Cancer Survivorship Surveillance Patterns Among Earlier-Staged Lung Cancer Patients

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INTRODUCTION

- The transition to cancer survivorship care, specifically surveillance for recurrence, is an important consideration in earlier-staged lung cancer, where 5-year recurrence rates are between 30–50%[1,2]
- Surveillance guidelines, such as those included within National Comprehensive Cancer Network (NCCN) treatment guidelines for non-small cell lung cancer, have provided recommendations for surveillance after therapy is completed (NCCN guidelines Version 5.2022)
  - For Stage I–II patients treated with surgery and/or radiotherapy, history and physical examination (H&P) as well as a chest computerized tomography (CT) procedure are recommended every 6 months for 2–3 years and then annually after 3 years
  - In contrast, for stage I–II treated with radiotherapy and stage III patients, H&P and chest CT are recommended every 3–6 months for 3 years, then every 6 months for 2 years, and then annually after 5 years
- While surveillance guidelines have been developed, real-world evidence regarding the surveillance patterns is limited

OBJECTIVE

- To describe earlier-staged lung cancer survivor surveillance patterns in a real-world setting in the US

METHODS

- Study Design
  - A retrospective analysis was conducted using Optum's de-identified Integrated Claims-Clinical dataset with Enriched Oncology, which includes electronic health records and claims data from Medicare Advantage and commercially insured members
- Inclusion criteria
  - Adult members identified with newly diagnosed stage I–III lung or bronchus cancer between 1/1/2016–6/30/2020
  - Initiated cancer treatment ≤ 365 days from diagnosis
  - ≥ 60 treatment-free days after completion of cancer treatment
- Analysis
  - Surveillance use included X-ray, CT, magnetic resonance imaging (MRI), positron emission tomography (PET/PET-CT), and low-dose CT (LDCT)
  - Surveillance patterns were evaluated by cancer stage at diagnosis and year since completion of initial treatment descriptively (unadjusted), with Kaplan-Meier estimates of time to first surveillance imaging following completion of cancer treatment to address patient censoring

RESULTS

- A total of 1,154 lung cancer patients were eligible for analysis. Among lung and bronchus cancer patients completing their initial treatment regimen, there was a uniform distribution among stage I–III patients evaluated (**Table 1**)

Table 1: Lung Cancer Survivor Surveillance Patient Selection and Attrition

Inclusion Criteria	Number of Lung & Bronchus Patients
Staging data available in the Optum Enriched Oncology database and linkage to claims data	305,644
Lung & bronchus patients in entire database 2008-2020	15,405
Received some form of cancer-specific resource (codes for cancer, CPTs, drugs, supportive care)[a]	6,021
Aged ≥ 18 years on the disease index date[b]	5,879
≥ 30 days of insurance eligibility prior to disease index date	5,662
Cancer diagnosis during the period 1/1/2016–6/30/2020	3,623
Received NCCN-recommended lung or bronchus treatment (surgery, radiation therapy, or chemotherapy) after disease index date	2,645
Received NCCN-recommended lung or bronchus treatment within 1 calendar year of disease index date	2,583
≥ 60 days of treatment-free surveillance after end of treatment period	1,974
Had a defined start and end date for insurance eligibility[c]	1,969
Stage I, II, and III patients only	1,154
Sample Completing Initial Treatment to Evaluate Surveillance Patterns Prior to Loss to Follow- Up (Death, Loss of Insurance, Progression): n (%)	
Stage I	430 (37)
Stage II	296 (26)
Stage III	428 (37)

CPT, current procedural terminology; NCCN, National Comprehensive Cancer Network
[a]Based on CPT and ICD-10 diagnosis/procedure codes
[b]Optum databases only provide the date of birth year. January is assumed as the month associated with the birth year
[c]Five subjects had an insurance eligibility end date of 31DEC9999 and were excluded

- The populations across stages were similar and consistent with the Surveillance, Epidemiology, and End Results (SEER) evidence.[3] The majority were insured by Medicare Advantage with a mean age of 70.7, 68.8, and 68.8 years for stage I, II, and III patients, respectively (**Table 2**)

Table 2: Lung Cancer Patient Demographics and Characteristics by Stage

	Stage I	Stage II	Stage III
n (%)[a,b]	430	296	428
Age, mean (SD), years[b]	70.7 (9.6)	68.8 (9.6)	68.8 (9.6)
Female Gender, n (%)[b]	252 (58.6)	153 (51.7)	208 (48.6)
Insurance Type, n (%)[a,b]			
Commercial	114 (26.5)	87 (29.4)	120 (28.0)
Medicaid	18 (4.2)	17 (5.7)	31 (7.2)
Medicare Advantage	284 (66.1)	182 (61.5)	261 (61.0)
Unknown	14 (3.3)	10 (3.4)	16 (3.7)
Geographic Region, n (%)[a,b]			
Midwest	171 (39.8)	127 (42.9)	201 (45.0)
Northeast	163 (37.9)	98 (33.1)	122 (28.5)
South	54 (12.6)	45 (15.2)	65 (15.2)
West	31 (7.2)	14 (4.7)	30 (7.0)
Unknown	11 (2.6)	12 (4.1)	10 (2.3)
CCI, mean (SD)[c]	2.1 (1.9)	1.77 (1.9)	1.76 (1.8)
COPD, n (%)[a,c]	266 (61.9)	166 (56.1)	253 (59.1)
Initial Treatment Period Length, mean (SD), months	1.8 (2)	2.8 (3)	4 (3.1)
Surveillance Period, mean (SD), months	17.7 (13.2)	12.9 (11.6)	10.5 (10.2)

SD, standard deviation; CCI, Charlson Comorbidity Index; COPD, chronic obstructive pulmonary disease
[a]Percentages may not total to 100% due to rounding
[b]Demographics were calculated at the time of cancer diagnosis
[c]CCI and COPD was calculated among subjects with 6 months of continuous insurance eligibility prior to their cancer diagnosis

- Many patients were lost to follow-up and relapse (**Figure 1**), but over the entire follow-up period (unadjusted), the rates of surveillance were generally consistent across stages (**Table 3**)

Figure 1: Surveillance Eligibility Over Time

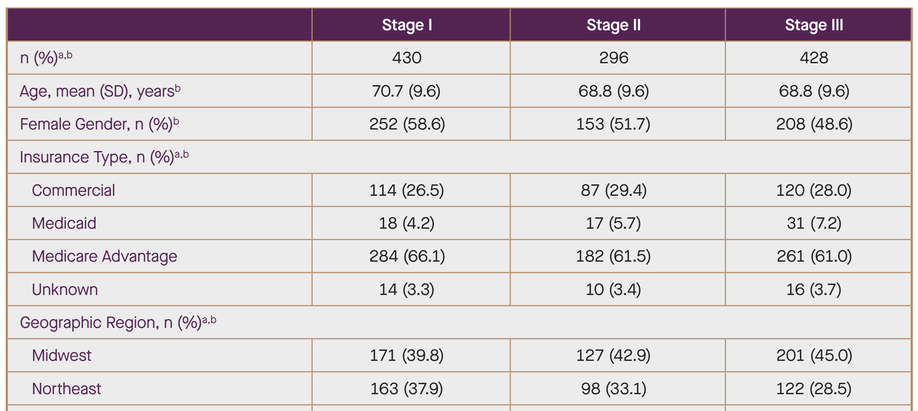


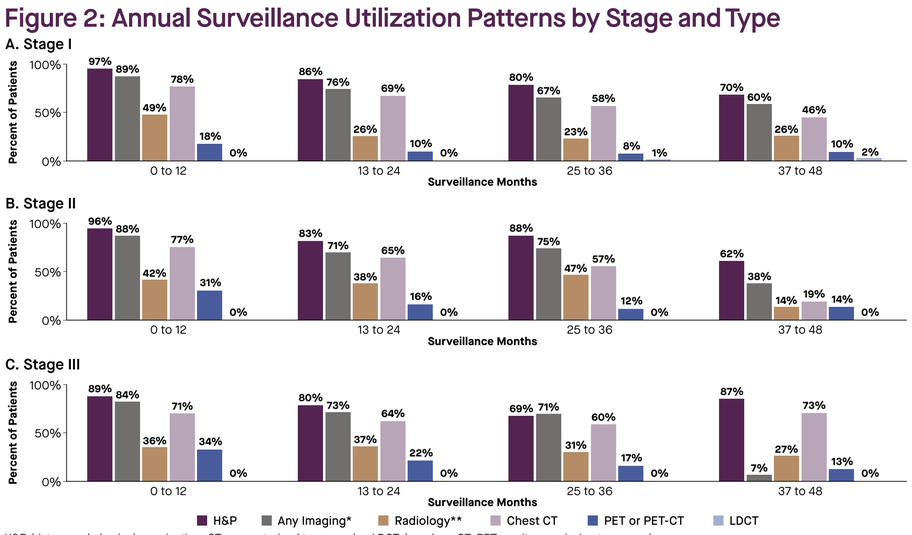
Table 3: Lung Cancer Surveillance Utilization Patterns Over Entire Follow-Up Period[a]

	Stage I	Stage II	Stage III
n	430	296	428
H&P Visits, n (%)	416 (96.7)	285 (96.3)	382 (89.3)
Any Imaging,[b] n(%)	387 (90.0)	261 (88.2)	357 (83.4)
CT	342 (79.5)	230 (77.7)	305 (71.3)
MRI	24 (5.6)	12 (4.1)	10 (2.3)
X-Ray	259 (60.2)	153 (51.7)	186 (43.5)
LDCT	2 (0.5)	0 (0.0)	0 (0.0)
PET or PET-CT	101 (23.5)	108 (36.5)	157 (36.7)

H&P, history and physical examination; CT, computerized tomography; MRI, magnetic resonance imaging; LDCT, low-dose CT; PET, positron emission tomography
[a]Agnostic of Time Period or Surveillance Follow-Up

- The use of CT for surveillance was highest in year 1 and declined in subsequent years (unadjusted [**Figure 2**]). Other surveillance procedures were also utilized, including MRI and LDCT, which were used in < 6% and < 1% of patients, respectively (**Table 3**)

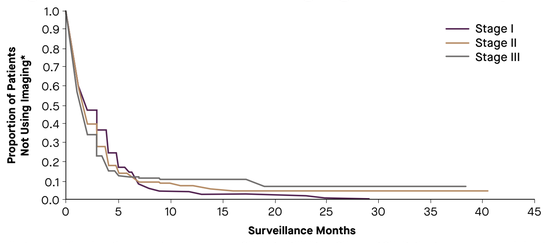
Figure 2: Annual Surveillance Utilization Patterns by Stage and Type



H&P, history and physical examination; CT, computerized tomography; LDCT, low-dose CT; PET, positron emission tomography
*Any imaging includes Radiology, Chest CT, PET/PET-CT, or LDCT
**Radiology includes X-ray of the chest

- Most patients had some form of imaging within the first month post treatment completion, and nearly all patients had an imaging procedure within the first 6 months
- Utilization of any form of imaging for stages I, II, and III by 6 months was 85%, 87%, and 75%, respectively, and at 12 months increased to 96%, 93%, and 77% (**Figure 3**)

Figure 3: Time to First Imaging Procedure by Stage

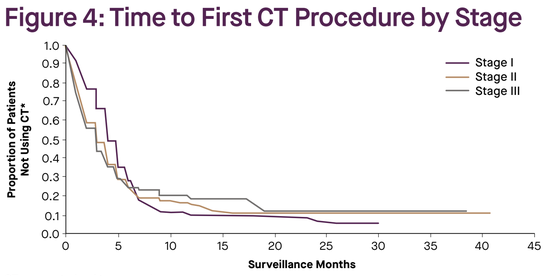


Key Findings			
	Stage I	Stage II	Stage III
Median time to first imaging,* months	1-2	1-2	1-2
At 6 months: % with no imaging	15	13	25
At 12 months: % with no imaging	4	7	23

*First-use defined as the use of any imaging—CT, MRI, PET/PET-CT, or LDCT. Patients are censored due to loss of insurance, initiation of second-line treatment, or death

- Utilization of chest CT only for stages I, II, and III within 6 months following active treatment was 72%, 76%, and 62%, respectively, and by 12 months increased to 90%, 86%, and 72% (**Figure 4**)

Figure 4: Time to First CT Procedure by Stage



Key Findings			
	Stage I	Stage II	Stage III
Median time to first imaging,* months	4	3	4
At 6 months: % with no imaging	28	24	38
At 12 months: % with no imaging	10	14	28

CT, computerized tomography
*First-use defined as the use of any CT. Patients are censored due to loss of insurance, initiation of second-line treatment, or death

- PET/PET-CT use ranged from 20–37% across stages, with some utilization prior to or in absence of CT (**Table 4**)

Table 4: PET/PET-CT Use Breakdown

	Stage I	Stage II	Stage III
Sample Size	430	296	428
Utilized PET/PET-CT during surveillance period, n (%)	101 (23)	108 (36)	157 (37)
Utilized PET/PET-CT after CT performed, n (%)	81 (80)	68 (63)	94 (60)
Utilized PET/PET-CT without any CT performed, n (%)	15 (15)	15 (14)	32 (20)
Utilized PET/PET-CT before CT performed, n (%)	5 (5)	25 (23)	31 (20)

CT, computerized tomography; PET, positron emission tomography

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CONCLUSIONS

- Consistent with NCCN guidelines, chest CT was the most common surveillance procedure and was associated with a high probability of use in the first year, but utilization declined significantly in subsequent years
- Depending on stage, at least a quarter of patients did not have a CT within 6 months of active treatment completion as recommended
- Enhancements in cancer survivorship surveillance for recurrence may improve outcomes for lung cancer survivors