Cost-Effectiveness of Adherence Intervention for Tuberculosis Treatments in South Korea Using Discrete Event Simulation Model

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Introduction

- Poor adherence to tuberculosis (TB) treatment is an obstacle to controlling the disease.

- The South Korean government's second national TB control plan includes projects regarding adherence to TB treatment to manage patients with TB.

- However, the cost-effectiveness of adherence intervention is still unknown.

Objectives

- This study aims to assess the cost-effectiveness of improving adherence in TB patients through the national TB program in South Korea by using a discrete-event simulation (DES).

Methods

- A DES model was built to estimate cost and quality-adjusted life-years (QALYs) in adherent and non-adherent patients (Figure 1).

- DES model is optimal for TB treatments as it reflects individual patients' changing attributes and the prognosis over time.

- To evaluate the cost-effectiveness of TB program, we set the population consisting of 25,400 TB patients and 78.91% of adherent patients among them, which is the proportion of adherent patients before TB program in South Korea. The total number was based on new TB patients in 2020.

- Through TB program spending the additional cost of $470 per patient, the proportion of adherent patients increased from 78.91% to 93%, which is the reported proportion of adherent patients after TB program.

- To evaluate the cost-effectiveness of TB program that increased adherence rate up to 93%, we simulated the following change of average costs and QALYs of total TB patients in response to the growing proportion of adherent patients and estimated the incremental cost-effectiveness ratio (ICER).

- An annual discount rate of 4.5% was applied to the costs and the QALYs.

Figure 1. The increasing proportion of adherent-group and DES model structure

Results

- As for TB patients in adherent and non-adherent group, an adherent patient gained an average of 0.02 QALYs and saved an average of $1,591 compared with a non-adherent patient.

- Following ICER was $10,538/QALY and adherence intervention in TB program was cost-effective given $20,000 of threshold.

- Given willingness-to-pay threshold of $20,000, adherence intervention was cost-effective when the proportion of adherent group was at least 91% (Figure 2) .

- Before and after the national TB program, as adherence rate rises from 78.91% to 93% in TB patients, costs and QALYs increased from $2,785 to $2,952 and 13.27 to 13.28 per person (Table 1).

Figure 2. ICER changed by the proportion of adherent groups and the additional cost of the TB program
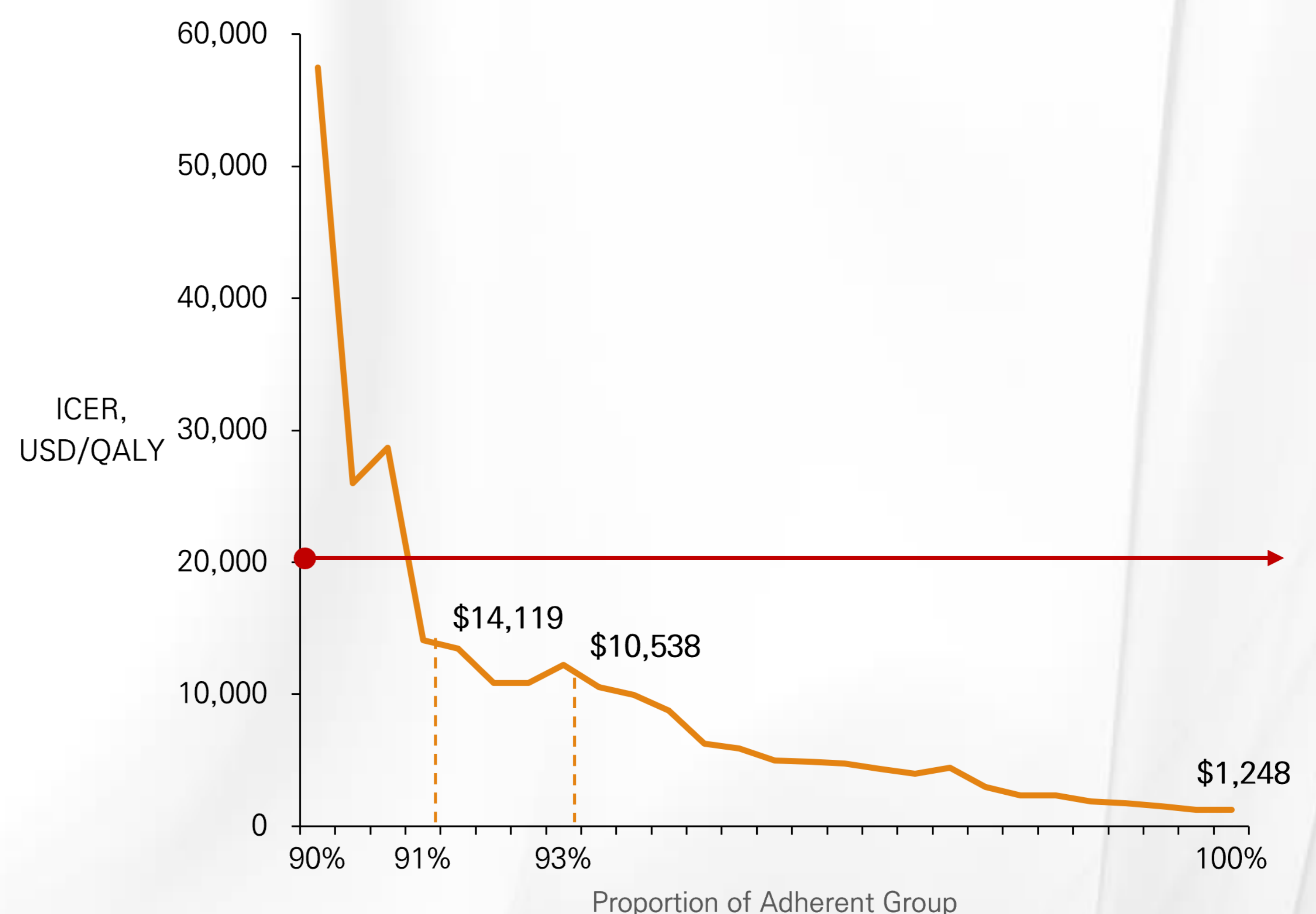

Table 1. Cost-effectiveness results of base case

	The Proportion of adherent-group	Life Years	QALYs	Cost (USD)	ICER (USD)
Before TB program	78.7%	28.062	13.268	2,785	10,538
After TB program	92.9%	28.065	13.284	2,952	

* 1USD=1,200KRW

Conclusion

- Improvement of adherence to TB treatment could be considered cost-effective through the current TB program.

- Commitment programs to improve patients' adherence can be helpful to manage TB nationwide.

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