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ORIGINAL ARTICLE – PANCREATIC TUMORS

Oncology Navigation Decreases Time to Treatment in Patients with Pancreatic Malignancy

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ABSTRACT

Background. Care of pancreatic cancer patients has become increasingly complex, which has led to delays in the initiation of therapy. Nurse navigators have been added to care teams, in part, to ameliorate this delay. This study investigated the difference in time from first oncology visit to first treatment date in patients with any pancreatic malignancy before and after the addition of an Oncology Navigator.

Methods. A single-institution database of patients with any pancreatic neoplasm evaluated by a provider in radiation, medical, or surgical oncology between 1 October 2015 and 30 September 2017 was analyzed. After 1 October 2016, an Oncology Navigator met patients at their initial visit and coordinated care throughout treatment. The cohort was divided into two groups: patients evaluated prior to the implementation of an Oncology Navigator and patients evaluated after implementation. Patient demographics and time from first visit to first intervention were compared.

Results. Overall, 147 patients with a new diagnosis of pancreatic neoplasm were evaluated; 57 patients were seen prior to the start of the Oncology Navigator program and 79 were evaluated after the navigation program was implemented. On univariate analysis, time from first contact by any provider to intervention was 46 days prior to oncology navigation and 26 days after implementation of oncology navigation ($p = 0.005$). While controlling for other covariates, employment of the Oncology Navigator decreased the time from first contact by any provider to intervention by almost 16 days ($p = 0.009$).

Conclusions. Implementing an oncology navigation program significantly decreased time to treatment in patients with pancreatic malignancy.

In 2018, it was estimated over 55,000 new cases of pancreatic adenocarcinoma, intraductal papillary mucinous neoplasm (IPMN), and pancreatic neuroendocrine tumors (PNETs) were diagnosed.[1–3] Care of these patients can be complex, often requiring multidisciplinary teams involving surgical, medical, and radiation oncology. As the complexity increases, several weeks may elapse before patients are seen by all providers and treatment is initiated. Patients are often concerned that long wait times may allow for disease progression, leading to additional anxiety over a new cancer diagnosis and potential gaps in care.[4–6] Bilimoria et al. demonstrated that wait times have increased over 20% in the last decade, and were considerably longer at National Cancer Institute (NCI)-designated cancer centers and Veterans Affairs (VA) hospitals.[7] Moreover, many groups advocate that wait times are an overall reflection of the efficiency and availability of care at a given hospital.[7,8] As regionalization of surgical care increases, especially for complex pancreas-related cases, wait times at high-volume, tertiary referral centers only threaten to increase.

Nurse navigation has been proposed as a method to decrease barriers to receiving complex cancer care and improve delays in treatment, and is defined by the NCI's Center to Reduce Cancer Health Disparities (CRCHD) as support and guidance offered to patients with abnormal

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cancer screening or a new cancer diagnosis in accessing the cancer care system.[9] This includes helping to overcome barriers to care and facilitating timely, quality treatment.[9] Navigators provide a wide range of services, including arranging financial assistance, addressing health literacy, identifying systems issues, and offering emotional support. Multiple studies have demonstrated the benefit of nurse navigation on time to diagnosis and treatment, quality of life, patient satisfaction, and completion of therapy in a variety of malignancies, including colorectal, breast, and cervical cancers.[10–14]

Wake Forest Baptist Medical Center (WFBMC) is an NCI-designated, tertiary referral comprehensive cancer center with pancreatic tumor specialists in surgical, medical, and radiation oncology. An Oncology Navigator was added to the patient care team at WFBMC in 2016, in part, to decrease barriers to receiving timely care. Our Oncology Navigator met patients at their first visit or contacted them prior to their first visit, and facilitated assistance with any financial, social, or travel needs. Throughout a patient's treatment course, the Oncology Navigator helped coordinate appointments, provided information and access to cancer support networks, and offered emotional support. The purpose of our study was to determine the effect of the Oncology Navigator on time from first oncology appointment to first intervention or treatment in patients with pancreatic neoplasms.

METHODS

Data

This was a retrospective cohort study based on data acquired from electronic medical records from patients evaluated for pancreatic neoplasms from 1 October 2015 to 30 September 2017 at WFBMC. The study cohort included 147 patients undergoing evaluation for pancreatic neoplasms (adenocarcinoma, IPMN, and PNETs) by any provider in surgical oncology, medical oncology, and radiation oncology. Eleven patients were excluded from the analysis because they were already under treatment and presented for a second opinion. The study protocol was reviewed and approved by the Institutional Review Board (IRB) at WFBMC (IRB 00050088).

Patient-level variables were collected, including patient demographics (age, sex, race/ethnicity), distance traveled to WFBMC, diagnosis (adenocarcinoma, IPMN, or PNETs), intervention (chemotherapy, surgery, radiation, palliation, or other), and days from first contact by any provider to intervention. Distance traveled was calculated as the distance from the patient's home address to WFBMC and was stratified into four groups: < 25 miles, 25–50 miles, 50–100 miles, and > 100 miles. Diagnosis was determined by tissue biopsy, cyst fluid analysis, or imaging characteristics. Palliation included referral to hospice care. Other outcomes included octreotide administration, surveillance, loss to follow-up, or, in one case, referral to a different cancer center. Days from first contact to intervention were calculated from the day of first contact with any provider at WFBMC until the day of any intervention or outcome.

The cohort was divided into two groups: patients seen between 1 October 2015 and 30 September 2016, and patients seen between 1 October 2016 and 30 September 2017. For the patients seen after 1 October 2016, the Oncology Navigator met them at their initial oncology visit and provided orientation to the facility and specialties. Based on individual patient requirements, the Oncology Navigator helped find internal, community, or national resources to meet their needs. For example, she made referrals and appointments with medical oncology practices that the WFBMC access center does not schedule, connected patients to attorneys who draft advanced directives and power of attorney, arranged appointments with dieticians, counselors, and support groups, and facilitated application for assistance programs for expensive medications such as Creon®. An estimate of the weekly activities of our Oncology Navigator is shown in Fig. 1. We employed a single Oncology Navigator with a registered nursing (RN) degree as well as a Bachelor of Science in Nursing (BSN). She has over 30 years of experience in the care of cancer patients, as well as over 20 years working at WFBMC. Prior to the employment of our Oncology Navigator, her current duties were managed either by advanced practice clinicians, resident physicians, attending physicians, or there was no formal support structure in place.

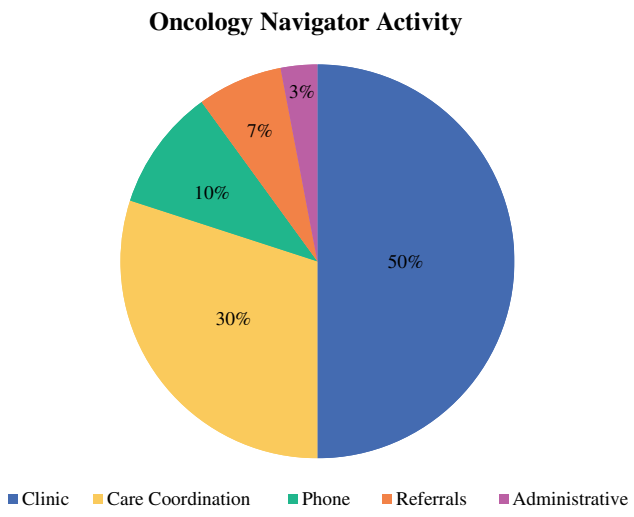

FIG. 1 Oncology Navigator activity

Throughout the study period, there were no provider changes or large changes to clinical management.

Statistical Analysis

Statistical analysis was performed primarily to determine whether employment of an Oncology Navigator was associated with a decrease in time from first contact to any intervention. Univariate analysis using Chi-square tests for binary and categorical variables was performed to determine whether there were differences in patient characteristics across the pre and post Oncology Navigator groups. Generalized linear regression was used to model the effects of employment of an Oncology Navigator on time to intervention, and assumed a gamma family of distributions and log-link function. This model was chosen because time to intervention was highly skewed and did not meet the normality assumption of the classical linear model. We report the marginal effects from the generalized linear model, which show the effect of a one-unit change in the independent variable on the outcome. All statistical analyses were performed using STATA version 12.1 (StataCorp LLP, College Station, TX, USA). Statistical significance for all analyses was defined as a p value < 0.05.

RESULTS

One hundred and thirty-six patients were evaluated for a pancreatic neoplasm between 1 October 2015 and 30 September 2017, after excluding 11 patients already under treatment who presented for a second opinion. Fifty-seven patients were evaluated prior to employment of the Oncology Navigator and 79 patients were evaluated after employment of the Oncology Navigator. The results are shown in Table 1. There was no significant difference in age or race between the two groups. More males were evaluated prior to oncology navigation, and this difference was significant ($p = 0.03$). The largest percentage of patients lived < 100 miles from WFBMC, but 10.5% of patients prior to oncology navigation and 16.5% of patients after oncology navigation lived 100 miles or more from WFBMC; however, this difference was not statistically significant. Most patients were evaluated for adenocarcinoma (84.2% and 88.6%, respectively), with only a minority with IPMN or PNETs. The majority of patients received chemotherapy as their first intervention (47.4% and 54.4%). There was no significant difference in the number of patients who went on to surgery, radiation, or palliation with the employment of the Oncology Navigator. After employment of the Oncology Navigator, patients who underwent an outcome other than chemotherapy, surgery, radiation, or palliation, which included loss to follow-up, decreased from 24.6% to 8.9% ($p = 0.012$). Days from first contact to intervention dropped from 46 to 26 days after the start of the Oncology Navigator ($p = 0.005$).

Table 2 shows the results of a generalized linear model of the effect of the Oncology Navigator on time from first contact to intervention, controlling for other covariates. Age, sex, race/ethnicity, distance from WFBMC, and diagnosis did not have a statistically significant impact on time from first contact to intervention. Patients who underwent an intervention other than chemotherapy, surgery, radiation, or palliation had a statistically significant lower number of days between time from first contact to intervention ($-$ 18.6 days, $p = 0.015$). Most notably, patients who were evaluated after employment of the Oncology Navigator had a statistically significant decrease in the number of days from first contact to intervention ($-$ 15.9 days, $p = 0.009$), while controlling for other covariates.

DISCUSSION

Our single-institution retrospective study investigated the impact of adding an Oncology Navigator to the care team to assist patients being evaluated for pancreatic neoplasms. On univariate analysis, we demonstrated a decrease in time from 46 days to 26 days from first contact to intervention with the addition of oncology navigation. When controlling for other patient factors, the addition of the Oncology Navigator significantly decreased the time from first contact to intervention by 15.9 days, which was both statistically significant and clinically relevant. To our knowledge, this is the first study demonstrating these results, as multiple other studies have demonstrated a benefit of nurse navigation in breast, colon, and cervical cancers;[10–14] however, none of these investigations included pancreatic neoplasms. The addition of the Oncology Navigator measurably decreased delays to treatment in our patients, while also adding to the somewhat unmeasurable psychosocial advantage patients may gain from proceeding to intervention in less time.

Our study included a heterogeneous group of pancreatic neoplasms (adenocarcinoma, IPMN, and PNETs), with adenocarcinoma representing the majority of the diagnoses. Although the medical and surgical treatment of each neoplasm can vary, they all require complex, multidisciplinary care and often multiple follow-up visits or referrals. This coordination of care among specialists can be time-consuming and may cause delay in treatment. Thus, because of the multiple treatment modalities available for each

TABLE 1 Summary statistics of patients undergoing evaluation for pancreatic neoplasm stratified by presence or absence of a nurse navigator

	No navigator *N* (%)	Navigator *N* (%)	*p* Value
Mean age, years	68.5	66.8	0.41
Sex			0.03
Male	36 (63.2)	35 (44.3)	
Female	21 (36.8)	44 (55.7)	
Race			0.57
White	49 (86.0)	65 (82.3)	
Black	8 (14.0)	14 (17.7)	
Distance from WFBMC, miles			0.42
< 25	21 (36.8)	22 (27.8)	
25–50	10 (17.5)	20 (25.3)	
50–100	20 (35.1)	24 (30.4	
> 100	6 (10.5)	13 (16.5)	
Diagnosis			
Adenocarcinoma	48 (84.2)	70 (88.6)	0.455
IPMN	5 (8.8)	1 (1.3)	0.035
Side branch	3 (60.0[a])	0 (0)	
Main duct	1 (20.0)	1 (100)	
Mixed	1 (20.0)	0 (0)	
PNET	4 (7.0)	8 (10.1)	0.528
Functional	1 (25.0)	0 (0)	
Non-functional	3 (75.0)	8 (100)	
Intervention			
Chemotherapy	27 (47.4)	43 (54.4)	0.416
Surgery	13 (22.8)	19 (24.1)	0.866
Radiation	1 (1.8)	3 (3.8)	0.487
Palliation	2 (3.5)	7 (8.9)	0.215
Other (octreotide, surveillance, loss to follow-up, referral to another institution)	14 (24.6)	7 (8.9)	0.012
Mean no. of days from first contact to intervention	46	26	0.005

WFBMC Wake Forest Baptist Medical Center, *IPMN* intraductal papillary mucinous neoplasm, *PNET* pancreatic neuroendocrine tumor

[a]Patients with IPMN

diagnosis, we hypothesized that patients with pancreatic neoplasms of any type would benefit from oncology navigation.

After the addition of the Oncology Navigator, the number of patients proceeding to interventions other than chemotherapy, surgery, radiation, or palliation, decreased from 24.6% to 8.9% ($p = 0.012$). These other interventions included loss to follow-up or octreotide infusion, as well as surveillance. The decrease in loss to follow-up is likely attributable to the Oncology Navigator's role in regularly contacting patients, whether to help arrange transportation for scheduled appointments or as a simple reminder of upcoming visits. Moreover, more patients may have proceeded on to chemotherapy, surgery, radiation, or palliation due to appointments and referrals facilitated through the Oncology Navigator, which may have been difficult for patients to arrange without assistance.

Prior to the start of the Oncology Navigator, all care coordination was performed by advanced practice clinicians, resident physicians, or attending physicians within surgical oncology, medical oncology, or radiation oncology; social workers; or there was no structured support program. With the initiation of a dedicated navigator program, this coordination of care was streamlined so patients could have one contact to help facilitate care, rather than several different providers in different departments. As multidisciplinary treatment becomes the standard of care

TABLE 2 Results of generalized linear model of effect of nurse navigation on days from initial contact to intervention, controlling for other covariates

Variable	Marginal Effect	95% Confidence Interval		*p* Value
		Lower	Upper	
Age	− 0.19	− 0.61	0.24	0.387
Sex				
Male	− 3.38	− 13.15	6.40	0.498
Female	Reference			
Race				
White	7.89	− 2.68	18.47	0.143
Black	Reference			
Distance from WFBMC, miles				
< 25				
25–50	− 1.47	− 13.80	10.86	0.815
50–100	0.72	− 11.26	12.69	0.907
> 100	5.23	− 12.85	23.31	0.571
Diagnosis				
Adenocarcinoma	Reference			
IPMN	− 5.63	− 34.27	23.01	0.700
PNET	19.60	− 8.85	48.05	0.177
Intervention				
Chemotherapy	Reference			
Surgery	11.04	− 2.50	24.59	0.110
Radiation	52.05	− 21.12	125.22	0.163
Palliation	9.16	− 34.18	52.50	0.679
Other (octreotide, surveillance, loss to follow-up, referral to another institution)	− 18.64	− 33.65	− 3.62	0.015
Navigator	− 15.88	− 27.75	− 4.02	0.009

WFBMC Wake Forest Baptist Medical Center, *IPMN* intraductal papillary mucinous neoplasm, *PNET* pancreatic neuroendocrine tumor

for patients with pancreatic malignancies, a dedicated provider to coordinate care among oncology divisions will be imperative to decrease delays in care.

The results of this study are in contrast to results from the Patient Navigation Research Program (PNRP) conducted by the NCI, which demonstrated no significant difference in timing of cancer care in the first 90 days after the implementation of a navigation program, and only modest differences from 91 to 365 days.[15] This discrepancy is likely multifactorial. First, the PNRP included patients with a variety of cancers (breast, cervix, colorectal, prostate), while our study only included pancreatic neoplasms. Pancreatic malignancies often require multimodal care and thus may be delayed due to the need for patients to coordinate care with several specialists. Patients with pancreatic neoplasms may therefore initially benefit more from navigation, versus other cancers that may require only one initial visit and potentially less need for a nurse navigator, such as localized colon cancer. Additionally, the PRNP included multiple sites, with variation in definitions of patient navigation and the role of the navigator.[15] They note variation in the time required to connect patients to navigators, with 13% of patients with abnormal breast cancer screening results unable to be contacted by their navigator within 60 days.[15] This is in contrast to our Oncology Navigator, who contacted all patients at their first visit, therefore there was no initial delay in communication. Although the PRNP is perhaps more widely generalizable due to the larger sample size, our study provides a specific evaluation of patients with pancreatic neoplasms with the unique barriers they may encounter with multidisciplinary care. It illustrates the potential benefit of a dedicated nurse navigation program in facilitating care for complex oncology patients. Our cancer center has nurse navigators for other oncology service lines such as lung and breast, which are also analyzing the effect of nurse navigation on their patient experience.

Several other factors in our study surprisingly did not make a significant difference in time to treatment. Controlling for other covariates, the time to treatment of

patients who traveled more than 100 miles to reach WFBMC was 5 days longer than patients who traveled < 25 miles, but this difference was not significant. Previous studies have demonstrated that distance from medical services is associated with clinical outcomes. In colorectal cancer patients, increasing distance to a hospital is associated with later stage at diagnosis, lower likelihood of receiving treatment, reduced likelihood of receiving treatment at a specialized center, and a decrease in survival.[16,17] Conversely, in patients with pancreatic adenocarcinoma, increasing distance traveled actually correlates with significantly improved overall survival.[18] However, this is almost entirely related to the known survival advantage of traveling to a high-volume center.[19] Our study did not find a difference in time to treatment regardless of how far the patient was traveling, implying that despite potential travel and logistic barriers that may have hindered timely diagnosis and treatment, the benefit of traveling to a high-volume center for care may have negated any negative effect from distance traveled.

Black race/ethnicity, another well-known barrier to treatment,[20,21] did not make a statistically significant difference in time from initial contact to intervention ($p = 0.143$). It is unclear if this lack of statistical significance of both distance traveled and race is likely due to the small sample size of both populations, with < 20% of patients of Black race, or traveling more than 100 miles, or due to the employment of an Oncology Navigator. However, with the implementation of the Oncology Navigator, more patients were of Black race (17.7% vs. 14.0%) and traveled more than 100 miles (16.5% vs. 10.5%), although these differences were not statistically significant. As our cohort of patients assisted by the Oncology Navigator increases, these known barriers to treatment can be further examined.

Several limitations to this study exist. First, only patients at WFBMC were included in the study, and a highly trained Oncology Navigator was employed. WFBMC is an academic, tertiary referral center and results may not be generalizable to all medical centers that treat pancreatic neoplasms. Although the same number of months were used to accrue patients for both the no navigation cohort and navigation cohort, the no navigation cohort patient information was gathered 1 year prior to the navigation cohort, and workflow processes may have changed over time. Lastly, patient information was largely gathered from chart review, and any inconsistencies or errors in charting would be carried over into our study.

CONCLUSIONS

Decreasing time from first contact to treatment is a quantifiable and actionable metric for cancer centers. In addition to achieving quality measures for hospitals, patients and caregivers will also enjoy a sense of relief with timely, coordinated treatment. This retrospective, single-institution study demonstrated a nearly 16-day decrease in time from first provider contact to intervention in patients evaluated for pancreatic malignancy with the implementation of an Oncology Navigator. Patient navigation represents a novel approach to decreasing barriers to receiving timely, complex cancer care.

AUTHOR CONTRIBUTIONS Conceptualization: PS. Data acquisition: LME, JF, RJD, BCP, AWB, RMH, CJC, EAL, PS. Data analysis and interpretation: LME, PS. Drafting of the manuscript: LME, PS. Editing and final approval of manuscript: LME, JF, RJD, BCP, AWB, RMH, CJC, EAL, PS

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