Physician Variation in Lung Cancer Treatment at the End of Life

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ABSTRACT

OBJECTIVES: To determine whether a treating oncologist's characteristics are associated with variation in use of chemotherapy for patients with advanced non–small cell lung cancer (aNSCLC) at the end of life.

STUDY DESIGN: Retrospective cohort.

METHODS: Using the 2009 Surveillance, Epidemiology, and End Results–Medicare database, we studied chemotherapy receipt within 30 days of death among Medicare enrollees who were diagnosed with aNSCLC between 1999 and 2006, received chemotherapy, and died within 3 years of diagnosis. A multilevel model was constructed to assess the contribution of patient and physician characteristics and geography to receiving chemotherapy within 30 days of death.

RESULTS: Among 21,894 patients meeting eligibility criteria, 43.1% received chemotherapy within 30 days of death. In unadjusted bivariate analyses, female sex, Asian or black race, older age, and a greater number of comorbid diagnoses predicted lower likelihood of receiving chemotherapy at the end of life ($P \leq .038$ for all comparisons). Adjusting for patient and physician characteristics, physicians in small independent practices were substantially more likely than those employed in other practice models, particularly academic practices or nongovernment hospitals, to order chemotherapy for a patient in the last 30 days of life ($P < .001$ for all comparisons); female physicians were less likely than males to prescribe such treatment ($P = .04$).

CONCLUSIONS: Patients receiving care for aNSCLC in small independent oncology practices are more likely to receive chemotherapy in the last 30 days of life.

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Despite a half century of treatment advances, lung cancer—the most common solid tumor in the United States—remains among the cancers least responsive to treatment.[1] A majority of patients are diagnosed at an advanced stage and, even with the newest therapies, barely 1 in 10 are alive a year after diagnosis.[2,3] In the final weeks of life, many patients with advanced non–small cell lung cancer (aNSCLC) undergo aggressive treatment that can include repeated emergency department visits, prolonged hospitalizations, intensive care, and additional lines of chemotherapy that contravene guidelines.[4-8] Attendant effects on quality of life are well documented, and the value of such expensive treatment is debated in the lay, clinical, and policy realms.[9-11]

Why aggressive end-of-life treatment occurs is not clearly understood. Regional variations in the aggressiveness of cancer treatment have been well established and patient factors have been explored[12,13]; however, the degree of variation between individual physicians is not known.[14,15] We conducted this study to determine the extent to which physician characteristics explain patients' receipt of chemotherapy in the 30 days prior to death among patients with aNSCLC.

METHODS

Sources of Data

We used the 2009 Surveillance, Epidemiology, and End Results (SEER) cancer registry and linked Medicare claims[16] to identify patients and describe treatment patterns. SEER regions include 28% of the US population. Approximately 68% of lung cancers diagnosed in SEER regions are in Americans older than 65 years.[2] Using the Unique Physician Identification Number Registry, we linked the physician submitting a Medicare claim to their characteristics in the American Medical Association (AMA) Masterfile.[17]

Study Cohort

The **Figure** details the initial sample and number of patients dropped due to each exclusion criterion. We first identified all

patients in the SEER registry diagnosed with lung cancer between 1999 and 2006. We selected 1999 due to changes in physicians' unique identification codes that year and 2006 to allow for up to 3 years of data after diagnosis. We limited the sample to those 65 years or older at diagnosis who were enrolled in traditional Medicare Part A and Part B from at least 12 months prior to a first diagnosis of lung cancer until 3 years after diagnosis or until death. Patients with other incident cancers were excluded to avoid erroneously counting chemotherapy directed toward another cancer.

TAKEAWAY POINTS

Oncologists' characteristics explain significant variation in patients' receipt of chemotherapy in the last 30 days of life:

- Patients should understand the variation in practices among oncologists treating the same condition.
- Awareness of such variation may influence an individual oncologist's practice decisions and eventually lead to consensus practices at end of life; practices may already have changed since the period under study.
- Less variation is likely to yield better alignment between patient goals and treatment received, and result in higher value care at the end of life.
- Payers may wish to consider oncologist practice type in determining network participation.

Among 193,200 subjects satisfying all conditions (ie, lung cancer, age ≥65, continuous enrollment in Medicare A and B, no other cancer), we excluded 4518 subjects who died on unknown dates and 123 subjects with charges for chemotherapy after their recorded date of death. Our cohort was then limited to 155,794 patients with stage 3b or 4 aNSCLC; an additional 38,311 were excluded for diagnosis dates out of range. We excluded 89,069 who had not received chemotherapy within 3 years of initial diagnosis and compared their characteristics with those who received chemotherapy. To avoid insufficient data biasing interpretation of physicians' practice patterns, subjects were excluded if not treated by an identifiable oncologist who provided care to 5 or more patients in the sample. In sensitivity analyses, we evaluated the impact of physician characteristics on receipt of chemotherapy in the last 30 days of life for all physicians, irrespective of the number of patients seen, and physicians with 10 or more patients. Our final analytic sample comprised 21,894 aNSCLC subjects.

Construction of the Dependent Variable

Chemotherapy use was established by Medicare charges in outpatient, inpatient, or physician claims for chemotherapy-related encounters (*International Classification of Diseases, Ninth Revision, Clinical Modification* [*ICD-9-CM*] diagnosis codes V58.1, V66.2, and V67.2), chemotherapy administration (*ICD-9-CM* procedure code 99.25; Current Procedural Terminology codes 96400-96549; Health Care Common Procedure Coding System codes J8530, J8560, J8600, J8610, J8999, Q0083-Q0085, and G0921-G0932; and Revenue Center Codes 0331, 0332, and 0335), or chemotherapy agents (J Codes other than diethylstilbestrol and leuprolide). The primary outcome was whether a patient who ever received chemotherapy received a final dose during the last 30 days of life.

Patient–Physician Link

Administration of chemotherapy at the end of life was attributed to the oncologist submitting a Medicare claim with the latest date of service rendered prior to a patient's death. Sensitivity analysis was performed, attributing the patient to the oncologist with the most visits. Physicians were considered oncologists if the billing physician's specialties in either Medicare claims or AMA-linked physician files included oncology, hematology-oncology, or hematology.

Independent Variables

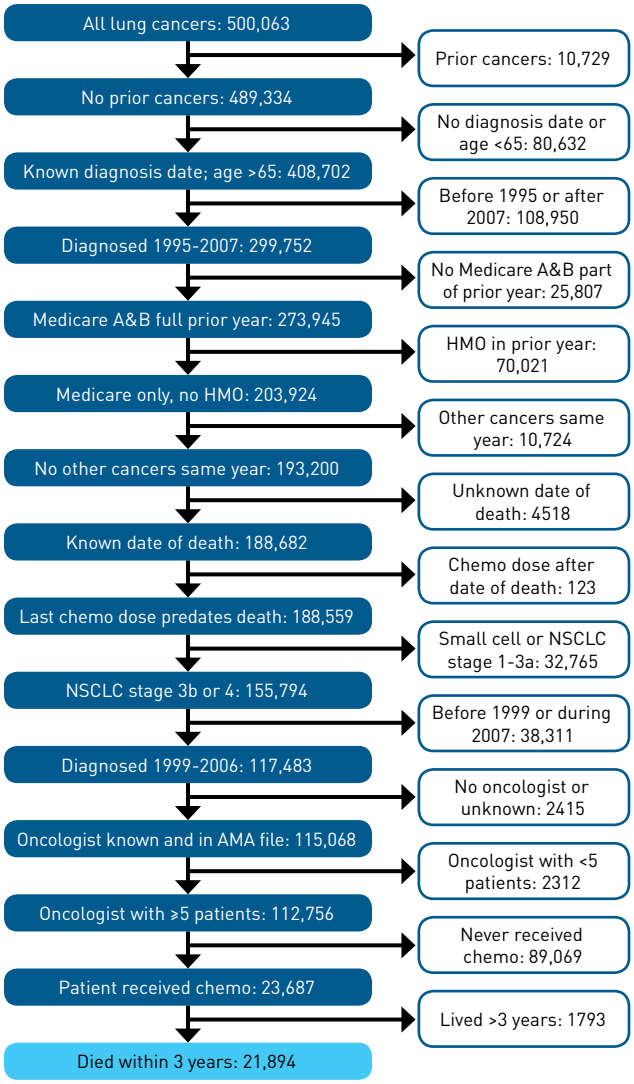
Patient were classified by race (white, black, Hispanic, Asian, other), sex, age at diagnosis (65-69, 70-74, 75-79, 80-84, ≥85 years), last known marital status, median income by zip code (by quartile, as a proxy for socioeconomic status), and year of diagnosis. Time between diagnosis and last chemotherapy was calculated and grouped (<1, 1, 2-3, 4-5, 6-7, 8-9, 10-11, 12-23, 24-36 months), as it was hypothesized that a recent diagnosis might be associated with receiving treatment at the end of life. We also included the proportion of blacks in the patient's residential zip code and birthplace outside of the United States.

We calculated a modified Charlson Comorbidity Index score for each patient using *ICD-9-CM*–coded diagnoses from inpatient claims, carrier claims, and outpatient claims using the Wang method.[18] In order to approximate patients' health leading up to death, comorbidity scores were calculated from claims for services provided during the 12 months prior to the month of death.

Physician characteristics included in the model were sex and year that medical training was completed. Age was strongly correlated with year of training completion and thus excluded. We examined the type of practice based on the present employer variable from the AMA Masterfile and classified this variable into 6 categories: small independent (physician-owned, 1-2 physicians), group practice (physician-owned, >2 physicians), government (employed by city, county, state, or federal government), academic (employed by medical schools), hospital (employed by non–government-owned hospital), and other.

As there is good evidence supporting geographic variations in treatment practices, we sought to control for such variation based on SEER registry sites; however, because of its size and previously demonstrated practice variation,[12] California was split by county into 4 zones: Los Angeles, non-LA Metro-South (San Diego, Riverside, San Bernardino, Orange, Ventura), Metro-North (San Francisco, Alameda, Santa Clara, Contra Costa, San Mateo, Marin), and Other. Rural Georgia, with just 47 eligible cases, was combined

FIGURE. Patients With Lung Cancer Dropped Due to Exclusion Criteria



AMA indicates American Medical Association; HMO, health maintenance organization; NSCLC, non–small cell lung cancer.

TABLE 1. Baseline Characteristics and Probability of Patients With Advanced Non–Small Cell Lung Cancer Receiving Chemotherapy Within 30 Days of Death

		Received Chemotherapy Within 30 Days of Death	
Variables	**N (%)**	**Yes (%)**	***P***
Total N	21,894	43.1	
Race/ethnicity			
White	18,631 (85.1)	43.9	<.001
Black	1676 (7.7)	40.0	
Hispanic	675 (3.1)	43.1	
Asian	867 (4)	33.3	
Other	45 (0.2)	40.0	
Sex			
Male	12,529 (57.2)	45.9	<.001
Female	9365 (42.8)	39.5	
Age, years			
65-69	5431 (24.8)	44.4	.038
70-74	6934 (31.7)	43.3	
75-79	5863 (26.0)	43.0	
80-84	2879 (13.1)	41.5	
≥85	787 (3.6)	40.8	
Year of diagnosis			
1999	1144 (5.2)	43.9	<.001
2000	2585 (11.8)	46.5	
2001	2727 (12.5)	46.2	
2002	2931 (13.4)	47.2	
2003	3304 (13.9)	43.8	
2004	3166 (14.5)	43.4	
2005	3182 (14.5)	37.8	
2006	2855 (13.0)	37.5	

(continued)

with Atlanta, yielding a single site for all of Georgia. SEER sites were otherwise categorized according to the SEER 17 registry.[19]

Statistical Analysis

Frequency distributions were calculated for patient, oncologist, and geographic variables. We used a multilevel logistic regression mixed model with dichotomous outcomes to estimate the probability of receiving chemotherapy treatment in the last 30 days of life. Patients were nested within physicians, who, in turn, were nested within geographic locations (SEER site, modified as above) as a random intercept at the highest level. The model adjusted for the patient and physician covariates, as described above. To facilitate interpretation of the magnitude of the effects, adjusted relative risks are presented along with the coefficient estimates and *P* values from the regression.

To calculate the marginal effect of the physician's type of practice on receiving chemotherapy at the end of life, each patient's probability of receiving treatment was recalculated as if all received treatment under a uniform type of practice, adjusting for patient variables and other physician variables. This was repeated for each type of practice.

University of California, Los Angeles, Institutional Review Board approved the study.

RESULTS

We identified 23,687 continuously enrolled Medicare (parts A and B) patients diagnosed with aNSCLC between 1999 and 2006. **Table 1**

TABLE 1. Baseline Characteristics and Probability of Patients With Advanced Non–Small Cell Lung Cancer Receiving Chemotherapy Within 30 Days of Death *(continued)*

		Received Chemotherapy Within 30 Days of Death	
Variables	**N (%)**	**Yes (%)**	***P***
Comorbidity score[a]			
0-2	17,928 (81.9)	42.6	.001
3-5	3458 (15.8)	45.0	
6-8	463 (2.1)	49.5	
≥9	45 (0.2)	57.8	
Months: diagnosis to last treatment			
<1	709 (3.2)	59.9	<.001
1	2486 (11.4)	56.6	
2-3	5334 (24.4)	47.1	
4-5	3642 (16.6)	39.8	
6-7	2387 (10.4)	39.7	
8-9	1544 (7.1)	44.2	
10-11	1052 (4.8)	40.9	
12-23	3253 (14.9)	38.1	
24-35	1487 (6.8)	23.5	
SEER site, states/regions			
California - Los Angeles[b]	1513 (6.9)	45.4	<.001
California - Metro-South[b]	1546 (7.1)	46.1	
California - Metro-North[b]	961 (4.4)	32.5	
California - Other[b]	2512 (11.5)	42.9	
Connecticut	1709 (7.8)	42.4	
Detroit	2089 (9.5)	45.5	
Georgia[c]	850 (3.9)	52.1	
Hawaii	290 (1.3)	32.1	
Iowa	1573 (7.2)	37.8	
Kentucky	1976 (9.0}	40.3	
Louisiana	1517 (6.9)	40.5	
New Jersey	3434 (15.7)	48.1	
New Mexico	361 (1.6)	39.9	
Seattle	1266 (5.8)	42.3	
Utah	297(1.4)	37.7	

[a]Based on records for 12 months prior to the month of death.
[b]California is 1 Surveillance, Epidemiology, and End Results (SEER) site; due to its size, it was partitioned.
[c]Rural Georgia SEER site had just 49 cases and was combined with Atlanta into "Georgia."

shows the distribution of patient characteristics and associated probability of receiving chemotherapy within 30 days of death, among the 21,894 (92.4%) patients receiving chemotherapy within 3 years of diagnosis. Of these, 9447 (43.1%) received chemotherapy within 30 days of death.

In bivariate analyses, men were more likely than women to receive chemotherapy near the end of their lives (45.9% vs 39.5%; P <.001) (Table 1). Patients were less likely to receive chemotherapy at the end of life if they were Asian (33.3%) or black (40.0%) compared with whites (43.9%; P <.001), older (40.8% among those aged ≥85 vs 44.4% among those aged 65-69; P = .04), had more comorbidities (P = .001), or diagnosed in 2005 (37.8%) or 2006 (37.5%) compared with 1999 (43.9%) (P <.001). Despite these differences in treatment, none of these variables were associated with a difference in survival (data not shown).

Characteristics of the 89,069 patients excluded for nonreceipt of chemotherapy matched closely on race, sex, year of diagnosis, and SEER site categories. Younger patients and those with low comorbidity scores were more likely to have started chemotherapy than those who were older and sicker; females were slightly more likely than males to have never received chemotherapy.

Physician characteristics and the numbers of patients attributed to physicians with each characteristic are shown in **Table 2**. Oncologists were primarily male (77.4%) and in group practices (61.2%). Physicians in small independent practices were significantly more likely to administer chemotherapy during the last 30 days of life (Table 2). Adjusting for all patient and provider covariates, the predicted probability of receiving chemotherapy in the last 30 days of life was 1.4-fold greater (0.56) for patients receiving care in small independent practices relative to those seeing oncologists in academic centers (0.40; P <.001) (**Table 3**). Predicted probabilities for patients receiving care in group practices, government facilities, hospitals, and other types of practice, were 0.55, 0.46, 0.42, and 0.52, respectively. Female oncologists were significantly less likely to administer chemotherapy at end of life (P <.001). Magnitude and direction of predictors were not meaningfully changed when analyses were repeated for patients of physicians treating at least 10 patients.

Adjusting for other patient and physician characteristics, the predicted probabilities of receiving chemotherapy in the last 30 days of life were lower for blacks, women, and those 75 years or older, diagnosed in 2005 or 2006 (vs 1999), for whom 2 or more months had elapsed since diagnosis, and with comorbidity scores of 3 to 5 or 6 to 8. Even within these subgroups, at least one-third would have been predicted to receive chemotherapy in the last 30 days of life (Table 3). Marital status and zip code–level median income categories were not significant predictors of chemotherapy receipt at end of life.

Overall, the model explained 28.9% of variation in chemotherapy use in the last 30 days of life among patients who were being treated for aNSCLC. Geographic location of care was a significant fixed-effects parameter (P <.001) and accounted for 16% of variation in chemotherapy use at the end of life. Patient characteristics accounted for 5.8%, while physician characteristics accounted for 7.1% of explained variation in chemotherapy use in the last 30 days of life.

TABLE 2. Physician Characteristics and Unadjusted Probability of Administering Chemotherapy to Patients Within 30 Days of Patient Death

Physician Variables	N	Patients in Medicare SEER Sample Treated by Physician[a]	Average Number of Patients per Physician	Percent of Chemo Recipients Administered Last Chemo Within 30 Days of Death	*P*
Sex					
Male	1938 (77.4%)	16,812	8.53	43.6%	.04
Female	445 (17.8%)	3941	8.66	40.4%	
Unknown	120 (4.8%)	1141	7.31	39.3%	
Type of practice					
Academic	100 (4.0%)	546	5.46	29.3%	<.001
Small independent	408 (16.3%)	4038	9.90	46.0%	
Group (>2 MDs)	1532 (61.2%)	14,367	9.38	43.7%	
Hospital (non-government, nonacademic)	60 (2.4%)	408	6.80	33.8%	
Government	114 (4.6%)	938	8.23	36.1%	
Other	289 (11.5%)	1597	5.53	42.6%	
Decade trained					
Before 1970	81 (3.2%)	435	5.37	42.9%	.01
1970s	609 (24.3%)	5935	9.75	44.3%	
1980s	600 (24.0%)	6299	10.50	43.6%	
1990s	644 (25.7%)	5988	9.30	43.1%	
2000s	411 (16.4%)	2381	5.79	39.7%	
Unknown	158 (6.3%)	856	5.42	41.8%	
Total	2503	21,894	8.75	43.1%	

[a]These are patients who were in the Surveillance, Epidemiology, and End Results-Medicare Claims Data. Only physicians treating 5 or more patients in the database are included; physicians might have treated other patients not in this database.

DISCUSSION

Advanced cancer is emotionally and physically taxing and can cause a great deal of suffering. Although patients are concerned about both quality and quantity of life,[20] most prefer not to undergo aggressive treatment at life's end,[21] making it particularly important that they understand expected clinical outcomes from treatment. Yet, Weeks et al found that 69% of patients with advanced lung cancer believed that they had some chance of cure.[22] Physician guidance regarding goals of care, prospective benefits of therapy, and helping to determine whether benefits are likely to outweigh expected side effects are critical components of quality care.

Physician prognostication is inexact, however, and variations in practice may reflect this uncertainty to some extent. Healthcare practices are known to vary—sometimes substantially—by geographic region or hospital[12]; few studies have examined whether physician characteristics are associated with variation in difficult clinical decisions, such as whether to continue therapy in the face of declining health.

Although the optimal rate of chemotherapy use at the end of life is unknown, our data suggest that nonclinical factors may strongly influence treatment decisions. In our study, 43% of chemotherapy recipients received final doses in the 30 days prior to death. Patients were much more likely to receive late chemotherapy if their physician was in a small independent practice or in a group practice. Of note, physicians in these types of practice were responsible for the care of almost three-fourths of all patients with aNSCLC. Since 2008, the ranks of community oncologists have dwindled,[23] and there has been a migration toward larger group practices.[24] Chemotherapy use at the end of life has trended downward during this same period, but it is not known whether these events are correlated or coincidental.

The data do not allow us to conclude why the type of practice is associated with chemotherapy use at the end of life. Many factors are likely to be associated, including differences in practice style—such as attitudes toward aggressive treatment, perceptions of the benefit of treatment, and the desire to provide hope to patients—and financial incentives for providing more treatment. Physicians in different types of practices may also see patients with diverse expectations and preferences for care, perhaps because patients seeking more aggressive treatment self-select physicians willing to provide that care.

Even for patients desiring aggressive treatments, physicians have a duty to provide treatment only to those who may reasonably be expected to benefit. Increased age and significant comorbid illness decrease the already limited benefits of late chemotherapy; our findings of there being a lower likelihood of these populations initiating chemotherapy suggest that appropriate clinical factors are playing some role in treatment decisions. Aggressive treatment also comes at great financial expense. Treatment of stage 4 aNSCLC is associated with particularly low value: $1.19 million per year of life saved.[25] Some commentators envision a "geriatric blast for oncologists" as more Baby Boomers become Medicare-eligible,[26] but humanistic and financial imperatives underline a need to reevaluate aggressive care for advanced cancers.[27]

Our study confirms aspects of others' work—generally conducted in a more heterogeneous group of cancers—while adding several important dimensions to the literature. Earle found that 15.7% of patients who start chemotherapy received a dose within 14 days of

death.[28] We confirm even higher rates in the last 30 days of life, specifically among those with aNSCLC. We also reaffirm geographic variation previously noted.

Our findings that physician characteristics predict patterns of care for aNSCLC patients at the end of life contribute a unique dimension to existing literature. Setoguchi, studying quality indicators in end-of-life care for lung, colorectal, breast, and prostate cancers in New Jersey (a SEER site with high treatment rates at the end of life[12]) and Pennsylvania (not in SEER, average end-of-life rates) noted that oncologists in small group practices were more likely to administer chemotherapy and less likely to initiate hospice than those in large groups.[29] Our geographically broader study examined a specific cancer in advanced stage that responds to chemotherapy only to a limited extent. Controlling for geographic variation, we nonetheless found meaningfully higher rates in small independent practices and among male physicians. As others have noted, we found that chemotherapy receipt within 30 days of death decreased in 2005, corresponding with the substantial decline in reimbursement by Medicare for providing outpatient chemotherapy, as well as FDA approval of an oral therapy (erlotinib), not included in our dataset.[30]

Limitations

This study has several limitations. Retrospective analysis of administrative data does not allow us to distinguish between aggressive treatment that is patient-driven from that which is physician-driven. It is possible that patients desiring aggressive treatment seek out physicians amenable to their demands, although this would not invalidate the observation that oncologists treating at higher rates gravitate to small independent practices. As our data were limited to Medicare patients living within SEER regions, and analysis was limited to 1999 to 2006 diagnoses, results may not be generalizable to other populations or time periods. Data sources limited the availability of physician demographics, practice characteristics, and the ability to distinguish among practices with more than 2 physicians. That so few measures explained more variation (7.1%)

TABLE 3. Predicted Probabilities for Receipt of Chemotherapy in the Last 30 Days of Life[a,b]

Patient Variables	Predicted Probability (%)	*P*[b]	Relative Risk	Bootstrapped 95% CI
Race				
White	0.40	–	1.00	
Asian	0.34	.01	0.84	(0.77-0.99)
Black	0.36	.01	0.90	(0.85-0.97)
Hispanic	0.38	.48	0.96	(0.85-1.07)
Other	0.29	.17	0.71	(0.34-1.23)
Gender				
Male	0.42	–	1.00	
Female	0.36	<.001	0.86	(0.84-0.89)
Age at diagnosis, years				
65-69	0.42	–	1.00	
70-74	0.40	.12	0.96	(0.91-1.02)
75-79	0.39	.01	0.93	(0.86-0.98)
80-84	0.36	<.001	0.86	(0.79-0.92)
>85	0.34	<.001	0.80	(0.73-0.91)
Marital status at diagnosis				
Married	0.39	–	1.00	
Single	0.39	.75	1.02	(0.90-1.08)
Divorced	0.39	.57	0.99	(0.89-1.00)
Widowed	0.40	.53	1.02	(0.96-1.08)
Unknown	0.39	.72	0.99	(0.84-1.13)
Year diagnosed				
1999	0.41	–	1.00	
2000	0.42	.45	1.04	(0.93-1.16)
2001	0.41	.97	1.00	(0.87-1.07)
2002	0.44	.15	1.07	(0.96-1.14)
2003	0.40	.83	0.99	(0.89-1.09)
2004	0.40	.60	0.98	(0.86-1.06)
2005	0.35	.001	0.84	(0.73-0.94)
2006	0.34	<.001	0.83	(0.75-0.92)
Zip code–level median income (quartile)				
0%-24%	0.38	–	1.00	
25%-49%	0.39	.35	1.03	(0.98-1.09)
50%-74%	0.40	.33	1.05	(0.99-1.15)
75%-99%	0.40	.32	1.06	(0.98-1.14)
Unknown	0.41	.31	1.08	(0.96-1.21)
Months since diagnosis				
<1	0.54	–	1.00	
1	0.51	.18	0.94	(0.85-1.04)
2-3	0.42	<.001	0.78	(0.73-0.83)
≥4	0.35	<.001	0.65	(0.63-0.69)

(continued)

TABLE 3. Predicted Probabilities for Receipt of Chemotherapy in the Last 30 Days of Life[a,b] *(continued)*

Patient Variables	Predicted Probability (%)	*P*[b]	Relative Risk	Bootstrapped 95% CI
Comorbidity score				
0-2	0.41	–	1.00	
3-5	0.38	<.001	0.92	(0.89-0.96)
6-8	0.37	<.001	0.91	(0.85-0.98)
≥9	0.35	.15	0.85	(0.67-1.07)
Physician variables				
Sex				
Male	0.54	–	1.00	
Female	0.52	.01	0.95	(0.90-0.99)
Type of practice				
Academic	0.40	–	1.00	
Small independent	0.56	<.001	1.40	(1.21-1.60)
Group (>2)	0.55	<.001	1.35	(1.17-1.59)
Hospital (nongovernment)	0.42	.72	1.04	(0.84-1.21)
Government	0.46	.13	1.14	(0.93-1.36)
Other	0.52	.001	1.29	(1.05-1.52)
Decade trained				
2000s	0.54	–	1.00	
1990s	0.54	.94	0.99	(0.93-1.08)
1980s	0.54	.98	0.99	(0.94-1.07)
1970s	0.55	.75	1.01	(0.96-1.13)
Before 1970	0.51	.47	0.95	(0.88-1.12)
Unknown	0.52	.47	0.96	(0.87-1.10)
Geographic site				
New Jersey	0.43	–	1.00	
California - Los Angeles	0.43	.97	0.99	(0.94-1.05)
California - Metro-South	0.43	.99	0.99	(0.92-1.04)
California - Metro-North	0.32	<.001	0.79	(0.71-0.86)
California - Other	0.40	.09	0.94	(0.87-1.02)
Connecticut	0.39	.10	0.94	(0.87-1.01)
Detroit	0.41	.44	0.97	(0.90-1.04)
Georgia	0.50	.002	1.13	(1.07-1.20)
Hawaii	0.31	.008	0.78	(0.63-0.93)
Iowa	0.32	<.001	0.79	(0.73-0.84)
Kentucky	0.35	<.001	0.86	(0.78-0.93)
Louisiana	0.39	.06	0.92	(0.87-1.04)
New Mexico	0.35	.03	0.86	(0.70-0.98)
Seattle	0.39	.14	0.94	(0.89-1.02)
Utah	0.34	.02	0.83	(0.72-0.95)

CI indicates confidence interval.
[a]These are patients who were in the Surveillance, Epidemiology, and End Results-Medicare Claims Data based on records for 12 months prior to the month of death; only physicians treating 5 or more patients.
[b]A multilevel logistic regression mixed model was used to estimate the probability of receiving chemotherapy treatment in the last 30 days of life. A random intercept model was used with patients nested within physicians, who, in turn, were nested within geographic locations. *P* values were derived from these respective models.

than the robust demographic data available for patients (5.8%) suggests that other physician characteristics may warrant exploration; parameters of interest might include physician wealth, marital status, and race, practice payer mix, and training environment. Assignment of responsibility to the last oncologist seen may incorrectly attribute final doses of chemotherapy, although this is unlikely to introduce bias regarding type of practice. Our study design did not permit inclusion of oral chemotherapeutic agents (eg, erlotinib), possibly used by a subset of patients during later parts of the observation period, but whose inclusion could only have increased treatment rates near death.

CONCLUSIONS

The disconnect between how patients report preferring care at the end of life and how they actually die may have any number of causes, including clinical uncertainty, poor prognostication, incomplete sharing of information with patients, misguided optimism, or physicians' failure to explore patients' preferences. Poor communication of information is notorious and pervasive. When two-thirds of patients with stage 4 lung cancer are unaware that chemotherapy is unlikely to cure their cancer and, therefore, they do not know they are approaching the end of life,[22] surely fewer know that late aggressive therapy may actually foreshorten life.[31,32]

Improved communication and early incorporation of palliative care can lead to care more consistent with patients' goals. Early enrollment in palliative care is associated with a significant decrease in receipt of chemotherapy close to death when chemotherapy's side effects outweigh any potential benefit.[33] Better tools are needed to help oncologists determine how to communicate prognoses in ways that patients can understand, as well as how best to partner with patients in shared decision making when a prognosis is poor. Together, these would help determine when to advise a patient to avoid the risks and discomforts of chemotherapy, and instead enjoy what quality can be had during the limited remaining life.

Prognosticative limitations notwithstanding, variable rates of late chemotherapy

receipt signify inconsistency in how cancer is treated as death nears. As variations in practice are also a cost driver, evidence of variation between physicians suggests the need to improve physician acceptance of the responsibility to more judiciously steward resources or, failing that, institute policies and practice guidelines to minimize variations in care.

When caring for people with advanced disease, an important aim of medicine includes helping patients experience death on their own terms. The present study provides some support for the common and long-held suspicion that our healthcare system may not always guide patients toward the best choices. Future efforts to improve the experiences of patients with advanced disease may be dampened by the extent to which variation and potential overtreatment are due to the unintended and untoward effects of forces influencing physician decisions. For the time being, it is important for patients to be aware that characteristics of their physician and where they receive care might strongly influence the care they receive. ■

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