Project Title

Fall Prediction and Prevention in Inpatient Open-Cubicle Wards

Project Lead and Members

Project lead: Adrian Tan

Project members: Arlene Dergam Aleta, Justin Lim, Chan Soo Sin, Alison Sim

Organisation(s) Involved

St. Andrew's Community Hospital

Healthcare Family Group(s) Involved in this Project

Medical, Nursing, Ancillary Care

Applicable Specialty or Discipline

Preventive Medicine, Rehabilitation Medicine, Palliative Medicine

Project Period

Start date: April 2023

Completed date: September 2023

Aims

To achieve the following objectives by the end of 2023:

1. Fall detection rate of >=80%^ for bed-exit prediction for 8-bedder open cubicle ward.
2. 67%* saving in manpower hours.
3. 34%* reduction in falls rate in SACH Integrated Building Ward 66 (Stroke Rehabilitation) open- cubicle ward.

Background

- St. Andrew's Community Hospital (SACH) is a service under the St. Andrew's Mission Hospital group. SACH was set up to provide intermediate medical care for rehabilitation and sub-acute care to children, adults, and the elderly; including those with dementia or needing palliative care.

- In 2022, the overall fall rate was at 0.51 per 1,000 bed days. Approximately 60% of the fall incidents occurred at night when the manpower was lean and 80% of them happened near the patient's bedside.

- With the successful implementation of PreSAGE®# at TTSH in all their single-bed and isolation rooms, SACH explored the feasibility of adopting the solution in the inpatient subsidized open-cubicle wards.

- Ward 66 (Stroke Rehabilitation Ward) was selected to be the pilot ward with a fall rate of 1.20 per 1,000 bed days in 2022.

Methods

See poster appended/below

Results

1. Analysis of 3-day (72 hours) data in Sep 2023,

- True Positives (Correct alarm triggers): 78%

- False Positives (False Alarm triggers): 22%

- False Negative (Potential Fall without alarm activation): 0%

2. Achieved 96% saving in man-hours which is equivalent to approximately one nursing FTE avoided on setting up and performing functional check for bed-exit sensors.

3. Fall rates reduced by 44% in the open cubicles of Ward

66.

Conclusion

See poster appended/below

Project Category

Care Continuum

Intermediate and Long Term Care & Community Care, Nursing Home,

Care & Process Redesign

Risk management, Preventive approach, Value Based care, Safe care

Keywords

Fall risk, bed sensor, PreSAGE, alarm, inpatient, fall incidents, bedside, rehabilitation and sub-acute care.

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ST. ANDREW'S COMMUNITY HOSPITAL

ST. ANDREW'S MISSION † HOSPITAL

Fall Prediction and Prevention in Inpatient Open-Cubicle Wards

Adrian Tan[1], Arlene Dergam Aleta[2], Justin Lim[3], Chan Soo Sin[4], Alison Sim[2]

1: Facilities; 2: Nursing; 3: Biomedical Engineering ; 4: Healthcare Performance & Innovation Office

1. Problem Statement

- St. Andrew's Community Hospital (SACH) is a service under the St. Andrew's Mission Hospital group. SACH was set up to provide intermediate medical care for rehabilitation and sub-acute care to children, adults, and the elderly; including those with dementia or needing palliative care.

- In 2022, the **overall fall rate was at 0.51 per 1,000 bed days**. Approximately **60% of the fall incidents occurred at night** when the manpower was lean and **80% of them happened near the patient's bedside**.

- With the successful implementation of PreSAGE®# at TTSH in all their single-bed and isolation rooms, SACH explored the feasibility of adopting the solution in the inpatient subsidized open-cubicle wards.

- Ward 66 (Stroke Rehabilitation Ward) was selected to be the pilot ward with a **fall rate of 1.20 per 1,000 bed days in 2022**.

    #: PreSAGE® is based on a thermography sensor that generates thermal images to predict bed exits through the use of artificial intelligence (AI) software

2. Project Aim

- To achieve the following objectives **by the end of 2023**:

  - Fall **detection rate of >=80%^** for bed-exit prediction for 8-bedder open cubicle ward.

  - **67%* saving in manpower hours**.

  - **34%* reduction in falls rate** in SACH Integrated Building **Ward 66 (Stroke Rehabilitation) open-cubicle ward**.

^: TTSH's target detection rate was at 100% for single rooms. SACH moderated it to 80% for 8-bedder open cubicle wards
*: Reference targets from TTSH's PreSAGE pilot for single rooms

3. Risk & Complexity

- Technical aspects:
  - **False alarms** are mostly due to patients extending one leg out of the bed or family member leaning towards the patients on the bed. Optimization and AI learning helped to address the issues.
  - Lack of **visual cue** (or display) indicating the bed number when PreSAGE alarm is triggered.

- Resources:
  - Lack of manpower attending to PreSAGE® alarm triggered by possible fall incident remains a challenge. It is therefore important to **involve all care staff and family members/ caregivers to work together to prevent falls in the wards**.

4. Potential Solutions

- SACH **adopted the PreSAGE® bed-exit sensor** and installed **20 units at the open cubicles** and **2 units at the Isolation Rooms** in one of our sub-acute wards from Apr 2023.
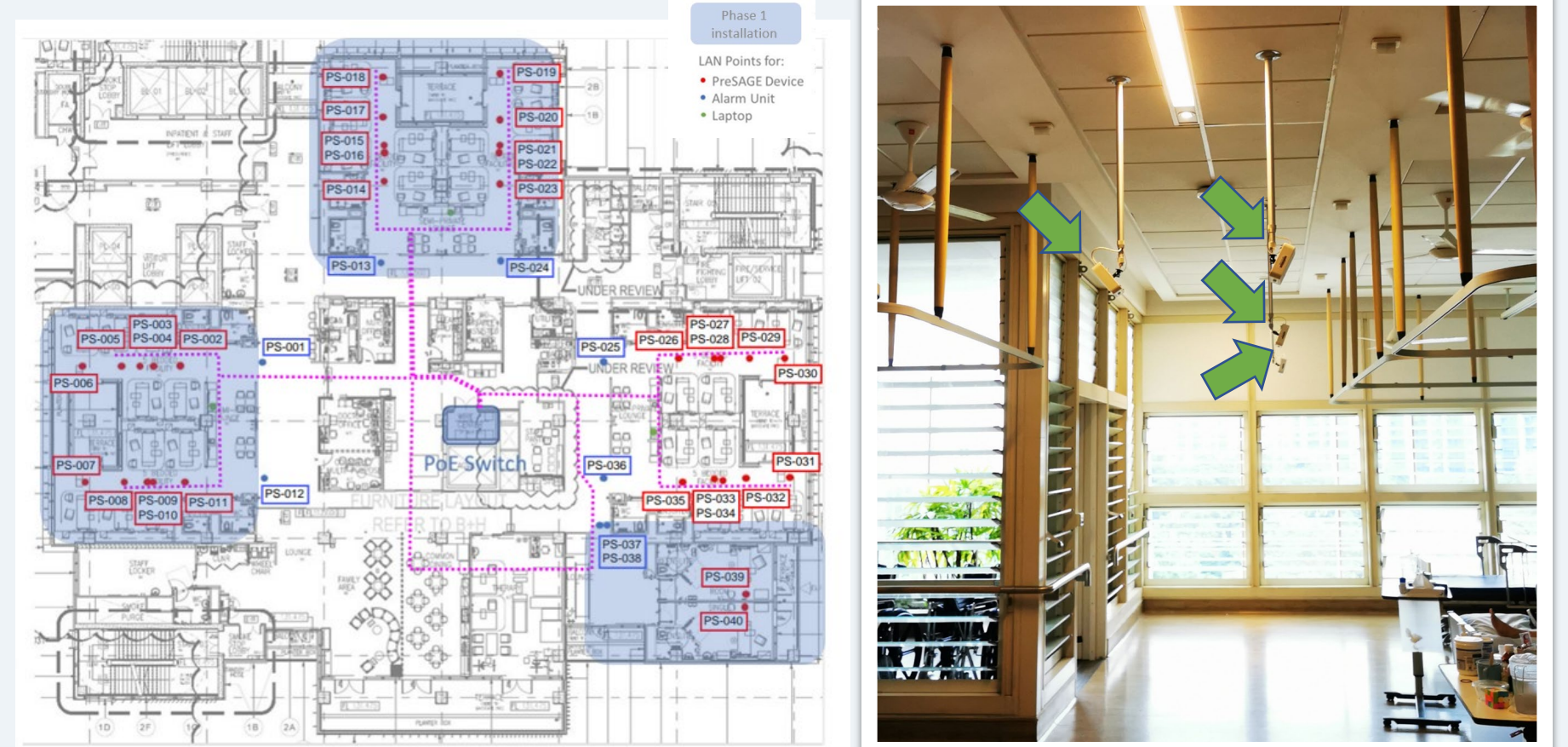

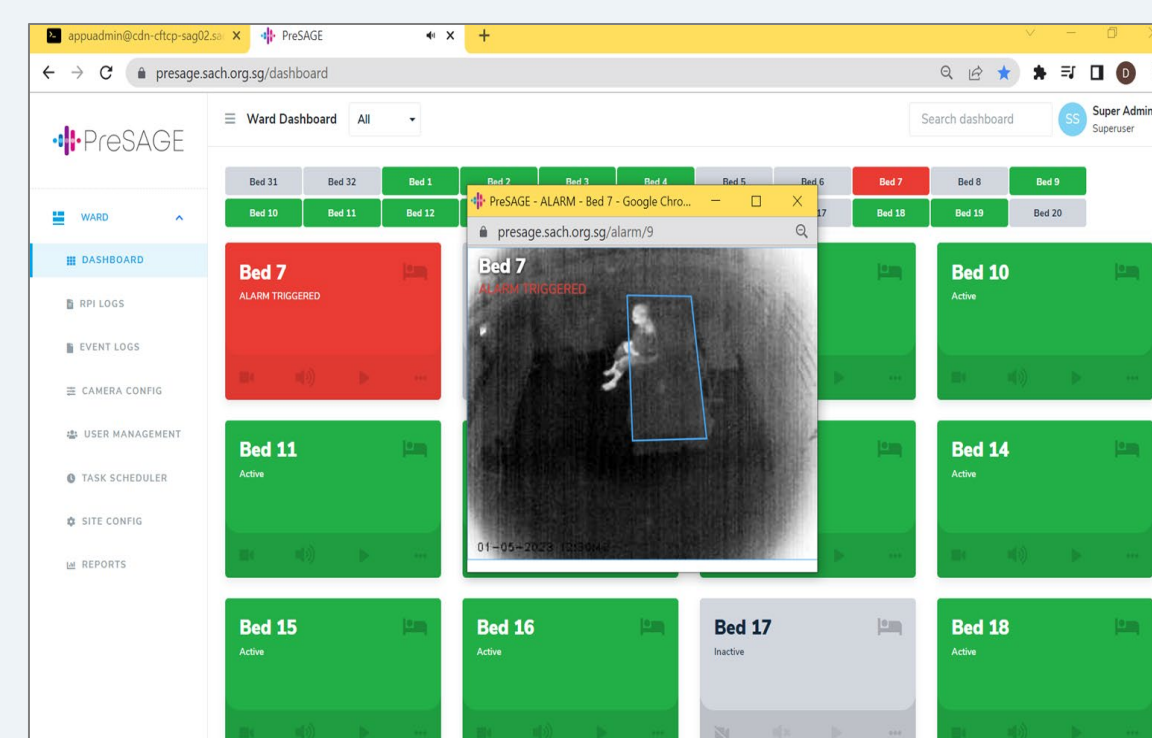*Figure 1. PreSAGE® sensor units installed at Sub-acute Ward 66.*

Figure 2. Live dashboard enables staff to continuously monitor patients remotely and automatically
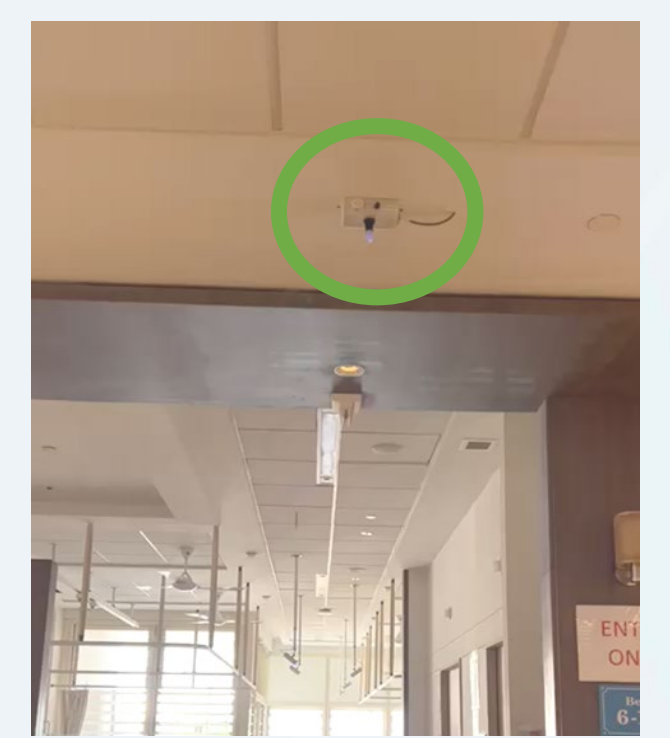
Figure 3. Alarm units on the ceiling

5. Outcome & Impact

- Analysis of 3-day (72 hours) data in Sep 2023,
  - **True Positives (Correct alarm triggers): 78%**
  - False Positives (False Alarm triggers): 22%
  - False Negative (Potential Fall without alarm activation): 0%
- **Achieved 96% saving in man-hours which is equivalent to approximately one nursing FTE avoided** on setting up and performing functional check for bed-exit sensors.

	Time to setup and perform function check for 20 beds for 3 shifts (hours/ year)	Remarks
Existing Bed Exit System	2,190	6 mins per bed
PreSAGE	73	12 sec per bed
Time-saved	**2,117**	

Table 1. Time-saved in setting up bed-exit sensor by application of PreSAGE®

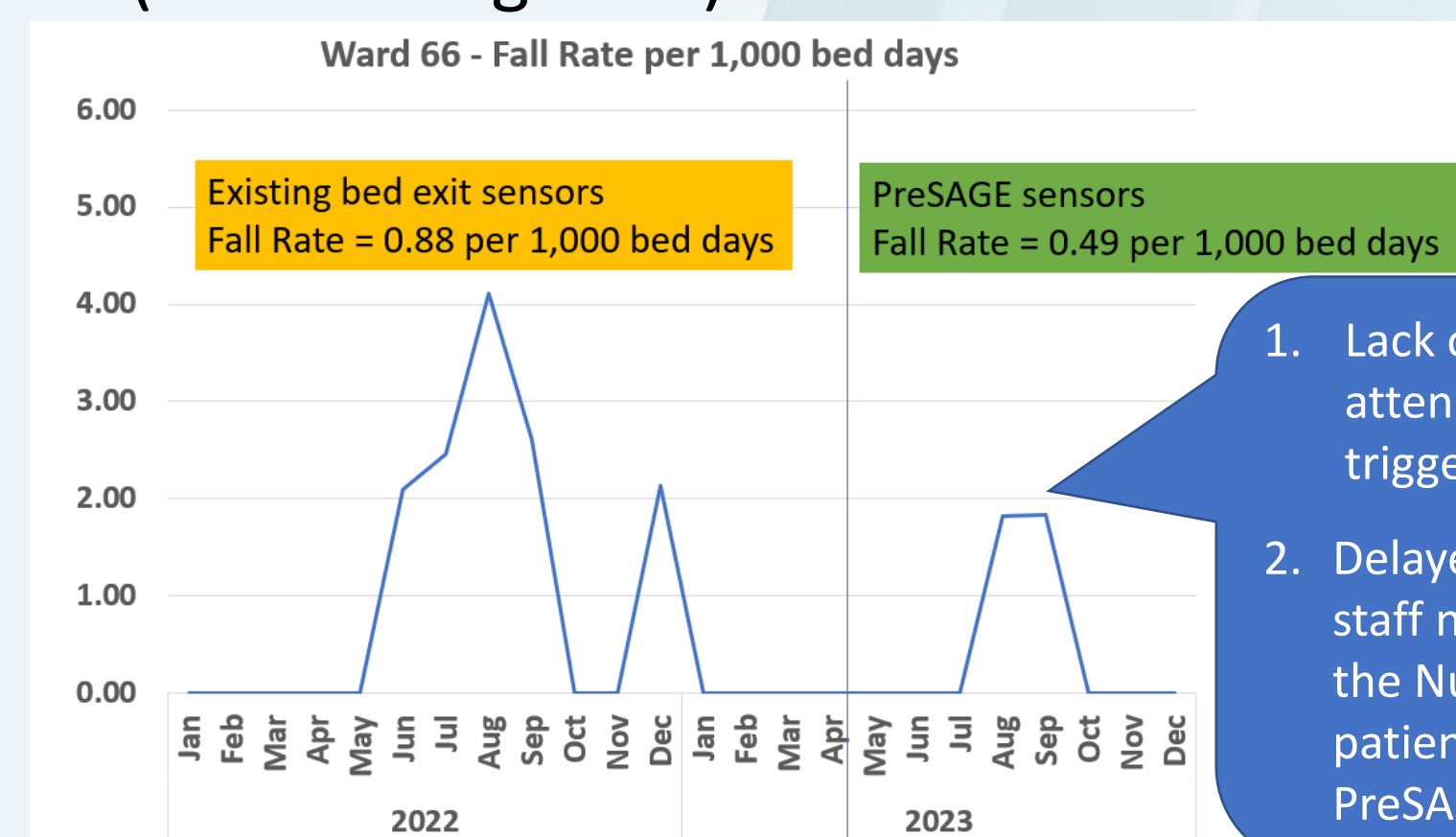- Fall rates **reduced by 44%** in the **open cubicles of Ward 66**. (Refer to Figure 4)

Ward 66 - Fall Rate per 1,000 bed days

Existing bed exit sensors
Fall Rate = 0.88 per 1,000 bed days

PreSAGE sensors
Fall Rate = 0.49 per 1,000 bed days

1. Lack of manpower to attend to the PreSAGE triggered alarm.
2. Delayed response due to staff needed to check at the Nursing Counter which patient triggered the PreSAGE alarm.

Figure4. Ward 66 Fall Rates per 1,000 bed days between 2022 and 2023