

Cost-Effectiveness Analysis of Pembrolizumab As a Second-Line Therapy for Advanced Urothelial Carcinoma in the United States



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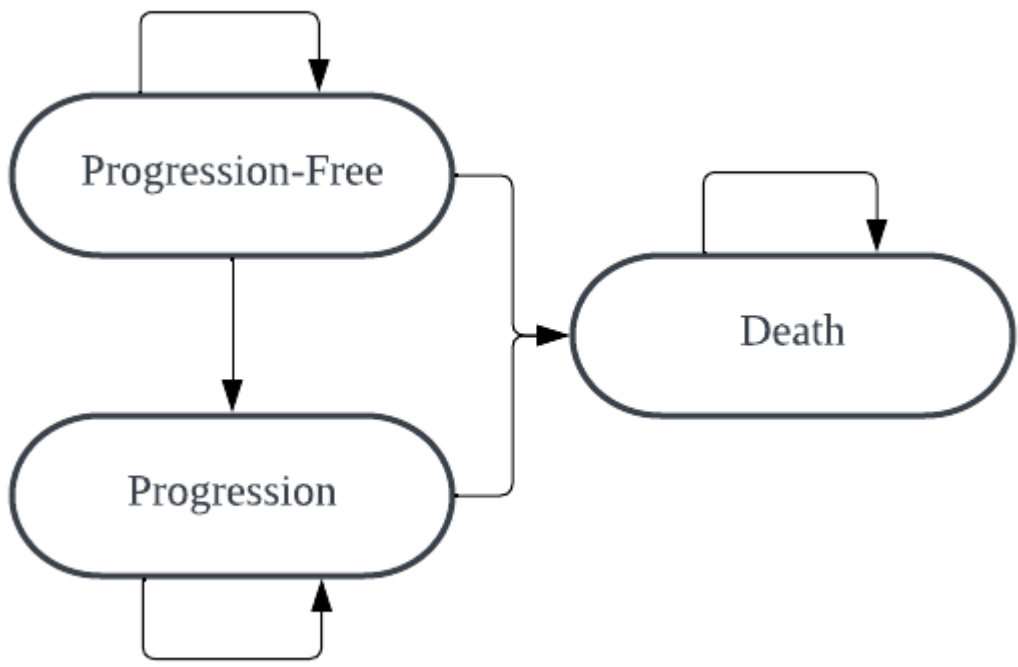
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Background

- Published cost-effectiveness analysis (CEA) studies of pembrolizumab as a 2nd-line therapy for advanced urothelial carcinoma (UC) were evaluated based on early trial results.¹
- The impact of different utility approaches is not yet well understood.
 - Dynamic time-to-death (TTD) utility
 - Static health-state utility

Methods

- A partitioned survival model with a 20-year time horizon from a 3rd-party payer perspective was built.



- Comparators were taxane-based chemotherapy (paclitaxel, docetaxel) as the standard of care.
- The overall survival (OS) and progression-free survival (PFS) were extrapolated from the most updated 5-year follow-up KEYNOTE-045 trial.²
- Costs, utilities, and adverse events were collected from published literature.
- Deterministic and probabilistic sensitivity analyses (PSA) and scenario analysis were performed.
- The model was developed in Microsoft Excel, Version 2304.

- Base-case results (**Table 1**) demonstrated pembrolizumab increased costs to the system but provided additional health benefits vs. taxane-based chemotherapy.
- Compared to the prior CEA study conducted by the manufacturer (\$93,481 per QALY with 1.14 gained incremental QALYs), our estimates were higher but still remained below the willingness-to-pay threshold of \$150,000.

- The one-way sensitivity analysis (**Table 2**) (**Figure 1**) suggested that OS had the most significant impact on the uncertainties of the ICER, followed by PFS.
- The highest uncertain input was OS, from more costly and less effective to \$110,542 per QALY.

- Scenario analyses along with PSA (**Figure 2**) demonstrates the impact on ICERs by different approaches of utility values.
 - Similar incremental QALYs between TTD and health state although lower ICER estimate with larger QALYs were observed in dynamic TTD approach.
 - Utility inputs had a lower sensitivity impact on the ICER.

Conclusion

- Results demonstrate that pembrolizumab may be cost-effective using a \$150,000 per QALY threshold compared to chemotherapy in advanced urothelial carcinoma using long-term follow-up survival evidence.
- No significant difference in incremental QALYs between the dynamic TTD and the static health-state utility estimation

Results

Table 1. Base-case results

Treatment	Costs	LYs	QALY (TTD)	QALY (Health state)
Pembrolizumab	\$130,630	2.24	1.60	1.65
Chemotherapy	\$44,491	1.37	0.97	1.04
ICER (TTD)			\$137,666 per QALY	
ICER (Health state)			\$141,458 per QALY	

TTD: dynamic time-to-death; LY: life-years; QALY: quality adjusted life-years; ICER: incremental cost effectiveness ratio

Table 2. One-way deterministic sensitivity analysis

Input	Treatment	Comparator	Distribution	ICER	
				Lower	Upper
OS	Pembrolizumab	Chemotherapy	Log-normal	More costly, less effective	\$110,542
PFS	Pembrolizumab	Chemotherapy	Log-logistic	\$120,931	\$174,982

Figure 1. Tornado diagram

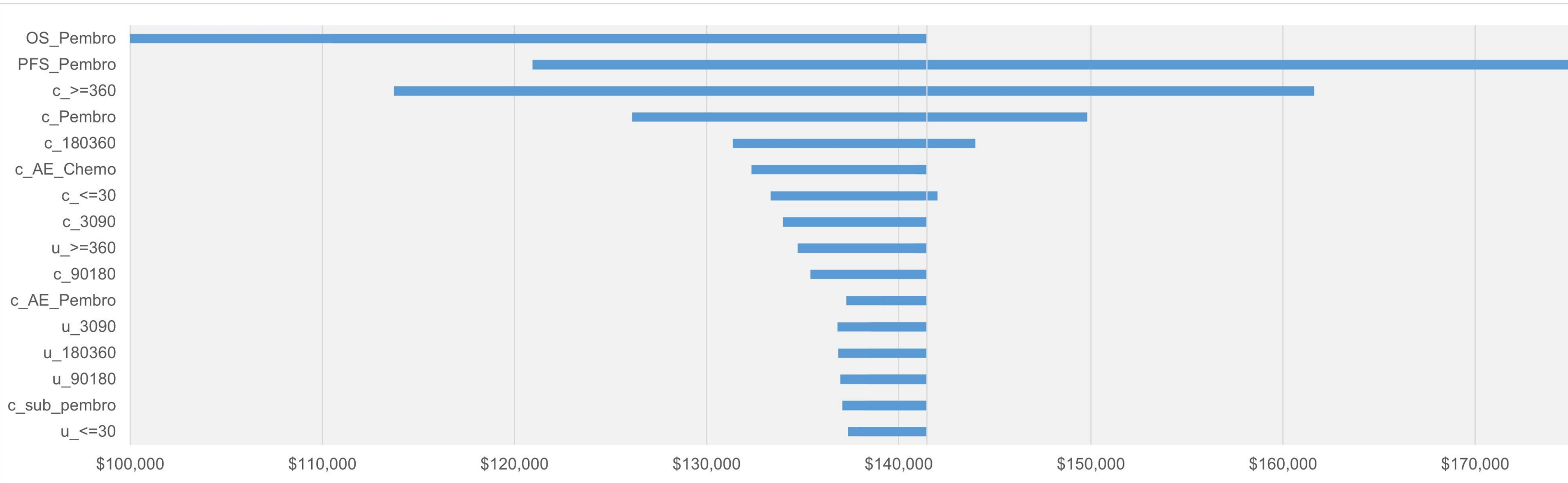
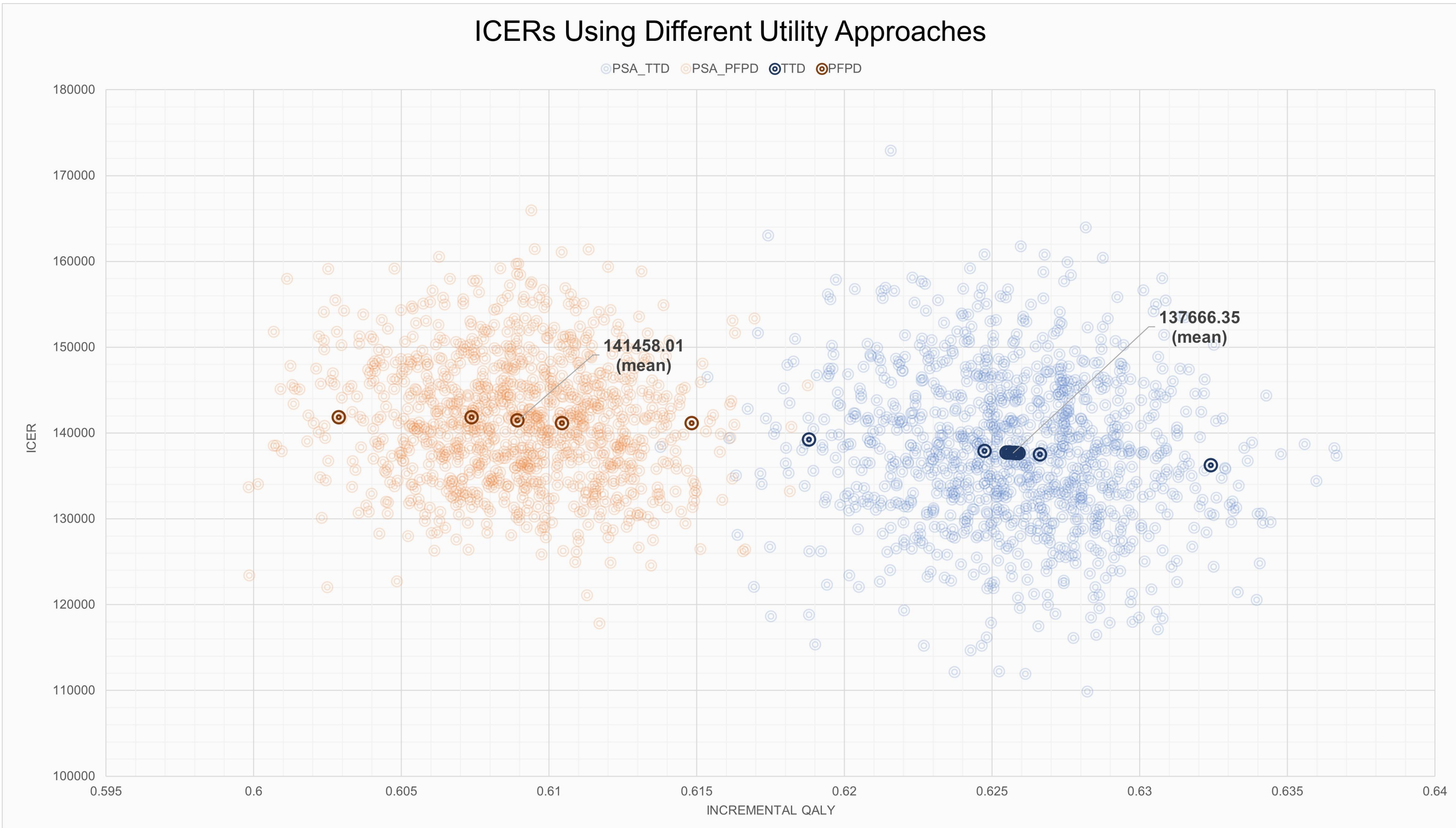


Figure 2. ICERs Using Different Utility Approaches



PSA: probabilistic sensitivity analysis

Reference

- Slater RL, Lai Y, Zhong Y, et al. The cost effectiveness of pembrolizumab versus chemotherapy or atezolizumab as second-line therapy for advanced urothelial carcinoma in the United States. J Med Econ. Sep 2020;23(9):967-977. doi:10.1080/13696998.2020.1770261
- Balar A.V., et al. Efficacy and safety of pembrolizumab in metastatic urothelial carcinoma results from KEYNOTE-045 and KEYNOTE-052 after up to 5 years of follow-up, Mar 2023;34(3):289-299

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