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Mahidol University
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Original Research

Botulinum Toxin Type A For The Treatment Of Focal Spasticity In Children With Cerebral Palsy In Thailand: A Cost-Utility Analysis

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INTRODUCTION

- Despite its widespread use in ambulatory children with spastic cerebral palsy (CP), botulinum toxin type A (BoNT-A) is not listed in Thailand's pharmaceutical reimbursement list.
- This exclusion leads to delayed access during optimal age range (2-5 years) and reduced treatment response.
- A cost-utility analysis is needed to aid policymakers in deciding whether one of BoNT-A should be listed in the pharmaceutical reimbursement list.

OBJECTIVE

- To evaluate cost-utility of two BoNT-A treatments for young children with ambulatory spastic cerebral palsy (CP).

METHODS

Study Design and Participants

- A five-state Markov decision-analysis model was constructed **(Figure 1)** using a societal perspective. A 3-month cycle length was used to estimate relevant costs and health outcomes for a lifetime horizon, given a 3% annual discount.
- The modelled cohort were CP patients aged 18 month-18 years, presenting spasticity in their upper or lower limbs (UL/LL), and falling within Gross Motor Function Classification System (GMFCS) levels 1-4, with a Modified Ashworth Scale (MAS) score ≥ 1+.

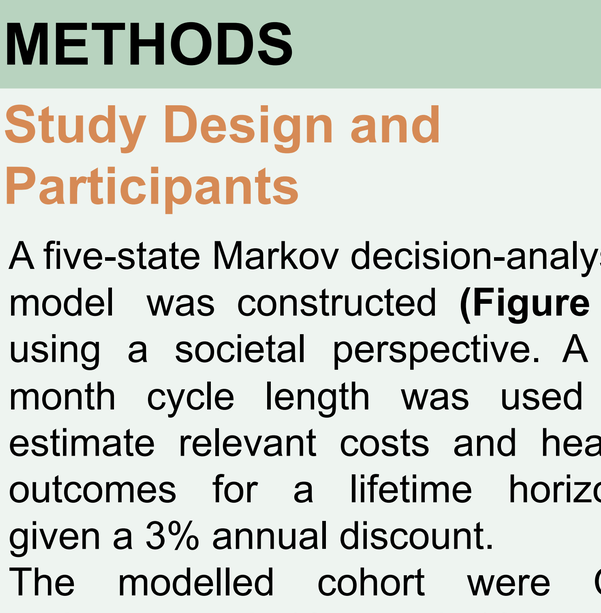

Figure 1. Five-state Markov Decision-Analytical Model

Treatment Options

- Abobotulinum toxin A (Abo) or Onabotulinum toxin A (Ona) combined with standard of care (SoC) were compared to the SoC alone
- The BoNT-As were administrated at six-month intervals over a two-year period.

Model Inputs

- Direct medical cost was calculated using a generalized linear model based on a five-year retrospective treatment cost from a tertiary hospital.
- Direct non-medical cost, utility, and transitional probabilities were primarily collected in three tertiary hospitals.
- A network meta-analysis was employed to estimate the treatment efficacy in terms of its impact on reducing MAS score by ≥ 1 grade *or* achieving the predefined goal.

Analyses

- Lifetime cost, quality-adjusted life years (QALYs) and an incremental cost-effectiveness ratio (ICER) were calculated and compared to the cost-effectiveness threshold of 160,000 THB (US $4,597, where 1 USD = 34.81 THB in 2023) per QALY gained.
- Probabilistic (PSA) and one-way sensitivity analyses were performed to estimate parameter uncertainties.
- Scenario analysis was conducted to estimate ICER for BoNT-A administration during optimal age range.

RESULTS

Base case

- The Abo or Ona combined with SoC provided 0.0033 and 0.0026 QALYs gained with additional costs of 709 and 1,054 compared to the SoC, respectively.
- Consequently, Abo had an ICER of 215,009 THB per QALY, while Ona had an ICER of 399,203 THB per QALY **(Table 1)**.

Sensitivity Analyses

- The PSA demonstrated that no BoNT-A had a chance of being cost-effective at the ceiling threshold. The Abo was more likely to be cost-effective if the ceiling threshold were set higher than 400,000 THB per QALY gained **(Figure 2A)**.
- The results were sensitive to the direct non-medical cost of non-responder **(Figure 2B)**.

Table 1. Lifetime cost, life year (LY), quality-adjusted life year (QALY) and incremental cost-effectiveness ratio (ICER): Base-case analysis

Base case[a]	Treatment options		
	SoC	Ona + SoC	Abo + SoC
Lifetime costs	19,104,428	19,105,486	19,105,139
Discounted lifetime costs[b]	9,239,278	9,240,331	9,239,987
Life years	54.27	54.27	54.27
Discounted life years[b]	25.89	25.89	25.89
QALYs	44.572	44.574	44.575
Discounted QALYs[b]	21.0169	21.0195	21.0202
Incremental costs[b]		1,054	709
Incremental life years[b]		0.00	0.00
Incremental QALYs[b]		0.0026	0.0033
ICER (THB/QALY gained)[b]		**399,203**	**215,009**

[a]The average values were obtained using a probabilistic model with 5,000 iterations
[b]Discounted by 3% annually

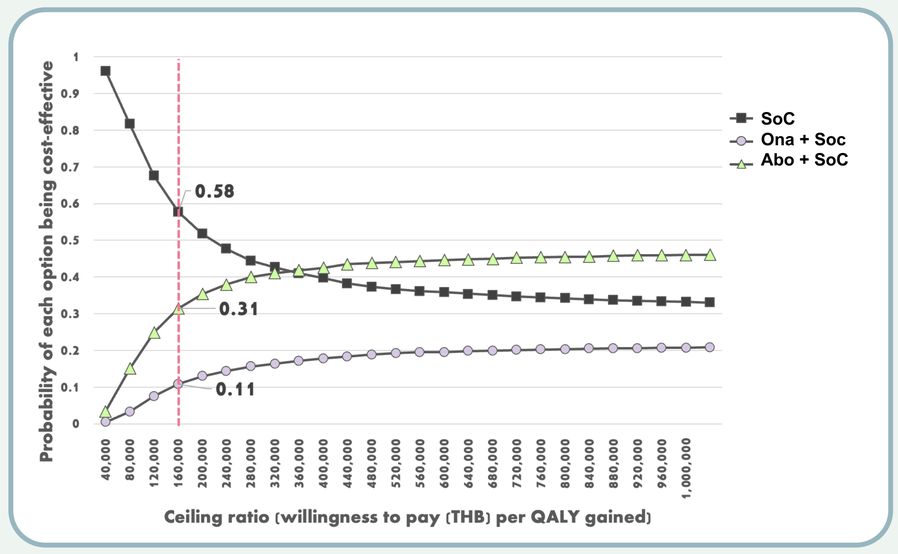

Figure 2A. Cost-effectiveness acceptability curve of probabilistic sensitivity analysis.

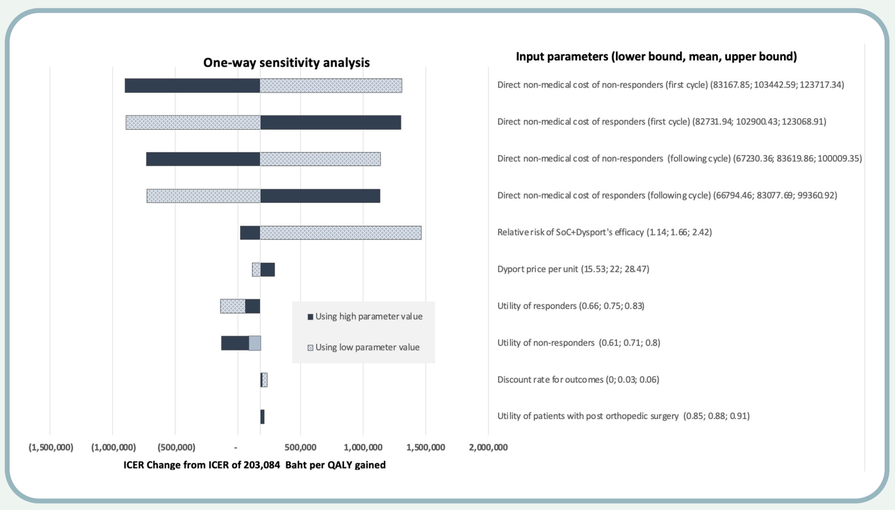

Figure 3B. One-way sensitivity analysis

CONCLUSIONS

Combining BoNT-A with SoC was not economically attractive for treating spastic CP in Thailand. Lowering Abo's price by 14% could enhance its effectiveness. Price negotiation process is crucial to ensure financial value and affordability.

REFERENCES

1. Multani I, Manji J, Hastings-Ison T, Khot A, Graham K. Botulinum Toxin in the Management of Children with Cerebral Palsy. Paediatric drugs.2019; 21(4):261-81.
2. Chaikledkaew U, Kittrongsiri K. Guidelines for health technology assess- ment in Thailand (second edition)–the development process. J Med Assoc Thai. 2014;97:S4-9.

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