

Cost effectiveness analysis of pembrolizumab for the treatment of advanced or metastatic renal cell carcinoma

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INTRODUCTION

- “Since the Early 1990s (1991-2019), Cancer Death Rates have declined by 32%.”¹
- 73 % of recent (1975-2017) survival gains in cancer are attributable to treatment advances including new medicines.”¹
- Kidney cancer is the 7th most common cancer in men and the 10th most common cancer in women,² with renal cell carcinoma (RCC) comprising most kidney neoplasms (90-95%).^{2,3}
- In Greece kidney cancer has the 10th highest incidence, with its 5-year prevalence being estimated around 5190 cases and it also shows the 11th highest mortality.⁴
- Pembrolizumab in combination with axitinib is indicated for first line treatment of patients with advanced or metastatic renal cell carcinoma (RCC), it has been reimbursed in Greece, since 2020.
- As a result, access to novel immunotherapies such as Pembrolizumab, is essential for Greek patients and especially in an indications like RCC, it can make the difference between life and death for patients.

AIM

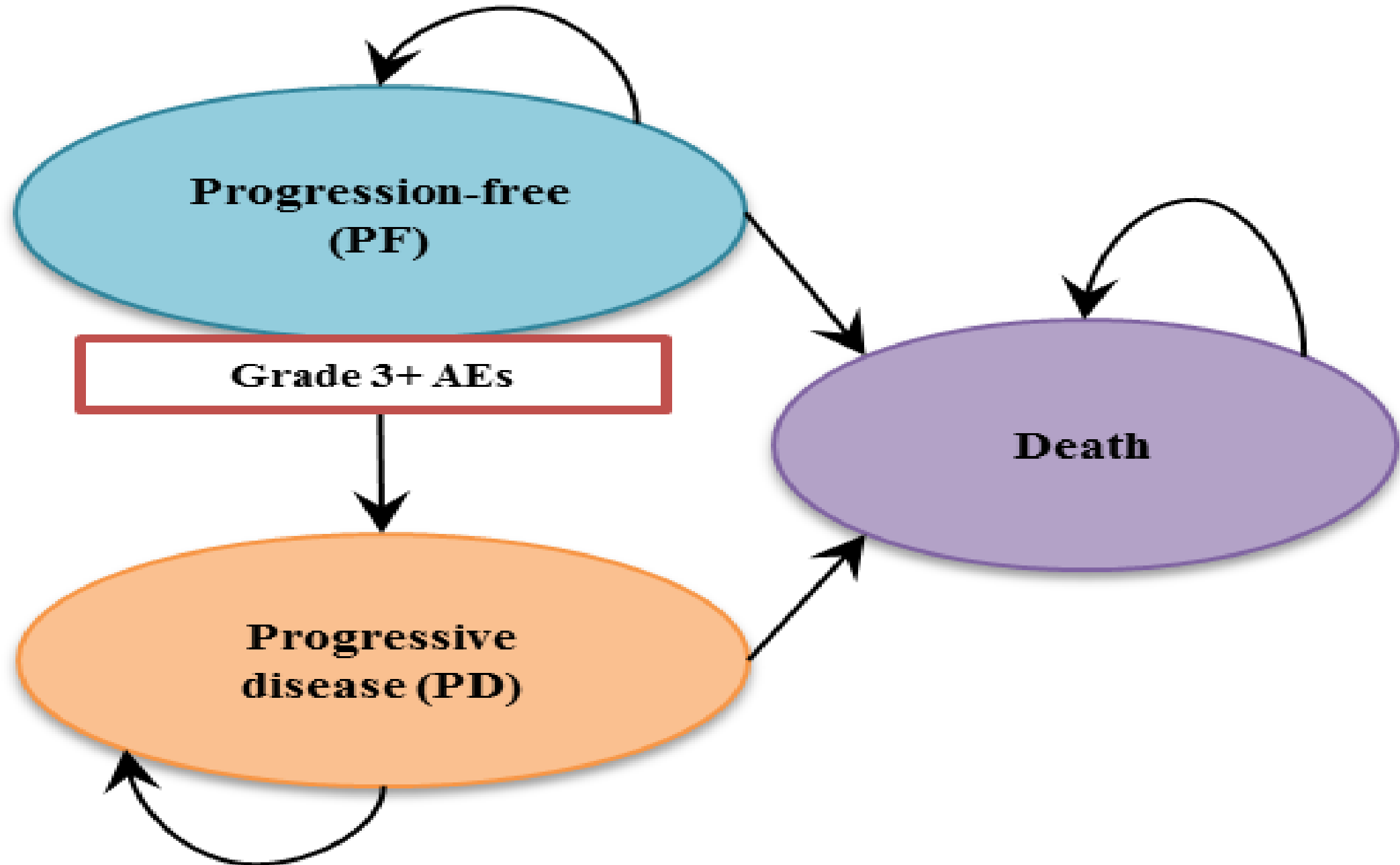
The present study estimated the cost-effectiveness of Pembrolizumab plus axitinib versus sunitinib in Greece.

METHODS

Description of the model structure

A partitioned survival model with three health states (pre-progression, progressed disease and death) was developed, adopting payer’s perspective with a 39 years’ time-horizon. Clinical, safety and quality of life data were drawn from KEYNOTE-426 trial and via literature review.⁵ Greek inputs were used to populate the model in order to be representative of the day-to day clinical practice. Primary outcomes were patients’ life years(LY) gained, quality-adjusted life years (QALYs) gained, total costs and incremental cost-effectiveness ratios (ICERs) per LYG and per QALY. Both costs and outcomes were discounted at 3.5% per annum.

Figure 1: Model Schema



RESULTS

Description of the model base case results

The model showed that, over a lifetime horizon, total average cost per patient with pembrolizumab and axitinib was estimated at €186,910 whereas the cost of sunitinib was €70,428. Pembrolizumab with axitinib was significantly more effective than sunitinib providing 6.92 LYs versus 3.86 LY gained which translated into 5.61 and 3.08 QALY’s respectively; overall incremental LY gained were 3.06 and the incremental QALYs were 2.53. Figure 2 shows the QALY’s projected per treatment arm. The ICER was estimated at €37,871/LYG and €46,822/QALY which is below the national cost effectiveness threshold for Greece. (3x Greece 2021 GDP per capita).⁶ Table 2 shows the outcomes for the 3 treatment regimens compared.

Deterministic Sensitivity Analysis

A Deterministic Sensitivity Analysis was run to estimate the parameters with the biggest impact on the ICER. The results are presented in Figure 3. The parameters with the biggest impact on the ICER was using the different ranges within the confidence interval in Utility’s Time to Death model. We observe that the variation of the parameters is low.

Probabilistic Sensitivity Analysis

A Probabilistic Sensitivity Analysis was run to correct for the collective parametric uncertainty. The analysis showed that Pembrolizumab plus anitinib. had a 73.3% probability of being cost effective at a threshold of 52,770 per QALY € (3x Greece 2021 GDP per capita).⁶

Table 1:Results of the Cost-effectiveness analysis

	Total Costs	Total QALYs (Time to Death-Based)	Total Lys	Incremental Costs (Costs in €)	Incremental QALY's	Incremental Lys	Incremental Cost per QALY Gained (Costs in €)	Incremental Cost per Gained Costs (Costs in €)
Pembrolizumab / axitinib	186,246	5.61	6.92					
Sunitinib	70,428	3.08	3.86	115,818	2.53	3.06	45,822	37,871

Table 2: Outcomes per each comparator

Time to death	QALY, pembrolizumab / axitinib	QALY, sunitinib	Increment
Adverse event-related QALY decrement	-0.013	-0.013	0.000
Time to death-based QALYs: ≥1 weeks	5.122	2.556	2.566
Time to death-based QALYs: [26, 51] weeks	0.257	0.271	-0.014
Time to death-based QALYs: [13, 26] weeks	0.137	0.149	-0.012
Time to death-based QALYs: [4, 13] weeks	0.077	0.086	-0.009
Time to death-based QALYs: <4 weeks	0.027	0.030	-0.004
Total	5.607	3.079	2.528

Figure 2: QALY’s projection per treatment arm

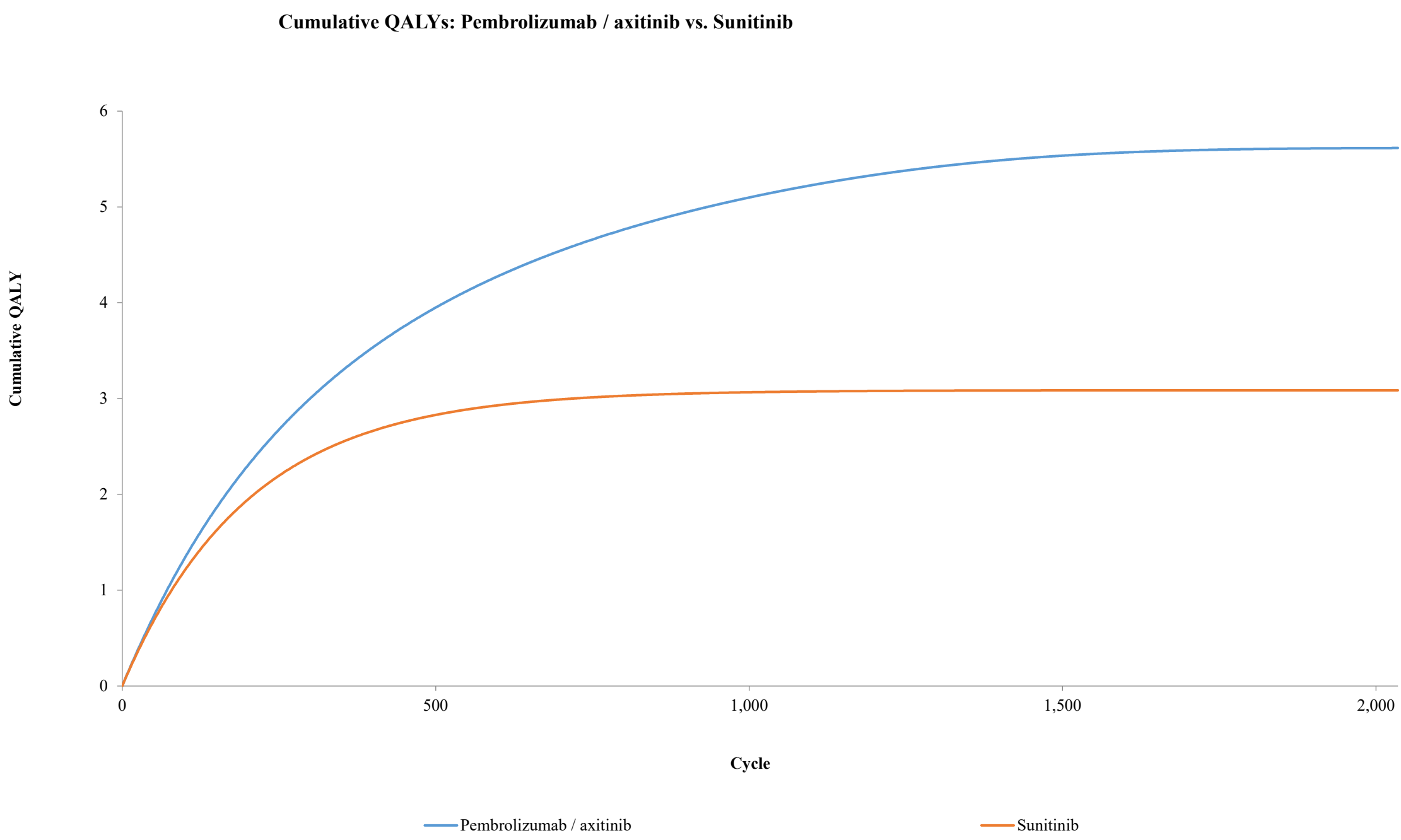
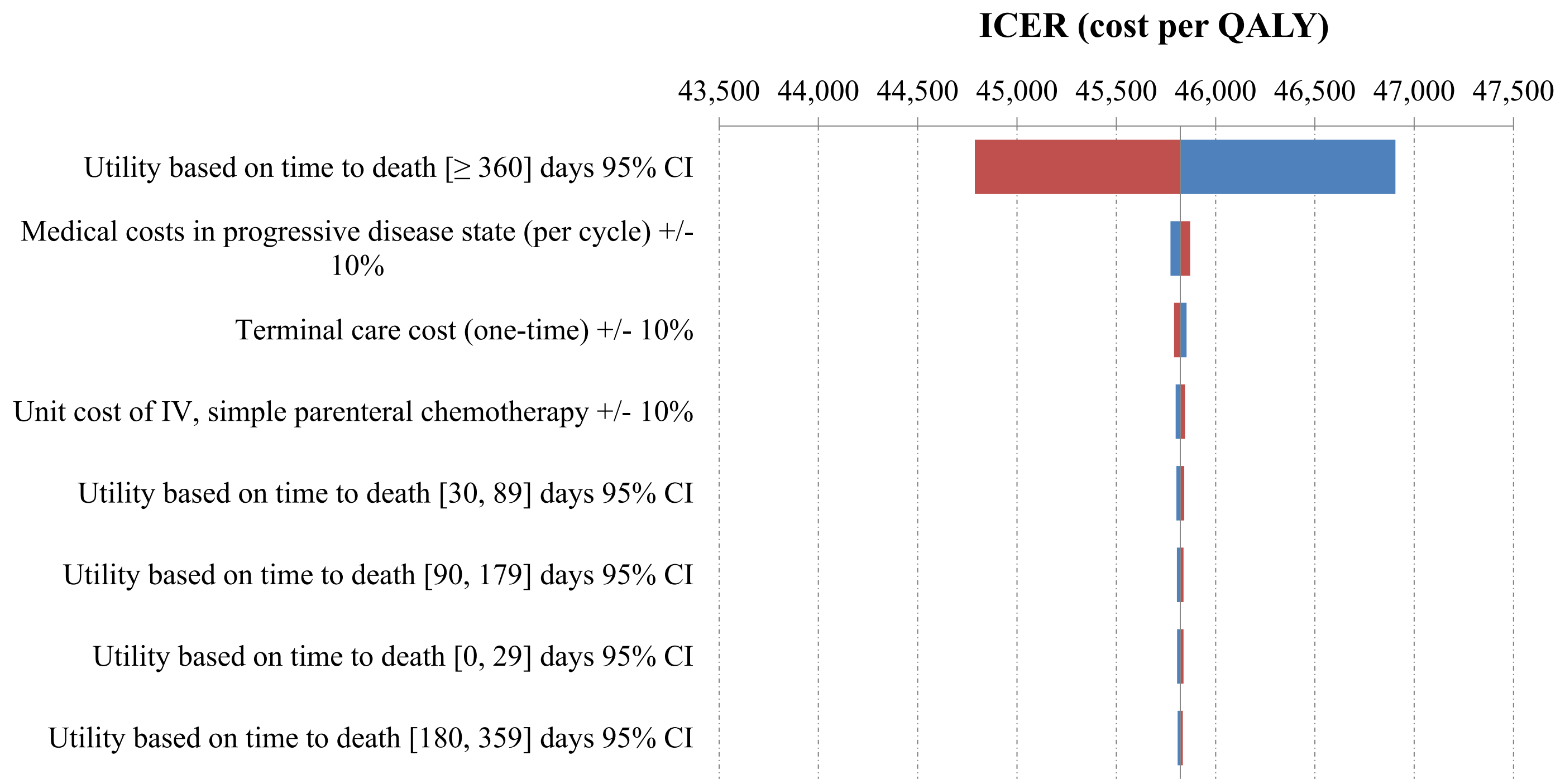


Figure 3: Deterministic Sensitivity Analysis Results-Tornado Diagram



CONCLUSIONS

- This analysis presents the value of Pembrolizumab and immunotherapy for cancer patients providing patients with the opportunity to spend more time in the health-states with better quality of life-further away from the time of death.
- We conclude that Pembrolizumab in combination with axitinib versus sunitinib is a highly cost effective and clinical effective intervention that optimizes health outcomes and the efficient allocation of resources invested in cancer in Greece.

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