National Consortium of Breast Centers
Cancer Genetic Risk Assessment Certification

COMPREHENSIVE TOOLKIT FOR CANCER GENETICS HEALTH CARE PROFESSIONALS BY NATIONAL CONSORTIUM OF BREAST CENTERS CERTIFICATION BOARD

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Intent Use Statement

- This toolkit provides structured guidance and practical resources for healthcare providers managing patients with elevated cancer risk due to personal, familial and hereditary factors. It outlines provider responsibilities in cancer risk assessment, cancer genetic counseling and testing, genomic and includes relevant tools to support clinical decision-making and patient care.

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About the Cancer Genetic Risk Assessment Program (CGRA™)

The Cancer Genetic Risk Assessment Certification Program is a certification program developed by a peer review team of the National Consortium of Breast Centers (NCBC) to acknowledge the healthcare professional with clinical experience and advanced knowledge in cancer genetics and cancer risk assessment within the scope of professional licensure and practice. The emphasis of this program is related to breast cancer risk assessment although a broader knowledge of cancer predisposition genes associated with cancer risk is expected of the candidate. The program is designed to acknowledge competencies in healthcare providers other than genetic counselors such as nurses, physicians and physician assistants.

1. Genetic Education and Counseling
Genetic Counselor vs. Cancer Genetics Medical Professional/Provider

A genetic counselor is a healthcare professional with a master's degree in genetic counseling, trained in both medical genetics and counseling, whose primary role is to guide patients through the process of understanding genetic risks, testing options, and implications for themselves and their families. They often work in a variety of settings, including prenatal, pediatric, and adult genetics, and focus heavily on education, psychosocial support, and informed decision-making. This professional may be required to obtain state licensure to practice genetic counseling and testing within the standards of their state requirements.

In contrast, a high-risk/cancer genetics health care professional, such as a physician, advanced practice provider or other licensed medical professional specializing in oncology genetics, typically has a more clinical and diagnostic role. They assess patients with personal or family histories suggestive of hereditary cancer syndromes, order and interpret complex genetic tests, provide patient education regarding cancer genetic test results and integrate results into medical management plans, including surveillance, risk-reducing strategies, and treatment decisions.

While both roles collaborate closely, the cancer genetics professional often operates within a more specialized, disease-focused framework, whereas the genetic counselor provides broader, patient-centered support across various genetic concerns. This toolkit focuses on the role of the cancer risk and genetics provider and does not elaborate on the role of a genetic counselor.

Role of High Risk/Genetics Provider
A high-risk/genetics provider plays a crucial role in managing hereditary cancer syndromes by performing risk stratification and calculating individual cancer risks. They offer comprehensive genetic counseling and testing, including pre- and post-test counseling, to help patients understand their genetic information. Additionally, they provide education on various screening modalities and are responsible for ordering necessary imaging tests such as breast imaging tests such as mammogram or breast MRI, or referring to Gastroenterology for screening procedures such as colonoscopy or upper endoscopy. They also refer patients for pancreatic screening or risk-reducing surgeries such as bilateral salpingo-oophorectomy. Longitudinal follow-up is an essential part of their role, ensuring ongoing support and monitoring for patients over time. Some provider key roles include:

- Risk stratification/calculation of risk
- Genetic counseling and testing (pre- and post-test counseling)
- Counseling/education regarding screening modalities
- Ordering breast imaging, colonoscopies/endoscopies, referring for pancreatic cancer screening, or risk-reducing breast or ovarian surgery
- Longitudinal follow-up

Resources:
National Library of Medicine https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8706495/

Traditional versus non-traditional service delivery models

- Traditional genetic counseling typically involves in-person sessions for pre- and post-test discussions, offering personalized risk assessment and support. While effective, this model is time-intensive and often constrained by geographic and logistical barriers. In order to improve access and efficiency, alternative service delivery models such as telephone, video-based (telegenetics), and group counseling have emerged, demonstrating comparable patient satisfaction and care quality. These models can be supported by non-genetics-trained staff (e.g., RNs, medical assistants, mammography technologists) who assist with scheduling and patient communication throughout the testing process. The CADRe framework recommends tailoring communication depth, ranging from brief communication to targeted discussion to traditional counseling, based on clinical complexity and patient needs, promoting culturally competent and scalable care.

- **Ethical Considerations**

  Ethical considerations in genetic counseling and testing encompass several key principles. Beneficence involves acting in the best interest of the patient, while nonmaleficence focuses on avoiding harm. Justice ensures fair access to genetic services, and respect upholds patient autonomy and confidentiality. The duty to warn involves informing relatives about potential genetic risks, balanced by privacy concerns. The Genetic Information Nondiscrimination Act (GINA) protects against genetic discrimination in employment and health insurance. GINA protections do not cover long-term care insurance, life insurance and disability insurance. Genetic testing in minors presents ethical considerations related to informed consent and potential long-term psychosocial impacts. While many hereditary cancer syndromes are classified as adult-onset, some may have relevance during childhood. Therefore, careful evaluation of the clinical context and potential benefits and risks is essential prior to initiating testing. In cases where the condition is unlikely to manifest during childhood, testing may not be appropriate. Addressing psychosocial implications is crucial to support patients emotionally and psychologically throughout the genetic testing process.

Resources:

Hallquist, M. L., et al. (2021). Application of a framework to guide genetic testing communication: The CADRe model. Genome Medicine, 13(1), Article 123. https://doi.org/10.1186/s13073-021-00926-2

2. Risk Assessment

Certain risk factors can elevate, and in some cases substantially increase, an individual's likelihood of developing cancer. It is essential to distinguish between general cancer risk and hereditary cancer risk, as this differentiation informs appropriate genetic testing strategies and personalized screening recommendations. In many cases, genetic testing is recommended as the initial step. If the personal or family history does not meet established criteria or remains unexplained after testing, validated cancer risk models may be used to further assess risk. While criteria for genetic testing continue to evolve, general principles such as early-onset cancers, multiple affected family members, or multiple primary cancers can guide decision-making. Referring to established guidelines from professional organizations is advised. Certain red flags can suggest a need for further risk assessment including the presence of young onset cancer, certain rare cancers (i.e. pancreatic, ovarian, male breast cancer), and multiple cancer diagnosis in a patient or family members . Patients should be considered for genetic testing when certain personal and family risk factors are identified:

- Family history of breast cancer, especially when diagnosed before age 50, bilateral breast cancer, male breast cancer or triple negative breast cancer (TNBC).
- Both breast and ovarian cancer on the same side of the family or in a single individual.
- Family history of cancer in addition to breast, such as prostate, melanoma, pancreatic, stomach, uterine, thyroid, colon, and/or sarcoma.
- Certain ancestries such as Ashkenazi Jewish (Eastern European) heritage.
- Known family mutation (KFM) in a gene associated with breast cancer.

It's important to refer to current guidelines when assessing patients for genetic testing.

Resources:

National Comprehensive Cancer Network. Genetic/Familial High-Risk Assessment: Breast, Ovarian, and Pancreatic- https://www.nccn.org/professionals/physician_gls/pdf/genetics_bop.pdf

National Comprehensive Cancer Network. Genetic/Familial High-Risk Assessment: Colorectal, Endometrial, and Gastric- https://www.nccn.org/professionals/physician_gls/pdf/genetics_ceg.pdf

Cancer Risk Models

Cancer risk models estimate an individual's likelihood of developing cancer or carrying a pathogenic gene variant based on genetic, environmental, and lifestyle factors. Differentiating between general cancer risk and mutation probability is essential for guiding prevention strategies, including enhanced surveillance, risk-reducing procedures, or risk-reducing medications. Each model has unique strengths and limitations, and should be applied thoughtfully within the clinical context.

- **Tyrer-Cuzick Model**: Combines genetic and non-genetic factors to estimate a life-time breast cancer risk, including family history, hormonal factors, and lifestyle factors. This model is well validated and the most widely used to determine breast cancer risk. Anyone with a score of 20% or greater on this model is considered high risk. It can also help determine a 5 or 10-year risk for breast cancer to help aid with recommendations for risk-reducing therapies such as Tamoxifen or Aromatase inhibitors.
- **Gail Model:** Estimates the risk of developing breast cancer based on factors such as age, family history, reproductive history, and history of breast biopsies and is primarily utilized in determining the role of risk reducing medications for breast cancer. A 5-year risk of 1.67% or higher is the threshold used by the FDA to determine eligibility for breast cancer risk-reducing drugs like tamoxifen or raloxifene.
- **Claus Model:** Uses family history to estimate breast cancer risk, particularly focusing on the number of relatives with breast cancer and their ages at diagnosis.
- **BRCAPRO Model:** Estimates the likelihood of carrying BRCA1 or BRCA2 mutations and the risk of developing breast and ovarian cancers based on family history..
- **BOADICEA/CanRisk Model**: Is a comprehensive tool used to predict the risk of developing breast and ovarian cancer. It incorporates various factors, including family history, genetic testing results for high- and moderate-risk genes, polygenic risk scores, lifestyle factors, and mammographic density. The CanRisk tool, which uses the BOADICEA model, provides healthcare professionals with a user-friendly interface to calculate cancer risks and estimate the probability of carrying pathogenic variants. This helps in making informed decisions about screening and preventive measures.
- **PREMM5 Model**: Estimates the likelihood that an individual carries a mutation in one of the five genes associated with Lynch syndrome: MLH1, MSH2, MSH6, PMS2, and EPCAM. It uses personal and family history of Lynch-associated cancers to guide decisions about genetic testing. A score of 2.5% or higher typically warrants referral for genetic evaluation
- **ASK2ME Tool**: A clinical decision support resource that provides cancer risk estimates and management recommendations for individuals with pathogenic variants in cancer susceptibility genes. It offers gene- and age-specific guidance based on current evidence to help inform surveillance and prevention strategies.

Use of Pedigree

Pedigrees can help healthcare providers identify patterns and recommend appropriate genetic testing and risk management strategies. Pedigrees show relationships between family members tracing traits, disease processes, particularly cancers to determine inheritance patterns within families. They should include gender, whether they are affected by a certain trait, diagnosis, age of death and cause of death.

To draw a cancer family pedigree, start by placing the proband (the individual seeking genetic counseling) at the center. An arrow or triangle is generally pointed toward the proband to illustrate

that is the patient under assessment. Use standardized symbols: squares for males, circles for females, and diamonds for unknown gender. Connect siblings with a horizontal line and parents with a vertical line. Indicate affected individuals by shading their symbols. Include relevant details such as age at diagnosis, type of cancer, and any known genetic mutations. Annotate the pedigree with information about the health status and ages of family members, including at least three generations. This visual representation helps identify patterns of inheritance and assess cancer risk within the family. (See example in NCCN guidelines)

- Free pedigree resources:
    - Epic: creates a pedigree after family history information has been entered.
    - Progeny Genetics: progenygenetics.com/online-pedigree/
    - Creately: Has free and paid subscription versions. https://creately.com/lp/pedigree-chart-maker/
    - Online Visual Paradigm: Free and paid subscriptions. https://online.visual-paradigm.com/diagrams/features/pedigree-chart-maker/
- Subscription pedigree resources (usually include genetic risk assessment tools and patient tracking):
    - CancerIQ: cancerig.com
    - FamGenix: famgenix.com

Resources:

National Comprehensive Cancer Network. Genetic/Familial High-Risk Assessment: Breast, Ovarian, and Pancreatic- https://www.nccn.org/professionals/physician_gls/pdf/genetics_bop.pdf

National Comprehensive Cancer Network. Genetic/Familial High-Risk Assessment: Colorectal, Endometrial, and Gastric- https://www.nccn.org/professionals/physician_gls/pdf/genetics_ceg.pdf

Powell S, Artigas M, Borovova I, Gadiya P, Hsu A, Kaur R, Kidd L, Rosenfeld D, Saeed MM, Scarelli E, Youssef MW. MAGENTA: a Multinational patient survey assessing the Awareness, perceptions, and unmet needs in Genetic Testing and counseling among patients with breast cancer. Front Oncol. 2024 May 14;14:1380349. doi: 10.3389/fonc.2024.1380349. PMID: 38807767; PMCID: PMC11130477.

3. Hereditary Cancer Syndromes and Cancer Susceptibility Genes

Hereditary cancer syndromes are inherited genetic conditions that significantly elevate an individual's lifetime risk of developing certain cancers. These syndromes result from pathogenic variants in specific cancer susceptibility genes, which may be passed down from one or both parents. Individuals with these syndromes often present with cancer at a younger age than the general population and may have a strong family history involving multiple relatives affected by similar or related cancers. In some

cases, pathogenic variants associated with hereditary cancer syndromes arise *de novo*, meaning they occur spontaneously during embryonic development rather than being inherited from a parent. These genetic changes result from errors in DNA replication or repair and are present in all cells of the individual, including germline cells, despite the absence of a family history of the condition. Although rare, de novo mutations can have significant clinical implications, particularly when they affect high-penetrance cancer susceptibility genes. Identifying such variants through genetic testing is essential for accurate diagnosis, risk assessment, and guiding appropriate surveillance and management strategies for the individual and potentially their offspring.

Accurate identification of hereditary cancer syndromes through genetic testing and counseling is essential for risk assessment, early detection, and personalized management strategies. Testing can inform surveillance recommendations, guide preventive interventions, and influence treatment decisions for both patients and at-risk family members.

Clinical practice guidelines from leading organizations including the National Comprehensive Cancer Network (NCCN), American Society of Clinical Oncology (ASCO), and American Society of Breast Surgeons (ASBrS) provide evidence-based recommendations for identifying, testing, and managing individuals with hereditary cancer risk.

4. Germline Genetic Testing

Germline genetic testing is a form of DNA analysis that identifies inherited pathogenic variants present in the germ cells, meaning the mutation exists in every cell of the body from birth. This type of testing plays a critical role in assessing an individual's inherited risk for various cancers and other genetic conditions. It is most commonly performed using a blood or saliva sample; however, in certain clinical scenarios such as when hematologic malignancies or bone marrow transplants may interfere with results, cultured fibroblasts from a skin biopsy may be required to ensure accuracy.

The results of germline testing can reveal whether an individual carries a hereditary predisposition to cancer, enabling proactive, personalized medical management. This may include enhanced surveillance, risk-reducing interventions, or targeted therapies. Furthermore, germline findings can have implications for biological relatives, who may also be at increased risk and benefit from cascade testing.

Germline testing is typically conducted in conjunction with genetic counseling to ensure patients understand the potential outcomes, limitations, and implications of the results, including privacy protections under laws such as the Health Insurance Portability and Accountability Act (HIPAA) and the Genetic Information Nondiscrimination Act (GINA).

Current ASCO guidelines support evidence-based recommendations for the use of germline multigene panel testing in adult patients with cancer, emphasizing the importance of collecting detailed family history to inform testing decisions and interpretation. The guideline outlines when and how to use

multigene panels, which genes to include based on cancer type and risk level, and when germline testing should follow tumor genomic profiling. It also addresses clinical considerations such as variant interpretation, patient communication, health disparities, and cost barriers, aiming to support oncologists in delivering equitable and informed genetic care.

Resources:

American Society of Breast Surgeons- https://www.breastsurgeons.org/docs/statements/Consensus-Guideline-on-Genetic-Testing-for-Hereditary-Breast-Cancer.pdf

American Society of Clinical Oncology https://ascopubs.org/doi/10.1200/JCO.24.00662
American Society of Clinical Oncology https://www.asco.org/news-initiatives/current-initiatives/cancer-care-initiatives/genetics-toolkit
National Comprehensive Cancer Network https://www.nccn.org

National Comprehensive Cancer Network. Genetic/Familial High-Risk Assessment: Breast, Ovarian, and Pancreatic- https://www.nccn.org/professionals/physician_gls/pdf/genetics_bop.pdf

National Comprehensive Cancer Network. Genetic/Familial High-Risk Assessment: Colorectal, Endometrial, and Gastric- https://www.nccn.org/professionals/physician_gls/pdf/genetics_ceg.pdf

Myriad Genetics https://myriad.com/gene-table/

5. Screening and Surveillance for High-Risk Individuals
Surveillance and screening are vital for patients at increased risk for cancer, as they enable early detection, intervention and significantly improving outcomes. Regular screening tests, such as mammograms, colonoscopies, and upper endoscopies, can identify cancer at its earliest stages when it is most treatable. For high-risk individuals, tailored surveillance protocols help monitor for signs of cancer development, allowing for timely preventive measures or treatments. This proactive approach not only reduces cancer mortality but also alleviates the emotional and financial burdens associated with advanced-stage cancer diagnoses. By prioritizing surveillance and screening, healthcare providers can offer high-risk patients a better chance at maintaining their health and quality of life.
Breast cancer:
High-risk breast cancer screening involves more intensive and frequent monitoring compared to standard screening protocols. For women at high-risk, such as those with BRCA1 or BRCA2 mutations, the following measures are typically recommended:

- Annual Mammograms: Starting at age 30 or earlier, depending on individual risk factors.
- Annual Breast MRI: Often recommended in addition to mammograms to provide a more detailed view of breast tissue.

- Clinical Breast Exams: Regular physical exams performed by a healthcare provider to check for lumps or other changes.

Screening protocols for individuals with positive gene mutations associated with hereditary cancer syndromes vary by gene and family history. Additional high risk surveillance may be considered in some cases where there is a relevant family history of certain cancers such as colorectal cancer or pancreatic cancer. Review current screening guidelines by gene in NCCN guidelines.
Resources:
American Cancer Society https://www.cancer.org/cancer/types/breast-cancer/screening-tests-and-early-detection/american-cancer-society-recommendations-for-the-early-detection-of-breast-cancer.html
American College of Radiology- https://www.acr.org/Media-Center/ACR-News-Releases/2023/New-ACR-Breast-Cancer-Screening-Guidelines-call-for-earlier-screening-for-high-risk-women
National Comprehensive Cancer Network. Genetic/Familial High-Risk Assessment: Breast, Ovarian, and Pancreatic- https://www.nccn.org/professionals/physician_gls/pdf/genetics_bop.pdf
National Comprehensive Cancer Network. Breast Cancer Screening and Diagnosis- https://www.nccn.org/professionals/physician_gls/pdf/breast-screening.pdf
National Comprehensive Cancer Network. (2025). NCCN Clinical Practice Guidelines in Oncology: Colorectal Cancer Screening (Version 2.2025). https://www.nccn.org/professionals/physician_gls/pdf/colorectal_screening.pdf

6. Personalized Approaches for Medical Management
Risk Reduction:
Risk-reducing strategies are crucial for individuals at high-risk of developing cancer. These discussions often include preventive measures such as prophylactic mastectomy, which involves the surgical removal of breast tissue to significantly lower the risk of breast cancer. Additionally, medications like tamoxifen or raloxifene can be prescribed to reduce cancer risk by modulating estrogen reception or uptake. Other risk reducing therapies are considered for patients with additional cancer risks (i.e. colorectal, ovarian, etc.) These strategies are tailored to each individual's risk profile and personal preferences, ensuring a comprehensive approach to cancer prevention. By proactively addressing these options, healthcare providers empower patients to make informed decisions about their health and future.
Resources:
National Comprehensive Cancer Network https://www.nccn.org

National Comprehensive Cancer Network. Genetic/Familial High-Risk Assessment: Breast, Ovarian, and Pancreatic- https://www.nccn.org/professionals/physician_gls/pdf/genetics_bop.pdf

National Comprehensive Cancer Network. Genetic/Familial High-Risk Assessment: Colorectal, Endometrial, and Gastric- https://www.nccn.org/professionals/physician_gls/pdf/genetics_ceg.pdf

National Comprehensive Cancer Network. Breast Cancer Risk Reduction- https://www.nccn.org/professionals/physician_gls/pdf/breast_risk.pdf

7. Targeted Therapies Based on Genetic Findings

Germline vs. Somatic Genetic Testing in Cancer Care

Germline testing identifies inherited mutations present in all cells, providing insight into lifelong cancer risk and informing preventive strategies for patients and their families. In contrast, somatic testing detects mutations acquired in tumor cells, guiding targeted treatment decisions. Both serve as critical biomarkers for assessing cancer risk, predicting recurrence, and supporting personalized therapy selection.

By monitoring disease progression, biomarkers provide insights into whether a treatment is working, guiding adjustments as needed. Additionally, they identify genetic changes driving tumor growth, aiding in the development and selection of targeted therapies that are more likely to succeed. Tailoring treatments based on biomarkers minimizes unnecessary interventions and associated toxicities, ultimately improving patient outcomes and quality of life.
Genomic findings from tumor testing may warrant confirmatory germline testing but should not be used as a substitute for germline screening. Patients with somatic variants in cancer-associated genes should be evaluated for germline testing when appropriate. All individuals who meet established criteria for hereditary cancer testing should be offered germline testing, as studies indicate that 8–10% of germline pathogenic variants may be missed through tumor testing alone.
Resources:
National Comprehensive Cancer Network. (Treatment Guidelines by Cancer Site)- https://www.nccn.org
MD Anderson Cancer Center https://www.mdanderson.org/cancerwise/how-are-biomarkers-used-in-cancer-treatment.h00-159460056.html

Das, S., Dey, M. K., Devireddy, R., & Gartia, M. R. (2024). Biomarkers in cancer detection, diagnosis, and prognosis. Sensors, 24(1), 37. https://doi.org/10.3390/s24010037 https://www.mdpi.com/1424-8220/24/1/37

American Society of Clinical Oncology https://ascopubs.org/doi/10.1200/JCO.24.00662

8. Psychosocial Implications of Hereditary Cancer Germline Genetic Testing

Hereditary cancer genetic testing provides valuable insight into cancer risk, but it can also introduce complex emotional and psychosocial challenges.

Emotional Impact:

- Anxiety & Uncertainty: Waiting for results or receiving a positive finding may trigger anxiety—even negative results can leave lingering concerns.
- Guilt & Distress: Individuals may feel guilt over passing mutations to children or distress about family members' potential risk.
- Depression: The emotional burden of genetic risk can lead to feelings of helplessness or sadness.

Family Considerations:

- Communication Challenges: Sharing results may be difficult due to strained relationships or differing views; family letters can support disclosure.
- Family Planning: Genetic findings may influence reproductive decisions, including options like PGD or adoption.
- Impact on Relatives: Relatives may face emotional, financial, or logistical barriers to testing and care.

Decision-Making & Life Choices:

- Preventive Actions: Positive results often lead to increased surveillance or risk-reducing interventions.
- Career & Financial Stress: Ongoing medical care may affect work schedules and create financial strain.

Support Strategies: Hereditary cancer risk providers play a key role in addressing these challenges by offering mental health resources, facilitating family discussions, promoting shared decision-making, and connecting patients with peer support networks.

Psychosocial Support & Special Considerations in Hereditary Cancer Risk

Hereditary cancer risk providers play a critical role in supporting patients through the emotional and psychosocial challenges of genetic testing. Key areas of support include:

- Emotional Counseling: Address anxiety, guilt, and distress related to test results and family implications.
- Mental Health Integration: Refer to professionals experienced in health-related psychological support.

- Family Communication: Facilitate discussions around shared risk and family planning; provide tools like family letters.
- Peer Support: Encourage participation in support groups to reduce isolation and foster resilience.
- Shared Decision-Making: Tailor surveillance and preventive strategies to individual values and circumstances.

Special Considerations

- Racial and Ethnic Disparities: Access to genetic testing and counseling remains uneven across racial and ethnic groups. Providers should be aware of systemic barriers, cultural differences, and mistrust in healthcare that may affect engagement and outcomes.
- Research Gaps: Continued research is needed to understand psychosocial impacts across diverse populations, improve culturally competent care, and expand access to underrepresented communities.
- Equity in Care: Advocacy for inclusive testing guidelines, insurance coverage, and community outreach is essential to reduce disparities and improve outcomes for all patients.

By integrating psychosocial care with attention to equity and inclusion, providers can help patients and families navigate hereditary cancer risk with greater confidence and support

Resources:

Campacci N, Grasel RS, Galvão HCR, Garcia LF, Ribeiro PC, Pereira KFJS, Goldim JR, Ashton-Prolla P, Palmero EI. The history of families at-risk for hereditary breast and ovarian cancer: what are the impacts of genetic counseling and testing? Front Psychol. 2024 Mar 4;15:1306388. doi: 10.3389/fpsyg.2024.1306388. PMID: 38500651; PMCID: PMC10946339
National Cancer Institute https://www.cancer.gov/publications/pdq/information-summaries/genetics/risk-assessment-hp-pdq#_142
National Society of Genetics Counselors http://www.nsgc.org

9. Legal and Ethical Issues

Informed Consent for Genetic Testing

Key elements to discuss with patients:

- Type of Test: Multi-gene Panel (MGPT), single gene/syndrome
    - Cascade testing (testing offered to family members after a mutation is identified)
- Turnaround Time: Varies by lab
- Possible Results: Positive, Negative, or Variant of Unknown Significance (VUS)
- Purpose & Impact: Voluntary testing; benefits/risks; implications for family members
- Next Steps: Management plan if positive; potential changes in care
- Limitations: Not all mutations or risks may be detected
- Privacy Protections: Results are protected under HIPAA
- Discrimination Protections: Covered under GINA (with exceptions)

Genetic Discrimination
Federal Protections (GINA):
The Genetic Information Nondiscrimination Act (GINA) prohibits most health insurers and employers from using genetic information to:

- Deny health insurance or increase premiums based on genetic test results
- Make employment decisions (hiring, firing, promotion) based on genetic data
- Require genetic testing for insurance or employment purposes

Exceptions to GINA:

- **Health Insurance:** Does *not* apply to life, disability, or long-term care insurance
- **Employers:** Excludes military, federal government, and employers with <15 employees
- **Health Plans:** May request genetic info to determine coverage for specific procedures (e.g., cancer screenings)

State Laws:
State-specific protections may vary. See the National Conference of State Legislatures for details:

http://www.ncsl.org/research/health/genetic-nondiscrimination-in-health-insurance-laws.aspx
https://www.ncsl.org/research/health/genetic-nondiscrimination-in-health-insurance-laws

Resources:
GINAhelp.org http://www.ginahelp.org/
National Library of Medicine https://www.ncbi.nlm.nih.gov/books/NBK236044/
National Library of Medicine https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4568442/
National Library of Medicine https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8706495/
National Society of Genetics Counselors http://www.nsgc.org

10. Glossary of Terms
Beneficence- Acting in the patient's best interest.

Biomarker- A biological molecule found in blood, other body fluids, or tissues that indicates a normal or abnormal process, or a condition or disease. In cancer care, biomarkers help assess risk, guide treatment, and monitor disease progression.

Cancer Genetics Medical Professional / High-Risk Provider- A licensed medical provider (e.g., physician, nurse practitioner, physician assistant, nurse) with specialized training and certification in oncology genetics. These professionals assess hereditary cancer risk, order and interpret genetic tests, and integrate results into clinical management plans including surveillance, risk-reducing strategies, and treatment.

Cancer Risk Models- Tools used to estimate an individual's likelihood of developing cancer or carrying a pathogenic variant based on genetic, personal, and family history, as well as lifestyle and environmental factors.

Cancer Susceptibility Gene- A gene in which mutations are associated with an increased risk of developing cancer (e.g., BRCA1, BRCA2, MLH1).

Cascade Testing- Genetic testing offered to family members of individuals with a known pathogenic variant to determine their risk.

Chemoprevention (Risk Reducing Medication)- The use of medications (e.g., tamoxifen, aromatase inhibitors) to reduce the risk of developing cancer in high-risk individuals.

Chemotherapy Toxicity- Side effects or harm caused by chemotherapy. Biomarkers can help minimize toxicity by guiding more precise treatment choices.

Culturally Competent Care- Healthcare delivery that respects and integrates patients' cultural beliefs, values, and practices to improve communication and outcomes.

De Novo Mutation-A genetic variant that arises spontaneously during embryonic development and is not inherited from either parent. These mutations are present in all cells of the body, including germline cells.

Duty to Warn- Balancing the obligation to inform at-risk relatives with patient privacy.

Gail Model-Estimates the risk of developing breast cancer based on factors such as age, family history, reproductive history, and history of breast biopsies. Primarily used to determine eligibility for risk-reducing medications.

Genetic Counseling- A communication process that includes education about genetic conditions, testing options, and implications of results. It is typically provided before and after genetic testing.

Genetic Counselor- A healthcare professional with a master's degree in genetic counseling, trained in medical genetics and psychosocial counseling. They help patients understand genetic risks, testing options, and implications for themselves and their families.

Germline Genetic Testing- DNA testing that identifies inherited mutations present in all cells of the body. It is used to assess hereditary cancer risk and guide medical management.

GINA (Genetic Information Nondiscrimination Act)- Federal law protecting individuals from genetic discrimination in health insurance and employment. Does not cover life, disability, or long-term care insurance.

Hereditary Cancer Risk- Cancer risk due to inherited genetic mutations, often associated with early-onset disease or multiple affected relatives.

Hereditary Cancer Syndrome- A genetic condition caused by inherited pathogenic variants that significantly increase an individual's lifetime risk of developing certain cancers.

High-Penetrance Gene- A gene in which mutations are strongly associated with a high likelihood of developing cancer (e.g., BRCA1, TP53).

HIPAA (Health Insurance Portability and Accountability Act)- A U.S. law that protects the privacy and security of individuals' health information, including genetic test results.

Justice- Ensuring fair access to services.

Mutation- A change in the DNA sequence. In cancer, mutations may be inherited (germline) or acquired (somatic), and can influence risk, prognosis, and treatment.

Mutation Probability- The estimated likelihood that an individual carries a pathogenic variant in a cancer susceptibility gene.

Nonmaleficence- Avoiding harm.

Non-Traditional Service Delivery Models- Alternative approaches to genetic counseling that improve access and efficiency, including telephone counseling, telegenetics, and group counseling.

Pathogenic Variant- A genetic alteration that increases the risk of disease, such as cancer, and is

considered clinically significant. Sometimes referred to as a gene mutation or deleterious variant.

Pedigree- A visual representation of a family's medical history used to identify inheritance patterns and guide genetic testing.

Post-Test Counseling- Follow-up after genetic testing to interpret results, discuss next steps, and address emotional and medical implications.

Precision Medicine- A medical model that uses genetic, environmental, and lifestyle data to customize healthcare, particularly in cancer treatment and prevention.

Pre-Test Counseling- Discussion prior to genetic testing that covers the purpose, potential outcomes, limitations, and psychosocial implications of testing.

Proband- The individual undergoing genetic evaluation, typically placed at the center of the pedigree and marked with an arrow or triangle.

Respect for Autonomy- Supporting informed decision-making and confidentiality.

Risk Assessment- Evaluation of personal and family history to determine cancer risk and guide testing and management.

Risk-Reducing Intervention- Medical or surgical strategies (e.g., prophylactic mastectomy, oophorectomy) used to lower the risk of developing cancer in high-risk individuals.

Risk-Reducing Surgery- Surgical procedures performed to lower the risk of developing cancer in individuals with hereditary cancer syndromes.

Risk Stratification- The process of evaluating personal and family history to estimate an individual's likelihood of having a hereditary cancer syndrome or developing cancer. Cancer risk stratification is often categorized as sporadic, familial or hereditary and may be represented by a percentage of risk or risk range.

Somatic Genetic Testing- Testing that identifies mutations acquired in tumor cells during a person's lifetime. These mutations are not inherited and are used to guide cancer treatment decisions.

Surveillance- Ongoing monitoring for cancer through regular screening tests based on genetic risk (i.e. imaging, physical exam, blood tests).

Targeted Therapy- Cancer treatment that uses drugs or other substances to precisely identify and

attack cancer cells based on specific genetic changes.

Traditional Genetic Counseling- An in-person model where patients meet with a trained genetic counselor for comprehensive pre- and post-test counseling, risk assessment, and psychosocial support.

Tyrer-Cuzick Model- A risk model that combines genetic and non-genetic factors to estimate lifetime breast cancer risk and guide decisions on screening and chemoprevention. Also referred to as the IBIS model.

Resources

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