Genetic testing for hereditary cancer risk in primary care: Patient considerations, meaningful messaging, and the element of time

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Abstract

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The following work uses qualitative and quantitative methods, underpinned by a pragmatic research paradigm, to explore what motivates individuals to pursue genetic testing for hereditary cancer risk, the reasons they ultimately do not complete genetic testing, and the way considerations and circumstances shift over time.

Chapter 1 is a qualitative study comparing the motivations, barriers, and permanence of genetic testing decisions across various points in the testing process. Interviews were conducted with participants from the Early Detection of Genetic Risk (EDGE) study, which offered testing to primary care patients at no cost. Interview findings explore if, how, and why, considerations vary by final stage of testing completion. Interviews occurred up to one year following EDGE study recruitment for testing. Results from this study informed chapters 2 and 3.

Chapter 2 is an exploratory quantitative study that examines reasons individuals do not return genetic testing kits, along with the permanence of their decision. Participants were from the EDGE study and were surveyed 1-3 years following their initial recruitment.

Chapter 3 is a qualitative study, which offers a deep dive into how circumstances and considerations around testing can change over time. Qualitative interviews were conducted with participants who dropped out of the MAking GENetic Testing Accessible (MAGENTA) trial at various stages in the testing process, 5-8 years following testing noncompletion. The MAGENTA study offered no-cost genetic testing for hereditary breast and ovarian cancer (HBOC) risk directly to participants.

Across all studies, participants expressed an openness to, and often an eagerness, for repeated offers of genetic testing for hereditary cancer risk. Both personal circumstances and participants' attitudes and perceived norms shifted over time, highlighting the dynamic nature of patient decision-making. As healthcare systems continue to improve genetic testing infrastructure and address physician capacity and burden around referrals, mechanisms for patient re-engagement should be considered. For individuals whose care could be meaningfully impacted by screening for hereditary cancer risk, a missed opportunity should not forever remove them from the testing pathway.

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Acknowledgments

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Introduction

Genetic testing for hereditary cancer risk (GT) holds the promise of greatly reducing the 5-10% of cancer cases estimated to be associated with pathogenic gene variants (Garber & Offit, 2005; Jahn et al., 2022). However, doing so requires integrating GT into primary care or other clinical settings where patients are seen before the onset of disease, a recommendation supported by the U.S. Preventive Task Force (US Preventive Services Task Force et al., 2019). Genetic testing in these settings can facilitate early detection through more intensive cancer screenings, such as the use of combined MRI and mammography screening, or prevention via risk-reducing surgeries, such as risk-reducing salpingo-oophorectomies—interventions that are less effective in oncological settings, where testing occurs after a cancer diagnosis (Domchek et al., 2010; Lubinski et al., 2024; Evans et al., 2016). However, barriers to testing in the primary care setting exist at the systems, clinic, provider, and patient level. Interventions aimed at increasing testing uptake have been most successful if they address barriers at multiple levels, such as those with patient and provider education, but multilevel interventions are resource intensive (Dusic et al., 2022; Bednar et al., 2022). Therefore, the majority of these interventions have taken place in high-resourced, academic, oncology settings. Further, interventions have not been able to address systems-level challenges, such as test cost and insurance coverage, at scale. Equitable integration of genetic testing into primary care settings will require strategies that can still address multi-level barriers but are more broadly feasible and can be employed in lower-resource settings such as community clinics and federally qualified health centers.

Evidence in oncological settings show that patients do not always perceive their GT refusals as permanent, suggesting that reoffering GT after noncompletion may be one low-resource strategy to address low testing uptake (Schlich-Bakker et al., 2007; Halverson et al., 2020; Kahn et al., 2023). Noncompletion in this case is either a direct decline of testing or a lack of follow through with the testing process. How these findings translate to the primary care setting is unclear, as little is known about the

stability of patient decisions in this setting or what may prompt reconsideration. If primary care patient considerations surrounding GT are regularly recalibrated, or the barriers experienced change, then re-offering testing over time could be an effective, equitable, and low-resource way to increase testing uptake in this setting. As such, we seek to illuminate the permanence of GT decisions and the messages and moments that may shift thinking using both qualitative and quantitative methods.

Chapter 1, entitled "Cancer genetic testing uptake in the primary care setting: Patient perspectives on barriers and facilitators throughout the testing process," is a qualitative study comparing the motivations, barriers, and permanence of GT decisions across various points in the testing process. Interviews were conducted with participants from the Early Detection of Genetic Risk (EDGE) study, which offered GT to primary care patients at no cost. Interview findings explore if, how, and why GT considerations vary by final stage of testing completion, along with the permanence of testing decisions. Interviews occurred up to one year following EDGE study recruitment for testing. Results from this study informed chapters 2 and 3.

Chapter 2, entitled "Non-return of a free genetic testing cancer kit from the EDGE study: Exploratory quantitative study of reasons and future testing intentions," examines reasons individuals do not return testing kits and the permanence of their decision. Participants were surveyed 1-3 years following recruitment for participation in the EDGE study.

Chapter 3, entitled "The permanence of genetic testing barriers and motivators: Qualitative interviews 5-8 years following decline," offers a deep dive into how circumstances and considerations around testing can change over time. Qualitative interviews were conducted 5-8 years following GT noncompletion, with participants who dropped out of the MAking GENetic Testing Accessible (MAGENTA) trial at various stages in the testing process. The MAGENTA study offered no-cost genetic testing for hereditary breast

and ovarian cancer (HBOC) directly to participants who had established primary care providers, with whom results would have been shared.

The methodological and analytic choices across all chapters are informed by a pragmatic research paradigm, with the objective of focusing on the practical implications of our findings (Allemang et al., 2022; Biesta & Burbules, 2003). Notably, we draw on both quantitative and qualitative sources, which can have differing epistemological perspectives. However, the analysis driving the work in this dissertation is grounded in the epistemological foundations of qualitative work.

Populations in Conversation

Miles, Huberman and Saldaña (2014) state that exploring the breadth of a construct requires us "*to see different instances of it, at different moments, in different places, with different people.*" (p. 33) In line with this philosophy, we consider multiple testing stages, time points, and populations across the three chapters. Using the collective findings will add depth and breadth to our understanding of GT decision-making and its associated permanence. Below are the key distinctions between the populations in each of this dissertation's three chapters, and a discussion of the value gained by looking at them in conversation with one another.

Participant-driven versus clinic-driven testing environments

Both EDGE and MAGENTA sought to improve systems for GT outside of the cancer care setting and thus our capacity to identify the 1-3% of the general population suspected to carry pathogenic variants in cancer susceptibility genes (Swisher et al., 2025; Bowen et al., 2021; Swisher et al., 2023; Shen et al., 2022). The EDGE study did this through the clinical setting — participants had a primary care appointment, were approached through the clinic, and were largely guided through the process by clinic or study staff. The MAGENTA study was participant-driven and predominantly outside of a clinical setting. Participants were made aware of the study through flyers or social media marketing and had to

independently work through the process (consent, eligibility, seven surveys, pre-test education) to receive testing.

The settings overlapped more in terms of release of results. Both EDGE and MAGENTA results were sent to the participants' primary care provider. For EDGE, they were uploaded to associated clinic EHRs. For MAGENTA, they were sent to the participants' chosen provider (identification of a provider was an eligibility requirement).

By comparing and contrasting EDGE interviews, EDGE surveys, and the MAGENTA interviews, we can extend our understanding of how considerations vary with increased clinical integration, or between traditional primary care and non-traditional patient-driven contexts.

Different time intervals

One of our primary objectives across the three chapters is to illuminate if, and how, GT considerations change over time. Each chapter captures a different time interval following initial patient decisions. Recruitment for the EDGE study happened during 2021-2022. Interviews were conducted in 2022-2023, one month to two years following the initial decision. EDGE surveys were sent out in 2024, 2-3 years following the initial decision. Recruitment for MAGENTA happened during 2017-2020 and interviews were conducted in 2025, 5-8 years following the initial testing decision. The variation in time between the initial GT offer and study follow-up offers a unique opportunity to explore the way time impacts decision-making. By comparing and contrasting all three datasets we can extend our understanding of how considerations change over short and long periods of time.

Additional/varying GT process stages

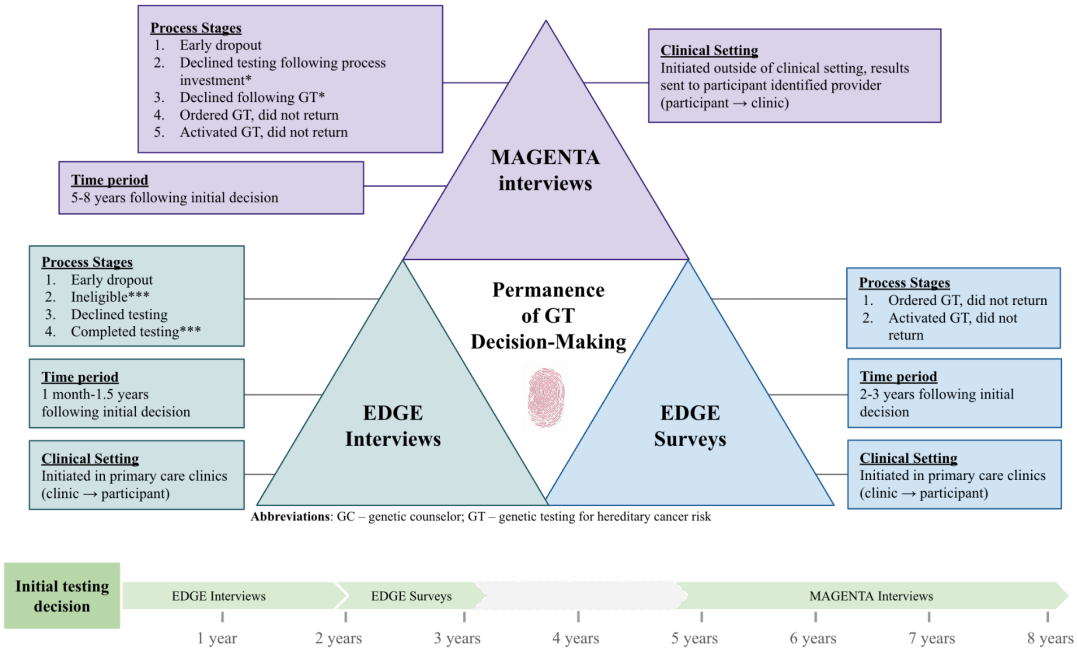
Similar to the different time intervals, the variation in when participants dropped out of the genetic testing process across the datasets also allows us to directly address the question: How and why do genetic testing considerations change at different stages in the testing process?

The GT process outside of cancer care settings does not follow a standardized model, with significant variation across clinics, states, and individual providers (Dusic et al., 2022; Hamilton et al., 2017). Implementation studies (including EDGE and MAGENTA) are actively exploring ways to maximize testing uptake and cost-effectiveness, while minimizing clinic and provider burden (Bednar et al., 2022; Dusic et al., 2022; Swisher et al., 2023; Bowen et al., 2021). As such, we are not suggesting there is a single "genetic testing process." Instead, we are providing a detail-rich analysis of reasons for drop-out at various points in the EDGE and MAGENTA studies. Ideally, the breadth and depth of this analysis will allow for transferability of our findings to new settings. Figure I.1 represents the relationship between the three chapters.

By looking at these studies in conversation with one another, we gain a richer understanding of GT considerations and decision permanence through data triangulation. Data triangulation has gone through many iterations over the past five decades (Denzin, 2012, 1970). As it stands, it can be considered an approach to provide more depth and breadth to a particular inquiry by bringing together multiple perspectives, methodologies, and data sources (Denzin, 2012; Flick et al., 2004). It is important to note that the use of triangulation for our purpose is not to establish an objective truth, validity, or assert generalizability (Flick et al., 2004). Rather, our aim is to add "rigor, breadth, complexity, richness, and depth," (Denzin, 2012) to the understanding of genetic testing decision-making. To do so, we explored each setting in its own right and subsequently explored the ways they build on, complement, or vary from one another.

Collectively, the three chapters outline evidence supporting the idea that patient considerations around testing are not static, along with what could be done with this knowledge to improve the delivery of genetic testing services in primary care.

Figure I.1. Data Triangulation for Permanence of GT Decision-Making



* MAGENTA participants had to complete 7 surveys to move forward to genetic testing.
** Pre-test genetic testing was offered to a portion of MAGENTA participants, unique to the MAGENTA population.
*** EDGE study interviews also look at considerations amongst participants who screened not eligible and those who completed testing

Chapter 1 | Cancer genetic testing uptake in the primary care setting: Patient perspectives on barriers and facilitators throughout the testing process

Publication Note

This chapter is adapted from Theoryn et al., (2026). The original article was published under a Creative Commons Attribution (CC-BY) license in *the Journal of Genetic Counseling* by this author. The present chapter has been modified for inclusion in this dissertation.

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Introduction

For over 20 years, cancer has been a leading cause of morbidity and mortality in the United States with inherited variants associated with 5-10% of cases (Garber & Offit, 2005; Centers for Disease Control, 2023; Jahn et al., 2022). Proactive identification of individuals who carry such variants is critical to reducing hereditary cancer burden. Genetic testing for hereditary cancer risk (GT) can facilitate interventions aimed at early detection and prevention, such as enhanced screenings and risk-reducing surgeries (Cragun et al., 2020). The reach of early identification can be increased by extending GT from primarily cancer care settings to medical spaces focused on prevention, such as primary care (Dusic et al., 2022; Petry et al., 2019). In the primary care setting, for example, providers can identify patients who may benefit from GT based on family history, order testing, and align cancer screenings according to clinical recommendations based on GT results. Ultimately, this integration would facilitate early detection of hereditary cancers.

Efforts to incorporate GT into primary care have been underway for over two decades, and clinical testing recommendations have been written accordingly (Bednar et al., 2022; Dieng et al., 2014; McCuaig et al., 2018; US Preventive Services Task Force et al., 2019). However, many people who may benefit are still not being tested (K. K. Childers et al., 2018). Primary care providers (PCPs) are best positioned to address this gap, but they face significant systemic challenges, including limited opportunities for genetics education and access to genetic specialists, incomplete or non-intuitive integration of genetic information within the electronic health record (EHR), and competing clinical priorities paired with short patient visits (Dusic et al., 2022; Evenson et al., 2016; Harding et al., 2019). Added to this, patient circumstances and concerns mean that when a provider is ultimately able to offer GT, the patient may not be situated to move forward with it (Actkins et al., 2021; Keogh et al., 2017). Recognizing that patient-provider interaction is still critical to facilitating GT, there is a need to identify feasible provider strategies, informed by patient experiences, to improve the delivery of GT services.

A substantial body of work is dedicated to understanding why people who may benefit from testing do not pursue it. Systematic reviews cataloging the barriers have captured perspectives from a range of populations, including those with a personal history of cancer, those with a family history of cancer, and the general population (including participants from both specialty and primary care settings) (Keogh et al., 2017; Shen et al., 2022; Smith-Uffen et al., 2021). Concerns over perceived cost, psychological harm, clinical utility, and privacy were consistently identified as key barriers. However, the earliest barriers to engagement with the testing process are not well captured, as those who are not eligible for testing, or who do not start the process, are often excluded from studies. Further, barriers are often looked at in aggregate rather than at specific stages in the testing process. The current approach to genetic testing for hereditary cancer consists of not one, but multiple steps towards completion, each of which represents an opportunity for patients to drop out of, or be removed from, the testing process (Bednar et al., 2022; Dusic et al., 2022). How barriers and considerations change as the GT process progresses is poorly understood, which limits our capacity to develop evidence-based interventions. One study with patients

with breast cancer did find a difference in why patients declined testing based on when they dropped out of the process – those who declined immediately saw little relevance to testing, while those who declined later had more psychological reasons (Schlich-Bakker et al., 2007). In line with the idea that barriers and considerations change throughout the testing process, we are also looking to explore how they continue to change following initial drop out. Only one identified study has explicitly focused on decision permanence. The study, conducted by Halverson and colleagues (2020) at a hereditary cancer clinic, found that the majority (67%) of individuals who declined testing would change their minds if their clinician offered it again. The literature on these topics in cancer care settings is sparse, and how they are reflected in the primary care setting, where the function of GT is slightly different, is entirely unknown.

A more complete understanding of the nature of patient barriers and thoughts around GT can inform provider communication – suggesting potential interventions and improvements to increase uptake of testing in the context of hereditary cancers and primary care. As such, we conducted a qualitative study to answer the question of how considerations change across the GT process and what is the permanence of these decisions, among primary care patients.

Methodology

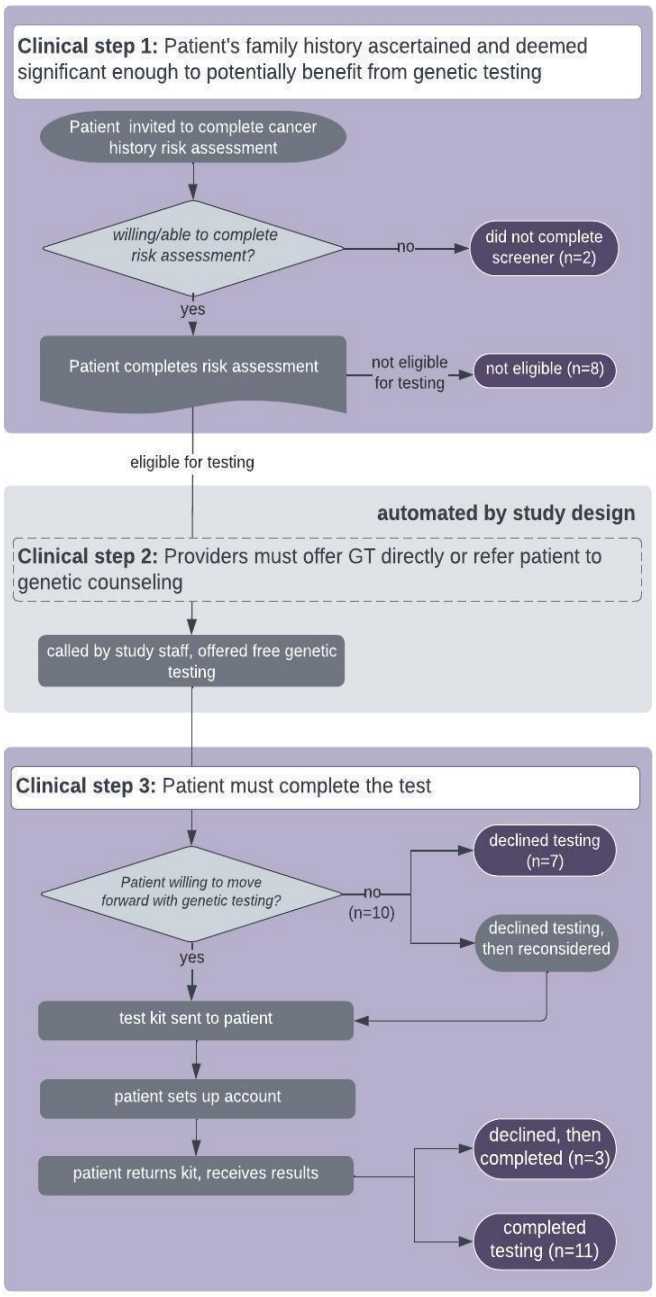
Parent Study and Participant Population

The Early Detection of Genetic Risk (EDGE) study was a cluster-randomized controlled trial that evaluated two engagement strategies for completing cancer risk assessments: direct-to-patient (completed independently online) and point-of-care (in clinic or over the phone). Regardless of arm, the risk assessment was offered prior to a patient's upcoming appointment, so as to allow participants the opportunity to discuss the study and GT with their provider. Providers were offered an optional training at the start of the study for continued medical education credit, focused on the process of identifying and following up with high-risk patients (Swisher et al., 2025). The study was conducted across two large healthcare systems with clinics in Washington, Wyoming, and Montana.

After completing the cancer risk assessment online or in person, everyone was treated the same in both arms. Those with a sufficient family or personal history of cancer were deemed eligible for at-home GT (Bowen et al., 2021; Swisher et al., 2025). All test-eligible patients were sent an overview of the next steps and a link to the study website with frequently asked questions (FAQs) about genetic testing (Appendix A). The FAQs went over potential impact on health insurance, utility of testing, genes tested, data privacy, and the testing process. However, no pre-test counseling was provided, where this information, along with alternatives to testing and implications for risk, would have likely been reviewed in more depth. For all eligible patients, one follow-up phone call was made by study staff to explain the logistics of the process, answer questions according to the study FAQs, and offer/order the at-home GT through Color Health (www.color.com) at no cost. If a participant was interested in moving forward with testing, a provider placed the order for the testing kit. Kits were sent to the participant's provided address. To complete testing, participants provided a saliva sample, mailed the testing kit back to Color Health, and set up an online account to access their results. Results were uploaded to participants' electronic health record (EHR) and were available via the participant's Color online account. Genetic counseling was offered for all individuals for whom a pathogenic variant was identified. Participants were given options to opt out of GT, or the study at large (interviews and surveys) at each contact point. Main outcomes of the EDGE study, along with the protocol, were published previously (Swisher et al., 2025; Bowen et al., 2021).

EDGE invited more than 59,500 primary care patients to complete the cancer history risk assessment. Of the 13,705 individuals who completed the risk assessment, GT was offered to the 4,673 who met cancer history criteria. Of these, 1,474 (31.5%) completed GT. We conducted semi-structured interviews (N=31) with participants at four stages in this GT process, those who: did not complete the initial risk assessment (n=2), completed the assessment but were ineligible due to an insufficient personal or familial history of cancer (n=8), were eligible and declined (n=10), and completed GT (n=11) (Figure 1.1).

Figure 1.1. Primary Care Testing Model and Interview Groups



Participant quotes were labeled according to their stage of drop out; 'Early' if they did not complete the risk assessment or were ineligible due to insufficient cancer history, 'Late' if they opted out of testing following eligibility, 'Switched' if they initially declined but later requested testing, and 'Completed' if they completed testing. This study was approved by the University of Washington Institutional Review

Board (STUDY00009476) and verbal informed consent was obtained prior to recording the interview. The study is reported using guidance from the Reflexive Thematic Analysis Reporting Guidelines (RTARG) (Braun & Clarke, 2024).

Recruitment

EDGE study participants were English-speaking individuals aged 25 years and older with scheduled appointments at a participating clinic. Individuals were ineligible for this nested qualitative study if they stated they did not want to be contacted for future research. For the interviews, we employed a purposive sampling strategy to select study participants who varied in gender, age, study arm, and clinic system. We aimed to recruit 40 individuals from the EDGE study to gather general perspectives and thoughts about genetic testing and sampled specifically for participants who dropped out at distinct stages of the testing process to capture unique considerations.

Potential interviewees were contacted via email up to three times. Emails were sent by the interviewer (TNT), who introduced herself, stated the purpose of the study, and provided a brief overview of the topics. Because of challenges in recruiting individuals who did not complete the risk assessment, those who called in to express that they were not moving forward with the assessment were also invited to interview. Participant contact data was stored in UW's HIPAA-compliant REDCap system.

Data Generation

Our research question focused on why people drop out at different stages of the GT process, and the permanence of their decision. To answer this exploratory, subjective question, we utilize qualitative methods for data generation. Semi-structured interview guides were developed based on the stage of drop out and pilot-tested with study staff, with only minor wording and question order changes. Topics included: general thoughts about GT, understanding of GT in the context of the study, reasons for considering GT, concerns or barriers, interactions with family members and physicians, and the

permanence of their decision. Participant demographics (e.g., age, sex, race) were collected during the interview. (Appendix B)

A research assistant (TNT) with formal training as an educator and an interest in GT and implementation work completed: patient follow-up after the risk assessment, participant recruitment for interviews, the one-on-one interviews, and led the analysis for this study. She was trained under a qualitative research expert (SBT). Recruitment and interviews took place between 2022 and 2023. The interviews were conducted on Zoom, with participants calling or videoconferencing. The interviews averaged approximately 22 minutes (range: 9–60 minutes), and participants were offered a $10 gift card for their time. The sessions were digitally recorded (audio and video), transcribed with filler words removed and bracketed researcher-inserted clarifications to improve readability in line with our pragmatic paradigmatic approach, and de-identified prior to analysis.

Data Analysis

We (TNT, FB, EJD, SBT) performed a reflexive thematic analysis (RTA), framed by pragmatism as a research paradigm, allowing us to focus on the practical consequences of our findings (Braun & Clarke, 2024; Wainstein et al., 2023). RTA offers a flexible method to explore the many complex paths and perspectives of individuals moving through GT, while taking into consideration the ways our pragmatic lens influences interpretation of the data (Braun & Clarke, 2021). The process involved recursively conducting six phases of analysis: data familiarization, coding, identifying initial themes, reviewing themes, refining themes, and writing up the findings (Braun & Clarke, 2021).

The codebook was initially developed with deductive codes derived from the interview guide. Initial code groups and associated example codes include genetic testing (opinions on testing, reaction, etc.), considerations (research, cost, discrimination, etc.), feedback (time, questions, etc.), and miscellaneous (other testing, etc.). While the use of a starting codebook allowed for alignment with our research

question, we also reviewed the transcripts to allow for inductive code generation more in line with RTA. Further, codes were continuously refined throughout the coding process. EJD and TNT used ATLAS.ti software to code the transcripts. At three points in the coding process, a random sample of three transcripts were selected and double-coded (three in the beginning, three in the middle, and three at the end). The coders met with a senior qualitative expert (SBT) to discuss the code choices and assumptions, aiming for a more in-depth understanding of the data and codes, focusing on areas where there were coding discrepancies and updating or adding codes when needed to ensure the final codes captured the coders interpretations. The remaining transcripts were then divided and coded individually by the two coders, with the analysts and qualitative expert (SBT) serving as sounding boards throughout the process.

Barriers and facilitators were broken down based on when participants dropped out of, or were removed from, the testing process, focusing on clinically relevant stages – early (did not complete cancer history risk assessment or completed the assessment and were ineligible) and late drop out (test-eligible individuals who declined GT). Differences in study arm were only considered at the earliest stage of drop-out due to the digital nature of the barriers.

Analysis

Response Rate and Participant Demographics

The interview response rate varied based on the testing process stage. Of those approached for interviews, those who did not complete the risk assessment or declined GT had the lowest response rates (2/49, 4.1% and 10/174, 5.5%, respectively). Those who were ineligible for GT due to insufficient personal or familial cancer history had the highest response rate (8/17, 47.1%), followed by those who completed GT (11/62, 17.8%). We saw recurring codes and considerations around motivations for GT and barriers following the risk assessment, representing a degree of completeness to the data. (Vasileiou et al. 2018; Saunders et al. 2018) However, themes relevant specifically to the subset of individuals who did not complete the initial risk assessment (i.e., did not engage in the study at all) did not reach sufficiency due to lower response

rate of these individuals. For this group, recruitment efforts were largely unsuccessful; however, two individuals reached out to the study staff and were invited to participate at that time. These interviews were included to represent the reported experience, but there are no claims that they represent a comprehensive view of the earliest barriers to testing.

Interview participants predominantly identified as white (88%) and female (60%). The median age was 58 years old and participants were roughly evenly split between healthcare systems (Table 1.1). Of the three individuals who reported a personal history of cancer, all completed GT.

Table 1.1. Participant Demographics

		Interview Groups					
Demographics		Did not complete risk assessment (n = 2)	Ineligible for GT (n = 8)	Declined GT (n = 7)	Declined, then completed GT (n = 3)	Completed GT (n = 11)	**TOTAL** (n = 31)
Sex	Male	1 (50%)	5 (62.5%)	3 (42.9%)	1 (33.3%)	2 (18.2%)	12 (38.7%)
	Female	1 (50%)	3 (37.5%)	4 (57.1%)	2 (66.7%)	9 (81.8%)	19 (61.3%)
Race	White	2 (100%)	4 (50%)	7 (100%)	3 (100%)	11 (100%)	27 (87.1%)
	Asian	-	4 (50%)	-	-		4 (12.9%)
Ethnicity	Not Hispanic or Latino	2 (100%)	7 (87.5%)	6 (85.7%)	3 (100%)	10 (90.9%)	28 (90.3%)
	Hispanic or Latino	-	1(12.5%)	1 (14.3%)	-	1 (9.1%)	3 (9.7%)
Age	25-45	-	4 (50%)	2 (28.6%)	1 (33.3%)	5 (45.5%)	12 (38.7%)
	46-65	1 (50%)	3 (37.5%)	2 (28.6%)	1 (33.3%)	2 (18.2%)	9 (29.0%)
	> 65	1 (50%)	1 (12.5%)	3 (42.9%)	1 (33.3%)	4 (36.4%)	10 (32.3%)
Clinic System State	Washington	1 (50%)	5 (62.5%)	4 (57.1%)	2 (66.7%)	6 (54.5%)	18 (58.1%)
	Montana/Wyoming	1 (50%)	3 (37.5%)	3 (42.95%)	1 (33.3%)	5 (45.5%)	13 (41.9%)
DPE		2 (100%)	8 (100%)	5 (71.4%)	3 (100%)	5 (45.5%)	23 (74.2%)
POC		-	-	2 (28.6%)	-	6 (54.5%)	8 (25.8%)
Personal History of Cancer*	Yes	Not collected	-	-	-	2 (27.3%)	2 (9.7%)
	No	Not collected	8 (100%)	7 (100%)	3 (100%)	9 (72.7%)	27 (90.3%)

*From risk assessment. Cancers included: breast, colon (large intestine), endometrial (uterine), kidney (renal) or urinary tract, melanoma, ovarian, pancreatic, prostate, skin cancer that is not melanoma, small intestine, stomach (gastric)

Barriers and Facilitators along the Genetic Testing Process

We crafted seven themes around early and late barriers to GT, early and late facilitators to GT, and testing permanence. (Table 1.2)

Table 1.2. Identified Themes

Themes	
Early Engagement Facilitator	Family cancer history (whether significant or missing), and general curiosity were early motivators to participation
Early Barrier	Technology use may lose interested individuals who also face compounded systemic barriers
Early Barrier	An unknown family cancer history can exclude individuals who may benefit from testing
Late Barrier	Skeptical of clinical utility
Late Barrier	Privacy and insurance discrimination are top of mind
Decision Permanence	Decisions to decline are not permanent
Completion Facilitator	Clinical relevance and familial impact were main drivers.

<u>Early Engagement Facilitators: Family cancer history (whether significant or missing), and general curiosity were early motivators to participation</u>

"I was all for the genetic testing." (Late-2)

Participants dropped out of the testing process for a variety of reasons, but perceptions of GT were consistently positive, as was initial interest in GT. Participants expressed that the potential of GT for cancer risk was an incentive to engage with the study, regardless of whether or not they ultimately completed GT. This was primarily motivated out of concern for existing family history, "I was interested because obviously cancer runs in my family, and so there is that curiosity, am I at a higher risk? and so forth." (Late-4)

Other motivators included taking advantage of a free opportunity, a general desire for information, helping with research, and the opportunity to fill in missing family history. Filling in gaps was a motivator both for someone who completed testing, for filling in gaps on one side of their family, and for

someone ineligible for testing: “I think, for someone in my position [adopted], genetic testing would be about the most valuable tool available in terms of assessing cancer risks.” (Early-1).

Ultimately, barriers outweighed motivators for those who declined testing. Of the 10 test-eligible individuals who declined, half expressed significant interest in GT, citing general curiosity or its value for their health and their families’ health. Four stated the potential for testing was an incentive for completing the risk assessment: “yeah, I was hoping that I'd get picked to get testing” (Late-6), and four believed testing could help with cancer prevention or have direct clinical relevance. These individuals later cited concerns that outweighed their desire for testing: “I'm bummed because I really wanted to get tested. I see the drawbacks outweighing the benefits, especially since I can just assume I have a genetic marker that predisposes me to cancer and just ask for a more aggressive schedule of screenings, at least specifically for colon cancer.” (Late-4)

Early Barrier: Technology use may lose interested individuals who also face compounded systemic barriers

“I don't have a computer. I really wouldn't be able to afford one, I'm living hand-to-mouth now.” (Early-10)

Both individuals who did not complete the cancer history risk assessment belonged to clinics randomized to the online study arm. These individuals reported that they did not have access to, or comfort with, computers and could not complete the risk assessment as a result. However, they were eager to participate and indicated that they were information seekers. One participant highlighted the potential for this information to allow them to best prepare for the future, saying, “knowledge is power…it's power enough for me to get my affairs in order. If it's bad, I don't want to leave strings behind. I'd rather know and take care of everything.” (Early-9) Both individuals also indicated a history of cancer; one mentioned a personal history of cancer, and the other stated, “everybody on my mother's side died of cancer.” (Early-

9). Whether these cancers were of the assessed hereditary cancers or not was not ascertained, and they are therefore not included in the demographics table.

While these participants reported that technological barriers kept them from participating in the study, they also highlighted other barriers that may have become prohibitive at later stages under the traditional testing model. These included test cost, unmet access needs, and difficulty navigating the healthcare system. For example, one said:

> There has always been specific things that I cannot do, like go [to the doctor] in the afternoon. Either it's too hot, or I'm too sore and tired because I start off good in the morning when I get up and progresses worse through the day with pain, movement. And because of the economic thing, I couldn't get in anyway. I couldn't even get in to see this doctor. [The cost of] gas is so high. I only have so much money. (Early-9)

<u>Early Barrier: An unknown family cancer history can exclude individuals who may benefit from testing</u>

“I'm adopted, so I don't really have a family history.” (Early-1)

Participants reported that the risk assessment was relatively easy to complete and similar to family history risk assessments they had completed in the past. However, of the eight ineligible individuals, three indicated that missing family history, due to adoption or lack of contact with biological relatives, hindered their ability to fill out the risk assessment accurately. One stated, “It's not like I can suddenly call my mom… like, ‘Hey, we haven't talked in years, but can you tell me your medical history?’” (Early-6)

Missing family history reduced participants’ confidence in the risk assessment’s results: “I definitely took the results of this one with a grain of salt, just because the quality of the information it was giving back was probably not particularly helpful in my case.” (Early-1) While these individuals knew they did not

have a complete family history, the prospect of free GT and the possibility of filling in some missing history motivated them to attempt the risk assessment regardless.

While individuals who were missing their entire family history were the only ones completely excluded from testing, they were not the only ones to cite missing family histories. Two individuals who were eligible for genetic testing and ultimately completed it also indicated missing family history. One was eligible due to a personal history of cancer, and the other because of a known history on one side of their family.

Late Barrier: Skeptical of clinical utility

"How would I benefit from genetic testing? I'd have more information, but it wouldn't impact me directly. I don't think." (Switched-3)

Test-eligible participants who declined testing voiced opinions that cancer could not be stopped, the results of GT could already be assumed based on cancer history, or that risk information was no longer useful to them at their age, "I am almost 60 years old, I think your perspective changes when you get older. I'm worried about other people, my kids, but let's face it, everybody's going to die of something…" (Late-2)

The individuals who held these beliefs were generally uncertain about what GT would achieve. Five individuals noted that they were unsure about what purpose GT would serve in their lives. One participant assumed lifestyle interventions would be the main recommendation for positive results and believed that they did not need the results to implement these changes:

> We should all be eating healthy, we should all be living healthy, we should all be doing these things. We all know that there's a risk, whatever level it is, that exists for us as

> humans, so we should be doing these things to mitigate those potential risks. If you were told that they didn't have a risk for cancer, would you go out and start doing crazier things? Probably not. So, for me I go, yeah, it would be a piece of trivia, I guess, about my life, but it would pretty much stop there. Chances of it changing much of what I do would be pretty minimal. (Late-1)

The perception that the clinical relevance of testing was limited also influenced how stressful individuals believed the results would be. One individual recognized the importance of information but felt that while navigating other health issues, the potential for stress was too significant without the guarantee of potential interventions:

> I thought, 'I don't want to be an ostrich that buries my head in the sand. I don't want to be the see no evil, hear no evil.' But I kind of do, because I deal with enough stress in my life right now, that if I had to worry that if I potentially had any of these, then I possibly would then be dreading ahead because maybe there were things that I couldn't do anything about, because not every one of them can you do kind of things to make sure it doesn't happen to you. I felt it was better to not know. (Late-3)

<u>Late Barrier: Privacy and insurance discrimination are top of mind</u>

"Everything's hackable, and then that's data that gets out there" (Late-1)

Participants shared privacy concerns and expressed unease about who would own their genetic data, how it would be protected, or whether insurance could access their results. This worry extended into the concern that life insurance coverage could be denied in the future. For one individual, this possibility was "actually almost scarier than having cancer." (Late-4) Despite an interest in GT and acknowledgment of the benefits of testing, concerns about privacy and insurance discrimination were the primary reasons for not moving forward with testing among those who were eligible but declined: "only one reason [for not doing testing], and that was because it could be used against me by insurance." (Late-6)

Further, one participant contemplated what healthcare protections mean in the political climate at the time of interviews, stating, “I'm very, very familiar with protected health information and closed and open data sets. I get very worried, especially with the political climate we have now…who would've thought that Roe v. Wade would've been overturned?” (Late-2), which speaks to decreasing confidence in the permanence of legal protections, “and the insurance lobby is a very, very powerful lobby. And so, it just makes me very, very nervous to have anything on my medical record.” (Late-2)

Decision Permanence: Decisions to decline are not permanent

“When you asked if I'd reconsider, I think I immediately said, ‘Yes,’ almost no time.” (Switched-3)

Only two individuals of the ten who declined testing reported that, if given the opportunity for GT again, they would make the same decision, citing psychological implications as their primary concern. When the remaining eight participants were asked if they would refuse testing again, they answered that they would change their decision or gave non-definitive responses such as “probably” and “I don't know.” This non-committal feeling toward testing is best captured by an individual who declined testing and compared the decision to test to a pop-up request on a computer that asks to share data with software developers—“Half of the time, I'm like, ‘Yeah, I don't care, you can have it,’ the other half of the time I'm like, ’You don't need to know my voice recordings, no, you don't get that.’” (Late-1) While he declined testing on this occasion, he made it clear it was not a static decision:

> There are good aspects to it, and maybe someday I'll change my mind on this one. I was enough on the fence that I was willing to keep going until I got blown over by a very soft wind [a conversation with his wife]. (Late-1)

Three individuals who had initially declined testing went so far as to request testing after being invited for the interview. One did so immediately after receiving the first email invitation, and the other two inquired about it as their interviews were concluding, “I assume based on this conversation, it's something that I can't have done at this point. Is that right? It's kind of done, the study?” (Switched-2) All three individuals were allowed to proceed with the free testing and ultimately completed all required steps.

Of those who switched, feelings about GT were similar to those who declined and gave non-committal responses to whether or not they would do so in the future. Two held positive feelings about GT that were initially outweighed by logistical issues and concerns over privacy and insurance implications. The third had no concerns about testing but did not see the clinical relevance. All three participants had different catalysts leading them to move forward with testing.

The first individual initially declined testing because she was applying for life insurance and was nervous about how GT results might impact that process. After completing that process, she was eager to move forward with testing and hopeful that she could still access it through the study.

The second participant declined testing because the offer essentially fell through the cracks and said that in the future, they would “make a better effort at actually mak[ing] things like [genetic testing] happen.” (Switched-1). During the interview, they highlighted the challenge of information overload and being inundated with scams via text, email, and phone, stating that they struggled to discern what was important. They also expressed that even with a clear understanding of the process, the amount of energy and time they had available would still be a major consideration for whether to complete testing. At the time of the interview, they were motivated to complete testing and had the time to do so. Further, the interview served as a reminder and provided the opportunity to ask questions and clarify the testing process.

The last individual did not feel strongly about their initial refusal or GT as a whole, so when they were recontacted, they decided to move forward with it. While the reasons for initially declining testing and then later completing it varied for all three individuals, the recontact was sufficient to facilitate reintroduction into the testing process.

Completion Facilitator: Clinical relevance and familial impact were main drivers

"Well, my mother and my grandmother had the same cancer that they both passed from. That was a huge factor. I'm an identical twin, so it's not even just for me; it's for my sister, too. I figure it's best to know than not know." (Completed-10)

Patients who moved completely through the testing pipeline were predominantly motivated by a concern over their family history of cancer. These participants were largely unsurprised by their risk assessment results, with many presuming an increased cancer risk from their family history alone: "it's an ongoing joke that if the war doesn't get the men, if the men don't get shipped off to war, they're probably going to... Somebody in the family's going to die from cancer." (Completed-4)

When asked about their perception of GT, most participants believed that it could improve their health management through increased screenings and preventative surgical options. Even if there were no current interventions for a pathogenic mutation, one participant highlighted their belief that it could still have a clinical impact "as preventative measures become more and more available." (Completed-7) While the possibility of prevention was the most common association with GT, concern over family and the opportunity to receive testing at no cost were also motivating factors.

People who moved forward with testing were less likely to bring up concerns, but those who did echoed the feelings highlighted by the individuals who declined testing, namely, older age, privacy, insurance discrimination, and psychological considerations. One participant commented, "The only thing that

concerned me was whether it was going to affect my health insurance later if I came up with positive genetic markers. I thought about that for about, oh, I don't know, 15 seconds. Otherwise, it was very straightforward." (Completed-3) A second participant stated, "I like privacy, but also I realize that sometimes some people have, they have medical problems and they don't know about it, and that's [genetic testing] the only way we can find out" (Completed-8). Other participants expressed that their feelings "morphed over time," and highlighted that when they thought of GT earlier in their life, they were concerned about cost. They also didn't "want to get bad news because I have enough bad news in my life." (Completed-11) However, when the study offered testing, they decided to move forward with it because they were interested in having the information and "the opportunity arose" without the cost barrier. Another individual, who was 64 years old, expressed a similar sentiment to those who declined testing due to their age but was motivated by the potential positive impact on their children, commenting, "I know it interests some of my children. I think one of my daughters did some more testing … but for me, I don't feel the need to do it." (Completed-2)

Two individuals who completed testing also had a personal history of an assessed hereditary cancer (prostate and endometrial) and three others indicated in their interviews that they had other cancers (lung and unnamed cancers). Primary motivations for completing GT for these individuals were among the primary reasons presented above. However, one stated they do not think they would have been as motivated to complete testing if they had not had a personal history of cancer, "up until this cancer diagnosis, I really have been super healthy, no problems. I'd probably looked at [genetic testing] and gone, "I don't know why I would do that." (Completed-2). Still, they indicated their ultimate motivator was providing information for their family. An additional individual with a personal history of cancer also stated a desire for GT to help discern whether their cancer was more likely to be environmental or hereditary.

Discussion

This study explored why participants dropped out at different points in the GT process. We found differences in GT barriers for those who dropped out of testing early in the process versus late in the process. Earlier barriers were largely systemic (e.g., the risk assessment required the use of technology, family history was a required criteria for testing), while later barriers involved limited perceived relevance and privacy/discrimination concerns. These findings, along with the identified motivators for testing, offer insight into potential provider strategies for improving testing equity and uptake, such as mitigating systemic barriers by re-offering GT over time and focusing messaging on potential clinical actions and family impact.

The barriers identified at the earliest stage of the testing process do not represent the breadth of early perspectives, as only two individuals detailed their experiences. However, survey data collected from approximately 7000 individuals who declined to participate in the EDGE study identified two main reasons for choosing not to enroll— 'not interested' and 'no relevant family or personal history of cancer'. These responses are in line with previous literature suggesting that individuals who decline testing early have low general interest in testing (Schlich-Bakker et al., 2007). However, those we interviewed spoke to practical limitations leading to early drop-out: limited access to technology and a lack of knowledge about their family cancer history. Participants were interested in testing but could not participate because either the process had an online component or required knowledge of family cancer history. Both barriers can exacerbate inequities in GT as they systematically exclude specific groups of individuals.

The use of technology and digital tools in medical spaces aims to reduce disparities stemming from access and availability (Webster et al., 2025). However, broad integration of these tools without interventions to ensure broad access and use may contribute to specific populations being systematically unable to access health services. A scoping review of health care inequities stemming from technology integration

identifies rurality, being from an ethnic minority, low income, poor health, and low digital literacy as factors associated with inequitable access to digital health tools (Mistry et al., 2022; Yao et al., 2022). As reliance on digital tools expands, considerations about clinic populations and ways to ensure equity must be part of the conversation. A few proposed interventions to enhance access and use may include providing technical help or establishing partnerships between libraries and clinics.

Those who could not demonstrate a sufficient family history cited adoption and strained family relationships, scenarios for which providers may lack training (Webster et al., 2025). The CHARM study, which was looking at ways to engage populations with inequitable access to genomic testing services, identified providing testing to individuals with limited family history knowledge as essential to ensuring equitable provision of GT (Gilmore et al., 2024). To do this, the CHARM study followed an adjusted genomic testing eligibility model, which included both individuals with a sufficient family history of cancer as well as those who indicated they did not know their cancer family history. This is a middle ground between population genetic testing and targeted genetic testing, balancing resource limitations and equity.

Those who opted out of testing later were often interested in testing, but at the time of the offer, their concerns regarding insurance discrimination, privacy, and psychological impact outweighed the perceived benefits. Many individuals who declined testing at this stage were uncertain if there were actual clinical implications of testing, so the primary perceived benefit was gaining general knowledge and information. Notably, participants did not perceive their decision as permanent: some individuals requested testing after their initial decline, and others expressed the possibility of changing their mind in the future. Our findings mirror those from studies conducted in the oncological setting, despite the different implications of GT in primary care (i.e., prevention as opposed to informing treatment) – both in terms of barriers to testing (Fogleman et al., 2019; Hayden et al., 2017; Keogh et al., 2017; Mallen et al., 2021; Schlich-Bakker et al., 2007) and decision permanence (Halverson et al., 2020; Kahn et al., 2023). To add to this

conversation, we were able to understand shifting motivations in real time of patients who initially opted out of testing but subsequently requested and completed it. These participants held concerns around GT similar to those who declined but changed their minds following a relatively short time interval post-initial decline.

Our findings suggest two recommendations providers can use to address both early- and late-stage barriers to GT: (1) communicating clinical and familial utility, and (2) re-offering testing over time. Those who completed testing cited the knowledge of clinical follow-up after receipt of results as a motivator for moving forward. This is contrasted with the individuals who declined GT, who perceived limited clinical utility. For individuals who feel results would not be particularly informative for their personal care, such as individuals who are already engaging in increased cancer screenings due to age or family history, the potential positive familial impact was a motivating factor. As such, we recommend that when PCPs are engaging in conversations with patients about genetic testing, they center their messaging around the tangible impacts of GT and the potential familial benefit, especially for those who are not personally motivated to complete GT. To reinforce the clinical importance of GT and meet other patient needs, clinicians can also re-offer testing over time.

Patient circumstances changed over the course of our study, and after a relatively brief amount of time, a few were able to proceed with testing. As such, in addition to addressing the systemic barriers inherent in the testing process, we can also potentially improve testing equity and uptake by re-offering GT (or the collection of family/personal cancer history) over time. When GT is offered only once, individuals who could benefit may be permanently excluded from testing due to their circumstances at the time. Individuals who were systemically excluded from testing (missing family history, technology issues, health issues, poverty) may be more likely to engage with testing if providers can present additional opportunities to enter the pipeline. While the re-offer approach may not address larger systems-level barriers, it does allow for changes in individual circumstances. An individual's family history of cancer

can change over time, shifting both their interest in, and eligibility for GT. Similarly, technology access, health issues, and financial status can all change over time. Re-offering testing would ensure these individuals can receive testing when they are situated to do so. This is supported by the three individuals whose minds changed throughout our study; two had more bandwidth upon follow-up, and the third had a change in life insurance status. Even those who opted not to move forward with testing indicated their decision was not set in stone, suggesting that re-offering could have a significant impact. Ultimately, reasons for not completing genetic testing are not always related to immutable or deeply held attitudes, beliefs, or values but instead are often subject to external/environmental factors and can change over time.

These findings are consistent with earlier work that found patients who initially declined GT were open to changing their minds if their physician made the recommendation again (Halverson et al., 2020). While further studies should explore the most effective means and timing to re-offer testing, as well as provider openness to this strategy, our findings suggest that the follow-up offer need not involve much time or effort, as we offered no additional counseling for the patients who changed their minds and completed testing. Due to the relationships between patients and their providers, existing trust, and the opportunity to provide concrete instructions, having providers re-offer testing is likely to have the most significant impact on uptake (Bardach & Schoenberg, 2018). However, recognizing this may not always be feasible, systems-level strategies for re-offer should also be considered. Research around the benefits of text and simple phone call reminders for cancer screening attendance suggests a potential starting point (Breedlove et al., 2023; Kerrison et al., 2015; Taplin et al., 2000). This strategy would be responsive to patient desires for more testing opportunities while minimizing additional provider burden. This is particularly informative for the ongoing efforts to systematize GT processes via Electronic Health Record systems (EHRs), providing evidence for point-of-care re-offer reminders (“Penn Chart Genomics Initiative: Optimizing the EHR for Use in Genomic Medicine,” n.d.).

Limitations

While the objective of qualitative studies is not generalizability, it is important to note where certain perspectives may not have been represented, as well as relevant considerations around those that were included. The vast majority (87%) of participants were non-Hispanic white and from the direct-to-patient engagement arm; other demographic groups may have different perspectives that are not represented here. Further, participants effectively opted into research twice, agreeing to participate in the primary EDGE study as well as this sub-study. This may have shaped participants' motivations and concerns, such as a desire to contribute to research or greater confidence in privacy protections; our results may not generalize to clinical (non-research) contexts. Additionally, because the EDGE study offered testing at no cost, utilized a testing company that provided genetic counseling, and had dedicated clinical staff/research members to introduce GT to patients, we were unable to thoroughly assess the associated barriers. Finally, while interviews were verbally debriefed with the analysis team throughout the process, formal/written field notes were not taken, and participants were not asked to review transcripts or findings.

In terms of the process-oriented lens of our study, the GT process has multiple decision points, not all of which are represented. We did not reach thematic sufficiency for the considerations pertaining to those who “did not complete risk assessment”. The re-offer of GT to those who requested it during the interview was participant-initiated rather than by study design, so there may be self-selection bias. Further, we don’t know how others would have responded if the offer were made to them, as the openness to testing in the future was present throughout the opt-out group, and those who switched had similar feelings and concerns around GT as the other individuals who opted out of GT. A study designed around the re-offer of testing could offer additional insight and generalizability about why and when people may change their minds about testing.

Conclusion

These findings demonstrate the fluid nature of patient barriers and considerations around genetic testing and suggest potential low-impact provider strategies for improving access to, and uptake of, testing. Patients' reasons for not completing testing varied by stage of drop-out, and their readiness for cancer risk assessment or testing changed over relatively brief follow-up times. Recognizing that genetic testing is clinically important and that individual circumstances are not static, our results highlight the value of offering testing over time to improve testing equity and uptake. While this study focused on drivers of patient drop out and did not consider the provider side of the equation, our finding that patients' openness to testing may change over time underscores the need to identify time-efficient, technology-supported approaches to support providers in making repeat offers of GT. Providers often cannot address the multitude of barriers patients may be facing at any given time, but they may be able to make genetic testing more accessible by 1) tailoring messaging around prevention and familial benefits and 2) offering patients multiple opportunities to move forward with testing.

Chapter 2 | Non-return of a free genetic testing cancer kit from the EDGE study: Exploratory quantitative study of reasons and future testing intentions

Introduction

The Centers for Disease Control (CDC) has identified three hereditary conditions as having "Tier 1 genomic applications," meaning screening for them has the possibility to have a significant positive public health impact. These include Hereditary Breast and Ovarian Cancer Syndrome (HBOC), Lynch syndrome (LS), and Familial hypercholesterolemia (FH) (CDC's Office of Public Health Genomics, n.d., archived). Both HBOC and LS have implications for hereditary cancer risk, and genetic testing (GT) can lead to early detection and prevention. For at least HBOC, there are explicit guidelines for primary care providers to screen for family history and refer indicated patients for genetic counseling or testing (Moyer & U.S. Preventive Services Task Force, 2014).

However, there are significant barriers to identifying individuals with a family history of cancer and referring them for genetic testing, including factors at the societal, clinic, provider, and patient levels (Dusic et al., 2022). Addressing these barriers is critical to improving rates of genetic testing uptake, and interventions have been designed accordingly. Notably, in a 2022 scoping review of existing genetic testing interventions, over 70% targeted the earliest stages in the testing process – identification of eligible patients and the referral process (Bednar et al., 2022). Most of the others addressed delivery of genetic counseling. Efforts included physician-coordinated testing, integration of genetic counselors into clinics, offering testing at no-cost, targeted patient and clinician education, assistance with care coordination, and changes to the delivery of genetic counseling (e.g., telephone vs. in-person counseling, pre- and post-test counseling compared with post-test only models) (Bednar et al., 2022; Dusic et al., 2022; Swisher et al., 2023). No studies explored strategies to improve follow-through after ordering, particularly in the case of at-home testing.

As at-home GT kits increase in popularity, we must recognize that they also present an additional opportunity for patient attrition, between ordering a test and completing the testing. For instance, 25% of participants in the EDGE study ordered testing, but never returned their kits (Swisher et al., 2025). The reasons for noncompletion at this stage are less understood, which limits our capacity to design critical interventions. Therefore, we conducted an exploratory quantitative study on patient reasons for noncompletion after ordering a kit, their openness to completing testing in the future, and their thoughts on conditions that could facilitate testing completion.

Methods

We conducted a cross-sectional survey to better understand late stage drop out of the genetic testing process, as well as the permanence of testing decisions. The project was primarily supported by U01CA232795 from the National Institute of Health (NIH). The survey was a part of a study approved by the University of Washington Institutional Review Board (IRB), which acted as a central IRB. Study ID: STUDY00009476.

Population and Recruitment

All participants in the Early Detection of Genetic Risk (EDGE) study who were eligible for testing based on their risk assessment and agreed to testing but never completed the process were invited to participate in this survey. These individuals received an at-home genetic testing kit from Color Health that was recorded as not-returned through the study. The survey was sent 1-3 years following testing noncompletion—initial EDGE study recruitment occurred between April 1, 2021, and March 31, 2022 (Swisher et al., 2025).

A total of 530 EDGE participants met survey eligibility criteria and were sent an invitation to complete the optional 10-minute survey. Up to seven emails were sent from Dec 21, 2023-March 3, 2024, one invitation and six reminders. One mailed copy of the survey was sent to those who did not complete the survey online. Survey responses were collected using the HIPAA-compliant RedCap platform, hosted by the University of Washington. Participants were offered a $10 e-gift card for their participation.

Survey Instrument

The survey instrument (Appendix C) was developed based on interviews with EDGE participants who had dropped out at earlier stages of testing and a review of relevant literature (Theoryn et al., 2026; Smith-Uffen et al., 2021). It included 20 questions organized into seven domains: (1) reasons for pursuing testing: 4-point scale ("did not consider" to "major consideration"), (2) access and usability questions: both binary and 5-point Likert scale response options, (3) considerations against genetic testing: one multi-select question, (4) permanence of decision: both binary and multi-select questions, (5) health and genetics self-efficacy, as measured by confidence in ability to fill out medical forms and understand genetic information: one 5-point Likert scale each, (6) health status: one 5-point ordinal ranking scale, and (7) demographic information: various response structures.

"Other" and "Additional Consideration" free-response boxes were provided when relevant. The survey was piloted amongst study staff for clarity, comprehensiveness, and time to complete. Minor changes were made before launching.

Data Analysis

We conducted an exploratory descriptive analysis of the quantitative data, with participant characteristics and survey responses summarized as counts and percentages. For demographic factors, participants had the option to select more than one response for insurance type – each response is represented in the demographic table counts. Additionally, the household size variable was collapsed from 10 categories (1-

10) into five categories – those with four or more household members were grouped together. This allowed for improved interpretability and table readability. For age, we present the mean and interquartile range. All analyses were performed using R version 4.3.3.

When cleaning data, the author reviewed all responses in "other" categories and the sorted responses into existing response categories when appropriate. For instance, "other" response for testing noncompletion, "*I just forgot*," was added to the group "I forgot to mail in my saliva sample." Remaining responses are included in "other" counts and the free text is analyzed qualitatively. We utilized an inductive content analysis method to code responses and identify themes. (Appendix D)

Because the purpose of this study is exploratory and descriptive, reasons for testing noncompletion were grouped into categories informed by prior literature to facilitate clinically relevant interpretation aligned with a pragmatic research paradigm (Theoryn et al., 2026; Dusic et al., 2022). These groupings did not impact statistical analyses, rather they offered a structure through which to discuss the findings in a broader context.

Results

Of 530 patients who participated in the EDGE study and met eligibility criteria for this survey, 131 (24.7%) returned the questionnaire. Participants were predominantly insured (97.7%), female (77.1%), White (83.2%), and had at least some college experience (68%). The average age was 63 years (IQR: 52-72 years). (Table 2.1)

Table 2.1. Demographics

Demographics		No. of Participants	%
Age, years	Median (IQR)	63 (52-72)	
Sex	Female	101	77.1%
	Male	29	22.1%
	Prefer not to answer/no response	1	0.8%
Race	Asian	1	0.8%
	Black or African American	8	6.1%
	White	109	83.2%
	Multiracial	5	3.8%
	Other	2	1.5%
	Prefer not to answer/no response	6	4.6%
Ethnicity	Not Hispanic or Latino	120	91.6%
	Hispanic or Latino	2	1.5%
	Prefer not to answer/no response	9	6.9%
Education	Less than high school	1	0.8%
	Some High School, no diploma	2	1.5%
	High school graduate	8	6.1%
	Some post high school training, no degree or certificate	31	23.7%
	Associate college degree, or completed occupational, technical, or vocational program and received degree or certificate	27	20.6%
	Bachelor's degree	38	29%
	Graduate or professional degree	23	17.6%
	No response	1	0.8%
Insurance*	Commercial (private) insurance	63	48%
	Government/military insurance	13	9.9%
	Medicare	69	52.7%
	Medicaid	24	18.3%
	None	1	0.8%
	No response	2	1.5%
Household Size **	One	29	22.1%
	Two	56	42.7%
	Three	14	10.7%
	Four or more	18	13.7%
	No response	14	10.7%

Household Income	Less than $15,000	10	7.6%
	Between $15,000 and $24,999	8	6.1%
	Between $25,000 and $49,999	21	16.0%
	Between $50,000 and $74,999	14	10.7%
	Between $75,000 and $99,999	15	11.5%
	Between $100,000 and $149,999	20	15.3%
	More than $150,000	19	14.5%
	Prefer not to answer/no response	24	18.3%
How confident are you in your ability to fill out medical forms by yourself? (n=129)	A little bit or not at all	3	2.3%
	Somewhat	6	4.7%
	Quite a bit or extremely	120	93.0%
How confident are you in your ability to understand information about genetics? (n=129)	A little bit or not at all	9	7.0%
	Somewhat	29	22.5%
	Quite a bit or extremely	92	71.3%
General Health (n=130)	Excellent	10	13.0%
	Very good	33	25.4%
	Good	45	34.6%
	Fair	36	27.7%
	Poor	6	4.6%

* Participants had the option to select more than one response. Participants who selected more than one response were counted for each box they checked.

** Participants were given the selection 1-10 on the survey, but responses have been grouped for interpretability and table readability.

In terms of recall, only 76.2% of participants remembered ordering testing. Similarly, 76.2%were certain their kit arrived. Conversely, 11.5% of participants did not remember ordering testing and a separate 9.2% of participants were certain their kit was never delivered. The remaining participants were unsure. The majority of respondents were confident in their ability to fill out medical forms and understand genetic information. (Table 2.2)

Table 2.2. Recall and Kit Delivery

Testing recall (n=130)	Yes	No	Unsure
Do you remember ordering GT?	99 (76.2%)	15 (11.5%)	16 (13.3%)
Was your kit delivered?	99 (76.2%)	12 (9.2%)	19 (14.6%)

Access and Usability

Participants largely (but not universally) had access to the tools needed to complete testing – a computer or device to access the internet (93.5%). However, only 20.4% felt they could find answers to their questions, if needed. Furthermore, only 29.3% felt the testing kit was easy to use, and only 28.3% felt the testing website was easy to use. (Table 2.3) More than half of the responses in each of these categories, however, were "Uncertain." This may reflect the participants who indicated their kit did not arrive (or were uncertain if it had) (Table 2.2) and those who never accessed the website or activated their kit (n=115/131, 88% never activated kit).

Table 2.3. Access and Usability

Access and Usability	Disagree/Strongly Disagree n (%)	Uncertain n (%)	Agree/Strongly Agree n (%)
I have a computer or device for accessing the internet (n = 124)	4 (3.2%)	4 (3.2%)	116 (93.5%)
If I had any questions, I was able to find the answers or get help (n = 113)	17 (15%)	73 (64.6%)	23 (20.4%)
The Color testing kit was easy to use (n = 111)	17 (15.3%)	61 (55.0%)	33 (29.7%)
The Color website was easy to use (n = 113)	14 (12.4%)	67 (59.3%)	32 (28.3%)

Motivations

The primary motivation for testing was a family history of cancer, with 95.3% of participants indicating it was a consideration in their testing decision, and 70.1% indicating it was a major consideration. Potential benefit for relatives was a consideration for 91.5% of participants, though only 44.9% indicated it was a major consideration. Similarly, 90.6% of participants considered the potential for changes in clinical care, with 44.1% listing it as a major consideration. The fact that testing was offered at no cost was a consideration for 76.2% of participants, with 34.9% classifying the cost as a major consideration. (Table 2.4) These concerns are captured by the following free-text response: "My father was diagnosed years ago with prostate cancer and then I was diagnosed. I have three sons and wanted to know if there was a genetic risk for them," (P90, would reconsider testing). Other motivations discussed in free text included:

provider recommendation of testing, fear of cancer, and personal cancer diagnoses or other health concerns.

Table 2.4. Motivations of Genetic Testing

Motivation	did not consider n (%)	minor/moderate consideration n (%)	major consideration n (%)
Because I have a family history of cancer (n = 127)	6 (4.7%)	32 (25.2%)	89 (70.1%)
Help my family members understand their risk of developing cancer (n = 127)	11 (8.7%)	59 (46.5%)	57 (44.9%)
See whether more frequent/different cancer prevention measures could reduce my risk of cancer (n = 127)	12 (9.4%)	59 (46.5%)	56 (44.1%)
I was curious (n = 127)	13 (10.2%)	65 (51.2%)	49 (38.6%)
It was free (n = 126)	30 (23.8%)	52 (41.3%)	44 (34.9%)

Reasons for noncompletion

Participants were given a multi-select question for reasons that may have contributed to their noncompletion. The primary responses were centered around logistics and competing priorities. The primary logistic challenge was that 26.7% of participants forgot to mail in their saliva sample. However, additional logistic barriers were elucidated in the free-text responses, including difficulties with the website, sample collection issues, and mail issues, as expressed by this individual, "*my sample box wouldn't fit in the post office drop box that is available after post office business hours*" (P60, would reconsider testing). (Table 2.5) In terms of competing priorities, 26.0% of participants stated they were overwhelmed with life circumstances and 13.7% indicated they have more pressing health concerns to deal with.

A smaller fraction of participants had test-related concerns, 8.4% selected the potential for insurance discrimination, and 3.1% preferred not to know about results. Additional concerns were also indicated in the free response — namely around anxiety and data privacy contributing to noncompletion, as expressed by this participant "*not clear about how genetic information would be stored and protected, in light of news of genetic information being hacked*" (P65, would reconsider testing).

Less common responses (≤ 2 individuals each) included: unanswered questions, cancer diagnosis, surprise/confusion in receiving the kit, misalignment with healthcare decisions, had to complete a second kit and did not, lost kit, or no reason for noncompletion.

Table 2.5. Reasons for noncompletion

Reasons for noncompletion* (n=131)		Selected reason for noncompletion n (%)
Logistics	I forgot to mail in my saliva sample	35 (26.7%)
	I did not understand the testing process	9 (6.9%)
Competing priorities	lack of time	14 (10.7%)
	More pressing health concerns to deal with	18 (13.7%)
	Overwhelmed with current life situations	34 (26.0%)
Inevitability	It wouldn't change my clinical care	8 (6.1%)
	It wouldn't change God's plan	1 (0.8%)
	If I'm meant to get cancer, it will happen regardless	2 (1.5%)
Concerns about genetic testing	Concerned about genetic discrimination (including insurance discrimination)	11 (8.4%)
	Prefer not to know about risk for any condition	4 (3.1%)
	Discussion with a family member	4 (3.1%)
Other**:	other responses included mail issues (n=23), sample collection issues (n=7), online difficulties (n=8), fewer than five responses for each of the following: anxiety over potential results, data privacy concerns, unanswered questions, no reason, cancer diagnosis, were surprised/confused by receiving the kit, didn't align with healthcare decisions, had to complete a second kit and didn't, lost kit	55 (41.2%)

*Multi-select question, so percentages will be greater than 100%

** Other responses were sorted into existing categories if they matched.

Permanence of decision

The vast majority of respondents (91.5%) expressed they would reconsider genetic testing in the future The main circumstance under which participants would reconsider testing was if it was free (55.7% selected), followed by if it would help a family member (45.8% selected), if it were recommended by a provider (36.6% selected), if they were experiencing health changes (26.7% selected), or if they had

established insurance (8.4% selected). Free-text responses included if they had help through the process, if it would benefit research, if there were alternate modes of testing (blood draw vs. saliva sample) or if their privacy could be assured. (Table 2.6)

Table 2.6. Would reconsider testing in the future

		yes n (%)
Would reconsider testing in the future (n = 129)		118 (91.5%)
		Selected helpful strategy n
Under what circumstances would you consider testing in the future	Recommended by my provider	48 (36.6%)
	Health changes	35 (26.7%)
	Would help a family member	60 (45.8%)
	If I already have insurance set up	11 (8.4%)
	Free	73 (55.7%)
	Other	26 (19.8%)
What might have helped participants complete testing at the time*	Additional Reminders	51 (38.9%)
	A phone call to talk with a study staff member, to answer any questions	44 (33.6%)
	An option for testing that did not require an online account	20 (15.3%)
	Nothing, I had decided not to move forward	17 (13.0%)
	Other help: the desire for online/tech help, more communication, alternative testing options (not saliva), protections from insurance discrimination, more communication from staff, and addressing the testing kit mail issues. Responses also reiterated barriers and noted bad timing and participant responsibility in noncompletion.	35 (26.7%)

*Other responses that matched with an existing category were sorted accordingly.

Participants also highlighted strategies that may have helped at the time of the study. 38.9% of participants felt additional reminders would have helped facilitate completion, 33.6% felt an additional phone call with study staff would have helped, and 15.3% felt not having to create an account online would have helped. Only 13% stated there was nothing that would have helped them complete testing. In free-text responses, participants highlighted the need for logistical help: a non-saliva option for testing, help with the online portion of testing, and checks to ensure the testing kit arrived and was returned.

Others highlighted that competing priorities tied with logistic issues made it bad timing for testing completion. When asked what may have helped with testing completion, one individual stated, “help me find [the testing kit] and kept my significant other from dying slowly because of cancer," (P24, would reconsider testing). (Table 2.6)

Free-Text Reflections

Two individuals indicated they ended up pursuing genetic testing through other avenues – one through their clinic and one through direct-to-consumer testing. The most frequent free-response comments (>20) often reiterated the barriers to testing but also indicated regret around noncompletion, a general desire to do testing in the future, or a general emphasis on the importance it could play in participants' lives (n=18. However, several individuals also reiterated psychological, privacy or insurance concerns as a final sentiment. (Appendix D)

Discussion

Motivations for, and concerns around, genetic testing completion amongst individuals who did not return their testing kit echo those found across studies in various populations (Smith-Uffen et al., 2021; Hayden et al., 2017; Dusic et al., 2022). However, the primary reason for noncompletion of these surveyed participants was rarely intentional refusal. Instead, participants highlighted logistic challenges, being overwhelmed with life, or having competing priorities. These findings suggest that late stage drop out may be driven by passive noncompletion rather than active resistance (participants changing their minds about testing). As such, these individuals may benefit from ongoing reminders or testing re-offers.

Notably, nearly a quarter of participants either had no recollection of ordering testing or were unsure about it. Studies across consent and clinical literature in various clinical settings have also found that patients recall only a fraction of the information they are provided with (Laws et al., 2018; Gabrijel et al., 2008; Kessels, 2003). Interventions in other medical settings suggest using information structuring

strategies, sharing written or audio-recorded information, and utilizing video animations (Siegrist et al., 2021; Smith et al., 2012; Watson & McKinstry, 2009; Hansen et al., 2024). With the increase in use of educational videos as pre-test counseling tools, these strategies seem appropriate and feasible to improve recall of genetic testing information in both research and clinical settings. In addition to addressing recall, participants demonstrated high access to necessary technology but limited confidence in finding answers about the research or testing process, using the testing kit, or operating the testing website. Establishing partnerships between clinics and local libraries has been presented as a creative solution to address challenges with technology use (Mistry et al., 2022; Yao et al., 2022).

This study also highlighted a few bottlenecks in genetic testing workflows for at-home testing kits: receiving the kit (mail issues), filling the saliva tube, and creating the online account. Integrating point-of-care genetic testing could address many of these issues, as well as earlier bottleneck issues like scheduling genetic counseling. This strategy was supported by a study performed by Wagner and colleagues (2024), which compared point-of-care (POC) testing with a traditional referral model and found significantly increased rates of testing completion for the POC avenue.

Ultimately, there was a strong openness to future testing, which is aligned with earlier findings indicating patient willingness to reconsider testing over time (Halverson et al., 2020; Theoryn et al., 2026). Further, it suggests that noncompletion could be addressed with additional support or testing re-offers. For additional support, participants recommended reminders and staff assistance – while participants desired direct interaction with a study staff member, simple text or electronic health record (EHR) reminders may be sufficient (Breedlove et al., 2023; Kerrison et al., 2015; Taplin et al., 2000). For future re-offers, participants indicated that a recommendation from their provider or a message about how it would benefit family members would be motivating factors. Emphasizing these benefits seems to have significant motivational power at all stages of the testing process, including for subsequent offers (Smith-Uffen et al., 2021; Theoryn et al., 2026).

Limitations

With a 24.7% response rate, this analysis may be susceptible to non-response bias. People who had more positive feelings about genetic testing may have been more likely to respond, and thus more likely to reconsider testing. Additionally, nearly a quarter of participants had limited recall about ordering genetic testing through the study; therefore, their reasons for noncompletion should be interpreted with caution. Further, we did not conduct inferential analyses, so there is no evidence about what considerations and reasons for decline are associated with an openness to future testing. The survey respondents are also predominantly female, white, and insured, which may limit the generalizability to other populations. However, as an exploratory study, these findings offer valuable insight into participant reasons for late drop-out.

Conclusion

Individuals who do not return their testing kit often face logistical challenges that are not well addressed in study interventions or testing barrier literature. Following up with patients via reminders or re-offering testing at later times may be a successful strategy to re-engage this population and maximize the clinical benefit of genetic testing for hereditary cancer risk.

Chapter 3 | The Permanence of Genetic Testing Barriers and Motivators: Qualitative Interviews 5-8 Years Following Decline

Introduction

Motivations for, and concerns around, genetic testing for hereditary cancer risk are often framed as static. The existing literature generally presents patients' reasons for declining testing without considering how these reasons may vary by circumstance or change over time (Morand et al., 2022; White et al., 2018). Accordingly, recommendations for interventions attempt to address the general barriers to genetic testing (GT) (e.g., cost, insurance coverage, patient understanding, clinical utility, privacy) at large (Dusic et al., 2022). While this is a critical pursuit, considering how patients experience or weigh barriers over time may offer an opportunity for small-scale, nuanced, real-time interventions that can improve testing uptake without significant resources.

Evidence from cancer care settings suggests that perceived barriers and their importance to patients change both throughout the testing process and over time (Schlich-Bakker et al., 2007; Halverson et al., 2020; Kahn et al., 2023). Studies have found that patients' reasons for declining GT vary based on when they drop out of counseling (early vs. late decliners) (Schlich-Bakker et al., 2007) and decisions can change with physician follow-up (Halverson et al., 2020). A cascade hereditary testing study also supported the idea of recontacting, where at-risk relatives who declined GT later requested and completed GT following recontact (Halverson et al., 2020; Kahn et al., 2023).

Notably, relevant studies have been mostly limited to cancer care and specialty genetics settings. However, chapter 1 illustrated similar shifting considerations amongst primary care patients (Theoryn et al., 2026). This study seeks to add to the body of literature by examining how individuals' circumstances and considerations regarding GT changed in the 5-8 years following their initial testing offer, as well as

their preferences for ongoing testing offers and the types of messages they have found meaningful over time.

Methods

We completed a rapid qualitative analysis (RQA) of semi-structured interviews with participants who initiated engagement with the MAking GENetic Testing Accessible (MAGENTA) trial but did not complete genetic testing. Interviews were completed five to eight years after the initial study. Our objective was to understand participants' considerations around noncompletion following initial interest, along with how those considerations change over time. This follow-up interview study was approved by the UW IRB, ID: STUDY00020965.

Parent Study (MAGENTA) Trial Design

Participants for this study were sampled from the MAGENTA trial, which occurred between April 2017 and September 2020 (Swisher et al., 2023). MAGENTA offered genetic testing for hereditary cancer risk at no cost, eligibility criteria included (1) Women over 30 years of age residing in the United States, with (2) access to a healthcare provider, and (3) no history of genetic testing or counseling for hereditary cancer risk. Participants were randomized to one of four arms, two with pre-test counseling and two without. Additional details can be found in Appendix D and the MAGENTA main outcomes paper (Swisher et al., 2023).

To complete genetic testing, participants had to initiate study engagement and move through the following steps: establish eligibility, provide consent, complete a demographic form, complete six baseline questionnaires, watch a pre-test video or complete pre-test genetic counseling, order a test, activate the testing kit by entering kit and participant details in the web portal, and mail the test back.

Testing-eligible participants dropped out of the study/testing at various points in the process: 36% dropped out after initiating engagement but prior to signing the consent, 7% after consent but before completion of baseline questionnaires, 12% after the baseline questionnaires but before the pre-test counseling or video, and 15% after receiving their kit. Additional study details can be found in the published main outcomes manuscript and in Appendix E (Swisher et al., 2023).

Study Population and Sampling

Interview participants were individuals who participated in the MAGENTA trial but did not complete genetic testing. All participants agreed to be contacted for future research at the time of the initial trial.

We utilized a maximum variation purposive sampling strategy to acquire a depth of knowledge around reasons for dropping out of the genetic testing process (Palinkas et al., 2015). Participants were sampled from all stages of drop out, and across different insurance statuses, ages, and income levels. As a result of the maximum variation sampling approach, we expected significant heterogeneity and sought to interview forty individuals to allow for greater possibility of representing a wide breadth of experiences.

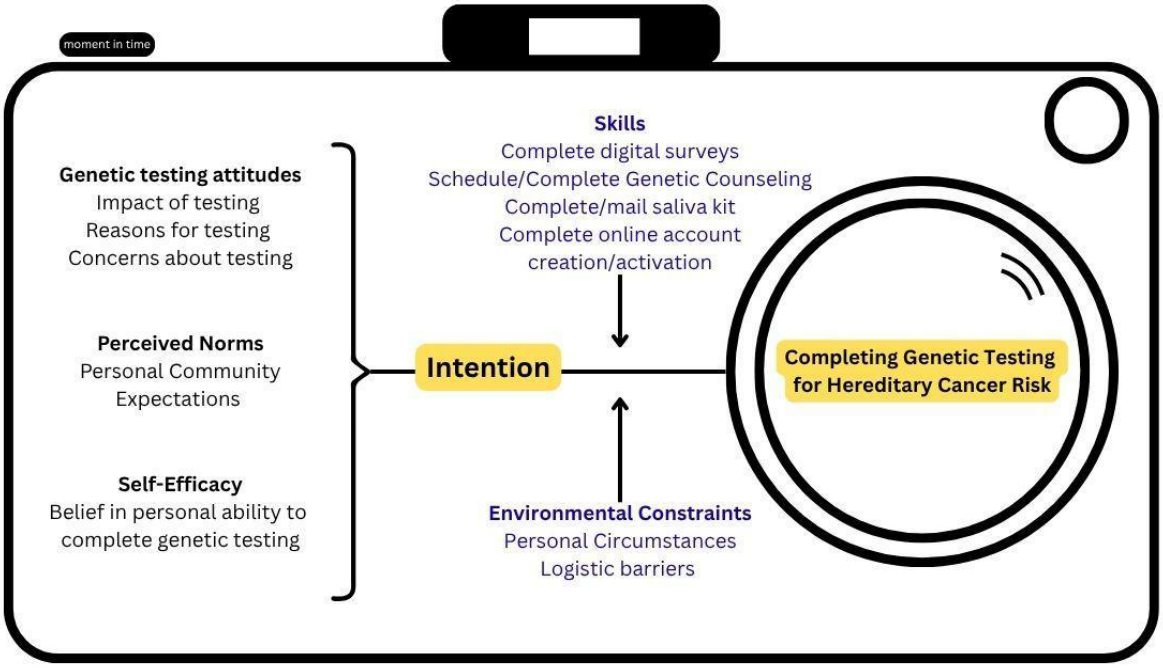
Further, the MAGENTA study identified two factors associated with decreased testing completion: self-identifying as Black and being in a pretest counseling arm (Swisher et al., 2023). Individuals belonging to these groups were considered information-rich cases and were oversampled (Patton, 2023). All participants who self-identified as Black, and all those who completed pre-test counseling, were invited to participate in the interviews. Because we aimed to understand late stage drop out, specifically, we also invited all individuals who activated but did not return their testing kit (the last stage before testing completion) to interview. Outside of these strategies, 20-60 eligible individuals were selected at random (de-identified IDs were entered into a random number generator) and invited to interview each week, depending on previous response rates and according to researcher availability.

Pragmatic Paradigm and Integrated Model of Behavioral Prediction Framework

With the overarching objective of understanding experiences to improve interventions and clinical practices, the action-oriented pragmatic paradigm was selected as a lens for guiding the investigation. The objective of this paradigm is not the development of theory but instead it is to understand experiences in unique contexts to inform interventions (Allemang et al,. 2022; Biesta & Burbules, 2003). As such, we seek to understand noncompletion of genetic testing through individual experiences and use these experiences to develop action-oriented recommendations relevant to improving cancer care (Allemang et al., 2022).

The Integrated Model of Behavioral Prediction (IMBP) was selected as an action-oriented framework that aligns with our overarching pragmatic paradigm (Fishbein, 2008). The IMBP evolved out of the Theory of Reasoned Action (TRA) and the Theory of Planned Behavior (TPB) (Ajzen, 1985; Fishbein, 2008). Similar to the TRA and TPB, the goal of the IMBP is to identify a small number of variables to account for the majority of variation in a particular behavior. (Fishbein, 2008) However, the IMBP places emphasis on skills and environmental constraints as moderators between intention and behavior (Yzer, 2012). At its core, the intention-behavior relationship is that intentions follow the beliefs about the behavior, and beliefs are shaped by background variables such as socio-demographics, culture, media, and individual difference variables (Fishbein, 2008). However, acting on those intentions requires the necessary skills and the absence of environmental constraints. Using this framework, we can identify genetic testing bottlenecks and point interventions toward factors that increase testing intentions or those that address environmental constraints, based on the findings. (Figure 3.1)

Figure 3.1 Genetic testing decision according to the Integrated Model of Behavioral Prediction – a snapshot in time



To contextualize the IMBP, we integrate the element of time and the concept of decision permanence as an overarching consideration to capture the temporal nuances of decision-making. Figure 3.1 visualizes this, highlighting how the act of completing genetic testing is situated within the moment in time To incorporate this into our investigation, we asked participants' what their lives were like at the time of the study, what they think about genetic testing currently (at the time of the interview, or at the time when they ultimately completed genetic testing), and changes that have happened over the span of the last 5-8 years that might have been relevant to their decision-making. Rather than pinpoint exact moments in time or map recall with fidelity to specific moments, we aim to explore the broader transient and shifting nature of decision-making and illuminate impactful changes that participants associate with shifting considerations.

Interview Guide

We developed a semi-structured interview guide using the IMBP as a structural framework (Fishbein, 2008). Four main domains are addressed in the guide: (1) genetic testing attitudes, (2) perceived norms around genetic testing, (3) perceived self-efficacy of testing completion, and (4) skills and environmental constraints. Within the domains, we asked questions relating to the permanence of circumstances, testing considerations, and their testing decision. The guide was pilot tested with participants who met eligibility criteria. (Appendix F) Minor adjustments were made to question flow and wording to reduce redundancy.

Over the course of the data collection, we added demographic questions and made minor changes to wording in response to perceived participant reaction to word choice. Namely, a question on how recent societal events "influenced" current perceptions on medical genetic testing was shifted to ask how these events have "factored into" current perceptions. Demographics were collected at two timepoints: (1) at the time of the MAGENTA study via RedCap survey, and (2) as either a RedCap survey or as questions at the end of the interview.

Recruitment and Data Collection

Two of the study authors (TNT and AW) completed participant recruitment and interviews between July 2025 and April 2026. Participants were emailed up to three times and were offered a $50 digital gift card for their participation. A study information sheet was provided to potential participants for reference (Appendix G). Interviews were conducted on Zoom, and verbal consent was obtained at two time points, (1) brief consent prior to beginning the audio recording, and (2) detailed consent at the start of each interview. Summary memos and reflections were completed following each interview. The audio was digitally recorded, transcribed, and de-identified prior to analysis. Filler words were removed and researcher clarifications were included in brackets when helpful for improving clarity.

Analysis

We conducted an RQA using domains captured from the interview guide. Beyond the time-saving element of RQA, this methodology is targeted towards producing actionable information and informing interventions and dissemination. Further, when paired with a framework, such as the IMBP, the RQA matrix methodology can facilitate comparisons across studies. As such, the methodology closely aligns with our pragmatic paradigm (Lewinski et al., 2021). RQA has also been shown comparable in effectiveness and rigor to traditional coding methods (such as content analysis, which utilizes a line-by-line coding method), when utilizing multiple analysts and integrating team reflexivity exercises (Nevedal et al., 2021).

Our RQA matrix includes both IMBP-associated domains and domains associated with process and timing. Domains were: Attitudes (reasons for testing, concerns about testing), Environmental Constraints (logistics, personal circumstances), Intention, Self-Efficacy, Background Variables, Perceived Norms (legal and societal contexts, conversations and information sources), Skills (genetic counseling and MAGENTA process), and Permanence (shifted circumstances, re-offer perspectives). For each interview, TNT wrote a brief summary for each domain and pulled associated quotes to complete the matrix. A second reader (AW) reviewed a subset of interviews (n=10 interviews) against original transcripts and noted areas of disagreement or needed depth. The coders met for discussion and reconciliation. The lead author created a summary memo for each domain, and the findings are shared here.

Member Checking

In line with our pragmatic paradigm, we conducted member checking to increase interpretative validity of our findings, meaning that participants' attitudes and experiences are represented accurately, as well as to respect the participants as the experts of their experience (McKim, 2023). The lead author produced participant summaries from the de-identified RQA matrix and included related quotations to share with interviewees. By utilizing the content from the RQA matrix for member-checking, participants had the

opportunity to ensure interpretations born from their interviews were appropriately derived from their original intent. Member checking is also a way to respect the temporal influence on experiences by incorporating an additional moment of reflection (Birt et al., 2016). This objective is aligned with our overarching aim to understand the element of time in relation to genetic testing decision-making.

Summaries were emailed to participants with targeted questions, a request that they provide feedback within one week, and a note that non-response will be interpreted as summary agreement. Questions include, (1) What are your general thoughts? (2) How accurately do you feel the findings capture your experience, perspectives, and circumstances? And (3) What could be added or removed to capture your experiences better? A summary of the responses is reported in the results section.

Results

A total of 400 participants were sent an email invitation to participate in interviews, with an overall response rate of 10%. Amongst the oversampled groups—we contacted all 27 participants who agreed to future research and self-identified as Black, with a response rate of 11% (3/27), and all 17 participants who agreed to future research and completed genetic counseling with a response rate of 5.9% (1/17). We also oversampled from the pretest counseling arm in general, regardless of whether they completed genetic testing, with a response rate of 10.1% (18/178).

Participants were predominantly non-Hispanic, white, employed, completed 1 or more years of college, had an annual household income of $75,000 or above, and insured through their employers. (Table 3.1) Participants were interviewed at all stages of the testing process: did not complete questionnaires (n = 10), completed questionnaires but did not order testing (n = 16), ordered testing (n = 9, only one of whom completed genetic counseling), and activated kit (n = 5). About half of the participants (n = 18) were from the pre-test counseling arm. (Table 3.2) Interviews averaged 34 minutes, with a range of 14:52 - 65:36 minutes.

Table 3.1. Demographics at the time of MAGENTA trial

Demographics (n=40)		n (%)
Age (mean)		45
Race*	White or Caucasian	34 (85%)
	Black or African American	3 (7.5%)
	Asian	1 (2.5%)
	Prefer not to answer	1 (2.5%)
	Other	1 (2.5%)
Ethnicity	Hispanic or Latino/a	0
	Not Hispanic or Latino/a	39 (97.5%)
	Prefer not to answer	1 (2.5%)
Highest grade/year of school completed	Grades 12 or GED (high school graduate)	1 (2.5%)
	College 1 year to three years (some college or technical school)	13 (9.3%)
	College 4 or more years (college graduate)	14 (35%)
	Post college (graduate school or professional school)	12 (30%)
Total household income	$10,000 to $14,999	1 (2.5%)
	$15,000 to $19,999	0
	$20,000 to $24,000	1 (2.5%)
	$25,000 to $34,999	2 (5.0%)
	$35,000 to $49,999	7 (17.5%)
	$50,000 to $74,999	8 (20%)
	$75,000 or more	20 (50%)
	I prefer not to answer	1 (2.5%)
Number in household		3.0
Employment status	Employed for wages	30 (75%)
	Self-employed	1 (2.5%)
	Out of work for 1 year or more	1 (2.5%)
	A homemaker	6 (15%)
	Retired	1 (2.5%)
	Unable to work	1 (2.5%)
Insurance	Yes	35 (70%)
	No	5 (12.5%)
Insurance source	A plan purchased through an employer or union	27 (67.5%)
	A plan purchased individually in the marketplace (not through an employer or union)	1 (2.5%)
	Medicare	3 (7.5%)
	Medicaid or other state program	3 (7.5%)
	TRICARE (formerly CHAMPUS), VA, or Military	1 (2.5%)

Table 3.2 Study arm and stage of drop-out

Testing arm, n = 40	n (%)
Dropped out pre-randomization	10 (25%)
Pre-test counseling (arms C/D of MAGENTA)	12 (30%)
No pre-test counseling (arms A/B of MAGENTA)	18 (45%)
Furthest stage of testing completed, n = 40	n (%)
Completed Consent/Eligibility	10 (25%)
Completed Surveys	16 (40%)
Ordered testing	9 (22.5%)
Activated kit	5 (12.5%

Member check

Interview summaries were sent to 39 participants for member checking, as one interviewee opted out of the member-check process. Eleven participants responded, nine felt no change was necessary to the transcript. Of these, two provided some general reflections – one stated she was going to ask her doctors why they did not encourage testing and highlighted how important she felt testing was. A second added that, as a cancer patient, she felt that there is little understanding early in the diagnostic process and that experiences range significantly.

Two individuals added details to their motivations for testing–one emphasized that her family history was more important than was reflected in the summary and another highlighted that she was also motivated by the potential to share results with her daughters and granddaughters.

Integrated Model of Behavioral Prediction Interpretation

Motivation/intention is the downstream variable in the IMBP that reflects participant attitudes, perceived norms, and self-efficacy around testing, along with associated background variables (Figure 3.1). While there is a broad diversity of thought and experiences within the IMBP upstream variables of attitudes, norms, and self-efficacy, the IMBP downstream variable, intention-to-test, was consistently moderate to high, ranked on a scale from 1-10.

Over half of participants felt their motivation was high, with one describing themselves as "fully planning to complete [genetic testing]" [P1] and another as “all in. I was all in. I thought it was wonderful.” [P2] A third participant went so far as to say, “it was inevitable I was going to do it." [P3] An additional quarter of participants felt their motivation was moderate, like this individual who was anxious about testing but also felt that with some discussion, their motivation could have changed “Probably like a 7 [motivation out of 10] because I was like, I really want to get this done. Even with the anxieties and whatnot, had I had some convincing, I probably would have pushed forward and done it." [P4] A few participants indicated their motivation was low, "Probably three [motivation out of ten] ...Always interested in helping out the studies, wasn't highly motivated to throw that label on my chart or I wasn't worried about it, so to speak. And life. It wasn't just a top priority." [P5]

Conversely, participants had significant environmental constraints, with personal circumstances being the primary reason for testing noncompletion. We did not measure skills (such as ability to provide a saliva sample or activate a testing kit online) directly as they cannot be captured by participant perceptions, but nearly half of the participants later completed testing, suggesting many participants had the necessary skills to complete testing. In the following sections, we will briefly discuss the findings in each variable, with a larger focus on the environmental constraints and how considerations and circumstances have shifted over time.

Attitudes about testing

Most participants indicated that family cancer history of breast or ovarian cancer–often a significant family history but occasionally a missing family history–was a key catalyst to pursuing genetic testing. Outside of family history, interest in testing at the time of the study was occasionally spurred by clinical factors that made screenings less effective, like dense breast tissue, or experiencing new symptoms around the age of menopause that can be conflated with potential cancer symptoms.

There were two dominant, but not entirely distinct, beliefs about the personal health impacts of genetic testing, each expressed by about half of the interview respondents, with some overlap. The first was that genetic testing could potentially inform clinical care through increased screenings, chemoprevention, new attention to symptoms, or surgical interventions – depending on the results. The second was that genetic testing was a way to get interesting information that would allow the proband to better understand their risk, potentially provide relief if negative, fulfill their curiosity, or mentally prepare, like this individual, "I mean, definitely to equip me mentally to what the possibilities could be. I was getting screened already every six months. I was doing a Pap smear and then ultrasound, Pap smear, ultrasound, Pap smear, ultrasound." [P6]

Other attitudes around testing included the perceptions that results could inform lifestyle choices, motivate more consistent engagement with their current preventative measures, could act as another puzzle piece toward understanding their broader health picture, or could help their relatives – either by providing them with the information directly, or by modeling proactive preventative health behaviors.

Because genetic testing was offered in the context of the MAGENTA trial, respondents expressed context-specific attitudes around contributing to research. Many participants expressed that they readily participated in research and were motivated to help, with a small fraction highlighting contributing to research as a primary motivator for interest in testing, like this individual, “that it would help the research.

That would've been my motivating, the top motivation for me was to help your research. And then if I got results back that helped me in any way, that would be a bonus." [P7]

A couple of individuals who noted minimal benefit to testing also felt there was minimal harm, exemplifying a “might as well” or “can’t hurt” attitude, as stated by this individual:

> I think it's just kind of curiosity and its very little risk in my opinion. Like to just give a blood sample or, you know, it's not like you're sacrificing very much, but you only can gain. I think the only downsides is I kind of... Why I probably dropped off is if it's just a little bit inconvenient, then clearly it doesn't work out as well. [P8]

In a few cases, this perceived lack of benefit was given as the primary reason for testing noncompletion, like this individual who reasoned that “if it's not my out, and I still have to do a colonoscopy, then what's the point?" [P9] When participants noted concerns, they most frequently centered on (1) data privacy, secondary data uses, and sample/data ownership, (2) insurance discrimination, and (3) potential anxiety from results. These concerns often added to internal tensions about testing but did not always preclude testing completion, like for this individual, “hackers are going to hack. They're going to do what they're going to do. I still need to live my life.” [P10] Additionally, while concerns around data privacy, secondary data uses, and sample/data ownership were expressed across the sample, two of the three Black interviewees referenced historical medical injustices and racial discrimination to contextualize these concerns, as demonstrated by the following quote:

> I guess the concern is, with genetic testing, you're giving your DNA, your cells, right? So, my question is, once you guys are in possession or MAGENTA is in possession of my DNA and my cells, what happens with that after they do the genetic testing? Is that stuff held on to? Is it destroyed? What happens after the process? [P11]

The root of this concern was further explained by the participant,

> I don't know, like being African American, I've heard, read stories of, I think her name is like Roberta Lacks, where her cells were kept and they use in her family, you know, her DNA has helped cure a lot of things and been influential in the progression of medicine. And that's like a concern of mine." [P11]

As with other expressed concerns, respondents felt these concerns would not necessarily preclude testing, rather "it's just something that kind of just sits in the back of my mind" [P11]

About a quarter of the participants weighed their concerns more heavily, ultimately leading to testing noncompletion, as expressed by this individual with concerns around data ownership:

> I can tell you exactly why I didn't participate. I didn't participate because when I read the fine print, it said, 'We will now own your genetic material, and you can't... 'And I thought, "No, I'm not going to give away my most personal information... " And they were like, 'We can do whatever we want with it.' And I was like, 'Hell, no.' So that was why I didn't participate. [P12]

Genetic Testing Self-Efficacy

Perceived self-efficacy was high across participants. Broadly, they believed they "would not have had any issues" [P2] completing testing and were, "completely confident" [P13] they had the skills necessary to do so. A few individuals indicated the saliva test would pose a challenge but would not be prohibitive if there were other options, or if they put in extra effort.

Perceived Norms

Mostly, participants stated their family and social circles would be supportive or encouraging of testing. A smaller fraction felt their family would have concerns around data privacy or may feel testing was not necessary and in a few cases familial concerns were at least partly responsible for testing noncompletion.

One participant felt she "probably got talked out of it" [P14] due to cultural concerns. Her family had severe medical distrust due to their Jewish heritage, and she felt it was sufficient to dissuade her from testing at the time, she explained their concerns, shared here:

> I mean, there's this whole thing about that, like if you're Black, you can't hide from the systemic racism, but if you're Jewish, you can sort of hide, you can straighten your hair, you can kind of fit in. But if you have it on your genetic record, you can't hide from it, which is, then it's there, and when they come after you, it'll be there, and that'll be on your record, and they'll come get you, and put you back in the concentration camp. [P14]

She proceeded to say,

> I listened to them…I would be like, 'you people are crazy.' I never thought about any of this stuff…they would lay all this stuff out and I would just be like, 'that is just not gonna happen.' Of course, now I'd be like, 'well, maybe.' You're going to come 'round me up and send me to [other country]. I don't know. You know what I mean? [P14]

And followed that in retrospect, "maybe I should have done [genetic testing] because there's a whole genetic line of people that, we die as higher, we have a higher risk." [P14]

Another individual had tense family relationships and believed "I think [my regular doctor] said I would also have to have my mom's genetic testing to see if she and I have the same gene for it...for me to get the best information from it. But my mom is just not a very open person, so then I kind of felt like it maybe

not be for me, I guess. Yeah. So again, not 100% on that, but yeah." [P15] In this case she also felt the unknown time commitment of the study would have also been a contributing factor.

In other cases, the family influence was less direct – when family members received a negative pathogenic result, participants often perceived reduced risk, as expressed here, "if it had come back as hereditary for my cousin, I probably would've tried to prioritize it." [P16] and echoed here, "I felt like, 'Well, I'm scared, I don't even want to know, I'm so young, and if my sister, who biologically has it on both sides for her family and she tested negative for it, there's no way I have it, so I don't need to worry about it,' which is not really how that works." [P4]

Environmental Constraints

The vast majority of participants expressed environmental constraints at the time of the study. To name a few identified circumstances, participants had caretaking roles, were moving house, were in unsafe environments, were working, were navigating other health issues, had financial difficulties, had lost insurance, were switching jobs, or had sick family members:

> [My son] became disabled and we became his primary caretakers and…that's all consuming in life and how you live your life and that's why I probably didn't... At that time, it was overwhelming and hard to probably follow through on something that I even thought was very important. [P7]

> At that time, so much was happening…I was just too overwhelmed. And part of that was what was going on with my health…I just did not have the functional ability to prioritize various things at once. [P17]

> So, in [year], I lost two grandmothers, an aunt, to ovarian cancer. And then the following [year] I lost a step-grandmother, a grandmother, and then in [year] I lost my other grandmother. In the meantime, my dad also got very ill, wasn't able to walk anymore, and I took on a primary role in some caretaking. My guess is that it was like, I just didn't have time. I was like, I have to prioritize these other things that are just happening all at the same time. That would be my guess, 'cause [that year] was not a great year for my family. [P16]

Participants were explicitly asked if costs would have factored into their decision making. The majority said no, but about an eighth indicated it would be a significant factor, "it's pretty expensive and insurance doesn't always cover it. That would be my typical response to not doing it" [P18]

When asked about the ultimate reason for testing noncompletion, environmental constraints were the primary response. Participants who indicated life circumstances as the reason for noncompletion often could not recall the precise reason(s) but indicated it must have been competing priorities, forgetfulness, and feeling overwhelmed by life circumstances, as expressed by these participants "I 100% am guessing something came up or and/or I completely just forgot about it because I was overwhelmed with life." [P19], and "honestly, I'm gonna chalk it up to my extreme distraction and overwhelm at the time." [P17] One participant specifically highlighted how the noncompletion did not equate to any perceived limited importance of testing, "there were a lot of other things on my plate that were more important or more immediate maybe. Important might not be the word. Needed more immediate attention." [P20]

Only a few individuals recalled the genetic counseling part of the MAGENTA study process. Some felt the genetic counseling would have been helpful to get their questions answered but most indicated that scheduling the appointment would be an added barrier that may have led to noncompletion, as demonstrated by these comments:

> I think if I had filled out the forms and then the sample kit had been sent, if it had just been that it would have been fine. I think it was the in-between having a schedule with somebody, and I'm suspecting that it was my schedule and perhaps the method of scheduling that made it more challenging. And so, I didn't do it right away when I was thinking about it, and then it just kind of fell off and then I just never came back to it. [P21]

In a few cases, people indicated that even if they had concerns about testing, life circumstances were at least partly responsible for noncompletion. One individual who had earlier expressed psychological concerns and insurance concerns stated, “something must have happened that distracted me from completing it. I don't remember. I think I would have completed it because I would have seen it as a free option, even though it was a scary one." [P22] This sentiment was echoed by another participant with similar concerns who ultimately stated, “my husband got sick at the end of [the month of the MAGENTA trial], and he's still sick with a chronic illness...So that's probably why I bounced out. Probably.” [P23] A third individual for whom providing a saliva sample was a serious barrier mentioned that this barrier, paired with her circumstances, were what likely led to noncompletion:

> I think I probably just forgot about it just because of what was going on at the time. I probably realized it was a spit test, and I probably tried to think it over and I just couldn't bring myself to do it. Plus, also then I kind of probably forgot about it 'cause I was dealing with my mom's thing 'cause I was power of attorney. So, then I had to deal with everything with that, with no real support there. So, I probably just kind of forgot about it. [P24]

<u>Shifted Circumstances since the time of the study</u>

Participants were asked about how their circumstances or considerations around testing have shifted in the past 5-8 years since the time of the MAGENTA study. More than half of the participants stated their circumstances had changed in a way that made testing easier to complete or their motivations higher at the time of the interview. These included starting new jobs or retiring, getting a new provider, sending

kids off to college, having children, having new caretaking roles, having more stable finances, having new routines, being in safer environments, being in more convenient locations (to post-offices or clinics), having shifts in family dynamics, or having established life insurance. One participant captured this idea of changing circumstances separate from any change in testing perceptions:

> We went through a whole pandemic and so I think now I'm more open and not just caught up in the things going on around us…My views, I'm all for genetic testing, so my views haven't changed. It's just the time and the space to do those things. [P11]

A handful of individuals stated that their circumstances have not changed in a way that makes genetic testing easier to complete now, or have gotten worse in the past 5-8 years, as expressed by this participant "I'm still navigating my situation, which I'll probably be navigating at this point for the rest of my life. And now with my new circumstance, it would be interesting to do, but my hands are kind of full right now." [P10]

Outside of logistics and capacity, some participants have had a change in testing perceptions in the past 5-8 years. Nearly a quarter of participants felt that they had increased trust in testing at the time of the interview, as a result of scientific advancements. This participant clarifies that her increased trust in the science is directly associated with an increased interest in testing. "I know with just the advances of science and everything…back then I would have said no, let me think about it. But now, yeah, I would do it. I would be very on board with going through genetic testing." [P25]

Similarly, about a quarter of participants felt an increase in perceived relevance due to aging, as "I've realized I'm not getting no younger. I'm 42 now, almost 43. Things start happening a lot more at this age." [P26]

Another quarter of participants have had new health considerations that have elevated their desire for testing, including cancer diagnoses, menopause symptoms, or findings on cancer screens (such as ovarian cysts). The association between the appearance of these clinical factors, anxiety, and the desire for genetic testing is expressed by this participant:

> Some noticeable changes are happening in my body and I'm like, oh, this is what they talked about. The next step is death…you start thinking about every ache and pain and, oh, is that [cancer]?... I have a hip problem. At first, I thought it was my ovaries because your hip socket is right in there. And my sister said, your hip is round and it goes there and that's part of the reason why you're having pain there. Oh, okay. But yeah, I definitely think I'm more interested in genetic testing now. [P27]

A couple participants had a reduction in perceived risk of breast and ovarian cancer due to surgical interventions – a bilateral salpingo-oophorectomy and a hysterectomy. While this surgery reduced their motivation for genetic testing associated with ovarian cancer, one participant stated she was still thinking about risk for other hereditary cancers:

> I'm having everything removed, we'll say, at the end of this month. So, uterus, cervix, ovaries, and fallopian tubes. And part of that is I'm almost in menopause, so don't need it, but also, I don't want to have to keep thinking about it. I don't want to have to have ultrasounds and blood tests knowing that they're not foolproof screening methods and that I'm eliminating the risk of ovarian cancer, which is the scary one because it's hard to find, and then just maybe cutting down my risk of breast cancer. So genetic testing for that specific thing going forward may not be as important, but I imagine there's other hereditary cancers that exist and maybe I should look into those. [P21]

Other shifts in perceived risks occurred as a result of new non-cancer diagnoses that explained symptoms and reduced perceived risk for cancer, feeling generally healthier and less at risk of cancer, aging and feeling less at risk for hereditary cancer, or having new family cancer diagnoses and feeling more at risk,

and gaining a new understanding about genetics and feeling more at risk for hereditary cancer, “just because one [sibling] doesn't have it doesn't mean... And that's where I was naive thinking, even as a half-sister, that's naive to think I was safe from that.” [P4] Urgency for testing was also impacted by new cancer diagnoses amongst friends.

Concerns about testing also changed, decreasing for some and magnified for others. A handful of individuals stated that their concerns around privacy, psychological implications, cost, and insurance have gone down. For example, this participant demonstrates how aging has recalibrated her perception of these issues, "I am now once again interested in genetic testing. Now I just don't care [about privacy concerns] I'm like, look, all our information's out there. Who cares? I wear this thing [watch] all the time, and it records all of my heart stuff and my breathing and all just to keep me in tune with the stuff I have going on. I'm like, oh, whatever. It's all out there. Maybe it's time. " [P17]

Increases in testing concerns have centered primarily on insurance discrimination, legal protections, and data privacy. Participants mentioned ongoing efforts to overturn the Affordable Care Act and uncertainty about how genetic testing results would be impacted if pre-existing conditions were no longer covered. Concerns also stemmed from perceived government overstep around data access, and the overturning of Roe v. Wade, which led participants to question the stability of legal protections. These sentiments are expressed by this participant:

> [Donald Trump] overturned... He got rid of abortion through changing the Supreme Court and immigrant rights. Oh my God...I don't know what other laws they might change. They've changed tariff laws. They seem to do what they want. And I'm not sure that they wouldn't say, hey, the insurance companies feel it's unfair that they can't charge you more because you're more at risk. So, I guess I'm just concerned that laws don't stay laws. [P20]

However, those who expressed these concerns did not always believe they would prevent them from completing testing. A participant who stated, “there's skepticism because there's always loopholes. No matter how ironclad you make something, somebody's always gonna find a workaround. And so, there is always that nervousness…just like with banks and other big [companies] who have your personal information, there's always that risk." [P26] later stated "it's something I am aware of. But for genetic testing, I would go ahead because, like I said, help give more numbers to help maybe find something, find that pattern." [P26] Another participant who said,

> I mean, just this current administration just completely bowling over privacy rights and various... I mean, not to get into the politics of it all, but yeah, I don't, I guess there's not really a trust there because so many things are just like, okay, this is not legal, but we're just gonna do it anyways with no repercussions. So, I just don't feel in a lot of things there is not safety right now. [P17]

later said,

> But I'm like, well, who cares what my genetic testing is? What are they gonna do with that? I'm an ant in the world. You know what I mean? So, for me, no, I don't see how that would be damaging. I think it was easy to get super... I mean, I'll admit I probably got caught up in the hype of, oh, they're gonna steal your information and they're gonna... But then when the critical thinking kicks in and you're like, well, what's it gonna do? I mean, I don't know. [P17]

Concerns around artificial intelligence came up less frequently, but one participant stated, “I could have possibly considered it previously, but I have so little faith in the data being protected at all and all of it being given to AI for data training and bullshit that, no, there is no one protecting any of us anymore.” [P19]

In just one case, their increasing concern over insurance discrimination stemmed from a personal experience (as opposed to general societal concern) – an individual who had short-term complications as a result of an infection was later denied life insurance, so she is now particularly wary of anything being added to her medical file.

Permanence of testing decision/noncompletion

No participant felt they had made a permanent decision about testing, and nearly half of the participants had completed testing since the time of the study. The main catalyst for testing completion was an offer from a provider, which often occurred following identification of new clinical symptoms, “when they first find the lump in my breast, it's like, ‘would you consider genetic testing?’ And I'm like, oh yeah. I just, chomped on it." [P14].

Other testing facilitators included better timing for the participant, new family history, in-clinic options for testing, or reduced concerns, as expressed by this participant, “I was willing to take the risk because I have insurance at this time and right now it's okay.” [P22] One individual eventually sent in the testing kit from the study after data collection concluded and was able to get results through the testing company.

On a couple occasions, participants mentioned provider that characteristics played a role in their testing completion. In one case, their provider was currently navigating breast cancer, which made the offer more salient. In another, a Jewish participant who had never been offered genetic testing previously started care with a provider who was also Jewish, stating:

> Maybe it's because [my previous provider] was a white man...And now the doctor that I go to is a Jewish female. And now she brings stuff up like all the time. So, I don't know, there's something to be said for a doctor who looks like me or you know what I'm saying? [P14]

Those who had not completed testing since the time of the study were broadly open to testing in the future, with one stating, “you don't offer it now, right?" [P28] Largely, participants felt they were better situated for testing currently than at the time of the original MAGENTA trial due to increased capacity, new health factors, aging, and shifted perspectives about test concerns and personal motivations. Similar to the group of participants who had completed testing, those who had not completed testing thought provider recommendation was thought of as a key catalyst, as demonstrated by this quote, “I have a very strong relationship with my primary care physician. I'm very confident in her. And so, if she told me to do it, I'm sure she would have told me why. And again, I trust her and so I would do it” [P29]

Only a few participants felt they were less likely to get testing now, mostly due to increased data privacy concerns over the last 5-8 years. However, these participants still allowed for potential shifts in their thinking at the moment of offer, as demonstrated by this quote:

> I want to say probably not [complete testing right now], just based on so many different factors of privacy and data and time and life and everything else that I want to say that I would sway not to get it done, but I can't answer that without being in the moment. [P19]

Re-offer testing: who wants it and how to do it?

All participants, even those who currently have serious distrust of medical institutions or felt they would not complete testing currently, recommended testing should be re-offered over time. About a fifth of participants felt testing should be offered regularly, either at annual appointments or aligned with cancer screening schedules. Others felt testing should be offered more occasionally, at specific “milestone” appointments, on a case-by-case basis, or if there is a clinical factor (e.g., ovarian cysts, new family history). One participant specifically highlighted that she only believes testing should be re-offered if there are clear clinical interventions to reduce risk.

Participants felt the need for re-offering testing was centered around changing circumstances and perceptions over time, including changing health or family history, advances in science, shifts in capacity, shifts in family perspectives, different understanding of risk, or different views on the pros and cons of testing. This sentiment was expressed by this individual, "people's opinions can change, their worries about their health can change." [P9] And experienced by this individual:

> I think it's very valuable to bring it back up because maybe some life condition might have changed and be more permissive now of scheduling an appointment. In my case, that was the limitation and then it fell through the cracks. And so, I would say that it should be a priority now that there is so much that there's this big wealth of knowledge about genetics and more and more we know about what to do with it. [P30]

Participants had various ideas about how re-offers could take place. They thought the first offer should be a more detailed conversation with their provider and subsequent offers could be reminders. For reminders, participants were open to mailings or notifications through their electronic health record, but a few participants indicated automated reminders can feel over the top, or “maybe like marketing. Like almost like they're trying to get you to pay for this extra thing and you're thinking, ‘Well, do I really need this?’” [P8] However, reminders directly from the provider were broadly appreciated. One participant stated it could be “just a little blip. It's a two-second question. Have you thought more about the possibility of genetic testing? It might be beneficial to you. Yes or no? Okay. Moving on. All right.” [P17] A few participants thought the offer should be tied to physician compensation or integrated into care checklists to ensure systematizing the process.

While all participants felt testing should be re-offered, the idea of “reading the room,” and being responsive to specific patient requests came up a few times. This meant providing participants an opportunity to opt-out indefinitely or considering the context of the appointment and the patient's current circumstances. These sentiments are expressed by the following two participant quotes, “[testing should

be re-offered] unless somebody just succinctly says, don't bring this up again. I'll never be interested. Leave me alone," [P17] and "I wouldn't say, like, if I'm coming in because I have a sore throat, bring it up, but, you know, occasionally would be good." [P11]

Desired Commentary from Providers

While nearly half of the participants indicated their provider had never brought up testing for them, they had clear thoughts on what they would want to hear. First, participants wanted to know why they were being identified for testing. A few participants felt like their medical care was not personalized to them and that their providers had no choice but to make a slew of unrelated recommendations, as expressed here:

> I can tell the lady [clinician] that I have now, I can tell that she probably got into the business for the right reason, and I can tell that she cares, but I don't think that she has the power to not recommend all of those things. And then of course, when they recommend them, I do them because you get this fear. There's a fear factor. Like, oh my gosh, what if I didn't do that? [P31]

Another participant demonstrated how providing the reason for testing could be tied in with discussing potential next steps:

> Maybe a little bit more in-depth saying, 'Look, you had this risk and it was at an earlier age and your breasts are dense. And this might help us to decide how frequently you need to be screened or with what measures you need to be screened, whether it be an MRI or something of your breasts in addition to a yearly mammogram.' [P32]

Discussing potential next steps was the most frequently desired message from participants, with half expressing they would want to know what clinical follow-up could be, such as increased screenings, preventative surgeries, and associated insurance coverage of the increased care. One participant discussed

that genetic testing without clear next steps is like being given a life raft with no way to steer it, "they would need to tell me that the results of this test is going to trigger action or no action. It's going to trigger something. They're not just, "Here you go. Here's a life raft. There's no oars. We're putting you on the ocean." [P27]

Other messages mentioned by a smaller fraction of participants included providing an opportunity for patient questions and explaining test accuracy, the testing process, how it differs from direct-to-consumer testing in both scope and implications, the cost and potential ramifications for insurance, possible impacts for their family, how the data is managed, and available legal protections. While messages on the legal landscape were appreciated by some, a couple participants felt it was outside of a provider's purview and unnecessary to include in decision-making discussions.

A few participants felt they did not need their provider to touch on anything specific. If their provider made the recommendation, they would want to follow-through with it out of trust for their provider, like this individual, "if they said you can go ahead and do it, I would just do it. I'm not one that typically asks questions. If they're like, go do this, I'm like, okay." [P24]

For a few individuals who got testing since the time of the study, perception of providers was tied with direct offers of genetic testing, with one stating "[My PA] was strong-arming me to get tested. She's pushy. My PA is pushy, which is great " [P33] and that it makes her feel like "she [provider] is worried about my health and she is strongly encouraging me to stay on top of things and do whatever I can to make sure that I don't have to go through all of that. And when I say all of that, I don't mean the testing, I mean the disease part." [P33] Another who got genetic testing echoed this sentiment, stating:

> He really didn't give me time to think and freak out about it. Not that it would have mattered because with everything else going on with my health and being older and things like that, it was like, 'Okay, we're done. I should have done this before. This is stupid. I'm playing with fire now.' But he really didn't give me... I mean, obviously I always have an option with my body and my health and whatnot, but he was like, 'No, I think we need to do it, and we need to do it now.' And he said, 'And if cost is a concern,' he flat out said right there, 'if you're paying for it, and a lot of times it's cheaper just to pay for it versus running it through insurance, it's like $249.' And he told me that right there in that as well. He gave me all the information as he was saying, 'We're going to do this. So, before you walk out the door, you're going to walk down the hall, two doors down to labs and have some blood drawn.' [P4]

She later stated, "I just happen to have a good doctor. Not all doctors are like that." [P4] and "I don't think [GPs] care as much as when you go to a specialist." [P4]

Discussion

The results of the IMBP analysis demonstrate that focusing on factors that feed into intention may be less effective than interventions aimed at addressing environmental constraints among individuals who drop out after expressing interest in testing. However, it is critical to note that the balance of testing attitudes, perceived norms, self-efficacy, and environmental constraints change over time.

Participant circumstances and perspectives shifted from the time they initiated the MAGENTA trial, to the end of the trial, to the time of the follow-up interview. While environmental shifts were the most common, testing attitudes (both concerns and perceived relevance), and perceived norms also changed. Other studies have found a similar shifting in patient considerations over time (Theoryn et al., 2026; Halverson et al., 2020). As such, in cases where concerns cannot be addressed, barriers are high, or perceived norms are low, an appropriate intervention may be to re-offer testing the following year rather than focusing solely on removing all obstacles to testing.

While re-offering testing might improve genetic testing uptake, the largest hurdle to implementation remains at the time of the initial offer, the point at which physicians have to overcome barriers contributing to low rates of referral (Carroll et al., 2016; Dusic et al., 2022; Melzer et al., 2020; Truong et al., 2021). To provide patients with the highest likelihood of being introduced to (and completing) genetic testing, future population-screening efforts should consider consistently including OB/GYNs as key partners in patient identification, referral, and reoffer. Our study participants who completed testing in the 5-8 years following the MAGENTA trial often noted it was their OB/GYN who brought them back to genetic testing. Their reflections demonstrated how well positioned OB/GYNs are to carry out this work. Even though OB/GYN care does not have the same reach as primary care, it represents a similar pre-diagnostic environment, where the preventative benefit of genetic testing can still be realized. In the long run, it may make sense to house genetic testing in one or the other of these environments, but while systems are being established, taking a "yes/and" approach, where any clinician who has an opportunity to discuss genetic testing does so, likely has the best opportunity to extend access (Dusic et al., 2022). Opportunities for introducing testing (for original or subsequent offers) by either OB/Gyns or primary care providers included the discovery of new family history events, new clinical symptoms, or any novel scientific advancements around genetic testing.

However, a significant portion of patients who get past the referral stage never make it to testing (C. P. Childers et al., 2017; Suri et al., 2022; Swisher et al., 2025; 2023; Ochoa et al., 2022; Armel et al., 2011). Multiple studies have illuminated that even when barriers are removed (no-cost, at-home kits) participants still frequently fail to complete the process. Two such examples include the MAGENTA trial, which had 40% of eligible participants drop out of the testing process, and the Early Detection of Genetic Risk (EDGE) study, which had drop out throughout with25% of participants dropping out *after* receiving their testing kits (Swisher et al., 2025). As such, there should be simultaneous and complementary efforts to improve both referral mechanisms and participant follow-up should be instituted. Focusing on the post-

referral stage of the testing pipeline, long time periods between referrals and appointments, as well as the lack of private insurance have been identified as contributing factors to noncompletion following referral (Ochoa et al., 2022; Bednar et al., 2022). We have similar findings in this study—we oversampled individuals from the pre-test counseling arms of the MAGENTA trial who were found to have lower rates of testing completion. While most respondents did not remember the genetic counseling requirement, the few who did noted that needing to schedule appointments and coordinate with another person was a barrier that would contribute to noncompletion. While increasing the efficiency of the testing timeline and process may be within the purview of health care systems, improving patient insurance coverage is less so. Re-offering testing, however, may re-engage these participants at a time when testing is more feasible for them. Participants suggested several strategies to support re-engagement including milestone-based offers, aligning testing offers with routine cancer screenings, integrating re-offers into clinical checklists, and implementing electronic health record (EHR) reminders. Efforts are currently being made to integrate GT supports into electronic health record systems (EHRs), creating a timely opportunity to integrate re-offer prompts ("Penn Chart Genomics Initiative: Optimizing the EHR for Use in Genomic Medicine," n.d.; Kaphingst et al., 2019).

This study specifically aimed to increase representation of Black participants who did not complete testing because the MAGENTA Trial observed a disproportionate rate of noncompletion among Black participants. While recruitment fell short of targets, a unique consideration amongst this population was a concern about medical injustices and genetic ownership, illustrated by the case of Henrietta Lacks (Skloot, 2010). Notably, this consideration weighed on participants, yet they felt compelled to make the right decision for their health, creating an internal tension. Equipping providers with the information to address these concerns, namely around lab practices, sample storage, and data ownership, is critical to increasing testing equity. Other interventions aimed at addressing testing gaps by race have found having onsite counseling and testing services can increase testing completion for all patients, but significantly more for Black patients (Shevach et al., 2023; Wagner et al., 2024).

This study identified both communication and timing strategies that could increase access to genetic testing for hereditary cancer risk. While there are no established guidelines or reported practices that emphasize ongoing discussion of GT opportunities over time, these findings both suggest and encourage this approach and offer messaging strategies that may facilitate implementation. Overall, the findings support a shift in the GT narrative and its clinical integration toward a model more similar to lifestyle or vaccine interventions, characterized by an ongoing conversation between provider and patient.

Limitations

The majority of the interviewed participants were employed and insured. Consequently, these findings may not fully represent the experiences, considerations, and circumstances of individuals who are unemployed or uninsured. Additionally, despite attempts to oversample Black participants, our sample was limited to only three participants. As a result, these findings likely do not represent the breadth of factors contributing to testing noncompletion amongst this population.

This study was conducted at a single time-point 5-8 years after a genetic testing noncompletion event and many participants did not remember specific details of the original trial. As such, many responses about the time of the study are retrospective interpretations and may conflate past and current attitudes or circumstances. Nevertheless, participants' current views on genetic testing, and their descriptions of how their circumstances and thinking have changed in the past 5-8 years provide valuable insights. Further, among the 19 participants who later completed genetic testing, their accounts of why they ultimately decided to do so offer more concrete insights about shifts in thinking and circumstances between testing offers.

Conclusion

Those interested in testing undergo a complex balancing of considerations that is regularly recalibrated with shifting personal, familial, and societal conditions. Given the option, many would appreciate opportunities to consider genetic testing for hereditary cancer risk again. With increasing genomic integration into EHR systems, one easy and low-cost approach that is aligned with participant recommendations for re-offer could be to use EHR flags. When a patient meets the eligibility criteria for genetic testing, the system could generate an alert to "offer/refer genetic testing" at a set time interval. Ultimately, re-offering testing may be a low-resource intervention to improve uptake and access to genetic testing for hereditary cancer risk.

Conclusion

Research studies have outlined the need for large-scale interventions and system-level changes to broadly improve the landscape of genetic testing for hereditary cancer risk. For instance, researchers and journalists alike urge policy makers to make changes to life or long-term care insurance coverage (Rothstein, 2018; Brown, 2024). Similarly, cost regularly bars patients from pursuing recommended genetic testing leading to calls for reducing the cost of testing or increasing insurance coverage (White et al., 2018; Lemke et al., 2022; Dusic et al., 2022). While these large institutional shifts are critical, they require immense resources and are often not entirely realized. As such, patients who may benefit from testing fail to receive it. Other researchers have highlighted the potential of less-resource intensive, small-scale interventions to address these barriers such as improving communication about costs and insurance coverage to address patient concerns (Morand et al., 2022). By centering pragmatic, low-effort interventions that can be realized quickly, we may be able to improve testing equity and access on a smaller (but more immediate) scale.

This work presents evidence for one such small scale, realistic, intervention – re-offering testing over time. We have demonstrated that patient circumstances and considerations around GT are regularly recalibrated, and their testing decisions change accordingly. As such, re-offering GT over time could result in a meaningful improvement in access.

Chapter one demonstrated that reasons for drop out vary based on the stage in the genetic testing process, and that patients do not always feel they would make the same decision in the future. It also illuminated that these changes in conditions and considerations can happen over a relatively short time period, 1-3 months following the original decline. Further, it highlighted key messages for patient decision-making around family history, familial benefit, and clinical actionability. These findings informed the development and exploration of these phenomena at other stages in the testing process (chapter 2), other populations, and over longer periods of time (chapter 3).

Chapter two demonstrated that those who dropped out of testing late in the process (after opting to receive a genetic testing kit) mostly did so due to logistic reasons and competing priorities. Like chapter one, nearly all of these individuals were still open, and often eager, for genetic testing over a year after their initial offer.

Informed by the exploratory findings from chapters 1 and 2, chapter 3 took an in-depth look at patient decision-making over a longer time period, 5-8 years after a noncompletion of offered testing, and in a broader population setting. The ways circumstances and considerations shifted, along with the meaningful messages identified, echoed and elaborated upon those introduced in chapters 1 and 2. Further, this chapter identified potential strategies to integrate repeating genetic testing offers into clinical care.

As a strategy, re-offering testing over time also upholds the four principles of biomedical ethics: autonomy, beneficence, non-maleficence, and justice. In terms of autonomy, some may frame re-offering testing as overriding patient choice. However, our findings demonstrate that preferences change over time, and removing the option to return to testing may solidify a decision that is no longer reflective of the patients' desires, thereby constraining their autonomy and foreclosing future chances for shared decision-making. However, it is important that efforts to implement this practice should be responsive to patients' wishes, particularly if they have specific preferences about future testing offers. In terms of justice, re-offering GT may help address inequities in access by allowing individuals who are systematically excluded from testing due to life circumstances to pursue testing when they are able to do so. In terms of beneficence, re-offering genetic testing for hereditary cancer risk increases access to the associated benefits around cancer prevention and early detection. Finally, to uphold non-maleficence, re-offers should be implemented in a way where they are not overly burdensome for providers or patients. Chapter 3 suggests a few ways to do so.

Across both study populations, three time periods, and multiple stages of drop out, participants expressed a willingness, and often an eagerness, for repeated offers of GT. Both personal circumstances and

participants' attitudes and perceived norms shifted over time, highlighting the dynamic nature of patient decision-making. As healthcare systems continue to improve GT infrastructure and address physician capacity and burden around referrals, mechanisms that allow for patient re-engagement should be considered. For individuals whose care could be meaningfully impacted by genetic testing for hereditary cancer risk, a missed opportunity should not forever remove them from the testing pathway.

Data Availability

The data are not publicly available at this time due to privacy restrictions. However, de-identified transcripts and the rapid qualitative analysis matrix from chapter 3 will be made available following publication.

Data Management

Data for chapters 1 and 2 were collected and managed through University of Washington's HIPAA compliant REDCap with the following support: UL1 TR002319, KL2 TR002317, and TL1 TR002318 from NCATS/NIH. REDCap (www.project-redcap.org) is a secure, web-based application with controlled access designed to support data capture for research studies, providing: 1) an intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless downloads to common statistical packages; and 4) procedures for importing data from external sources.

Interview demographic data for Chapter 3 was collected and managed using RedCap tools at the University of Washington, UL1 TR002319 (Harris et al., 2009; Harris et al., 2019). The original MAGENTA data for chapter 3 was collected and managed using REDCap (Research Electronic Data Capture) electronic data capture tools hosted at MD Anderson (Harris 2009). REDCap (https://redcap.mdanderson.org) is hosted on a secure server by MD Anderson Cancer Center's Department of Research Information Systems & Technology Services. REDCap has undergone a Governance Risk & Compliance Assessment by MD Anderson's Information Security Office and found to be compliant with HIPAA, Texas Administrative Codes 202-203, University of Texas Policy 165, federal regulations outlined in 21CFR Part 11, and UTMDACC Institutional Policy #ADM0335.

Conflict of Interest

The authors declare no commercial or financial relationships that could be construed as a potential conflict of interest.

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Ethics Declaration

The work described in chapters 1 and 2 were part of a study approved by the University of Washington Institutional Review Board (IRB), which acted as a central IRB. Study ID: STUDY00009476. Verbal informed consent was obtained prior to recording the interview.

The research detailed in chapter 3 was also supported by a UW IRB, Study ID: STUDY00020965. Verbal informed consent was obtained at multiple time points, including at the initiation of interview recording.

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Appendix

APPENDIX A: EDGE Website Main Page and FAQs

About the EDGE Study

Most cancers are due to random chance. However, 5-10% of certain cancers are due to harmful genetic changes, called pathogenic variants, which can be passed down through families. This is called hereditary cancer.

The Early Detection of GEnetic Risk (EDGE) study wants to make it easier for you to know if genetic testing would be helpful, based on your personal or family history. And if testing would be helpful, we want to make it easier for you to get that genetic testing. We hope that by making genetic testing more accessible, we will save more lives by preventing cancer in those that are at-risk.

Eligibility

Everyone has the potential to develop cancer. The EDGE study partnered with the MultiCare Health System and Billings Clinic to screen all of the patients they see over the course of a year who are age 25 or older. Depending on the results, there may be additional screening or other steps that can help your doctor reduce your risk or catch a developing cancer early.

Genetic Testing

We worked with a genetic testing company called Color Health Inc. If personal or family history indicated genetic testing might be helpful, our study staff walked participants through the steps. We collected a mailing address and Color Health mailed a test kit to the participant's home with instructions on how to provide a saliva sample. Results were returned through an online account and participants had the opportunity to talk with a Color Genomics genetic counselor whether their results were positive or negative.

More information can be found on our **FAQs page.**

EDGE Website FAQs

What kinds of questions are in the hereditary cancer screening survey?
We will ask you questions about you and your family's cancer history. Based on your answers, you may be asked additional questions, but the survey should take less than 10 minutes to complete.

What will happen if I am a candidate for genetic testing?
If you are found to be a candidate for genetic testing, we will ask you for your email address and telephone number. A member of our study staff will reach out to you for your mailing address and to walk you through the steps of the testing, as needed.

Will this have an impact on my health insurance?
The Genetic Information Nondiscrimination Act, passed in 2008 and ensures that you cannot be discriminated against by your **healthcare insurer** or **employer** based on the results of a genetic test. To learn more about GINA protections, please visit http://ginahelp.org.

But please note, life insurance, long-term care insurance, and disability insurance are not covered by GINA. A positive genetic testing result may increase the premiums you would be expected to pay for a policy. If you think you might be interested in applying for either of these types of insurance, you may want to postpone genetic testing or choose not to have testing.

What if I am not a candidate for genetic testing?

We look at a combination of factors to determine whether you might benefit from genetic testing. Even if you are not a candidate for testing, it is always a good idea to consider your personal and family history. If you have any concerns, talk to your doctor. They may suggest making changes to your cancer screening schedule.

I'm afraid of what I might learn. If the genetic testing finds a mutation, does this mean I have cancer or am going to develop cancer?

No. This kind of genetic testing is not meant to test whether you already have cancer. And a change in your genes (mutation) does not mean you will definitely develop cancer.

What can I gain from this test if it doesn't tell me if I have cancer or am going to get it?

While most results come back negative, if a mutation associated with cancer is identified there are actions you and your doctor can take. A few examples are:

i. Earlier and more frequent screenings (example: if you have an increased risk for breast cancer, your doctor might recommend mammograms at an earlier age)

ii. Preventive measures (example: taking a particular medication may help reduce the risk of developing certain cancers)

iii. Proactive care for family members (example: since the mutations we are testing for run in families, your results can help loved ones determine whether genetic testing might be helpful for them as well)

What exactly is being tested?

The test analyzes 30 genes. Genes are pieces of DNA. Each gene contains a single set of instructions. Changes (mutations) in genes can lead to mistakes in these instructions. Mutations in the 30 genes being tested have all been linked with an increased risk of cancer, and are known to run in families. These cancers include breast, colon, skin, ovarian, pancreatic, prostate, stomach, and uterine cancers. See the figure below for the list of genes being tested and which cancers they are associated with.

Color Hereditary Cancer: The most relevant genes for common hereditary cancers

Gene	Breast	Ovarian	Uterine	Colorectal	Melanoma	Pancreatic	Stomach	Prostate*
BRCA1	o	o				o		o
BRCA2	o	o			o	o		o
MLH1		o	o	o		o	o	o
MSH2		o	o	o		o	o	o
MSH6		o	o	o			o	o
PMS2*		o	o	o				o
EPCAM*		o	o	o		o	o	o
APC				o		o	o	
MUTYH				o				
MITF*					o			
BAP1					o			

CDKN2A					o	o		
CDK4*					o			
TP53	o	o	o	o	o	o	o	o
PTEN	o		o	o	o			
STK11	o	o	o	o		o	o	
CDH1	o						o	
BMPR1A				o		o	o	
SMAD4				o		o	o	
GREM1*				o				
POLD1*				o				
POLE*				o				
PALB2	o	o				o		
CHEK2	o			o				o
ATM	o					o		o
BARD1	o							
BRIP1	o	o						
RAD51C		o						
RAD51D		o						

* CDK4: analysis is limited to chr12:g.58145429-58145431 (codon 24). EPCAM: analysis is limited to deletions that minimally encompass the 3' end of the gene including exons 8 and/or 9. GREM1: analysis is limited to duplications that overlap the upstream regulatory region. MITF: analysis is limited to chr3:g.70014091 (including c.952G>A). PMS2: variants of uncertain significance are not reported for exons 12-15. Analysis excludes three variants commonly observed in the pseudogene PMS2CL: c.2182_2184delinsG, c.2243_2246delAGAA and deletion of exons 13-14 (chr7:g.6015768_6018727del). POLD1: analysis is limited to chr19:g.50909713 (including c.1433G>A). POLE: analysis is limited to chr12:g.133250250 (including c.1270C>G).

How will the test be paid for?

The EDGE Study will cover the cost of the testing so there are no out-of-pocket costs to you. A pre-paid code will be provided for you to set up your account and order your kit from Color Genomics.

Can you describe the testing process?

If you agree to complete testing, a testing kit will be mailed to your home. The kit will require that you provide a saliva sample and will include full instructions on how to provide the sample. It will also include a return envelope with pre-paid postage for you to ship the sample back to the Color Genomics laboratory.

You will be asked to set up an online account. In 4-5 weeks, your results will be posted to your online account and you will be notified that they are available.

If a mutation is found, a Color Genomics genetic counselor will reach out to you by phone to explain your results and to make sure you have an opportunity to ask any questions you might have. Even if no mutation is found, you may contact Color Genomics with questions at any time.

How will my genetic information be protected?

There are privacy laws in place to protect your genetic information. The Genetic Information Nondiscrimination Act was passed in 2008 and ensures that you cannot be discriminated against by your healthcare insurer or employer based on the results of a genetic test. To learn more about GINA protections, please visit http://ginahelp.org.

If you would like to know more about Color, the testing service we are using for this study, and their privacy policy, please visit www.color.com/privacy-policy-2.

Please note, life insurance, long-term care insurance, and disability insurance are not covered by GINA. A positive genetic testing result may increase the premiums you would be expected to pay for a

policy. If you think you might be interested in applying for either of these types of insurance, you may want to postpone genetic testing or choose not to have testing.

Where can I go for more information?

For more information about cancer and genetics, visit:

The American Cancer Society:
https://www.cancer.org/cancer/cancer-causes/genetics.html.
The National Cancer Institute:
https://www.cancer.gov/about-cancer/causes-prevention/genetics.
FORCE (Facing Hereditary Cancer EMPOWERED):
https://facingourrisk.org.

For more information about the genetic testing provided by Color Genomics, visit:

www.color.com/learn/can-cancer-be-inherited-learn-about-hereditary-cancer.

To contact a member of the study staff, send an email to edgestudy@uw.edu.

APPENDIX B: EDGE Interview Guide: Participants who are eligible for gx testing but DID NOT complete

Before the call:

1. *Send reminder 1-2 days before via email or vm.*
2. *Test audio/video setup.*
3. *Have study ID in hand.*

Before you start recording:

1. *Confirm availability for the scheduled duration.*
2. *Verbal consent: Participation is voluntary; can stop at any time; can decline any question*
    a. *invite and answer any questions*
3. *Confirm ok to record.*

INTRODUCTION

Thank you for talking with me today.

Before we get started, I need to quickly double-check:

- That you are 18 or older
- That you're a patient at the [CLINIC NAME]

Thank you.

We're interviewing participants in the EDGE Study to learn about their thoughts and feelings about preventive cancer screening and cancer testing. Our ultimate goal is to use this information to improve the process for future patients.

There are no right or wrong answers to any of these questions. We really want to hear from people who have been through this experience, what it was like for them.

Also, just to be clear: I don't have access to any of your medical information.

Do you have any questions before we get started?

SECTION 1: RECEIVING RESULTS OF FAM HX RISK ASSESSMENT

Our study records show that the family history questionnaire you completed indicated a higher than average risk of developing cancer. Different people have different reactions to receiving this kind of information.

1. **How was it for you to receive those results?**
    a. ***Probe, if needed:***
        i. Were the results surprising or unexpected? Why or why not?

2. **What questions did you have?**
    a. ***Probes, if needed:***
        i. Were they answered to your satisfaction?
        ii. Where did you go for more information?

3. **How long did it take for you to complete the survey?**

SECTION 2: BEING OFFERED GENETIC TESTING

4. **What are your thoughts about genetic testing, in general?**
    a. ***Probes, if needed:***
        i. Good / bad
        ii. Helpful / not helpful
        iii. Cool, cutting edge / scary, risky

In the process of signing up for this study, we explained that you might be offered genetic testing, depending on your family history.

5. **How did that affect your decision to join the study?**

6. **When you <u>were</u> offered genetic testing, how did you feel about it?**

7. **What questions did you have?**
    a. ***Probes, if needed:***
        i. Were they answered to your satisfaction?
        ii. Where did you go for more information?

8. **In your understanding, what was the purpose of genetic testing in this situation?**
    a. ***Probe, if needed:***
        i. What made you think so?

9. **What did you think of the way you were invited to have genetic testing?**
    a. ***Probes, if needed:***
        i. Did you think everyone was being asked to do so, or did you think you were getting a special invitation? If the latter, what did you think was the reason?
        ii. Did you think it was for a research study, or part of your regular medical care?

10. **Did you think your doctor wanted or expected you to have genetic testing?**
    a. ***Probe, if needed:***
        i. What made you think so?

SECTION 3: REASONS FOR <u>NOT COMPLETING</u> GENETIC TESTING

We are following up with study participants like you who were eligible for genetic testing but decided <u>not</u> to complete the testing process.

11. **Could you tell me about why you didn't go ahead with that?**

Sometimes people decline testing because they just didn't have time that day, or the doorbell rang – <u>something came up</u>. For some people, the <u>testing process</u> – setting up an account, doing the test at home, sending it back -- is too complicated or time consuming. And there could be <u>other reasons</u> – like concerns about privacy, or unanswered questions about genetics – that might make someone say no.

I'm not here to judge you or your answers. We'd really like to understand more about why people like you might choose not to pursue genetic testing.

12. **What would you say was the main reason you declined**
    a. ***Probes, if needed:***
        i. Didn't see value
            1. Don't think it would tell me anything new
            2. Doctor didn't ask me to – if it was important, they would
        ii. Implementation issues:
            1. Didn't like the way I was approached
            2. Thought it would cost money
            3. Don't want to be in research
        iii. Concerns:
            1. Worried about getting unwanted information
            2. Privacy concerns
            3. Worried about potential discrimination (e.g., employment, insurance)
            4. Worried about possible follow-on expenses, procedures
        iv. Logistics:
            1. Didn't have time
            2. Forgot my glasses and couldn't read the form
            3. Other

For some people, this is a pretty straightforward decision, and they don't spend a lot of time or energy thinking about it. For others, it feels more complicated, with different issues to weigh.

13. **How was it for you?**
    a. ***Probes, if needed:***
        i. Hard / easy
        ii. Complicated / simple
        iii. Emotionally challenging / not
        iv. Time-consuming / quick
        v. Confusing / straightforward

14. **What considerations were you thinking about as you made this decision?**

15. **What else was in your mind, as you were deciding?**
    a. ***Probes, if needed:***
        i. Family history of cancer
        ii. Cancer worry, psychological / emotional distress
        iii. Environmental / occupational exposures
        iv. Concern for family members (hereditary cancer)
        v. Planning for the future
        vi. Concerns about genetic testing
        vii. Concerns about discrimination (employment, insurance, other)
        viii. Concerns about having results in the medical record
        ix. Cost implications of a positive result
        x. Whether I want to know my risk status / potential for unwanted information

16. **What might have changed your mind, or made it easier for you to proceed with testing?**

17. **Who did you talk with as you were deciding?**
    a. ***Probes, if needed:***
        i. Why that person / people?
        ii. How did they respond?
        iii. *If not offered:* probe for family communication

iv. *If not offered:* probe for physician communication

18. **How did the fact that this was a genetic test figure in your thinking? Did it seem different from, say, a routine blood test?**

19. **How long did it take for you to contemplate and make the decision of whether to follow through with genetic testing (minutes and hours)?**

20. **If you had it to do over, would you make the same decision? Why or why not?**

21. **Had you ever had any other kind of genetic testing?**
    a. ***Probes, if YES and if needed:***
        i. For a medical reason?
        ii. To learn more about your background or your where your ancestors were from?
        iii. You've had genetic testing before. What seemed different about that from doing it as part of this study?

Some people feel that information is power – even if it's not necessarily good news. Other people feel that there are certain things about their health – like their cancer risk – that they'd just rather not know.

22. **Where would you say you fit? Why?**

In some situations, the need for medical intervention is very clear, and we expect doctors to tell us what to do. For example, if you break your arm, you don't usually have a long conversation about whether or not to put a cast on it.

But in other situations, it's less clear: either the balance of risks and benefits may be uncertain, or could be different for different people. In these cases, we need to balance between what the patient wants and what the doctor thinks is best.

There is strong evidence that genetic testing for people with a family history of certain kinds of cancer can provide important information for patients and their doctors. We also know that, for people whose family history suggests increased risk, cancer screening and early detection can save lives.

23. **Given that information, how should doctors talk with such patients about whether to have genetic testing to learn more about cancer risk?**
    a. ***Probes, if needed:***
        i. Just offer it, give information, and leave it up to the individual patient
        ii. Ask repeatedly (in multiple visits) if patients say no – keep the conversation open
            1. Tell patients they should do it
            2. Encourage patients to do it
            3. Offer to help patients do it

SECTION 4: QUESTIONS ABOUT PREVIVORSHIP & SELF-CONCEPT

Doctors and researchers are always working on finding better ways of helping patients identify and manage cancer risk, to help them live longer and with the best possible quality of life. One of the ideas that people are talking about right now is the concept of "previvorship."

You've heard of cancer survivors – people who have had cancer and been treated successfully, so that their cancer is either cured or controlled.

Previvors are individuals who have been determined to have a predisposition, or an increased risk, for cancer but who have not yet been diagnosed with the disease. This includes people who have a family history of cancer that defines them as high risk, carry a genetic variation that is known to cause cancer, or have other things going on that are known to greatly increase risk.

24. **What do you think of the term, "previvor"?**

25. **How would it feel to you if someone referred to you as a previvor?**

26. **Can you think of a better term?**

Identifying people as previvors might create the opportunity for peer support – for example, people who have a predisposition to colon cancer could connect with each other and share their knowledge, advice, and concerns.

On the other hand, some people might worry that "previvor" could become an unhelpful label – one that could do more harm than good.

27. **What do you think?**

WRAP-UP & HOUSEKEEPING

28. **Is there anything else you think we should know?**

Thank you very much. I have just a few more easy questions about your age and such, and where we can send your gift card.

Participant Demographics

What is your age? ***(write in)***	
What is your gender?	● Male ● Female ● Other
How would you describe your race? ***(allow multiple responses)***	● American Indian/Alaska Native ● Asian ● Native Hawaiian or Other Pacific Islander ● Black or African American ● White ● More than one race
Are you Hispanic or Latino?	● Yes ● No

Address for Gift Card

Please let me know your [MAILING ADDRESS? EMAIL ADDRESS?] so that I can send your gift card.

Thank you very much for talking with me today.

APPENDIX C: EDGE Survey Instrument

EDGE Study Process Survey

Thank you for participating in the EDGE Study. One goal of the study is to make it easier for people to complete genetic testing when it might be helpful. Your feedback is very valuable.

You may skip any questions you do not feel comfortable answering. If you would like to talk to someone on the study team, please call 206-616-0507.

1. Do you remember ordering a genetic testing kit in [month] of [year]?

   Most orders were placed for you by a study staff member after talking with you on the phone.

   ◯ No
   ◯ Yes
   ◯ Unsure

2. Did you receive a genetic testing kit from Color Health in the mail?

   ◯ No
   ◯ Yes
   ◯ Unsure

3. Below is a list of reasons someone might give for having genetic testing for hereditary cancer. Rank how much you considered each of the following reasons when making the choice to order a genetic testing kit:

	Did not consider	Minor consideration	Moderate consideration	Major consideration
Because I have a family history of cancer.	○	○	○	○
See whether more frequent / different cancer prevention measures could reduce my risk of cancer.	○	○	○	○
Help my family members understand their risk of developing cancer.	○	○	○	○
I was curious.	○	○	○	○
It was free.	○	○	○	○

If you had another consideration, please describe it here: _____

4. Please select whether you agree or disagree with each of the statements below.

	Strongly disagree	Disagree	Uncertain	Agree	Strongly Agree
I have a computer or device for accessing the Internet.	○	○	○	○	○
The Color website was easy to use.	○	○	○	○	○
The Color testing kit was easy to use.	○	○	○	○	○
If I had any questions, I was able to find the answers or get help.	○	○	○	○	○

We did not receive a saliva sample for testing. The window for testing is now closed, but it is still helpful for us to know why you did not complete genetic testing.

5. Why did you not move forward with testing? (check all that apply)

- ☐ Wouldn't change my clinical care.
- ☐ More pressing health concerns to deal with.
- ☐ I did not understand the testing process.
- ☐ I forgot to mail in my saliva sample.
- ☐ Lack of time.
- ☐ Overwhelmed with current life situation.
- ☐ Concerned about genetic discrimination (including insurance discrimination).
- ☐ Discussion with a family member.
- ☐ Prefer not to know about risk for any condition.
- ☐ If I'm meant to get cancer it will happen regardless.
- ☐ It wouldn't change God's plan.
- ☐ Other: (please describe below)

If you selected "Other" please describe: _____

6. What might have helped you move forward with genetic testing? (check all that apply)

- ☐ Additional reminders.
- ☐ A phone call to talk with a study staff member, to answer any questions.
- ☐ An option for testing that did not require an online account.
- ☐ Nothing, I had decided to not move forward.
- ☐ Other: (please describe below)

If you selected "Other" please describe: _____

7. Would you consider having genetic testing in the future?

- ○ No
- ○ Yes

7a. If yes, why? (check all that apply)

- ☐ If it was recommended by my provider.
- ☐ If my health changes.
- ☐ If it would help a family member.
- ☐ If I have already set up insurance.
- ☐ If the test was free.
- ☐ Other: (please describe below)

If you selected "Other" please describe:

_____

8. Please share any other personal considerations about genetic testing.

_____

9. How confident are you in your ability to do each of the following?

	Not at all	A little bit	Somewhat	Quite a bit	Extremely
Fill out medical forms by yourself.	○	○	○	○	○
Understand information about genetics.	○	○	○	○	○

10. In general, would you say your health is:
- ○ Excellent
- ○ Very good
- ○ Good
- ○ Fair
- ○ Poor

11. What is your sex assigned at birth?
- ○ Male
- ○ Female
- ○ Intersex
- ○ Prefer not to answer

12. What is your current gender identity?
- ☐ Male
- ☐ Female
- ☐ Transgender
- ☐ Non-binary / Gender diverse
- ☐ Decline to state
- ☐ Other: (describe below)

If you selected "Other" please describe: _____

13. What is your age? _____

14. How would you describe your race? (check all that apply)
- ☐ White
- ☐ Black or African American
- ☐ Asian
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ Native American / American Indian / Alaskan Native
- ☐ Multiracial
- ☐ Other (describe below)
- ☐ Prefer not to answer

If you selected "other" please specify: _____

15. Do you consider yourself Hispanic/Latino or not Hispanic/Latino?
- ○ Hispanic or Latino
- ○ Not Hispanic or Latino
- ○ Prefer not to answer

16. What health insurance do you have? (check all that apply)
- ☐ Commercial (private) insurance (for example Premera, Regence, Blue Cross / Blue Shield, Marketplace)
- ☐ Government / military insurance (for example: VA, Indian Health Service)
- ☐ Medicare (for example: Medicare Advantage)
- ☐ Medicaid (for example: Apple Health)
- ☐ None

17. What is the highest grade or level of school you have completed or the highest degree you have received?

- ◯ Less than high school (less than 9th grade)
- ◯ Some high school (9th to 12th grade), no diploma
- ◯ High school graduate (diploma or GED or equivalent)
- ◯ Some post-high school training (college or occupational, technical, or vocational training), no degree or certificate
- ◯ Associate (2-year) college degree, or completed occupational, technical, or vocational program and received degree or certificate
- ◯ Bachelor's degree (for example: BA, AB, BS)
- ◯ Graduate or professional degree (for example: MA, MBA, JA, MD, PhD)

18. How many individuals live in your household, including yourself?

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6
- ◯ 7
- ◯ 8
- ◯ 9
- ◯ 10 or more

19. What was your total family income from all sources last year?

- ◯ Less than $15,000
- ◯ Between $15,000 and $24,999
- ◯ Between $25,000 and $49,999
- ◯ Between $50,000 and $74,999
- ◯ Between $75,000 and $99,999
- ◯ Between $100,000 and $149,999
- ◯ More than $150,000
- ◯ Prefer not to answer

20. What is the zip code for your home address?

_____

Thank you for taking the time to complete this survey. A $10 e-giftcard (electronic giftcard) will be emailed to the email address below. If we do not have an email address for you, or if you would prefer the Tango card go to a different email, please enter it below.

Tango cards can be converted into an electronic giftcard for a variety of stores including Amazon, Target, and Walmart, or the funds can be donated to a non-profit such as the American Cancer Society.

Email address for Tango card:

_____

If you do not want to receive an e-giftcard, please check the box below.

☐ I do NOT wish to receive a $10 e-giftcard. I understand these funds will be used for other study operations.

APPENDIX D: EDGE Survey Free-Text Responses

Free-text: Reasons for testing noncompletion
privacy/confidentiality concerns • anonymity from staff in [clinic] • had no control over who would see the info without my permission • Lack of trust over possible future Genetic information sharing • Not clear about how genetic information would be stored and protected, in light of news of genetic information being hacked
Psychosocial concerns • anxiety over potential results • I'm not sure if I really want to know. Scary to think about. • It would cause great anxiety to kno • Nervous about resilts
Challenges producing saliva sample • conditions of when I needed to get the sample was difficult, so never had right conditions to take sample. • could not produce the required amount of saliva • I couldn't get enough silva to fill the test tube • I couldn't make enough saliva • I was gagging at the thought of spitting that much. would have rather submitted a blood sample. • I was unable to get all the necessary saliva to fill the tube • Saliva makes me gag!
Color website/technical difficulties • Couldn't log in to the site • I could not log in to your site • I set up an account/personal website as requested but couldn't find the [study] website & it ended up at one of the other university sites. Then it was impossible to cancel the entry. • I was unable to log in and register for the process and could not get assistance in doing so. • tried to log-in to websites and could not. gave up trying. • unable to access site. Acct not valid. • I didn't understand why they wanted my debit card details. I wasn't sure of the source
Didn’t get testing kit/lost testing kit • Did not get • did not receive kit • Did not receive kit! • did not receive testing kit • didn't receive it • didn't receive test • don't remember getting test kit • I don't know if I received it • I don't remember receiving the kit • I live at three places. Not sure where I would have received it. • I never received a kit • I'm not sure I recieved it. • never received • Never received test in mail • we moved and having issues getting mail forwared • It got lost in the move • Not sure if I got the kit in the mail • I did send it back. Was told I needed to do it again. Never received another test kit

- My sample box wouldn't fit in the post office drop box that is available after post office business hours
- I forgot to mail in the sample, and when I remember, I noticed that I was missing a cap that was needed in order to secure the sample

[presumed didn't set up account]

- I did mail it in but it was a little late so I never heard anything back about it
- I did mail the kit back
- I did move forward

Other health concerns/cancer diagnosis

- I had Covid (moved to other health concerns)
- found out I had breast cancer
- I started getting sick in [month/study year], i got worse in [following month] and in [the following month] i was diagnosed with [abnormal growth of pregnancy tissue] which required me to have chemo. (moved to other health concerns)
- I was concentrating on recovering from surgery for my Parkinson's diagnosis. (already included in other health concerns, removed from other)

Didn't mean to/remember ordering

- Frankly, I don't remember explicitly ordering it when I spoke with the person over the phone, so it was a surprise when it arrived.
- no instructions and was not certain from where it originated. I was not familiar with the genetic Color test.

Difficulty getting questions answered

- had questions but couldn't get an answer when I tried to contact someone at the # provided.
- I tried to call to talk to somebody at one point & I didn't get a call back on it
- No one answered the phone to help me, I called several times.

Process got too annoying

- I completed it according to the instructions and received a notification with a new kit stating that I needed to do it again. I didn't get around to doing it a second time.

Forgot (reclassified out of 'other')

- I just forgot (moved to forgot category)
- I forgot I had (moved to forgot category)

Life insurance (reclassified out of 'other')

- needed to establish a life insurance policy first (moved to insurance discrimination)

Misalignment with health decisions

- It felt like it did not align with my health care decisions.

Free-text: What would help them complete testing

Non-saliva alternative

- additional testing options example. blood sample
- Didn't know I'd have to collect saliva
- Be able to take sample under any condition at any time. I answered the questions over the phone, then they wanted me to do it again electronically and my mom wasn't around to help me then.
- saliva test hard - I have dry mouth from medications

Help with online portion

- Better instructions to set up the online access.
- couldn't get the online account to work
- Had difficulty with the computer login
- I did move forward [presumably didn't set up account]

- I mailed the kit back [presumably didn’t set up account]
- more user friendly account
- The numbers on my test couldn't be entered inot the template provided. I needed technical assistance that was unavailable.
- Was hoping to get results back from my test but never did, I'm bummed !! [presumably didn’t set up account]

Wait + recontact - Other life/health challenges

- help me find it and kept my significant other from dying slowly because of cancer
- I had ankle surgery, was not a good time.
- i was extremely sick and i forgot about the testing, which i really wanted to do.
- I wish I would have complied but I was scared to know and busy. I put it off and waited too long. I was contacted and you made it easy. It's my fault.

Wait + recontact - Life insurance

- Insurance and Medicare can't exclude me with information of increased risk of cancer
- I had difficulty obtaining life insurance at the time to still be able to send in the kit in time. I have other health history that make obtaining life insurance difficult.

Didn’t get kit

- don't remember getting test kit
- I could have requested a new kit
- If I got the kit
- just need a new test at new address
- Not sure I got the test
- receiving it
- unsure I even recieved it.

Reminder

- Phone call
- Reminders via email clearly indentifying the sender; voice mail; txt message

More communication/more contact

- Better communication
- confirm test was received

Other/none

- don't know
- none, I just forgot to send back in.
- privacy
- reviewing test
- my insurance ordered a genetic test through a specialist

Free-text: Reasons to get GT in the future

Family cancer history

- 5 close family members diagnosed w/cancer - only 1 survivor
- Family Hx
- Genetics, family history
- I remain curious because of my family history and my Bio degree
- I still would like to know if I have the potential for cancer genetically

Online help

- BETTER online instructions

Alternate draw (non-saliva)

- Blood draw
- if it were easier to get a sample

Preparation
- I want to know what I possibly could face in the near future
- Information regarding possible benefits for better health for myself & family
- To have more knowledge
- To know my future risks

Desire to test now
- I really want this test
- I would do it again if asked
- I would love to have the opportunity for a test in the future
- I wouldn't be surprised by receiving a test kit the second time around.

Systematic Changes
- if my privacy was assured [privacy]
- I'm on disability can't afford. [cost]

Other
- better attitude now
- Curiosity
- if it helps future studies
- If I had someone help me through the process.

Free-text: Other testing thoughts – general free-response

Already completed elsewhere
- I've done 23&me already - saliva test was awful. Blood test maybe option.
- i already had it done through [clinic] and my insurance plan.

Wants/wanted to do it, general regret, or general positive comments
- It's important to me.
- I believe it is a worth while thing to do to understand my genetic makeup.
- I did [DTC testing] years ago and really wanted to do this testing, but the instructions were that you couldn't drink or eat a lemon or anything and I was unable to complete the test due to insufficient saliva
- I was really interested to go for the test, but I just wasn't sure or feel safe putting my debit card details
- I feel genetic testing is very important
- I regret not prioritizing the test kit and would absolutely make it a priority if given another opportunity.
- It's important to find out these results - my family tree has multiple members that died from cancer -
- I have Lupus & Hashimoto' s and would love additional information from this testing.
- I have always thought I would get breast cancer based on genetic history. I would love to know my risk and subsequently my children's risk. I was extremely excited for this opportunity but just couldn't provide a saliva sample.
- I want to know for my own and families health concerns.
- I feel bad that I didn't follow thru. I had intended to but set it aside and just got too busy!
- I did not recieve the first test in the mail. I contacted the company and recieved a late test which i then set aside accidentally and forgot about as my dad was sick with cancer. I had just found it and decided to send it in during that last week of testing when one of my kids got sick and I was sidetracked and forgot. I'm actually pretty sad not to have done it when it was available.
- I mailed my kit back and I never received anything stating that it wasn't received nor did I receive a follow up call. If I did receive that call I would have been able to let someone know that the kit was mailed back. I was very curious to see what the test results would show.
- I still would like to do this. A future study if possible.
- Sorry I couldn't participate!

- can be useful for family members
- My mother was dying and living with me and life was chaotic - also my stepfather in law was living with me at the time and then died at my house. I should have done the testing
- I would have really liked to have the testing done. For whatever reason I didn't receive my kit & with a busy life I kind of forgot about it. I'm disappointed in myself for not following up when I didn't receive my kit. Hopefully you will consider me again in the future.
- Generally supportive of this research and its potential to improve individual healthcare and also to inform overall healthcare industry policy/strategy.
- A valuable tool for myself and family as well as to support a larger effort.
- Could help save lives in the future and possible cure for diseases
- I find it fascinating that DNA can show possible health issues

Logistics

- I got stuck in the process because one of the questions asked where I got recommended for the study, and I couldn't remember at the time. After that I was in the processes of retirement and moving to another state, so it got lost in the inertia.
- i procrastinated and missed the window to send it it

Privacy/confidentiality/insurance concerns

- I am a bit concerned about privacy guarantees. I have several anomalies in my own medical history; e.g. (seriously) I break computerized medical equipment that won't accept my measurements, including ocular pressures, breathing tests into computerized test equipment at [medical center]. I have an unknown object in my chest (transverse echocardiogram found it)
- I do worry that the results would not be kept confidential
- I already have a known genetic defect that I am forever being treated for. I'm afraid of any discrimination or future insurance issues if cancer was added to it. Unfortunately I don't think the healthcare environment is very conducive for people who have chronic medical conditions.
- Privacy and protection of genetic information
- I am open to consider each opportunity but i dont know what would give me enough reassurance the genetic material and information would never be used against me.
- The penalty of possible insurance impact is significant for me. It is not a risk I can accept.
- if I was confident the results were kept confidential

Family history concerns/unsure if testing would help/motivated to get testing

- I have had cancer as well as my brother and dad.
- I had cancer and my Mother had cancer, the same kind, would it help my grandchildren?
- I have multiple adoption & confusion. Serious health concerns are "family secrets"
- Have several cancer in family. I also have 3 20-30 years old children. I want them to know their risk.
- I really don't for one thing. There is nothing the doctors can do about it. My mother died from the cancer,my sister has it. My older sister died from breast/turn into bone cancer. Now my two daughters have it,my sister's son died from Lymphomic cancer. The connection we have besides being blood relatives is we grew up in [state]. This state sprays chemicals on the fields to the point where the air miles away will stink. If you take a look at the percentage of people in that state that have cancer and especially leukemia, It's the major cause of death,Why do we need a genetic testing? Chemical companies,drug companies and sad to say some Dr are not interested in helping, Only in what money they can make off us &this business.they really are not interested in this blood cancer or any of the cancers that arise in [state]. Thank you for letting me give you my opinion.
- I found out today that my Dad has skin Cancer.

Psychosocial

- I am interested in the technology. with my mental health, it is not a good fit.
- I thought I would become paranoid with any little symptom. I didn't look at the possibility of other preventative measures besides removing everything. I already have had a hysterectomy for Luther reasons.

Other health concerns

- altizimers
- As mentioned, I still deal daily with my Parkinson's and to live as normally as possible.

APPENDIX E: MAGENTA Supplemental Methods

Parent Study Supplemental Methods

MAGENTA sought to evaluate the impact of eliminating pre- and post-test genetic counseling on patient distress following genetic testing for hereditary cancer risk. It was a randomized noninferiority trial with 4-arms: (1) both pre- and post-test counseling, (2) only pre-test, (3) only post-test, and (4) neither pre- nor post-test counseling.

Participants had to have either (1) a personal or familial history of cancer or (2) a familial pathogenic variant (PV).

Interview Participants

Participants were sampled from the family history cohort, which means that their eligibility for testing was established due to their family history of cancer rather than a familial PV.

APPENDIX F: MAGENTA Follow-up Interview Guide

Interviewer Checklist
● Pull up year of participation in the magenta study ● Pull up sample surveys/demographics ● Record what stage the participant dropped out at ● Record whether or not they participated in genetic counseling. ● Check to see if they got genetic testing since MAGENTA – use alternate guide.

GUIDE START	Topics
1. Before we begin our interview, do you consent to audio recording of this Zoom interview? 2. We are here today to discuss a research study conducted by the University of Washington. Do you consent to the audio recording of this Zoom/phone interview? 3. Now I am going to read a consent form, similar to the one you were sent.	Before recording Consent Overview

What is this study about?
You are being asked to participate in a research study conducted by the University of Washington. We are asking you to be in this study because you participated in the MAGENTA trial but did not complete genetic testing. The goal of this research study is to improve our understanding of genetic testing barriers and provide information to help design supportive strategies that will broaden access to cancer genetic testing (and ultimately eliminate hereditary ovarian cancer). Participation in this research study is voluntary. If you decide to enroll, you can stop participation at any time. This study is funded by the Rivkin Center.

What will you be asked to do?
If you agree to be in this research study, we will ask you to complete a 20-40-minute interview on Zoom/phone about your perceptions of genetic testing, your reasons for not moving forward with genetic testing, and your ongoing considerations around genetic testing. You do not have to answer any questions you do not wish to answer. Audio from the interview will be recorded and transcribed. The transcripts will be de-identified and a summary sent back to you to review for accuracy and to add clarifying statements, if necessary. Your participation in the study will end when the study team has completed any necessary follow-up of qualitative interviews.

Compensation
As a token of our gratitude, you will be given a $50 gift card upon completion of the interview.

Risks
Some questions posed during the interview may cause discomfort. You can choose not these questions.
Benefits
You will not directly benefit from this study, but we hope this research will add to our understanding of potential barriers to genetic testing.

What will happen to the information you provide?
The information you provide will be kept confidential. We will store the data with a code instead of your name. We will keep a list that links the code to your name and will store it securely and separate from the

data. Access to your identifying information will be limited to certain members of the study team and individuals from the UW or other agencies that may need to audit study records. We may de- identify your data to share with other researchers or use for future research studies.

What can you do if you want more information?
Dr. Elizabeth Swisher is the lead researcher at the University of Washington for this study and the study team can be contacted at swisherlabrc@uw.edu
If you want to talk with someone who is not part of the study team about the study, your rights as a research subject, or to report problems or complaints about the study, contact the UW Human Subjects Division at hsdinfo@uw.edu or 206-543-0098.

Questions about the Study
Do you have any questions about the study or interview?
Do you consent to participating in this interview?
And have you had genetic testing for cancer risk since the study?

RECALL PROMPTS	Topics
4. Do you recall participating in the MAGENTA study in 2017 a. If no: No problem, as a reminder, MAGENTA was offering free genetic testing for individuals with a personal or familial history of breast or ovarian cancer. To receive this testing, you had to complete an eligibility screener, some consent documentation, a series of surveys that asked about your demographics, your health, anxiety, and then an educational video about testing. i. Does that sound familiar? Can you recall any thoughts you had about the study process, or about being invited to participate? ii. If no: that's ok, if there are any questions you don't feel like you can answer then just let me know and we will move on – but a lot of what we are talking about will focus on your current feelings around testing as well. b. If yes, Can you tell me what you remember about the MAGENTA study or your thoughts about being invited to participate? 5. Can you walk me through what your understanding of what genetic testing for this study was?	Recall & thoughts on study

ATTITUDES	same page check
6. At the time, what were some of the reasons, if any, you thought it might be good to move forward with it?	pros
a. Did you think it was/is relevant to your personal care, or could change your care?	
b. Prompt: What about family history?	Clinical relevance?
c. If they don't remember: skip to don't remember guide	
7. Were there any reasons why you thought it might not be a good idea?	
a. Prompt: religious beliefs, privacy concerns, not wanting to know	cons spiritual, psychological
8. So, weighing all of these considerations – I'd like to hear how motivated you were to get genetic testing at the time of the study. If you think of a scale of 1-10, here 1 is "not at all interested, never will be," 5 is "I could have been convinced," and 10 is "I was fully planning on completing it," where would you place yourself? Why not higher/lower?	motivation
a. People's motivation can change over time and as we have discussed, there were a few different steps in this process. First, filling out the eligibility and consent documentation, then the surveys, then genetic counseling, and ordering testing. Would you say your motivation changed over the course of the study?	process-based motivation shifts
i. If yes, how/when	
ii. If no, why not?	
Spoke with a GC	
9. It looks like you also spoke with a genetic counselor. They likely reviewed your family history and discussed what you may learn from genetic testing. Do you remember that conversation at all? Can you tell me a little about it?	GC questions recall + general overview
10. How did that conversation influence your thinking about genetic testing?	
a. Prompt: Were there additional reasons you considered for, or against, testing after the conversation?	shifts in thinking
11. How much did you trust the information about genetic testing and genetic risk the genetic counselor provided to you?	trust
12. What would you say was the ultimate reason you didn't complete testing?	
13. At the time, do you think you were saying 'no for now,' or making a more final decision?	post-GC motivation ultimate reason for decline permanence
14. [current] Considering where you are now, do you think your considerations around the pros and cons of testing have changed at all since then?	
a. prompt: Can you say more about that?	
15. Science, generally, and genetics, specifically, have been in the news a bit more since your original decision – during the pandemic, there was news about the COVID vaccine development, and more recently the genetic testing company, 23andme, declared bankruptcy. These moments both launched a lot of public debate about how people feel about science, research, and genetics.	permanence world event - influence/trust in science

a. Would you say your thinking about genetic testing in the medical setting has been influenced at all by these or other societal conversations? In what way? b. OR would you say you factor in these considerations as it relates to medical decision-maknngi around genetic testing, specifically? 16. OBJ In 2008, the Genetic Information Nondiscrimination act, also known as GINA, was enacted. It prohibits discrimination based on test results by both employers and health insurers. Are you confident in the legal protections around clinical genetic testing?	

SKILLS and ENVIRONMENTAL CONSTRAINTS	Topics
17. When you were deciding whether to complete the genetic testing, did you face any logistical challenges, such as getting the kit, filling the saliva tube, mailing it back, or fitting the process into your schedule?	logistic challenges
18. Were there any personal circumstances—like health issues, anxiety, a busy schedule, or other obligations—that made it difficult for you to complete the testing at the time?	personal challenges
19. How, if at all, did your insurance coverage, or concerns about follow-up care expenses, play a role in your decision to not move forward with the testing? a. Prompt: Like your life insurance status, or needing to change your screening frequency, insurance or out of pocket costs, or the potential for changes to insurance costs?	insurance/costs permanence

SELF-EFFICACY and perceived control	Topics
20. At the time, were there any parts of the process that felt difficult or confusing or that you were skeptical of?	Self-efficacy
21. How confident were you that you could complete testing – order the kit, mail it in, check your results, if you had decided to?	
22. Looking back over the past 8 years, have any of these factors—logistics, cost, or personal circumstances—changed for you in a way that might make you more likely to pursue genetic testing now?	

PERCEIVED NORMS	Topics
23. At the time, Who, if anyone, did you talk to about the decision to do or not do the testing? a. Prompts: friends, family, or doctors? b. Was there anyone you thought about talking to but decided not to? If no one: why?	inner circle influences Permanence
24. What did you talk about? a. Did they encourage you to do the testing, or to hold off? b. Do you think they'd feel differently now?	community influences
25. [Updated 2/20: If you had questions about genetic testing, where would you seek out information about genetic testing – online, provider, your circle] Where would you seek out information about genetic testing – online, your provider, a. Did you seek out any other information—online, reddit, youtube, podcasts, etc—about genetic testing? b. If yes, could you tell me about that a little.	
26. Before this study, had a healthcare provider ever discussed genetic testing with you? a. If yes: did you feel that they wanted you to get tested or not get tested?	provider influence

PROVIDER CONVERSATIONS	Topics
Finally, we have a few questions about how genetic testing should be discussed and presented in the medical setting.	readiness for testing
27. If your provider recommended it today, do you think you'd follow through with genetic testing? a. Why or why not? b. prompt: is there anything specific that would need to change for you to reconsider? c. If no: What about sometime further down the road? d. Do you think your opinion odrn it may change over time?	 frequency of offer
28. [preface for those who wouldn't consider testing again: Even though you don't foresee yourself moving forward with genetic testing…] Some things are brought up at nearly every doctor's appointment—like checking your blood pressure and talking about your day-to-day habits. Other things come up more occasionally, maybe once every few years—like certain cancer screenings. Thinking about that kind of scale, where would you place offering genetic testing to someone who may benefit but hasn't completed it in the past? Is it something you want to come up regularly, occasionally, or more like a one-and-done conversation? Why? a. Prompts: Do you think it would make sense for your provider to re-offer testing over time?	 content of offer
29. [if more than a one-and-done conversation] How would you want your provider to discuss this with you? A more detailed overview or just a reminder that you are still eligible for testing?	

DEMOGRAPHICS

Now we have a few demographic questions

[age] what is your age, in years: [text]

[Race] Race – all that apply
1. White or Caucasian
2. Black or African American
3. Asian
4. Native Hawaiian or Other Pacific Islander
5. American Indian or Alaskan Native
6. Prefer not to answer
7. Other
8. Unknown

[Ethnicity] Ethnicity
1. Hispanic or Latino/a
2. Not Hispanic or Latino/a
3. Prefer not to answer
4. Unknown

[education] What is the highest grade or year of school you completed?
1. Never attended school or only attended Kindergarten
2. Grades 1 through 8 (elementary)
3. Grades 9 through 11 (some high school)
4. Grades 12 or GED (high school graduate)
5. College 1 year to three years (some college or technical school)
6. College 4 or more years (college graduate)
7. Post college (graduate school or professional school)

[income] Which category best represents your total household income last calendar year, from all sources, before taxes?
1. Less than $10,000
2. $10,000 to $14,999
3. $15,000 to $19,999
4. $20,000 to $24,000
5. $25,000 to $34,999
6. $35,000 to $49,999
7. $50,000 to $74,999
8. $75,000 t or more
9. I prefer not to answer

[income_support] How many people, including yourself, did your income support? [text]

[employment] What is your employment status?
1. Employed for wages
2. Self-employed
3. Out of work for 1 year or more
4. Out of work for less than 1 year
5. A homemaker

6. A student
7. Retired
8. Unable to work

[insurance] Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, government plans such as Medicare, or Indian Health Service?

1. Yes
2. No
3. Don't know/not sure

[if insurance = 1] [Insurance_source] What is the primary source of your health care coverage (either for yourself or through someone else)?

1. A plan purchased through an employer or union
2. A plan purchased individually in the marketplace (not through an employer or union)
3. Medicare
4. Medicaid or other state program
5. TRICARE (formerly CHAMPUS), VA, or Military
6. Alaska Native, Indian Health Service, Tribal Health Services
7. Some other source

a. [if insurance_source = 7] [other_source_insurance] Other source of healthcare coverage = [text]

[children] Do you have any biological children (children genetically related to you)? We ask this because it can sometimes factor into genetic testing decision making

1. Yes
2. No
3. Prefer not to answer

[children_gender] What is the sex assigned at birth of your biological children?

1. Only female
2. Only male
4. Both female and male
5. Prefer not to answer

REFLECTIONS AND CLOSING
30. Is there anything we haven't talked about that feels important to share about your experience?

APPENDIX G: MAGENTA Follow-up Study Information Sheet

MAGENTA FOLLOW-UP INTERVIEWS – STUDY INFORMATION SHEET
UNIVERSITY OF WASHINGTON and FRED HUTCH CANCER CENTER

Optimizing Genetic Testing Uptake and Outcomes for Hereditary Ovarian Cancer Risk

Why you?

You were an original participant in the MAGENTA trial (2017-2020), which offered genetic testing for cancer risk.

You did not complete the genetic testing but you indicated that you were open to being contacted for future studies. This is why we have contacted you to participate in this interview.

Confidentiality

The audio recording and transcript of your interview will be assigned a unique study ID and all identifying information (names, locations) will be removed before analysis. The interview recording itself will be destroyed once transcribed and checked for accuracy.

University staff sometimes review studies to make sure they are done legally and safely. If this study is chosen for review, your records may be examined. The reviewers will protect your privacy. The study records will not be used to put you at legal risk of harm.

Uses of Information

The information that we obtain from you for this study might be used for studies beyond the immediate investigation. If so, we will remove anything that might identify you from the information before it is shared or used by others.

Potential Risks

We don't expect any major risks or discomfort. However, discussing your decision to not do genetic testing may bring up personal, emotional, or sensitive topics, particularly if the decision was influenced by health concerns, family history, or past experiences with medical care. To minimize these risks, you can skip questions or withdraw at any time.

Potential Benefits

There is little personal benefit from being in this study. However, the interview gives you a chance to share your thoughts about why you decided not to do genetic testing and if your views have changed. What you share could help improve how genetic testing is explained and offered to others in the future.

Study Purpose

These interviews aim to learn about the challenges around genetic testing for inherited cancer. Understanding these challenges can help us find ways to make testing easier and improve health.

Procedures

If you agree to be in this study:

- We will ask you to complete a virtual (telephone or Zoom based) interview with a member of the study team.
- The interview will take no more than an hour.
- We'll talk about why you decided not to do genetic testing and what influenced your decision. We'll also ask about your current thoughts on genetic testing and if your views have changed.
- With your permission, we will audio-record and transcribe the interview. We will remove your name and all other identifying information from the final written transcript.
- You will receive a summary of our conversation to review, so you can check it, make sure it reflects what you said, and add anything if you'd like.
- In appreciation for your time and participation, you will receive a $50 gift card

You may decline to participate in this interview. You are also free to withdraw at any time.

Contact

If you have questions about your rights as a research participant, you can contact the University of Washington Human Subjects Division at (206) 543-0098.

If you have any questions about participating in the study, please reach out to the study Research Assistant:
Tesla Theoryn, theoryn@uw.edu.

Lead Researchers:
Elizabeth Swisher, MD
Professor, University of Washington
Swishere@uw.edu, 206-543-3669

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