

# Hereditary Breast and Ovarian Cancer Syndrome

Hereditary Breast and Ovarian Cancer syndrome (HBOC) is an inherited genetic condition that increases the risk for breast, ovarian and other cancers. Inherited conditions are passed to a person by their parents. Although most cancers are not inherited, about 5% to 10% of people who have breast cancer and about 15% of women who have ovarian cancer have HBOC. Gene changes (mutations) in the BRCA1 and BRCA2 genes cause HBOC.

## What are the cancer risks for people with HBOC?

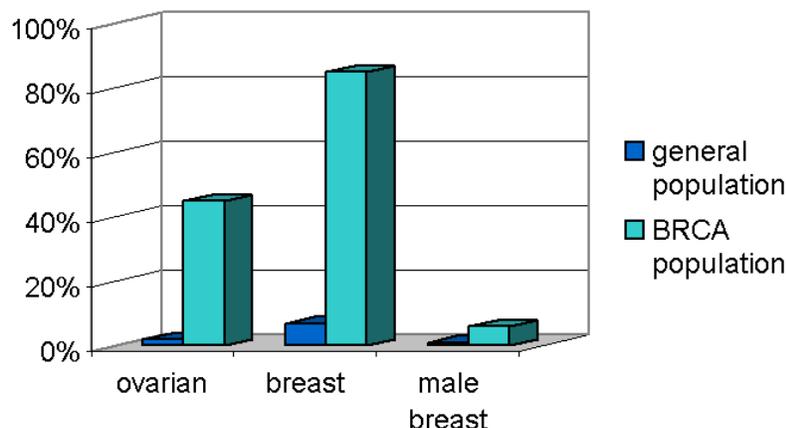
HBOC places a person at higher risk for developing:

- A higher than usual risk of developing breast cancer (40% to 87% lifetime risk)\*
- A higher than usual risk of breast cancer that occurs before age 50, or before a woman reaches menopause
- An increased risk of developing a second primary breast cancer (15% to 60% risk)
- A higher than usual risk of developing ovarian cancer (10% to 44% lifetime risk)\*\*
- The risk of breast cancer in men is higher than usual (6% lifetime risk)
- Prostate cancer that occurs at younger ages than in the general population. Men at risk should discuss the benefits, risks and limitations of prostate cancer screening with their doctor
- Other cancers, including pancreatic cancer and melanoma

\*The clinical data does not currently provide separate risk figures for specific mutations within the BRCA1 and BRCA2 genes.

\*\*More recent data suggests that mutations in the BRCA2 gene may have risks in the lower end of this range.

**HBOC cancer risks compared to the general population**



## **What causes HBOC?**

HBOC is caused by an inherited change in a gene, called a mutation. Genes are the set of instructions that tell all of the cells in our bodies what to do. Genes define our hair and eye color, the shape of our nose, our blood type and the number of fingers and toes we have. A mutation is a change in a gene's DNA that causes it to stop working. With HBOC, a gene has stopped working that normally helps prevent breast, ovarian and other cancers. This makes it more likely for these types of cancer to develop. This change also makes it more likely for a cancer to occur at a younger age. Most cases of HBOC are caused by a change in either the BRCA1 or BRCA2 genes.

## **What are my chances of inheriting HBOC?**

Each person has two copies of all genes, including the BRCA1/2 genes. One copy is inherited from the mother, and one copy is inherited from the father. One inherited gene mutation in either copy of a BRCA gene will cause HBOC. There is a 50% chance that a person with HBOC will pass the change or mutation to each of their children. Inheriting this mutation causes an increased risk for several types of cancers (refer to page 1). If a person does not have the mutation, they may have about the same risk for breast and ovarian cancer as others in the general population. The risk is about a 12% lifetime risk for breast cancer and about a 1% to 2% lifetime risk for ovarian cancer.

## **Why is it important to diagnose HBOC?**

People who have HBOC are at much higher risk for breast, ovarian and other cancers than people in the general population. For someone who has cancer, the diagnosis of HBOC may also mean a higher risk of developing a new cancer in the future. For these reasons, people with HBOC should follow different screening and prevention guidelines than people at average risk. Following the early detection and prevention guidelines for people with HBOC can reduce these cancer risks.

Because HBOC is inherited, this affects the entire family. If genetic testing finds the specific mutation causing HBOC in one person, other family members may also need to be tested.

## **How is HBOC diagnosed?**

### **Family History**

A review of medical and family history is used to screen for HBOC. A genetic counselor usually conducts this screening and assesses the risk for HBOC. During the screening, the patient and counselor create a multi-generation family tree. Some signs that suggest HBOC may run in a family include:

- Close relatives with breast, ovarian or other related cancers
- Breast cancer diagnosed at a younger age (such as before menopause)
- One person having multiple related cancers, such as breast and ovarian cancer
- Male breast cancer
- Pancreatic cancer

- Ashkenazi Jewish ancestry

Testing may be needed if the medical and family history suggests the possibility of HBOC.

### **Genetic Testing for HBOC**

Genetic testing of a blood or saliva sample can find a mutation in the BRCA1 or BRCA2 gene. If a mutation is found, then the HBOC diagnosis is confirmed. Other family members may have a genetic test to learn whether or not they carry the same mutation and also have increased cancer risks.

Sometimes, genetic testing will not find a mutation in the BRCA1 or BRCA2 genes even in persons with a clinical history that suggests HBOC. This does not always mean that they do not have HBOC. Current genetic testing technology is not able to identify all mutations or other genes that may cause HBOC.

Another result that is possible is called a variant of uncertain significance (VUS). This is a gene change that does not provide clear information about cancer risks. In these cases, further testing may be ordered to help clarify the result.

### **Genetic Testing for Relatives**

People who have a BRCA1/2 mutation, inherited it from either their father or mother. There is a 50/50 (1 in 2) chance of passing the mutation to each of their children. BRCA1 and BRCA2 mutations do not skip generations and both men and women are equally likely to inherit or pass down the mutation.

At-risk relatives may decide to do genetic testing to check for the mutation. This may help determine who needs to adjust their cancer screening and prevention options. If a person did not inherit the BRCA1/2 mutation, their family history of cancer is used to make screening recommendations.

In rare cases when both parents have a BRCA2 mutation, their child has a risk for inheriting two BRCA2 mutations. Someone who has two BRCA2 mutations (one inherited from each parent) has a different genetic condition called Fanconi Anemia. This is a rare childhood blood disorder that causes bone marrow failure, physical changes and increased blood cancer risks. People with a BRCA1/2 mutation may want to talk with their partner about testing for the mutation before having children.

### **How is HBOC managed?**

It is very important for people with HBOC to reduce their cancer risk by following specific cancer prevention and early detection guidelines. Cancer screening exams, and/or preventive surgery are tailored to each patient and their family by a team of specialists. Cancer screening exams are medical tests performed to ensure that any existing cancers are found at their earliest, most treatable stages. See page 4 for general screening and prevention guidelines for people with HBOC.

## Recommendations for Women

### Breast Cancer Screening Recommendations

- **Beginning at age 18** – Do a monthly breast self-exam and general breast awareness.
- **Beginning at age 25** (or earlier, depending on family history) – Have a clinical breast exam by a health care provider every 6 to 12 months and an annual breast MRI.
- **Beginning at age 29** – Have an annual mammogram and breast MRI. The mammogram and breast MRI may be alternated every 6 months.
- You may also wish to discuss taking prescription medicines for prevention (such as tamoxifen) with your doctor.
- Preventive surgical removal of the breasts (referred to as prophylactic bilateral mastectomy) is another option for women with HBOC.

### Breast Cancer Symptoms

Although many changes in the breast are not caused by cancer, some changes to look for include:

- A lump or mass in your breast
- Enlarged lymph nodes in the armpit
- Changes in breast size, shape, skin texture or color
- Skin redness
- Swelling, soreness or rash
- Skin dimpling or puckering
- Nipple changes or discharge

If you have any of these changes for **more than 2 weeks**, contact your doctor right away.

### Ovarian Cancer Screening Recommendations

- **Beginning at age 30** – Have a pelvic exam, vaginal ultrasound and a blood test for a tumor marker called CA-125. These screening tests are usually done every 6 months. However, ovarian cancer is difficult to detect by symptoms and screening alone.
- **For women between the ages of 35 to 40 or older who are finished having children** – Have surgical removal of the ovaries and fallopian tubes, called prophylactic bilateral salpingo-oophorectomy. This protective surgery greatly decreases the risk of developing ovarian cancer. You may also wish to discuss taking prescription medicines (such as oral contraceptives) as a preventive measure with your doctor.

### Ovarian Cancer Symptoms

Ovarian cancer symptoms are not very specific. Other common conditions can also cause the same symptoms. This can make it hard to find ovarian cancer by symptoms alone. Talk with your doctor if you have symptoms that will not go away or if you have new symptoms.

Symptoms to watch for include:

- Swelling or bloating of the abdomen
- Feeling of pain or pressure in the pelvic area
- Change in appetite
- Feeling full after eating only a small amount
- Changes in bowel or bladder habits (such as urgency to urinate or frequency of urination)

## Recommendations for Men

- **Beginning at age 35** – Do breast self-exam, education and have a clinical breast exam.
- **Beginning at age 45** – Consider starting prostate cancer screening.

## Recommendations for Men and Women

- Learn about signs and symptoms of cancer, especially breast, ovarian, prostate, pancreatic and skin (melanoma) cancer.
- No specific guidelines exist for pancreatic cancer and melanoma screening. Your doctor may recommend screening based on your family history.

## Where can I find more information?

If you are concerned about HBOC in your family, contact the department of Clinical Cancer Genetics at 713-745-7391 to schedule a visit with a genetic counselor. The genetic counselor will perform a cancer risk-analysis and discuss further testing and medical management options for you and your family members. More information about the Clinical Cancer Genetics program is also available at <http://www.mdanderson.org/departments/ccg/>.

## Resources

### Clinical Cancer Genetics Program

713-745-7391

[www.mdanderson.org/departments/ccg/](http://www.mdanderson.org/departments/ccg/)

MD Anderson's Clinical Cancer Genetics Program provides hereditary cancer risk assessment and consultation services.

### FORCE

<http://www.facingourrisk.org>

FORCE is a nonprofit organization for women who are at high risk of developing breast and/or ovarian cancer due to their family history and genetic status and for members of families in which a BRCA mutation may be present.

### Be Bright Pink

<http://www.bebrightpink.com>

Bright Pink is a national non-profit organization that provides education and support to young women who are at high risk for breast and ovarian cancer.

### Breast and Ovarian Cancer

#### National Ovarian Cancer Coalition (NOCC)

<http://www.ovarian.org>

The NOCC's mission is to raise awareness and promote education about ovarian cancer. The coalition strives to improve the quality of life for ovarian cancer survivors. The site includes sections on detection, treatment, coping, surviving and more.

### **Susan G. Komen Breast Cancer Foundation**

<https://ww5.komen.org/>

The Komen mission is to save lives by meeting community needs and funding research to prevent and cure breast cancer.

### **Young Survival Coalition**

<http://www.youngsurvival.org>

The Young Survival Coalition (YSC) is dedicated to the critical issues that young women with breast cancer face. YSC works with survivors, caregivers and the medical, research, advocacy and legislative communities to increase the quality of life for women diagnosed with breast cancer ages 40 and under.

### **General Genetics**

#### **Genetic Alliance, Inc.**

<http://www.geneticalliance.org>

This organization supports individuals with genetic conditions and their families, educates the public and advocates for public policies. This site provides information on genetic policy, research and a telephone helpline.

### **Genetics Home Reference (National Institutes of Health)**

<https://ghr.nlm.nih.gov/>

Genetics Home Reference provides consumer-friendly information about genetics and genetic related conditions.