Factors Contributing to Palliative Care Use in Pancreatic Cancer: A Review of the 2004 – 2016 National Cancer Database

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Abstract

Introduction: Palliative Care (PC) is offered to patients with pancreatic cancer with the aim of providing symptomatic relief and enhancing quality of life. Despite its benefits, utilization varies. The purpose of this study was to determine factors associated with PC use amongst patients who died of pancreatic cancer. Methods: Deceased patients treated for pancreatic adenocarcinoma were identified using the 2004-2016 National Cancer Database. Multivariable logistic regression was used to evaluate patient, disease, and institutional features associated with PC use. Patients were classified into three categories based on survival: <6 months, 6-12 months, and 12+ months.

Results: A total of 296,617 patients were identified, of which 14.7% received PC. Patient characteristics with the largest percentages included: white (83.8%), Charlson-Deyo score of 0 (65.1%), Medicare (59.3%), metropolitan location with population >1 million (50.5%), stage IV cancer (45.2%), East Coast (43.3%), and treatment in an academic/research program (40.9%). Patients with stage II, III, and IV cancer had increased odds of receiving PC in all survival groups compared to stages 0 and I. The percentage of patients receiving PC was significantly greater in those surviving <6 months *vs.* >12 months (17.0% *vs.* 9.7%, respectively). Multivariable logistic regression revealed that patients who received PC were more likely to be younger, Asian, Medicaid, recently diagnosed, have stage II-IV disease, not have a high school diploma, have a higher Charlson-Deyo score, report a median annual income <$38,000, and live in urban or rural areas.

Conclusions: Amongst patients diagnosed with pancreatic cancer, there is a national underutilization of PC with <15% of patients engaging in these services. Disparities are known to exist in both access to and provision of PC services. Identifying patterns associated with PC use is the first step towards closing this gap in health equity, as these factors can be used to create interventions aimed at increasing patient participation in these adjuncts.

Keywords: Pancreatic cancer; Palliative care; Health disparities; Health equity; NCDB

Introduction

Pancreatic cancer accounts for 3% of all cancers in the United States and 7% of all cancer deaths [1]. The American Cancer Society estimates that 57,600 people will be diagnosed and approximately 47,050 people will die of pancreatic cancer in 2020.1 Despite recent improvements in overall survival, pancreatic cancer remains a highly lethal disease, with nearly 80% of patients presenting with metastatic or locally advanced disease [2]. Given its aggressive nature and high mortality rate, it serves to reason that most patients will benefit from adjunct treatments at some point during their disease process. The World Health Organization describes palliative care (PC) as "an approach that improves the quality of life of patients and their families facing the problem associated with life-threatening illness, through the prevention and relief of suffering by means of early identification and impeccable assessment and treatment of pain and other problems, physical, psychosocial and spiritual" [3]. Indeed, PC aims to improve quality of life by providing treatment that extends beyond the traditional goals of addressing physical symptoms associated with advanced disease by integrating the psychosocial and spiritual aspects of patient care [2]. Early intervention with PC has been shown to result in significant improvements in quality of life, mood, and functional status as well as decreased suffering with less aggressive care at the end of life, increased palliation of symptoms, and longer survival as compared with patients receiving standard care alone [4-5].

It has been suggested that PC should be viewed as part of the spectrum of survivorship and supportive care, with introduction early in the course of an illness in conjunction with standard therapy [2]. In fact, the American Society of Clinical Oncology (ASCO) provisional clinical opinion (PCO) on the integration of PC into standard oncology care for all patients diagnosed with cancer states that inpatients and outpatients with advanced cancer should receive dedicated palliative care services early in the disease course concurrent with active treatment, optimally with referral of patients to interdisciplinary palliative care teams [6,7]. However, disparities are unfortunately known to exist in cancer care and outcomes, as well as in the access to and provision of adjunct treatments including PC [8-10]. That said, there is a paucity of literature examining the nature of these disparities [8,9]. Although previous studies have demonstrated the success of palliation and supportive therapy in pancreatic cancer, [2,11-13] there is no documentation in the literature regarding the population that utilizes these services. In order to close the gap in health equity across patients with pancreatic cancer as it pertains to PC, it is imperative to distinguish patterns of variation in its use as there is currently a knowledge gap regarding the patient, institutional, and regional factors associated with the use of PC services in pancreatic cancer. This data can subsequently be used to help target interventions, which could in turn increase the use of PC in this vulnerable patient population. The

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objective of this study was to determine factors associated with PC use amongst patients who died of pancreatic cancer.

Equipment and protocol

The National Cancer Database (NCDB) is a joint project of the American College of Surgeons Commission on Cancer (CoC) and the American Cancer Society containing Health Insurance Portability and Accountability Act compliant de-identified patient data. It is a prospectively maintained registry which gathers information on >70% of all malignant diagnoses compiled from over 1500 CoC accredited institutions across the United States. After obtaining a Data Use Agreement, as well as Institutional Review Board approval, the 2004-2016 NCDB database was queried for patients with pancreatic adenocarcinoma utilizing histology codes 8140 and 8500. The analysis was then limited to those who were deceased. Patients were classified according to their length of survival from of time diagnosis (<6 months, 2-24 months, >24 months). The percentage of patients receiving PC was calculated by the number of patients receiving PC at each facility in the given year as the numerator and the total number of patients with a diagnosis of pancreatic adenocarcinoma in the given year as the denominator. Patient characteristics extracted included age, gender, race, income, primary insurance payer, attainment of high school diploma, year of diagnosis, great circle distance from treating facility, clinical stage, tumor grade, and Charlson-Deyo comorbidity score. Treatment facility data extracted included treatment facility type, geographic region, and urban or rural location.

PC receipt and type of PC provided were defined by the NCDB PC treatment code (palliative_care_hosp). The NCDB PC codes are as follow: 0=" no PC provided", 1="surgery to alleviate symptoms", 2="radiation therapy to alleviate symptoms", 3="chemotherapy, hormone therapy, or other systemic drugs to alleviate symptoms", 4="pain management therapy with no other PC", 5 = "any combination of codes 1, 2, and/or 3 without code 4", 6="Any combination of codes 1, 2, and/or 3 with code 4", 7="PC was performed or referred, but no information on the type of procedure is present in record", 9="it is unknown if PC was performed or referred, not stated in patient record". For the purposes of this study, treatment codes [1-7] were defined as PC received, and 0 or 9 as PC not received.

Data were described as percentages, and the Pearson Chi Square test was used to compare distributions of patient characteristics, facility characteristics, and cancer information across duration of survival. Multivariable logistic regression models stratified into three groups by duration of survival (<6 months, 6-12 months, and 12+ months)

were used to determine the associations between PC use and patient characteristics, facility characteristics, and cancer characteristics. All tests of significance were 2-sided and P<0.01 was considered significant. All calculations were performed using commercially available software (Stata version 14.2; Stata Corp, College Station, TX).

Results

A total of 296,617 deceased patients treated for pancreatic cancer from 2004 through 2015 were identified. Overall, 14.7% of these patients received PC. Use of PC varied significantly across patient characteristics by duration of survival. Percentage of patients receiving PC was significantly greater in those surviving for less than 6 months (17.0%) compared to those surviving for more than 12 months (9.7%). Pain management was the most commonly received PC service, more so in patients surviving for less than 6 months. Patient categories with the largest percentages of PC utilization were white (83.8%), Charlson-Deyo score of 0 (65.1%), Medicare (59.3%), metropolitan location with population >1 million (50.5%), stage IV cancer (45.2%), East Coast (43.3%), and treatment in an academic/research program (40.9%). Table 1 shows patient characteristics by duration of survival.

Table 2 shows the results of multivariate logistic regression analysis evaluating the factors associated with the use of PC by duration of survival. Older patients who survived less than 6 months had lower odds of receiving PC (OR=0.94, P<0 .001) as compared to younger patients. A more recent year of diagnosis was associated with increased odds of PC use compared to earlier years of diagnosis. This association was consistent across all categories of survival (OR=1.07, P<0.001; OR=1.04, P<0.001; OR=1.04, P<0.001 for the <6 months, 6-12 months, and >12 months survival groups, respectively). Patients of Asian race, especially those surviving for >12 months, had a significantly increased odds of receiving PC compared to the patients of White race.

Patients with Medicare insurance, other government insurances and those without insurance had similar odds of receiving PC compared to private insurance, while those with Medicaid had a significantly higher odds of PC use compared to private insurance if they survived for more than 12 months (OR=1.34, P=0.005). Patients with an unknown insurance status had lower odds of PC use if they survived for less than 6 months (OR=0.70, P=0.003).

Deceased patients who had a median annual income of more than $63,000 and survived for more than 6 months had decreased odds of receiving PC compared to those with a median annual income less than $38,000. Patients who lived in areas with a lower percentage

	Survival, Months			Total	
	<6 (n=156,584)	6-12 (n=61,782)	>12 (n=78,251)	(n=296,617)	P
Palliative care					
Received palliative care					<0.001
No	82.7	84.1	89.2	84.7	
Yes	17.0	15.1	9.7	14.7	
Unknown	0.3	0.8	1.1	0.6	
Type of palliative care					<0.001
None	82.7	84.1	89.2	84.7	
Surgery/radiotherapy/chemotherapy only	0.3	0.6	0.4	0.4	
Pain management only	3.6	1.1	0.5	2.3	
Surgery/radiotherapy/chemotherapy in combination with pain management	1.0	0.9	0.5	0.8	
Unknown	0.3	0.8	1.1	0.6	
Patient characteristics					
Age, years					<0.001

<50	3.8	6.5	7.6	5.4	
50-64	23.8	32.4	35.8	28.7	
65-74	27.5	30.4	31.8	29.2	
75-84	30.2	24.0	20.6	26.4	
≥ 85	14.7	6.7	4.2	10.3	
Year of diagnosis					<0.001
2004-2005	14.5	14.3	13.6	14.2	
2006-2007	15.7	15.8	15.5	15.7	
2008-2009	16.8	17.2	16.9	16.9	
2010-2011	17.4	17.2	18.6	17.7	
2012-2013	17.4	17.7	19.4	18.0	
2014-2015	18.1	17.8	16.0	17.5	
Sex					0.003
Female	49.5	49.3	48.7	49.2	
Male	50.5	50.7	51.3	50.8	
Race/ethnicity					<0.001
White	83.3	84.0	84.7	83.8	
Black	12.5	11.7	10.8	11.9	
Hispanic	0.3	0.2	0.3	0.2	
Asian	2.2	2.1	2.2	2.2	
Other/unknown	1.8	2.0	2.0	1.9	
Primary payer					<0.001
Private insurance	23.6	33.5	38.6	29.6	
Medicaid	5.1	5.1	4.6	4.9	
Medicare	65.2	55.3	50.6	59.3	
Other government insurance	1.0	1.2	1.1	1.1	
Not insured	3.1	2.7	2.3	2.8	
Insurance status unknown	2.0	2.3	2.7	2.3	
Median income quartiles (2008-2012)					<0.001
Missing	0.5	0.5	0.5	0.5	
<US $38,000	19.4	17.6	15.5	18.0	
US $38,000-US $47,999	24.0	23.5	22.2	23.4	
US $48,000-US $62,999	26.4	26.6	26.8	26.6	
≥ US $63,000	29.7	31.7	35.0	31.5	
% with no high school diploma (2008-2012)					<0.001
Missing	0.4	0.5	0.4	0.4	
≥ 21	18.1	16.5	14.9	16.9	
13 – 20.9	26.7	25.7	24.5	25.9	
7-12.9	32.4	32.9	33.3	32.8	
<7	22.4	24.4	26.9	24.0	
Urban/rural 2013					<0.001
Missing	2.5	2.6	2.7	2.6	
Metro >1 million	50.0	50.3	51.6	50.5	
Metro 250,000-1 million	21.7	20.6	20.6	21.2	
Metro <250,000	10.0	9.9	9.6	9.9	
Urban >20,000 adjacent to metro	4.6	4.8	4.6	4.6	
Urban >20,000 not adjacent to metro	1.4	1.5	1.3	1.4	
Urban 2500-19,999 adjacent to metro	5.3	5.7	5.2	5.4	
Urban 2500-19,999 not adjacent to metro	2.5	2.6	2.6	2.5	
Rural/urban < 2500 adjacent to metro	1.0	0.9	0.8	0.9	
Rural/urban < 2500 not adjacent to metro	1.0	1.0	0.9	1.0	
Great circle distance, miles					<0.001
<2	11.1	8.4	7.1	9.5	
2-4	21.5	17.1	15.1	18.9	
5-9	21.3	19.6	18.5	20.2	
10-20	17.7	18.7	19.2	18.3	
21-45	14.4	17.3	18.1	16.0	
>45	14.0	18.9	22.0	17.1	

Charlson-Deyo score					<0.001
0	61.4	68.6	70.0	65.1	
1	26.2	23.7	23.2	24.9	
2	7.9	5.6	5.0	6.7	
≥ 3	4.5	2.1	1.8	3.3	
Hospital characteristics					
Geographic region					<0.001
Missing	0.5	0.9	1.2	0.8	
East Coast	42.9	43.3	43.9	43.3	
Central	40.5	40.6	39.1	40.1	
Mountain	4.2	4.2	4.2	4.2	
Pacific	11.9	11.0	11.6	11.6	
Facility type					<0.001
Missing	0.5	0.9	1.2	0.8	
Community cancer program	8.9	6.4	5.2	7.4	
Comprehensive Community cancer program	41.6	35.6	30.8	37.5	
Academic/research program	34.8	44.2	50.5	40.9	
Integrated Network Cancer Program	14.2	12.9	12.3	13.4	
Tumor characteristics					
Grade					<0.001
Well differentiated	2.3	3.6	7.7	4.0	
Moderately differentiated	8.5	14.8	23.8	13.8	
Poorly differentiated	14.1	16.0	16.6	15.2	
Undifferentiated, anaplastic	0.9	0.8	0.8	0.9	
Cell type not determined	74.2	64.8	51.1	66.1	
AJCC stage					<0.001
Occult/0/I	6.3	10.7	15.5	9.6	
II	10.4	19.6	24.2	16.0	
III	7.3	13.8	13.4	10.3	
IV	58.7	38.2	23.6	45.2	
NA/unknown	17.3	17.7	23.3	18.9	
Abbreviations: AJCC: American Joint Committee on Cancer; Metro: Metropolitan Area; NA: Not Available.					

Table 1: Patient demographics and clinical characteristics by duration of survival for patients with pancreatic cancer.

Covariate	<6 months		6-12 months		>12 months	
	OR (95% CI)	P	OR (95% CI)	P	OR (95% CI)	P
Age	0.94 (0.90-0.97)	<0.001	0.99 (0.93-1.05)	0.69	1.01 (0.95-1.08)	0.71
Year of diagnosis	1.07 (1.06-1.09)	<0.001	1.04 (1.01-1.07)	0.007	1.04 (1.01-1.07)	0.01
Male (ref female)	0.95 (0.89-1.01)	0.08	0.91 (0.83-1.00)	0.04	0.95 (0.87-1.04)	0.28
Race/ethnicity (ref White)						
Black	0.88 (0.80-0.97)	0.01	1.00 (0.87-1.16)	0.96	1.04 (0.89-1.21)	0.62
Hispanic	1.42 (0.90-2.23)	0.14	1.31 (0.57-2.99)	0.53	1.05 (0.45-2.45)	0.90
Asian	1.24 (1.02-1.51)	0.03	1.29 (0.93-1.77)	0.13	1.52 (1.15-2.01)	0.003
Other/Unknown	0.94 (0.74-1.18)	0.58	1.08 (0.77-1.53)	0.65	1.24 (0.91-1.69)	0.17
Primary payer (ref private)						
Medicaid	1.16 (1.02-1.33)	0.02	1.07 (0.87-1.32)	0.55	1.34 (1.09-1.64)	0.005
Medicare	1.03 (0.96-1.12)	0.41	1.11 (0.98-1.25)	0.10	1.07 (0.95-1.21)	0.28
Other government insurance	0.86 (0.64-1.15)	0.31	1.46 (0.99-2.14)	0.06	1.02 (0.66-1.58)	0.93
Not insured	1.00 (0.86-1.18)	0.98	1.14 (0.88-1.49)	0.32	1.13 (0.85-1.49)	0.39
Insurance status unknown	0.70 (0.52-0.87)	0.003	0.79 (0.51-1.22)	0.29	0.61 (0.39-0.95)	0.03
Median income quartiles 2008-2012 (ref <US $38,000)						
US $38,000-US $47,999	0.97 (0.89-1.07)	0.57	0.88 (0.76-1.02)	0.09	1.04 (0.90-1.21)	0.60
US $48,000-US $62,999	0.97 (0.87-1.07)	0.53	0.83 (0.71-0.97)	0.02	0.86 (0.73-1.01)	0.06
≥ US $63,000	0.89 (0.79-1.01)	0.07	0.61 (0.50-0.74)	<0.001	0.71 (0.59-0.86)	0.001
Percentage with no high school diploma (2008-2012)	1.10 (1.06-1.15)	<0.001	1.17 (1.10-1.24)	<0.001	1.14 (1.07-1.21)	<0.001
Great circle distance (ref <2), miles						

2-4	0.98 (0.89-1.11)	0.96	1.04 (0.86-1.25)	0.70	0.94 (0.77-1.15)	0.54
5-9	1.10 (0.98-1.23)	0.10	1.00 (0.83-1.19)	0.96	1.06 (0.87-1.29)	0.55
10-20	1.05 (0.93-1.17)	0.44	0.96 (0.80-1.16)	0.68	0.96 (0.79-1.18)	0.72
21-45	1.06 (0.94-1.20)	0.36	0.84 (0.70-1.02)	0.09	0.95 (0.77-1.16)	0.59
>45	0.85 (0.74-0.97)	0.02	0.69 (0.56-0.85)	0.001	0.81 (0.66-1.00)	0.05
Urban/rural 2013 (ref metro > 1 million)						
Metro 250,000-1 million	1.03 (0.96-1.12)	0.39	1.04 (0.92-1.18)	0.50	1.09 (0.97-1.23)	0.15
Metro < 250,000	1.24 (1.12-1.37)	<0.001	1.13 (0.96-1.33)	0.13	1.18 (1.00-1.39)	0.05
Urban > 20,000 adjacent to metro	1.23 (1.05-1.42)	0.008	1.08 (0.85-1.35)	0.53	1.36 (1.10-1.68)	0.005
Urban > 20,000 not adjacent to metro	1.29 (1.00-1.65)	0.05	1.66 (1.18-2.35)	0.004	1.14 (0.76-1.71)	0.52
Urban 2500 – 19,999 adjacent to metro	1.50 (1.30-1.73)	<0.001	1.43 (1.15-1.77)	0.001	1.16 (0.93-1.45)	0.19
Urban 2500-19,999 not adjacent to metro	1.47 (1.20-1.80)	<0.001	1.19 (0.87-1.63)	0.27	1.73 (1.32-2.28)	<0.001
Rural/urban <2500 adjacent to metro	1.55 (1.16-2.07)	0.003	1.07 (0.63-1.80)	0.80	0.92 (0.54-1.58)	0.77
Rural/urban <2500 not adjacent to metro	1.44 (1.07-1.94)	0.02	1.95 (1.27-3.00)	0.002	1.60 (1.04-2.46)	0.03
Charlson-Deyo score	1.10 (1.06-1.14)	<0.001	1.05 (0.99-1.12)	0.12	1.10 (1.03-1.17)	0.004
Geographic region (ref East Coast)						
Central	0.93 (0.88-1.00)	0.04	0.93 (0.85-1.03)	0.18	0.87 (0.78-0.95)	0.004
Mountain	0.99 (0.85-1.15)	0.88	1.14 (0.92-1.41)	0.23	0.98 (0.78-1.21)	0.83
Pacific	0.74 (0.66-0.83)	<0.001	0.66 (0.55-0.79)	<0.001	0.72 (0.61-0.85)	<0.001
Facility type (ref Community cancer program)						
Comprehensive Community cancer program	0.95 (0.85-1.06)	0.33	0.95 (0.79-1.15)	0.63	1.04 (0.84-1.29)	0.71
Academic/research program	1.10 (0.98-1.23)	0.11	1.05 (0.87-1.28)	0.60	1.17 (0.94-1.45)	0.16
Integrated Network Cancer Program	1.09 (0.96-1.23)	0.19	1.10 (0.89-1.37)	0.38	1.22 (0.96-1.54)	0.11
Grade of tumor	1.00 (0.96-1.04)	0.99	0.98 (0.92-1.04)	0.46	1.06 (1.00-1.12)	0.06
AJCC stage of tumor (ref occult/0/I)						
II	1.40 (1.20-1.64)	<0.001	1.20 (1.00-1.43)	0.05	1.40 (1.21-1.62)	<0.001
III	2.04 (1.74-2.40)	<0.001	2.55 (2.12-3.07)	<0.001	2.84 (2.40-3.36)	<0.001
IV	2.08 (1.82-2.38)	<0.001	2.83 (2.41-3.32)	<0.001	4.00 (3.45-4.63)	<0.001
NA/unknown	1.06 (0.91-1.24)	0.46	0.91 (0.75-1.10)	0.31	0.95 (0.82-1.12)	0.56

Abbreviations: AJCC: American Joint Committee on Cancer; CI: Confidence Interval; Metro: Metropolitan Area; NA: Not Available; Ref: Reference.

Age categories (<50, 50-64, 65-74, 75-84, ≥ 85 years), year of diagnosis in 2-year categories (2004-2013), percentage with no high school diploma categories (≥ 21%, 13%-20%, 7%-12%, < 7%), Charlson-Deyo score categories (0, 1, ≥ 2), and grade categories for differentiation (well, moderately, or poorly, and undifferentiated) are modelled ordinally.

Table 2: Associations between palliative care and patient characteristics using multivariate logistic regression for deceased patients with pancreatic cancer stratified by duration of survival.

of high school graduates had significantly increased (P<0.001 for all associations) odds of PC use in all survival categories.

Distances farther than 45 miles from the reporting or treating institution, as described by great circle distance, were associated with decreased odds of PC use as compared to distances <2 miles from the treating institution; the association being statistically significant (OR=0.69, P=0.001) among patients who survived between 6-12 months. Patients who lived in urban and rural areas had higher odds of receiving PC compared to the patients who lived in metropolitan areas. Patients living in Pacific Coast had a significantly decreased odds of receiving PC in all three survival groups compared to the patients living in the East Coast. Facility type was not associated with the use of PC.

The odds of PC use increased with increase in Charlson-Deyo score in all 3 survival groups. However, the association was statistically significant in the <6 months and >12 months survival groups only. PC was not associated with the tumor grade while it was significantly associated with the American Joint Committee on Cancer stage. Patients with stage II, III and IV cancer had increased odds of receiving PC in all 3 survival groups compared to stage 0 and I. OR for the association between PC and stage III cancer was 2.04, 2.55, and 2.84 (P<0.001 for

all associations) in <6 months, 6-12 months and >12 months survival groups respectively. OR for the association between PC and stage IV cancer was 2.08, 2.83, and 4.00 (P<0.001 for all associations) in <6 months, 6-12 months and >12 months survival groups respectively.

Discussions

This retrospective study examined data from the NCDB to establish patient, disease, and institutional features associated with PC use in patients who died of pancreatic cancer in the United States. The analysis shows that certain patient populations with pancreatic cancer are more likely than others to engage in PC as an adjunct to standard medical treatment.

Overall, 84.7% of patients did not receive PC services. This number is alarming given the documented benefits of this treatment adjunct with regards to quality of life and symptom improvement [2,11-13]. Previously proposed reasons for low PC use include lack of availability of PC services at treating institutions, unwillingness of physicians to refer patients to PC due to differences in practice, poor patient and/or physician awareness of PC services and options, and inability of patients to afford palliative interventions [14].

Most patients who did engage in PC survived <6 months; this pattern makes sense, given that these patients were likely not candidates for therapies with curative intent and were possibly encouraged to seek alternative methods to ameliorate symptoms associated with their disease. Statistical analysis revealed that younger patients, patients of Asian race, Medicaid patients, patients with a median annual income less than $38,000, patients who lived in areas with a lower percentage of high school graduates, patients residing distances <2 miles from the treating institution, patients who lived in urban and rural areas, patients in the East Coast, patients with a high number of comorbidities as calculated by the Charlson-Deyo score, and patients with disease stage II-IV were more likely to receive PC. These findings suggest that socioeconomic and demographic factors do play a role in PC utilization, contributing to the disparities seen in cancer care. It is possible that these groups pursue PC because they do not have access to other therapeutic modalities or are not candidates for other treatments. For example, patients with a high Charlson-Deyo score may not be optimized for an oncologic resection. It is also possible that these underserved groups - namely Medicaid, financially disadvantaged, low educational level, and residence outside of metropolitan areas – are more likely to engage in PC due to delayed presentation and initiation of care.

Interestingly, the results show that a more recent year of diagnosis was associated with increased odds of PC use compared to earlier years of diagnosis in all survival categories. This may be due to a recent shift towards patient-centered care involving treatment adjuncts, with a push for PC utilization in cancer therapy early on in the disease process as stated in the ASCO PCO on the integration of PC into standard oncology care for all patients diagnosed with cancer [6,7].

There is a paucity of papers on factors associated with PC use amongst patients with a cancer diagnosis. A comprehensive search revealed such documentation only in the colorectal literature, where PC services were pursued by 4.3% of patients and found to be associated with a younger age, a more recent year of diagnosis, insurance status, academic hospitals, and living in Mountain and Pacific regions [14]. Interestingly, a previous study limited to stage IV rectal cancer revealed a rate of PC use of 20.6% and association with age >60 years and increasing chronic comorbidities [15]. Some of these characteristics were also found to be associated with engagement in PC services in the current study on pancreatic cancer, indicating that there may be a pattern that spans all cancer diagnoses. The difference in age seen upon stratification by stage in the colorectal literature, however, suggests that more factors may be at play. Further investigations are needed to make a conclusion. That said, the overall rate of PC use is low across all studies including the current one, supporting the conclusion that PC is an underutilized service and efforts should be directed at expanding its reach

Conclusion

PC continues to be an area of opportunity in the fight to provide comprehensive care which extends beyond treatment of physical symptoms in order to enhance quality of life and mental well-being. Amongst patients diagnosed with pancreatic cancer, there is a national underutilization of PC with <15% of patients engaging in these services. Patients who received PC were more likely to be younger, Asian, recently diagnosed, not have a high school diploma, have a higher Charlson-Deyo score, report a median annual income <$38,000, and live in urban or rural areas. Disparities are known to exist in both access to and provision of PC services. Identifying patterns associated with PC use is the first step towards closing this gap in health equity, as these factors can be used to create interventions aimed at increasing patient participation in these adjuncts. More studies are needed to assess whether or not these disparities are similar across various types of cancer.

Limitations

The decision to pursue PC services, as well as the timing of these interventions, are influenced by subjective patient, disease, and hospital factors that cannot be captured by a database. It is important to recognize the static nature of the data provided by the NCBD and to interpret these results as such. Moreover, the data extends from 2004 to 2015, a decade during which cancer care changed. Therefore, the results may not be representative of current patterns

Conflicts of Interest

All authors confirm that there is no conflict of interest.

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