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Impact of Race, Insurance Status, and Primary Language on Presentation, Treatment, and Outcomes of Patients with Pancreatic Adenocarcinoma at a Safety-Net Hospital

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- BACKGROUND:** Social determinants of health impact the delivery of care and outcomes in patients with pancreatic cancer. We explored the relationship between social determinants of health and presentation, treatment, and outcomes of patients with pancreatic adenocarcinoma at an urban safety-net medical center.
- DESIGN:** A single-institution retrospective chart review of patients with pancreatic adenocarcinoma was conducted. Demographic, tumor, and treatment characteristics were obtained. Median overall survival, stage-specific survival, receipt of curative operation, and receipt of perioperative therapy were analyzed. Chi-square tests were used for categorical variables. Survival was determined by the Kaplan-Meier method.
- RESULTS:** We identified 240 patients with pancreatic adenocarcinoma treated between January 2006 and December 2017. Median age was 66 years, 51% were female, 48% were non-white, 22% were non-English-speaking, 16% were Hispanic, and 40% were Medicaid/uninsured. There were 74 (31%) patients with early-stage (I/II) disease. There were no statistically significant differences between race, primary language, or ethnicity and receipt of surgical therapy or receipt of perioperative therapy. Relatively more patients with private insurance (100%) received perioperative therapy compared with Medicaid/uninsured (64%) and Medicare-insured (50%) patients ($p = 0.018$). Nearly 30% of patients with operable disease either declined having an intervention or were found to be too frail to undergo surgical intervention.
- CONCLUSIONS:** There were no statistically significant relationships between examined social determinants of health and use of operation or perioperative therapy. Patients treated at an urban safety-net hospital with a focus on vulnerable patient populations are able to provide outcomes similar to national averages. Additional exploration of factors affecting outcomes for pancreatic cancer in these patients will be important, as many centers absorb higher immigrant and indigent populations. (J Am Coll Surg 2019;229:389–396. © 2019 by the American College of Surgeons. Published by Elsevier Inc. All rights reserved.)

Despite continued advances in the multimodal treatment of pancreatic adenocarcinoma, it maintains a poor prognosis.¹ The overall 5-year survival rate for pancreatic

adenocarcinoma is approximately 8.5%, with nearly 56,000 new cases per year in the US.¹ The treatment for localized and locoregional disease is curative resection, in combination with chemotherapy and/or radiotherapy. Patients with localized disease experience 5-year survival rates between 25% and 35%, and those with advanced disease demonstrate 5-year survival rates of only 5% to 11%.¹⁻³

Multimodal care is generally required to achieve optimal outcomes for patients with pancreatic adenocarcinoma. Vulnerable populations, defined by socioeconomic and demographic determinants of health, might

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not have access to such complex care. These populations include patients of minority race or ethnicity and those with low-income status, government-assisted healthcare or those without insurance, and those for whom English is not a primary language. Previous studies have established associations between minority race or ethnicity, low socioeconomic status, and decreased use of adjuvant therapy with worse overall and disease-specific survival.⁴⁻⁹ Few studies have demonstrated uniform delivery of standard therapy—or higher overall survival rates—among these vulnerable populations.^{10,11}

Safety-net hospitals are those with the highest number (top quartile) of inpatient stays covered by Medicaid or those that are not covered (uninsured), and they are dedicated to vulnerable patient populations.¹² We sought to determine our experience in an urban, academic, safety-net hospital with regard to the diagnosis and treatment of patients with pancreatic adenocarcinoma. Our hypothesis was that, despite disparities in presentation, treatment, and outcomes identified in previous population-based studies, there would be no difference in therapy or overall survival compared with national averages.

METHODS

Data source and study population

After approval by the Boston Medical Center IRB, raw data were obtained by querying the Boston Medical Center Clinical Data Warehouse (CDW). The CDW consolidates patient data from all electronic medical records used in the hospital system. The CDW was queried for patients older than 18 years of age with a diagnosis of pancreatic cancer (ICD-9 codes: 157.0, 157.1, 157.2, 157.3, 157.4, 157.7, 157.9; ICD10: C25.0, C 25.1, C25.2, C25.3, C25.4, C25.7, C25.8, and C25.9) and subsequent treatment at our facility between January 2006 and December 2017. Patients were reviewed and included in analysis if they underwent a diagnostic, curative, or palliative operation or procedure at our institution. Those who initiated either palliative or adjuvant chemotherapy at our institution and subsequently continued this therapy at another facility were included in the analysis. Patients were excluded from review and analysis if they underwent a pancreas operation at another facility or if they were diagnosed or treated initially at an outside facility but later referred to our institution for continuation of care.

Data collection

A retrospective chart review was performed for each patient. Demographic information considered age, sex, race, ethnicity, insurance status, and primary language.

Data about other health conditions were calculated using the Charlson-Deyo Comorbidity Index. Tumor characteristics included American Joint Committee on Cancer's *AJCC Cancer Staging Manual* clinical stage (I to IV),^{13,14} tumor histology, and tumor location. Treatment characteristics were also collected, such as nature of operation (diagnostic, curative, or palliative) and type of chemotherapy or radiation therapy (neoadjuvant, adjuvant, or palliative). Electronic medical records were individually reviewed to validate data gathered from the CDW, and additional information about reasons for lack of standard therapy was collected.

Statistical analysis

Outcomes analyzed were mean and median overall survival, median stage-specific survival (early vs late stage), performance of curative operation, and administration of perioperative therapy (neoadjuvant therapy, adjuvant therapy, or both). Categorical-dependent variables were compared using chi-square tests. Overall survival was censored to last follow-up and was determined by the Kaplan-Meier method. Statistical computations were performed using Statistical Package for the Social Sciences, version 25 (IBM Corp). All tests were 2-sided, and a p value <0.05 was considered statistically significant.

RESULTS

We identified 240 patients who were diagnosed with and treated for pancreatic adenocarcinoma at our institution between January 2006 and December 2017 (Fig. 1).

Patient characteristics

Overall median age of the study population was 66 years (interquartile range [IQR] 58 to 75 years), of whom 51% were women, 48% were non-white, and nearly one-quarter were non-English-speaking (Table 1). Patients of Hispanic ethnicity comprised 16% of the study population. Insurance status was available for 200 patients, of whom 40% were either uninsured or Medicaid-insured. Only 12% of patients had private or supplemental insurance, and 30% had Medicare coverage. Nearly one-third of patients had 2 or more comorbidities, as classified by the Charlson-Deyo Comorbidity Index.

Presentation and treatment

There were 74 (31%) patients who presented with potentially resectable stage I or stage II pancreas cancer (Fig. 1). There was no statistically significant difference in the stage at time of presentation with respect to race, as 73.9% of black patients presented with late-stage (stage III or IV) disease compared with 65.3% of white

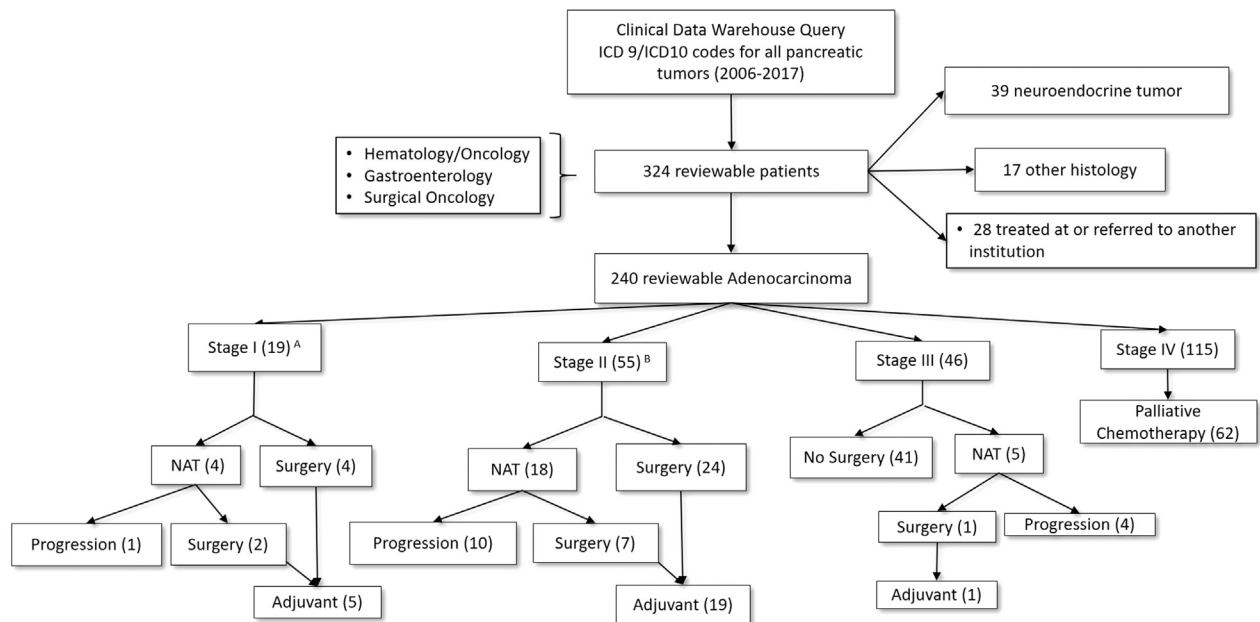


Figure 1. CONSORT (Consolidated Standards of Reporting Trials) diagram and distribution of patients by stage and therapeutic modality. There were no curative operations for patients with stage IV disease. NAT, neoadjuvant therapy. ^AStage 1 nonsurgical patients: 11 patients treated without surgical intent, 4 of whom were not medically fit for operation, 5 declined an operation, 2 were lost to follow-up. ^BStage II nonsurgical patients: 13 patients treated without surgical intent, 6 of whom were not medically fit for operation, 5 declined an operation, 2 were lost to follow-up.

patients ($p = 0.38$). There were also no statistically significant differences in the relative proportion of patients presenting with resectable disease between Hispanic and non-Hispanic ethnicity (29.4% vs 38.5%; $p = 0.30$), language spoken (English 29.4% vs Non-English 35.8%; $p = 0.56$), or insurance status (Medicaid/uninsured 26.0% vs Medicare insured 31.5% vs privately insured 37.9% vs Veterans Affairs insured 100%; $p = 0.10$) (Table 2).

Overall survival

Overall survival for all 240 patients with pancreatic adenocarcinoma was calculated and categorized by stage (Fig. 2). Patients with American Joint Committee on Cancer stage I disease experienced the best median survival (17 months; IQR 2 to 23.5 months), followed by stage II (14 months; IQR 6.5 to 26 months), stage III (11 months; IQR 4 to 15 months), and stage IV (5 months; IQR 1 to 9 months). There was no association between median overall survival and race, primary language, insurance status, or ethnicity for patients with early-stage disease (Table 3). Curiously, among patients presenting with late-stage disease, language other than English (8 vs 5 months; $p = 0.039$) and Hispanic vs non-Hispanic ethnicity (8 vs 5 months; $p = 0.043$) were associated with longer median overall survival.

Median overall survival was compared for patients who underwent curative resection with those who did not (19 vs 6 months; $p < 0.001$) and for patients who underwent surgical resection and perioperative chemotherapy (with or without radiation) with those who underwent operation alone (34 vs 11 months; $p < 0.001$).

Receipt of therapy

Data were captured for all patients with regard to curative operation and any perioperative treatment, such as chemotherapy, radiation therapy, or chemoradiation. Table 4 displays the association of race, primary language, insurance status, and ethnicity with performance of a pancreas resection and perioperative therapy. Half of the patients presenting with operable disease underwent operations with curative intent, and nearly 60% of patients with early-stage disease received some form of perioperative therapy, including neoadjuvant therapy. There were no statistically significant differences between race, primary language, ethnicity, performance of a resection, and administration of perioperative therapy. Although there was no association between insurance status and surgical use, a greater proportion of patients with private insurance (100%) received perioperative therapy compared with Medicaid/

Table 1. Demographic Characteristics for 240 Patients with Pancreatic Adenocarcinoma

Characteristic	Data (n = 240)	
	n	%
Age		
≥ 65 y	136	57
< 65 y	104	43
Sex		
Male	118	49
Female	122	51
Primary language		
English	187	78
Non-English	53	22
Race		
Black	84	37
White	124	52
Other minority	27	11
Ethnicity		
Hispanic	39	16
Non-Hispanic	201	84
Insurance		
Medicare	73	30
Medicaid/uninsured	96	40
Veterans Affairs	2	1
Private	29	12
Unspecified/unknown	40	17
Charlson-Deyo Comorbidity Index score		
0	93	39
1	80	33
2+	67	28

uninsured (64%) and Medicare-insured (50%) patients ($p = 0.018$).

Shared decision-making

The roles of patient autonomy and fitness for an operation were also examined. Approximately 14% ($n = 10$) of patients with resectable disease declined an operation. An additional 14% of patients with stage I and II disease were too frail to undergo operations, and 5% were lost to follow-up before undergoing operations (Table 1).

DISCUSSION

Despite advances in therapy for pancreatic cancer, 5-year survival remains poor.^{1,15} The complexity of care required to achieve optimal outcomes can affect the ability of vulnerable populations to receive optimal treatment.^{4,6-9,11,16-26} There is a lack of data to demonstrate equivalent treatment use and outcomes for all, including patients of minority race and ethnicity.¹⁰ We found that, at an urban safety-net center treating a large volume of patients with

sociodemographic risk factors, there was no significant impact of race, Hispanic ethnicity, primary language, insurance status, or use of surgical therapy on overall survival for patients with pancreatic adenocarcinoma. With the exception of insurance status, we show no significant association between these sociodemographic factors and the use of perioperative chemotherapy or radiation.

Earlier studies have examined associations between sociodemographic risk factors and disparities in cancer care and survival.^{4,6,8,9,11,16-26} Patients of black race, Hispanic ethnicity, lower socioeconomic status, and with a non-English-speaking background have been less likely to receive surgical therapy, and they experience worse overall survival compared with their counterparts.^{4,6-8,19-22} Academic safety-net hospitals present an opportunity to bridge the gap between vulnerable patient populations and optimal treatment and outcomes in pancreatic cancer. However, the literature is conflicting when evaluating the delivery of care and outcomes of these patients at safety-net hospitals.^{11,25} In addition, some evidence exists that safety-net hospitals are associated with increased rates of complications and a higher percentage of patients with worse comorbidities relative to hospitals with a lower burden of Medicaid and uninsured patients.^{11,24,25} Although these conclusions have been drawn from population-based studies using large databases, treatment and outcomes disparities have not been validated at safety-net centers. In addition, variables that might be pertinent to the study of populations with sociodemographic risk factors, such as performance status, frailty, housing status, immigration status, primary language, and access to follow-up care, cannot be extracted from most databases.

In this series from a single academic safety-net medical center, the likelihood of a patient with an early-stage pancreas adenocarcinoma undergoing an operation was comparable with the national cohort, as was their median survival.^{5,15,20,27} One-half of stage I and II patients in this study underwent resection compared with about 45% of patients with early-stage pancreas cancer in a recent large population-based study using the Surveillance, Epidemiology, and End Results database.²⁰ This is consistent with findings published previously using the Surveillance, Epidemiology, and End Results database, in which 55% of patients with stage I or II pancreatic cancer underwent curative resection.²⁸ These studies show an improvement in use of surgical procedures for early-stage pancreatic cancer compared with an earlier population-based analysis of the National Cancer Database from 1995 to 2004 suggesting that only 29% of patients with stage I disease underwent curative resection.²⁹ In contrast to our data, analysis of the National

Table 2. Impact of Race, Ethnicity, and Insurance Status on Stage at Presentation

Characteristic	Early stage (I/II)		Late stage (III/IV)		p Value
	n	%	n	%	
Race					0.383
White	4	34.7	78	65.3	
Black	23	26.1	65	73.9	
Other minority	8	29.6	18	70.4	
Insurance					0.103
Medicaid/uninsured	25	26	71	74	
Medicare	23	31.5	50	68.5	
Private	11	37.9	18	62.1	
Veterans Affairs	2	100	—	—	
Language					0.561
English	55	29.4	132	70.6	
Non-English	19	35.8	34	64.2	
Ethnicity					0.301
Non-Hispanic	59	29.4	142	70.6	
Hispanic	15	38.5	24	61.5	
Total within stage	74	30.8	166	69.2	—

Cancer Database revealed an association between race and insurance status, and surgical use.^{29,30}

Outcomes achieved in patients who underwent operation and perioperative therapy (median overall survival 34 months) were comparable with studies examining the combination and sequence of multimodal therapy

for pancreatic adenocarcinoma, where median overall survival was 26 to 36 months.^{15,27,31} Importantly, we attempted to examine the role of patient autonomy, shared decision-making, and medical fitness on the likelihood of receiving appropriate surgical and perioperative therapy. Nearly 30% of patients with operable disease either

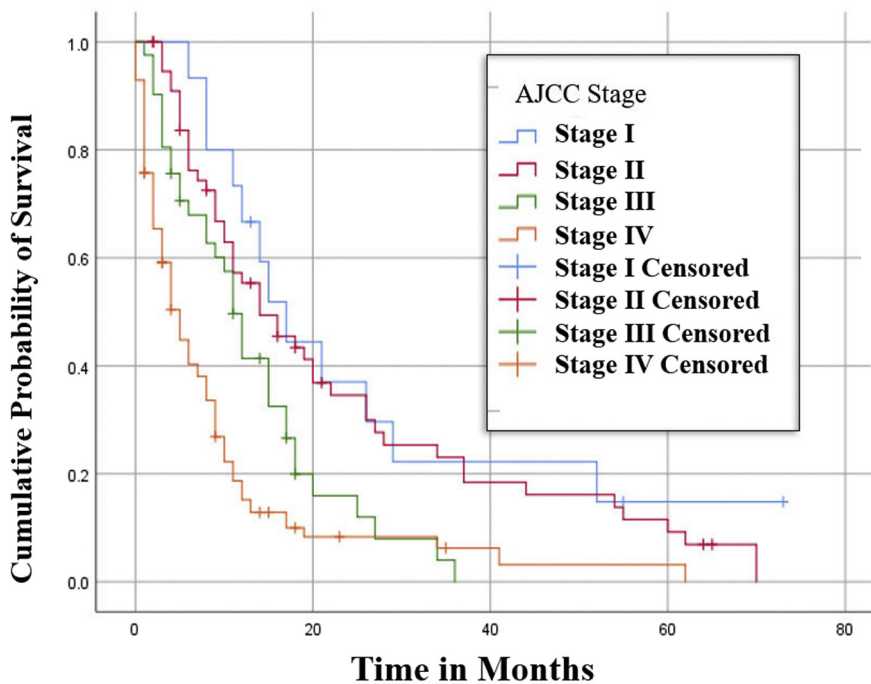


Figure 2. Stage-specific overall survival censored to last known follow-up. AJCC, American Joint Committee on Cancer.^{13,14}

Table 3. Impact of Race, Ethnicity, and Insurance Status on Stage-Specific Survival in Months

Patient demographic	Stage I/II median overall survival, mo	p Value	Stage III/IV median overall survival, mo	p Value
Race		0.721		0.844
White	15		8	
Black	16		4	
Primary language		0.778		0.039
English	16		5	
Non-English	16		8	
Insurance		0.331		0.713
Medicaid	14		4	
Medicare	21		7	
Private	19		8	
Ethnicity		0.681		0.043
Non-Hispanic ethnicity	17		5	
Hispanic ethnicity	14		8	

declined or were not medically well enough to undergo operations. No standard definition or set of physiological criteria was used to select candidates for resection. Instead, fellowship-trained, board-certified surgical oncologists determined medical fitness.

Although there is no algorithm or clinical pathway for patients with sociodemographic risk factors at our institution, several services likely attenuate risks conferred by social determinants of health, including race, ethnicity, language, insurance status, immigration status, housing status, and food security. Although these services have not been directly associated with differences in treatment or outcomes in cancer patients, our nurse navigators, robust interpreter services, immigrant clinic, formal

respite care, and on-site food pantry have enhanced our ability to care for vulnerable populations.

There are several weaknesses that limit the generalizability of this study to all patients from vulnerable populations and to all safety-net medical centers. This was a single-institution, retrospective chart review with a small sample size. Data collected were restricted by the availability of information in the medical record system. Although there were no statistically significant associations between social determinants of health, treatment, and survival, this analysis likely suffers from its sample size. Nevertheless, the data show no adverse influence of race, ethnicity, or primary language on survival or the use of operative or perioperative therapy among patients with pancreatic adenocarcinoma.

Table 4. Impact of Race, Ethnicity, and Insurance Status on Treatment of Stage I and II Patients

Patient characteristic	Patient undergoing operation		p Value	Patient receiving peri-operative therapy*		p Value
	n	%		n	%	
Race			0.357			0.884
White	21	48.8		23	59.0	
Black	12	52.2		13	59.1	
Primary language			0.790			0.948
English	27	49.1		32	64.0	
Non-English	10	52.6		12	63.2	
Insurance			0.252			0.018
Medicaid	15	60.0		16	64.0	
Medicare	9	39.1		10	50.0	
Private	7	63.6		11	100.0	
Ethnicity			0.772			0.384
Non-Hispanic	29	49.2		33	61.1	
Hispanic	8	53.3		11	73.3	

*Perioperative therapy encompassed patients treated with neoadjuvant therapy with intention to perform curative operation.

In addition, patients with private insurance coverage were more likely to receive perioperative therapy.

CONCLUSIONS

This series from an academic safety-net medical center revealed no association between race, ethnicity, or primary language and the survival of patients with pancreatic adenocarcinoma. Similarly, these factors did not influence the likelihood of an operation being performed or perioperative therapy being administered. Even still, privately insured patients with early-stage disease were more likely to receive perioperative therapy than were those with Medicare, Medicaid, Veterans Affairs benefits, or no insurance. A substantial number of patients with operable disease either declined an operation or were not medically fit to undergo curative operation. For patients who had pancreas resections and perioperative therapy, survival was similar to that in a national series, despite a host of factors known to be associated with adverse outcomes among patients with pancreatic cancer. Additional investigations of experiences elsewhere will be important, as the demographics of many urban and rural centers care for larger immigrant and indigent populations.

Author Contributions

Study conception and design: Sridhar, Misir, Tseng, Sachs

Acquisition of data: Sridhar, Misir, Kwak, Sachs

Analysis and interpretation of data: Sridhar, Misir, Kwak, deGeus, McAneny, Tseng, Sachs

Drafting of manuscript: Sridhar, Misir, deGeus, Drake, Cassidy, McAneny, Tseng, Sachs

Critical revision: Sridhar, deGeus, Drake, Cassidy, McAneny, Tseng, Sachs

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