RWD188

Healthcare cost and healthcare resource utilization (HCRU) among first-line (1L) treated patients with metastatic non-small cell lung cancer (mNSCLC): Analysis of SEER-Medicare linked claims in the US

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Introduction

- Pivotal clinical trials of pembrolizumab for the treatment of patients with metastatic non-small cell lung cancer (mNSCLC) without actionable driver mutations, ie, epidermal growth factor receptor (EGFR) mutations or anaplastic lymphoma kinase (ALK) alterations, have shown significantly longer overall survival compared to chemotherapy[1-5]
- Based on clinical trials, the preferred first-line (1L) treatments for patients with mNSCLC are either pembrolizumab monotherapy or in combination with:
  - Carboplatin/cisplatin and pemetrexed for nonsquamous mNSCLC[2,3]
  - Carboplatin and taxane (paclitaxel/nab-paclitaxel) for squamous mNSCLC[4,5]
- There remains a gap in understanding the healthcare resource utilization (HCRU) and economic burden of patients on pembrolizumab-containing therapy (ie, 5th cycle initiation after 4 cycles on induction therapy)

Objective

- To examine the baseline characteristics, HCRU, and healthcare costs among mNSCLC patients with nonsquamous or squamous histology who initiated 5th cycle with 1L pembrolizumab monotherapy or combination therapy in the real-world setting

Methods

Study design and data source

- A retrospective cohort study was conducted using claims data from the Surveillance, Epidemiology, and End Results (SEER)-Medicare linked cancer database during the years 2007-2020 (ie, study period)

Study population

- Patients included were: aged ≥66 years with NSCLC [≥1 inpatient/emergency department (ED) lung cancer diagnosis or ≥2 outpatient lung cancer diagnoses ≥30 days apart] and metastatic staging [Stage IV per American Joint Committee on Cancer (AJCC) 7th edition],[6] had no history of other (non-NSCLC) cancers, and were continuously enrolled for ≥6 months in Medicare parts A, B, and D following mNSCLC diagnosis between 2007 and 2019 (ie, patient identification period)

Study cohorts

- Of the mNSCLC patients selected above, those who initiated 5th cycle after 4 induction cycles with 1L pembrolizumab monotherapy or combination therapy were stratified into 2 cohorts:
  - Cohort 1: Patients with nonsquamous histology who received 1L pembrolizumab either as monotherapy or in combination with cisplatin/carboplatin plus pemetrexed (nonsquamous cohort)
  - Cohort 2: Patients with squamous histology who received 1L pembrolizumab either as monotherapy or in combination with carboplatin plus paclitaxel/nab-paclitaxel (squamous cohort)

Study preindex/postindex period

- Baseline period: A minimum of 12 months preceding the index date (ie, pembrolizumab 5th cycle initiation date)
- Follow-up/observation period: Period between the index date and the earliest of the following: (i) end of data availability, ie, 12-31-2020; (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 (IP), outpatient (OP), ED, and skilled nursing facility (SNF)] services
- AEs included were Grade ≥3 AEs reported in historical pembrolizumab 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 2020 US dollars based on the medical care component of the Consumer Price Index (CPI)

Subanalysis

- A subanalysis was conducted to examine the disease management costs (ie, sum of all-cause direct healthcare costs except for NSCLC-specific drug acquisition and administration costs) for those who utilized specific services or incurred costs during the time spent (i) in 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 the 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 the 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

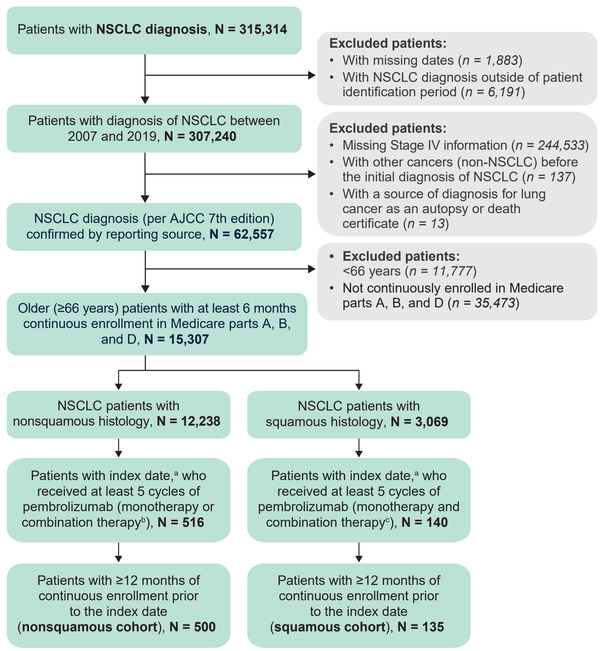
Statistical methods

- 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 nonsquamous and squamous cohorts are provided in Figure 1
- Baseline characteristics (Table 1) were similar between both cohorts, with a lower proportion of males in the nonsquamous cohort
- All-cause, NSCLC-specific, AE-associated, and other HCRU and cost outcomes are described in Tables 2 and 3, respectively

Figure 1. Study population selection



NSCLC, non-small cell lung cancer; AJCC, American Joint Committee on Cancer.
[a]Start of the 5th cycle after receiving 4 cycles of pembrolizumab monotherapy or pembrolizumab combination therapy (ie, index date)
[b]Combination therapy for nonsquamous cohort included pembrolizumab in combination with pemetrexed and platinum chemotherapy (carboplatin or cisplatin) as first-line (1L) therapy
[c]Combination therapy for squamous cohort included pembrolizumab in combination with carboplatin and taxanes (paclitaxel/nab-paclitaxel) as 1L therapy
Note: Exclusion criteria for both cohorts: (1) Use of anti-CTLA4 therapy, anti-VEGF, EGFR inhibitors, ALK inhibitors, BRAFV600 inhibitors, mTKIs, other chemo drugs, ROS inhibitors, RET inhibitors, MET inhibitors, MEK inhibitors, HER2 inhibitors, and KRAS G12C inhibitors within 30 days prior to metastatic diagnosis and any time before 1L pembrolizumab-containing therapy initiation; (2) use of EGFR or ALK or ROS inhibitors between metastatic diagnosis and 4th cycle of pembrolizumab-containing therapy as 1L

- Regardless of the cause of utilization (all-cause, NSCLC-specific, AE-associated, and other cause), PPPM OP visits were higher than IP, SNF, and ER visits in both cohorts (Table 2)
- As both primary and secondary diagnosis codes were used to identify AEs, higher total AE-associated PPPM costs were observed in both cohorts (Table 3). Moreover, these high costs were incurred due to OP visits in the nonsquamous cohort ($2,294) and inpatient admissions in the squamous cohort ($3,365)
- Higher costs were incurred in Year 1, irrespective of the disease state (Table 4)
  - Progressed disease state vs progression-free state had higher PPPM costs in both cohorts (Table 4)
- Mean terminal care costs were $18,955 for nonsquamous and $20,330 for squamous cohort (Table 4)

Table 1. Baseline demographic and clinical characteristics

Demographics	Nonsquamous cohort N = 500	Squamous cohort N = 135
Age		
Mean (SD)	75.80 (6.25)	75.68 (5.97)
Sex, n (%)		
Female	276 (55.20%)	50 (37.04%)
Race/ethnicity, n (%)		
White	438 (87.60%)	116 (85.93%)
African American	23 (4.60%)	a
Asian	30 (6.00%)	a
Other	a	a
Unknown/Missing	a	a
Geographic region, n (%)		
Northeast	117 (23.40%)	29 (21.48%)
Midwest	54 (10.80%)	11 (8.15%)
South	106 (21.20%)	41 (30.37%)
West	223 (44.60%)	54 (40.00%)
Unknown/Missing	a	a
Time from NSCLC diagnosis to index date (months)		
Mean (SD)	5.64 (5.41)	5.02 (1.81)
Charlson Comorbidity Index		
Mean (SD)	8.73 (2.99)	8.57 (3.40)

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

Table 2. Healthcare resource utilization (HCRU) in nonsquamous and squamous cohorts

PPPM HCRU by service type	Nonsquamous cohort N = 500	Squamous cohort N = 135
All-cause[a] PPPM		
Inpatient	0.15	0.21
Inpatient days	0.78	1.24
Skilled nursing facility	0.01	0.05
Emergency department	0.19	0.3
Outpatient	1.83	1.79
NSCLC-specific[b] PPPM		
Inpatient	0.14	0.19
Inpatient days	0.73	1.14
Skilled nursing facility	0.01	0.03
Emergency department	0.12	0.18
Outpatient	0.74	0.75
AE-associated[c] PPPM		
Inpatient	0.13	0.19
Inpatient days	0.75	1.12
Skilled nursing facility	0.01	0.03
Emergency department	0.16	0.23
Outpatient	0.53	0.44
Other-cause[d] PPPM		
Inpatient	0.00055	0.0013
Inpatient days	0.0019	0.01
Skilled nursing facility	0.00045	0.0089
Emergency department	0.017	0.053
Outpatient	0.48	0.48

AE, adverse event; PPPM, per-patient per-month
[a]All-cause included claims for any reason for the different medical services.
[b]NSCLC-specific: NSCLC was identified through claims for medical services using primary or secondary ICD-9/10 codes or administration of antineoplastic treatments using HCPCS/NDC codes. For outpatient visit, a primary diagnosis using ICD-9/ICD-10 was considered.
[c]AE-associated: Occurrence of AE was identified through claims with AE as either primary or secondary diagnostic ICD-9/10 code.
[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. Healthcare costs among nonsquamous and squamous cohorts

PPPM medical costs by service type	Nonsquamous cohort N = 500	Squamous cohort N = 135
Total medical costs[a]		
All-cause	$9,523	$10,951
NSCLC-specific	$4,645	$6,259
AE-associated	$4,943	$6,138
Other cause	$401	$511

AE, adverse event
[a]Total medical costs include costs from IP + SNF + ER + OP

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

Cost Item	Progression-free (PF)	Progressed disease (PD)
Nonsquamous cohort		
Year 1	$2,212	$2,252
Year 2	$431	$816
Year 3	$234	$498
Year 4-5	$147	$162
Year 6+[a]	-	-
Mean terminal care costs, mean (SD)	**$18,955 ($17,216)**	
Squamous cohort		
Year 1	$2,232	$3,190
Year 2	$815	$1,095
Year 3	$327	$472
Year 4-5	$9	$6
Year 6+[a]	-	-
Mean terminal care costs, mean (SD)	**$20,330 ($22,592)**	

PPPM, per-patient per-month; SD, standard deviation
[a]No patients observed for 6+ years for both cohorts.
Note: Disease management costs were defined as the sum of all-cause direct healthcare costs except for NSCLC-specific drug acquisition and administration costs across the different medical services (inpatient, outpatient, emergency department, skilled nursing facility). Terminal care costs were 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. In addition, the data may not capture the most up-to-date treatment patterns and costs, given that data is available only up to 2020
- In claims data, it is not possible to assess the association between therapy and AEs. Furthermore, the data may not be generalizable to a population <65 years of age

Conclusions

- In this analysis of patients with mNSCLC who initiated a 5th cycle of pembrolizumab (monotherapy or combination therapy), patients bear substantial economic burden
- HCRUs were mainly driven by outpatient visits
- Disease management costs were highest in Year 1, irrespective of the disease state for both cohorts

Disclosures

Drs. Rai, Min, and Aggarwal 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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