Lung Cancer 103 (2017) 66–74

Contents lists available at ScienceDirect

Lung Cancer

journal homepage: www.elsevier.com/locate/lungcan

Temporal patterns of care and outcomes of non-small cell lung cancer patients in the United States diagnosed in 1996, 2005, and 2010

Filip Kaniski[a], Lindsey Enewold[a,*], Anish Thomas[b], Shakuntala Malik[c], Jennifer L. Stevens[d], Linda C. Harlan[a]

[a] National Cancer Institute, Division of Cancer Control and Population Sciences, Healthcare Delivery Research Program, United States
[b] National Cancer Institute, Center for Cancer Research, Thoracic and Gastrointestinal Oncology Branch, United States
[c] National Cancer Institute, Division of Cancer Treatment and Diagnosis, Cancer Therapy Evaluation Program, United States, United States
[d] Information Management Services, Inc., United States

ARTICLE INFO

Article history:
Received 18 August 2016
Received in revised form
15 November 2016
Accepted 28 November 2016

Keywords:
Lung cancer
Treatment
Surgery
Radiation
Chemotherapy
Targeted therapy survival

ABSTRACT

Introduction: Lung cancer remains a common and deadly cancer in the United States. This study evaluated factors associated with stage-specific cancer therapy and survival focusing on temporal trends and sociodemographic disparities.
Methods: A random sample (n = 3,318) of non-small cell lung cancer (NSCLC) patients diagnosed in 1996, 2005 and 2010, and reported to the National Cancer Institute's Surveillance Epidemiology and End Results (SEER) program was analyzed. Logistic regression was utilized to identify factors associated with receipt of surgery among stage I/II patients and chemotherapy among stage IIIB/IV patients. Cox proportional hazard regression was utilized to assess factors associated with all-cause mortality, stratified by stage.
Results: Surgery among stage I/II patients decreased non-significantly overtime (1996: 78.8%; 2010: 68.5%; p = 0.18), whereas receipt of chemotherapy among stage IIIB/IV patients increased significantly overtime (1996: 36.1%; 2010: 51.2%; p < 0.01). Receipt of surgery (70–79 and ≥80 vs. <70: Odds Ratio(OR):0.31; 95% Confidence Interval (CI): 0.16–0.63 and OR:0.04; 95% CI: 0.02–0.10, respectively) and chemotherapy (≥80 vs. <70: OR: 0.26; 95% CI:0.15–0.45) was less likely among older patients. Median survival improved non-significantly among stage I/II patients from 51 to 64 months (p = 0.75) and significantly among IIIB/IV patients from 4 to 5 months (p < 0.01).
Conclusion: Treatment disparities were observed in both stage groups, notably among older patients. Among stage I/II patients, survival did not change significantly possibly due to stable surgery utilization. Among stage IIIB/IV patients, although the use of chemotherapy increased and survival improved, the one-month increase in median survival highlights the need for addition research.
Published by Elsevier Ireland Ltd.

1. Introduction

Lung cancer, the vast majority (85%) of which is non-small cell lung cancer (NSCLC), is the leading cause of cancer mortality in the United States. It is estimated that 158,040 people died from lung cancer in 2015, accounting for 27% of all cancer deaths [1]. Although recent trends show significant decreases in lung cancer incidence and mortality, in large part due to the decline in national smoking rates, more effective treatment and improved delivery of care (e.g., cancer-directed and supportive), the 5- year survival rate remains low at 18% [1].

For the past two decades, the recommended treatment for early stage disease, particularly for patients with good performance status, has been surgery and for late stage has been systemic therapy [2–4]. However, improvements in treatment efficacy have been made, especially for late stage disease due to the introduction of platinum-based chemotherapies in the mid-1990s and systemic targeted therapies (e.g., antibodies and tyrosine kinase inhibitors) over the following decade [5–7].

Though there is a strong base of evidence for the efficacy of recently developed systemic therapies in the treatment of late stage NSCLC [7], the implementation of these therapies into general practice, regardless of tumor stage, as well as variations in administration of traditional modalities (e.g., surgery, radiotherapy and

* Corresponding author at: Healthcare Delivery Research Program, National Cancer Institute, 9609 Medical Center Drive, Room 3E506, Bethesda, MD 20892-9762, United States.
E-mail address: lindsey.enewold@nih.gov (L. Enewold).

http://dx.doi.org/10.1016/j.lungcan.2016.11.020
0169-5002/Published by Elsevier Ireland Ltd.

Table 1
Characteristics of non-Small Cell Lung Cancer Patients by Year of Diagnosis, Patterns of Care (N = 3,318).

Characteristic	1996 (N = 906) N[1] (%)[2]	2005 (N = 1,061) N[1] (%)[2]	2010 (N = 1,351) N[1] (%)[2]	p[3]
Sex				
Male	498 (56)	560 (53)	681 (53)	0.67
Female	408 (44)	501 (47)	670 (47)	
Age at diagnosis, years				
<70	574 (59)	609 (51)	800 (55)	<0.01
70–79	259 (31)	312 (32)	354 (28)	
≥80	73 (10)	140 (16)	197 (17)	
Race/ethnicity				
non-Hispanic white	416 (84)	335 (75)	364 (74)	0.64[4]
non-Hispanic black	303 (11)	300 (12)	345 (12)	
non-Hispanic other	0	225 (8)	364 (8)	
Hispanic	187 (5)	201 (6)	278 (7)	
Health insurance				
Other (Private/HMO/VA)	584 (72)	604 (65)	776 (64)	<0.01
Medicaid, any	141 (9)	253 (14)	315 (16)	
Medicare only	128 (15)	155 (17)	182 (16)	
None/Unknown	53 (4)	49 (3)	78 (4)	
Marital status				
Married	468 (57)	558 (56)	646 (47)	<0.01
Not married/Unknown	438 (43)	503 (44)	705 (53)	
COPD				
No	297 (37)	339 (36)	478 (42)	0.22
Yes	609 (63)	722 (64)	873 (58)	
Charlson comorbidity score[5]				
0	702 (78)	797 (75)	936 (71)	0.02
1	173 (19)	209 (19)	328 (23)	
≥2	31 (3)	55 (7)	87 (7)	
Smoking History				
Never Smoker	69 (7)	168 (11)	247 (12)	<0.01
Ever Smoker	762(86)	812 (80)	1036 (83)	
Unknown	75 (7)	81 (9)	68(5)	
Tumor Characteristics				
Stage[6]				
I/II	245 (31)	270 (28)	321 (26)	0.01
IIIA	112 (12)	84 (7)	117 (8)	
IIIB/IV	549 (57)	707 (65)	913 (66)	
Histology				
Squamous cell	245 (25)	231 (21)	327 (28)	<0.01
Adenocarcinoma	377 (45)	484 (43)	721 (49)	
Carcinoma, NOS	213 (23)	298 (30)	262 (20)	
Large cell	71 (7)	48 (5)	41 (3)	

COPD: Chronic Obstructive Pulmonary Disease; NOS: not otherwise specified; VA: Veteran Affairs.
[1] Unweighted number of patients.
[2] Weighted percentage of patients.
[3] X^2 across years.
[4] X^2 across 2005 and 2010 only.
[5] Charlson comorbidity score, excluding lung cancer and COPD from the calculation.
[6] American Joint Committee on Cancer (1996: 3rd Edition; 2005 and 2010: 6th Edition).

older chemotherapy agents) over time, have not been comprehensively studied.

A growing base of evidence has demonstrated disparities by race [8–10], age [10–12] and insurance status with respect to receipt of appropriate care [13,14]. However, many of these studies have had narrow scopes in terms of study period, patient population, and the number of sociodemographic factors examined.

A better understanding of the temporal treatment patterns and outcomes among NSCLC patients could lead to more equitable evidence-based care, particularly if the influence of sociodemographic characteristics can be better understood. In this analysis we use a population-based sample of NSCLC patients, stratified by stage adjusting for factors such as age, race/ethnicity, insurance, and comorbidities, to investigate how treatment practices and survival have changed between 1996 and 2010.

2. Methods

2.1. Data sources

The data used in this analysis was obtained from the National Cancer Institute (NCI) Patterns of Care (POC) studies, which are conducted annually and include a stratified random sample of cancer patients ascertained through the Surveillance, Epidemiology, and End Results (SEER) program. The aim of the POC studies is to describe the dissemination of state-of-the-art cancer therapies into community practice.