RWD145

Health care resource utilization (HCRU) and costs among previously treated patients with metastatic non-small cell lung cancer (mNSCLC): A retrospective analysis of SEER-Medicare linked claims

Pragya Rai[1]; Deepika Paratane[2]; Fatema Turkistani[2]; Jae Min[1]; Krithika Rajagopalan[2]; Xiaohan Hu[1]

[1]Merck & Co., Inc., Rahway, NJ, USA
[2]Anlitiks Inc., Windermere, FL, USA

Introduction

- In patients diagnosed with epidermal growth factor receptor (EGFR) mutation-positive metastatic non-small cell lung cancer (mNSCLC), tyrosine kinase inhibitors (TKI) are the standard of care[1-3]
  - While optimal subsequent therapy following EGFR TKI-resistance remains an active area of study, clinical guidelines list multiple regimens, most being platinum-based therapies[2,3]
- In patients with mNSCLC with no evidence of EGFR/ALK/ROS1 alterations, treatment includes anti–programmed death (ligand)-1 (PD-(L)1) therapies administered concomitantly, as first line (1L), or sequentially, as second line (2L), or beyond, with platinum doublet chemotherapy (PDC)[4-6]
  - There are limited treatment options for later lines of therapy, following progression on anti-PD-(L)1 and PDC[4-10]
- Due to limited effective treatment options following progression, real-world evidence on economic burden among these previously treated patients with mNSCLC will highlight the need for newer therapies

Objective

- To examine the baseline characteristics, health care resource use (HCRU), and health care costs among previously treated patients with mNSCLC

Methods

Study design and data source

- A retrospective cohort study was conducted using claims data from surveillance epidemiology and end-results (SEER)-Medicare linked cancer database during the years 2007 to 2017 (ie, study period)

Study population

- Patients included were age ≥66 years old, with NSCLC diagnosis (≥1 inpatient/emergency department [ED] lung cancer diagnosis, or ≥2 outpatient lung cancer diagnosis ≥30 days apart) and metastatic staging (stage IV per American Joint Committee on Cancer [AJCC] 7th edition),[11] had no history of other (non-NSCLC) cancers, and continuously enrolled for ≥6 months in Medicare parts A and B and D following mNSCLC diagnosis

Study cohorts

- From the patients selected above, 2 cohorts were created:
  - Cohort 1 included patients with nonsquamous histology who initiated 2L/3L platinum-containing regimens (ie, index date) after receiving
    - 1L first- or second-generation EGFR TKIs (eg, erlotinib/afatinib /gefitinib/dacomitinib) followed by 2L third-generation EFGR TKI (osimertinib)
    - 1L first-, second-, or third-generation EGFR TKIs
  - Cohort 2 included patients with either squamous or nonsquamous histology who were previously treated with anti-PD-(L)1 in combination with PDC (sequentially or concomitantly); initiation date of any therapy following exposure with anti-PD-(L)1 and PDC was used as the index date

Study preindex/postindex period

- Baseline period: A minimum of 12 months preceding the index date
- Follow-up/observation period: Period between the index date and the earliest of the following: (i) end of data availability, (ii) end of Medicare Part A (inpatient), Part B (outpatient), or Part D (prescription drug coverage) eligibility, or (iii) death

Study measures and definitions

The following measures were analyzed for both cohorts:

Baseline measures (preindex)

- Demographic characteristics and clinical characteristics

Follow-up outcome measures (postindex)

HCRU and cost outcomes

- Per patient per month (PPPM) all-cause, NSCLC-related, adverse event (AE)-associated and other-cause HCRU for different medical (ie, inpatient, outpatient, emergency department, and skilled nursing facility) services
- AEs included were Grade ≥3 AEs reported in historical anti-PD(L)1 and platinum chemotherapy doublet clinical trials
- Costs were derived from Medicare claims and included the amount paid by Medicare, patients, and other payers
- All costs were inflation-adjusted to December 2019 US dollars based on the medical care component of the Consumer Price Index

Subanalysis

- A subanalysis was conducted to examine the disease-management costs (ie, sum of all-cause direct health care costs except for NSCLC-specific drug acquisition and administration costs) for those who utilized specific services or incurred costs during the time spent in (i) a specific disease state, and (ii) by years within that disease state after the index date
- Disease states were defined as follows:
  - Progression-free state: Time in days from index date until earliest of either initiation of a second-line treatment, administrative censoring, or 3 months prior to death
  - Progressed-disease state: Time from index date to end of follow-up among patients receiving second-line treatment for lung cancer, excluding costs from the last 30 days of life
- In addition, terminal care costs were also calculated as costs incurred within 30 days prior to death

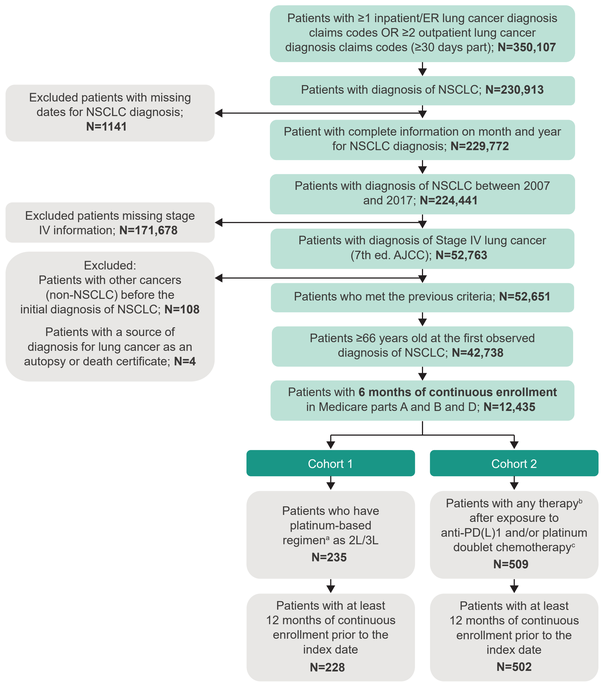
Statistical methods

- Baseline characteristics and treatment outcomes were reported as frequencies and percentages for categorical variables and mean (SD) and median (IQR) as well as 95% confidence intervals as appropriate
- PPPM was calculated as the total cost divided by the total number of days of enrollment in the cohort, multiplied by 30 days

Results

- Patient selection and final sample for Cohort 1 (n = 228) and Cohort 2 (n = 502) are provided in Figure 1
- Baseline demographic and clinical characteristics (Table 1) were similar between both cohorts
- All-cause, NSCLC-specific, AE-associated, and other HCRU and health care cost outcomes are described in Tables 2 and 3, respectively
- Total PPPM all-cause cost was $9612.00 and $10,200.10 for Cohort 1 and 2, respectively (Table 3)

Figure 1. Study population selection



NSCLC, non-small cell lung cancer; AJCC, American Joint Committee on Cancer.
[a]Cohort 1: Platinum-based regimens included administration either as a single agent (cisplatin or carboplatin) or as combination with any drug (including chemotherapy, PD1/PD-(L)1, anti-VEGF, anti-CTLA4, EGFR inhibitors, ALK inhibitors, BRAFV600 inhibitors, NTRK1/2/3 fusion inhibitors, MET fusion TKI, RET mutation TKI).
[b]Cohort 2: Any therapy included taxane regimens and/or other common alternative regimens (nonplatinum or nonimmunotherapy monotherapy or combination therapy).
[c]Anti-PD(L)1 and platinum doublet chemotherapy were administered concomitantly or sequentially.

Table 1. Baseline demographic and clinical characteristics

Demographics	Cohort 1 (N=228)	Cohort 2 (N=502)
Age		
Mean (SD)	75.17 (5.34)	74.67 (5.12)
Sex, n (%)		
Female	152 (66.67%)	259 (51.59%)
Race, n (%)		
White	141 (61.84%)	408 (81.27%)
Asian	78 (34.21%)	64 (12.75%)
African American	[a]	28 (5.58%)
Other	[a]	[a]
Geographic region, n (%)		
West	155 (67.98%)	224 (44.62%)
Northeast	42 (18.42%)	106 (21.12%)
South	24 (10.53%)	110 (21.91%)
Midwest	[a]	62 (12.35%)
Time from NSCLC diagnosis to index date (months)		
Mean (SD)	15.86 (12.57)	21.73 (14.67)
Charlson Comorbidity Index		
Mean (SD)	8.10 (2.91)	9.23 (2.67)

SD, standard deviation.
[a]Cell sizes below 11 are suppressed.

- HCRUs were driven by outpatient visits across both cohorts (Table 2)
- PPPM AE-associated costs were $5309.20 and $6950.60 for Cohort 1 and 2, respectively (Table 3)
  - The high AE-associated cost may be attributed to the fact that AEs were identified using either primary or secondary diagnosis codes
  - In addition, these costs were driven by inpatient admissions (Cohort 1 = $3170; Cohort 2 = $4490)

Table 2. Health care resource utilization (HCRU) in Cohort 1 and Cohort 2

PPPM HCRU by service type	Cohort 1, N=228	Cohort 2, N=502
All-cause[a] PPPM		
Inpatient	0.24	0.35
Inpatient days	1.26	1.82
Skilled nursing facility	0.03	0.04
Emergency department	0.32	0.47
Outpatient	2.03	2.21
NSCLC-specific[b] PPPM		
Inpatient	0.23	0.33
Inpatient days	1.19	1.68
Skilled nursing facility	0.02	0.03
Emergency department	0.2	0.29
Outpatient	0.93	0.93
AE-associated[c] PPPM		
Inpatient	0.18	0.31
Inpatient days	1.02	1.65
Skilled nursing facility	0.022	0.033
Emergency department	0.2	0.4
Outpatient	0.5	0.69
Other-cause[d] PPPM		
Inpatient	0.0026	0.003
Inpatient days	0.01	0.011
Skilled nursing facility	0.0022	0.001
Emergency department	0.054	0.045
Outpatient	0.57	0.85

AE, adverse event; PPPM, per patient per month; NSCLC, non-small cell lung cancer.
[a]All-cause included claims for any reason for the different medical services.
[b]NSCLC-specific: NSCLC were identified through claims for medical services using primary or secondary ICD-9/ICD-10 codes or administration of antineoplastic treatments using HCPCS/NDC codes. Exception included, for outpatient visit, a primary diagnosis using ICD-9/ICD-10 codes were considered.
[c]AE-associated: Occurrence of AE was identified through claims with AE as either primary or secondary diagnostic ICD-9/ICD-10 codes.
[d]Other-cause HCRU estimated as all costs excluding NSCLC-specific and AE-associated HCRU.
Note: HCRU was calculated as a percentage of the total population (patients ≥0 utilization/costs) between index date and observation end date.

Table 3. Health care costs among nonsquamous and squamous cohorts

PPPM medical costs by service type	Cohort 1, N=228	Cohort 2, N=502
Total medical costs[a]		
All-cause	$9,612.00	$10,200.10
NSCLC-specific	$6,233.90	$7,182.40
AE-associated	$5,309.20	$6,950.60
Other cause	$662.10	$486.80

AE, adverse event; NSCLC, non-small cell lung cancer; PPPM, per patient per month.
[a]Total medical costs include costs from inpatient (IP), outpatient (OP), emergency department (ED), and skilled nursing facility (SNF).

- Higher costs were observed in Year 1 in both cohorts, regardless of the disease state (Table 4)
- Disease-management costs were higher for patients in the progressed disease state in both cohorts (Table 4)
- Mean terminal-care costs were approximately $20,000 in both cohorts ($22,520 [$22,215] for Cohort 1 and $17,675 [$16,975] for Cohort 2) (Table 4)

Table 4. Disease-management costs by disease state and year and terminal-care cost

Cost item	Progression free (PF)	Progressed disease (PD)
Cohort 1		
Year 1	$2,523	$2,370
Year 2	$559	$787
Year 3	$409	$470
Years 4-5	$40	$762
Years 6+[a]	-	-
Mean terminal-care costs, mean (SD)		$22,520 ($22,215)
Cohort 2		
Year 1	$3,736	$3,237
Year 2	$772	$999
Year 3	$604	$642
Years 4-5	$4	$409
Years 6+[a]	-	-
Mean terminal-care costs, mean (SD)		$17,675 ($16,975)

SD, standard deviation.
[a]No patients observed for 6+ years for both the cohorts.
Note: Terminal-care costs defined as costs incurred within 30 days before death across the different medical services (inpatient, outpatient, emergency department, skilled nursing facility) and pharmacy services.

Limitations

- As with any analysis using claims data, this study has limitations related to undercoding or miscoding. Additionally, the data may not capture the most up-to-date treatment patterns and costs given that updated data are available only up to 2019
- The analysis includes patients aged 65 and older only; therefore, these findings may not be generalizable to younger populations
- Additionally, certain clinical variables such as biomarkers and ECOG PS that may confound the results are not available in the dataset, thus limiting the depth of analysis and the ability to draw inferences
- In claims data, it is not possible to assess the association between therapy and AEs

Conclusions

- In this analysis of patients with mNSCLC who are previously treated, substantial economic burden was observed
- Outpatient visits were higher than other health care setting visits, regardless of the cause of health care visit
- Disease-management costs peaked in the first year of treatment, regardless of the disease state in both cohorts

Disclosures

- Drs. Rai, Min, and Hu report employment with Merck Sharp & Dohme LLC, a subsidiary of Merck & Co., Inc., Rahway, NJ, USA, and stock ownership of Merck & Co., Inc., Rahway, NJ, USA
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Contact Information

Pragya.rai@merck.com

https://bit.ly/44rS14M

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