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# Genetic Risk Evaluation and Testing

Many people have a family member who has had cancer. While most cancer happens by chance, about 5-10% of cancers are hereditary. Hereditary cancers are caused by a harmful variant in a gene that runs in families and may be passed down from parents to children, causing a higher risk for cancer. Hereditary cancers may also be called "inherited cancers," and they may be associated with the terms "specific genetic syndromes" or familial cancer syndromes. If you have a strong history of cancer in your family, ask your healthcare provider about a genetic risk evaluation. Learning if you have inherited a harmful variant in a cancer gene can help you take steps for early detection and cancer prevention.

## Why are Some Cancers Inherited?

All cancers are caused by harmful changes, or variants (also called mutations), in genes. Genes are like blueprints or instructions our body uses to grow and function. Cancer genes work to protect our bodies from developing cancer. When a cancer gene contains a harmful variant, the gene cannot function correctly and does not protect against cancer as well as it should; this leads to a higher risk for cancer. Usually, these harmful variants are acquired over the course of a person's life. However, sometimes a harmful variant can be inherited from one or both parents. These inherited variants increase the chance of developing certain cancers, often at a younger age than expected, and they can be passed down to the next generations of a family.

## Factors Associated with Hereditary Cancer

- Multiple cancers in one person
- Cancer diagnosed at a young age
- Multiple family members with the same type of cancer
- Cancer in multiple generations
- Family member with a harmful variant in any cancer gene
- Rare cancers or cancers in the less affected gender (e.g., male breast cancer)
- Cancer in paired organs (e.g., both breasts, bothovaries, both kidneys)
- More than one childhood cancer in siblings

## Common Hereditary Cancer Syndromes

Most hereditary cancer syndromes are rare, but some are more common than others. About 1 in 400 people have a harmful variant in a *BRCA1* or *BRCA2* gene which causes Hereditary Breast, Ovarian, and Pancreatic Cancer Syndrome. About 1 in 279 people have Lynch Syndrome, caused by a harmful variant in the *MSH1, MSH2, MSH6, PMS2,* or *EPCAM* genes. Lynch syndrome related cancers include: colon, rectal, endometrial (uterine), ovarian, stomach, ureter/renal pelvis, biliary tract, small bowel, pancreatic, brain, or sebaceous adenomas. Some red flags for these syndromes are listed below. If your or your family members have any of these risk factors, discuss a genetic risk evaluation with your healthcare provider.

| Hereditary Breast, Ovarian, and Pancreatic Cancer Syndrome Risk Factors | Lynch Syndrome Risk Factors |
|---|---|
| • Breast cancer at age 45 or younger<br>• Ovarian, male breast, pancreatic, intraductal prostate, metastatic prostate, or metastatic (HER2 negative) breast cancers at any age<br>• Two breast cancers in a person, with 1 before age 65<br>• Triple negative breast cancer at age 60 or younger<br>• Two or more relatives with breast cancer with 1 before age 50<br>• Three or more relatives with breast, ovarian, pancreatic, and/or aggressive prostate cancer at any age<br>• Ashkenazi Jewish ancestry<br>• A relative with a harmful variant in BRCA1 or BRCA2 | • Colon or endometrial cancer before age 50<br>• A person with two or more of the Lynch syndrome associated cancers listed above<br>• Two or more relatives with a Lynch cancer, with one diagnosed before the age of 50<br>• Three or more relatives with a Lynch cancer<br>• A relative with a harmful variant in a Lynch Syndrome gene |

## What to Expect During a Genetic Risk Evaluation

A genetic risk evaluation is done by a trained genetic counselor to determine your risk for developing cancer, make genetic testing recommendations, and promote appropriate medical management. A genetic evaluation may include:

- **Medical History:** A detailed review of your personal medical and family history. This information helps determine your risk of developing cancer and if genetic testing would be useful to help clarify your cancer risk.
- **Counseling:** Before having genetic testing, you should be counseled about the risks, benefits, and limitations of genetic testing and cancer risk assessments, to help you make an informed decision about whether or not testing is the right choice for you. After testing, counseling should include a review of your test results and what they mean for you and your family.
- **Testing:** Genetic testing looks at a set of your genes (usually through a blood sample or a cheek swab) to see if you have any harmful variants that increase your risk for cancer. Insurance companies usually cover the cost of testing if you have a personal or family history that is concerning for hereditary cancer. Cost and insurance coverage for testing are discussed during your evaluation.
- **Next Steps:** Based on whether or not you have genetic testing and what the results show, you may have different options for cancer screenings and prevention, risk reducing procedures, and tailored cancer treatments.
- **Family Risk:** If a harmful variant is found in a family, other family members are encouraged to consider genetic testing as well. The information from genetic counseling and testing helps family members make decisions that could prevent cancer, detect cancer early, and save their lives. This information can also be reassuring to those who do not have the harmful variant found in their family.

| Benefits of Genetic Testing | Risks of Genetic Counseling and Testing |
|---|---|
| • Relief from uncertainty<br>• Understand your cancer risk<br>• Make informed medical and lifestyle decisions<br>• Provide helpful information for relatives | • Difficulty coping with cancer risk<br>• Impact on family and personal relationships<br>• Concerns about privacy or discrimination<br>• Cost of testing and recommended medical care |

## Who Should Have Hereditary Cancer Genetic Testing?

It is important to identify individuals with hereditary cancers, but not everyone needs genetic testing. Before doing hereditary cancer testing, you should meet with a genetics professional who can review your personal and family history, determine if genetic testing would be helpful for you and/or your family, and decide the best test for you. Individuals with cancer are usually better candidates for genetic testing than their family members who have not had cancer. However, ask your healthcare provider for a referral for genetic evaluation if you or anyone in your family has any of the risk factors listed above or if you have a specific concern about your family cancer history.

## Confidentiality of Results

The results of genetic counseling and testing are confidential, with very limited exceptions. Neither your health insurance company nor your employer can require you to have genetic testing. It is also against the law (Genetic Information Nondiscrimination Act) for health insurance companies or employers to discriminate against someone based on genetic information. This law does not apply to life, disability, or long-term care insurance, nor to military members, very small companies, or many federal health plans.

## About Texas Oncology

With more than 530 physicians and 280 locations, Texas Oncology is an independent private practice that sees more than 71,000 new cancer patients each year. Founded in 1986, Texas Oncology provides comprehensive, multi-disciplinary care, and includes Texas Center for Proton Therapy, Texas Breast Specialists, Texas Colon & Rectal Specialists, Texas Oncology Surgical Specialists, Texas Urology Specialists, Texas Infusion and Imaging Center, and Texas Center for Interventional Surgery. Texas Oncology's robust community-based clinical trials and research program has contributed to the development of more than 100 FDA-approved cancer therapies. Learn more at www.TexasOncology.com.

*Sources: American Cancer, American Society of Clinical Oncology, Centers for Disease Control and Prevention, National Society Cancer Institute, and National Comprehensive Cancer Network*

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