Oregon Health & Science University
School of Medicine

Scholarly Projects Final Report

Title *(Must match poster title; include key words in the title to improve electronic search capabilities.)*

Outcomes of Patients Undergoing Pancreatic Surveillance for BRCA2 and ATMG Mutations

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Date of Submission *(mm/dd/yyyy)*

03/23/2026

Graduation Year

2026

Project Course *(Indicate whether the project was conducted in the Scholarly Projects Curriculum; Physician Scientist Experience; Combined Degree Program [MD/MPH, MD/PhD]; or other course.)*

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Project/Research Question

What are the outcomes of patients with BRCA2 and ATMG mutations who undergo pancreatic cancer surveillance and how do they compare to each other and patients with these mutations who do not undergo surveillance?

Type of Project *(Best description of your project; e.g., research study, quality improvement project, engineering project, etc.)*

Retrospective cohort clinical research study

Key words *(4-10 words describing key aspects of your project)*

Pancreatic Cancer, BRCA2, ATMG, Screening, Surveillance, Early Detection, Outcomes

Meeting Presentations

If your project was presented at a meeting besides the OHSU Capstone, please provide the meeting(s) name, location, date, and presentation format below (poster vs. podium presentation or other).

N/A

Publications *(Abstract, article, other)*

If your project was published, please provide reference(s) below in JAMA style.

N/A

Submission to Archive

Final reports will be archived in a central library to benefit other students and colleagues. Describe any restrictions below (e.g., hold until publication of article on a specific date).

There are no known restrictions.

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Next Steps

What are possible next steps that would build upon the results of this project? Could any data or tools resulting from the project have the potential to be used to answer new research questions by future medical students?

A potential next step for this project would be to analyze the same dataset with more robust statistical methods, which may be able to better identify relationships between screening and outcomes. Other potential next steps could include expanding the control group of patients with pancreatic cancer with no prior early detection screening through the Oregon Pancreas Tumor Registry and/or expanding the early detection screening group via multi-center collaboration to potentially analyze more patients who developed pancreatic cancer and better characterize the relationship between screening and outcomes. Additionally, more genetic mutations and variables like BMI and/or markers of socioeconomic status could be included in analyses for more robust assessment of factors affecting outcomes and screening compliance. Exploring reasons patients decide to stop undergoing screening would also provide valuable information that could inform efforts to update guidelines, fund screening initiatives, etc.

The data collected from this project could be used by future medical students to answer new research questions if those questions focused on variables related to screening not already examined in this study or if the student broadened the scope of the project to look at different germline mutations or aspects of screening.

Please follow the following link and complete the archival process for your project in addition to submitting your final report: https://ohsu.ca1.qualtrics.com/jfe/form/SV_3ls2z8V0goKiHZP.

Student's Signature/Date *This report describes work that I conducted in the Scholarly Projects Curriculum or alternative academic program at the OHSU School of Medicine. By typing my signature below, I attest to its authenticity and originality and agree to submit it to the Archive.*

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Introduction

Pancreatic cancer is one of the leading causes of cancer-related mortality worldwide and is being diagnosed at progressively younger ages.[1,2,3] Its global incidence has doubled over the past 25 years, and it is projected to become the second leading cause of cancer-related mortality by 2030.[1,4] Despite many advances in therapies and detection methods, its prognosis even with treatment remains poor: approximately 80% of pancreatic cancer patients have advanced disease by the time of diagnosis, only about 20% are good surgical candidates, and five-year survival remains low at about 9% in the U.S. and Europe.[3,4,5,6,7] Given its rising prevalence and the poor outcomes associated with it, understanding the factors that influence the development, progression, and outcomes of the malignancy is becoming increasingly more important.

Many factors have been shown to contribute to the development and prognosis of pancreatic cancer. Among the known risk factors for pancreatic cancer, germline mutations in oncogenes or proto-oncogenes and tumor suppressor genes remain a focus of research due to their implications for developing effective screening strategies, as early detection is a key prognostic factor.[7,8] Germline mutations known to contribute to the development of pancreatic cancer include those associated with genes such as ATM, BRCA1, BRCA2, CDKN2A, PALB2, STK11, and TP53 genes.[9] However, the value of early detection in genetically predisposed populations remains uncertain. For example, in a study evaluating early detection for patients with BRCA1 and BRCA2 mutations, standard screening modalities did not demonstrate a clear increase in early detection in these patients.[10] In contrast, for other mutations such as for the ATM gene (ATMG), the effectiveness of early detection mechanisms has not been well-characterized.[11] Much remains unknown regarding optimal surveillance strategies for early detection of germline mutations known to cause pancreatic cancer.

Given the importance of early detection in disease prognosis and the limited prior research conducted in this area, we developed the following overarching question for this study: What are the outcomes of patients with ATMG or BRCA2 mutations who undergo pancreatic cancer screening? We also sought to compare outcomes between the mutation groups, as well as between patients enrolled in surveillance and those not enrolled in surveillance for each mutation group. Based on the literature referenced above, we hypothesized that patients undergoing screening would have better outcomes for both genetic mutation groups and that the improvement in outcomes for the surveillance group as compared to those patients not in surveillance would be more significant for ATMG than for BRCA2.

Methods

This investigation was a student-led sub-project that sought to address a unique and narrowed research question within the scope of a broader retrospective cohort study being conducted by the OHSU Brendon-Colson Center for Pancreatic Care on early detection for patients known to be at high risk of developing pancreatic malignancies due to family history or predisposing genetic mutations (IRB#22981). We first accessed the early detection screening clinic's database and extracted basic information about patients ages 18 - 89 with known germline mutations in ATMG and BRCA2 who received pancreatic care for their high-risk mutations at least partially through OHSU between January 1, 2010, and December 31, 2025.

The basic information extracted included name, sex, date of birth, mutation type, medical reference number, and patient-specific notes. On initial query, 308 patients met our inclusion criteria. After reviewing notes left for patients in their database entries and medical charts, five patients were excluded from our study because they declined to participate in research. Of the remaining 303 patients, six patients possessed germline mutations in both ATMG and BRCA2, so these patients were excluded from all analyses. In total, 297 patients were included in statistical analyses.

We then accessed patient records in the Epic Hyperspace electronic medical record at OHSU to extract study-relevant data for each patient. For each patient, the primary intervention we assessed was whether the patient was enrolled in screening and their degree of compliance with recommended annual screening studies. The date of each patient's initial screening study or clinic visit, whichever came first, was recorded along with each subsequent screening study and clinic visit related to pancreatic cancer screening. Then, we simplified these data by recording each year in which a patient completed at least one screening study. From these data, we calculated the number of expected screening studies and annual visits based on current recommendations by the American Gastroenterological Association: annual surveillance via endoscopic ultrasound (EUS) and/or MRI/MRCP.[12] The expected number of screening studies was corrected for patients who developed pancreatic cancer and for those patients who died during our study period.

Of note, we discovered that eight patients in our sample had acute presentations of pancreatic cancer rather than pancreatic cancer discovered over the course of screening. These patients were used as a control/reference group in analyses involving the very small number of patients in our population who developed pancreatic cancer. This was to address our aim of comparing outcomes between those who were enrolled in screening and those who were not.

The demographic information we collected included patient age, which was calculated from date of birth, sex, tobacco use history (most often cigarette pack-year values), pre-existing diabetes history, and prior cancer history. The outcomes assessed included development of a new malignancy (whether pancreatic or non-pancreatic) since establishing care with the OHSU screening clinic, recurrence or metastasis of a prior or active non-pancreatic malignancy, interval development of new or worsening diabetes, and whether a patient died since establishing care. A standard threshold of A1c $\geq$ 6.5 or glucose levels of $\geq$ 126 mg/dL was used to assess whether a patient developed new diabetes.

For patients who developed a pancreatic malignancy, additional outcome data collected included stage at diagnosis and whether surgical intervention was pursued for patients who developed a pancreatic malignancy. We also collected additional data that we ultimately did not include in our analyses due to time constraints and limited relevance to the overarching aims of our study. These included the presence of pre-existing premalignant lesions (i.e. intraductal papillary mucinous neoplasms) and the interval development of these lesions since establishing care, whether a patient was still enrolled in screening during the last three years of our study period, and the location of premalignant and malignant lesions within the pancreas where relevant.

After extracting data for each patient from their electronic medical record in Epic, we processed data to facilitate statistical analyses. This included removing additional annotations from our data sheets, ensuring data were documented according to an appropriate standardized format for each variable, and performing calculations to prepare data for analyses. Specifically, we calculated compliance with screening study recommendations and then used the resulting proportions to categorize patients into low compliance (< 50% of recommended screenings completed) and high compliance groups (> 50% of recommended screenings completed), we simplified pancreatic cancer stage at diagnosis data into early stage (Stages 1 and 2) and late stage (Stages 3 and 4) groups, and we combined new and worsening diabetes cases into a single category.

We then analyzed data with Fisher's Exact test and T-tests through Microsoft Excel and cloud-based statistical test software. In the results section below, results with $p \leq 0.250$ were described as demonstrating a weak association between variables, whereas those with $p > 0.250$ were described as demonstrating no statistically significant association between variables.

Results

Characteristic	ATMG	BRCA2
Number of Patients	81	216
Proportion Female	83%	77%
Median Age	58	61
Age Range	36 - 79	30 - 87
Tobacco History	33%	40%
Pre-existing Diabetes	5%	10%
Prior Malignancy	57%	53%
Pre-existing Premalignant Lesion	15	24
No Screening Completed	2	11
Developed Premalignant Lesion	6	18
Died Since 2010	3	8

Table 1. General characteristics of the high-risk pancreatic cancer screening population we examined. "Tobacco History" includes any documented history of tobacco use, whether cigarette smoking, cigar use, or chew tobacco. "Prior Malignancy" refers to whether a patient had documentation of at least one cancer diagnosis prior to establishing care with the OHSU screening clinic, regardless of whether this malignancy was treated to remission or cure.

In our study population, 57.3% of patients enrolled in pancreatic cancer screening demonstrated high compliance, defined as completing more than half of the recommended annual imaging studies. The remaining 42.7% of patients demonstrated low compliance, completing less than half of the recommended annual imaging studies. Among the individual mutation groups, 59.7% of ATMG patients demonstrated high compliance, and 56.4% of BRCA2 patients demonstrated high compliance.

Several outcomes assessed in relation to screening compliance did not demonstrate a statistically significant relationship. There was no statistically significant association between screening compliance and development or progression of diabetes (Fisher's Exact $p = 1$ overall and for BRCA2 individually; only 1 ATMG patient demonstrated new or worsening diabetes, so this was not calculated). Similarly, no statistically significant association was observed between screening compliance and development of metastases from or recurrence of a prior malignancy (Fisher's Exact $p = 0.702$ overall; Fisher's Exact $p = 0.667$ for BRCA2 and $p = 1$ for ATMG individually). There was no statistically significant association between screening compliance and development of a premalignant lesion (i.e. an intraductal papillary mucinous neoplasm). For ATMG patients, those in the low screening compliance category had an incidence of 3.2% and those in the high screening compliance category had an incidence of 10.9%, while the incidence for BRCA2 patients was 9.8% for those in the low compliance category and 7.6% for those in the high compliance category (Fisher's Exact $p = 1$ overall; Fisher's Exact $p = 0.624$ for BRCA2 and $p = 0.392$ for ATMG). Additionally, among ATMG patients, there was no statistically significant association between compliance and being diagnosed with a non-pancreatic malignancy (Fisher's Exact $p = 1$) or between compliance and surgical intervention for acute non-pancreatic malignancies (Fisher's Exact $p = 0.4$).

A few outcomes were assessed in relation to mutation type and found to not exhibit a statistically significant relationship. There was no statistically significant association between mutation type and whether pre-existing diabetes worsened over a patient's course of care (Fisher's Exact $p = 0.317$ overall). Fisher's Exact Test was not performed separately for the individual mutation groups given the very small sample of ATMG patients for this outcome, but 75% of patients with an ATMG mutation and pre-existing

diabetes and 42% of patients with a BRCA2 mutation and pre-existing diabetes demonstrated worsening of their glucose control. There was no statistically significant association between mutation type and whether patients underwent surgical resection for a newly diagnosed non-pancreatic malignancy (Fisher's Exact p = 1 overall).

Several outcomes demonstrated weak associations ($p < 0.250$) with mutation type and screening compliance. Mutation type was weakly associated with the development or progression of diabetes (Fisher's Exact p = 0.237 overall); 4.9% of all ATMG patients and 9.6% of all BRCA2 patients developed new or worsened diabetes. High screening compliance was weakly associated with a lower incidence of non-pancreatic cancer diagnosis over the course of screening for BRCA2 patients (Fisher's Exact p = 0.179 overall and p = 0.142 for BRCA2) and lower rates of surgery for these malignancies (Fisher's Exact p = 0.076 overall and p = 0.233 for BRCA2). Rates of diagnosis with an acute non-pancreatic malignancy for patients with low screening compliance were 13.8% overall and 16.3% for the BRCA2 group individually. Rates of diagnosis with an acute non-pancreatic malignancy for patients with high screening compliance was 8.5% overall and 9.2% for the BRCA2 group individually. Rates of surgery for acute non-pancreatic malignancies were 70.7% in the low compliance group and 35.7% in the high compliance group.

As shown in Table 1, 33% of ATMG patients and 40% of BRCA2 patients had a history of tobacco use. In assessing the relationship between tobacco use and the development of a malignancy after establishing care at the OHSU screening clinic, 22 patients were excluded from analyses due to unclear documentation of the extent of their tobacco use; some excluded had an unquantified pack-year smoking history, while others had an unquantifiable history due to vaguely documented cigar or chew tobacco use. Among the remaining patients, there was no statistically significant association between tobacco use and cancer development for ATMG patients (Fisher's Exact p = 0.430), with 68% (13/19) of ATMG tobacco users developing cancer and 57% (31/54) of ATMG non-smokers developing a malignancy. In contrast, there was a statistically significant relationship between tobacco use and the development of cancer for BRCA2 patients (Fisher's Exact p = 0.0043), with 75% (54/72) of BRCA2 tobacco users and 55% (71/130) of BRCA2 non-smokers developing malignancies.

Characteristic	ATMG	BRCA2
Number of Patients	5	7
Median Age	70	58
Age Range	64 - 79	39 - 76
Completed Screening	1	3
Early Stage at Diagnosis	2	6
Late Stage at Diagnosis	3	1
Underwent Surgery	4	6
Pre-Existing Diabetes	3	0
New or Worsening Diabetes	3	4
Died Despite Treatment	2	2

Table 2. General characteristics of patients who developed pancreatic cancer in the screening population we examined. "Completed Screening" refers to the number of patients who presented to OHSU for pancreatic cancer screening in the absence of any known pancreatic malignancy and then developed pancreatic cancer over the course of screening. Of note, all four patients who underwent screening in this subset of our population demonstrated high screening compliance (completed more than 50% of recommended annual screening studies since initiating care). Patients with no prior screening presented for subacute or chronic symptoms and were subsequently diagnosed with pancreatic cancer. "Early Stage at Diagnosis" refers to pancreatic cancer Stage 1 or 2, and "Late Stage at Diagnosis" refers to pancreatic

cancer Stage 3 or 4. "Underwent Surgery" refers to patients who underwent surgical resection as part of their treatment for their pancreatic malignancy.

In total, only 12 patients in our dataset developed pancreatic cancer. Of these 12, four patients had established care for screening and were subsequently diagnosed with pancreatic cancer over the course of their care. The remaining eight patients established care for management of newly diagnosed pancreatic cancer discovered during medical evaluation for subacute or chronic symptoms.

Among patients who underwent screening, three were diagnosed with early-stage pancreatic cancer (Stage 1 or 2) and one was diagnosed with late-stage pancreatic cancer (Stage 3 or 4). For the eight patients who presented for acute malignancy and had no prior screening, five patients were diagnosed with early-stage pancreatic cancer, and three patients were diagnosed with late-stage pancreatic cancer. There was no statistically significant association between undergoing screening and cancer stage at diagnosis (Fisher's Exact $p = 1$; T-test $p = 0.439$).

Regarding management-related outcomes, there was no statistically significant association between screening enrollment and whether a pancreatic cancer patient underwent surgical resection (Fisher's Exact $p = 1$). However, screening enrollment demonstrated a weak association with mortality (Fisher's Exact $p = 0.208$). Of the 12 patients with pancreatic cancer in our study population, none of the four patients who were enrolled in screening died by the end of the study period, whereas 50% of the eight patients without prior screening died during the same period.

Regarding diabetes-related outcomes, the development of new or worsening diabetes demonstrated a weak association with whether a pancreatic cancer patient underwent surgical resection (Fisher's Exact $p = 0.152$). Of the few pancreatic cancer patients who developed new or worsening diabetes, all underwent surgery for their malignancy. In contrast, 60% of patients with no change in glucose control underwent surgery for their malignancy. However, there was no statistically significant association between the development of new or worsening diabetes and pancreatic cancer stage at diagnosis (Fisher's Exact $p = 1$; T-test $p = 0.749$).

Discussion

Aside from the relationship observed between tobacco use and the development of a malignancy, none of the analyses we conducted demonstrated statistically significant associations ($p < 0.05$) between screening or mutation type and the various outcome variables we examined. The association between cigarette smoking and pancreatic cancer has been previously described in the literature.[13,14] While confirming this relationship supports the validity of our dataset, it does not address the primary aims of this study. However, we did observe several weak associations (defined in this study as $0.05 < p < 0.25$) between screening and outcomes. Although patients who developed pancreatic cancer while undergoing screening were not, as a group, diagnosed at earlier stages than those who did not undergo any screening, our cohort did demonstrate reduced mortality in the screening group, the latter of which is supported by the literature. For example, a cohort study that evaluated patients with genetic or familial predispositions for pancreatic cancer found that their screening patients tended to have an earlier stage at diagnosis, higher 5-year survival rate, and lower pancreatic cancer-related mortality.[15] Similarly, a multicenter pancreatic cancer screening study published years prior showed a greater proportion of early-stage pancreatic cancer diagnosis and increased five-year survival in high-risk patients who underwent screening, citing a median survival of 9.8 years in screening patients compared to 1.5 years for patients diagnosed with pancreatic cancer outside of screening.[16]

For our cohort, screening did not appear to confer improved outcomes for one mutation group over the other. Based on prior literature that discussed a potentially limited benefit from early detection studies in BRCA2 patients and studies such as those above that showed improved outcomes with screening in high-risk populations in general, we initially hypothesized that screening would yield a greater benefit for the ATMG group than for BRCA2 patients. However, our data did not support this hypothesis. Some analyses demonstrated the opposite trend rather than findings consistent with the null hypothesis, as both incidence of non-pancreatic malignancy and rates of surgery were weakly associated with screening for BRCA2 patients, but there was no statistically significant relationship for ATMG patients. However, these trends contradict what would be expected for patients undergoing regular screening, which is discussed at greater length below.

These findings suggest that there may be statistically significant associations between screening or mutation type and some of the outcomes assessed in this study. However, our study was likely insufficiently powered, and/or more complex statistical tests would be required to identify strong relationships with these outcomes. Although several weak associations were observed for the BRCA2 group, many analyses did not demonstrate statistically significant associations for the ATMG group, which was approximately one-third the size of the BRCA2 group. Additionally, across the overall study population, few patients who underwent pancreatic screening developed pancreatic cancer, experienced new or worsening diabetes, or died during the study period. These factors limited the ability of our analyses to detect statistically significant associations or draw meaningful conclusions from our data. For example, there were too few mortality events among pancreatic cancer patients to warrant calculating 5-year survival rates using the Kaplan-Meier method. Similarly, calculating measures such as relative risk was deemed inappropriate given the small number of patients who developed pancreatic cancer in both the screening group (n =4, as shown in Table 2) and the reference group (n = 8, as shown in Table 2). As previously noted, prior studies have shown that relationships do exist between these variables, so increasing sample size may improve the power of our analyses and demonstrate these statistically significant relationships in our patient population.

Regarding statistical methodology, unanticipated challenges and time constraints necessitated that data be processed to allow for analysis via Fisher's Exact test and the T-test. However, some variables, such as screening compliance proportions, were originally continuous, and alternative statistical approaches may have yielded more meaningful results for these variables. For instance, the use of regression analyses or Bayesian modeling may have yielded statistically significant results for these variables.

This study has several limitations related to dataset characteristics and study design. First, the project was developed before we were able to fully characterize the available dataset, limiting our ability to assess feasibility and determine whether the dataset could adequately address the research question or detect meaningful associations in variables of interest. For example, the study initially focused on whether patients remained in active surveillance, but during data collection, screening compliance was identified as a more appropriate outcome to evaluate for our aims. Furthermore, we likely overlooked important variables relevant to this study, such as BMI and post-operative complications.[17] With a better understanding of dataset characteristics earlier in the project, and in the absence of time constraints, it may have been possible to expand the dataset through collaboration with other screening programs or by incorporating data from OHSU's Oregon Pancreas Tumor Registry. Either effort could have increased the number of patients eligible to participate in our study and allowed for a more robust control group than the eight pancreatic cancer patients with no prior screening who appear to have been mistakenly included in the clinic's dataset.

In addition to limitations related to available data and sample size, this study was also constrained by time. Several unanticipated challenges and project approval late within the student's program limited the amount of time available to obtain IRB approval for data expansion or to consult a statistician for more advanced analyses. As a result, this project relied on basic statistical tests that required data standardization and processing, which may have unintentionally contributed to the lack of statistically significant findings. It may be worthwhile for the principal investigator and other research associates to pursue further analyses of the same dataset with a statistician. Even relatively simple statistics, such as calculating relative risks for patients undergoing screening compared to those not screened, may provide valuable insights.

Last, the results of this study and the conclusions we can draw from them are limited by inherent sample characteristics and inconsistencies within the dataset. As shown in Table 1, both mutation groups demonstrated a strong female predominance and low proportion of pre-existing diabetes, which may be specific to OHSU's screening population and may not be representative of or generalizable to the broader population of patients at high risk of developing pancreatic cancer. Additionally, many patients established care with the screening clinic during the last four years of the study period following changes in screening guidelines, resulting in limited longitudinal screening data for much of the cohort. Any skewed population-specific characteristics may have been amplified due to sample biases and small sample size.

Apart from sample biases, limitations in data availability may have affected our results and analyses. For example, many patients had incomplete data available for blood glucose control and diabetes status, with many patients not obtaining A1c blood draws regularly. Given this, not every patient had A1cs available from the last year of data collection (2025), which occasionally made it difficult to assess whether a patient exhibited a change in diabetes status over their course of care. Additionally, although screening compliance was evaluated against the American Gastroenterology Association's guidelines of annual screening studies, documentation for some patients screened during the 2010s reflected biennial screening recommendations by their clinicians. Patients who established care in the 2020s also elected to forgo screening during certain years for various reasons.

Furthermore, a subset of patients who underwent an initial screening study were subsequently told that they did not meet criteria for continued screening on the basis of age and should defer subsequent screening until they reached an age minimum (typically age 45). Age-based recommendations for screening initiation are another standard that, per clinic documentation, has evolved over the window of time represented in this study. Although these patients were relatively few in number (n= 11), we documented that they were not actively undergoing screening. However, they were included in the clinic's database and met our inclusion criteria, so for the purpose of standardization, they were included in our analyses and screening compliance was still calculated against the same standard, which may have skewed our findings somewhat. Overall, variability in data completeness, screening practices, and evolving guidelines contributed to the heterogeneity within the dataset and limited the generalizability of our findings to the broader population of patients at high risk for pancreatic cancer. As previously mentioned, a larger, more diverse sample across multiple screening sites may be necessary to more completely address our study aims and make our findings more applicable to high-risk patients in general.

Beyond the limitations discussed above, several findings in this study raised important questions for future investigations. Notably, the relationships observed between screening compliance and outcomes such as non-pancreatic malignancy diagnosis and need for surgical intervention were not consistent with clinical expectations. We would expect higher screening compliance to be associated with increased detection of incidental malignancies and potentially higher rates of surgical intervention due to a higher likelihood of diagnosis at earlier stages, when malignancies tend to be more amenable to resection. However, our data

demonstrated the reverse relationship, suggesting there may be other factors not accounted for that are contributing to patient outcomes and that may be worth exploring. Other potential factors like BMI, which was previously mentioned, but also greater health literacy, higher socioeconomic status (as screening in this population relied on private insurance coverage), and improved access to care, nutritious food, and healthier lifestyles overall may better explain this trend than screening compliance alone. Future iterations of this project should aim to identify the most significant contributing factors and incorporate additional measures of patient health, such as BMI and indices of socioeconomic status, into statistical analyses. Additionally, chart review throughout the data collection process revealed several cases in which patients discontinued screening due to the misconception that it would be covered by the screening institution rather than their private health insurance. In contrast, reasons for discontinuation of screening were not documented in other patient records.

As such, exploring factors that influence whether patients continue or choose to discontinue screening is important for informing the development of effective screening guidelines and policies, including decisions regarding funding and institutional support. The Healthy Oregon Project (HOP) provided free genetic testing for several patients in our population, which led to the discovery of the germline mutations that made them eligible for surveillance.[18] HOP has also organized focus groups to better understand the factors affecting whether patients pursue cancer screening and the barriers that may be preventing them from doing so. These efforts and others like it may provide useful guides for developing tools to examine factors in future studies or serve as the basis of collaboration for investigating this area further.

Conclusions

In this study, we characterized outcomes of patients at high risk of developing a pancreatic malignancy who underwent screening and compared them to similar patients who did not undergo screening. Although our findings suggest that associations exist between screening and outcomes that may indicate a potential benefit from screening, which is consistent with the literature, we were unable to confidently support or refute our hypothesis or identify any statistically significant relationships between screening and patient outcomes. Limitations in sample size and variability, the consistency and completeness of data available, and the statistical methods employed restrict the generalizability of our findings and warrant further investigation through more robust studies in the future.

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