

Disparities in End of Life Care for Elderly Lung Cancer Patients

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Abstract The objective of this study was to examine geographic and race/ethnic disparities in access to end of life care among elderly patients with lung cancer. The study sample consisted of 91,039 Medicare beneficiaries with lung cancer who died in 2008. The key outcome measures included the number of emergency room visits, the number of inpatient admissions and the number of intensive care unit (ICU) days in the last 90 days of life, hospice care ever used and hospice enrollment within the last 3 days of life. Medicare beneficiaries with lung cancer residing in rural, remote rural, and micropolitan areas had more ER visits in the last 90 days of life as compared to urban residents. Urban residents however, had more ICU days in the last 90 days of life and were more likely to have ever used hospice as compared to residents of rural, remote rural and micropolitan counties. Racial minority lung cancer patients had more ICU days, ER visits and inpatient days than non-Hispanic White patients, and also were less likely to have ever used hospice care or be enrolled in hospice in the last 3 days of life. Lung cancer patients with

very low socioeconomic status (SES) were less likely to ever use hospice or be enrolled in hospice care in the last 3 days of life, as compared to those who had very high SES. Geographic, racial and socioeconomic disparities in end of life care call for targeted efforts to address access barriers for these groups of patients.

Keywords Rural/urban · Race/ethnic disparities · End of life care · Lung cancer

Introduction

The Institute of Medicine report “Approaching Death: Improving Care at the End of Life” [1] was the first comprehensive report shedding light on end of life care for dying patients. Medicare is the largest payer for dying patients. It is estimated that one quarter of Medicare dollars are spent in the last year of life and half in the last month of life [2]. In spite of this spending, patients in the last year of life often do not get the care they need.

Palliative or supportive care aims to relieve suffering and improve the quality of life and focuses on the patient and family rather than the disease [3]. The 6 month period before death, or the end of life [4–7] when disease is at an advanced stage, is when patients are likely to benefit the most from palliative care. Palliative care is provided through the hospice program which is funded through Medicare since 1982 under the Tax Equity and Fiscal Responsibility Act (TEFRA). Although hospice utilization has increased after TEFRA from 177,000 in 1987 to 1,400,000 in 2007 [8], significant barriers to hospice care have remained and it was estimated that only one-third of eligible Medicare beneficiaries used hospice care in 2007 [9]. Factors contributing to the under-utilization of hospice

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care include the lack of availability of hospice services [10], and lack of awareness of the hospice benefit and delayed physician referrals [11–15].

The availability of hospice services varies significantly with geographic location, with rural areas having lower availability of hospice services, as compared to urban areas. While it is estimated that around 332,000 elders (7.5 % of ZIP codes) reside in areas not served by home-based hospice, 15,000 deaths occur in these un-served areas. Further, whereas all of the ZIP codes in the most urban areas are served by hospice, in rural areas not adjacent to an urban area almost 24 % of ZIP codes are not served by hospice [16]. An examination of 1999 Medicare data found that rural Medicare beneficiaries have lower utilization rates of hospice care before death, with the lowest rate of hospice use, (15.2 % of deaths) in rural areas not adjacent to an urban area and the highest rate of use (22.2 % of deaths) in urban areas [17]. Rural residence was also found to be associated with later entry into hospice care for Medicare beneficiaries with lung and colorectal cancer [18]. Use of the intensive care unit (ICU) at the end of life has been found to be associated with increasing age and severity of co-morbidity [19] and residence in metropolitan areas [20]. The quality of end of life care has been the subject of recent research [21, 22]. Earle et al. [23] identified eight quality-of-care indicators: (1) proportion receiving chemotherapy in the last 14 days of life, (2) proportion starting a new chemotherapy regimen in the last 30 days of life, (3) ER visits in the last month of life, (4) hospitalization in the last month of life, (5) admission to the ICU in the last month of life, (6) death in an acute care hospital, (7) lack of admission to hospice, and (8) admission to hospice <3 days before death. These quality of end of life care indicators can be measured using claims data and have a high degree of agreement with data abstracted from the medical charts [23].

This study evaluates differences in end of life care for elderly Medicare beneficiaries with lung cancer, based on county of residence, race/ethnicity and socioeconomic status (SES), using Medicare claims data for a national sample of Medicare beneficiaries. We hypothesized that significant disparities in end of life care exist based on geography, race and SES.

Methods

This study was approved by the institutional review board at the University of Nebraska Medical Center. The study population consisted of all Medicare beneficiaries 66 years and older with lung cancer who died in 2008. The data files used included the Beneficiary Annual Summary File (2007–2008), the Beneficiary Summary File (2007–2008),

MEDPAR (2007–2008), and claims files for outpatient, home health agency, hospice, durable medical equipment, and carrier data (2007–2008).

The dependent variables examined were five end-of-life care quality indicators: (1) number of ER visits in the last 3 months of life, (2) number of inpatient hospital admissions in the last 3 months of life, (3) number of ICU days in the last 3 months of life, (4) proportion of people who used hospice, and (5) proportion of people who enrolled in hospice <3 days before death. The independent variables included demographic characteristics (age, race and gender), SES, co-morbidity status, and county of residence. Age, gender, and race were obtained from the Medicare denominator file. SES was measured by the median income of the patient's zip code of residence. Age at the time of death was categorized in three age groups: 66–74 years, 75–84 years, and ≥ 85 years. Race/ethnic categories were classified as non-Hispanic White and Other. The majority of Medicare beneficiaries were classified as non-Hispanic White. The remaining individuals did not provide an adequate sample size for categorization as separate races/ethnicities. Therefore, these individuals were grouped together as “Other” in the race/ethnicity category.

All lung cancer cases were categorized into four residence-county groups (metropolitan, micropolitan, rural, and remote rural) using a modified version of the US Department of Agriculture's 12-level Urban Influence Codes (UICs). The UIC classification incorporates “adjacency” of a county to “urban influence” that may reflect a county having or being near accessible resources and available local health services. The county groups included (1) metropolitan counties [UICs 1 and 2, i.e., populations of 1 million or more and small metropolitan areas (fewer than a million residents)]; (2) micropolitan counties (UICs 3, 4, 5, and 8, i.e., micropolitan adjacent or not adjacent to a metropolitan area and noncore counties adjacent to a large metropolitan area); (3) rural counties (UICs 6, 9, and 11, i.e., non-core counties not adjacent to a large metropolitan area and containing a town of at least 2,500 residents); and (4) remote rural counties (UICs 7, 10, and 12, i.e., non-core counties not adjacent to a large metropolitan area and not containing a town of more than 2,500 residents).

Data on co-morbidity were obtained from the beneficiary summary and claims files. ICD-9-CM diagnostic codes documented in Medicare hospital claims and physician claims during the 12-month period prior to the patient's death were examined for co-morbid conditions using enhanced Deyo ICD-9-CM coding algorithms developed by Quan. Tumor co-morbid conditions were excluded to establish non-cancer co-morbidity. For physician claims, the co-morbid condition was included in the calculations of co-morbidity indices only if the diagnostic

code corresponding to the co-morbid condition appeared at least twice in physician claims during the year prior to the patient's death and the in-between period was greater than 30 days.

All analyses were performed using SAS version 9 (SAS Institute, Inc., Cary, NC). The key outcome variables and covariates were summarized for all decedents and compared across four residence-county groups, using Chi square to test for significant differences. Multivariate regression analyses were conducted to determine the potential effects of county of residence, race and SES on the end-of-life care indicators. Poisson and negative binomial regression models were used to examine the association between the covariates and the number of ER admissions, inpatient hospital admissions, and ICU days in the last 3 months of life. Logistic regression models were used to examine the relationship between demographic/clinical factors and hospice enrollment and usage. Regression coefficients and odds ratios were reported for variables in each model. All *P* values were 2-sided, and *P* < .05 was deemed statistically significant.

Results

The majority of Medicare beneficiaries with lung cancer who died in 2008 were residents of metropolitan counties (*n* = 68,938, 75.72 %) and micropolitan counties (*n* = 13,877, 15.24 %). Only 6,184 (6.79 %) of the sample of Medicare beneficiaries with lung cancer and 2,040 (2.24 %) lived in rural and remote rural counties, respectively. There were significant differences in the age, gender, race/ethnicity, SES, and co-morbidity status of Medicare beneficiaries with lung cancer, by type of county. A higher proportion of lung cancer patients residing in rural counties (45.8 %) were in the youngest age group (66–74 years) compared to metropolitan counties (38.97 %). The proportion of lung cancer patients in the oldest age group (aged \geq 85 years) was highest in metropolitan counties (16.47 %) and lowest in the rural and remote counties (12.6 %). The majority of lung cancer patients were male, with the highest proportion of males in rural counties (59.91 %) compared to metropolitan counties (53.4 %). Medicare beneficiaries with lung cancer who resided in metropolitan counties were racially/ethnically more diverse than beneficiaries living in other county types. The proportion of non-Hispanic Whites was lowest in metropolitan counties (87.4 %) compared to all other county types (92.74 %). Medicare beneficiaries with lung cancer residing in metropolitan counties had higher SES than beneficiaries in rural or remote rural counties. The proportion of individuals with very high SES was significantly higher in metropolitan counties (65.85 %) as

compared to rural (4.38 %) and remote rural counties (3.53 %). The proportion of beneficiaries with very low SES was highest in remote rural counties (41.13 %) and lowest in metropolitan counties (1.22 %). Medicare beneficiaries with lung cancer living in metropolitan counties had the highest mean co-morbidity index (2.17), and those living in rural and remote rural counties had the lowest index (2.04). Table 1 summarizes the study sample characteristics by county of residence.

Table 2 summarizes the descriptive statistics of key end-of-life care utilization measures by county of residence. The mean number of ER visits in the last 90 days of life ranged from 1.32 for residents of metropolitan counties to 1.42 for rural residents. In general, residents of metropolitan counties had lower mean utilization (ICU days, ER visits and inpatient admissions) than residents of rural and remote rural counties. In addition, a higher proportion of residents of metropolitan counties had ever used hospice (59.97 %) and were first enrolled in hospice (16.12 %) <3 days before death.

Table 3 summarizes the descriptive statistics of key end-of-life care utilization measures by race/ethnic categories. Race ethnic minorities had more ICU days, ER visits and inpatient admissions in the last 90 days of life, as compared to non-Hispanic White lung cancer patients. The proportion of race/ethnic minority patients who were ever enrolled in hospice and enrolled in the <3 days before death was also lower than non-Hispanic White patients (Table 3).

Medicare beneficiaries with lung cancer residing in rural, remote rural, and micropolitan areas had significantly more ER visits in the last 90 days of life as compared to urban residents. Urban residents however, had more ICU days and were more likely to have ever used hospice as compared to residents of rural, remote rural and micropolitan counties. Residents of micropolitan counties had lower inpatient utilization in the last 90 days of life as compared to urban residents and were less likely to be first enrolled in hospice in the last 3 days of life. Older patients (75 years and older) had fewer ICU days, ER visits and inpatient admissions in the last 90 days of life. Older patients were also more likely to have ever used hospice and less likely to be enrolled in hospice in the last 3 days of life. Racial minority lung cancer patients had higher ICU days, ER visits and inpatient admissions than non-Hispanic White patients, and also were less likely to have ever used hospice care or be first enrolled in hospice in the last 3 days of life. SES was also significantly associated with end of life care. Lung cancer patients with very low SES had more admissions ER visits and inpatient days in the last 90 days of life and were less likely to ever use hospice or be first enrolled in hospice care in the last 3 days of life, as compared to those who had very high SES. Female patients were more likely to have ever used hospice and were also less likely to be first enrolled in hospice in the last 3 days

Table 1 Sample characteristics by county of residence

Characteristics	Metropolitan N = 68,938		Micropolitan N = 13,877		Rural N = 6,184		Remote Rural County N = 2,040		Chi Square/F-value	p value
	N	%	N	%	N	%	N	%		
Age										
66–74 years	26,865	38.97	6,159	44.38	2,832	45.8	894	43.82	288.01	<.0001
75–84 years	30,720	44.56	5,864	42.26	2,573	41.61	890	43.63		
≥85 years	11,353	16.47	1,854	13.36	779	12.6	256	12.55		
Mean ± SD	77.19 ± 7.05		76.3 ± 6.85		76.11 ± 6.81		76.24 ± 6.86		102.25	<.0001
Sex										
Male	36,812	53.4	7,997	57.63	3,705	59.91	1,205	59.07	178.3	<.0001
Female	32,126	46.6	5,880	42.37	2,479	40.09	835	40.93		
Race/ethnicity										
Non-Hispanic White	60,235	87.38	12,869	92.74	5,735	92.74	1,894	92.84	487.28	<.0001
Non-Hispanic African American	6,047	8.77	745	5.37	315	5.09	97	4.75		
Other	2,656	3.85	263	1.9	134	2.17	49	2.4		
Socioeconomic status										
Very low	842	1.22	1,611	11.61	2,047	33.1	839	41.13	37,481	<.0001
Low	2,876	4.17	3,494	25.18	1,726	27.91	548	26.86		
Average	5,561	8.07	3,514	25.32	1,131	18.29	371	18.19		
High	14,265	20.69	3,331	24	1,009	16.32	210	10.29		
Very high	45,394	65.85	1,927	13.89	271	4.38	72	3.53		
Comorbidity										
0	11,458	16.62	2,290	16.5	1,096	17.72	359	17.6	31.8	0.0002
1	18,926	27.45	3,984	28.71	1,741	28.15	580	28.43		
2	14,903	21.62	3,058	22.04	1,370	22.15	445	21.81		
≥3	23,651	34.31	4,545	32.75	1,977	31.97	656	32.16		
Mean ± SD	2.17 ± 1.85		2.08 ± 1.75		2.04 ± 1.73		2.04 ± 1.73			

Table 2 End-of-life indicators by county of residence

Residence-county type	Number of emergency room visits in last 90 days		Number of inpatient admissions in last 90 days		Number of intensive care unit days in last 90 days		Ever used hospice %	Hospice enrollment in last 3 days %
	Mean ± SD	Median (range)	Mean ± SD	Median (range)	Mean ± SD	Median (range)		
Total (n = 91,039)	1.32 ± 1.23	1 (0.28)	1.35 ± 1.13	1 (0.13)	2.25 ± 5.8	0 (0.90)	58.76	16.12
Metropolitan (n = 68,938)	1.32 ± 1.19	1 (0.23)	1.34 ± 1.12	1 (0.13)	2.4 ± 6.05	0 (0.90)	59.97	16.62
Micropolitan (n = 13,877)	1.38 ± 1.3	1 (0.28)	1.34 ± 1.13	1 (0.9)	1.8 ± 4.83	0 (0.88)	55.97	14.3
Rural (6184)	1.42 ± 1.39	1 (0.16)	1.39 ± 1.16	1 (0.9)	1.73 ± 5.12	0 (0.90)	54.15	14.78
Remote Rural (n = 2,040)	1.41 ± 1.43	1 (0.13)	1.44 ± 1.22	1 (0.8)	1.74 ± 5.06	0 (0.90)	50.83	14.18

of life. Female patients also had lower inpatient admissions and ICU days as compared to male patients. Higher number of comorbidities was associated with more ICU days, hospital admissions, and ER visits, a lower likelihood of ever using hospice, and with a higher likelihood of hospice enrollment within 3 days of death. Table 4 presents the regression coefficients and odds ratios in the multivariate regression analyses.

Discussion

The study found that as hypothesized there is a significant association between county of residence, race/ethnicity and SES and end of life care for elderly lung cancer patients. Past research has found a lower percentage of patients in rural hospitals being treated in ICUs [28] and the level of ICU care varied across critical access hospitals in rural

Table 3 End-of-life indicators by race

Race	Number of emergency room visits in last 90 days		Number of inpatient admissions in last 90 days		Number of intensive care unit days in last 90 days		Ever used hospice %	Hospice enrollment in last 3 days %
	Mean ± SD	Median (range)	Mean ± SD	Median (range)	Mean ± SD	Median (range)		
Total (n = 91,039)	1.32 ± 1.23	1 (0.28)	1.35 ± 1.13	1 (0.13)	2.25 ± 5.8	0 (0.90)	58.76	16.12
Other (n = 10,306)	1.5 ± 1.33	1 (0.18)	1.47 ± 1.19	1 (0.8)	2.86 ± 6.77	0 (0.90)	50.79	14.7
Non-Hispanic White (n = 80,733)	1.3 ± 1.22	1 (0.28)	1.33 ± 1.12	1 (0.13)	2.17 ± 5.66	0 (0.90)	59.78	16.28

Table 4 Regression coefficients/odds ratios for end-of-life indicators

	Number of emergency room visits in last 90 days (coefficients) ^b	Number of inpatient admissions in last 90 days (coefficients) ^b	Number of intensive care unit days in last 90 days (coefficients) ^b	Ever used hospice (odds ratio)	Hospice enrollment in last 3 days (odds ratio)
Residence-county type					
Remote rural	0.07**	0.02	−0.41***	0.71***	0.91
Rural	0.08***	−0.01	−0.38***	0.81***	0.94
Micropolitan	0.06***	−0.02*	−0.28***	0.86***	0.87**
Metropolitan	Reference	Reference	Reference	Reference	Reference
Age					
≥85 years	−0.12***	−0.2***	−0.52***	1.29***	0.77***
75–84 years	−0.09***	−0.09***	−0.2***	1.17***	0.87***
65–74 years	Reference	Reference	Reference	Reference	Reference
Sex					
Female	−0.003	−0.01*	−0.13***	1.22***	0.88***
Male	Reference	Reference	Reference	Reference	Reference
Race/ethnicity					
Other ^a	0.13***	0.07***	0.21***	0.7***	0.85***
Non-Hispanic White	Reference	Reference	Reference	Reference	Reference
Socioeconomic status					
Very low	0.06***	0.12***	0.08	0.93*	0.83*
Low	0.001	0.03*	−0.03	0.95	0.86*
Average	−0.02*	0.004	−0.09*	0.99	0.96
High	−0.009	0.003	−0.11***	0.99	0.95
Very High	Reference	Reference	Reference	Reference	Reference
Comorbidity					
0	Reference	Reference	Reference	Reference	Reference
1	0.32***	0.42***	0.59***	0.76***	1.4***
2	0.5***	0.63***	0.92***	0.64***	1.62***
≥3	0.71***	0.85***	1.28***	0.53***	1.97***

* Significance at 0.05; ** significance at 0.001; *** significance at 0.0001

^a Individuals who are not non-Hispanic Whites

^b The regression coefficient for one level of one covariate is the expected difference in log count between this level and the reference level

communities and the availability of certain ICU equipment and specialists was limited in some of these hospitals [29]. Our study found that urban lung cancer patients had more ICU days in the last 90 days of life, as compared to residents of rural, remote rural and micropolitan counties, indicating that urban residents are likely to receive a higher intensity of care in the last months of life and may be reflecting higher availability of ICU services in urban areas as shown in past studies [28, 29].

The study also found that residents of rural, remote rural and micropolitan counties had higher ER visits indicating poorer quality of end-of-life care. Whereas, there were no significant differences between rural and remote, rural and urban residents in terms of inpatient utilization in the last 3 months of life, residents of micropolitan counties had fewer inpatient admissions compared to metropolitan residents, indicating that metropolitan residents may be receiving higher intensity of care in their last months of life, compared to micropolitan residents. The study also examined two indicators of quality of end of life care related to hospice use: ever used hospice and hospice enrollment for the first time within 3 days of death. Urban residents were more likely to have ever used hospice as compared to residents of rural, remote rural and micropolitan counties. This greater hospice utilization in urban areas may be reflecting the greater availability of hospice services in urban areas as noted in past research [21, 22]. Disparities in hospice use among rural residents were documented in an earlier study of Surveillance Epidemiology and End Results (SEER) Medicare data (1973–1996). The study found that rural residence was associated with later hospice enrollment [18].

The study also found that age, race/ethnicity and co-morbidity were all significantly associated with ER, ICU and inpatient utilization, with younger age (below 75 years of age), higher co-morbidity status and minority status being associated with higher utilization. Racial minority patients were less likely to have ever used hospice care or be first enrolled in hospice in the last 3 days of life. SES was also significantly associated with end of life care. Lung cancer patients with very low SES had more ER visits and inpatient days in the last 90 days of life and were less likely to ever use hospice or be first enrolled in hospice care in the last 3 days of life, as compared to those who had very high SES. In general, these findings indicate lower access to end of life care for very low SES patients, as compared to very high SES patients, and for race/ethnic minority as compared to White lung cancer patients.

Female patients were more likely to have ever used hospice and less likely to be first enrolled in hospice in the last 3 days of life. Female patients also had lower inpatient and ICU utilization as compared to male patients, but there were no gender differences in ER visits in the last 90 days of life.

This indicates that female patients are likely to receive less intensive treatment at the end of life than male lung cancer patients. A higher number of co-morbidities was associated with lower likelihood of ever using hospice, but higher likelihood of hospice enrollment within 3 days of death.

This study generally corroborates the findings from past research. A study of colorectal and lung cancer patients using SEER Medicare data (1973–1996) found that male, non-White, and rural patients had later hospice enrollment [18]. As found in this study, Smith et al. [30] found lower enrollment in hospice among nonWhites than Whites. They also found that compared to Whites, a higher proportion of Blacks and Asian patients were hospitalized two or more times, spent more than 14 days hospitalized, and were admitted to the ICU in the last month of life. Another study found lower hospice enrollment rate among Blacks versus non-Blacks in a sample of Medicare patients with cancer [31]. White patients with advanced cancer were also found to be more likely than black patients to receive the end-of-life care they initially prefer. End-of-life discussions were not associated with care for black patients, indicating a need to improve physician-patient communication [32]. Older age (≥ 75 vs. < 75), female gender, and black (vs. nonblack) race have all found to be associated with higher likelihood of late hospice enrollment [31]. Further, a study of death certificates and Medicare data from 2002 showed that the use of hospice was consistently higher in men within a given race, and that blacks were less likely than whites to use hospice for all conditions [33].

The study has some limitations due to the data used. Medicare claims data do not contain information regarding services not covered by, or billed to Medicare or information for beneficiaries enrolled in Medicare Advantage plans. However, the majority of Medicare beneficiaries (80 %) are in the traditional fee-for-service program. Therefore, it is expected that the data will represent 80 % of the population of elderly cancer patients. In addition, claims data do not have detailed clinical information, including functional impairments that may influence end-of-life care. The study sample included only lung cancer patients who were 66 years of age and older. Therefore the findings may not be generalizable to Medicare recipients with other cancers and those lung cancer patients who are younger than 66 years of age. However, this study contributes to the literature by using a national sample of data to examine the relationship between county of residence, race, and SES with multiple measures of end-of-life care quality among older US adults with lung cancer and demonstrates that rural residents with lung cancer have limited use of hospice compared to urban residents. The study also highlights disparities in end-of-life care, including ER use, inpatient care, and ICU use among racial/ethnic minority patients and those of lower SES.

In conclusion, this study found empirical evidence that geographic and racial disparities in end of life care exist for elderly lung cancer patients. This study adds to a growing body of literature documenting disparities in access to care and outcomes based on place of residence, SES and race. Further research should explore possible causes for the observed disparities that can lead to targeted efforts to address access barriers to optimal end of life care for these groups of lung cancer patients. The perspectives of a diverse group of stakeholders including patients, families, and providers, as well as structural and financial barriers that make it difficult for patients to receive adequate and timely end-of-life care, should be considered while designing policy options.

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