Racial/Ethnic Patterns of Care for Pancreatic Cancer

Vickie L. Shavers, Ph.D.,¹ Linda C. Harlan, Ph.D.,¹
Monica Jackson, Ph.D.,² and JaMuir Robinson, Ph.D., M.P.H.³

Abstract

Introduction: The small proportion of cancers diagnosed at the local disease stage, resectable at the time diagnosis, and responsive to chemotherapy contribute to poor survival making pancreatic cancer the fourth leading cause of cancer death among Americans. This emphasizes the importance of receiving appropriate palliative care. Racial/ethnic cancer treatment disparities have been observed for many cancer sites. We examine patterns of care in a population-based sample of African American, Hispanic and non-Hispanic white patients diagnosed with pancreatic cancer.

Methods: Eligible cases were age 20 or older and newly diagnosed in 1998 with primary adenocarcinoma of the pancreas reported to the National Cancer Institute's Surveillance Epidemiology and End Results (SEER) program and selected for the NCI Patterns of Care/Quality of Care (POC/QOC) project ($n = 697$).

Results: Chemotherapy, the most frequently received treatment was less frequently received by African American patients (odds ratio [OR] 0.61, 95% confidence interval [CI] 0.37–0.95) and radiation less frequently received by Hispanic compared to non-Hispanic white patients (OR 0.50, 95% CI, 0.27–0.95) after adjustment for age, stage, size of tumor, and insurance status in a multivariate regression model. Cancer-directed surgery of the primary site was received by 14.1% of patients, which did not significantly differ by race/ethnicity. Uninsured patients less often were recommended for or received surgery (OR 0.09, 95% CI 0.01–0.62) and (OR 0.07, 95% CI, 0.01–0.49), respectively.

Conclusion: Differences in primary tumor size, stage and insurance status contributed to racial/ethnic differences in the receipt of cancer-directed surgery but did not explain differences in the receipt of chemotherapy for African American or radiation for Hispanic patients. More population-based research is needed to examine race/ethnicity, insurance status and receipt of treatment and palliative care for pancreatic cancer.

Introduction

CANCER OF THE PANCREAS is the fourth leading cause of cancer death among Americans accounting for approximately 3% of overall cancer incidence and 6% of all cancer deaths.¹ It is estimated that more than 37,000 new cases of cancer of the pancreas will be diagnosed among Americans and more than 34,000 deaths from cancer at this site will occur in 2008. The small proportion of cases that are potentially curable^{2–6} makes palliation of symptoms a critical component of patient management^{7,8} because less than 24% of patients are still alive 1 year after diagnosis.² The goals of palliative care for patients with pancreatic cancer include symptom reduction, reduction of in-hospital stays, and adequate pain management.⁹ Practice guidelines for the treatment of locally advanced pancreatic cancer recommend, "palliation for symptomatic patients and life prolongation in medically suitable cases."¹⁰ Approximately 65%–75% of patients de-

velop symptomatic biliary obstruction and 10%–25% symptomatic gastric outlet obstruction.¹¹ Palliative interventions may also be required for pancreatic insufficiency, treatment of thromboembolic disease, depression, pain, and malnutrition. Treatment with surgery, radiation, or chemotherapy generally provides palliation and pain relief. Nutritional support, biliary stenting, and bowel decompression may also be provided for supportive care as appropriate.

Pancreatic cancer incidence rates for 2000–2004 were 27% and 40% higher for African American men and women compared to non-Hispanic white men and women while the respective mortality rates were 29% and 38% higher.² Data from observational research studies have shown racial/ethnic disparities in receipt of cancer treatment^{12–14} and palliative care including receipt of effective pain medication¹⁵ and use of hospice among patients with cancer in general.^{16,17} However, little is known about patterns of care for patients diagnosed with pancreatic cancer or how this might vary by

¹Applied Research Program, National Cancer Institute, Bethesda, Maryland.

²Department of Mathematics and Statistics, American University, Washington, D.C.

³Walden University, Washington, D.C.

racial/ethnicity. This study examined treatment for pancreatic cancer using the NCI Patterns of Care/Quality of Care (POC/QOC) population-based sample of African Americans, Hispanic, and non-Hispanic white patients.

Materials and Methods

Data source

Patients included in this analysis were registered at one of the National Cancer Institute's (NCI) Surveillance Epidemiology and End Results (SEER) programs in the study (i.e., the states of Connecticut, Iowa, New Mexico, and Utah and the metropolitan areas of Detroit, Michigan; Atlanta, Georgia; San Francisco–Oakland and San Jose–Monterey, California; Los Angeles, California; and Seattle, Washington).

The NCI (POC/QOC) studies are designed as exploratory investigations of therapy received for specific cancer sites using cases identified in the SEER registries. In general, these studies provide population-based data on therapy received during the first course of treatment by patients. However, for this study of pancreatic cancer medical record abstractors were asked to record all therapy provided regardless of the time frame and physician. These studies also provide more complete information on the receipt of outpatient treatments such as chemotherapy and radiation than the routine data collection using hospital medical records. For POC/QOC studies, hospital medical records are re-abstracted and the patient's treating physician is contacted to verify all treatments received and/or recommended and refused. The physician is also asked whether another physician provided therapy, if so that physician is also contacted.

Eligibility criteria

Individuals eligible for inclusion in this analysis were age 20 or older at diagnosis, newly diagnosed in 1998 with primary adenocarcinoma of the pancreas (ICDO-2 C25.0–C25.9) reported to one the selected SEER programs. Individuals were ineligible if they were diagnosed at autopsy or by death certificate, did not have microscopically or radiologically confirmed primary pancreatic cancer, or if they had been previously diagnosed with another primary cancer other than nonmelanoma skin cancer.

Demographic characteristics

Demographic characteristics included race/ethnicity (African American, Hispanic, non-Hispanic white), age (years), gender, and marital status (single, married, divorced, separated, widowed, or unknown). Race and Hispanic ethnicity were obtained from the hospital medical records. If ethnicity was not available, the patient's surname or maiden name was used to assess Hispanic ethnicity. Insurance status was assessed at the time of the receipt of the most definitive therapy received by the patient and was categorized as no insurance, private insurance only, HMO or other managed care plan, Medicaid/Medicare only and other insurance.

Cancer-directed surgery

Patients were considered to have received cancer-directed surgery if they received surgery that included resection of the primary tumor. Patients were considered to have received a

recommendation for cancer-directed surgery if surgery was performed, if surgery was recommended but not performed, if surgery was recommended but unknown whether performed, or if surgery was refused. Patients were considered not to have received a recommendation for cancer-directed surgery if surgery was not recommended for the initial course of treatment (first 4 months after diagnosis) or was contraindicated due to other conditions.

Chemotherapy and radiation

Patients were categorized as having received chemotherapy or radiation if the medical record or the physician indicated that the patient received these treatments.

Statistical methods

Sampling. For this study, within each SEER registry, patients diagnosed with invasive pancreatic adenocarcinoma meeting the eligibility criteria were first stratified by race/ethnic group, gender and diagnostic confirmation (i.e., microscopic or radiographic) and then randomly sampled within strata. African Americans and Hispanics were oversampled to obtain more stable estimates.

Analytical methods. All data analyses were performed with SUDAAN (Research Triangle Institute, Research Triangle Park, NC), a statistical software program for the analysis of complex survey and correlated data. χ^2 tests for homogeneity of proportions and p values are used to evaluate racial/ethnic variation in the distribution of demographic and clinical categorical variables. χ^2 tests are also used to separately examine the significance of differences between non-Hispanic whites and African Americans with regard to the receipt of a recommendation for cancer-directed surgery, receipt of cancer-directed surgery, receipt of chemotherapy or radiation. Multivariate logistic regression analyses were performed to examine the receipt of a recommendation for and receipt of cancer-directed surgery and receipt of chemotherapy, or radiation as treatment for pancreatic cancer. Explanatory variables examined in the multivariable analyses included age (years), gender, insurance status (insured/uninsured), the size of primary tumor (<3 cm, >3 cm, unknown size), and comorbidity measured by the Charlson comorbidity score (i.e. 0, 1, and 2+). All variables were entered in a multivariable model for each of the respective response variables. The comorbidity variable was removed from the models related to chemotherapy and radiation because it was not significantly associated with these outcomes. An α of 0.05 was used as the cut point for assessing statistical significance.

Kaplan-Meier survival analyses were used to examine 5-year overall survival (the percentage of participants that did not die from any cause and disease-specific survival) (the percentage of participants who did not die from pancreatic cancer). Stratified survival analyses and the log rank test were used to assess the statistical significance of differences in survival times between the racial/ethnic groups.

Results

Demographic characteristics

There were 2404 patients diagnosed with pancreatic cancer and reported to the SEER registries in 1998, of whom, 697

were sampled. African Americans comprised 25.1%; Hispanics, 18.7%; and non-Hispanic whites, 56.2% of the total sample. The mean age at diagnosis overall was somewhat lower for African Americans (65.0) and Hispanics (64.2) than non-Hispanic whites (69.7; $p < 0.001$). Nearly 8% of Hispanics and more than 5% of African Americans had no health insurance compared to 1% of non-Hispanic whites (Table 1).

Clinical characteristics

Overall, 62.3% of patients with pancreatic cancer in this study were diagnosed with distant-stage disease. Sixty-six percent of African Americans, 62.7% of non-Hispanic whites, and 52.5% of Hispanic patients were diagnosed with distant-stage disease (Table 2). The most common location of the primary tumor was the head of the pancreas. A higher percentage of the tumors among African Americans (16.4%) were diagnosed in the tail of the pancreas compared to Hispanics (7.7%) and non-Hispanic whites (10.2%). Only 5.2% of tumors among African American were less than 3 cm compared to 11.3% of the tumors among Hispanics and 12.7% of the tumors among non-Hispanic whites.

Receipt of cancer-directed surgery

Cancer-directed surgery was received by only 14.1% of patients overall, including 14.8% of Hispanic, 14.5% of NHW and 10.7% of African American patients ($p = 0.365$; Table 3). Surgery was not recommended for 42.9% of patients, contraindicated for 8.1% and was known not to have been recommended for 44.6% of non-Hispanic whites, 36.5% of African Americans and 35.4% of Hispanic patients. For more than 53% of African American, 52% of Hispanic and 35% of non-Hispanic white patients the reason for no cancer-directed

surgery was unknown. Surgery was refused by less than 2% of African American and non-Hispanic white patients while no Hispanic patients refused surgery. While surgery was infrequent, the Whipple was the most frequently performed surgical procedure overall (62.3%) and within each racial/ethnic group (65% non-Hispanic whites, 47% African Americans, 50% Hispanics; Table 3).

In a multivariable logistic regression analysis of the receipt of cancer-directed surgery, older age (OR 0.96, 95%CI 0.93–0.98), distant (OR 0.08, 95% CI 0.03–0.22) or unstaged disease (OR 0.03, 95% CI 0.01–0.17), tumor size greater than 3 cm (OR 0.32, 95% CI 0.14–0.72) or unknown tumor size (OR 0.07, 0.02–0.19) and a Charlson comorbidity score of 2 or more (OR 0.28, 95% CI 0.09–0.84) were significantly associated with lower receipt of cancer-directed surgery. Uninsured patients also had significantly lower adjusted odds of receiving cancer-directed surgery (OR 0.07, 95% CI 0.01–0.49). Race/ethnicity was not significantly associated with the receipt of cancer-directed surgery in models adjusted for other covariates (Table 4).

In multivariate regression model of the receipt of a recommendation for cancer-directed surgery was significantly associated with primary tumor size greater than 3 cm (OR 0.03, 95% CI 0.14–0.74), unknown tumor size (OR 0.08, 95% CI 0.03–0.23), comorbidity score of 2 or more (OR 0.26, 0.08–0.83), and being uninsured (OR 0.09, 0.01–0.62) after controlling for other covariates (Table 4). Race/ethnicity was not statistically associated with a recommendation for cancer-directed surgery in the adjusted model.

Receipt of chemotherapy

Chemotherapy, the most frequently received treatment, was received by 42% of patients with pancreatic cancer in this

TABLE 1. DEMOGRAPHIC CHARACTERISTICS OF PATIENTS DIAGNOSED WITH PANCREATIC CANCER, SEER-POC, 1998 (UNWEIGHTED)

	African American n ^a = 175	Hispanic n ^a = 130	White Non-Hispanic n ^a = 392	Total n ^a = 697	p value
Age ^b					
Mean	65.0	64.2	69.7	67.5	<0.001
Median	65	67	70	—	—
Gender					
Male	46.9	42.3	49.0	47.2	0.413
Female	53.1	57.7	51.0	52.8	
Marital status ^b					
Single	20.0	13.8	11.0	13.8	<0.001
Married	44.6	53.1	57.7	53.5	
Divorced	1.1	1.5	0.3	0.7	
Separated	13.7	9.2	5.4	8.2	
Widowed	18.3	16.2	24.2	21.2	
Unknown	2.3	6.2	1.5	2.6	
Insurance status ^c					
No insurance	5.1	7.7	1.0	3.3	<0.001
Private only (non-HMO)	13.7	12.3	18.9	16.4	
HMO or other managed care plan	22.9	28.5	19.9	22.2	
Medicaid/Medicare only	33.7	37.7	23.0	28.4	
Other insurance	24.6	13.9	37.2	29.7	

^an = Unweighted sample size for the indicated analysis. Numbers may differ from the total sample size indicated because of missing data. Proportions are weighted.

^bSEER 1998.

^cPatterns of Care, 1998.

TABLE 2. INITIAL CLINICAL CHARACTERISTICS OF PATIENTS DIAGNOSED WITH PANCREATIC CANCER, SEER-POC, 1998 (WEIGHTED PERCENT)

<i>Clinical variable</i>	<i>African American ^an = 175</i>	<i>Hispanic ^an = 130</i>	<i>White Non-Hispanic ^an = 392</i>	<i>Total ^an = 697</i>	<i>p value</i>
Stage ^b					
Local	6.0	5.9	5.7	5.8	0.117
Regional	18.6	29.1	25.1	24.6	
Distant	66.0	52.5	62.7	62.3	
Unstaged	9.4	12.5	6.6	7.3	
Size of primary tumor ^b (cm)					
<3 cm	5.2	11.3	12.7	11.7	0.006
3–4.9 cm	23.7	16.9	27.3	26.0	
5 or more cm	23.9	20.0	18.4	19.2	
Unknown	47.3	51.9	41.6	43.1	
Mean and median size of tumors with known size	^a n = 94	^a n = 59	^a n = 208	^a n = 361	0.693
Mean tumor size	4.8	4.7	4.5	4.7	
Median tumor size	4.0	4.0	4.0	—	
Location of primary tumor ^b					
Head of pancreas (C25.0)	49.1	55.1	54.1	53.6	<0.001
Body of pancreas (C25.1)	6.4	2.2	11.1	9.9	
Tail of pancreas (C25.2)	16.4	7.7	10.2	10.8	
Pancreatic duct (C25.3)	0	0.7	1.5	1.3	
Islets of Langerhans (C25.4)	0	0	0.2	0.2	
Pancreas and other, NOS (C25.9)	17.5	17.9	16.5	16.7	
Other/overlapping lesions of pancreas (C25.7–C25.8)	10.6	16.4	6.4	7.7	
Comorbidity ^c					
Charlson co-morbidity score					
0	66.0	58.6	63.2	63.1	0.614
1	24.6	33.5	27.4	27.6	
2 or more	9.4	7.9	9.4	9.3	

^an = unweighted sample size for the indicated analysis. Numbers may differ from the total sample size indicated because of missing data. Proportions are weighted.

^bSEER 1998.

^cPatterns of Care, 1998.

study. Receipt of chemotherapy varied by race/ethnicity with 34.2% of African Americans receiving chemotherapy compared to 42.4% of Hispanics and 43.2% of non-Hispanic white patients (Table 3) but this was not a statistically significant difference in unadjusted analyses. Chemotherapy was refused by 7.4% of African Americans, 7.2% of non-Hispanic whites, and 8.2% of Hispanics ($p = 0.960$).

African Americans were significantly less likely to receive chemotherapy for their pancreatic cancer (OR 0.61, 95% CI 0.37–0.95) compared to non-Hispanic whites in the adjusted logistic regression model. The odds of receiving chemotherapy decreased with increasing years of age (OR 0.94, 95% CI 0.92–0.96). Patients with regional stage disease were significantly more likely to receive chemotherapy compared to those with local stage disease (OR 2.53, 95% CI 1.01–6.30). The most frequently received chemotherapeutic agents were 5-fluorouracil (21.7%) and gemcitabine (20.4%). There were no significant differences between the race/ethnic groups with respect to specific agents (data not presented).

Receipt of radiation

Radiation was received by 20.4% of patients with pancreatic cancer. Radiation was most frequently received in conjunction with chemotherapy (either before, after, or concurrently; Table 3). In the unadjusted analyses radiation did

not significantly vary by race/ethnicity, which was received by 15.5% of Hispanics, 16.4% of African American, and 21.5% of non-Hispanic white patients ($p = 0.223$; Table 3).

In a multivariable logistic regression model that examined receipt of radiation, Hispanic patients were significantly less likely than non-Hispanic whites to receive radiation (OR 0.50, 95% CI 0.27–0.95; Table 4) after adjustment for other covariates. Although there was less frequent receipt of radiation among African Americans compared to non-Hispanic whites this was not a statistically significant finding. Patients with distant and unstaged disease also less frequently received radiation which also decreased with increased age.

Survival

Both the median overall and disease-specific survival times was 4 months while the mean was 9.6 months and 8.1 months, respectively (data not presented in tables). The three race/ethnic groups did not significantly differ in terms of either the mean or median overall survival. The mean and median overall survival times were 8.1 and 4 months for African Americans, 10 and 6 months for Hispanics, and 9.5 and 4 months for non-Hispanic whites, respectively. The mean and median disease specific survival times were 6.5 and 3 months for African Americans, 8.9 and 4.5 months for Hispanics, and 8.2 and 4 months for non-Hispanic whites, respectively.

TABLE 3. PATTERNS OF CARE FOR PATIENTS DIAGNOSED WITH PANCREATIC CANCER, SEER-POC, 1998 (WEIGHTED PERCENT)

	<i>African American</i> ^a n = 175	<i>Hispanic</i> ^a n = 130	<i>Non-Hispanic white</i> ^a n = 392	<i>Total</i> ^a n = 697	<i>p value</i>
Site-specific surgery					
No cancer directed surgery of primary site	89.3	85.2	85.5	85.9	0.365
Received cancer directed surgery of primary site	10.7	14.8	14.5	14.1	
Type of surgery (<i>among those receiving surgery</i>)					
Partial pancreatectomy, NOS	18.1	10.6	14.2	14.3	0.084
Total pancreatectomy	7.6	0	0	0.7	
Total pancreatectomy with subtotal gastrectomy or duodectomy.	0	4.4	10.6	9.2	
Local or partial pancreatectomy and duodenectomy	0	13.0	2.6	3.2	
Without subtotal gastrectomy	15.2	4.4	2.8	4.0	<0.0001
With subtotal gastrectomy (Whipple)	46.7	49.6	65.2	62.3	
Extended pancreatoduodenectomy	0	9.7	2.2	2.6	
Pancreatectomy, NOS	0	0	1.5	1.3	
Surgery, NOS	0	4.1	0.8	1.0	
Unknown if cancer directed surgery performed	12.3	4.2	0	1.4	
Reason no cancer-directed surgery (<i>among those not receiving surgery</i>)					
Cancer directed surgery not recommended	36.5	35.4	44.6	42.9	
Contraindicated due to other conditions	4.1	6.1	8.9	8.1	
Unknown reason for no cancer-directed surgery	53.2	52.3	35.4	38.8	
Cancer directed surgery was refused	1.6	0	1.6	1.4	0.130
Recommended unknown if done	0	0	0.3	0.2	
Unknown if cancer directed surgery performed	4.7	6.2	9.3	8.5	
Chemotherapy					
Chemotherapy not given	65.8	57.6	56.8	57.9	0.130
Received chemotherapy	34.2	42.4	43.2	42.1	
Reason no chemotherapy					
Refused chemotherapy	7.4	7.2	8.2	8.0	0.960
Did not refuse chemotherapy	92.6	92.8	91.8	92.0	
Radiation					
Radiation not given	83.6	84.5	78.5	79.6	0.223
Received radiation	16.4	15.5	21.5	20.4	
Radiation sequence with surgery					
No radiation and/or no cancer directed surgery	95.5	93.3	94.0	94.1	0.436
Radiation before surgery	0.4	0	0.2	0.2	
Radiation after surgery	4.1	5.6	5.2	5.1	
Intraoperative radiation	0	0.6	0.5	0.4	
Intraoperative radiation with other radiation given before or after surgery	0	0.6	0.2	0.2	
Radiation therapy sequence with chemotherapy					
No radiation and/or chemotherapy	84.9	85.1	81.9	82.5	0.085
Radiation before chemotherapy	2.7	0	0.6	0.8	
Radiation after chemotherapy	2.4	4.4	3.5	3.4	
Concurrent radiation and chemotherapy.	8.0	8.7	11.2	10.7	
Concurrent radiation and chemotherapy with other radiation given before or after chemotherapy	1.3	0.6	2.2	1.9	
Chemotherapy before and after radiation	0.8	0	0	0.1	
Both given, sequence unknown	0	1.2	0.6	0.6	
Treated on a clinical trial protocol					
Yes	3.3	0.7	5.5	4.9	0.027
No	90.5	95.6	90.3	90.7	
Refused	1.2	0	0.3	0.4	
Recommended, unknown if treated on protocol	0	0	0.9	0.7	
Unknown	5.0	3.8	3.1	3.4	

^an, Unweighted sample size for the indicated analysis. Numbers may differ from the total sample size indicated because of missing data. Proportions are weighted.

ⁿ* Unweighted sample size for the indicated analysis. Numbers may differ from the total sample size indicated because of missing data. Proportions are weighted.

TABLE 4. MULTIPLE LOGISTIC REGRESSION ANALYSES OF RECEIPT OF A RECOMMENDATION AND RECEIPT OF CANCER-DIRECTED SURGERY, CHEMOTHERAPY, OR RADIATION AS TREATMENT FOR PANCREATIC CANCER, SEER-POC 1998

	<i>Receipt of recommendation for cancer-directed surgery OR (95% CI)</i>	<i>Receipt of cancer-directed surgery OR (95% CI)</i>	<i>Receipt of chemotherapy OR (95% CI)</i>	<i>Receipt of radiation OR (95% CI)</i>
Race/ethnicity				
Non-Hispanic white	1.0	1.0	1.0	1.0
African American	1.22 (0.59–2.55)	0.93 (0.46–1.89)	0.61 (0.37–0.95)	0.74 (0.42–1.30)
Hispanic	1.30 (0.62–2.74)	0.91 (0.44–1.89)	0.88 (0.55–1.39)	0.50 (0.27–0.95)
Age (Yrs)	0.98 (0.95–1.00)	0.96 (0.93–0.98)	0.94 (0.92–0.96)	0.97 (0.95–0.99)
Stage				
Local	1.0	1.0	1.0	1.0
Regional	1.0 (0.39–2.55)	0.82 (0.37–1.82)	2.53 (1.01–6.30)	1.35 (0.54–3.36)
Distant	0.15 (0.05–0.42)	0.08 (0.03–0.22)	1.74 (0.73–4.14)	0.19 (0.07–0.49)
Unstaged	0.32 (0.08–1.32)	0.03 (0.01–0.17)	1.20 (0.40–3.62)	0.25 (0.07–0.88)
Charlson comorbidity score				
0	1.0	1.0	—	—
1	0.62 (0.25–1.51)	0.72 (0.30–1.71)		
2+	0.26 (0.08–0.83)	0.28 (0.09–0.84)		
Size of primary tumor				
<3 cm	1.0	1.0	1.0	1.0
>3 cm	0.32 (0.14–0.74)	0.32 (0.14–0.72)	0.81 (0.40–1.66)	0.88 (0.39–2.01)
Unknown size	0.08 (0.03–0.23)	0.07 (0.02–0.19)	0.75 (0.36–1.60)	0.47 (0.19–1.16)
Insurance status				
Insured	1.0	1.0	1.0	1.0
Uninsured	0.09 (0.01–0.62)	0.07 (0.01–0.49)	0.36 (0.11–1.21)	1.82 (0.56–5.96)

Note: Comorbidity was significantly associated with the receipt of a recommendation and receipt of cancer directed surgery only.
OR, odds ratio; CI, confidence interval.

Discussion

Generally only patients with pancreatic cancer with localized disease are considered potentially curable.¹⁸ Treatment of patients with locally advanced and metastatic disease therefore is generally for palliation.¹¹ After adjusting for other clinical and demographic variables African Americans were less often given chemotherapy and Hispanics less often received radiation than non-Hispanic whites. Chemotherapy can relieve symptoms,¹⁹ improve functional status,⁶ and slightly improves survival among patients with advanced pancreatic cancer^{20,21} compared to the best supportive care or symptom management only.¹⁹ Chemotherapy, although the most frequently received treatment among patients in this study, was significantly less frequently received by African American patients compared to non-Hispanic white patients. This difference was not explained by differences in clinical or demographic characteristics.

A possible explanation for the racial/ethnic differences in care could be differences in provider referral to a medical oncologist. As Luo et al.²² note, medical oncology referral is one of the most important determinants of the receipt of chemotherapy. However, other studies have found a lower receipt of chemotherapy for African Americans compared to non-Hispanic whites although there were no differences in the receipt of a consultation with a medical oncologist.²³ Another explanation is that African American and Hispanic patients may have been palliated with other treatments. It is unlikely, however, that treatment with radiation was used in lieu of chemotherapy as less than 17% of African Americans received radiation, which was similar to the rates among Hispanics

and non-Hispanic whites. It is also possible but unlikely that pain medication or other supportive care may have been more frequently used by African Americans and Hispanics, however, this could not be directly assessed in this study. Differences in patient refusal of chemotherapy would also not explain differences in the receipt of chemotherapy as the rates of refusal were similar across the race/ethnic groups.

Reasons for the racial/ethnic variation in the receipt of radiation are not clear. Radiation is seldom used as a stand-alone treatment for pancreatic cancer. Treatment of pancreatic with radiation is usually done in combination with chemotherapy. Therefore, it is not clear whether or not Hispanic patients received less appropriate care because of the lower use of radiation.

We also observed a trend toward the lower receipt of a recommendation for and receipt of cancer-directed surgery and a nonsignificant lower use of chemotherapy among uninsured patients in this study. The use of either chemotherapy or radiation also decreased with age.

Overall, only 14% of patients received cancer-directed surgery that did not significantly differ by race/ethnicity. This finding is consistent with other reports of the low resectability of pancreatic tumors.^{24, 25}

Although a slightly lower proportion of African Americans received cancer-directed surgery, results from the multivariate analyses suggest that differences in size of the primary tumor, stage and insurance status contributed to racial/ethnic differences in the receipt of cancer-directed surgery. In another study Eloubeidi²⁶ found that African Americans were more likely to refuse surgery; however, in our study there was little racial/ethnic variation in the proportion of patients that

refused surgery. Our data show that receipt of cancer-directed surgery also varied significantly by stage, Charlson comorbidity score, size of the tumor, and insurance status.

Racial/ethnic differences in receipt of treatment of other cancer sites have primarily focused on cancer directed surgery and adjuvant therapy with curative intent and thus is sometimes explained by differences in stage at diagnosis. Because of the low number of patients with pancreatic cancer diagnosed with early stage disease or that can be treated surgically, treatment frequently focuses on palliation of symptoms including pain. Approximately 70%–80% of patients with pancreatic cancer have pain at the time of diagnosis which increases to approximately 90% among patients with advanced pancreatic cancer.²⁷ We therefore believe that most of the treatment recorded in this study was for palliation. The low number of patients who received resection and the less frequent use of chemotherapy and radiation among African Americans and Hispanics, respectively, suggest that there may be racial/ethnic disparities in receipt of palliative care for pancreatic cancer. Future research studies are needed that further examine racial/ethnic variation in receipt of palliative care among patients treated for pancreatic cancer.

We also examined disease-specific and overall survival to assess whether racial/ethnic differences in the receipt of chemotherapy and other treatment might be due to earlier mortality among African Americans. Our results showed no significant differences by race/ethnicity with regard to either overall or disease-specific survival which suggests that earlier mortality is unlikely to account for differences noted in the receipt of cancer-directed surgery, chemotherapy or radiation among patients with pancreatic cancer in this study.

Study limitations

Although we had no information on patient preferences for treatment we did have information regarding treatment refusals. Since this is often a rapidly fatal disease patients may have strong opinions on the type of therapy they would be willing to accept. Because we found little difference between the race/ethnic groups with regard to treatment refusals it is unlikely that this explains much of the treatment differences we observed. We are also unable to determine why patients who had surgery recommended did not have it performed. It is possible that further diagnostic imaging after the initial assessment may have revealed contraindications to surgery, that the patient's condition deteriorated before surgery could be performed, or that other contraindications to surgery were found after the opening incision.

Hispanic ethnicity was assigned to about 1.2% of all patients with pancreatic cancer because they had Hispanic surnames but a country of origin was not identified. A recent study comparing SEER-assigned ethnicity with self-reported race/ethnicity has estimated SEER sensitivity to be 79% for Hispanic ethnicity and 90% for African American and white race.²⁸

The small sample sizes should be considered in the interpretation of the findings from the analyses containing health insurance status. Only 23 patients in this study were uninsured. A higher percentage of uninsured patients had contraindications to surgery which partially explains the lower receipt of a recommendation for cancer-directed surgery. Nonetheless, these data suggest that there is a need to take a

closer look at the role of the lack of health insurance at the time of diagnosis among cancer patients and the role it plays the prevalence of contraindications to treatment. We were also unable to examine site of care due to insufficient sample size.

Conclusion

Consistent with the observations of other studies, only approximately 14% of patients with pancreatic cancer in this study presented with resectable tumors. Differences in the overall pattern of care observed across the racial/ethnic groups were not fully accounted for by differences in clinical characteristics. More research may be needed to fully understand the role that race/ethnicity, age, insurance status, and patient preference play in the receipt of palliative care for pancreatic cancer. Utilization patterns of other palliative measures for pancreatic cancer, such as pain medications, nerve blocks, and other procedures that alleviate the pain, reduce symptoms and discomfort, and their acceptability among diverse patients should also be investigated.

Acknowledgments

The authors thank the participating SEER registries without whom this research would not have been possible. The authors also thank Dr. Rachel Ballard-Barbash, John Kerner, and Martin L. Brown of the National Cancer Institute for their review of the draft manuscript and Jennifer Stevens of Information Management Services for her assistance with the data analysis. Funding was provided by National Cancer Institute (NCI) Contract Numbers: N01-PC-35133, N01-PC-35135, N01-PC-35136, N01-PC-35137, N01-PC-35138, N01-PC-35139, N01-PC-35141, N01-PC-35142, N01-PC-35143, N01-PC-35145; HHS Contract Numbers: HHSN261200544002C, HHSN261200544003C, HHSN261200544004C, HHSN261200544005C; and Interagency agreement Y1-PC-4033.

Author Disclosure Statement

No competing financial interests exist.

References

1. American Cancer Society: Cancer Facts & Figures 2008. Atlanta, GA: American Cancer Society, 2008.
2. Ries LAG, Melbert D, Krapcho M, Stinchcomb DG, Howlander N, Horner MJ, Mariotto A, Miller BA, Feuer EJ, Altekruse SF, Lewis DR, Clegg L, Eisner MP, Reichman M, Edwards BK (eds): SEER Cancer Statistics Review, 1975–2005. http://seer.cancer.gov/csr/1975_2005/, based on November 2007 SEER data submission, posted to the SEER website, 2008. National Cancer Institute. Bethesda, MD (Last accessed May 28, 2009).
3. Mancuso A, Calabro F, Sternberg CN: Current therapies and advances in the treatment of pancreatic cancer. *Crit Rev Oncol Hematol* 2006;58:231–241.
4. Erickson RA. Pancreatic Cancer. Updated December 15, 2005. www.emedicine.com/med/topic1712.htm (Last accessed November 13, 2006).
5. Kamar FG, Grossbard ML, Kozuch PS: Metastatic pancreatic cancer: Emerging strategies in chemotherapy and palliative care. *Oncologist* 2003;8:18–34.
6. Shore S, Raraty MGMT, Ghaneh P, Neoptolemos JP: Review article: Chemotherapy for pancreatic cancer. *Ailment Pharmacol Ther* 2003;18:1049–1069.

7. Nakakura EK, Warren RS: Palliative care for patients with advanced pancreatic and biliary cancers. *Surg Oncol* 2007;16:293–297.
8. Vulfovich M, Roch-Lima C: Novel advances in pancreatic cancer treatment. *Expert Rev Anticancer Ther* 2008;8:993–1002.
9. Bahra M, Jacob D: Surgical palliation of advanced pancreatic cancer. *Recent Results Cancer Res* 2008;177:111–120.
10. Earle CC, Agboola O, Maroun J, Zuraw L; Gastrointestinal Cancer Disease Site Group: The treatment of locally advanced pancreatic cancer. Practice guideline Report #2-7. Program in evidenced-based care. www.guideline.gov/summary/summary.aspx?doc_id=5585 (Last accessed February 11, 2009).
11. National Comprehensive Cancer Network, Inc. Practice Guidelines in Oncology – v.1.2008. Pancreatic Adenocarcinoma. www.nccn.org/professionals/physician_gls/PDF/pancreatic.pdf (Last accessed February 11, 2009).
12. Smedley BD, Stith AY, Nelson AR (eds): *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*. Committee on Understanding and Elimination Racial and Ethnic Disparities in Health Care. Health Board on Science Policy. Institute of Medicine. Washington, D.C.: National Academies Press, 2003.
13. Shavers VL, Brown ML: Racial/ethnic disparities in the receipt of cancer treatment. *J Natl Cancer Inst* 2002;94:334–357.
14. Bach PB, Cramer LD, Warren JL, Begg CB: Racial differences in the treatment of early stage lung cancer. *N Engl J Med* 2005;352:205–213.
15. Rabow MW, Dibble SL: Ethnic differences in pain among outpatients with terminal and end-stage chronic illness. *Pain Med* 2005;6:235–241.
16. Connor SR, Elwert F, Spence, Christakis NA: Racial disparity in hospice use in the United States in 2002. *Palliat Med* 2008;22:205–213.
17. O'Mara A, Arenella C: Minority representation, prevalence of symptoms and utilization of services in a large metropolitan hospice. *J Pain Symptom Manage* 2001;290–297.
18. Pierantoni C, Pagliacci A, Scartozzi M, Berardi R, Bianconi M, Cascinu S. Pancreatic cancer: Progress in cancer therapy. *Crit Rev Oncol Hematol* 2008;67:27–38.
19. Desai SP, Zalupski MM: Pancreatic cancer and survival: The role of chemotherapy. *Cancer News*. www.cancernews.com/data/Article/323.asp (Last accessed September 30, 2008).
20. Molinari M, Helton WS, Espat NJ: Palliative strategies for locally advanced unresectable and metastatic pancreatic cancer. *Surg Clin North Am* 2001;81:651–666.
21. Polati E, Finco G, Götting L, Bassi C, Pederzoli P, Ischia S: Prospective randomized double-blind trial of neurolytic coeliac plexus block in patients with pancreatic cancer. *Br J Surg* 1998;85:199–201.
22. Luo R, Giordano SH, Freeman JL, Zhang D, Goodwin JS: Referral to medical oncology: A crucial step in the treatment of older patients with stage III colon cancer. *Oncologist* 2006;9:1025–1033.
23. Baldwin L, Dobie SA, Billingsley K, Cai Y, Wright GE, Dominitz JA, Barlow W, Warren JL, Taplin SH: Explaining black-white differences in receipt of recommended colon cancer treatment. *J Natl Cancer Inst* 2005;97:1211–1220.
24. National Cancer Institute: Pancreatic Cancer (PDQ): Treatment. Health Professional Version. www.cancer.gov/cancertopics/pdq/treatment/pancreatic/HealthProfessional (Last accessed November 13, 2006).
25. Cardenas HR, Chiorean EG, DeWitt J, Schmidt M, Loehrer P: Locally advanced pancreatic cancer: current therapeutic approach. *Oncologist* 2006;11:612–623.
26. Eloubeidi MA, Desmond RA, Wilcox CM, Wilson RJ, Manichikalapati P, Fouad MM, Eltoum I, Vickers SM: Prognostic factors for survival in pancreatic cancer: A population-based study. *Am J Surg* 2006;192:322–329.
27. Michaels AJ, Draganov PV: Endoscopic ultrasonography guided celiac plexus neurolysis and celiac plexus block in the management of pain due to pancreatic cancer and chronic pancreatitis. *World J Gastroenterol* 2007;13:3575–3580.
28. Clegg LX, Reichman ME, Hankey BF, Miller BA, Lin YD, Johnson NJ, Schwartz SM, Bernstein L, Chen VW, Goodman MT, Gomez SL, Graff JJ, Lynch CF, Lin CC, Edwards BK: Quality of race, Hispanic ethnicity, and immigrant status in population-based cancer registry data: Implications for health disparity studies. *Cancer Causes Control* 2007;18:177–187.

Address correspondence to:
 Vickie L. Shavers, Ph.D.
 Applied Research Program
 National Cancer Institute
 6130 Executive Boulevard
 EPN Room 4005
 Bethesda, MD 20892

E-mail: shaversv@mail.nih.gov