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Outcomes, treatment pattern and related cost of late-stage non-small cell lung (NSCLC) cancer in Taiwan

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RESEARCH OBJECTIVE

Non-small cell lung cancer (NSCLC) is a prevalent cancer worldwide, with treatment efficacy varying according to driver mutations. However, there is a gap regarding the real-world effectiveness associated with NSCLC patients who do not receive targeted therapy or experience first-line treatment failure. This study aims to examine treatment patterns for advanced NSCLC patients and evaluate the costs related to not receiving targeted therapy and experiencing first-line treatment failure.

METHODS

- **Study design and data source**
  A comprehensive analysis was conducted using secondary data to determine treatment patterns and healthcare costs for patients with advanced NSCLC.

Taiwan Cancer Registry (TCR) in 2015-2019 → National Health Insurance claims data in 2014-2020 → Cause of Death data in 2015-2020

- **Target patients**
  - A total of 28,497 patients with advanced or metastatic NSCLC received first-line treatment. (Figure. 1)
  - Out of the total, 6,449 patients (22.63%) lacking driver mutations encountered 1L treatment failure.
- **Outcomes**
  - Overall survival (OS) and Time to next treatment (TTNT)
  - Medical utilization after second-line treatment

Figure 1. Patient selection flow chart

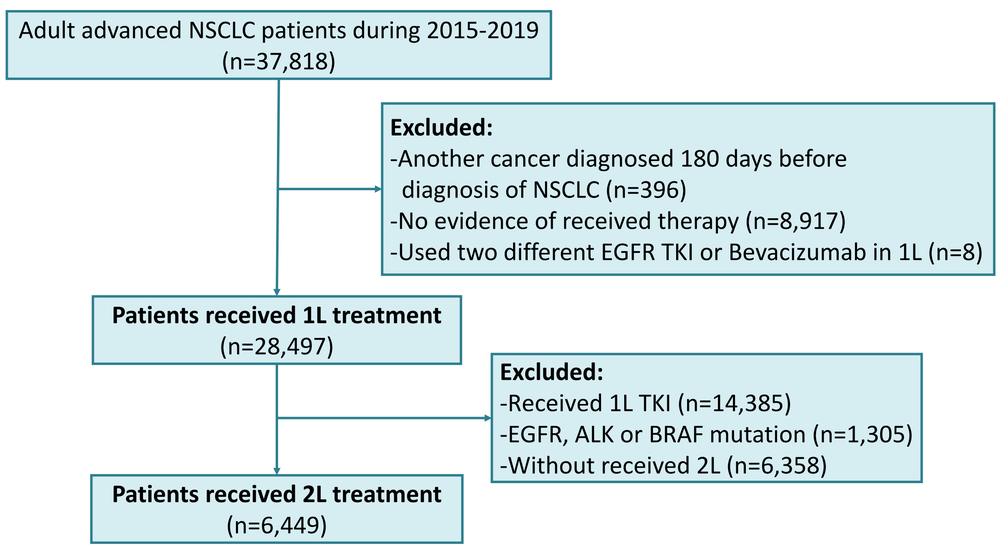

Table 1. Baseline characteristics of NSCLC patients received 1L or 2L treatment

Characteristics	Received 1L treatment (n=28,497)		Received 2L treatment (n=6,449)	
	n	%	n	%
Baseline characteristics				
Male	15,566	54.62	4,423	68.58
Age, year, mean (SD)	66.51(12.03)		63.49(11.43)	
Median (IQR)	66.47(58.41-75.67)		63.58(55.93-71.76)	
BMI, kg/m^2				
<18.5	2,064	7.24	373	5.78
18.5 ≤ BMI < 24	12,729	44.67	2,821	43.74
24 ≤ BMI < 27	6,110	21.44	1,463	22.69
≥ 27	3,957	13.89	935	14.50
Unknown	3,637	12.76	857	13.29
Smoking	7,751	27.20	2,197	34.07
Drinking	5,614	19.70	1,682	26.08
Betel nut chewing	2,544	8.93	877	13.60
Charlson Comorbidity Index (CCI)	1.53±1.62		1.49±1.56	
Tumor status				
Tumor stage				
III B/C	3,532	12.39	1,148	17.80
IV	24,965	87.61	5,301	82.20
Size of tumor				
≤ 3 cm	5,697	19.99	1,158	17.96
3.1-5cm	8,639	30.32	1,715	26.59
5-7cm	5,359	18.81	1,353	20.98
>7 cm	4,380	15.37	1,209	18.75
Unknown	4,422	15.52	1,014	15.72
Histology				
Adenocarcinoma	20,563	72.16	4,116	63.82
Squamous-cell carcinoma	3,897	13.68	1,357	21.04
Adenosquamous carcinoma	359	1.26	92	1.43
Large cell carcinoma	291	1.02	115	1.78
Others	3,387	11.89	769	11.92
Malignant Pleural Effusion	7,898	27.72	1,384	21.46
EGFR mutation	13,570	47.62	-	-
ALK mutation	652	2.29	-	-
ECOG PS score ≥ 2	4,925	17.28	707	10.96
First-line treatment				
TKI	14,385	50.48	-	-
Immunotherapy	109	0.38	-	-
Chemo: Monotherapy	6,147	21.57	-	-
Chemo: Platinum-based therapy	3,897	13.68	-	-
Chemo: Other combination	3,959	13.89	-	-
Second-line treatment				
TKI	-	-	1,682	26.07
Immunotherapy	-	-	123	1.92
Chemo: Monotherapy	-	-	3,136	48.63
Chemo: Platinum-based therapy	-	-	1,217	18.87
Chemo: Other combination	-	-	291	4.51

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PRINCIPAL FINDINGS

- **Baseline characteristic (Table 1)**
  Adenocarcinoma constituted the primary histological subtype, accounting for 72.2% of NSCLC patients undergoing first-line (1L) treatment. Moreover, 50.5% of these patients were treated with tyrosine kinase inhibitors (TKIs) in the 1L setting, and 47.6% presented with mutations in the epidermal growth factor receptor (EGFR).
- **Treatment pattern (Figure 2)**
  - Among patients undergoing 1L treatment, 52.1% transitioned to an alternative therapy in the 2L, while 35.7% died before receiving 2L treatment.
  - Approximately 9.1% of patients who were administered TKI as 1L treatment transitioned to platinum-based chemotherapy in the 2L, whereas 8.4% continued with TKI treatment.
- **Overall survival and Time-to-next Treatment (Table 2, Figure 3 & 4)**
  Patients who were administered platinum-based chemotherapy as 2L treatment exhibited an improved OS with a median duration of 10.9 months (IQR: 5.29-23.70) and the TTNT was a median of 6 months (IQR: 3.32-11.18).
- **Healthcare expenditure (Table 2)**
  Medical costs were highest for patients receiving 2L immunotherapy ($7,696 per patient per month) and receiving platinum-based chemotherapy ($5,356 per patient per month) in 3L.

Figure 2. Distribution of Treatment Switching between 1L and 2L treatment

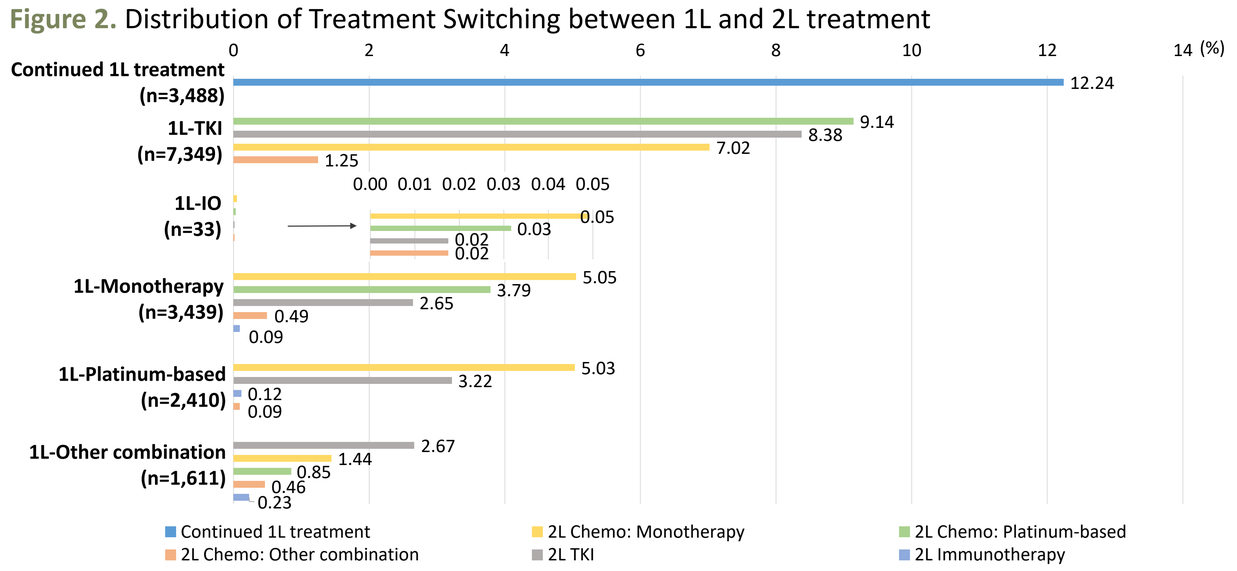

Figure 3. KM survival curves for patients receiving 1L treatment: (A) Overall survival (B) Time to next treatment

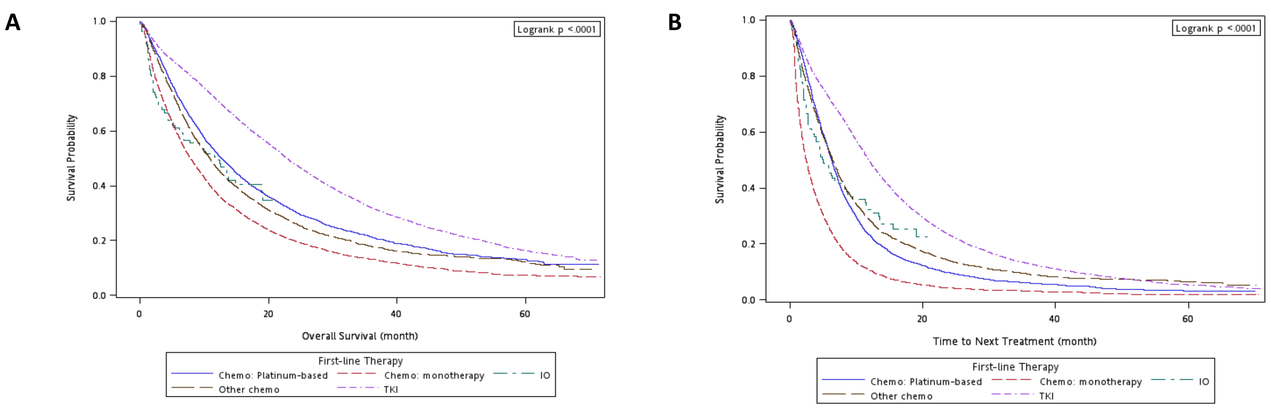

Figure 4. KM survival curves for patients receiving 2L treatment: (A) Overall survival (B) Time to next treatment

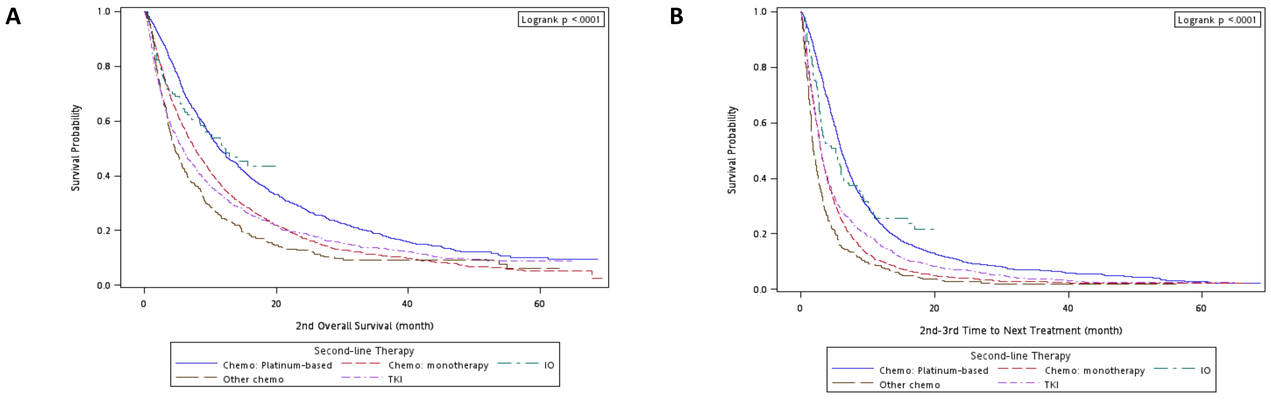

Table 2. Healthcare expenditure for patients receiving 2L treatment

Healthcare expenditure (US$) (per patient per month)	TKI		Immunotherapy		Chemo: Monotherapy		Chemo: Platinum-based therapy		Other chemotherapy	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
During OS after 2L treatment (n=6,449)										
Survival time (month), median (Q1-Q3)	5.21(1.94-12.79)		7.40(2.37-13.32)		6.77(2.99-13.91)		10.88(5.29-23.70)		4.34(2.20-10.06)	
Outpatient cost	1,365	42.46	2,831	263.12	1,039	16.68	1,237	30.36	709	43.59
Emergency visit cost	88	7.56	60	9.41	80	3.82	66	4.03	70	7.71
Hospitalization cost	3,633	143.67	4,805	612.71	2,627	71.52	2,790	109.54	4,270	324.90
Total medical cost	5,086	140.09	7,696	589.40	3,745	69.64	4,093	105.88	5,049	310.90
During TTNT between 2L-3L treatment (n=6,449)										
TTNT time (month), median (Q1-Q3)	2.96(1.38-6.64)		3.42(1.81-8.81)		2.96(1.41-5.75)		5.98(3.32-11.18)		1.91(1.02-4.01)	
Outpatient cost	1,547	47.05	3,215	295.56	1,181	35.29	1,274	35.59	797	60.28
Emergency visit cost	84	8.54	59	9.81	72	4.18	54	4.05	55	7.61
Hospitalization cost	3,208	144.38	5,327	652.44	2,098	69.60	2,718	108.21	4,314	338.31
Total medical cost	4,839	140.32	8,601	594.94	3,351	73.52	4,047	102.89	5,166	324.12
During OS after 3L treatment (n=3,535)										
Survival time (month), median (Q1-Q3)	6.07(2.56-12.85)		5.36(2.55-10.49)		5.72(2.52-12.21)		6.18(2.40-15.42)		4.83(1.91-11.51)	
Outpatient cost	1,295	55.53	1,056	136.02	1,121	28.51	1,200	42.01	810	68.25
Emergency visit cost	69	6.41	58	17.30	84	4.82	89	7.60	78	10.51
Hospitalization cost	3,706	233.13	2,779	651.81	3,763	150.98	4,067	239.76	4,360	460.21
Total medical cost	5,071	226.65	3,893	604.64	4,968	148.24	5,356	230.31	5,248	441.10

CONCLUSION AND IMPLICATION FOR POLICY PRACICE

- In advanced NSCLC, TKIs were the predominant choice for first-line therapy, while chemo-monotherapy was commonly employed in the second-line treatment.
- Patients who received TKI or platinum-based chemotherapy in 1L showed better survival.
- Immunotherapy is associated with the highest total medical costs of the first- and second-line treatment.
- These observations provide critical insights into the treatment trajectories and associated financial considerations for advanced non-small cell lung cancer, guiding clinical decisions and the distribution of healthcare resources.

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