Provider-Based Research Networks Demonstrate Greater Hospice Use for Minority Patients With Lung Cancer

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Abstract

Purpose: The Community Clinical Oncology Program (CCOP) and Minority-Based Community Clinical Oncology Program (MBCCOP) are provider-based research networks (PBRN) that improve minority enrollment in cancer-focused clinical trials. We hypothesized that affiliation with a PBRN may also mitigate racial differences in hospice enrollment for patients with lung cancer.

Methods: We used the SEER-Medicare data, linked to the National Cancer Institute's CCOP program data, to identify all patients ($\geq$ age 65 years) with lung cancer, diagnosed from 2001 to 2007. We defined clinical treatment settings as CCOP, MBCCOP, academic, or community-affiliated and used multivariable logistic regression analysis to determine factors associated with hospice enrollment.

Results: Forty-one thousand eight hundred eighty-five (55.1%) patients with lung cancer enrolled in hospice before death. Approx-

imately 55% of CCOP, 57% of MBCCOP, 57% of academic, and 52% of community patients enrolled. Patients who were more likely to enroll were female (odds ratio [OR], 1.36; 95% CI, 1.31 to 1.40); $\geq$ age 79 years (OR, 1.11; 95% CI, 1.06 to 1.16); white; lived in more educated areas; had minimal comorbidities; and had distant disease. Asian and black patients in academic (41.1% and 50.4%, respectively) and community practices (35.2% and 43.4%, respectively) were less likely to enroll in hospice compared with white patients (academic, 58.8%; community, 53.1%). However, hospice enrollment was equivalent for black and white patients in MBCCOP (59.5% v 57.2%) and CCOP (52.2% v 56.3%) practices.

Conclusion: Minority patients with lung cancer receiving treatment in cancer-focused PBRN-affiliated practices have greater hospice enrollment than those treated in academic and community practices.

Introduction

Lung cancer accounts for an estimated 159,480 deaths annually, approximately 27% of all cancer deaths in 2013.¹ Patients who are diagnosed with stage IV non-small-cell lung cancer (NSCLC) have a 5-year survival rate of 1%.¹ Racial disparities in lung cancer treatment, survival, and end-of-life care have been shown consistently.²⁻¹² Minority patients undergo surgery less often than white patients for equivalent stage lung cancer.⁵⁻⁸ Disparities in lung cancer treatment result in poorer outcomes and survival for minority patients who are also less likely to receive end-of-life care compared with white patients.^{2-5,7,9,11,12} Given the racial disparities in lung cancer treatment and end-of-life care, there are many uncertainties concerning the continuum of care for minority patients with lung cancer. Identifying mechanisms to decrease racial disparities in cancer care will ideally improve cancer care quality.

Hospice care is recommended when it is anticipated that a patient will live for less than 6 months, during which time focus shifts from curative treatment to palliation.¹³ Overall, hospice use has increased since the inception of the Medicare Hospice Benefit as set up by the United States congress in 1982.^{14,15} Despite the increase, racial disparities in hospice enrollment persist.²⁻¹² Differences in hospice use between groups may result from patient and family preferences, physician referral practices, and access to hospice services.¹⁶⁻²¹ Research results suggest that considerable racial and ethnic variation in the

structure and process of care might affect the care choice and experiences of patients with terminal illness.^{11,16-20} However, it is unknown how clinical practice affiliation influences racial variations in hospice enrollment.

The Community Clinical Oncology Program (CCOP) and Minority-Based Community Clinical Oncology Program (MBCCOP) are provider-based research networks (PBRN) that aim to increase involvement of community physicians in cancer-focused clinical trials.²²⁻²⁴ The CCOP is known for facilitating rapid adoption of advances in cancer therapy.^{22,24} MBCCOPs, differing from CCOPs in having a population that is at least 30% minority or underserved, moderate racial disparity in clinical trial enrollment.^{25,26} PBRNs also facilitate early adoption of innovations.²⁷⁻²⁹ The role of PBRNs in facilitating end-of-life care is unknown.

The first objective of our study was to determine whether hospice use for patients with lung cancer varied on the basis of the treating providers' practice affiliation. We then examined whether there was variation in hospice use, by race, within these practice affiliations. The study hypothesis was that affiliation with a PBRN would mitigate racial differences in hospice enrollment.

Methods

Data Sources

We used the SEER-Medicare data linked to data on physician and hospital CCOP affiliation from the National Cancer Insti-

tute's (NCI) CCOP program. Approximately 93% of all SEER patients age 65 years and older are matched with Medicare enrollment files that contain claims for services including hospice. The Medicare Hospice Benefit funds services provided to approximately 84% of hospice patients annually.¹⁵ The NCI CCOP files include affiliated providers names and unique physician identification numbers.

Study Population

We included all patients with incident lung cancer from 2001 to 2007 who died before 2008. The population was then limited to patients with their first cancer diagnosis who were age 65 years and older and diagnosed with primary lung cancer defined by the primary site and the International Classification for Diseases for Oncology (ICD-O-3) morphology code 39 (lung and bronchus). To ensure completeness of Medicare claims data, we excluded patients who were not continuously enrolled in Medicare Parts A and B, those who had health maintenance organization coverage throughout the study period, and those diagnosed by autopsy or death certificate (Appendix Figure A1, online only).

Clinical Practice Affiliation

The main exposure, clinical practice affiliation, was defined as MBCCOP, CCOP, academic, or community. To determine MBCCOP and CCOP affiliation, physician and hospital affiliation data from the NCI were linked to SEER-Medicare data by unique physician identification number. Patients with claims for treatment from physicians associated with MBCCOP practices were considered MBCCOP patients. Of the remaining patients, those with CCOP claims were considered CCOP patients. Academic patients were defined as those treated at an academic practice defined by association with a medical school or teaching hospital but not affiliated with an MBCCOP or CCOP. All other patients—those not classified as academic, MBCCOP, or CCOP—were considered community patients.

Patient Characteristics

Possible covariates impacting the relationship between clinical practice affiliation and hospice enrollment were determined a priori. Patient race was defined as Asian (Asian or Pacific Islander), black, white, and other. Ethnicity was defined as Hispanic and non-Hispanic. Given that the SEER-Medicare database does not include individual level socioeconomic status information, census tract high school graduation rates grouped in quartiles were used as an area-based measure of socioeconomic status. The Charlson comorbidity index (CCI) was constructed from Medicare claims from the 12 months before diagnosis and used to measure comorbidity.³⁰ Given that there were few people with CCI more than two, CCI was analyzed in three categories (0, 1, ≥ 2). NSCLC was defined by ICD-O-3 histology codes: 8010, 8014, 8020, 8022, 8031, 8033, 8046, 8052, 8071, 8073, 8082, 8084, 8123, 8140, 8200, 8230, 8250, 8260, 8310, 8333, 8430, 8470, 8480, 8490, 8550-8560, 8570, 8972-8980. All other histologies were defined as "other." The

SEER-Medicare extent of disease (diagnosis 2001 to 2003) and collaborative stage schemes (diagnosis 2004 to 2007) were used to create four categories for tumor stage (local, node-positive, distant, other/missing) on the basis of disease extension, lymph node involvement, and metastasis at diagnosis.^{31,32}

Hospice Enrollment

The outcome of interest was hospice enrollment. Patients who had at least one claim in the Medicare hospice file from 2001 to 2009 were considered enrolled in hospice.

Statistical Analyses

Univariable, bivariable, and multiple logistic regression analyses were used to examine the relationship between patient characteristics, clinical practice affiliation, and hospice enrollment. Descriptive statistics of the cohort were performed using the Pearson χ^2 test with a cutoff value of $P < .05$. Models stratified by clinical practice affiliation were created to study the interaction with race. Given that the coding for Hispanic ethnicity in SEER-Medicare data is complex and not entirely reliable, we performed a sensitivity analysis examining Hispanic patients separately.³³

We also examined the relationship between patient characteristics, clinical affiliation, and number of days in hospice before death. For hospice patients, time in hospice was defined as the number of days from the start date of the hospice admission claim to the date of death. Patients with missing dates or with negative values for days in hospice were excluded ($n = 18$). After adding 1 day to all values to account for those who died on the day of hospice admission (0 days in hospice), the number of days in hospice before death was log transformed to account for the skewed distribution and used as the continuous outcome variable in multiple linear regression. All statistical analyses were performed using SAS 9.2, and two-sided P values are presented. Institutional review board exemption was obtained from the University of North Carolina at Chapel Hill.

Results

There were 221,856 patients with incident lung cancer from 2001 to 2007 (Fig 1, online only). Of these, the 40,032 patients living at the end of 2008 were excluded. Of the remaining 181,824 deceased patients, 105,750 did not meet inclusion criteria, leaving a final cohort of 76,074 patients. The racial distribution among included and excluded patients was similar.

Of the final cohort, 41,885 (55.1%) patients were enrolled in hospice. White patients represented 84.8%, black 7.4%, Asian 4.1%, and other 3.7% of the cohort (Table 1). Hispanic patients were analyzed with their race groups. In the cohort, 54.3% of patients were treated in academic, 35.1% in community, 9.9% in CCOP-affiliated, and 0.8% in MBCCOP-affiliated practices.

Hospice use was more common among patients who were white (56.6%), were female (59.3%), were not married (56.2%), and had fewer comorbidities (57.9%). Furthermore, hospice patients tended to reside in more educated census tracts

Table 1. Descriptive Characteristics of Overall Study Cohort: Deceased Patients $\geq$ Age 65 Years Diagnosed With Lung Cancer Between 2001 and 2007 From SEER-Medicare

Characteristic	All Patients With Lung Cancer		% in Hospice	Hospice v Nonhospice <i>P</i>
	No.	%		
Total population	76,074	100	55.1	
Sex				< .001
Male	38,940	51.2	51.0	
Female	37,134	48.8	59.3	
Race				< .001
Asian	3,102	4.1	39.0	
Black	5,663	7.4	48.8	
White	64,481	84.8	56.6	
Other	2,828	3.7	50.0	
Age, years				< .001
65-69	12,092	15.9	52.5	
70-74	18,713	24.6	53.0	
75-79	20,141	26.5	55.0	
80-84	15,007	19.7	57.4	
$\geq$ 85	10,121	13.3	58.5	
Married				< .001
Yes	36,692	48.2	53.9	
No	39,382	51.8	56.2	
Residence				.1143
Urban	74,568	98.0	55.1	
Rural	1,506	2.0	53.1	
Education*				< .001
Quartile 1: lowest	17,634	23.2	49.9	
Quartile 2: low-medium	19,192	25.2	54.5	
Quartile 3: medium-high	19,812	26.0	56.7	
Quartile 4: highest	19,436	25.6	58.6	
CCI				< .001
0	32,660	47.8	57.9	
1	21,311	31.2	55.5	
$\geq$ 2	14,430	21.1	50.9	
Tumor type				.0234
NSCLC	45,389	59.7	55.4	
Other	30,685	40.3	54.6	
Tumor stage†				< .001
Local	14,072	18.5	51.0	
Node positive	24,905	32.7	52.8	
Distant	37,057	48.7	58.1	
Other/missing	40	0.1	45.0	
Clinical practice affiliation				< .001
Academic	41,280	54.3	57.3	
CCOP	7504	9.9	55.0	
Community	26,661	35.1	51.6	
MBCCOP	629	0.8	57.4	

Abbreviations: CCI, Charlson comorbidity index; CCOP, Community Clinical Oncology Program; MBCCOP, Minority-Based Community Clinical Oncology Program; NSCLC, non-small-cell lung cancer.

* Proportion of patient's census tract age 25 years and older with high school diploma.

† Local indicates not in situ, no lymph node involvement, no metastasis; node positive indicates not in situ, lymph node involvement, no metastasis; distant indicates metastatic disease.

(fourth quartile, 58.6%) and urban locations (55.1%). Finally, compared with nonhospice users, patients enrolled in hospice were more likely to have distant disease (58.1%) and be treated in MBCCOP-affiliated (57.4%) practices (Table 1).

The racial distribution of the patient populations across the different practice settings was similar for Asian, Black, and white patients (Table 2). Asian patients were more likely to be age 85 years or older (odds ratio [OR], 1.19; 95% CI, 1.04 to 1.35) and have greater comorbidity (OR, 5.21; 95% CI, 4.69 to 5.78) whereas black patients were more likely $\leq$ age 75 years (OR, 1.40; 95% CI, 1.27 to 1.54). Both Asian (OR, 1.83; 95% CI, 1.64 to 2.05) and black (OR, 13.41; 95% CI, 11.83 to 15.20) patients resided predominantly in the lowest education areas. White patients were more likely to have few comorbidities and reside in highly educated areas.

On multivariable analysis controlling for patient sociodemographic and clinical characteristics, patients who were most likely to use hospice were female (OR, 1.36; 95% CI, 1.31 to 1.40), age 79 years and older (OR, 1.11; 95% CI, 1.06 to 1.16), and white; they also tended to resided in higher education areas and had minimal comorbidities (CCI, 0), and distant disease at diagnosis (Table 3). The lowest hospice use was associated with patients who were black (OR, 0.80; 95% CI, 0.76 to 0.85) or Asian (OR, 0.49; 95% CI, 0.45 to 0.53), residents of the lowest education areas (OR, 0.78; 95% CI, 0.75 to 0.82), and more comorbidities (CCI, 1 [OR, 0.93; 95% CI, 0.90 to 0.97] or CCI $\geq$ 2 [OR, 0.81; 95% CI, 0.78 to 0.85]). Community patients (OR, 0.79; 95% CI, 0.67 to 0.94) were less likely to enroll in hospice when compared with MBCCOP patients (Table 3).

When stratified by practice affiliation, there was a similar pattern of hospice use by race in academic, community, and CCOP practices (Table 3). Hospice enrollment was less likely for Asian patients treated in CCOP (OR, 0.53; 95% CI, 0.39 to 0.72), academic (OR, 0.50; 95% CI, 0.45 to 0.55), and community practices (OR, 0.46; 95% CI, 0.39 to 0.53) and for black patients treated in academic (OR, 0.78; 95% CI, 0.72 to 0.84) and community practices (OR, 0.78; 95% CI, 0.68 to 0.89) compared with white patients. In contrast, there was no statistically significant difference in hospice use by race for patients treated in MBCCOPs (Table 3).

The number of days in hospice before death ranged from 0 to 2,594 days (> 7 years). The mean and median lengths of hospice enrollment were 26 and 14 days, respectively. Of the patients admitted to hospice, 999 (2.4%) died on the day of hospice admission, whereas 207 patients (0.49%) were enrolled in hospice for more than 180 days. Patients who were married, lived in urban areas, were younger than age 70 years, and had greater comorbidity had shorter hospice stays. Longer hospice stays were associated with those who were older than age 79 years, female, Asian, less educated, and higher-staged disease at diagnosis. There were no differences in time in hospice on the basis of practice affiliation.

Sensitivity analyses were performed to examine Hispanic patients as a separate group. The results for likelihood of hospice use and length of time in hospice were unchanged.

Discussion

Racial/ethnic minority patients with lung cancer treated at PBRN practices are more likely to receive hospice care than those treated at non-PBRN practices. Our data show hospice use is most uniform for patients treated in MBCCOP practices. However, racial differences in hospice enrollment remain for Asian patients treated in CCOP practices and Asian and black patients treated in academic and community practices when compared with white patients. The reasons for these enduring differences involve the interplay of factors at the patient, physician, and health care system levels.

Although studies show improved survival and quality of life with early initiation of end-of-life care, some patients and physicians still hold the belief that hospice causes premature death.^{34,35} A SEER-Medicare study examining hospice care and survival for patients with advanced NSCLC from 1991 to 1999 found, compared with nonhospice patients, hospice patients did not experience worse survival rates.³⁶ Despite this evidence, patient-level factors such as poor understanding of the services provided by hospice, preference for aggressive measures at the end of life, and distrust of the health care system contribute to the longstanding hospice enrollment gap for black and Asian patients.¹⁶⁻²⁰

Current literature does not address the persistently low hospice enrollment for Asian patients in CCOP practices despite equal enrollment for black and white patients. The difference in enrollment may reflect retention of Asian language and cultural norms by the Asian population that is age 65 years and older with lung cancer, in lieu of adopting the English language and end-of-life services. This reasoning is consistent with the fact that, in our study, Asian patients were more likely to be age 85 years and older compared with non-Asian patients.

Patient preferences alone do not account for the difference. Differential referral patterns by physicians as well as system-level hospice policies that impact access disproportionately affect the underserved, which in most studies, like ours, are more commonly nonwhite patients.²¹ Our study demonstrates that PBRNs may be more effective than other practices at leveling racial differences and enrolling minority patients into hospice.

Cancer-focused PBRNs increase minority participation in cancer clinical trials, facilitate diffusion of innovative therapies, and decrease cancer treatment disparities with the goal of improving cancer care quality.²²⁻²⁹ As a result, one could expect higher rates of hospice enrollment for patients treated at PBRN practices. However, since PBRN patients are also more likely to participate in clinical trials, this could have a negative impact on end-of-life care. In a recent study, Enzinger et al³⁷ demonstrated that, for patients with terminal cancer, clinical trial participation was associated with aggressive end-of-life care and later hospice enrollment. Notably, trial participants were also less likely to be from minority groups.³⁷

Ideally, if hospice is presented as acceptable palliative therapy when curative treatment is no longer advantageous and is offered universally, minority patients may be more willing to enroll.^{23,38-40} In one study, Keating et al⁴¹ found no difference in hospice enrollment by patient race or marital status in an

Table 2. Descriptive Characteristics of Deceased Patients $\geq$ Age 65 Years Diagnosed With Lung Cancer Between 2001 and 2007 From SEER-Medicare, by Clinical Practice Affiliations

Characteristic	MBCCOP (n = 629; %)	CCOP (n = 7,504; %)	Academic (n = 41,280; %)	Community (n = 26,661; %)
Sex				
Male	49.3	49.8	50.4	52.8
Female	50.7	50.2	49.6	47.2
Race				
Asian	2.4	2.8	4.5	3.9
Black	6.7	7.4	8.8	5.5
White	90.9	84.6	86.8	81.6
Other	0.0	5.3	0.0	9.1
Age, years				
65-69	15.9	15.2	16.3	15.5
70-74	25.8	25.4	25.1	13.6
75-79	27.7	28.1	26.8	25.4
80-84	20.4	19.3	19.4	20.4
≥ 85	10.3	12.0	12.5	15.1
Married				
Yes	47.5	48.9	49.3	46.5
No	52.5	51.1	50.7	53.5
Residence				
Urban	> 98.0	98.8	98.3	97.4
Rural	< 2.0	1.3	1.7	2.6
Education*				
Quartile 1: lowest	34.3	22.6	20.6	27.1
Quartile 2: low-medium	25.9	24.8	25.2	25.4
Quartile 3: medium-high	22.6	25.8	26.8	25.0
Quartile 4: highest	17.2	22.5	27.5	22.5
CCI				
0	42.8	42.4	47.3	50.3
1	32.6	30.9	31.5	30.7
≥ 2	24.7	26.7	21.3	19.0
Tumor type				
NSCLC	64.2	59.9	60.7	57.9
Other	35.8	40.1	39.3	42.1
Tumor stage†				
Local	25.6	22.3	19.0	16.5
Node positive	32.0	32.2	32.5	33.3
Distant	42.5	45.5	48.4	50.2
Other/missing	< 1.0	< 1.0	< 1.0	< 1.0
Enrolled in Hospice				
Yes	57.4	55.0	57.3	51.6
No	42.6	45.0	42.8	48.4

Abbreviations: CCI, Charlson comorbidity index; CCOP, Community Clinical Oncology Program; MBCCOP, Minority-Based Community Clinical Oncology Program; NSCLC, non-small-cell lung cancer.

* Proportion of patient's census tract age 25 years and older with high school diploma.

† Local indicates not in situ, no lymph node involvement, no metastasis; node positive indicates not in situ, lymph node involvement, no metastasis; distant indicates metastatic disease.

integrated health care system that offers hospice services to participants. In a different study by Cowall et al³⁵ hospice enrollment differed on the basis of whether a patient was treated in a teaching or nonteaching hospital.

In the late 1990s, when the need for more training in hospice and palliative medicine as a means of decreasing futile use of health care resources was realized, training in this area became a part of the medical education curriculum, and the hospice and

Table 3. Adjusted* Odds of Enrolling in Hospice for Deceased Patients $\geq$ Age 65 Years Diagnosed With Lung Cancer Between 2001 and 2007 From SEER-Medicare

Variable	All Patients		MBCCOP		CCOP		Academic		Community	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Sex										
Male	1		1		1		1		1	
Female	1.36	1.31 to 1.40	1.68	1.18 to 2.38	1.34	1.21 to 1.48	1.40	1.34 to 1.46	1.29	1.22 to 1.36
Race										
Asian	0.49	0.45 to 0.53	1.21	0.41 to 3.57	0.53	0.39 to 0.72	0.50	0.45 to 0.55	0.46	0.39 to 0.53
Black	0.80	0.76 to 0.85	1.22	0.62 to 2.38	0.94	0.77 to 1.13	0.78	0.72 to 0.84	0.78	0.68 to 0.89
White	1		1		1		1		1	
Other	0.89	0.82 to 0.97			0.70	0.57 to 0.87			0.93	0.84 to 1.01
Age, years										
65-69	0.90	0.86 to 0.95	1.07	0.64 to 1.79	0.98	0.84 to 1.14	0.92	0.86 to 0.98	0.85	0.78 to 0.93
70-74	0.93	0.89 to 0.97	1.04	0.66 to 1.64	1.03	0.91 to 1.17	0.92	0.87 to 0.98	0.91	0.84 to 0.98
75-79	1		1		1		1		1	
80-84	1.11	1.06 to 1.16	1.39	0.86 to 2.24	1.17	1.02 to 1.35	1.10	1.03 to 1.17	1.09	1.01 to 1.18
≥ 85	1.14	1.08 to 1.19	1.51	0.81 to 2.81	1.29	1.10 to 1.53	1.13	1.06 to 1.21	1.09	1.00 to 1.19
Married										
Yes	1.01	0.98 to 1.05	1.04	0.73 to 1.49	0.97	0.88 to 1.07	1.02	0.98 to 1.07	1.022	0.96 to 1.08
No	1		1		1		1		1	
Residence										
Urban	0.98	0.87 to 1.09	0.75	0.17 to 3.27	1.07	0.70 to 1.65	0.90	0.77 to 1.06	1.06	0.90 to 1.25
Rural	1		1		1		1		1	
Education†										
Quartile 1: lowest	0.78	0.75 to 0.82	0.56	0.34 to 0.94	0.70	0.61 to 0.80	0.81	0.77 to 0.87	0.77	0.71 to 0.83
Quartile 2: low-medium	0.88	0.85 to 0.92	0.72	0.42 to 1.23	0.85	0.74 to 0.97	0.92	0.87 to 0.97	0.84	0.78 to 0.90
Quartile 3: medium-high	0.94	0.91 to 0.99	0.65	0.38 to 1.12	0.94	0.82 to 1.07	0.95	0.90 to 1.01	0.94	0.87 to 1.01
Quartile 4: highest	1		1		1		1		1	
CCI										
0	1		1		1		1		1	
1	0.93	0.90 to 0.97	0.83	0.57 to 1.23	1.04	0.93 to 1.17	0.93	0.89 to 0.98	0.91	0.85 to 0.96
≥ 2	0.81	0.78 to 0.85	0.91	0.60 to 1.39	0.89	0.79 to 1.00	0.80	0.75 to 0.84	0.81	0.76 to 0.88
Tumor type										
NSCLC	1.01	0.98 to 1.04	0.95	0.67 to 1.34	1.03	0.94 to 1.14	1.02	0.98 to 1.06	0.99	0.93 to 1.04
Other	1		1		1		1		1	
Tumor stage‡										
Local	0.74	0.71 to 0.77	0.75	0.49 to 1.13	0.76	0.67 to 0.86	0.70	0.66 to 0.74	0.79	0.73 to 0.85
Node positive	0.80	0.78 to 0.83	0.98	0.66 to 1.45	0.79	0.70 to 0.88	0.80	0.76 to 0.84	0.81	0.77 to 0.87
Distant	1		1		1		1		1	
Other/missing	0.75	0.38 to 1.46	—	—	0.34	0.03 to 3.83	0.94	0.37 to 2.41	0.65	0.22 to 1.89
Clinical practice affiliation										
Academic	0.97	0.83 to 1.15	—	—	—	—	—	—	—	—
CCOP	0.90	0.76 to 1.07	—	—	—	—	—	—	—	—
Community	0.79	0.67 to 0.94	—	—	—	—	—	—	—	—
MBCCOP	1									

Abbreviations: CCI, Charlson comorbidity index; CCOP, Community Clinical Oncology Program; MBCCOP, Minority-Based Community Clinical Oncology Program; NSCLC, non-small-cell lung cancer; OR, odds ratio.

* Adjusted for patient sex, race, age, marital status, residential location, education, CCI, and tumor type.

† Proportion of patient's census tract age 25 years and older with high school diploma.

‡ Local indicates not in situ, no lymph node involvement, no metastasis; node positive indicates not in situ, lymph node involvement, no metastasis; distant indicates metastatic disease.

palliative medicine residency was developed.^{42,43} Some suggest that one explanation for the slow improvement in hospice use after these efforts may be the optional nature of the training in some institutions.⁴³ More extensive mandatory training in hospice and palliative medicine starting at the level of medical school, in addition to the already implemented cultural sensitivity curriculum, may help alleviate the persistent racial gap in hospice enrollment. This education is especially important for physicians treating patients in community practices, because, in practice, most patients are treated in the community, but patients in community settings are least likely to enroll in hospice.²⁴

The finding that the fewer comorbidities patients had the more likely they were to enroll in hospice was surprising. This result differed from a previous study showing that hospice patients had more comorbidities than nonhospice patients.⁴⁴ We expected patients with more comorbidities to be less likely candidates for curative therapies and thus more likely candidates for hospice care. After recognizing the impact of their comorbidities, we also expected patients with greater comorbidity to enroll in hospice earlier in the course of their disease than those with less comorbidity. However, in our study, patients with greater comorbidity had shorter hospice stays than those with minimal comorbidity. A possible explanation for these surprising findings is that those with fewer comorbidities may have a great concern for quality of life and thus enroll in hospice more often and sooner in the course of illness as a means of maintaining quality of life and possibly length of survival.⁴⁵ Alternatively, this could reflect the relatively poor sensitivity of claims-based CCI for measuring patient functional and performance status. For example, we were not able to adjust for baseline lung function or cumulative/ongoing tobacco use.

The small sample size for CCOP and MBCCOP practices limits the power of this study for detecting small differences in hospice enrollment. Therefore, our findings need to be confirmed in a larger patient sample. Additionally, our findings are limited by a lack of information on provider referral patterns and patient preferences and NCI clinical trial participation. Although the definitions for clinical practice affiliations in the study were mutually exclusive, in practice, patients are seen in various clinical practice settings by physicians who are associated with various affiliations.

Our study is unique in showing that characteristics of the clinical practice where minority patients are treated, including research culture and willingness of physicians to adopt advances in cancer therapy, may affect hospice use. This is significant because it represents an area for modifiable change that could improve cancer care. The NCI Community Oncology Research Program, which was recently created to replace cancer-focused networks such as the CCOP and MBCCOP, has the potential to increase our knowledge in this area through its concentration on both cancer care delivery and disparities research.⁴⁶ Although the study findings are valuable, given the observational design of the study, they are hypothesis generating and should serve as a foundation for further investigation in this area. Future studies should focus on identifying how the recruitment strategies used by PBRN-affiliated practices for clinical trial

enrollment may impact minority hospice enrollment. Additionally, given the continued enrollment gap in most settings for Asian patients, further work should identify modifiable factors that are responsible for the persistently low hospice use for these patients.

Racial disparities remain throughout the continuum of lung cancer care. MBCCOPs seem to be associated with decreasing differences in cancer care for minority patients with lung cancer by increasing both clinical trial enrollment and use of hospice services. By identifying and implementing techniques used by these practices, we may improve overall care for minority patients with lung cancer in other practice settings.

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Appendix

Figure A1. CONSORT diagram of study population. HMO, health maintenance organization.