JOURNAL OF GERIATRIC ONCOLOGY 6 (2015) 101–110

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Guideline-concordant lung cancer care and associated health outcomes among elderly patients in the United States

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ARTICLE INFO

Article history:
Received 15 October 2014
Received in revised form
26 November 2014
Accepted 4 January 2015
Available online 17 January 2015

Keywords:
Lung
Cancer
Elderly
Medicare
Disparities
Guidelines
Treatment

ABSTRACT

Objectives: In the United States (US), the elderly carry a disproportionate burden of lung cancer. Although evidence-based guidelines for lung cancer care have been published, lack of high quality care still remains a concern among the elderly. This study comprehensively evaluates the variations in guideline-concordant lung cancer care among elderly in the US.
Materials and Methods: Using the Surveillance, Epidemiology, and End Results (SEER)-Medicare database (2002–2007), we identified elderly patients (aged ≥65 years) with lung cancer (n = 42,323) and categorized them by receipt of guideline-concordant care, using evidence-based guidelines from the American College of Chest Physicians. A hierarchical generalized logistic model was constructed to identify variables associated with receipt of guideline-concordant care. Kaplan–Meier analysis and Log Rank test were used for estimation and comparison of the three-year survival. Multivariate Cox proportional hazards model was constructed to estimate lung cancer mortality risk associated with receipt of guideline-discordant care.
Results: Only less than half of all patients (44.7%) received guideline-concordant care in the study population. The likelihood of receiving guideline-concordant care significantly decreased with increasing age, non-white race, higher comorbidity score, and lower income. Three-year median survival time significantly increased (exceeded 487 days) in patients receiving guideline-concordant care. Adjusted lung cancer mortality risk significantly increased by 91% (HR = 1.91, 95% CI: 1.82–2.00) among patients receiving guideline-discordant care.
Conclusion: This study highlights the critical need to address disparities in receipt of guideline-concordant lung cancer care among elderly. Although lung cancer diagnostic and management services are covered under the Medicare program, underutilization of these services is a concern.

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http://dx.doi.org/10.1016/j.jgo.2015.01.001
1879-4068/

1. Introduction

In the United States (US), lung cancer is the leading cause of cancer deaths.[1] It causes more deaths than the next three most common cancers combined (colon, breast, and prostate).[1] The elderly carry a disproportionate burden of lung cancer, as approximately 81% of those living with lung cancer are age 60 and older.[1] This pattern is expected to persist as the estimated number of elderly in the US doubles to approximately 70 million by 2030.[2]

Although lung cancer in the elderly is associated with poor prognosis, several treatment strategies can cure, or at least prolong survival. Therefore, significant reduction in lung cancer mortality can be achieved if the elderly receive timely and medically effective therapies. To that end, specific strategies for the management and treatment of lung cancer have been recommended in clinical guidelines by American College of Chest Physicians (ACCP), American Society for Clinical Oncology (ASCO), National Cancer Institute (NCI), and others.[3–8] These guidelines ensure uniformity of care, and are thought to be capable of improving quality, appropriateness, and cost-effectiveness of care.[9] However, studies of clinical practice patterns in the US have documented variations in the management of lung cancer by age, race, education, comorbidity, insurance and hospital type.[10–21] Therefore, lack of high-quality-cancer-care is a continuing concern, and it is attributable to variations in the use of appropriate standards of care.[22]

While studies to date have examined the variations in guideline-concordant lung cancer care, a majority of them have been limited to Non-Small Cell Lung Cancer (NSCLC) care,[11,18–21] early or late stage cancer care,[18–20] cancer care among patients with comorbidities,[21] and/or cancer care in the Veterans Affairs setting.[19] Furthermore, previous studies have defined guideline-concordant lung cancer care primarily on the bases of the treatment received, and failed to capture the appropriateness of lung cancer staging prior to the receipt of treatment.[11,18–21] Specifically, the ACCP guidelines recommend mediastinal lymph node evaluation prior to surgery, as its a determinant of postoperative survival.[4] Given the lack of a comprehensive evaluation of the variations in guideline-concordant care, and associated health outcomes, among the elderly patients with NSCLC and Small Cell Lung Cancer (SCLC), the objectives of this study were to: (1) identify lung cancer treatment patterns among the elderly; (2) identify the proportion of elderly patients with lung cancer receiving guideline-concordant care; (3) identify factors associated with the receipt of guideline-concordant care; (4) determine survival benefits associated with the receipt of guideline-concordant care; and (5) determine lung cancer mortality risk associated with the receipt of guideline-discordant care.

2. Materials and Methods

2.1. Data Source

This study used NCI's Surveillance, Epidemiology, and End Results (SEER)-Medicare linked data files from years 2002–2007. SEER is a consortium of 20 population-based cancer registries covering approximately 28% of the US population and its data are representative of US cancer incidence and mortality.[23] Cancer registry data files provided clinical, demographic, cause of death, and initial treatment information for elderly individuals with lung cancer in selected geographic regions. The Medicare administrative data files provided the health service claims (utilization and reimbursement) information for care provided by physicians, inpatient hospital stays, hospital outpatient clinics, home health care agencies, skilled nursing facilities, and hospice programs.

2.2. Study Cohorts

We identified Medicare beneficiaries aged 66 years and older, with incident lung cancer diagnosis (International Classification of Diseases for Oncology (ICD-O) codes: C34.0, C34.1, C34.2, C34.3, C34.8, C34.9, and C33.9; American Joint Committee on Cancer Staging (AJCC) Tumor Node Metastasis (TNM) Stages: I–IV), between July 1, 2003 and December 31, 2006, in the SEER-Medicare data files.[24] Beneficiaries were excluded if they were diagnosed only at death, had a prior malignancy, were enrolled in a managed care plan, or lacked Part A or B of Medicare. This population cohort was used for study objective 1, and for study objectives 2–3 after excluding beneficiaries with Stage IV disease. Given the limited years of follow-up data, for study objectives 4–5, we limited the above population cohort to patients with cancer diagnosis (AJCC TNM Stages I–III) between July 1, 2003 and December 31, 2004, and followed them for three years following the cancer diagnosis to determine lung cancer specific mortality. Beneficiaries with Stage IV disease were excluded in our analysis for study objectives 2–5, as the data source lacked complete treatment information for these patients.

2.3. Accessing Receipt of Guideline-concordant Lung Cancer Care

The ACCP evidence-based guidelines for diagnosis and management of lung cancer were incorporated in an algorithm and used to determine receipt of guideline-concordant care (see Fig. 1).[4] Specifically, patients were followed for one year following their cancer diagnosis to determine receipt of guideline-concordant lung cancer care. Lung cancer treatments and procedures were identified from Medicare claims data using appropriate International Classification of Diseases (ICD-9) diagnosis and procedure codes, Healthcare Common Procedure Coding System (HCPCS) codes, Current Procedural Terminology (CPT) codes and revenue center codes (Appendix A).

2.4. Dependent Variables

Treatment patterns were categorized as 'surgery only', 'radiation only', 'chemotherapy only', 'combination treatment', or 'no treatment'. The primary outcome of interest, receipt of guideline-concordant lung cancer care, was categorized as 'Yes' or 'No'. Survival time in days was calculated from the date of cancer diagnosis to the date of death or the three-year follow-up cutoff date, whichever came first. SEER only provides the month and year of cancer diagnosis: therefore we approximated the date of cancer diagnosis by