Real-World Treatment Patterns, Healthcare Resource Utilization (HCRU) and Healthcare Costs (HCC) of Patients with Small-Cell Lung Cancer in the US

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BACKGROUND and OBJECTIVES

- Small cell lung cancer (SCLC) is an aggressive lung cancer subtype that accounts for 10% to 15% of lung cancers[1,2].
- Patients often require several lines of therapy leading to high costs of care [3,4].
- The recommended first-line systemic therapy for patients with limited stage (LS) SCLC is platinum (cisplatin or carboplatin) + etoposide. While for patients with extensive stage SCLC, a combination of an immune checkpoint inhibitor (ICI) durvalumab or atezolizumab to platinum + etoposide is the preferred regimen with platinum + etoposide alone as another option[2,5].
- Preferred second-line regimens include rechallenge with platinum + etoposide (in platinum-sensitive patients), topotecan, or lurbinectedin[2,5].
- Median overall survival in 1L trials of ICI combinations is ~12 to 13 months which reduces significantly in subsequent lines of treatment. [6,7].
- This study describes treatment patterns, adverse events (AE), and healthcare resource use (HCRU), health care costs (HCC) associated with SCLC in the US.

METHODS

Study design

- A retrospective, observational, cohort study that leveraged the Optum® Market Clarity dataset of integrated pharmacy and medical claims and electronic health records (EHR) data.

Inclusion criteria

- Adults diagnosed with lung cancer who had at least one non-diagnostic inpatient or outpatient lung cancer claim from 1 July 2011 to 31 March 2021 and were treated with systemic SCLC cancer agents following the lung cancer diagnosis date.

Table 1: Study objectives and endpoints

Objective	Endpoints
Patient characteristics	Age, sex, insurance type, geographical location, disease stage, smoking status, Charlson comorbidity score
Treatment patterns	Frequency of systemic therapy regimens, by LOT, treatment attrition
AEs	Proportion of patients experiencing AEs following treatment
Total HCRU and HCC	Ambulatory visits (physician office and hospital outpatient), emergency room (ER) visits, inpatient admissions, length of stay and intensive care unit (ICU) stays.
AE- related HCRU and HCC	Ambulatory visits (physician office and hospital outpatient), ER visits, inpatient admissions, length of stay and ICU stays.

Abbreviations: AE; adverse event, ER; emergency room, HCC; healthcare costs, HCRU; healthcare resource use, ICU; intensive care unit, LOT; line of therapy

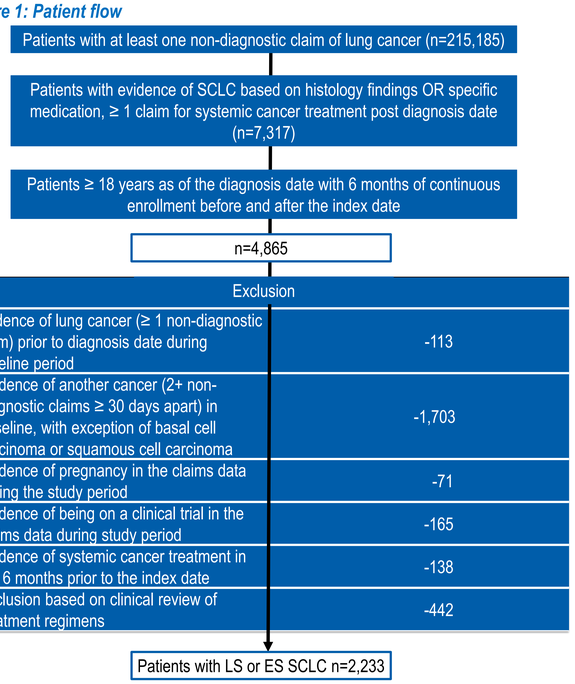
- This study was descriptive in nature, there were no pre-specified hypotheses and no comparative analyses across groups and subgroups of intertest were undertaken.

RESULTS

Study population

- 2,233 patients were included in the study after applying all the study inclusion and exclusion criteria.

Figure 1: Patient flow



Abbreviations: ES; extensive stage, LS; limited stage, SCLC; small cell lung cancer.

RESULTS

Baseline characteristics

- Of the included patients, 69.7% had extensive stage (ES) disease, 41.3% had limited stage (LS disease).
- Patients with LS disease, and ES disease generally had similar baseline characteristics, however, those with LS disease were more likely to be female, less likely to be a current or former smoker, and had a lower Charlson comorbidity score.

Table 2: Baseline characteristics

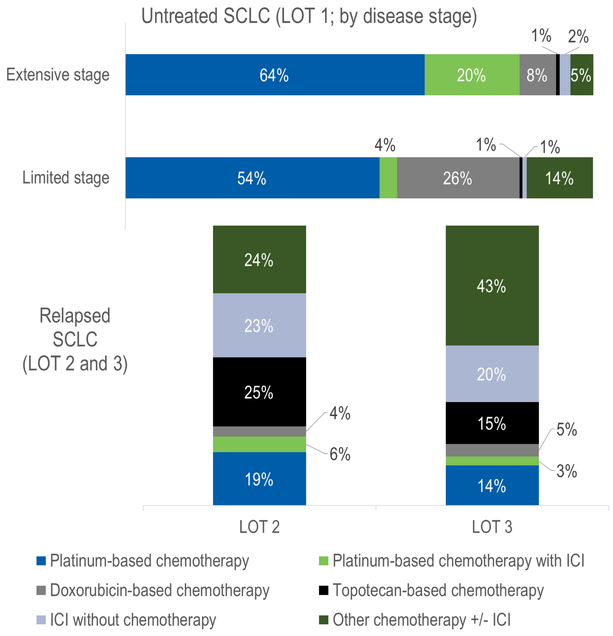
Demographics	LOT 1 (n= 2,233)		LOT 2	LOT 3
	ES (n= 1,557)	LS (n= 676)	(n=933)	(n=287)
Age at index diagnosis date, mean (SD)	64.7 (10.4)	65.2 (11.5)	64.2 (10.0)	63.4 (10.2)
Female, n(%)	774 (49.7)	369 (54.6)	476 (51.0)	160 (55.8)
Male, n(%)	783 (50.3)	307 (45.4)	457 (49.0)	127 (44.3)
Insurance type				
Commercial, n(%)	728 (46.8)	286 (42.3)	452 (48.5)	146 (50.9)
Medicare, n(%)	581 (37.3)	282 (41.7)	336 (36.0)	100 (34.8)
Medicaid, n(%)	159(10.2)	63 (9.3)	94 (10.1)	28 (9.8)
Multiple known, n(%)	89 (5.7)	44 (6.5)	51 (5.5)	13 (4.5)
None/unknown, n(%)	0 (0.0)	1 (0.2)	0 (0.0)	0 (0.0)
Smoking Status at index date				
Current smoker, n(%)	431 (27.7)	147 (21.8)	237 (25.4)	74 (25.8)
Previous smoker, n(%)	347 (22.3)	124 (18.3)	191 (20.5)	51 (17.8)
Never smoked, n(%)	51 (3.3)	29 (4.3)	21 (2.3)	2 (0.7)
Other (unknown) , n(%)	728 (46.8)	376 (55.6)	484 (51.9)	160 (55.8)
Stage at index date				
ES, n(%)	1557 (100)	-	709 (76.0)	213 (74.2)
LS, n(%)	-	676 (100)	224 (24.0)	74 (25.8)
Charlson comorbidity score, mean (SD)	7.5 (1.9)	4.2 (2.1)	6.62 (2.3)	6.44 (2.4)

Abbreviations: ECOG; Eastern Cooperative Oncology Group, ES; extensive stage, LOT; line of therapy, LS; limited stage, SCLC; small cell lung cancer, SD; standard deviation

Treatment patterns

- Attrition between lines of treatment was high with only 41.8% of patients receiving a 2nd LOT and 12.9% receiving a third LOT.
- Treatment regimens for previously untreated patients with ES and LS primarily comprised platinum-based chemotherapy.
- Given the recent FDA approval of programmed death ligand 1 (PD-L1) inhibitors [8] in patients with untreated ES disease, platinum-based chemotherapy with ICI was the 2nd most frequently used regimen in this patient group, while in those with LS disease, doxorubicin-based chemotherapy and other chemotherapies were frequently used.
- In LOTs 2 and 3, patients were more evenly distributed across topotecan-based chemotherapy, platinum-based chemotherapy, and ICIs. A significant proportion were treated other types of chemotherapy while a very low proportion(~5%) were treated with doxorubicin-based chemotherapy and platinum-based chemotherapy.

Figure 2: Treatment patterns

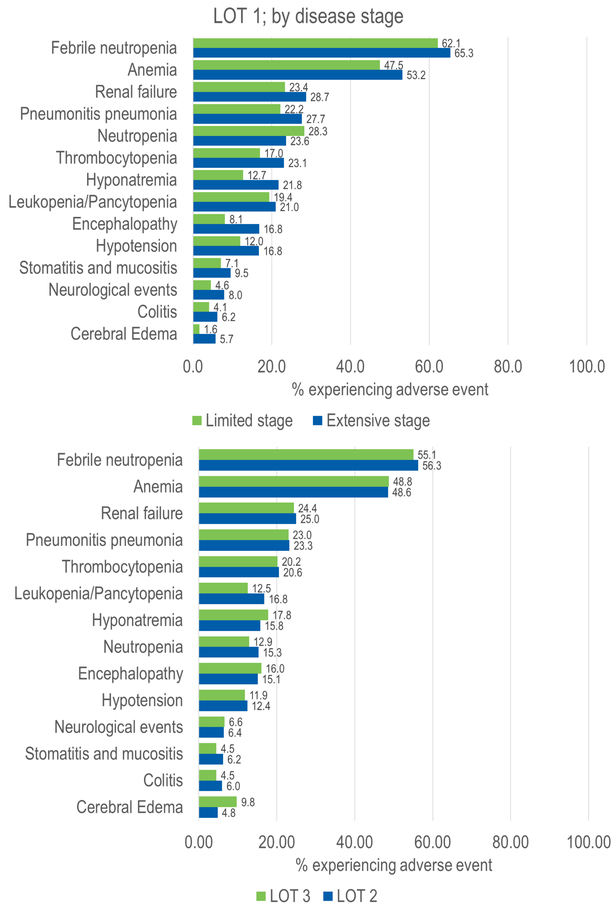


Abbreviations: ICI; immune checkpoint inhibitor, LOT; line of therapy.

Adverse events following treatment

- Adverse events associated with currently available chemotherapy options including febrile neutropenia, anemia, pneumonia, and thrombocytopenia were highly incident in the study population across all LOTs.

Figure 3: Adverse events occurring in >5% of patients following treatment (all grades)



Healthcare resource use and costs

- Ambulatory visits were the most utilized component of all-cause, and AE related HCRU across all LOTs while ICU and inpatient stays were the least utilized (Table 3).
- Consequently, ambulatory accounted for the highest proportion of all-cause and AE-related costs and despite the relatively low utilization, inpatient stays were the 2nd highest cost category (Figure 4).

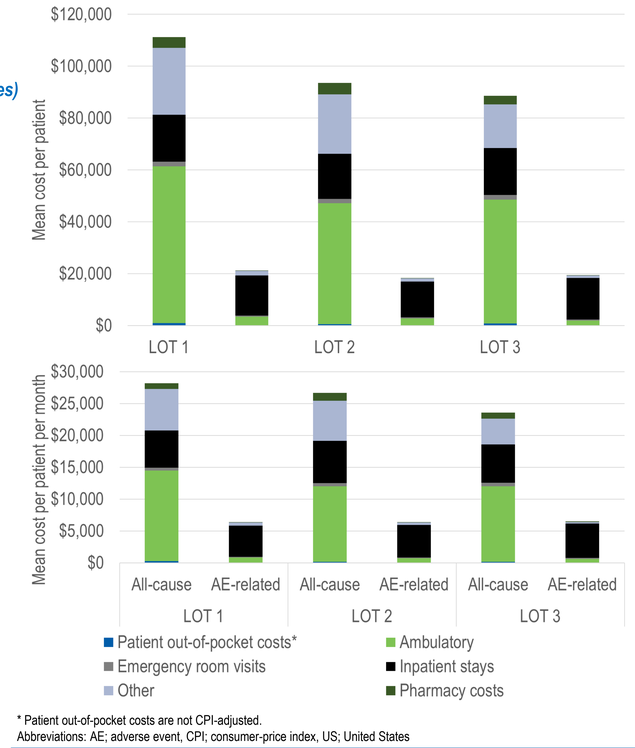
Table 3: HCRU of patients with SCLC by LOT

	LOT 1		LOT 2		LOT 3	
	Usage n(%)	Per patient Mean (SD)	Usage n(%)	Per patient Mean (SD)	Usage n(%)	Per patient Mean (SD)
All Cause						
Ambulatory visits	2,148 (96.2)	39.6 (30.8)	883 (94.6)	29.8 (35.0)	270 (94.1)	25.1 (25.4)
Office	1,968 (88.1)	18.7 (18.6)	788 (84.5)	16.6 (30.4)	240 (83.6)	13.4 (16.3)
Outpatient	1,956 (87.6)	25.1 (26.3)	792 (84.9)	17.1 (18.7)	239 (83.3)	15.4 (18.3)
ER visits	1,208 (54.1)	2.4 (2.2)	518 (55.5)	2.1 (1.7)	166 (57.8)	2.2 (1.9)
Inpatient stays	795 (35.6)	1.6 (1.0)	363 (38.9)	1.4 (0.9)	98 (34.2)	1.5 (0.9)
Inpatient days	-	12.0 (4.5)	-	11.3 (14.5)	-	14.0 (17.8)
ICU stays	189 (8.5)	1.1 (0.4)	78 (8.4)	1.1 (0.5)	27 (9.4)	1.2 (0.5)
Pharmacy fills	1,931 (86.5)	23.4 (23.6)	799 (85.6)	22.2 (29.7)	248 (86.4)	19.3 (20.7)
AE-related						
Ambulatory visits	1,428 (64.0)	5.0 (6.1)	562 (60.2)	5.0 (7.1)	147 (51.2)	4.9 (6.2)
Office	1089 (49.0)	4.1 (4.6)	406 (43.5)	4.3 (5.6)	107 (37.3)	3.8 (5.3)
Outpatient	822 (36.8)	3.4 (5.0)	320 (34.3)	3.4 (5.6)	82 (28.6)	3.8 (4.3)
ER visits	748 (33.5)	1.6 (1.1)	293 (31.4)	1.5 (0.9)	99 (34.5)	1.5 (0.8)
Inpatient stays	667 (29.9)	1.5 (0.9)	286 (30.7)	1.3 (0.9)	78 (27.2)	1.4 (0.8)
Inpatient days	-	12.4 (15.0)	-	10.9 (12.9)	-	13.4 (16.1)
ICU stays	170 (7.6)	1.1 (0.3)	71 (7.6)	1.1 (0.4)	27 (9.4)	1.2 (0.5)
Pharmacy fills	756 (33.9)	2.4 (1.9)	279 (29.9)	2.3 (1.9)	77 (26.8)	2.3 (1.8)

Usage = number and percentage of patients with at least one of each type of HCRU

Abbreviations: AE; adverse event, ER; emergency room, ICU; intensive care unit, LOT; line of therapy, PPPM; per patient per month, SD; standard deviation

Figure 4: Healthcare costs by line of therapy (CPI adjusted US$)



* Patient out-of-pocket costs are not CPI-adjusted.

Abbreviations: AE; adverse event, CPI; consumer-price index, US; United States

CONCLUSIONS

- **Platinum based chemotherapy is the current standard of care for patients with previously untreated LS disease; this has also been historically true for patients with ES disease but recent approvals of PD-L1 inhibitors for this patient group are reflected in the relatively high frequency of treatment with platinum-based chemotherapy in combination with ICI regimens for ES-SCLC.**
- **Most patients did not receive treatment beyond LOT 1, due to high mortality rates, and symptom burden of SCLC that may limit patients' suitability for additional treatment.**
- **Patients receiving subsequent treatments were evenly distributed across all available treatment options in LOT 2 and LOT 3 demonstrating a lack of preferred standard of care.**
- **Currently available treatment options are associated with high costs, partly driven by the management of adverse events in the inpatient setting.**
- **There remains substantial unmet need for effective treatments with a better safety and tolerability profile to reduce the clinical and economic burden of SCLC.**

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