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Cost-Effectiveness of Peripheral Neuropathy Screening in Malaysian Adults with Thalassemia: An Integrated Modeling Approach

*Ai Ch'I Liew[1,2], Irene Looi[3], Asrul Akmal Shafie[1]
[1]Discipline of Social &Administrative Pharmacy, Universiti Sains Malaysia, Penang, Malaysia [2]Clinical Research Center, Hospital Seberang Jaya, Penang, Malaysia [3]Medical Department, Hospital Seberang Jaya, Penang, Malaysia

Introduction

High Burden of Disease: Peripheral Neuropathy (ThalPN) is a significant and common complications in adults with thalassemia, affecting 20 - 78% of patients globally[1-3]. In Penang, Malaysia, the prevalence is 25%.

Impact of Patients: ThalPN is often subclinical and underdiagnosed in early stages. The condition is frequently irreversible once established, leading to a significant reduction in quality of life.

Gap in Current Practice: Despite its impact, routine screening for ThalPN is not standard care. Crucially, no previous studies have analyzed the cost-effectiveness of screening to guide policy in resource-limited settings.

Objective

To evaluate the cost-effectiveness of a systematic routine screening (SRS) program for ThalPN compared to standard care (symptomatic diagnosis) for adult thalassemia patients in Malaysia from a healthcare payer perspective.

Methods

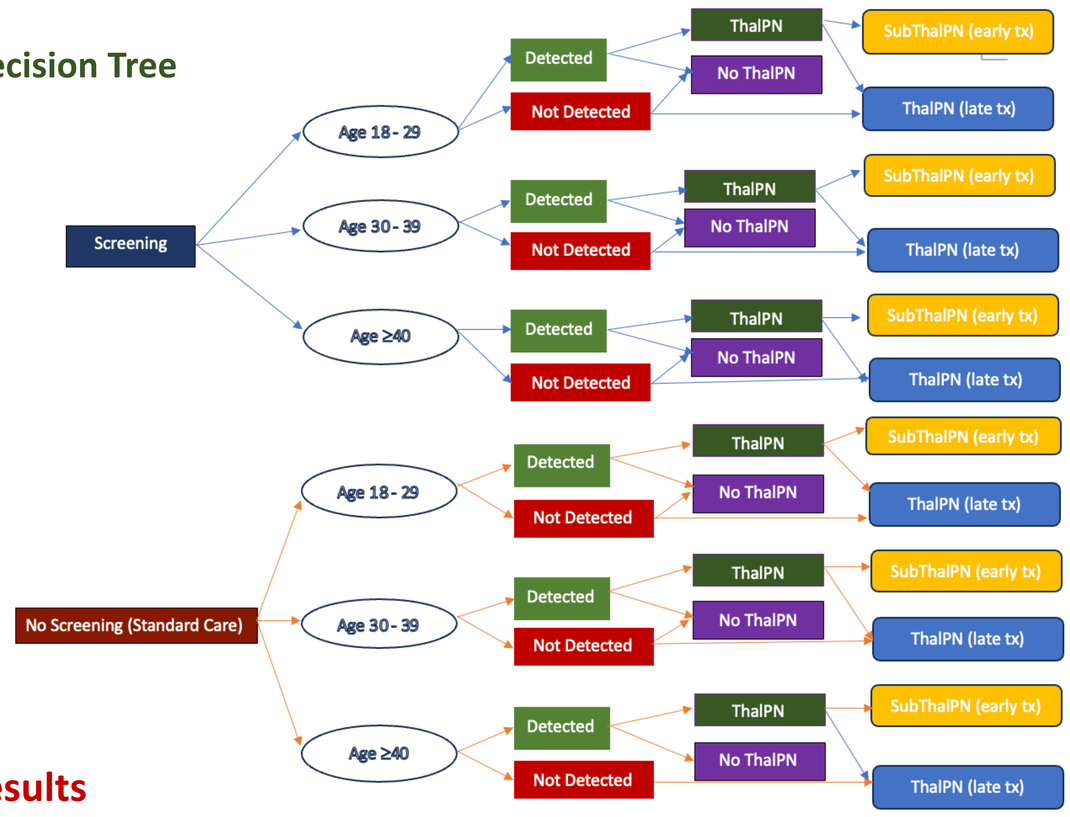
Model Structure: A dual-model approach was used.

Decision Tree: To model the initial screening and detection outcomes.

Lifetime Markov Model: To simulate the long-term progression of ThalPN through different health states with annual cycles.

Uncertainty Analysis: One-way and Probabilistic Sensitivity Analyses (PSA) with 1,000 simulations were performed to assess uncertainty.

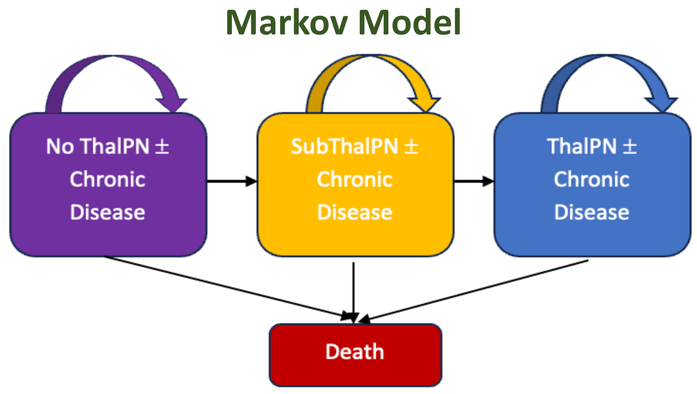
Decision Tree



Parameter

Source: A local cohort study, Malaysia Thalassaemia Registry[3], published literature [4,5], and experts 'opinion
Perspective: Healthcare Payer
Population: Adult Thalassemia Patients (by age groups: 18 – 29, 30 – 39, ≥ 40
Discount Rate: 3% for costs and outcomes
WTP Threshold: USD 11,161 per QALY
Outcomes: Incremental Cost-Effectiveness Ratio (ICER) in USD per QALY gained

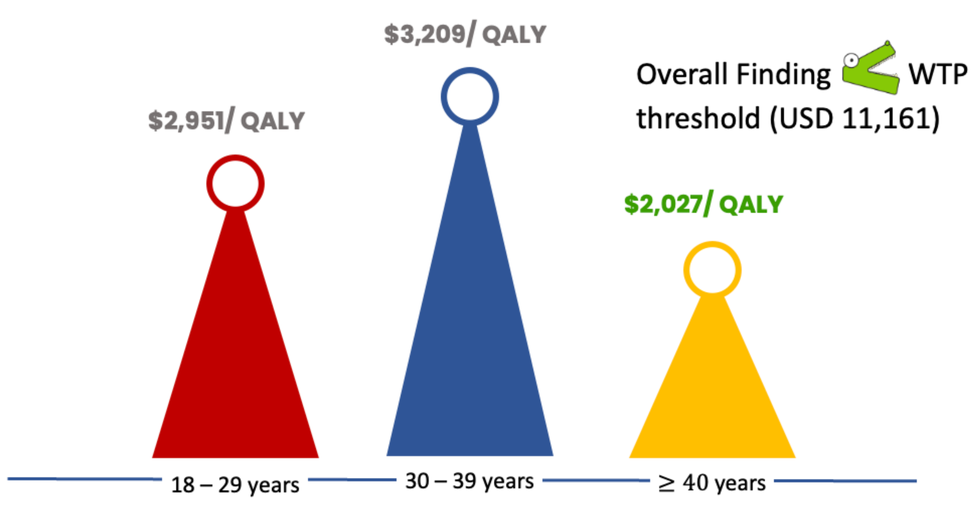
Markov Model

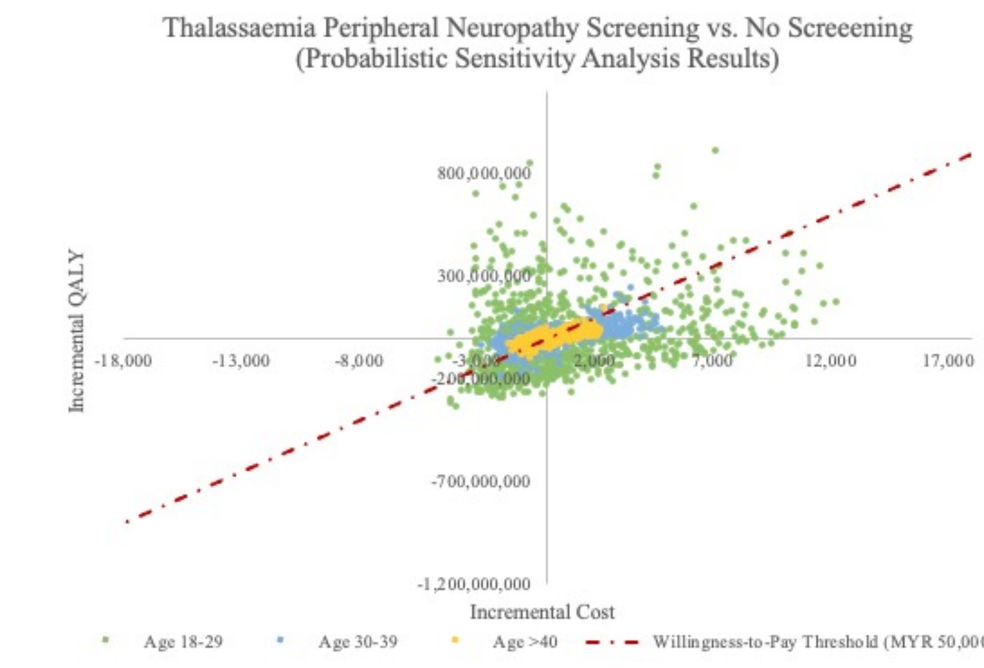


Abbreviation: SubThalPN, subclinical thalassemia peripheral neuropathy; ThalPN, Thalassaemia-associated Peripheral Neuropathy; tx, treatment

Results

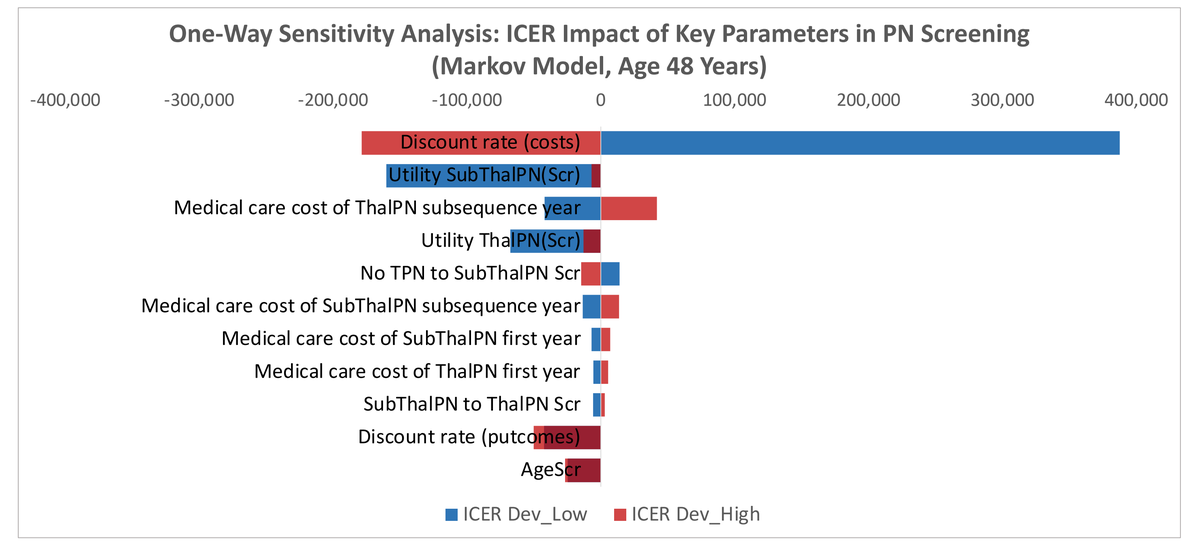
Base Case Results: Incremental Cost-Effectiveness Ratio (ICER) by Age Group





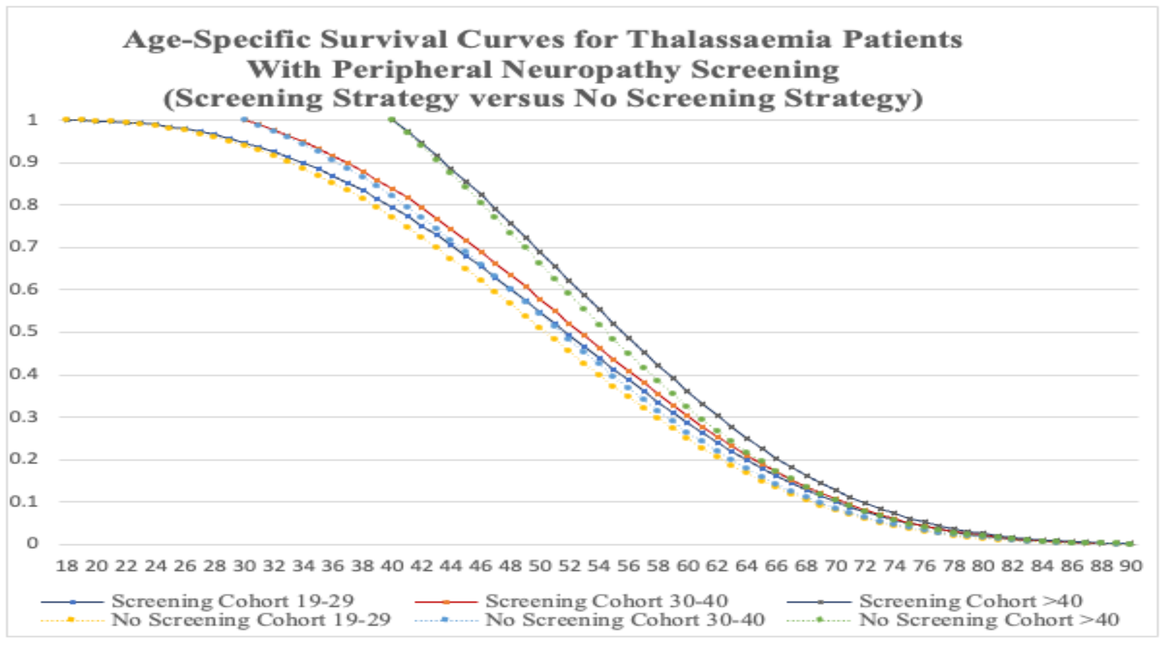
Probabilistic Sensitivity Analysis: Incremental Cost-Effectiveness Plane for Thalassaemia Peripheral Neuropathy Screening versus No Screening, by Age Group.
Abbreviation: QALY, Quality-adjusted Life Year

The **CEA curve** shows probabilities of ***62%, 58%,*** and ***68%*** for the age groups 18-29, 30-39, and **≥40**, respectively.



Abbreviations: AgeScr, Age of Screening; Dev, Deviation; ICER, Incremental Cost-Effectiveness Ratio; Neuropathy Disability Score; NSS, Neuropathy Symptom Score; PN, Peripheral Neuropathy; Scr, Screening; SubThalPN, Subclinical Thalassaemia Peripheral Neuropathy; ThalPN, Thalassaemia Peripheral Neuropathy

The **ICER** was ***most sensitive*** to the ***discount rate, health utility for Subclinical Peripheral Neuropathy (SubThalPN), and annual medical costs***.



Survival curves by age cohort for thalassaemia patients under standard care (no peripheral neuropathy screening strategy vs peripheral neuropathy screening strategy)

The SRS strategy led to **life expectancy extensions** of ***0.25%*** for the 18-29 cohort, ***0.27%*** for the 30-39 cohort, and ***0.32%*** for the ≥40 cohort

Limitations

- The model relied on certain assumptions due to limited published data specifically on the long-term progression of ThalPN in thalassemia patients
- Parameters were validated by expert opinion where local data were unavailable

Conclusion & Policy Implications

- This is the **1st economic evaluation** to support ThalPN screening in adult thalassemia patients.
- Systematic ThalPN screening is **cost-effective strategy** in Malaysia, delivering significant health benefits (QALYs) at an acceptable cost.
- **Earlier screening provides the greatest value.** These findings provide strong evidence to support the integration of SRS ThalPN into the standard of care for adults with thalassemia

Note: Results supersede those in the submitted abstract.

Email: aichiliew81@gmail.com

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Abbreviation: QALYs, quality-adjusted life years, CEA, cost-effectiveness analysis