

Real World Evidence (RWE) Evaluation of Cost Savings through Continuous Vital Sign Monitoring in the Medical-Surgical Ward: A National Health Service (NHS) Experience

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Background

- Hospital medical-surgical units (MSU, or “wards”) provide care to patients for a variety of conditions.
- Unrecognized deterioration may take place due to numerous causes.
- The literature is unequivocal and robust in that a significant proportion of these adverse events can be prevented by improved monitoring, but information on the cost-effectiveness of improved monitoring is lacking.
- Due to patient complexity and staffing resources, compliance with scheduled routine vital sign measurement is often low and escalation time points may be missed.
- To address this gap in timely detection of deterioration, continuous vital sign monitoring systems have emerged as an essential component potential for early detection of deterioration in a patient’s condition, but the perceived cost of continuous monitoring deters some clinicians.

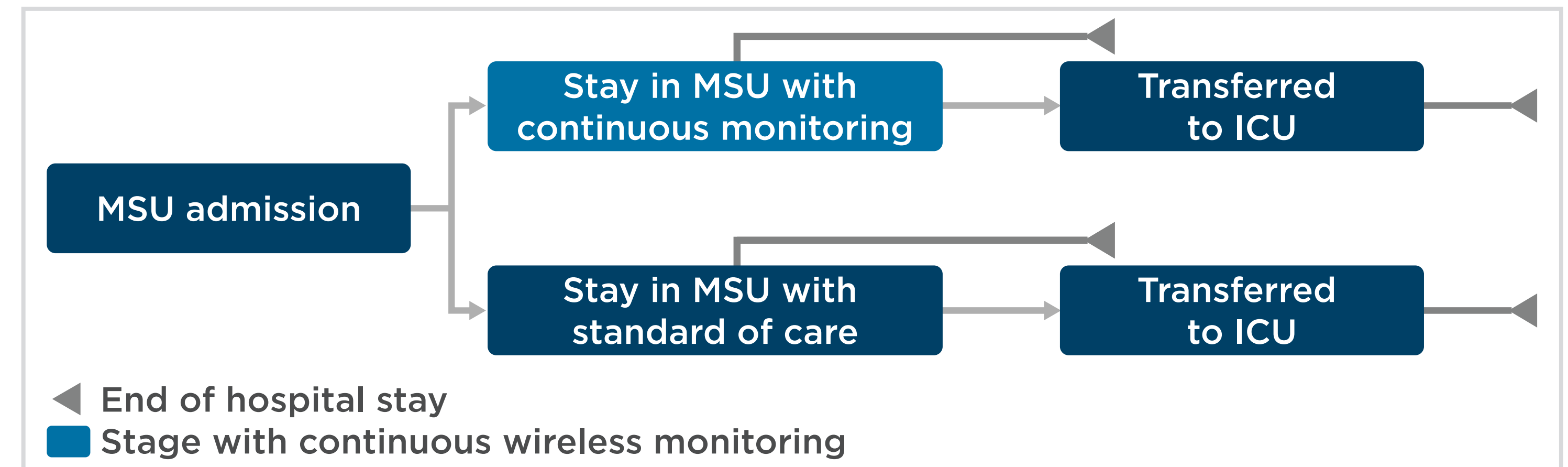
Objective

- Use Real World Evidence to estimate cost-savings from continuous vital sign monitoring in National Health Service medical-surgical wards.

Methods

- A model to estimate cost-savings for patients receiving continuous vs. intermittent vital sign monitoring (oxygen saturation, pulse rate, respiratory rate) in wards was recently published using United States data and was adapted for this study¹ (Figure 1).
- 2022 Real World Evidence (RWE) was extracted from the Chelsea and Westminster Hospital NHS Foundation Trust (CWFT) and was used as model inputs (Table 1).
- The reduction ratios found in the US model were applied to the RWE values revealed from the CWFT.
- The analysis modeled 50% and 100% adoption rates of continuous monitoring technologies across the ward.

FIGURE 1: SIMPLIFIED MODEL DIAGRAM



Results

- Potential annual cost-savings for ward stays were estimated at £4,611,803 and £9,223,605 for a 50% and 100% adoption rate (Table 2).
- The largest contribution to cost-savings came from reduced ward average length of stay (ALOS) for patients not transferred to the intensive care unit (ICU).
- Additional cost-savings were conferred from reductions in ICU ALOS, in-hospital cardiac arrest (IHCA) and rapid response team (RRT) activation.

TABLE 1: KEY ANALYSIS INPUT PARAMETERS

Analysis Inputs	Value	
General Inputs		
Number of annual Discharges in Ward	24,000	
Continuous monitoring adoption rate	50.00% and 100.00%	
Clinical Data Inputs		
	SoC	Continuous Monitoring
Average LOS in Ward among patients without ICU stay, per discharge (days)	7.7	7.1
Average Ward LOS prior to-ICU transfer, per discharge (days)	8.5	6.0
Average LOS in ICU (days)	6.2	3.3
Ward to ICU transfer rate	2.18%	2.13%
RRT events/1000 discharges	371.0	310.1
IHCA events/1000 patients	4.6	0.6

Analysis Inputs	Value
Cost inputs	
Ward cost per patient per day	£333
ICU cost per patient per day	£2,730
RRT cost per activation	£234
IHCA-associated hospitalization cost per arrest	£203

Abbreviations: SoC, Standard of care; ICU, Intensive care unit; LOS, Length of stay; RRT, Rapid response team; IHCA, In-hospital cardiac arrest

Reduction Ratios from US Model¹

Reductions due to Implementation of Continuous Monitoring Technology	
ICU Transfer Rate	0.02
Ward LOS	0.07
Ward LOS prior ICU	0.29
ICU LOS	0.45
RRT	0.16
IHCA	0.85

TABLE 2: CONTINUOUS MONITORING ECONOMIC OUTCOMES

	Unit Cost Per Discharge		Scenario 1: Continuous Monitoring Adoption = 50%			Scenario 2: Continuous Monitoring Adoption = 100%		
	SoC	Continuous Monitoring	Annual Hospital Cost, SoC	Annual Hospital Cost, Continuous Monitoring	Annual Hospital Cost Savings	Annual Hospital Cost, SoC	Annual Hospital Cost, Continuous Monitoring	Annual Hospital Cost Savings
Hospital Stay			£535,694,400	£531,082,597	£4,611,803	£535,694,400	£526,470,795	£9,223,605
Ward stay without ICU transfer	£2,564.10	£2,372.52	£61,538,400	£59,239,491	£2,298,909	£61,538,400	£56,940,582	£4,597,818
Ward stay before transfer to ICU	£2,830.50	£2,009.28	£67,932,000	£67,705,476	£226,524	£67,932,000	£67,478,952	£453,048
ICU Stay	£16,926.00	£9,154.24	£406,224,000	£404,137,630	£2,086,370	£406,224,000	£402,051,261	£4,172,739
RRT Activation	£86.81	£72.57	£2,083,440	£1,912,568	£170,872	£2,083,440	£1,741,696	£341,744
IHCA Hospitalization	£0.95	£0.14	£22,800	£13,070	£9,730	£22,800	£3,340	£19,460

Discussion and Conclusions

- Despite quality improvement efforts, patient deterioration is global and constant.
- There is continued need to improve early detection of patient deterioration.
- Early detection with implementation of continuous monitoring technology on hospital wards may confer significant cost savings and improved patient outcomes.

Directions for Further Study

- Identify RWE capabilities in other European countries and apply model to determine if similar patient- and cost-savings outcomes can be demonstrated.

References

- Beard JW, Sethi A, Jiao W, Hyatt HW, Yapici HO, Erslon M, Overdyk FJ. Cost savings through continuous vital sign monitoring in the medical-surgical unit. *J Med Econ.* 2023 Jan-Dec;26(1):760-768.