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Cost-effectiveness analysis of serplulimab combined with chemotherapy in the treatment of extensive-stage small-cell lung cancer from the perspective of the healthcare system in China

Yunchun Long,1 Yuan Xu,2 Li Liao,2 Yujie Zhou,3 Hao Wang2

ABSTRACT

Objective The ASTRUM-005 trial showed that serplulimab plus chemotherapy (SEP) significantly extended survival time compared with chemotherapy in the treatment of small cell lung cancer. But the survival benefits of SEP came at high costs, and its economy is not clear. Therefore, this study aimed to evaluate the cost-effectiveness of SEP from the perspective of the Chinese healthcare system.

Design A partition survival model was built to simulate the outcomes. The clinical data came from the ASTRUM-005 trial, and only direct medical costs were included in the model. The utility values referred to the published literature. Scenario analyses 1 and 2 explored outcomes in the presence of a patient assistance plan (PAP) and different simulation periods, respectively. Scenario analysis 3 compared the cost-effectiveness of atezolizumab plus chemotherapy (AEP) with SEP by network meta-analysis. Sensitivity analyses were conducted to assess the robustness of the results.

Outcome measures Total costs, incremental costs, life years, quality-adjusted life years (QALYs), incremental QALYs and incremental cost-effectiveness ratio (ICER).

Results Compared with chemotherapy, SEP achieved an additional 0.34 QALYs at incremental costs of US$41,682.63, with an ICER of US$122,378.86/QALY. When PAP was available, ICER was US$58,316.46/QALY. In the simulation time of 5 years and 20 years, the ICER was US$132,637.97/QALY and US$118,054.59/QALY, respectively. When compared with AEP, SEP not only reduced the costs by US$47,244.87 but also gained 0.07 QALYs more. Sensitivity analyses showed that the price of serplulimab and the utility value of the progression-free survival stage were the main influencing parameters, and the results were stable.

Conclusions Compared with chemotherapy, SEP was not cost-effective from the perspective of the Chinese healthcare system. However, SEP was absolutely dominant in comparison with AEP.

INTRODUCTION

Lung cancer is one of the most common malignant tumours. Since 2000, the incidence and mortality of lung cancer in China have been increasing year by year.1,2 According to the statistics of Global Cancer 2020, the number of new lung cancer cases and deaths in the world was about 2.2 million and 1.8 million, respectively, and the number of lung cancer cases and deaths in China accounted for 37.0% and 39.8% of the world’s total, ranking first in cancer incidence and mortality.3 Small cell lung cancer (SCLC) is the most malignant subtype of lung cancer, with a percentage of about 13–17% of all lung cancers.4,5 Due to the atypical early symptoms, rapid progress and easy metastasis, most patients are in the extensive stage at the time of initial diagnosis, and the lack of clinically effective drugs, the 5-year survival rate falls short of 7%.6,7

In the past 30 years, etoposide coupled with platinum (EP) has been the dominant treatment regimen for extensive-stage small cell lung cancer (ES-SCLC). Although the initial efficacy is acceptable, most patients develop relapse and drug resistance after initial treatment and the median survival time is only about 9–11 months.6,8,9 Therefore, finding a...
novel therapy to solve the problem of drug resistance and prolong survival has become popular research in SCLC.

In recent years, immunotherapy, which prolongs the survival time and improves the quality of life without increasing the occurrence of serious adverse events, has made a breakthrough in the treatment of ES-SCLC, bringing new hope to patients with SCLC. The US Food and Drug Administration (FDA) and the National Medical Products Administration (NMPA) successively approved atezolizumab and durvalumab for the treatment of SCLC. However, the characteristics of high malignant degree and rapid disease progression of SCLC have not changed. The survival advantage of each additional month can bring more treatment options for patients, so the survival benefit of patients still needs to be further improved. Serplulimab, a newly developed programmed death 1 (PD-1) inhibitor, combined with chemotherapy not only improved the median overall survival (OS) of patients with ES-SCLC to 13.4 months (10.9 months in the chemotherapy group) for the first time, achieving an unprecedented survival benefit, but also accomplished the lowest HR (HR: 0.63) to date and the risk of death was also reduced by 37%.

Although serplulimab has significant survival benefit advantages, its high price will bring a heavy economic burden to patients as well as the healthcare system, and its economics are not clear. Therefore, this study aimed to evaluate the cost-effectiveness of serplulimab in combination with EP (SEP) versus EP, based on the perspective of the Chinese healthcare system.

METHODS

Patients and treatment

The study was based on the ASTRUM-005 trial, so the baseline characteristics of the patients in the model were consistent with the ASTRUM-005 trial (NCT04063163). Eligible patients were older than 18 years of age, had been diagnosed with ES-SCLC, and had not received previous systemic therapy.

Patients in the SEP group received 4.5 mg/kg serplulimab every 3 weeks until disease progression, death, unacceptable toxicity or other reasons for discontinuation, and all patients received 12 weeks of EP treatment. To calculate the drug dose, the patients in this model were assumed to have the following characteristics: weight of 65 kg, body surface area of 1.72 m² and creatinine clearance of 70 mL/min. So dose per cycle was as follows: serplulimab 4.5 mg/kg (d1), etoposide 100 mg/m² (d1-d3), carboplatin within the area under the serum drug concentration-time curve of 5 mg/mL/min (d1). Consistent with the ASTRUM-005 trial, 44% of patients in the SEP group and 43.4% of those in the EP group received subsequent therapy. Patients who did not receive subsequent treatment received the best supportive care (BSC). Because the ASTRUM-005 trial did not publish a specific subsequent treatment regimen, the study selected topotecan (1.25 mg/m²/d, d1 per cycle) as the main treatment drug after disease progression referred to the guidelines of the National Comprehensive Cancer Network (NCCN) and the Chinese Society of Clinical Oncology (CSCO).

Model structure

In this study, TreeAge 2020 was applied to establish a partitioned survival model containing three states of progression-free survival (PFS), progressive disease (PD) and death, and it was assumed that all patients entered the model in the PFS state (figure 1). In line with the ASTRUM-005 trial, the model cycle was set to 5 weeks and the simulation time was 10 years. The willing-to-pay threshold (WTP) was set at three times China’s Gross Domestic Product (GDP) per capita in 2021 (US$11,702.58), as recommended by the WHO. According to the Chinese Pharmacoeconomic Evaluation Guide 2020, an annual discount rate of 5% was applied for the costs and utility values. Incremental cost-effectiveness ratio (ICER) was used as the main evaluation index, and other secondary indicators included total costs, incremental costs, life years (LYs), quality-adjusted life years (QALYs) and incremental QALYs.

Survival estimate

Points were taken from Kaplan-Meier curves reported in the ASTRUM-005 trial using Engage Digitizer software (https://github.com/markummitchell/engagedigitizer/releases). Then the survHE package in the R software (https://www.r-project.org/) was applied to reconstruct the individual patient data based on data such as survival rate, time, sample size and the number of people at risk. Finally, exponential distribution, Weibull distribution, log-normal distribution, log-logistic distribution and Gompertz distribution were used to fit the hazard function to the survival curve. The Akaike information criterion (AIC) and Bayesian information criterion (BIC) of hazard functions with different distributions were shown in online supplemental table 1. The log-logistic distribution was selected as the optimal distribution according to AIC and BIC combined with a visual inspection, and its fitting parameters and fitting curves were shown in online supplemental table 2 and figure 1, respectively.

Costs and health utility value estimate

Only direct medical costs were incorporated in the model, which mainly included drug costs, adverse event management costs, follow-up costs, hospitalisation costs and BSC costs. The costs of the drug were the average price of the winning twice daily in all provinces and cities across the country in 2022, which came from the China Medical Information Network (https://www.menet.com.cn). Because grade 1 and 2 adverse effects are usually not addressed, the costs of management of adverse events were calculated only for the costs of treatment drugs for adverse effects of grade 3 or higher with an incidence greater than 4%. This study assumed a follow-up every 3 months, and the follow-up costs included diagnosis and
treatment costs and examination costs, such as blood routine, urine routine, stool routine, biochemical tests, coagulation five items, CT, B ultrasound, MRI and bone scan. Hospitalisation costs included bed costs, nursing costs, hospitalisation costs, intravenous infusion costs and chemical drug allocation costs. The information on follow-up costs, hospitalisation costs, and BSC costs mainly came from the average price of medical and health services in Jiangsu province. The cost information and incidence of adverse reactions were shown in table 1.

The ASTRUM-005 trial did not report information on the quality of life of patients, and there was no study on the utility value of SCLC, so this study used the utility value of non-small cell lung cancer (NSCLC), which was obtained from the data of the Chinese population in an international study. The health utility value of the PFS and PD stages were 0.804 and 0.321, respectively. In addition, disutility values related to adverse reactions also came from published literature (table 1). Sensitivity analysis

Sensitivity analyses, including deterministic sensitivity analysis and probabilistic sensitivity analysis (PSA), were conducted to evaluate the uncertainty of model parameters. The most common one in deterministic sensitivity analysis is one-way sensitivity analysis. Therefore, one-way sensitivity was performed on important parameters in the model, such as cost values, health utility values and discount rate, and the results were presented in a tornado diagram. The cost range of drugs was derived from the upper and lower limits presented by China Medical Information Network (https://www.menet.com.cn). Because there is no possibility that serplulimab will increase in price, the upper limit was set to the baseline value, and the lower limit was set to 80% of the baseline value. The health utility values of PFS and PD stages were obtained from the upper and lower limits published in the literature. The discount rate fluctuates from 0% to 8%. The remaining parameters were taken to be ±20% of their baseline values. PSA was carried out to model the effect on the analysis results when multiple uncertainty parameters were changed simultaneously. In this study, the second-order Monte Carlo simulation was used to randomly sample 1000 iterations, and the results were presented as a cost-effectiveness scatter plot and a cost-effectiveness acceptability curve. In this study, the cost data followed the gamma distribution, and the utility value and the incidence of adverse reactions followed the beta distribution.

Scenario analysis

Three scenarios were simulated in this study. (1) Shanghai Life Oasis Public Service Center has provided the Patient Assistance Programme (PAP) for patients with low-income and subsistence allowances, and patients voluntarily apply for assistance. The assistance programme was as follows: after receiving six consecutive serplulimab treatments, patients could receive free drug assistance for the subsequent six treatments, and if continued treatment is required and the disease does not progress, free drug assistance will continue. This scenario was validated to ensure the cost-effectiveness of serplulimab in the treatment of SCLC. (2) Under the same conditions as scenario (1), patients with low-income and subsistence allowances received serplulimab assistance for six free courses, but if the disease progresses, the patient is no longer eligible for assistance. (3) Similar to scenario (2), patients with low-income and subsistence allowances received serplulimab assistance for six free courses, but if the disease progresses and continues to progress, the patient is no longer eligible for assistance.

Figure 1  A three-state partitioned survival model simulating extensive-stage small cell lung cancer. (A) Decision tree and (B) graph of the partitioned survival model. EP, etoposide+platinum; ES-SCLC, extensive-stage small cell lung cancer; OS, overall survival; PD, progressive disease; PFS, progression-free survival; SEP, serplulimab+etoposide+platinum.
Table 1  Cost and utility parameters

<table>
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<th>Variable</th>
<th>Baseline value</th>
<th>Low value</th>
<th>High value</th>
<th>Distribution</th>
<th>Source</th>
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<td></td>
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<td>646.06</td>
<td>807.57</td>
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<td>Menet</td>
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<td>Neutrophil count decreased per event</td>
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<td>0.16</td>
<td>0.24</td>
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<tr>
<td>Decreased white blood cell count</td>
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<td>0.16</td>
<td>0.24</td>
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<td><strong>HR for SEP vs AEP</strong></td>
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<td>PFS</td>
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<td>0.41</td>
<td>6.4</td>
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<td>NMA</td>
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<td>OS</td>
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<td>0.49</td>
<td>3.0</td>
<td>Log-normal</td>
<td>NMA</td>
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<td>Discount rate</td>
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<td>P_SEP</td>
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<td>0.414</td>
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<td>Beta</td>
<td>14</td>
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</tbody>
</table>

AEP, atezolizumab+etoposide+platinum; AEs, adverse events; EP, etoposide+platinum; NMA, network meta-analysis; P_AEP, proportion of subsequent treatment in AEP group; PD, progressive disease; P_EP, proportion of subsequent treatment in EP group; PFS, progression-free survival; P_SEP, proportion of subsequent treatment in SEP group; SEP, serplulimab+etoposide+platinum.
assistance until disease progression can be obtained after six consecutive treatments. But the cumulative duration of serplulimab does not exceed 24 months. This study assumed that patients in the serplulimab group would receive a donation to evaluate the economics of the two regimens in this scenario. (2) The simulation time of the model was set to 5 years and 20 years, respectively, to simulate the costs consumption and survival benefit of different times. (3) The IMPower133 trial evaluated the efficacy and safety of atezolizumab in combination with EP (AEP) in the treatment of ES-SCLC. Baseline characteristics of patients in IMPower133 and ASTRUM-005 were similar (online supplemental table 3), such as median age, sex, Eastern Cooperative Oncology Group (ECOG) score and brain metastases, and were controlled by EP, so we thought SEP was comparable to AEP. First of all, due to the lack of head-to-head clinical trials between SEP versus AEP, this study used the survival data of the SEP group as a control, and calculated the survival data of AEP using the HR derived from the network meta-analysis (NMA) results for indirect comparison. Second, the R software (https://www.r-project.org) was used to invoke the gemtc package for Bayesian NMA using the HR effect scale index. The fitting degree of the fixed effect and random effect models was judged according to the value of the deviance information criterion (DIC). If the difference of DIC between the two models was less than or equal to 5, the fitting degree of the two models was considered consistent and the model with a smaller I² was selected. If the DIC difference was more than 5, the model with a smaller value of DIC was selected. Finally, following the method of Hoyle et al, the fitting parameters (scale parameter (λ) and shape parameter (γ) of the best fit (log-logistic distribution) of PFS and OS curves for the AEP group were transformed with the following formula: \( \gamma_{\text{AEP}} = \gamma_{\text{SEP}} \) and \( \lambda_{\text{AEP}} = \lambda_{\text{SEP}} \times \text{HR} \) (table 1). The survival rate of the AEP group was calculated according to the transformation parameters.

**Patient and public involvement**

None.

**RESULTS**

**Base-case results**

The basic analysis showed (table 2) that the total costs of the EP group were US$10,827.82, and 0.88 QALYs and 1.82 LYGs were obtained. SEP group yielded 1.22 QALYs and 2.25 LYGs at the price of US$52,510.45. In comparison with EP chemotherapy alone, SEP generated 0.34 QALYs more, but the costs increased by US$41,682.63, resulting in an ICER of US$122,378.86/QALY, which was higher than the WTP (US$35,107.74/QALY). Therefore, SEP was not a cost-effective treatment option.

**Sensitivity analysis**

One-way sensitivity analyses showed that parameters varying within preset ranges did not change the results of the model (figure 2). The variables that had the greatest impact on ICER included the price of serplulimab and the health utility value of the PFS stage. The utility value of the PD stage, the total utility value of the adverse reactions in the two groups and the proportion of the two groups receiving subsequent treatment also had a moderate impact on the ICER. Other variables such as the costs of follow-up, hospitalisation costs, the costs of BSC and the annual discount rate had little or no effect on the model.

The cost-effectiveness acceptability curve (figure 3) indicated that SEP started to be cost-effective when WTP was US$100,000/QALY. When WTP was US$145,000/QALY and US$240,000/QALY, the probability of SEP being economical was 50% and 95%, respectively.

The scatter plot (online supplemental figure 2) represented the probability of SEP being cost-effective over 1000 Monte Carlo simulations. In 1000 simulations, all the points were above the WTP line, indicating that SEP did not have a cost-effective advantage regardless of how the parameters were changed within the preset range.

**Scenario analysis**

Scenario analysis 1 showed that when all patients in the SEP group received PAP, the total costs in the SEP group were still higher than that in the EP group (US$30,690.59 vs US$10,827.82), resulting in an ICER of US$58,316.46/QALY.

Scenario analysis 2 showed that over a simulated period of 5 years, the SEP group achieved 1.13 QALYs at costs of US$49,783.69, while the EP group yielded 0.85 QALYs at costs of US$9885.97, with an ICER of US$132,637.97/QALY. When the simulation time was 20 years, the total costs of the SEP group were US$53,853.25 and 1.26 QALYs were obtained. The total costs of the EP group were US$11,320.25 and 0.90 QALYs were obtained. The ICER was US$11,805.49/QALY.

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Base-case results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
<td>Cost (US$)</td>
</tr>
<tr>
<td>EP group</td>
<td>10,827.82</td>
</tr>
<tr>
<td>SEP group</td>
<td>52,510.45</td>
</tr>
</tbody>
</table>

EP: etoposide+platinum; ICER: incremental cost-effectiveness ratio; LYs: life years; QALYs: quality-adjusted life years; SEP: serplulimab+etoposide+platinum.
Scenario analysis 3 showed that the AEP group achieved 1.15 QALYs at US$99,755.32, while the SEP group achieved 1.22 QALYs at US$52,510.45. The SEP group not only reduced the costs by US$47,244.87 but also obtained 0.07 QALYs more.

All scenario analysis results are shown in online supplemental table 4.

**DISCUSSION**

In recent years, the emergence of immunotherapy drugs has broken the dilemma of SCLC treatment. Clinical trials such as IMpower133 and CASPIAN have confirmed the efficacy and safety of programmed cell death-ligand 1 (PD-L1) inhibitors in the first-line treatment of SCLC. Therefore, FDA and NMPA have approved PD-L1 inhibitors, such as atezolizumab or durvalumab coupled with chemotherapy for the first-line treatment of ES-SCLC. It is also recommended by NCCN and CSCO guidelines as the first-line treatment. However, atezolizumab...
coupled with chemotherapy only prolonged the median overall survival (mOS) of 2 months in the IMpower133 clinical study, and durvalumab coupled with chemotherapy also extended the mOS of 2.4 months in the CASPIAN clinical study, which showed limited clinical benefit.\textsuperscript{25, 26} Therefore, new immunosuppressants are urgently needed to change this situation. The ASTRUM-005 trial showed that the addition of serplulimab, a novel PD-1 inhibitor, to chemotherapy significantly improved OS by 4.5 months (15.4 months vs 10.9 months) and PFS (5.7 months vs 4.3 months).\textsuperscript{16} It is the first drug to prolong the OS of patients with SCLC to more than 4 months. Based on the results of this clinical trial, the serplulimab plus EP was entered into the CSCO guidelines as category 1A evidence. In addition, Chinese patients accounted for 67% of the enrolled population in the ASTRUM-005 trial, which was more in line with Chinese clinical practice.

This study evaluated the cost-effectiveness of EP versus SEP as the first-line treatment for SCLC from the perspective of the Chinese healthcare system. The results showed that ICER (US$122,378.86/QALY) was much higher than the WTP (US$35,107.74/QALY). Therefore, SEP is impossible to be an economical treatment option. Univariate sensitivity analysis showed that the cost of serplulimab and the health utility value of the PFS stage had the greatest impact on the model, but neither changed the results of the base analysis. Our results were consistent with other cost-effectiveness research conclusions about PD-(L)1 inhibitor in the treatment of SCLC, namely the newly approved drugs combined with EP for SCLC, such as atezolizumab and durvalumab, were not economic.\textsuperscript{27, 28} The reasons why these drugs did not have cost-effective advantages were related to the disease type and lower WTP values in addition to their high price. First, a drug often has more than one indication. For example, durvalumab can be used not only for the treatment of SCLC but also for the treatment of NSCLC. Although durvalumab coupled with chemotherapy was not economical for the treatment of ES-SCLC, a meta-analysis showed that durvalumab combined with chemotherapy was cost-effective for the consolidation treatment of NSCLC.\textsuperscript{29} Regrettably, there are no cost-effective studies on serplulimab in the treatment of other types of diseases, so the economics of serplulimab in the treatment of other types of diseases is still unclear. Second, the economy of a drug is largely affected by the WTP value. Because antineoplastic drugs are expensive, the ICER value of oncological drugs would be approximately two times higher than that of other drugs.\textsuperscript{30} Therefore, when assessing the cost-effectiveness of drugs ground on the viewpoint of the healthcare system in the USA, the WTP of anticancer drugs (US$100,000-150,000/QALY) tends to be higher than that of other drugs (US$50,000-100,000/QALY).\textsuperscript{30} Unfortunately, most PD-(L)1 anticancer drugs did not have an economic advantage even if their WTP threshold was higher than other drugs in America, such as atezolizumab and durvalumab.\textsuperscript{27, 28} In the case of high prices of antitumour drugs, China still follows the recommendation of WHO and chooses one to three times per capita GDP as the threshold of willingness to pay. But even if three times the per capita GDP of the most developed cities in China, such as Beijing, are selected to do WTP (US$79,765.9/QALY), these new drugs will not have cost-effective advantages. So, for a country with limited resources like China, what can be done to improve the economics of new antitumour drugs?

First, negotiate a lower price for the drug and put it on the Medicare list. One study showed that atezolizumab, when reduced in price by 80%, may have a cost-effective advantage at a WTP threshold of US$32,517/QALY.\textsuperscript{31} Same as serplulimab, sintilimab, a domestic PD-1, was launched in China at the end of 2019 with a price as high as US$113,274. In just 2 years, the price dropped to US$156,08, a whopping 86% drop. Therefore, the economy of serplulimab will be greatly improved after the price reduction. Second, it is recommended that biomarkers can be used to select patients who are most suitable for immunosuppressive therapy so that the survival benefit of patients will be improved and the drug will be more economical. The expression of PD-L1 has been used as a biomarker to forecast the efficacy of immunosuppressive agents in a variety of solid tumours, but its predictive value in SCLC has not been determined.\textsuperscript{32, 33} SCLC is usually accompanied by a high tumour mutation burden (TMB). Some studies have found that patients with high TMB have the advantage of immunosuppressive therapy benefits, but further studies based on TMB are needed.\textsuperscript{34-36} Other potential predictors of immunosuppressive efficacy in SCLC include gene-expression profile, tumour-infiltrating lymphocyte and circulating tumour cells.\textsuperscript{37} However, due to the high heterogeneity of SCLC, combinatorial biomarkers may be more valuable than single biomarkers in screening the population benefiting from immunotherapy.\textsuperscript{33, 38} Finally, studies have shown that the time spent at the end of a patient’s life is often more socially meaningful than at any other stage of life, which means that the opportunity costs of prolonging life near the end are acceptable.\textsuperscript{39} Britain and America have introduced policies for treatment at the end of life, raising the threshold for the average willingness to pay. Therefore, it is suggested to explore a reasonable willingness to pay threshold at the end of life by combining China’s economic development level and the social average willingness to pay.

Scenario analysis 1 showed that the ICER in the presence of PAP was US$38,316.46/QALY, which was about one-half of that in the absence of PAP. Mainly because most of the total costs of patients receiving immunotherapy were generated by immunotherapy drugs. After obtaining PAP, the healthcare system only paid for no more than 12 cycles of immunotherapy drugs, so the total costs dropped by about half.

Scenario analysis 2 explored the ICER under different simulation times, and the results showed that the ICER decreased with longer simulation times. This may be related to the ‘delayed effect’ of the action mechanism...
of immunotherapy drugs. Cancer immunotherapy can bring durable immune responses and long-term survival benefits to patients, and patients continue to benefit in subsequent survival over time. Therefore, the longer the simulation time, the greater the clinical benefit of the SEP group and the better economy of the protocol.

In the exploration of SCLC immunotherapy, the IMPower133 trial and CASPIAN trial have confirmed the efficacy and safety of PD-L1 inhibitors in the treatment of SCLC. In contrast to the PD-L1 inhibitors, the PD-L1 inhibitors pembrolizumab and nivolumab were both approved for the treatment of SCLC, but subsequent clinical trials demonstrated unsatisfactory results, so the FDA quickly withdrew their SCLC indications, which has made researchers doubt the feasibility of PD-L1 inhibitors in ES-SCLC. However, the emergence of serplulimab not only broke the dilemma of PD-L1 inhibitors in the treatment of ES-SCLC but also brought the longest survival benefit to date when it was combined with chemotherapy. Although SEP did not have a cost-effectiveness advantage in comparison with conventional chemotherapy, scenario analysis 3 showed that SEP was absolutely dominant in comparison with AEP, a new first-line treatment regimen in ES-SCLC, which suggested that PD-L1 inhibitors may be more economical than PD-L1 inhibitors in the treatment of ES-SCLC.

There are also some limitations in this study. First, because of the short follow-up time in the ASTRUM-005 trial, we had to extrapolate long-term survival beyond the follow-up time; however, this was unavoidable. Second, to simplify the model, only serious adverse reactions with an incidence of more than 4% were included in the model, and only drug costs were calculated for the management costs of adverse events, which may lead to a reduction in costs, but sensitivity analysis showed that the management costs of adverse events had little effect on the results. Third, one-way sensitivity analysis showed that the utility value of the PFS stage had a great impact on the model, but there was no domestic study on the utility value of SCLC, so we had to use the utility value of NSCLC instead of SCLC. Fourth, the treatment plan after disease progression was recommended by the CSCO guidelines and the NCCN guidelines, without considering individual differences. However, in the actual clinical treatment setting, patients may receive immunotherapy after chemotherapy, which may lead to high ICER.

Conclusion
From the perspective of the healthcare system in China, serplulimab combined with chemotherapy was not cost-effective, but when compared with AEP, it was the absolute dominant regimen, which suggested a promising application prospect of PD-L1 inhibitors in the treatment of SCLC.

Contributors
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