

# Palliative care and end-of-life health care utilization in elderly patients with pancreatic cancer

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**Background:** Palliative care has been associated with improved survival and quality of life, with lower rate of end-of-life health care utilization and cost. We examined trends in palliative care utilization in older pancreatic cancer patients.

**Methods:** Pancreatic cancer patients with and without palliative care consults were identified using the Surveillance, Epidemiology, and End Results (SEER)-Medicare linked database between 2000 and 2009. Trend of palliative care use was studied. Emergency room/intensive care unit (ICU) utilization and costs in the last 30 days of life were compared between both groups using propensity score-matched (PSM) analysis.

**Results:** Of the 54,130 patients, 3,166 (5.8%) received palliative care and 70% received it in the last 30 days of life. The proportion of patients receiving palliative care increased from 1.4% in 2000 to 7.4% in 2009 ( $P < 0.001$ ). Patients with palliative care were more likely to be older, Asian and women. In the unmatched and PSM population, the average visits to the ER in the last 30 days of life were significantly higher for patients who received palliative care, and had a significantly higher cost of care. Similarly, ICU length of stay in the last 30 days of life was higher in patients who did not receive palliative care in both PSM and unmatched patients. Cost of care and number of ICU admissions were not different between palliative and non-palliative care groups in PSM and unmatched patients.

**Conclusions:** In this study of Medicare patients with pancreatic cancer, palliative care use has increased between 2000 and 2009. Palliative care was largely offered close to the end of life and was not associated with reduced health care utilization or cost.

**Keywords:** Palliative care; end-of-life; intensive care unit (ICU); emergency room; cost of care; pancreatic cancer

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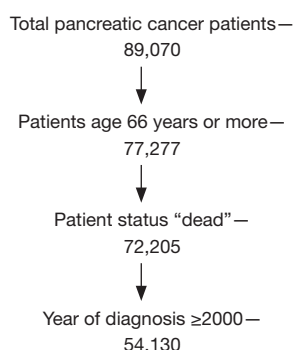
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## Introduction

Pancreatic cancer is the fourth leading cause of cancer related mortality in the United States and has a 5-year overall survival (OS) of less than 10% (1,2). Patients with pancreatic cancer also experience high symptom burden, especially towards the end of life, and symptom palliation is

the cornerstone of management (3).

Palliative care programs offer comprehensive supportive care services for cancer patients beyond conventional, disease-directed therapies, and provide holistic care which can lead to better cancer outcomes. There has been a sharp increase in availability of palliative care services in US hospitals (4). This can be in the form of dedicated



**Figure 1** Inclusion criteria and exclusion criteria.

palliative care, nutrition, physical therapy, nursing, mental health and social services. This is particularly relevant to pancreatic cancer, which has exceptionally high mortality and morbidity. Palliative care, when provided in parallel with antineoplastic therapies, can lead to improved cancer outcomes including improved OS and quality of life (5-9). Especially if offered early in the disease course, palliative care can lead to less aggressive interventions near the end of life (6). These interventions are frequently futile, can be detrimental to patient quality of life and significantly add to overall health costs. This is particularly relevant to pancreatic cancer, which has exceptionally high mortality and morbidity. In this study, we look to understand utilization of palliative care services among geriatric pancreatic cancer patients across the United States (US). We used a national database of Medicare beneficiaries diagnosed with pancreatic cancer to study the patterns of palliative care consultations. Additionally, we assessed the effect of palliative care on end-of-life health care utilization.

## Methods

### Data

Patients were identified using the National Cancer Institute Surveillance, Epidemiology, and End Results (SEER)-Medicare linked database which is a linkage of patient records from the SEER cancer registries with their Medicare enrollment and claims files (10). SEER is a national program that includes 18 cancer registries from 14 states across the United States, representing about 30% of the US population. The Medicare claim files include sociodemographic, clinical, tumor specific and treatment related information along with diagnostic and procedure details for linked patients aged 65 or more. Medicare files consists of health claims from

both inpatient and outpatient care. We obtained inpatient hospitalizations from the Medical Provider Analysis and Review (MEDPAR) file which is a 100% utilization file with a unique record for each inpatient hospitalization covered under Medicare part A. Outpatient and National Claims History (NCH) files were used as indicated for institutional and non-institutional outpatient claims.

### Patients

The inclusion criteria were:

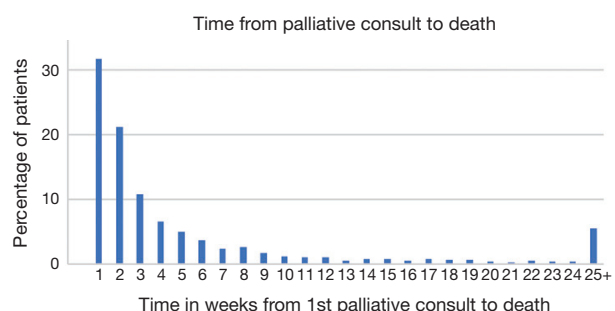
- (I) Medicare beneficiaries with a new diagnosis of pancreatic cancer between 2000 and 2009;
- (II) Age at least 66 years at the time of analysis to include only those beneficiaries who received at least 1 year of Medicare benefits before death.

We excluded those patients with status as 'alive' since our aim was to assess health utilization before death only which resulted in a final study sample size of 54,130 (Figure 1).

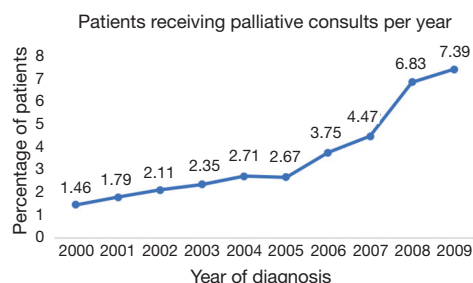
We used the International Classification of Diseases, ninth revision codes (ICD-9) to identify the nature of care received during the hospital stay. Palliative care consultation was identified from appropriate Medicare files using ICD-9 code V66.7 (11). For patients with more than one palliative care consult, only the first episode was included. Age, year of diagnosis, sex, race, marital status and stage were assessed from SEER-Medicare file.

We assessed the trends of palliative care consults and healthcare utilization patterns for patients diagnosed between 2000 and 2009. The following measures of health care utilization were assessed for the last 30 days of life: number of intensive care unit (ICU) admissions, mean length of stay in the ICU, cost associated with ICU stay, number of emergency room visits, and cost associated with ER visits. Cost of care was calculated by taking a sum of all charges in the last 30 days for each patient in the group (palliative care *vs.* no palliative care) and then dividing it by the number of patients in that group.

Chi-square tests and univariate logistic regression analyses were conducted to investigate if there were significant differences in patient demographics between palliative care and non-palliative care groups. Student's *t*-tests were used to examine if there were significant differences in health services utilization between palliative care and non-palliative care groups. We used multivariate logistic regression to identify demographic characteristics and health service utilization that were significantly associated with palliative care consults.



**Figure 2** Time in weeks from 1st palliative consult to death.



**Figure 3** Percentage of newly diagnosed patients receiving palliative care consults each year.

We used propensity score matching to balance for observed differences between palliative and non-palliative care (12). Patients with palliative care were propensity matched with patients without palliative care in a 1:2 ratio. The following five variables were selected for propensity score matching based on multivariate analysis: sex, race, marital status and stage of disease. Health services utilization of patients who did and did not receive a palliative care consult were compared between the two groups.

Statistical analyses were performed with SAS version 9.4 (SAS Institute, Inc., Cary, NC, USA).

## Results

Of 54,130 cases, 54% were female, 81% were white and 5.8% (3,166) received a palliative care consult. Of all palliative care consults, 31.6% were in the last 7 days of life, 70% were within 30 days from death and 14% were between 30–60 days of death (*Figure 2*). Only 11% of patients received a palliative care consult more than 12 weeks before death. The proportion of patients receiving palliative care increased consistently from 1.46% for patients diagnosed in

2000, to 7.4% in 2009 (*Figure 3*,  $P < 0.001$ ) with a sharp rise in later years. *Table 1* describes the sociodemographic and clinical characteristics of patients with and without palliative care. On univariate analysis, patients receiving palliative care were more likely to be female and Asian compared to patients without palliative care. Patients older than 85 years of age were more likely to receive palliative care consults. No statistically significant associations were seen between marital status and disease stage. On multivariate analysis, only Asian patients and female patients were more likely to receive palliative care consults.

## Trends of health care utilization

The mean number of visits to the ER in the last 30 days of life were significantly higher for patients who received palliative care consults versus those who did not ( $0.9 \pm 0.6$  vs.  $0.8 \pm 0.6$ ,  $P < 0.001$ ) and had a significantly higher cost of care (\$1,436.8 vs. \$1,060.7,  $P < 0.001$ ) (*Table 2*). The length of ICU stay for patients with palliative care was lower than those without (1.0 vs. 1.3 days,  $P = 0.0017$ ) (*Table 2*). There was no difference in the cost of care for ICU (\$5,470.6 vs. \$4,909.8,  $P = 0.182$ ) or number of ICU admissions between the two groups ( $P = 0.140$ ).

## Propensity score matching

We compared health care utilization of patients with palliative care with propensity score-matched (PSM) patients without palliative care (*Table 3*). Univariate analysis revealed that in the last thirty days of life, the number of ED visits and cost of ED care were significantly higher for patients with palliative care. The cost of ICU care and number of admissions to ICU were not different between the two groups.

## Discussion

In this study of Medicare patients with pancreatic cancer, the rate of palliative care consults increased a near 4-fold from 1.8% in 2000 to 7.8% in 2009. This increase in referral rates reflects recognition of palliative care as a distinct service for terminally ill patients and is a response to calls for increased integration of palliative services for cancer patients (13–15). In this analysis, palliative care is being offered to sicker patients near the end of life and is not associated with reduced health care utilization or cost. These findings are in contrast with controlled prospective

Table 1 Patient demographics

Characteristic	Palliative care		Total (%)	Odds ratio (95% CI)	P value
	No (%)	Yes (%)			
Total patients	50,964 (94.2)	3,166 (5.8)	54,130 (100.0)	–	–
Age (years)					
66–69	7,587 (14.9)	494 (15.6)	8,081 (14.9)	0.99 (0.87, 1.12)	0.9122
70–74	11,065 (21.7)	724 (22.9)	11,789 (21.8)	0.99 (0.89, 1.15)	0.9728
75–79	11,934 (23.4)	706 (22.3)	12,640 (23.3)	0.90 (0.80, 1.00)	0.0682
80–84	10,646 (20.9)	604 (19.1)	11,250 (20.8)	0.86 (0.76, 0.97)	0.0135*
85+	9,732 (19.1)	638 (20.1)	10,370 (19.2)	Reference	–
Sex					
Male	23,224 (45.6)	1,359 (42.9)	24,583 (45.4)	Reference	–
Female	27,740 (54.4)	1,807 (57.1)	29,547 (54.6)	1.13 (1.03, 1.96)	0.0037* <sup>†</sup>
Race					
White	41,286 (81.0)	2,499 (78.9)	43,785 (80.9)	Reference	–
Black	5,156 (10.1)	321 (10.1)	5,477 (10.1)	0.88 (0.91, 1.15)	0.6449
Asian	1,838 (3.6)	164 (5.2)	2,002 (3.7)	1.47 (1.25, 1.73)	<0.001* <sup>†</sup>
Hispanic	1,199 (2.3)	80 (2.5)	1,279 (2.4)	1.1 (0.87, 1.38)	0.4062
Native	139 (0.3)	14 (0.4)	153 (0.3)	1.3 (0.95, 2.8)	0.0701
Other	1,250 (2.4)	84 (2.6)	1,334 (2.5)	1.1 (0.88, 1.38)	0.3615
Marital status					
Single	3,858 (7.6)	233 (7.4)	4,091 (7.6)	0.95 (0.82, 1.10)	0.5523
Married	25,242 (49.5)	1,563 (49.4)	26,805 (49.5)	0.98 (0.90, 1.06)	0.6383
Separated	327 (0.6)	22 (0.7)	349 (0.6)	1.0 (0.68, 1.64)	0.7753
Divorced	3,514 (6.9)	223 (7.0)	3,737 (6.9)	1.0 (0.86, 1.16)	0.9466
Widowed	16,282 (31.95)	1,028 (32.5)	17,310 (32.0)	Reference	–
Stage <sup>∞</sup>					
Stage I	2,008 (8.1)	154 (7.4)	2,162 (8.1)	0.91 (0.76, 1.08)	0.2938
Stage II	5,989 (24.3)	501 (24.2)	6,490 (24.3)	0.99 (0.89, 1.10)	0.9087
Stage III	2,126 (8.6)	189 (9.1)	2,315 (8.7)	1.06 (0.90, 1.23)	0.5040
Stage IV	14,480 (58.8)	1,219 (59.0)	15,699 (58.8)	Reference	–

\*, statistically significant in univariate logistic regression analysis; <sup>†</sup>, statistically significant on multivariate regression analysis; <sup>∞</sup>, patients with unknown cancer stage not reported (86 patients).

studies that suggest that palliative care can reduce cost of care and resource utilization (16,17).

One-third of all palliative care consults in this cohort took place in the last week of life. Another population based study in patients with breast and colon cancer also reported

that 40% of palliative care consults were ordered in the last 7 days of life (18). In contrast, Osta *et al.* (19) reported that time between palliative consult and death in a large comprehensive cancer center was 42 days—significantly longer than our analysis. This difference between the

**Table 2** Health Services Utilization in the last 30 days of life

Variable	Palliative care		Total	P value
	No (%)	Yes (%)		
Total patients	50,964 (94.2)	3,166 (5.8)	54,130 (100.0)	–
Number of ER visits	0.8±0.6	0.9±0.6	0.8±0.6	<0.001
Cost of care in ER (\$)	1,060.7±1,524.3	1,436.8±2,089.6	1,098.3±1,593.7	<0.001
Cost of care in ICU (\$)	4,909.8±16,407.2	5,470.6±19,163.8	4,965.4±16,703.5	0.182
Number of days in ICU	1.3±3.1	1.0±2.9	1.2±3.0	0.0017
Number of ICU admission	0.28±0.5	0.26±0.5	0.27±0.5	0.140

The values show a mean ± SD; P values by Student's *t*-test. ER, emergency room; ICU, intensive care unit.

**Table 3** Propensity score matched health services utilization in the last 30 days of life

Variable	Palliative consult		Total	P value
	No (%)	Yes (%)		
Total patients	6,332 (66.7)	3,166 (33.3)	9,498 (100.0)	–
Number of ER visits	0.86±0.6	0.94±0.6	0.9±0.6	<0.0001
Cost of care in ER (\$)	1,081.8±1,488.0	1,436.8±2,089.2	1,249.0±1,805.0	<0.0001
Cost of care in ICU (\$)	4,751.0±1,5161.0	5,470.6±19,163.7	5,090.1±17,165.6	0.153
Number of days in ICU	1.2±3.1	1.1±2.9	1.17±3.0	0.054
Number of ICU admissions	0.28±0.5	0.26±0.5	0.27±0.5	0.318

The values show a mean ± SD; P values by Student's *t*-test. ER, emergency room; ICU, intensive care unit.

single institution experiences and population based analysis suggests that although palliative care referrals are increasing nationally, there are significant differences in patterns of utilization. Systematic implementation of palliative services is needed to extend findings from controlled studies to the broader population.

Previous studies have evaluated the rate of palliative care referrals in other solid tumors and also observed an increase in recent years (18). Age was significantly associated with palliative care consults while marital status was not. Other studies have also suggested that older patients are more likely to receive palliative care and this may provide insight on why population based studies have failed to demonstrate an impact of palliative care on markers of end of life health care utilization (20,21). Treatment decisions for elderly and terminally ill cancer patients can be complex and recommendations are to aim for early palliative care discussions for all patients, regardless of age. The potential benefit of palliative care in large database analysis can be diluted as older, and possibly sicker, patients are more likely

to be referred.

In addition to trends and predictors of palliative care referrals in a cohort of elderly pancreatic cancer patients, we evaluated the impact of real world palliative care referrals on measures of end-of-life health care utilization. As most data on end of life health care utilization are based on studies in controlled prospective trials it is important to assess the impact in the real world setting. The unique features of the SEER-Medicare dataset made this analysis possible. Patients who received palliative care consults had more ER visits and higher cost of ER care compared to those with no palliative care. These findings are in contrast to a prospective single institution experience from a large US academic medical center (22) which demonstrated that palliative care results in lower re-admission rates in the last 30 days of life. The most common reason cancer patients seek care in the ER are uncontrolled symptoms which suggests ER visits may be a surrogate measure for poor symptom control (23). Patients with palliative care had more ER visits towards the end of life suggests palliative care referrals are preferentially

offered to sicker patients with higher symptom burden. Guidelines which advocate for integration of palliative care services for cancers with poor prognosis such as pancreatic cancer, recommend universal palliative referrals early in the disease course (9). Our analysis suggest that palliative care referrals are being offered to sicker patients, and very late in the disease course which likely limits the impact of palliative care on end of life health care utilization as demonstrated in this paper.

There was no difference in ICU admissions and cost of care in ICU between the palliative and non-palliative groups. The length of ICU stay was lower in the palliative care group in univariate analysis which was not seen on multivariate analysis. This is likely explained by palliative care referrals being placed so close to death. Prior studies have shown that patients with palliative care consults are dying in the ICU which supports this observation (24–27). Propensity score matching was performed to reduce the effect of known confounding variables on outcome. The effect of palliative care on end of life health care utilization in the form of ER visits and ICU admissions in the last 30 days life utilization did not change. There is little difference in ICU costs or higher ER costs for palliative patients since sicker patients are likely to have higher treatment costs (28–30).

This observation is in contrast to the reported effect of palliative care referrals for cancer patients in controlled studies (6). Palliative care referrals are placed very late in the course of the disease. Patients are likely to have developed complications and encumbered significant costs by the time of referral which prevents palliative care from significantly impacting patient care. Lack of effective control of symptoms earlier in the disease course leads to higher symptom burden, poor quality of life and higher ER use (31,32). It is for these reasons that palliative care guidelines by professional oncology societies advocate for early incorporation of palliative care, as early as within 8 weeks of cancer diagnosis (9). This provides clinicians with more lead time to identify and address cancer symptoms before the onset of downstream complications.

Limitations of this study are those expected from a claims database of elderly patients. We only included patients older than 66 years of age, and the results may not be generalizable to the entire population. But as the average age of diagnosis of pancreatic cancer is in the 70s this study population is likely representative. For the purpose of this analysis we are unable to identify palliative care offered without an associated claim. This raises the potential for

under-reporting of palliative care in our cohort. Reduced re-admission after palliative care in other studies was likely due to more goal oriented discussions about end of life care, rather than symptom management alone (22). The nature, and quality, of palliative care and quality of the program cannot be determined from a claims database. We performed propensity score matching to adjust for confounding factors associated with palliative care referrals but it is not possible to adjust for factors not measured by a claims database such as patient performance status. Cancer registries capture anticancer systemic therapies, radiation therapies and surgery but palliative care is not generally identified as a discrete treatment. The specific strengths of the SEER-Medicare linked database allowed this analysis to be completed and evaluate predictors of palliative care and time from death.

In conclusion, the rate of palliative care for elderly patients with pancreatic cancer has increased between 2000 and 2009. Referral to palliative care was not associated with a reduction in end of life ICU care and ED visits. Referrals are placed very late in the disease course and increasingly used for sicker patients. Early referral to palliative care may allow patients a greater opportunity to benefit from services targeting symptom control which may reduce potentially futile end of life health care utilization. Pancreatic cancer is associated with high mortality and morbidity and future studies should assess the effect of universal palliative care referral for all pancreatic cancer patients at the time of diagnosis.

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## Footnote

*Conflicts of Interest:* The authors have no conflicts of interest to declare.

*Ethical Statement:* This study was conducted in accordance with a SEER-Medicare data use agreement, and was approved by the University of Texas Southwestern Medical Center Institutional Review Board (No. STU 032013-045). This was a secondary analysis of an existing database the

need for informed consent was waived.

*Disclaimer:* The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

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