Cost-effectiveness of Relmacabtagene autoleucel (anti-CD19 autologous CAR-T cell immunotherapy product) vs salvage chemotherapy for Chinese Relapsed or Refractory Large B-Cell Lymphoma Patients

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Objective:

To estimate the long-term survival and the cost-effectiveness of relmacabtagene autoleucel (relma-cel) anti-CD19 autologous CAR-T cell immunotherapy product vs salvage chemotherapy for treating Chinese relapsed or refractory large B-cell lymphoma (r/r LBCL) patients.

Methods

Model Structure

✧ A decision tree and a partitioned survival model were developed from the perspective of Chinese healthcare system with a lifetime horizon. The overview of the model is illustrated in Figure 1.

✧ A standard parametric survival model and a mixture cure model were built to extrapolate the survival of patients with salvage chemotherapy and with relma-cel, respectively.

✧ The best fit model for each curve was determined according to AIC/BIC and the clinicians' opinions.

Figure 1 | Model structure
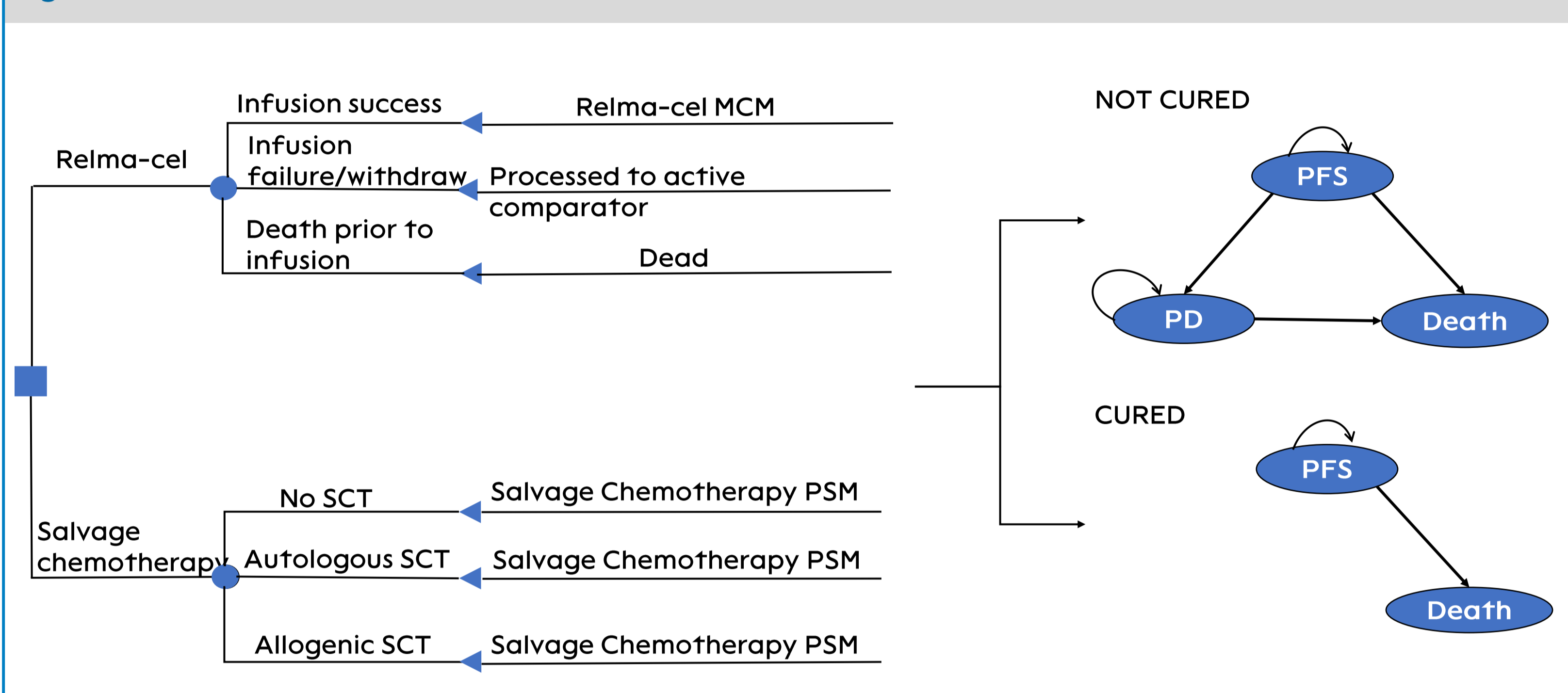
Model parameters

Clinical Data

✧ The individual patient data of the 59 r/r LBCL patients in the RELIANCE[1] trial used in the model was provided by the manufacturer, including the data of 41 r/r DLBCL patients and the data of other several LBCL subtypes patients.

✧ Because the study of efficacy in patients with r/r LBCL is limited and DLBCL is the predominant subtype of LBCL, the OS data of salvage chemotherapy patients were obtained from CORAL extension[2] study which reported efficacy of r/r DLBCL patients who fail second-line salvage regimens.

✧ For CORAL extension[2] study, as the PFS curves were not reported in the literature, we applied the mean cumulative hazard ratio (HR) of 0.65 from the main CORAL trial in estimating PFS data assuming a constant proportional relationship between the published PFS and OS[3].

✧ The all-cause mortality data for the general population was extracted from the national vital statistics.

Cost Data

✧ All reported costs were in local currency and adjusted to 2022 Chinese Yuan (¥) ($1 USD=¥6.76).

✧ Only direct medical costs were considered from the perspective of health care system in China in the model.

✧ The costs associated with each therapy included the prescription cost, pre-treatment cost, adverse event cost, and follow-up care cost in various health states post infusion.

✧ With exception of the costs associated with the CAR-T drug, stem cell transplant, and end of life care (3-month prior to death), all other costs were estimated based on an in-depth interview of 10 clinical experts.

Utility Data

✧ Patient level data on health-related quality of life (HRQoL) while receiving treatment with relma-cel were provided by the manufacturer.

✧ Utility values associated with salvage chemotherapy and SCT treatment were based on external literature.
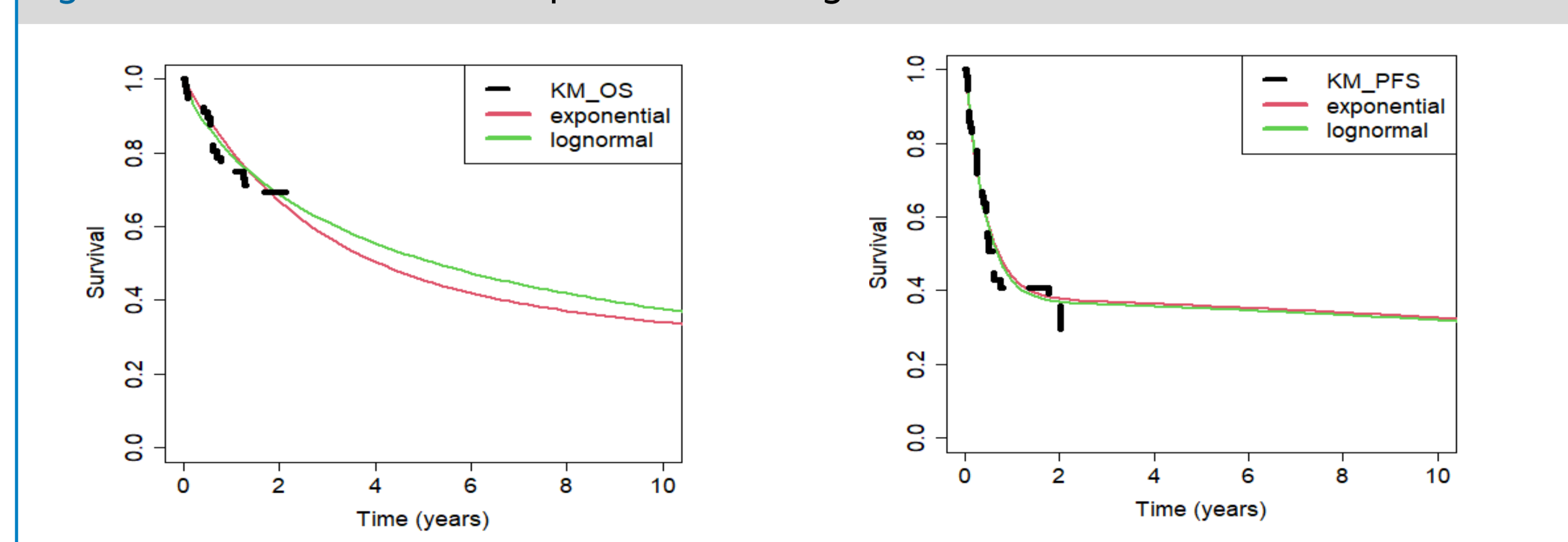
Results

Base-Case

✧ Patients treated with relma-cel were estimated to gain 5.26 more QALYs and cost ¥1,067,430.03 more than those with chemotherapy. Hence, the incremental cost-effectiveness ratio was ¥203,137 per QALY.(Table 1)

✧ A log-logistic model for salvage chemotherapy and an exponential model for relma-cel were respectively selected to predict the long-term survival and progression-free survival of the two arms. Goodness-of-fit test of MCM based on AIC/BIC indicated that both exponential and lognormal distributions fit the underlying data.(Figure 2)

✧ The cure fraction for patients with relma-cel was estimated to be 38.1% representing those who will not experience disease progression or die from r/r LBCL. The 5-year survival rates for chemotherapy and relma-cel were predicted to be 7.2% and 45.5%, respectively.

Table 1 | The cost, effectiveness and incremental cost-effectiveness ratios (ICERs)

	Relma-cel	Salvage Chemotherapy
Total Discounted LYs	7.55	2.44
Total Discounted QALYs	6.67	1.41
Total Discounted Costs	¥1,608,889.57	¥541,459.54
Incremental QALYs	5.26	
Incremental Costs	¥1,067,430.03	
ICER (relma-cel vs chemotherapy)	¥ 203,137	

Figure 2 | OS and PFS rate of exponential and lognormal distributions for CAR-T Patients
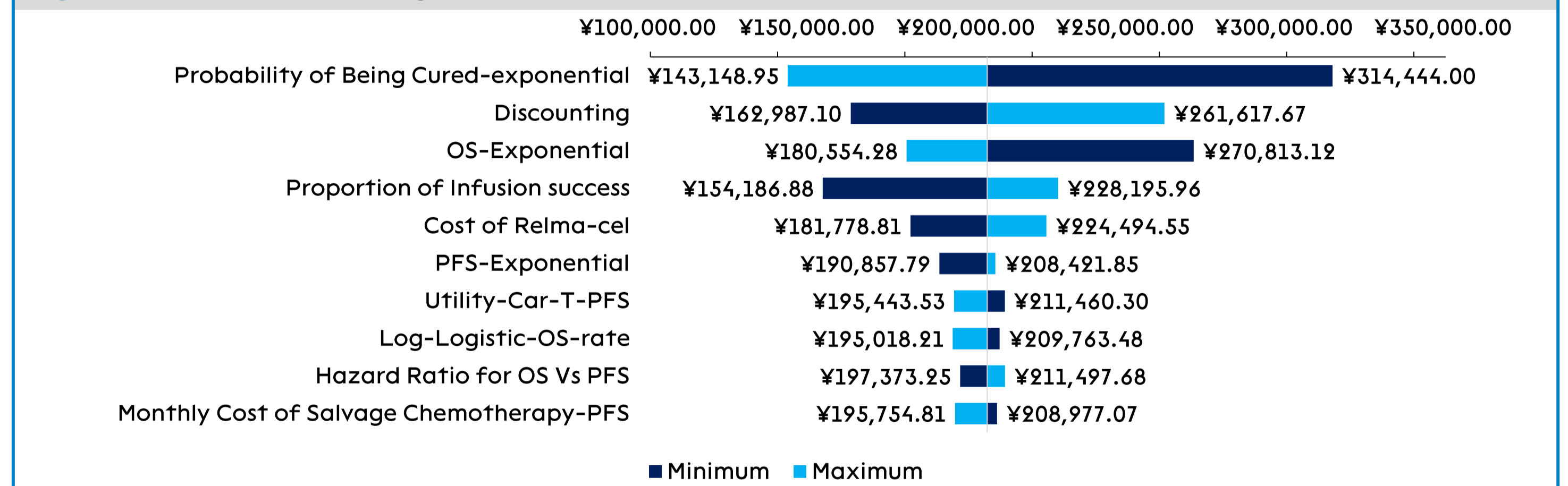
Sensitivity Analysis

One-way Sensitivity Analysis

✧ The model was most sensitive to changes in projected CAR-T cure rate, discount rate, and overall survival function statistics of exponential distribution.

✧ Results of one-way sensitivity analyses are displayed in the tornado diagram Figure 3.

Figure 3 | The tornado graphs

Probabilistic Sensitivity Analysis

✧ For all patients, the costs and QALYs were plotted in a cost-effectiveness plane as shown in Figure 4.

✧ When a 3-time-GDP threshold was used, the probabilities of CAR-T being cost-effective are both 74% for all patients.

Figure 4 | The cost-effectiveness plane
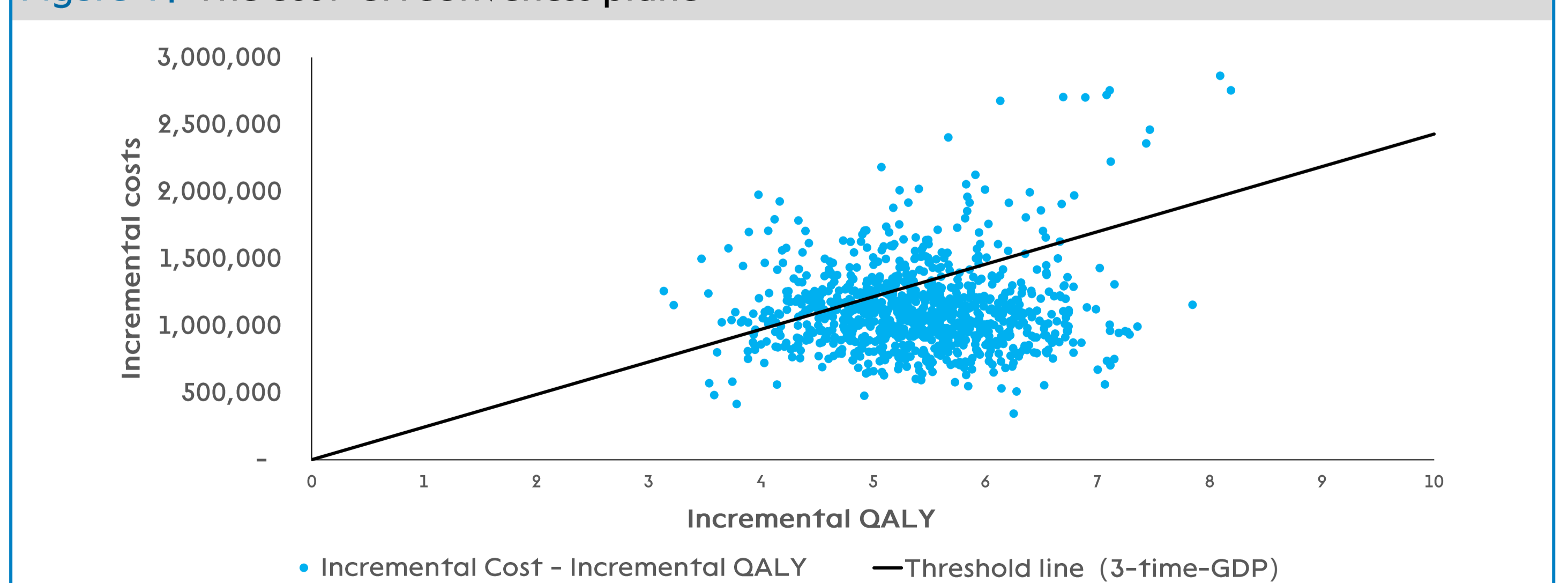
Reference

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Conclusion:

For Chinese r/r LBCL patients, relma-cel was associated with a significant QALY gained. The uncertainty exists, which however may be reduced by a longer follow-up of the RELIANCE trial.

If you have any question or comment about this study, please contact the authors at linziyi@centennialsci.com