Economic Evaluation of Selumetinib for Treating Pediatric Patients with Neurofibromatosis Type 1 Inoperable Plexiform Neurofibromas in Thailand

RWD112

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Background

- Neurofibromatosis type 1 (NF1) is a genetic disorder affecting 1 in 3,000 people.
- It can lead to plexiform neurofibromas (PN), which cause pain, disfigurement, and reduced quality of life in children.
- Selumetinib, a MEK inhibitor, has demonstrated effectiveness in shrinking PN tumors but is associated with high treatment costs.

Objective

This study aims to conduct the cost-utility analysis of selumetinib compared to best supportive care (BSC) for the treatment of pediatric patients with NF1 and symptomatic inoperable PNs.

Method

- A cost-utility analysis (CUA) was conducted to evaluate costs and health outcomes, including Quality Adjusted Life Years (QALY), from a societal perspective.
- A Markov model with three health states (progression-free state (PFS), progressed disease (PD), and death) was constructed, as shown in Figure 1.
- The model adopted a lifetime time horizon with a cycle length of one year.
- All key parameter inputs are summarized in Table 1.
- The incremental cost-effectiveness ratio (ICER) was calculated to present the results of the cost-utility analysis.

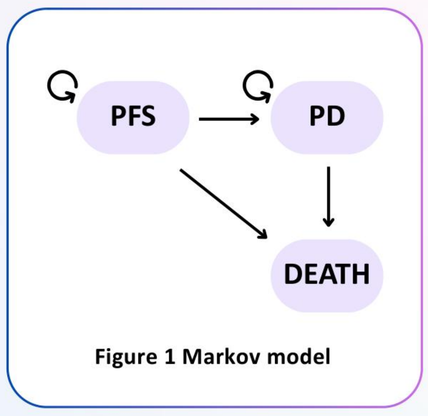

Figure 1 Markov model

Table 1 Key Parameters for Economic Evaluation of Selumetinib vs Best Supportive Care in NF1: Societal Perspective

Parameters	Selumetinib	BSC	Source/Method used
Transition probabilities	Probability of PFS to PD		SPRINT trial
	Mortality		Thai AMR x NF1 SMR = estimated NF1 mortality rate in Thai context
Outcomes			
Utility - PFS	0.74	0.74	Ault et al. (2024), patients classified within the same health state are expected to have equal utility values. However, this assumption may not align with the actual lived experiences of patients.
Utility - PD	0.51	0.51	NICE (2022, UK)
Caregiver disutility	0.07	0.07	NICE (2022, UK)
Costs, USD (THB) [1 USD = 34 THB (2024)]			
Direct medical cost:			
Annual drug cost	222,930 (7,579,622)		Market price in Thailand
Annual cost of complications - PFS	1,441 (49,005)	1,230 (41,833)	Incidence: SPRINT trial Unit cost: DMSIC, Thai HTA cost list • Pain management (medicines), Motor dysfunction (Physical therapy), Airway (Mechanical Ventilator), Bowel obstruction (medicines), High blood pressure (medicines), Epilepsy (Medicines), Cognitive impairment (Learning skills training, Group psychotherapy), Glaucoma (medicines, Laser trabeculoplasty), Scoliosis (medicines, physical therapy, surgery)
Annual cost of complications - PD	1,627 (55,333)	1,627 (55,333)	
Annual cost of adverse events	1 (48)	-	Incidence: SPRINT trial Unit cost: DMSIC, Thai HTA cost list • Diarrhoea, Pyronychia, Vomiting, Dermatitis acneiform
Annual cost of follow-up	1,019 (34,648)	1,034 (35,162)	Unit cost: Thai HTA cost list
Cost of administration per visit	11 (359)	45 (1,543)	Unit cost: Thai HTA cost list
Direct non-medical cost:			
Transportation costs per visit	27 (905)		Unit cost: Thai HTA cost list
Food costs per visit	10 (333)		Unit cost: Thai HTA cost list
Productivity loss of caregiver	7,120 (242,080)		GNI per capita (2024)
Sub-group proportions	Head & Neck, Trunk, Extremities		Calculated from SPRINT trial

Abbreviations: PFS = Progression-Free State; PD = Progressive Disease; AMR = Age-specific Mortality Rate; SMR = Standardized Mortality Ratio; DMSIC = Drug and Medical Supply Information Center; HTA = Health Technology Assessment; GNI = Gross National Income; SPRINT = Selumetinib trial in pediatric NF1; THB = Thai Baht; USD = United States Dollar.

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Results

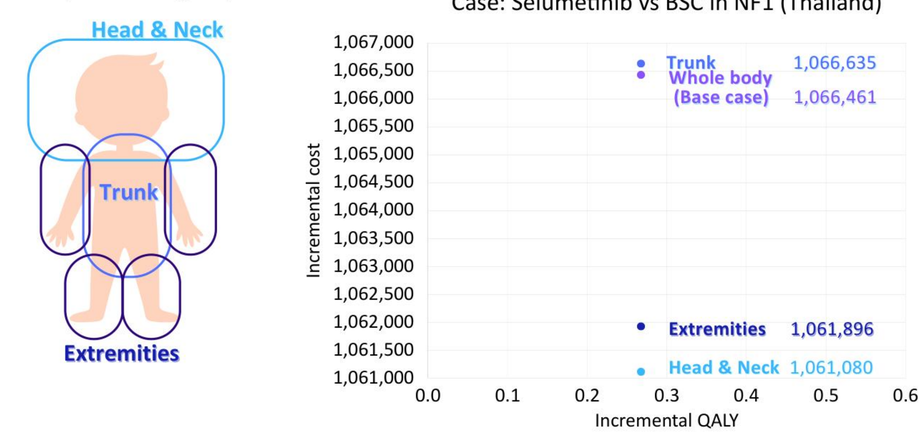
- The study results indicated that Selumetinib costs USD 392,941 (THB 13,360,003) for 19.07 QALYs, whereas BSC costs USD 108,206 (THB 3,679,020) for 18.80 QALYs.
- The incremental cost of USD 284,735 (THB 9,680,983) for a 0.27 QALY gain resulted in an ICER of USD 1,066,461 (THB 36,259,682) per QALY, which exceeds Thailand's cost-effectiveness threshold of 4,706 USD/QALY (160,000 THB/QALY).
- The subgroup analysis revealed variations in ICER across tumor locations, ranging from 1,061,080 USD/QALY for the head and neck to 1,066,635 USD/QALY for the trunk.

Table 2 Base-Case Analysis: Costs, QALYs, and ICER for Selumetinib vs BSC (Whole-Body NF1, Thailand)

Treatment	Cost (USD)	QALYs	Incremental Cost	Incremental QALY	ICER* (USD/QALY)
Selumetinib	392,941	19.07	284,735	0.27	1,066,461
BSC	108,206	18.80	—	—	—

* ICER values (USD) were converted from THB-based estimates and may not precisely reflect the cost-per-QALY ratio shown.
Abbreviations: QALY = Quality-Adjusted Life Year; ICER = Incremental Cost-Effectiveness Ratio; BSC = Best Supportive Care; THB = Thai Baht; USD = United States Dollar. (conversion rate: 1 USD = 34 THB, 2024).

Figure 2. ICER per QALY
by Site-specific subgroups vs Whole-Body Base Case: Selumetinib vs BSC in NF1 (Thailand)



Discussion

- **Clinical benefit:** Selumetinib yielded a QALY gain of 0.27 in pediatric NF1 patients with symptomatic inoperable PN.
- **Economic barrier:** The ICER of 1.06 million USD/QALY was not cost-effective under Thailand's WTP threshold (4,706 USD/QALY), limiting reimbursement feasibility.
- **Policy options:** Alternative funding solutions or managed entry agreements should be considered to balance clinical value with budgetary sustainability.
- **Evidence gaps:** Long-term outcomes, real-world effectiveness, and health economic benefits remain underexplored.
- **Study limitations:**
  - Mortality outcomes for Thai NF1-PN patients were unavailable.
  - Subgroup distribution and site-specific complication profiles were not reported.
  - Utility data capturing psychosocial burden and caregiver disutility were not collected.
- **Future Research:** Future research should incorporate broader value elements such as family spillovers, productivity, psychosocial impacts, and the value of hope consistent with ISPOR's Value Flower framework.

Conclusion

Selumetinib has demonstrated clinical benefits; however, its high cost poses challenges for reimbursement within Thailand's healthcare system. To address this issue, evidence from this study should be used to explore and support alternative funding solutions.

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