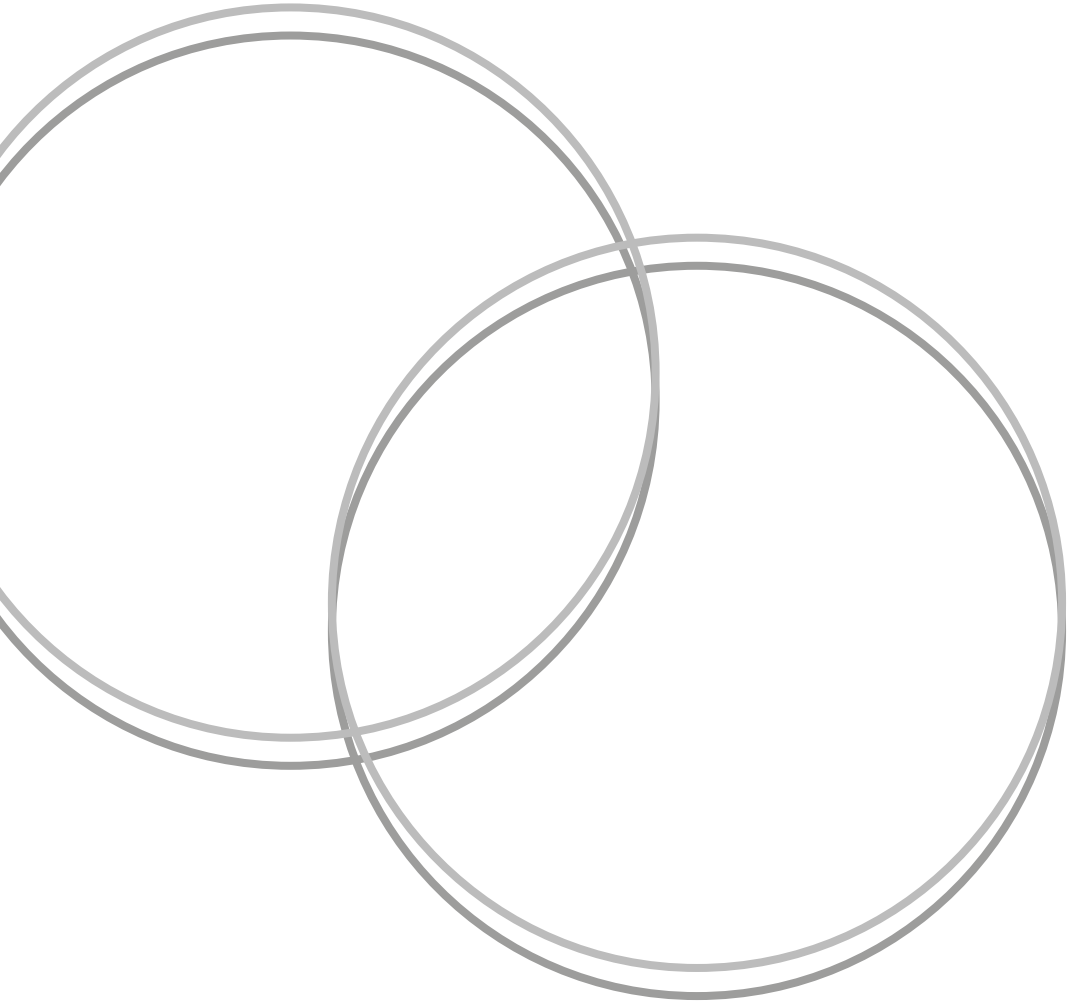
NHS
Oxford University Hospitals
NHS Foundation Trust

Carriers of Haemophilia

Information for patients



You have been given this leaflet to explain what being a carrier of haemophilia means and the screening tests which are available.

What is haemophilia?

Haemophilia is a bleeding disorder. People with haemophilia bleed for longer than normal, because their blood does not contain enough clotting factors. Clotting factors are proteins in the blood that help to control bleeding.

There are two types of haemophilia:

- haemophilia A
- haemophilia B.

People with haemophilia A do not have enough factor VIII (8) and people with haemophilia B do not have enough factor IX (9).

Genetics and inheritance of haemophilia

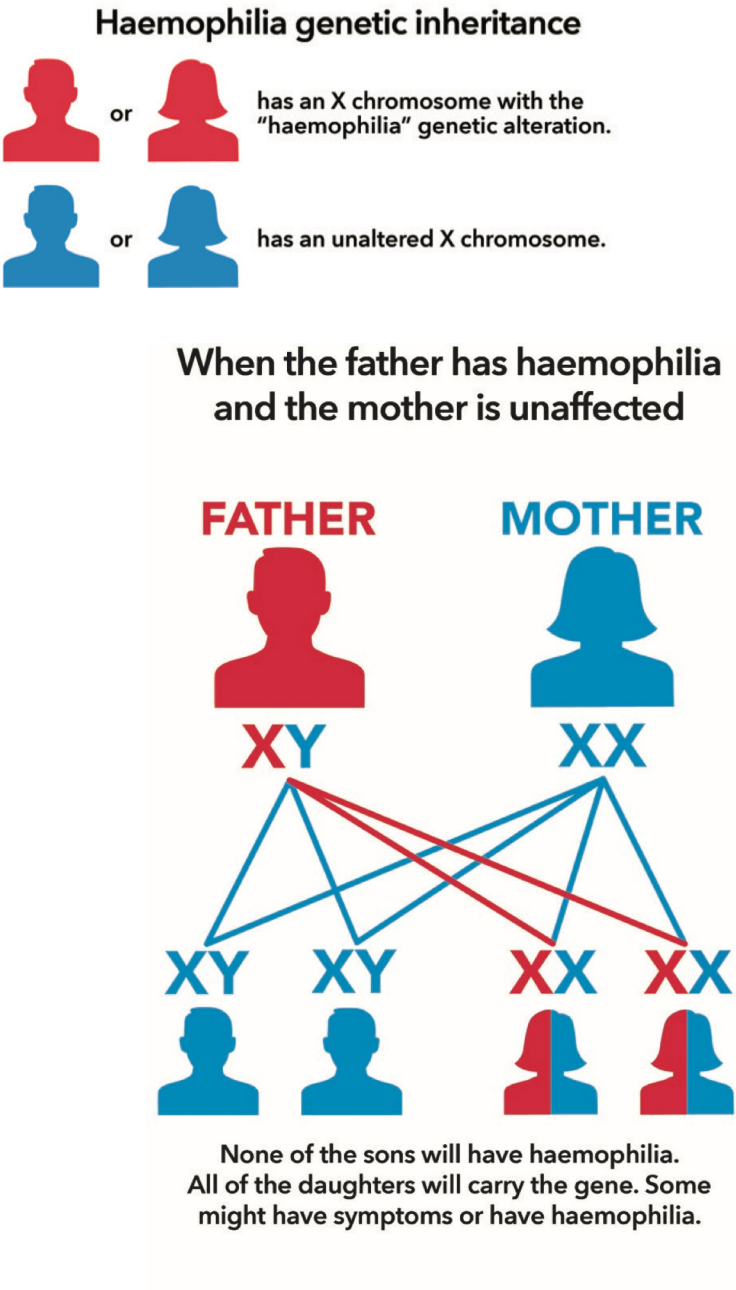
Haemophilia is an inherited disease, which means that it is passed from parent to child through the parents' genes. Genes carry messages about the way the body's cells will develop. In people with haemophilia, the genes responsible for the production of clotting factors are altered. As a result, their body will either produce very little or no factor VIII or factor IX.

Genes are packaged within the body's cells in chromosomes. The genes involved in haemophilia are found on the 'X' chromosome.

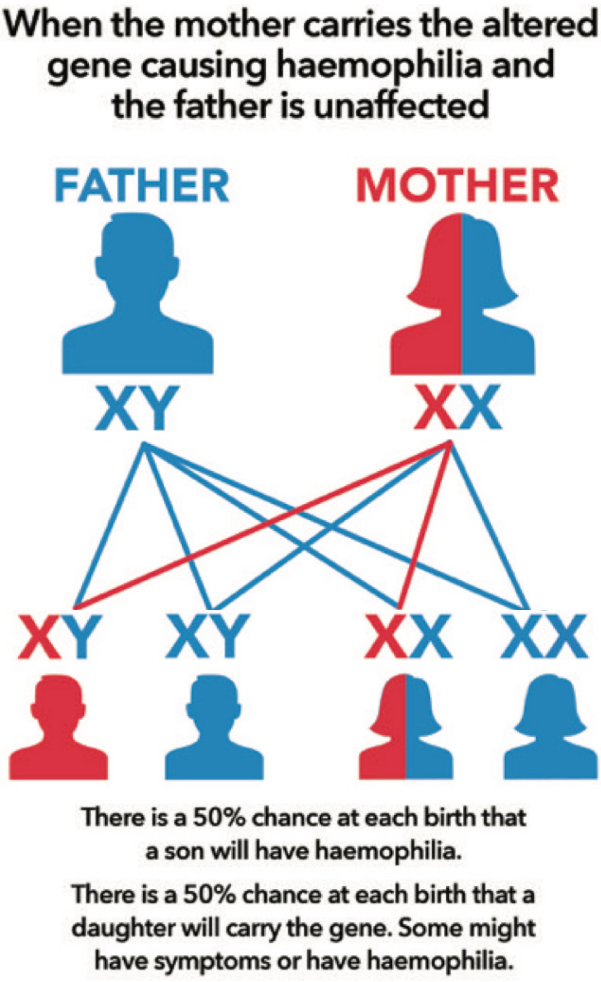
Boys have one 'X' chromosome, which they inherit from their mother, and one 'Y' chromosome, which they inherit from their father. If the 'X' chromosome that a boy inherits from his mother has the altered clotting gene, he will have haemophilia.

Girls have two 'X' chromosomes, one from each parent. If a girl inherits a copy of the altered gene from either of her parents, she is said to 'carry' the haemophilia gene and is therefore called a 'carrier'.

This is explained in the following diagram.



Source: Haemophilia Foundation Australia (www.haemophilia.org.au), 2017



Source: Haemophilia Foundation Australia (www.haemophilia.org.au), 2017

Due to the genetics of haemophilia, girls who are daughters of men who have haemophilia will be carriers (sometimes called obligate carriers). Girls who are daughters of female carriers have a 50% chance of being a carrier (sometimes called potential carriers). The only way of confirming carrier status is by genetic testing.

Factor levels

The normal amount of clotting factor in a person's blood ranges from 40% to 200%. Some carriers of haemophilia will have factor levels that are normal and some will have levels below normal. If your factor level is below 40% you will be diagnosed as a person with haemophilia. Regardless of your factor level you may have increased bleeding tendencies. If this is the case you are a symptomatic carrier.

All carriers (both obligate carriers and potential carriers) will have their factor VIII or factor IX level checked routinely aged 4 and above or if intervention such as surgery or dental work is required. This test can be arranged either at the adult or children's Haemophilia Centre (depending on which one you might usually go to) and involves taking a blood sample.

It is useful to know your specific clotting factor level if, for example, you were to need surgery or a dental procedure. The clotting factor test will not confirm whether you or your daughter is a carrier of haemophilia.

Factor levels in females can vary among family members; this is due to lyonization (see next section). Males in a family who have haemophilia will have similar factor levels.

Lyonization explained

In each cell in the female body, one of the two 'X' chromosomes is turned off, or 'suppressed'. This process is called 'lyonization', after Mary Lyon, who first described it.

Lyonization is a random process, the cause of which is not fully understood. If the chromosome that's turned off has the altered gene, that cell will produce clotting factor. If the chromosome with the normal gene is turned off, the cell will not produce clotting factor, or the clotting factor it makes won't work properly.

On average, female carriers of haemophilia will have about 50% of the normal amount of clotting factor, because about half of their cells will have the 'normal' gene turned off. Some carriers have far lower levels of clotting factor, because more of the 'X' chromosomes with the normal gene are switched off.

Factor levels can vary. Stress, inflammation, infections, pregnancy and certain medications can all cause factor VIII levels to rise, which can affect the test results. Factor IX levels are not affected by these things

The degree of Lyonization will differ from individual to individual, therefore females in the same family may have very different factor levels. This is why it is important to have your personal level checked.

National Haemophilia Database

Confirmed carriers will be registered on the National Haemophilia Database (please see the leaflet attached). If you are female and have low factor levels, you will also be registered and given a bleeding card, which you should carry with you at all times. The bleeding card will state your diagnosis and any treatment you would require in the event of an injury/accident.

Genetic testing

A genetic test to confirm carrier status is offered to girls when they reach 16 years of age (when they usually have enough understanding to consent for genetic testing able to consent for genetic testing), or to any adult who could be a carrier. The test looks at either the factor VIII or factor IX gene, to look for changes in the gene that can cause haemophilia. In girls with a factor level below 40%, genetic testing will be offered at any age.

If the change (or alteration) in the gene has already been found in your family, the genetic test can directly look at this specific area of the gene. If the alteration in the gene has not been found in your family, you will need to have a full analysis of the gene.

If you have received this leaflet because you are being offered testing to confirm whether you are a carrier for haemophilia, you will be able to discuss the process for genetic testing (and what this might mean) in detail with the haemophilia specialist, or with a genetic counsellor. This will help to make sure you are fully informed of the risks and benefits of having genetic testing.

Bleeding symptoms

If you are female and a haemophilia carrier with a lower than normal factor level, you may experience the symptoms below:

- easy bruising
- prolonged bleeding after cuts and grazes
- prolonged bleeding after tooth extraction
- increased bleeding following trauma, i.e. accidents or injury
- heavier and prolonged bleeding during menstrual periods
- nosebleeds.

Treatment of bleeding symptoms

Bleeding symptoms may be treated with:

- **Tranexamic acid**

  This is an antifibrinolytic agent, which is used to prevent the breakdown of fibrin, which helps with the forming of blood clots. It can be used to control nose bleeds, heavy menstrual bleeding and also during minor surgeries and dental procedures.

- **Desmopressin (DDAVP)**

  This is a synthetic (manufactured) hormone, which may help control bleeding in an emergency or during surgery by raising the factor VIII level. It is usually injected under the skin (subcutaneously).

  It does not work for every person with a lower than normal factor VIII level, so a DDAVP trial will be needed to assess your response to this medication before it is prescribed.

  DDAVP is not effective in carriers of haemophilia B, as it does not raise the factor IX levels.

- **Clotting factor concentrates**

  These may be needed when the risk of severe bleeding is high, such as before major surgery or there has been a head injury.

Psychosocial issues

If bleeding symptoms are causing you any concerns, impacting on your health, school or social life (psychosocial issues), please contact your local haemophilia centre, where we can offer you support.

Appointments

If you have mild haemophilia or are a symptomatic carrier of haemophilia you may be invited for annual follow-up appointments, these may be face-to-face or telephone appointments.

If you are a carrier of haemophilia with normal levels and no bleeding symptoms you will not need to come for regular follow-up appointments.

However, if you would like to make an appointment or wish to contact us for advice prenatal counselling or are pregnant, need psychosocial support or have any queries,, we would be very happy to speak with you. Our contact details are on the next page.

Further information

World Federation of Hemophilia (Haemophilia)

Website:
www.wfh.org/about-bleeding-disorders/#women-and-girls-with-hemophilia

NHS Choices

Website:
www.nhs.uk/conditions/Haemophilia/Pages/Introduction

The Haemophilia Society

Website:
www.haemophilia.org.uk

How to contact us

Paediatric Haemostasis Unit

Telephone: 01865 226 562
(Monday to Friday, 9.00am to 5.00pm)

Email: paediatric.haemophiliaclinic@ouh.nhs.uk

Oxford Haemophilia and Thrombosis Centre

Telephone: 01865 225 316
(Monday to Friday, 9.00am to 5.00pm)

Email: haemophilia.reception@ouh.nhs.uk

Out of hours

Please contact the On-Call Haematology Registrar through the Hospital switchboard.

Telephone: 0300 304 7777

Further information

If you would like an interpreter, please speak to the department where you are being seen.

Please also tell them if you would like this information in another format, such as:

- Easy Read
- large print
- braille
- audio
- electronic
- another language.

We have tried to make the information in this leaflet meet your needs. If it does not meet your individual needs or situation, please speak to your healthcare team. They are happy to help.

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