



Cost-Effectiveness Of An Accelerated Diagnostic Protocol Incorporating Heart Rate N-Variability Versus Traditional Chest Pain Diagnostic Protocol: A Decision Tree Model-Based Study.

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Background & Objective(s)

Chest pain is one of the most common presenting complaints at Emergency Departments (ED) worldwide. Most chest pain patients are not suffering from life-threatening causes of chest pain and present with non-specific electrocardiogram (ECG) changes. Hence:

1. Need for safe but resource efficient risk stratification of chest pain patients with non-specific ECG changes.
2. Accelerated diagnostic protocols incorporating Heart rate n-variability (HRnV ADP) have been shown to be useful in diagnosis and risk stratification of chest pain.

The **objective** of this study was to compare the cost-effectiveness of our previously published HRnV ADP to traditional chest pain protocols used in our hospital.

Methods

This was a retrospective decision tree model-based analysis [Figure 1] of cost-effectiveness. Data from an institutional database of patients presenting to our ED from CY2010-2017 was used. Inclusion criteria for the study was as follows:

1. Patients presenting with "chest pain" as primary complaint **AND**
2. Age \geq 21 years old **AND**
3. Non-specific ECG changes

Outcome measures include:

1. Primary outcome measures are net monetary benefit (NMB) and incremental NMB (INMB).
2. Secondary outcomes are cost per life year (C/LY) saved and incremental cost effectiveness ratios (ICER).

The base-case cost-effectiveness of HRnV ADP versus traditional protocol was determined by comparing the point estimates of NMB, INMB, C/LY and ICER. Probabilistic sensitivity analysis (PSA) was performed using Monte-Carlo simulations.

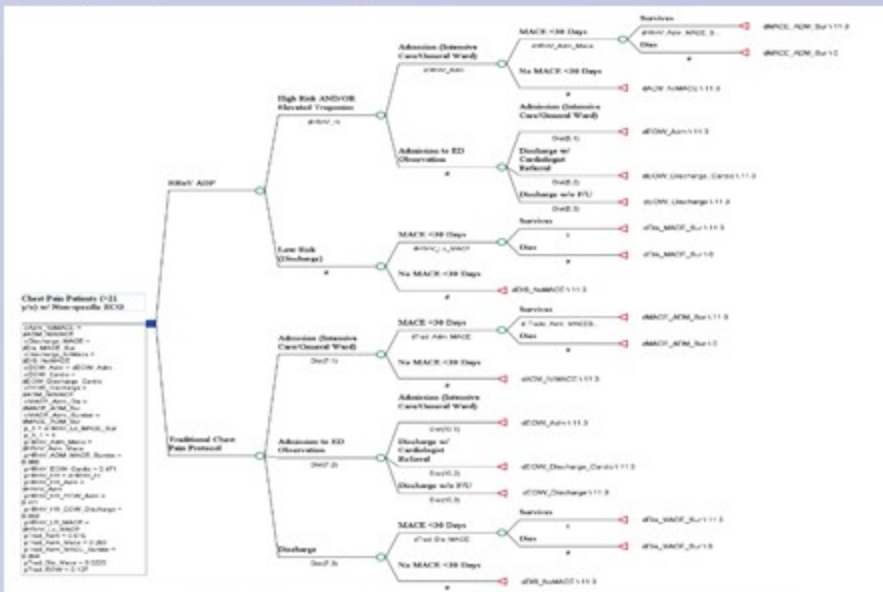


Figure 1 Overview of Decision Tree Model

Results

535 chest pain patients presenting to Singapore General Hospital from 2010-2017 was included for analysis. Average age of the study population was 59 years with an approximate male to female ratio of 2:1.

| Protocol | Cost (SGD) | Effectiveness | Outcome Measure(s) | | | |
|-------------------------------------------------------------------|--------------------|-----------------------|--------------------------|-----------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------|
| | | | NMB | INMB | C/E | ICER |
| Deterministic Estimate of Cost Effectiveness (Base-case Estimate) | | | | | | |
| HRnV ADP | 2298 | 11.26 | 560564 | 1818 (>0) | 204 | ICER < 87000 ¹ |
| Traditional | 4142 | 11.26 | 558746 | -1818 (<0) | 368 | ICER > 87000 |
| Results of Probabilistic Sensitivity Analysis ² | | | | | | |
| HRnV ADP | 2299 (2197 - 2401) | 11.26 (11.24 - 11.28) | 560888 (559801 - 561691) | >0 in 71.7% of the iterations; <0 in 28.3% of the iterations | 204 (195 - 213) | ICER < 87000 in 71.7% of the iterations; ICER > 87000 in 28.3% of the iterations |
| Traditional | 4156 (4033 - 4281) | 11.26 (11.24 - 11.28) | 559081 (557993 - 559850) | >0 in 28.3% of the iterations; <0 in 71.7% of the iterations | 369 (358 - 380) | ICER > 87000 in 71.7% of the iterations; ICER < 87000 in 28.3% of the iterations |

¹Willingness-to-pay assumed to be 87000 SGD.
²Value(s) reported as median (range) when appropriate.

Table 1 Summary of Outcomes

For the base-case estimate [Table 1]:

1. HRnV ADP NMB > traditional protocol NMB (SGD 560564 compared to SGD 558746 respectively)
2. HRnV ADP INMB >0 indicating superior cost-effectiveness to the traditional protocol when point estimates are used.

After PSA, HRnV ADP NMB was 560888 compared to 559081 for the traditional protocol [Table 1]. HRnV ADP INMB positive proportion was 71.7% implying that HRnV ADP outperformed the traditional protocol in 71.7% of the Monte-Carlo simulations [Figure 2]. C/LY saved and ICER were in favour of HRnV ADP both in the base-case estimate and after PSA was performed.

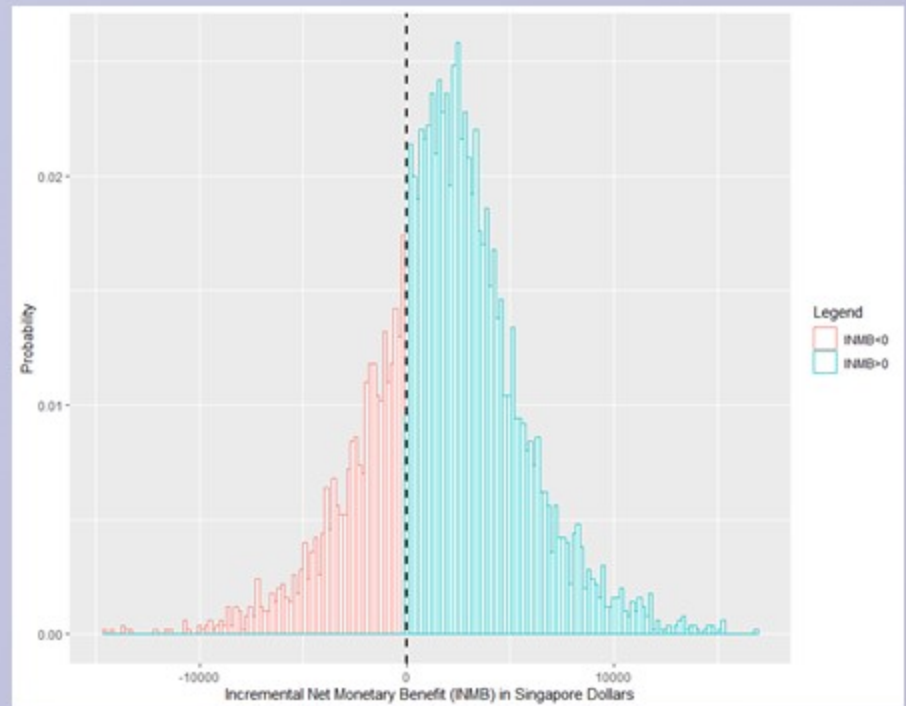


Figure 2 Histogram of INMB after PSA

Conclusions

The HRnV ADP was more cost-effective than the traditional protocol both in the base-case estimate and after PSA was performed. Large scale trial-based cost-effectiveness studies of HRnV ADP are needed to validate our results.