EE 213:Cost-Utility Analysis of Dinutuximab Beta in Treating High-Risk Neuroblastoma A Partitioned Survival Model Using R Programming Language

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Background & Objective

Dinutuximab has become a standard of care in modern treatment guidelines for high-risk neuroblastoma (HR-NBL)[1,2]. Given the high cost of dinutuximab beta, evaluating its cost-effectiveness is highly important. This study aims to evaluate the cost-effectiveness of dinutuximab beta plus isotretinoin compared to isotretinoin monotherapy as maintenance therapy following transplant in patients with HR-NBL from the Jordanian payer perspective.

Method

- A three-health state partitioned survival model was developed using R programming language with a cycle length of one month and a time horizon of 10 years. (Figures 1 & 2). Both costs and outcomes were discounted using a 3% annual discount rate.
- Parametric survival distributions (Exponential, Weibull, Gompertz, Loglogistic, and Lognormal distributions) were fitted to individual patient data to extrapolate costs and outcomes over the time horizon.
- An indirect comparison was conducted using reconstructed individual patient data from the HR-NBL1/SIOPEN trials for the intervention group and the COG-ANBL0032 trial's data for the comparator group.
- The KHCC cancer registry provided real-world patient-level data representing the comparator, which were tested as a separate scenario in the model.
- Utilities input parameters were taken from the literature, and resource use and unit costs were taken from the KHCC databases.
- Conducted deterministic sensitivity analysis, probabilistic sensitivity analysis, and scenario analysis to assess

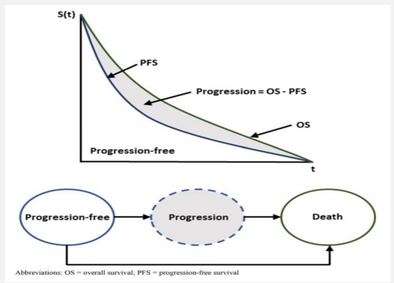


Figure 1

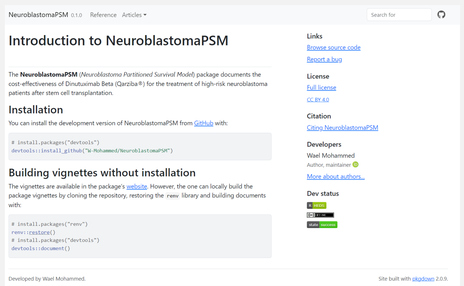


Figure 2

Results

Table 1: Basecase results

	Life Years	Quality-Adjusted life years	Total Costs (USD)
Dinutuximab Beta + Isotretinoin	6.15	4.88	$377,190
Isotretinoin	5.8	4.51	$19,168
Incremental Value	+0.35 LYs	+0.37 QALYs	+$358,022
ICUR per LYs Gained	$1,022,920/LY		
ICUR per QALY Gained	$967,627/QALY		

Table 2: Comparator real-world effectiveness data scenario results

	Life Years	Quality-Adjusted life years	Total Costs (USD)
Dinutuximab Beta + Isotretinoin	6.15	4.88	$376,071
Isotretinoin	4.36	3.58	$10,182
Incremental Value	+1.79 LYs	+1.30 QALYs	+$365,889
ICUR per LYs Gained	$204,407/LY		
ICUR per QALY Gained	$280,821/QALY		

- The cost of Dinutuximab beta had the most significant impact on the incremental cost-utility ratio (ICUR). (Figure 3)
- The model is also sensitive to utility scores during progression-free and progressed health states. (Figure 3)
- At a threshold of US$56,000/QALY, the cost-effectiveness acceptability curve indicated a 0% probability of Dinutuximab beta being cost-effective. (Figure 4)
- A reduction of 85% to 90% in the acquisition cost of the intervention is required to become cost-effective from the Jordanian payer perspective

Figure 3

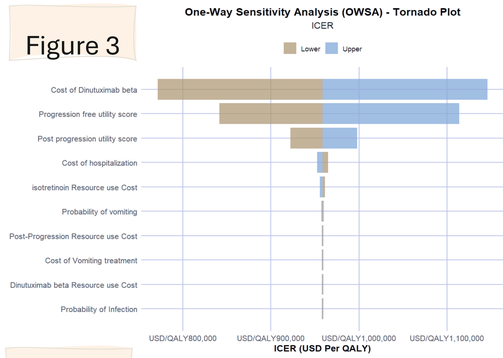
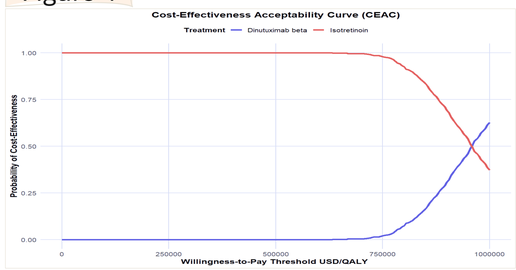


Figure 4



Conclusion

- From a Jordanian healthcare system perspective, Dinutuximab beta is not cost-effective compared to Isotretinoin at a threshold value of US$56,000 per QALY.
- Price negotiations, including customized risk-sharing agreements targeting low- and middle-income countries, are required to improve its value and affordability.

References

1. Yu AL, Gilman AL, Ozkaynak MF, et al. Anti-GD2 Antibody with GM-CSF, Interleukin-2, and Isotretinoin for Neuroblastoma. *N Engl J Med*. 2010;363(14):1324-1334. doi:10.1056/NEJMoa0911123 2. Yu AL, Gilman AL, Ozkaynak MF, et al. Long-Term Follow-up of a Phase III Study of ch14.18 (Dinutuximab) + Cytokine Immunotherapy in Children with High-Risk Neuroblastoma: COG Study ANBL0032. *Clin Cancer Res*. 2021;27(8):2179-2189. doi:10.1158/1078-0432.CCR-20-3909