RWD285

Cost-Utility Analysis of Eculizumab and Ravulizumab in Patients with Atypical Hemolytic Uremic Syndrome (aHUS) in Thailand

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Introduction

- Atypical hemolytic uremic syndrome (aHUS) is a rare, life-threatening disease caused by complement system dysregulation, leading to thrombotic microangiopathy, end-stage renal disease (ESRD), and death. Eculizumab and Ravulizumab, complement C5 inhibitors, significantly reduce the risk of progression to ESRD and mortality in aHUS patients.
- Economic evaluation is required to support the listing of medicines in Thailand's national essential list of medicines. However, while several economic evaluations have been conducted, no local cost-utility analysis (CUA) and budget impact analysis (BIA) have been conducted in Thailand.
- **Objective:** To evaluate the cost-utility and budget impact of eculizumab and ravulizumab compared with plasma therapy in Thai patients with aHUS.

Methods

A decision tree and Markov model were used to conduct the CUA over a lifetime horizon and BIA over a 5-year horizon. Clinical inputs were derived from published literature and expert opinions, while cost data were obtained from Thai health economic databases. Outcomes were measured in life-years and quality-adjusted life-years (QALYs). Sensitivity and scenario analyses, including the use of genetic testing, were also conducted.

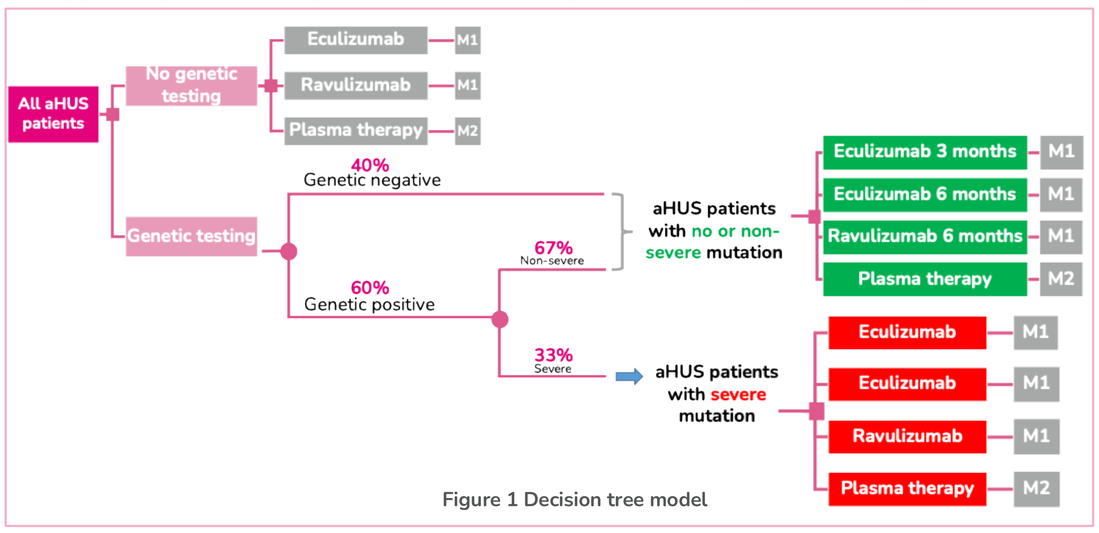


Figure 1 Decision tree model

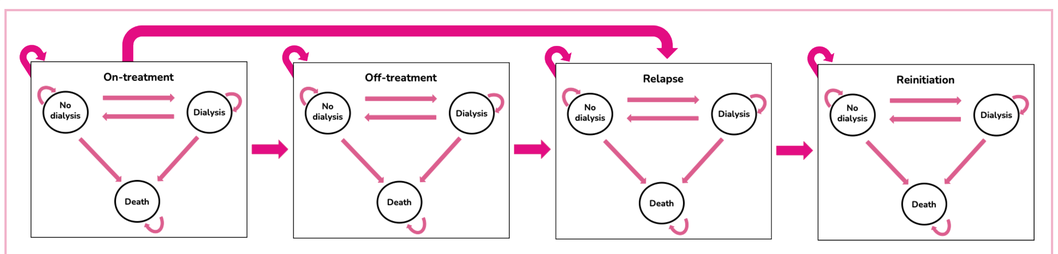


Figure 2 Markov Model (M1) for Eculizumab and Ravulizumab

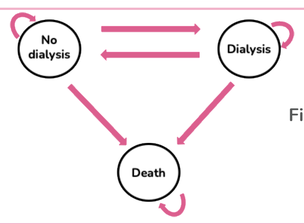


Figure 3 Markov Model (M2) for Plasma therapy

Results

Base-case analysis

- **Neither Eculizumab nor Ravulizumab is cost-effective** under the willingness-to-pay threshold at THB 160,000 and THB 500,000.
- Threshold analysis indicated that the price of **Eculizumab should be discounted by 96% and 93%** to achieve cost-effectiveness under the WTP thresholds of THB 160,000 and THB 500,000, respectively.
- While the price of **Ravulizumab should be discounted by 95% and 90%** to achieve cost-effectiveness under the WTP thresholds of THB 160,000 and THB 500,000, respectively.

Table 1 Results from the base-case analysis

PAIRWISE ANALYSIS	Cost (THB)	Life years	QALYs	Incremental cost (THB)	Incremental life year	Incremental QALY	ICER per LY gain (THB)	ICER per QALY gain (THB)	WTP at THB 160,000	WTP at THB 500,000
Plasma therapy	2,844,735	5.33	3.34							
Eculizumab	59,613,282	9.92	8.73	56,768,547	4.60	5.39	12,344,960	10,522,713	Not-cost effective (Dominated by Ravulizumab)	
Ravulizumab	45,732,923	9.92	8.86	42,890,188	4.60	5.52	9,326,954	7,769,253	Not-cost effective	

Sensitivity analysis

- In the **one-way sensitivity analysis**, varying each input parameter causes changes in ICERs, but **none of them are cost-effective.**
- **The most sensitive input parameters are the discount rate and drug costs.**
- In the **probabilistic sensitivity analysis, all simulation points (ICERs) lie above both willingness-to-pay thresholds**, indicating that these treatments are **not cost-effective** at current prices.

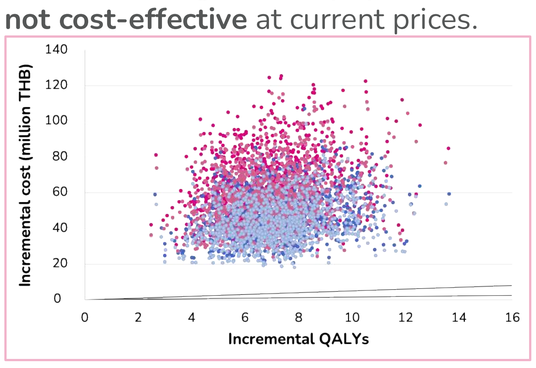
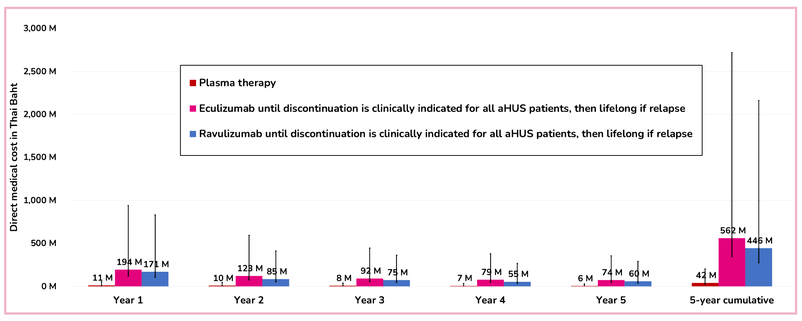


Figure 5 Probabilistic sensitivity analysis

Budget impact analysis

- Over five years, Eculizumab and Ravulizumab result in substantially higher direct medical costs (THB 562 million and THB 446 million, respectively) for a cohort of 26 aHUS patients, compared to plasma therapy (THB 42 million).
- Varying annual incidence (0.23–1.90 per million population) projects five-year cumulative costs ranging from THB 346 million–2,722 million for Eculizumab and THB 275 million–2,164 million for Ravulizumab.

Figure 4
Direct medical cost of Plasma therapy, Eculizumab, and Ravulizumab over five years in 26 aHUS patients



Scenario analysis

Although using genetic testing to shorten the duration of treatment in aHUS patients with no/non-severe mutation, **neither Eculizumab nor Ravulizumab is cost-effective.**

Table 2 Results from the scenario analysis

PAIRWISE ANALYSIS	Cost (THB)	Life years	QALYs	Incremental cost (THB)	Incremental life year	Incremental QALY	ICER per LY gain (THB)	ICER per QALY gain (THB)	WTP at THB 160,000	WTP at THB 500,000
Plasma therapy	2,844,735	5.33	3.34							
ECU 3 m/ECU	48,766,222	9.93	8.73	45,901,487	4.60	5.39	9,972,188	8,509,753	Not-cost effective (Dominated by Ravulizumab)	
ECU 6 m/ECU	49,517,568	9.93	8.73	46,672,833	4.60	5.39	10,141,594	8,652,754	Not-cost effective (Dominated by Ravulizumab)	
RAVU 6 m/RAVU	38,081,621	9.93	8.86	35,236,886	4.60	5.52	7,656,664	6,380,512	Not-cost effective	

ECU 3 m /ECU: Eculizumab 3 months for no/non-severe mutation & Eculizumab until discontinuation is clinically indicated for severe mutation, then lifelong if relapse. **ECU 6 m/ECU:** Eculizumab 6 months for no/non-severe mutation & Eculizumab until discontinuation is clinically indicated for severe mutation, then lifelong if relapse. **RAVU 6 m/RAVU:** Ravulizumab 6 months for no/non-severe mutation & Ravulizumab until discontinuation is clinically indicated for severe mutation, then lifelong if relapse.

Conclusion

Neither Ravulizumab nor Eculizumab is cost-effective for the treatment of aHUS under Thailand's willingness to pay threshold. The budget impact is significantly influenced by high drug costs and the limited data on the incidence and prevalence of aHUS in Thailand, which can be addressed through managed entry agreements and a patient registry, respectively. The treatment duration also affects the budget impact, which can be optimized through clearly defined start and stop criteria guided by genetic testing results.

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References