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AVBC Appropriate and Value-Based Care

Tan Tock Seng Hospital
NHG Health

A Value Evaluation of Falls Prevention Technology

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Introduction

Falls remain a prevalent and costly adverse event in hospital settings, with significant implications for patient outcome, length of stay (LOS), and healthcare costs. Tan Tock Seng Hospital (TTSH) embarked on the smart technology (PreSAGE® bed-exit prediction system) to enhance fall prevention efforts in high-risk patients.

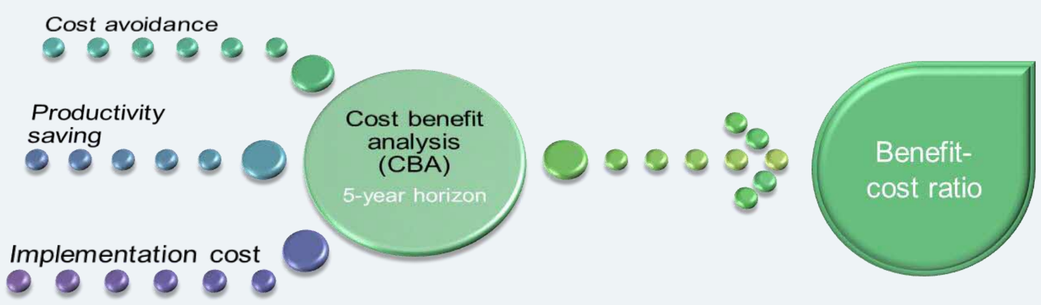
Initially implemented in 107 single/isolation rooms at TTSH, early results indicate a 42% reduction in overall falls rate in single/isolation room (comparison between September 2022 – June 2023 [pre-implementation] with September 2023 – June 2024 [post-implementation]).

Objective

To evaluate the value of scaling this smart technology across all multi-bedded cubicles in general wards, with the goal of enhancing patient safety and optimising resources.

Method

Value evaluation (cost-benefit analysis) was conducted by quantifying the multi-faceted benefits and costs of the implementation. This analysis compared the five-year investment outlay with projected savings.



Cost avoidance	Productivity saving	Implementation cost
40% reduction* of inpatient fall with major injury	Nurses' time saved from less time required to operate PreSAGE® system compared to Legacy system at 40% utilization# across general wards.	Procurement
40% reduction^ of inpatient fall with moderate or minor injury	This translates to reduction in nursing strain.	System integration
40% reduction^ of inpatient fall with no injury		Maintenance
Purchase of sensor mat		

* Derived from 2023 data on major injury falls involving patients at risk of injury and/or cognitive impairment who exited their beds without assistance.
^ Derived from the decrease in fall rates in single and isolation rooms within TTSH general wards before and after the implementation of the PreSAGE system.
# Based on point prevalence data of patients who fulfil bed-exit monitoring clinical criteria in all general wards.
Note: Injury levels are classified according to the National Database of Nursing Quality Indicators (NDNQI) classification.

Cost Components & Formulas

40% reduction* of inpatient fall with major injury

1. Cost of extra (attributable) LOS per patient
2. Cost of radiological investigation per patient
3. Cost of added monitoring per patient
4. Cost of post fall assessment per patient
5. Cost of surgical operation per patient
6. Admin overheads per patient (communication)
7. Admin overheads per patient (investigation)

(Per patient cost of extra LOS + radiological investigation + added monitoring + post fall assessment + surgical operation + admin overheads) x 40% reduction in inpatient falls with major injury

40% reduction^ of inpatient fall with moderate or minor injury

1. Cost of radiological investigation per patient
2. Cost of post fall assessment per patient
3. Admin overheads per patient (communication)
4. Admin overheads per patient (investigation)

(Per case cost of radiological investigations + post fall assessment + admin overheads) x 40% reduction in falls with minor or moderate injury

40% reduction^ of inpatient fall with no injury

1. Cost of post fall assessment per patient
2. Admin overheads per patient (communication)
3. Admin overheads per patient (investigation)

(Per case cost of post fall assessment + admin overheads) x 40% reduction in falls with no injury

Productivity saving

[A] System set-up time per patient (one time) (minute)

[B] System functional check time per patient per day (minute)

[C] Time to attend to false alarm per patient per day (minute)

[D] Total time spent per patient (ALOS = 7.8 days)

[E] Patient occupancy per bed in a year

[F] Estimated no. of bed using PreSAGE® system per year

[G] Total time required to operate system per year (hour)

70% RN and 30% EN ratio is used for calculation to reflect the current RN to EN ratio in GW.

Results

Cost to organization

- **Major injury** S$30,000 (rounded figure)
- **Moderate or Minor injury** S$600 (rounded figure)
- **No injury** S$300 (rounded figure)

Extrapolating fall-reduction effects hospital-wide yielded cumulative five-year savings that exceeded total implementation costs, generating a **benefit-cost ratio of 1.66**.

Qualitative feedback beyond monetary value;

- Easy to operate → Improved staff satisfaction
- Thermal-video playback → Instrumental in post fall management in understanding fall mechanism, especially in poor historian patients
- Dashboard thermal-videos view → Provide a bird's-eye view of patients at risk

Learning points

- A structured cost–benefit analysis provides tangible evidence to guide decision-making and resource allocation
- Value positioning is multi-dimensional
- Empower practitioners → Enable AVBC (Appropriate and Value-Based Cre)