a woman who carries the gene for haemophilia is pregnant, it is important that her haematologist is consulted during pregnancy to give advice for pregnancy, and prepare with the obstetrics team for a smooth and safe delivery, care for the newborn and genetic testing of the baby.

Genetic testing

Finding out whether a girl or woman carries the haemophilia gene is a process which may take some time. This involves:

- Preparing to have genetic testing with a genetic counsellor
- Looking at the family history to determine the risk
- Checking for the particular gene alteration causing haemophilia in her family. This would mean laboratory tests on a blood sample from a man with haemophilia or a woman who definitely carries the gene in her family to identify their family gene alteration.
- Laboratory tests on a blood sample from the girl or woman to see if she has the same family gene alteration
- A blood test to check clotting factor levels. Factor level tests alone will not tell girls or women whether they carry the haemophilia gene as they may have normal factor levels, but still carry the gene.

In some cases, if a pregnant woman knows she carries the haemophilia gene, parents or the medical teams may test for the sex of the baby or for haemophilia before birth. The parents can choose if they want to be told the sex of the baby or not before delivery. Currently available technology such as Chorionic Villus Sampling (CVS) can determine the sex of a foetus. If the child is male, it is also possible to go on to have a gene test using the CVS sample to see whether he has haemophilia, if the gene alteration has already been identified in the family.

Many people find that undertaking these tests gives them a lot to think about. Genetic counselling is available for girls/women and their parents/partners when they are considering testing for the haemophilia gene or testing a baby for haemophilia and most people find this very valuable. Some women or couples may wish to consider their reproductive options or plan carefully for having a family. If you consider genetic testing but decide against it, there is no obligation to complete the process. However, it is important if you have a history of haemophilia in the family and are pregnant to let your obstetrician know so that a safe delivery of the baby can be planned if your carrier status is unknown.

The Haemophilia Centre can also help with information and advice about genetic testing and can provide a referral to a genetic counsellor.

TREATMENT

Haemophilia Centres have a team of health professionals with expertise in providing treatment and care to people with haemophilia. They can work with the person with haemophilia to make a treatment plan and advise on ways to live well with haemophilia.

There are a variety of treatment products used to treat haemophilia.

- **Clotting factor concentrates**

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.

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

Clotting factor concentrate can be given:

- **“On demand”** – before surgery, childbirth or dental treatment, or after an injury or accident, or once a bleed has started.
- As **“prophylaxis”** – taken regularly, two to three times a week, to prevent bleeds from happening.

Factor concentrates are infused (injected) into a vein at home by parents trained to treat their child, or by people themselves when they are confident enough to do it, or at the Haemophilia Centre.

- **Desmopressin (DDAVP)**

This is a synthetic hormone which stimulates the body to make factor VIII. It is used for treating some people with mild haemophilia A and some women with bleeding disorder symptoms. DDAVP is given as an injection subcutaneously (into the fatty tissue under the skin), as a slow injection into a vein or as a nasal spray in some situations for home therapy.

- **Tranexamic acid**

This stops some 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.

After treatment with a clotting factor product, a small percentage of people with haemophilia may develop antibodies – known as ‘inhibitors’ - which make treatment less effective. There are a number of ways to treat inhibitors and many people are successful in overcoming them while others have ongoing problems.

How often do people need treatment?

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 factor concentrate is injected twice to three times a week to keep factor levels high enough to prevent spontaneous bleeds. Many children and young people have benefited from prophylaxis, which reduces the arthritis and joint problems experienced by many older people who grew up without adequate clotting factor treatment due to limited availability of treatment product.

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

People with mild haemophilia will not need 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.

The Haemophilia Centre team will help with learning how to recognize a bleed and deal with it promptly.

Tips for people with haemophilia or girls/women carrying the haemophilia gene:

- *Stay in regular contact with your local Haemophilia Centre team and make sure you keep up with anything new*
- *A regular review may be recommended by your Haemophilia Centre, depending on the severity of your bleeding disorder and your individual needs*
- *Let your dentist or your doctor know you have a bleeding disorder so that any procedures such as surgery or dental procedures that may result in bleeds can be managed in liaison with your Haemophilia Centre team*
- *If you use treatment product, know which one you use*
- *Always carry an emergency card or medic alert.*

Treatment product safety

Haemophilia treatment product safety is a high priority for blood bank services, manufacturers, governments and the bleeding disorders community in Australia. Collection of blood and manufacture of blood products, such as plasma concentrates, are 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 are now treated with recombinant clotting factor, which is genetically engineered and contains little or no human or animal material. There have been no reports that viruses have been transmitted by recombinant 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 organizations such as Haemophilia Foundation Australia continue to take a strong and watchful interest in product safety.

What about those already affected by HIV or hepatitis C?

- Ongoing support is needed to help with the social, emotional and health impacts
- People with hepatitis C are advised to keep a regular check on their hepatitis C and their liver health
- People with HIV need care from a doctor and health care team specializing in HIV as well as from the Haemophilia Centre team
- HFA continues to provide advocacy, education and support.

LIVING WELL WITH A BLEEDING DISORDER

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 in all sorts of activities, including play, travel, sports, career and other activities that are sustaining or inspiring.

At the various stages of life, issues can arise for a person with a bleeding disorder 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 play and have fun while dealing with the potential for bruises and bleeds. 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.

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

What do people with bleeding disorders suggest?

You are not alone

- Stay in contact with the Haemophilia Centre. The Haemophilia Centre team is there to help and can give you advice or talk over any problems or concerns
- Keep in touch with your Haemophilia Foundation. State and territory Haemophilia Foundations have newsletters to keep members updated and social activities such as family 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. Haemophilia Foundation Australia also has a youth program run by young people affected by bleeding disorders.

Be informed and aware

- Know about your or your child's condition and how best to manage it
- Develop a relationship with the Haemophilia Centre team to keep in touch about your or your child's wellbeing and any health issues that might arise
- Keep up with the latest on treatments and services.

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.



MORE INFORMATION

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

How to find out more about:

- **Your state/territory Haemophilia Foundation?**
- **Your local specialist Haemophilia Centre?**

For up-to-date contact details

- See the HFA web site www.haemophilia.org.au
- Phone HFA on 1800 807 173
- Email HFA hfaust@haemophilia.org.au.

Sources and Acknowledgements

National Blood Authority; Australian Haemophilia Centre Directors' Organisation. *Evidence-based clinical practice guidelines for the use of recombinant and plasma-derived FVIII and FIX products*. Australian Health Ministers' Advisory Council, Canberra, June 2006.

Some information and images adapted from:

What is hemophilia? World Federation of Hemophilia, Montreal, 2004.

Hemophilia in pictures. World Federation of Hemophilia, Montreal, 2005.

This booklet was reviewed by Leonie Mudge and Robert Hearn from Australia/New Zealand Haemophilia Social Workers' and Counsellors' Group, Anne Jackson, Penny McCarthy and Megan Walsh from Australian Haemophilia Nurses' Group, Lynette Hing from Australian and New Zealand Physiotherapy Haemophilia Group, Dr James Daly from Australian Haemophilia Centre Directors' Organisation, and bleeding disorder community representatives from this booklet's Consumer Review Panel.

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.

Haemophilia Foundation Australia

1624 High Street Glen Iris
Victoria Australia 3146

P: 03 9885 7800

F: 03 9885 1800

Freecall: 1800 807 173

E: hfaust@haemophilia.org.au

W: www.haemophilia.org.au

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