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Patterns of Symptom Management Medication Receipt at End-of-Life Among Medicare Beneficiaries With Lung Cancer

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Abstract

Context.—Older adults with advanced lung cancer experience high symptom burden at end of life (EOL), yet hospice enrollment often happens late or not at all. Receipt of medications to manage symptoms in the outpatient setting, outside the Medicare hospice benefit, has not been described.

Objectives.—We examined patterns of symptom management medication receipt at EOL for older adults who died of lung cancer.

Methods.—This retrospective cohort used the Surveillance, Epidemiology, and End Results—Medicare database to identify decedents diagnosed with lung cancer at age 67 years and older between January 2008 and December 2013 who survived six months and greater after diagnosis. Using Medicare Part B and D claims, we identified monthly receipt of outpatient medications for symptomatic management of pain, emotional distress, fatigue, dyspnea, anorexia, and nausea/vomiting. Multivariable logistic regression estimated associations between medication receipt and patient demographic characteristics, comorbidity, and concurrent therapy.

Results.—Of the 16,246 included patients, large proportions received medications for dyspnea (70.7%), pain (62.5%), and emotional distress (49.4%), with lower prevalence for other symptoms. Medication receipt increased from six months to one month before death. Women and dual Medicaid enrolled were more likely to receive medications for pain, emotional distress, dyspnea, and nausea/vomiting. Receipt of symptom management medications decreased with increasing age and racial/ethnic minorities.

Conclusion.—Symptom management medication receipt was common and increasing toward EOL. Lower use by males, older adults, and nonwhites may reflect poor access or poor patient-provider communication. Further research is needed to understand these patterns and assess adequacy of symptom management in the outpatient setting.

Keywords

Lung cancer; palliative; symptom management; medications; older adults; Medicare

Introduction

The end-of-life (EOL) period for patients dying with cancer may be associated with substantial symptom burden because of disease progression and late and long-term side effects of cancer treatment.¹ This is particularly true for older adults diagnosed with lung cancer, who experience higher symptom burden and greater emotional distress compared with patients with other cancer diagnoses.^{2,3} The most prevalent symptoms in patients with advanced stage lung cancer include fatigue (up to 100%),⁴ dyspnea or cough (up to 84%), depression (up to 83%), and pain (up to 58%).⁵ Patients with advanced disease report a greater impact of disease-specific symptoms on their ability to carry out normal functional activities and maintain quality of life;^{6,7} symptom severity often increases as patients approach death.⁷ Pharmacologic approaches represent a central component of palliative care for symptom management.

Delivery of palliative care to older adults with cancer in the U.S. must be considered within the context of the Medicare program, which plays a critical role in financing care received during EOL.⁸ Palliative care is appropriate across the disease trajectory for seriously ill patients, whereas Medicare has historically embraced hospice as the locus for palliative care services. Once enrolled in hospice, patients have access to a wide array of resources for care coordination and symptom management, including medications, procedures, and professional services. However, less than half of Medicare beneficiaries who die of cancer enroll in hospice; among those using hospice, enrollment commonly does not occur until the final month or even days before death.^{9–11} Given the combination of heavy symptom burden and tendency toward late hospice enrollment, it is critical to understand what types of palliative services patients receive in the course of primary oncologic care or specialty palliative care but outside the hospice setting.

Likewise, it is important to understand whether patient, provider, and disease-related characteristics are associated with symptom medication management, so that barriers to access can be identified and addressed. For example, age, race/ethnicity, sex, and comorbidities have also been associated with receipt of supportive care and symptom management medications among Medicare beneficiaries with cancer in other settings.^{12–14} In addition, out-of-pocket costs for medications may create barriers to care. Under the hospice benefit, a bundled payment fully covers all symptom management medications and services. In contrast, oral symptom management medications covered through Part D are subject to the costsharing provisions of the prescription drug benefit, and patients are subject to a 20% liability for intravenous medications administered in the physician office. Reductions in out-of-pocket requirements for patients through receipt of Part D low-income subsidy (LIS) or dual Medicare-Medicaid enrollment are expected to increase use of medications for symptom management in patients with cancer.^{15–17}

Despite its importance, relatively little is known about symptom management medications received at EOL for Medicare beneficiaries outside the hospice setting. Prior studies describe medication use either in small clinical cohorts or in selected settings such as nursing homes,^{18–20} hospitals,^{21,22} hospice,²³ or palliative care centers common in Western Europe, the U.K., and Canada.^{24–26} Population-based studies on specific palliative care services for home-based older adults are limited and have focused primarily on medication management for pain.^{20,27,28} In this study, we begin to fill this gap, reporting on receipt of pharmacologic symptom management interventions in the outpatient setting outside hospice, to manage symptoms during the six-month EOL period for Medicare beneficiaries who die of lung cancer.

Methods

Data Source and Study Population

Using the Surveillance, Epidemiology, and End Results (SEER)–Medicare database, we conducted a retrospective cohort study of decedents diagnosed at age 67 years and older with lung cancer between January 1, 2008 and December 31, 2013. We required individuals to survive at least six months after diagnosis but to have died by December 31, 2014. To ensure complete capture of claims data, patients were required to have Medicare Parts A/B fee-forservice and no Medicare Advantage enrollment during the last 24 months of life and Part D (prescription drug) coverage for at least six months before death. We limited our sample to individuals who had at least one day in the outpatient nonhospice setting during EOL-1 (the last month before death); and excluded those who spent the full month in hospice and/or inpatient or skilled nursing facility settings because we would be unable to observe their medication use. In analyses examining care patterns over time, we limited further to individuals who met this criterion each month for the entire six-month EOL period.

Covariate Selection

Patient characteristics included sex, age at diagnosis, race/ethnicity, marital status, region of the U.S., survival months from diagnosis, year of death, histology (small cell lung cancer vs. non-small cell lung cancer), linked census tract-level poverty rates, residence in a large metropolitan statistical area, smaller urban area, or rural area based on information provided through the SEER registry. We used claims data from the period before diagnosis to assess comorbidity using the approach developed by Elixhauser et al.²⁹ and created a three-level indicator: zero, one to two, or three and more comorbid conditions. Using claims, we also identified cancer-directed treatment modalities initiated before the six-month EOL observation period (surgical resection, radiation, and first-line systemic therapy) as well as radiation or systemic therapy during month of EOL-1. Other variables included dual Medicaid enrollment at any point within the six-month EOL period.

Outcome Measures

We identified receipt of outpatient symptom management medications based on the presence of Part A/B claims with specific Healthcare Common Procedural Coding System or revenue codes or generic drug names that had been linked to Part D claims. The medications

captured through Part A/B claims represent medications administered; Part D claims represent medications prescribed and filled, which we refer to as medications received. Relevant symptom categories and individual drugs most commonly used to manage those symptoms were specified based on prior literature^{30,31} and clinical guidelines³² as well as input from clinicians on our team (see the Appendix Table 1 for complete classification of medications). Specifically, we identified medications used for pain (opioids, nonopioid analgesics, and adjuvants); emotional distress (antidepressants, anxiolytics/sedatives, and antipsychotics); fatigue (transfusions, erythropoietin-stimulating agents [ESAs], or methylphenidate); dyspnea (inhaled bronchodilators or corticosteroids, diuretics, oral chronic obstructive pulmonary disease or asthma medications, and secretion management medications); anorexia (appetite stimulants); and nausea/vomiting (serotonin [5-hydroxytryptamine 3] antagonists, neurokinin-1 antagonists, prochlorperazine/promethazine, cannabinoids, and metoclopramide). We also collected data on oral corticosteroids but did not assign them to any symptom category. We created indicators for receipt of medications in each symptom category for each of the six months before death. If an individual received chemotherapy during the month, we did not capture medications for nausea/vomiting as we could not determine whether those medications were for palliative intent or for prophylaxis of chemotherapy-induced symptoms.

Statistical Analysis

Descriptive statistics report the sample proportions receiving symptom management medications in each symptom area for each of the six months before death. We used t-tests to compare these sample proportions at six months (EOL-6) compared with one month (EOL-1) before death. In addition, we estimated multivariable logistic regression models to examine associations between patient and disease characteristics as well as prior and current cancer-directed treatment with receipt of symptom management medications at EOL-1. Results are reported as relative risks with robust SEs. All statistical analyses in this section were performed using Stata 14 (College Station, TX) and SAS 9.4 (SAS Institute, Cary, NC).

Results

The total sample included 16,246 patients who survived at least six months and had at least one day in the home setting outside hospice during EOL-1 (Tables 1). Women comprise 50.2% of the sample, 80.5% were white, non-Hispanic, and came disproportionately from the western region (46.9%), with onethird (33.8%) dual enrolled in Medicare and Medicaid. Mean age was 76.8 years (SD 6.6), and mean survival from initial diagnosis was 580 days (SD 425.3). Twenty-nine percent of patients had three or more comorbid conditions. Non-small cell lung cancer was the predominant histology (79.4%). Before the six-month EOL period, 16.1% underwent surgical resection, 35.0% received first-line systemic therapy, and 19.0% received radiation. During the six-month EOL period, only 1270 patients (7.8%) experienced no inpatient, skilled nursing facility, or hospice enrollment, whereas 14,343 patients (88.2%) remained in the outpatient setting for at least part of the month across all six months.

The overwhelming majority of outpatient symptom management medications received during EOL-1 was identified through Part D claims, except for management of fatigue, where we identified principally receipt of blood transfusions or injected ESAs (Table 2). Overall, pain medication was received by 62.5% with 54.7% receiving an opioid, 23.7% a nonopioid analgesic, and 14.8% an adjuvant pain medication. Nearly half of the patients received medications for emotional distress, with 29.9% receiving antidepressants. The symptom for which the greatest percentage of patients were prescribed medication was dyspnea, with 70.7% receiving any medication that comprises inhaled bronchodilators or corticosteroids (39.4%), diuretics (32.1%), and oral chronic obstructive pulmonary disease/asthma medication (6.0%). In addition, nearly 30% of patients received oral corticosteroids. A smaller percentage of patients received medication for fatigue (19.9%), anorexia (22.5%), and nausea/vomiting (19.2%).

The proportion of patients receiving symptom management medications increased during the six-month EOL period for all symptom categories (Fig. 1; Table 3). At EOL-6, dyspnea (49.9%), pain (42.6%), and emotional distress (37.8%) were the symptom areas where medication management was most common. The greatest absolute increase was for pain medications (20.7% points), specifically short-acting opioids, followed closely by dyspnea medication and oral corticosteroids. Although prevalence of medication management in all symptom areas was stable or increasing slowly during months EOL-6 to EOL-2, the final month saw dramatic increases in medications received for dyspnea, pain, emotional distress, anorexia, and oral corticosteroids. We observed a significant increase in the proportion of patients with claims for all individual medication categories between EOL-6 and EOL-1 aside from ESAs and neurokinin-1 antagonists. For these two medications, we found a small but significant decrease in the proportion of patients who had claims in the outpatient setting.

Receipt of symptom management medications during EOL-1 was associated with demographic and cancer treatment-related characteristics (Table 4). Women were more likely to receive medications to manage symptoms of pain (adjusted relative risk [aRR] 1.32; 95% CI 1.23–1.42; $P < 0.001$), emotional distress (aRR 1.35; 95% CI 1.27–1.45; $P < 0.001$), dyspnea (aRR 1.10; 95% CI 1.02–1.18; $P = 0.019$), and nausea/vomiting (aRR 1.27; 95% CI 1.17–1.38; $P < 0.001$) but less likely to receive therapy for fatigue (aRR 0.89; 95% CI 0.82–0.97; $P = 0.007$) or anorexia (aRR 0.85; 95% CI 0.79–0.92). Increasing age was associated with a lower likelihood of receiving medications for symptom management across all medication categories except anorexia. For example, patients aged 80 years and older were less likely to receive medications for pain (aRR 0.45; 95% CI 0.41–0.51; $P < 0.001$), emotional distress and fatigue (aRR 0.68; 95% CI 0.66–0.77; $P < 0.001$), dyspnea (aRR 0.86; 95% CI 0.77–0.97; $P = 0.011$), and nausea/vomiting (aRR 0.57; 95% CI 0.50–0.65; $P < 0.001$). Race/ethnicity categories other than non-Hispanic white were associated with lower receipt of symptom management in all categories except for fatigue and anorexia. Dual Medicaid enrollment was associated with increased receipt of medications in all symptom categories except for fatigue. Current systemic therapy was associated with increased receipt of medications for emotional distress, anorexia, and fatigue, whereas current receipt of radiation therapy was associated with increased risk of medication therapy for pain, dyspnea,

anorexia, and nausea/vomiting. The results for any opioid medication use were qualitatively similar to the receipt of any pain medication across all patient characteristics.

Discussion

Symptom management is essential to reduce suffering and improve quality of life at EOL, regardless of care setting, and medication therapy is an essential care component. In this large retrospective cohort study of Medicare beneficiaries with lung cancer who received outpatient care, outside hospice, we found high rates of symptom management medication receipt. Medications used to manage dyspnea, pain, and emotional distress were received most commonly, and we observed significant increases in medication receipt from EOL-6 to EOL-1. The overwhelming majority of medications was oral and covered through Medicare Part D. Receipt of medications in most symptom management categories was positively associated with female sex, dual Medicaid enrollment, and concurrent receipt of cancer-directed therapy, with lower rates among patients with increasing age and racial and ethnic minorities. These first population-level estimates document the extensive receipt of medications to manage symptoms at EOL outside hospice. They will help to guide future research on prescribing patterns at EOL, with the goal of ensuring adequate and appropriate access to symptom management across care settings.

The medication utilization patterns observed in this study are fairly consistent with previously reported prevalence of symptoms and change as EOL approaches.²⁻⁵ A large proportion of patients in our study sample received medications at EOL-1 for dyspnea (71%) and pain (63%), and medication receipt in all categories increased substantially as death approached in month EOL-1. However, only 49% of patients in our study received medications for emotional distress, and 20% received specific therapies for management of fatigue. Hence, our results suggest high rates of medication management targeted at dyspnea and pain, with less use observed for depression and fatigue. Although we observed some evidence of fatigue management, this symptom area may be less amenable to medication management. Two of the interventions captured for management of fatigue (transfusion and ESAs) are relevant only for patients with symptoms related to anemia. Oral stimulants may be used to manage fatigue not associated with anemia, whereas nonpharmacologic interventions, such as energy conservation, mild exercise, and psychosocial care, are recommended more highly.³³ On the other hand, depression is amenable to medication therapy, yet fewer than 30% of patients in this study received antidepressants at EOL-1, which is low relative to symptom prevalence in this population. Clinicians may be reluctant to prescribe antidepressants to older adults because of risk of major adverse events such as falls or fractures,³⁴ intolerable side effects such as nausea and dizziness, or lack of time to receive benefit if prognosis is poor.³⁵ When we combine antidepressants and anxiolytics, we find that almost half of our study patients received medications for emotional distress. We acknowledge that some patients may receive nonpharmacologic interventions such as psychotherapy or other counseling instead of medication therapy. These alternatives or complements to medication are not captured in the present study measures.

It is difficult to compare rates of symptom medication management in our sample with those in the literature, as there is little U.S.-based evidence regarding medication use at EOL in an

environment dominated by Medicare hospice policy.³⁶ Dwyer et al.²⁷ reported receipt of opioid (95.4%), antiemetic/antivertigo (81.8%), anxiolytic/sedative hypnotic (73.8%), and bronchodilator (25.2%) medications for patients with cancer dying in hospice, rates substantially higher than the levels observed in this study during EOL-1. These higher rates likely reflect selection of patients with the highest symptom burden into hospice and symptom management during the final days of life. Otherwise, in one study of commercially insured decedents, 47% of adults with lung cancer received opioid prescriptions at EOL. The study did not examine other medication groups, and opioid results were limited to adults younger than 65 years.³⁷ Non-U.S. studies of community-based palliative care at EOL often focus on home visits or opioid use but do not report on a broad range of medications.^{24,36}

Our results indicate a lower likelihood of receiving symptom management medications across symptom categories for men, older age groups, and nonwhite race/ethnicity groups, with higher rates for patients with Medicaid dual enrollment/Part D LIS. These results are consistent with findings from other studies, particularly those related to receipt of opioids^{38,39} and suggest systematic gaps in access or other barriers to care. Although many of the symptom management medications are of low cost, at least compared with systemic therapies (i.e., chemotherapy, immunotherapy, targeted therapies), patients may have already experienced financial toxicity and have few remaining financial reserves to pay the out-of-pocket costs for medications. The extra help offered by Medicaid and LIS may mitigate that financial barrier.

With respect to patient characteristics, including age, race, and sex, we acknowledge that a portion of the variation observed in symptom management medication receipt may be explained by differences in the experience of symptoms along these dimensions or in the comfort level reporting them.^{5,40} Regardless, we found a persistent gap in symptom management medication by age and race/ethnicity. This corroborates the few studies that have already demonstrated differences in symptom management medication receipt by age, sex, and race/ethnicity, while controlling for symptom severity.^{41,42} Although the symptom experience may vary across these dimensions, gaps in access, communication, or even provider bias may also contribute to these patterns.^{43,44} The complexity of the relationships between patient symptom experience, reporting to providers, provider prescribing behavior, medication receipt, and adherence highlights the need for further research in these areas.

Limitations

Our study used administrative cancer registry and claims data and is subject to limitations typically associated with those data sources. The claims data provide very reliable information on oral and parenteral medications prescribed, received, and reimbursed by Medicare through Parts B and D but do not include medications that may be purchased over the counter. Furthermore, many Medicare Part D plans excluded barbiturates and benzodiazepines until 2013, but they may have been purchased out of pocket and would not be recorded. Hence, our measures in certain categories may understate true utilization. The claims data do not include information on associated symptoms or palliative intent of prescribing physicians. Instead, we identified medications commonly associated with management of selected common symptoms, with categorization based on expert clinical

guidance. Where a medication is used for management of multiple symptoms, we assigned it to the symptom for which it is used most commonly. For example, short-acting opioids may be used as multisymptom treatment for both pain and dyspnea, but we assigned them to the category of pain treatment. Corticosteroids are used for multiple symptoms at the EOL, such as pain, fatigue, and nausea, and may even be incorporated into systemic therapy regimens. We assigned inhaled formulations to the dyspnea category in our specific patient population; oral corticosteroids were captured but assigned to an independent category not linked to a specific symptom. Additional detail on medication use by pharmacologic class may be available on request, subject to restrictions on data release. Our sample was limited to Medicare fee-for-service beneficiaries enrolled in Part D benefit, and as such, may not be generalizable to beneficiaries with Medicare Advantage plans, employment-related retiree prescription drug benefits, or beneficiaries without drug coverage. Beneficiaries with retiree coverage may have more generous benefits, including out-of-pocket caps. In contrast, beneficiaries without prescription drug coverage may rely more heavily on parenteral administration covered through Part B and low-cost medications, which can be purchased out of pocket. The study is also limited to patients with lung cancer, where the symptom burden is particularly high; hence, our results may not generalize to patients dying with other cancers. Finally, our study captures information on medications commonly used for symptom management in the outpatient setting but does not report on nonpharmacologic services, including home health care, and physical, occupational, and psychotherapy, which are often recommended for management of pain, fatigue, and emotional distress.

Despite the limitations, this study has important strengths, including a large population-based sample and detailed information on receipt of symptom management medications. Furthermore, the study results provide important new information concerning care received by Medicare beneficiaries outside the hospice setting. Historically, hospice has been the locus of palliative care provision in the Medicare program, yet there is a growing awareness that many patients delay or completely forgo hospice enrollment and growing concern about whether patients receive palliative care services outside hospice. The study documents the extent to which symptom management medications are received in this setting and patterns and patient characteristics associated with therapy receipt. The study also provides an initial template for using insurance claims to evaluate the effects of various policy or coverage changes on symptom management medication receipt. Medicare payment models, including accountable care organizations and the oncology care model, create incentives for better care coordination and lower intensity at EOL; in 2020, the Centers for Medicare & Medicaid Services will initiate bundled payment systems to incentivize coordinated palliative care services for Medicare beneficiaries with serious illness. The present study highlights strengths and limitations of using medication claims to enrich the evaluation of these payment models and baseline estimates that may be useful in identifying targets for evaluation.

Conclusion

Medications for symptom management were frequently received by older adults with lung cancer at EOL in the outpatient setting, outside hospice. Medication receipt was most common for dyspnea, pain, and emotional distress, consistent with previously reported high

symptom prevalence, with medication receipt less common for fatigue, anorexia, and nausea/vomiting. Systematic differences by sex, age, and race/ethnicity suggest potential gaps in access and/or differences in patient-provider preferences. More research is needed to assess adequacy and appropriateness of medication management at EOL across care settings; the study methods and results provide important insights and guidance for future research.

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Appendix

Appendix Table 1

List of Generic Drug Names Included in Symptom Categories

Dyspnea— Inhaled	Dyspnea—Other	Pain	Emotional Distress		Fatigue
Acclidinium	Acetazolamide	Acetaminophen	Alprazolam	Lurasidone	Darbepoetin alfa
Albuterol	Albuterol	Amitriptyline	Amoxapine	Maprotiline	Epoetin alfa
Albuterol/ ipratropium	Amiloride	Aspirin	Asenapine	Meprobamate	Methylphenidate
Arformoterol	Amiloride/ hydrochlorothiazide	Capsaicin cream	Bupropion	Milnacipran	Red blood cells
Beclomethasone	Atropine sulfate ophthalmic	Celecoxib	Buspirone	Mirtazapine	
Budesonide	Bumetanide	Choline magnesium trisalicylate	Chlordiazepoxide	Nefazodone	Anorexia
Budesonide/ formoterol	Chlorothiazide	Codeine	Chlorpromazine	Olanzapine	Cyproheptadine
Ciclesonide	Chlorthalidone	Desipramine	Citalopram	Oxazepam	Megestrol acetate
Flunisolide	Eplerenone	Diclofenac	Clomipramine	Paliperidone	
Fluticasone	Ethacrynic acid	Etodolac	Clonazepam	Paroxetine	Nausea/Vomiting
Fluticasone/ salmeterol	Furosemide	Fentanyl	Clorazepate	Perphenazine	Aprepitant
Fluticasone/ vilanterol	Glycopyrrolate	Fentanyl transdermal	Clozapine	Phenelzine	Dolasetron
Formoterol	Hydrochlorothiazide	Gabapentin	Desvenlafaxine	Phenobarbital	Dronabinol
Glycopyrrolate	Hyoscyamine	Hydrocodone	Diazepam	Pimozide	Fosaprepitant

Dyspnea— Inhaled	Dyspnea—Other	Pain	Emotional Distress		Fatigue
Glycopyrrolate/ formoterol	Indapamide	Hydrocodone ER	Doxepin	Primidone	Granisetron
Indacaterol	Metaproterenol	Hydromorphone	Duloxetine	Protriptyline	Metoclopramide
Indacaterol/ glycopyrrolate	Methazolamide	Hydromorphone ²⁴ ER	Escitalopram	Quetiapine	Nabilone
Ipratropium	Methyclothiazide	Ibuprofen	Estazolam	Risperidone	Netupitant/ palonosetron
Levalbuterol	Methylprednisolone	Indomethacin	Eszopiclone	Sertraline	Ondansetron
mometasone	Metolazone	Ketoprofen	Fluoxetine	Temazepam	Palonosetron
Mometasone/ formoterol	Montelukast	Ketorolac	Fluphenazine	Thiothixene	Prochlorperazine
Olodaterol	Roflumilast	Levorphanol	Flurazepam	Tranlycypromine	Promethazine
Pirbuterol	Scopolamine transdermal	Lidocaine	Fluvoxamine	Trazodone	Rolapitant
Salmeterol	Spironolactone	Lidocaine patch	Haloperidol	Triazolam	Oral Corticosteroids
Tiotropium	Terbutaline	Magic mouthwash	Hydroxyzine	Trifluoperazine	
Tiotropium/ olodaterol	Theophylline	Meloxicam	Iloperidone	Trimipramine	Dexamethasone
Umeclidinium	Torsemide	Meperidine	Imipramine	Venlafaxine	Methylprednisolone
Umeclidinium/ vilanterol	Triamterene	Morphine	Isocarboxazid	Vilazodone	Prednisolone
	Triamterene/ hydrochlorothiazide	Morphine ER	Lithium	Zaleplon	Prednisone
	Zafirlukast	Nabumetone	Lorazepam	Ziprasidone	
	Zileuton	Naproxen	Loxapine	Zolpidem	
		Nortriptyline			
		Oxycodone			
		Oxycodone ER			
		Oxymorphone			
		Oxymorphone ER			
		Piroxicam			
		Pregabalin			
		Propoxyphene			
		Sulindac			
		Tapentadol			
		Tramadol			
		Valproic acid			

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Key Message

Symptom management medications were received frequently by older adults with lung cancer at end of life in the outpatient nonhospice setting. Medication therapy for dyspnea, pain, and emotional distress was more common than for fatigue, anorexia, and nausea/vomiting. Systematic differences by sex, age, and race/ethnicity indicate potential gaps in access.

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Fig. 1.

Trends in receipt of palliative symptom management medications by category during the six-month EOL period. EOL = end of life.

Table 1

Sample Characteristics: Medicare Beneficiaries Who Died of Lung Cancer and Received Care in the Outpatient Setting During Their Final Month of Life (EOL-1)

Characteristic	N (%)
Overall	16,246 (100.0)
Sex	
Female	8162 (50.2)
Age (yrs)	
66–69	2371 (14.6)
70–74	4485 (27.6)
75–79	3990 (24.6)
80+	5400 (33.2)
Race/ethnicity	
White, non-Hispanic	13,077 (80.5)
Black, non-Hispanic	1322 (8.1)
Hispanic	828 (5.1)
Asian, other	1019 (6.3)
Marital status	
Unmarried	8252 (50.8)
Poverty rates (census tract level)	
Low (0%–<5%) poverty	3355 (20.7)
5%–<10% poverty	4058 (25.0)
10%–<20% poverty	4896 (30.1)
High (20%–100%) poverty	3937 (24.2)
Histology	
Non-small cell lung cancer	12,898 (79.4)
Dual Medicaid enrolled	5492 (33.8)
Elixhauser Comorbidity Index	
0	4282 (26.4)
1–2	7253 (44.6)
3	4711 (29.0)
Characteristics of lung cancer decedents within the outpatient setting during their final month of life (EOL-1)	
Current cancer-directed therapy	
Chemotherapy	2262 (13.9)
Radiation	710 (4.4)
Treatment modality initiated before EOL observation period	
Surgical resection	2611 (16.1)
First-line systemic therapy	5679 (35.0)
Radiation	3086 (19.0)
MSA	
Large MSA	12,913 (79.5)
Urban	1063 (6.5)

Characteristic	N (%)
Less urban/rural/unknown	2270 (14.0)
Region	
Northeast	1022 (6.3)
South	1444 (8.9)
Central	6154 (37.9)
West	7626 (46.9)
Calendar year of death	
2008	1512 (9.3)
2009	2019 (12.4)
2010	2415 (14.9)
2011	2351 (14.5)
2012	2659 (16.4)
2013	2708 (16.7)
2014	2582 (15.9)

EOL = end of life; MSA = metropolitan statistical area.

Source: Surveillance, Epidemiology, and End Results–Medicare database, 2008–2013.

Medications Received for Symptom Management During EOL-1 Among Patients With Lung Cancer in the Outpatient Setting (N = 16,246)

Table 2

Symptom	Medication	Claim Type		
		Part A or B	Part D N (%)	Any N (%)
Dyspnea	Any	1489 (9.2)	11,278 (69.5)	11,475 (70.7)
	Inhaled bronchodilators or corticosteroids	1477 (9.1)	5717 (35.2)	6394 (39.4)
	Diuretics		5215 (32.1)	5215 (32.1)
	Oral COPD/asthma		974 (6.0)	974 (6.0)
Pain	Secretion management	17 (0.1)	118 (0.7)	134 (0.8)
	Any	1213 (7.5)	9863 (60.7)	10,144 (62.5)
	Opioids	1133 (7.0)	8565 (52.7)	8890 (54.7)
	Short-acting opioids		8373 (51.6)	8373 (51.6)
	Long-acting opioids		2651 (16.3)	2651 (16.3)
	Nonopioid	132 (0.8)	3767 (23.2)	3846 (23.7)
	NSAIDs	132 (0.8)	1210 (7.5)	1315 (8.1)
	Local anesthetics		677 (4.2)	677 (4.2)
	Adjuvant		2404 (14.8)	2404 (14.8)
	Antiepileptics		2149 (13.2)	2149 (13.2)
Emotional distress	Selected antidepressants ^a		358 (2.2)	358 (2.2)
	Any	1165 (7.2)	7371 (45.4)	8014 (49.4)
	Antidepressants		4855 (29.9)	4855 (29.9)
	Anxiolytics/sedatives	1150 (7.1)	3610 (22.2)	4480 (27.6)
Fatigue	Antipsychotics	38 (0.2)	848 (5.2)	879 (5.4)
	Any	3161 (19.5)	106 (0.7)	3233 (19.9)
	Other—methylphenidate		96 (0.6)	96 (0.6)
	Transfusions (RBC)	2616 (16.1)		2616 (16.1)
Anorexia	ESAs	879 (5.4)	106 (0.7)	981 (6.0)
	Appetite stimulant		3479 (21.4)	3479 (21.4)
Nausea/vomiting	Any	1161 (7.2)	2343 (14.4)	3126 (19.2)
	Serotonin (5-HT3) antagonists	1094 (6.7)	851 (5.2)	1790 (11.0)

Symptom	Medication	Claim Type		
		Part A or B	Part D	Any
			N (%)	
	Neurokinin-1 antagonist	48 (0.3)	12 (0.1)	57 (0.4)
	Prochlorperazine/promethazine	80 (0.5)	1109 (6.8)	1171 (7.2)
	Cannabinoid		215 (1.3)	215 (1.3)
	Other—metoclopramide		505 (3.1)	505 (3.1)
Oral corticosteroids	Oral corticosteroids	116 (0.7)	4801 (29.6)	4801 (29.6)

EOl = end of life; COPD = chronic obstructive pulmonary disease; NSAIDS = nonsteroidal anti-inflammatory drugs; RBC = red blood cell; ESA = erythropoietin-stimulating agents; 5-HT3 = 5-hydroxytryptamine 3.

^aIncludes amitriptyline, desipramine, and nortriptyline.

Source: Surveillance, Epidemiology, and End Results—Medicare database, 2008–2013.

Table 3
Monthly Proportion of Use of Palliative Care and Concurrent Cancer-Directed Therapy, Overall and Six Months Before Death (N = 14,343)

Symptom	Medication	Month Before Death							Change (EOL-6-EOL-1)
		EOL-6	EOL-5	EOL-4	EOL-3	EOL-2	EOL-1		
Dyspnea	Any	61.1	62.4	63.2	65.4	68.9	80.1	19	
	Inhaled bronchodilators or corticosteroids	29.7	30.0	30.3	30.8	31.9	39.9	10.2	
	Diuretics	18.1	18.3	18.9	19.6	20.2	32.2	14.1	
	Oral COPD/asthma	3.9	3.9	4.1	4.4	4.4	6.1	2.2	
Pain	Secretion management	0.2	0.1	0.1	0.1	0.2	0.7	0.6	
	Any	42.6	42.9	44.3	46.4	50.7	63.3	20.7	
	Opioids	34.5	35.0	36.2	38.6	43.7	55.7	21.2	
	Short-acting opioids	31.6	32.8	34.1	36.3	41.0	52.5	21	
	Long-acting opioids	4.3	5.2	5.8	6.7	8.0	16.7	12.4	
	Nonopioid	15.9	15.8	16.3	16.8	17	23.8	7.8	
	NSAIDs	6.2	5.8	6.1	6.3	6.3	8.4	2.3	
	Local anesthetics	2.3	2.3	2.3	2.3	2.7	4.0	1.8	
	Adjuvant	9.1	9.2	9.6	9.9	9.9	14.7	5.6	
	Antiepileptics	7.7	7.8	8.3	8.6	8.6	13.1	5.4	
Emotional distress	Selected antidepressants ^a	1.6	1.6	1.5	1.6	1.5	2.2	0.5	
	Any	37.8	37.8	37.9	37.8	38.7	48.9	11.1	
	Antidepressants	16.9	17.5	17.9	18.6	19.8	28.9	12	
	Anxiolytics/sedatives	25.2	24.7	24.3	23.6	23.7	28.4	3.1	
	Antipsychotics	2.4	2.5	2.5	2.6	2.7	4.8	2.4	
	Any	13.0	14.1	14.7	15.6	16.3	20.8	7.8	
Fatigue	Other—methylphenidate	0.3	0.2	0.2	0.3	0.3	0.6	0.3	
	Transfusions (RBC)	6.4	7.2	7.7	8.8	10.1	16.5	10.2	
	ESAs	7.9	8.4	8.6	8.7	8.1	6.1	−1.8	
Anorexia	Appetite stimulant	5.1	5.8	6.5	7.6	9.2	17.3	12.2	
Nausea/vomiting	Any	10.0	10.5	11.5	12.7	15.0	19.6	9.7	
	Serotonin (5-HT3) antagonists	6.5	6.7	7.5	8.4	9.5	11.4	5	
	Neurokinin-1 antagonist	0.5	0.4	0.6	0.6	0.5	0.4	−0.1	

Symptom	Medication	Month Before Death							Change (EOL-6-EOL-1)
		EOL-6	EOL-5	EOL-4	EOL-3	EOL-2	EOL-1		
Oral corticosteroids	Compazine/promethazine	3.5	3.6	3.9	4.2	5.1	7.3	3.8	
	Cannabinoid	0.2	0.3	0.4	0.5	0.6	1.4	1.1	
	Other—metoclopramide	1.1	1.1	1.3	1.4	1.7	3	1.9	
	Oral corticosteroids	10.3	11.0	12.1	14.1	17.6	30.1	19.8	

EOL = end of life; COPD = chronic obstructive pulmonary disease; NSAIDS = nonsteroidal anti-inflammatory drugs; RBC = red blood cell; ESAs = erythropoietin-stimulating agents; 5-HT3 = 5-hydroxytryptamine 3.

^aIncludes amitriptyline, desipramine, and nortriptyline. All changes in the percentage receiving medications from EOL-6 to EOL-1 are significant at $P < 0.001$.

Source: Surveillance, Epidemiology, and End Results–Medicare database, 2007–2013.

Adjusted RR of Medication Receipt by Symptom Category Among Medicare Beneficiaries With Advanced Lung Cancer at EOL-1

Table 4

Decedent Characteristic	Any Dyspnea Medication			Any Pain Medication			Any Emotional Distress Medication		
	RR	P	95% CI	RR	P	95% CI	RR	P	95% CI
Sex (reference = male)									
Female	1.10	0.019	1.02–1.18	1.32	<0.001	1.23–1.42	1.35	<0.001	1.27–1.45
Age category (reference = 66–69)									
70–74	1.05	0.443	0.93–1.18	0.82	0.001	0.73–0.92	0.88	0.012	0.79–0.97
75–79	0.95	0.424	0.85–1.07	0.68	<0.001	0.60–0.76	0.74	<0.001	0.67–0.83
80+	0.86	0.011	0.77–0.97	0.45	<0.001	0.41–0.51	0.68	<0.001	0.61–0.75
Race/ethnicity (reference = white, non-Hispanic)									
Black, non-Hispanic	0.80	0.002	0.70–0.92	0.79	0.001	0.69–0.91	0.57	<0.001	0.50–0.64
Hispanic	0.73	<0.001	0.62–0.85	0.74	<0.001	0.63–0.87	0.62	<0.001	0.53–0.72
Asian, other	0.73	<0.001	0.63–0.85	0.57	<0.001	0.49–0.65	0.51	<0.001	0.44–0.59
Marital status (reference = married)									
Unmarried	0.92	0.051	0.85–1.00	0.98	0.558	0.91–1.05	0.92	0.026	0.86–0.99
Poverty rates (census tract level) (reference = low)									
5%–<10%	1.04	0.439	0.94–1.16	1.10	0.051	1.00–1.22	0.94	0.228	0.86–1.04
10%–<20%	1.03	0.643	0.92–1.14	1.10	0.055	1.00–1.21	0.86	0.003	0.78–0.95
High (20%–100%)	0.94	0.322	0.83–1.06	1.21	0.001	1.08–1.35	0.80	<0.001	0.72–0.90
Lung cancer histology (reference = SCLC)									
NSCLC	1.08	0.111	0.98–1.18	0.95	0.265	0.87–1.04	0.94	0.150	0.87–1.02
Dual Medicaid enrolled (reference = no)									
Yes	1.24	<0.001	1.13–1.36	1.46	<0.001	1.34–1.58	1.23	<0.001	1.14–1.33
Elixhauser Comorbidity Index (reference = 0)									
One to two conditions	1.61	<0.001	1.48–1.76	1.10	0.031	1.01–1.19	1.24	<0.001	1.15–1.34
Three or more conditions	2.10	<0.001	1.90–2.32	1.15	0.004	1.05–1.26	1.51	<0.001	1.38–1.65
Current cancer-directed therapy (at EOL-1) (reference for each = no)									
Chemotherapy	1.11	0.064	0.99–1.24	0.97	0.533	0.87–1.07	1.35	<0.001	1.23–1.49
Radiation	1.47	<0.001	1.20–1.81	1.32	0.006	1.08–1.61	0.94	0.503	0.79–1.12
Treatment modality initiated before EOL observation period (reference for each = no)									

First-line systemic therapy	1.14	0.002	1.05–1.23	1.11	0.009	1.03–1.19	0.93	0.038	0.86–1.00
Surgical resection	1.06	0.263	0.96–1.17	1.03	0.545	0.94–1.13	1.15	0.003	1.05–1.26
Radiation	1.05	0.363	0.95–1.16	1.30	<0.001	1.17–1.44	1.01	0.843	0.92–1.11
MSA (reference = large MSA)									
Urban	0.91	0.196	0.79–1.05	1.16	0.041	1.01–1.35	0.96	0.522	0.84–1.09
Less urban/rural/unknown	1.07	0.212	0.96–1.20	1.22	0.000	1.09–1.36	1.02	0.675	0.92–1.13
Any Anorexia Medication									
RR	P	95% CI	RR	P	95% CI	RR	P	95% CI	RR
Sex (reference = male)									
Female	0.85	<0.001	0.79–0.92	0.89	0.007	0.82–0.97	1.27	<0.001	1.17–1.38
Age category (reference = 66–69)									
70–74	0.99	0.901	0.88–1.12	0.92	0.195	0.82–1.04	0.88	0.040	0.78–0.99
75–79	1.09	0.187	0.96–1.23	0.78	<0.001	0.69–0.89	0.78	<0.001	0.68–0.88
80+	1.02	0.698	0.91–1.15	0.68	<0.001	0.60–0.77	0.57	<0.001	0.50–0.65
Race/ethnicity (reference = white, non-Hispanic)									
Black, non-Hispanic	1.49	<0.001	1.32–1.69	1.48	<0.001	1.28–1.72	0.76	0.001	0.64–0.89
Hispanic	1.13	0.151	0.96–1.33	1.43	<0.001	1.20–1.71	1.01	0.883	0.84–1.22
Asian, other	1.90	<0.001	1.66–2.19	1.38	<0.001	1.16–1.63	0.75	0.002	0.62–0.90
Marital status (reference = married)									
Unmarried	0.84	<0.001	0.78–0.91	0.96	0.376	0.88–1.05	0.90	0.021	0.83–0.98
Poverty rates (census tract level) (reference = low)									
5%–<10%	0.99	0.931	0.88–1.12	0.92	0.145	0.81–1.03	0.98	0.752	0.87–1.11
10%–<20%	1.16	0.010	1.04–1.30	0.86	0.015	0.77–0.97	1.04	0.547	0.92–1.17
High (20%–100%)	1.32	<0.001	1.17–1.49	0.89	0.078	0.78–1.01	0.99	0.929	0.87–1.14
Lung cancer histology (reference = SCLC)									
NSCLC	1.05	0.288	0.96–1.15	1.05	0.350	0.95–1.16	0.87	0.004	0.79–0.96
Dual Medicaid enrolled (reference = no)									
Yes	1.27	<0.001	1.17–1.38	0.98	0.655	0.89–1.08	1.12	0.018	1.02–1.24
Elixhauser Comorbidity Index (reference = 0)									
One to two conditions	0.99	0.787	0.90–1.08	0.98	0.697	0.89–1.08	1.00	0.939	0.91–1.11
Three or more conditions	0.86	0.003	0.77–0.95	1.41	<0.001	1.26–1.56	0.93	0.222	0.84–1.04
Current cancer-directed therapy (at EOL–1) (reference = no)									

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Chemotherapy	1.83	<0.001	1.64–2.05	2.82	0.000	2.55–3.12	N/A	N/A	N/A
Radiation	1.31	0.011	1.06–1.60	0.95	0.643	0.77–1.17	1.40	0.001	1.14–1.71
Treatment modality initiated before EOL observation period (reference = no)									
First-line systemic therapy	1.12	0.006	1.03–1.21	0.90	0.020	0.83–0.98	0.87	0.001	0.80–0.95
Surgical resection	1.09	0.111	0.98–1.21	1.06	0.349	0.94–1.18	1.26	<0.001	1.13–1.40
Radiation	1.34	<0.001	1.21–1.49	1.13	0.030	1.01–1.26	1.02	0.694	0.91–1.15
MSA (reference = Large MSA)									
Urban	0.89	0.141	0.76–1.04	0.80	0.009	0.67–0.95	1.13	0.134	0.96–1.33
Less urban/rural/unknown	1.14	0.018	1.02–1.27	0.91	0.145	0.80–1.03	1.22	0.001	1.08–1.37

RR = relative risk; EOL = end of life; SCLC = small cell lung cancer; NSCLC = non-small cell lung cancer; MSA = metropolitan statistical area; N/A = not available.