Genetic Testing:

Information for decision making

The following handout is designed to provide you with important information about genetic testing. Please read it carefully and discuss any questions that you have with your healthcare team.

What are some reasons to consider genetic testing?

There are special medical plans for people with a pathogenic variant in many cancer predisposition genes. Having a pathogenic variant, also known as a mutation, means a person has a version of a gene that does not work properly. Recommendations for people with a pathogenic variant may include more frequent cancer screenings, the use of different cancer screening tests, risk-reducing surgery, and sometimes specific medications. The medical plan is made on an individual basis. It is believed that these recommendations will help to reduce the risk to develop cancer and/or detect cancer at an earlier, more treatable stage.

What would my genetic test results say about my risk for cancer?

The cancer risks linked to pathogenic variant are unique to the specific gene. Please read the gene-specific information provided to you in addition to this handout.

What are the possible results of genetic testing?

1. **You have a pathogenic variant (i.e. 'positive' or 'mutation'):**
   Having a pathogenic variant, also known as a mutation, means you have a version of a gene that does not work properly. This can cause an increased chance of developing specific types of cancer in your lifetime. As these risks are gene specific, we will discuss referral to appropriate doctors when your results are available.

2. **You do not have a pathogenic variant:**
   a. **A pathogenic variant has previously been found in another family member (i.e. 'true negative'):**
   If you do not have the pathogenic variant that has been identified in your family, then the associated family history does **not** increase your chance of developing specific cancers. You have a similar cancer risk as anyone else in the general population with a comparable personal medical history. In addition, you cannot pass the familial pathogenic variant on to your children.
   b. **A pathogenic variant has <u>not</u> been found in another family member (i.e. 'uninformative negative'):**
   The test has provided little new information about your cancer risk. The possible interpretations of this result are:
      - you may still have a pathogenic variant in the gene being tested, but it was not detectable with the testing technology that was used, or
      - you may have a pathogenic variant in another gene that was not analyzed in this test, or
      - you may not have an inherited risk for cancer at all. The cancer may have been caused by other risk factors.

3. **You have a variant of uncertain significance (VUS):** The laboratory does not have enough information to determine whether this VUS is a benign (harmless) genetic variant or if it is associated with an increased risk of cancer. As more information becomes available some VUS are eventually reclassified, and research shows that if a VUS is reclassified, the odds are high that it will turn out to be benign.

What are the limitations of genetic testing?

- Test results cannot tell you if you will/will not develop cancer (or another cancer) in your lifetime. Genetic test results tell us your risk of cancer compared to the general population.
- If you do not have a pathogenic variant, but someone in your family does, the negative test does **not** mean that you will never develop cancer. You still need to be screened for cancer appropriately.
- If you do not have a pathogenic variant, and no one in your family has a pathogenic variant, then a negative test gives limited information. Your cancer risk may still be higher than the general population.
- Occasionally, new information about a gene may lead to a change in how your results are interpreted. In most cases, this occurs when a variant of uncertain significance is determined to be benign (negative). In rare cases, gene alterations initially classified as positive may also be re-classified.

What are the possible benefits of genetic testing?

- Genetic testing information may relieve anxiety and the worry of not knowing your gene status. It may reduce feelings of uncertainty. For some people, knowing is better than not knowing.
- Genetic testing information may help explain the pattern of cancer in your family. If you have been diagnosed with cancer, testing may explain your own cancer history.
- Genetic test results may give you and other family members information about the chance of having a pathogenic variant, of passing it on to children, and of developing cancer.
- You may gain knowledge about your cancer risk. This information may help you and your doctors plan a program that watches for early signs of cancer. You may also take steps, such as surgeries or medications, to reduce the risk of developing certain cancers.
- If you do not have a pathogenic variant, but a family member does, you do **not** have an increased risk of developing certain cancers because of this pathogenic variant. This may relieve anxiety.

What are the possible risks of testing?

- You could feel that you must make difficult decisions about your medical care.
- Genetic test results may affect relationships with family members, your spouse or partner, or children. This information may be upsetting to your family members and strain relationships.
- You may be concerned that you will be discriminated against because you have a pathogenic variant. State and federal law provide some protections against discrimination by most health insurers and employers based on genetic information. However, these laws do not prohibit the use of test results in connection with health insurance, benefits, or employment. Please see the section on confidentiality (page 4) in this document for more information.
- If you do not have a pathogenic variant, but a family member does, you may experience feelings of guilt about not having inherited the pathogenic variant that other family members have.
- There is a possibility of learning sensitive information about your family that you may not have known prior to testing. For instance, if more than one family member is tested, there is a chance of learning about non-paternity or unknown adoption.
- In some cases, genetic testing may identify a change in a gene that is present in *some* of your cells, but not all. This finding is called mosaicism. We may not be able to establish whether this finding is clinically relevant for you and/or your family. In rare cases, additional work up may be needed to rule out malignancy.

How much does testing cost?

Costs are different according to the specific gene(s) analyzed and the type of test to be performed. Your health insurance may cover all, part, or none of the cost of this test.

Can I choose not to be tested?

Genetic testing is your choice. You can discuss with your doctor ways to reduce your risk of getting cancer or find cancer early with or without genetic testing. You may choose NOT to be tested at any time before having your blood or saliva (spit) sample taken.

What else do I need to know about the testing?

- **Obtaining the sample** – If you decide to have genetic testing, we will draw 1-4 tubes of blood (about 2-8 tablespoons) or collect a saliva sample, depending on which genetic test(s) are being performed. From time to time, there are technical problems that could mean that we need an additional sample. Having to give a new sample does not mean that your test results were abnormal.

- **Accuracy of testing –** Genetic test results are as accurate as possible. However, as with any laboratory test, the results may not be 100% accurate.

- **Receiving your test results** – Some people would like to meet in person to learn their test results when they are available. Others would prefer to learn their test results over the phone, with the option of coming in for a follow-up appointment after that. It is important for you to consider how you would like to discuss the test results. In either case, we strongly encourage you to bring someone with you or have someone available to you if you learn your results over the phone.

- **Psychological and emotional support** – Genetic testing can be stressful. Some people may find preparing for testing and coping with genetic test results to be very distressing. If you feel that the testing process is causing you major distress, you may choose to decline or delay genetic testing. If your healthcare providers become concerned about your emotional health, they may suggest that you take extra time before continuing with the analysis, or ask that you speak with a psychologist, psychiatrist or social worker that works with our program. Members of our staff are available to help you throughout the testing process as well as after test results are available, including our team of mental health professionals.

- **Keep in touch** – With the rapid pace of medical research, new discoveries may lead to expanded genetic testing options in the future. How we interpret your genetic test result may also change as new information becomes available. It is important that you contact us every so often for updated information. We also encourage you to visit our website (www.massgeneral.org/ccra) for updates on genetic testing.

What laws protect me from discrimination based on my genetic test result?

Below, we have described some of the laws that relate to genetic testing and discrimination. You should not rely on this summary to decide on whether to have genetic testing. If you are concerned about possible uses of the results of a genetic test, contact an attorney.

State Law: In Massachusetts, a law prevents most health insurers and employers from using genetic test results to make decisions about health care coverage or employment. This law applies to genetic testing done to identify genes or inherited or acquired (developed at some point in life) genetic changes. This law does not protect the result of a genetic test done to diagnose an existing disease, illness, or disorder. The law does not prevent the disclosure of genetic test results for life insurance, disability insurance or long-term care insurance. More than 40 states (including all the New England states) have laws that address the use of genetic test results.

Federal Law: The Genetic Information Non-discrimination Act (GINA) prohibits most group health insurance plans from using genetic test results or family history information as a pre-existing condition. Additionally, the law prevents some health insurers from using the results of a genetic test to make decisions about eligibility, premiums, underwriting or coverage. It is also against the law for employers with 15 or more employees to use genetic information in hiring, firing, promotion, or other employment decisions. GINA does not protect against discrimination from life insurance, disability insurance or long-term care insurance companies. Under GINA, protection for individuals with the U.S. Military's TRICARE insurance program is more limited. Additionally, GINA's employment protections do not apply to the US military. For more information visit https://www.genome.gov/about-genomics/policy-issues/Genetic-Discrimination.

What is our policy on confidentiality of genetic test results?

Your genetic test results will be placed into your electronic medical record and shared with your referring doctor.

- Since your test results will be placed into your electronic medical record, they may be viewed by any healthcare provider involved in your care.
- As with any medical records, information about you, such as your genetic test results or your decision to be tested, will not be shared with anyone, including your family members, without your permission, except for treatment purposes or as allowed by law. You may, of course, specifically instruct us to share information with others, including other doctors or family members.
- Genetic testing information is important for us and your other doctors to know to give you the best care possible.

How can I find more information about genetic testing?

For additional information, please feel free to contact one of our genetic counselors or doctors in the Center for Cancer Risk Assessment by calling 617-724-1971. You can also visit our website at massgeneral.org/ccra for more information.