

Budget Impact Model for the Use of Continuous Monitoring of Patient Vital Signs in US Hospital Medical-Surgical Floors

D. Brandt¹, M. Blüher², F. Distler², R. Saunders²
 1. Medtronic, USA; 2. Coreva Scientific, Germany

Objectives:

- Continuous monitoring (CM) of patient vital signs during their hospital stay can to reduce mortality and ICU length of stay.
- Recently, a trend towards reduced risk for unplanned ICU transfer and rapid response team (RRT) activation has also been observed when using CM.¹
- The budget impact of introducing CM to the medical-surgical floor (MSF) of a US hospital is assessed from the hospital perspective.

Methods:

- The model was developed in Excel to estimate the costs of care for patients on the medical-surgical floor, comparing use of standard monitoring practice to use of CM of temperature, respiratory rate, heart rate, and movement.
- Effectiveness data were taken from a meta-analysis of CM, with a relative risk (RR) of 0.86 (95% CI 0.67-1.11) for unplanned ICU transfers and RR 0.61 (95% CI 0.26–1.43) for RRT activations.¹ (Table 1)
- The cost of CM was \$10,000 per bed per year.
- Probabilistic sensitivity analysis (PSA) tested outcome robustness to changes in inputs.
- Costs are presented in 2022 USD (\$).

Table 1 Key Model inputs

	Traditional monitoring	Continuous monitoring
Unplanned ICU transfer rate	5.3% ²	4.6% (RR: 0.86) ¹
RRT activation rate	18.9% ²	11.5% (RR: 0.61) ¹
MSF days before ICU transfer	16.82 days ³	11.94 days ³
ICU stays	4.53 days ³	2.45 days ³
ICU cost per day	\$3,083 ⁴	
General care floor cost per day	\$1,882 ⁴	
RRT cost per activation	\$282 ⁵	

Disclaimer

DB is an employee of Medtronic. MB and FD are employees and RS is the owner of Coreva Scientific, which received consultancy fees for this work. This research was funded by Medtronic.

Reference

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Conclusion:

- CM has the potential to be a cost-saving solution for hospitals and is likely to be of particular interest to hospitals faced with staff shortages or high workloads.

Results:

- Adopting CM for a hospital with 350 post-surgical patients per month using 50 monitored beds would reduce adverse-event-related costs from \$10,381,076 to \$6,385,504. (Figure 1)
- During the PSA, cost savings with CM were identified in 93.8% of simulations.

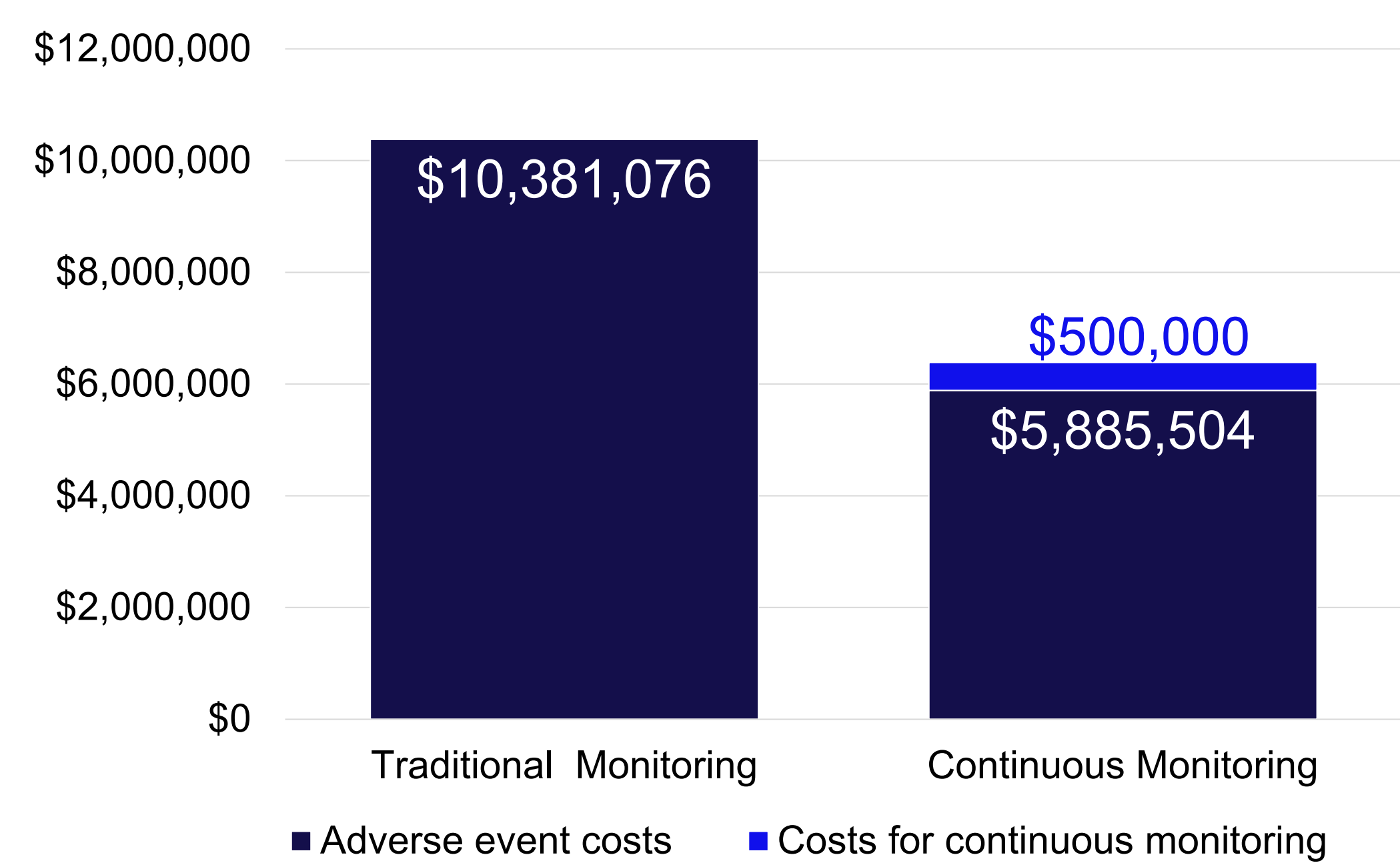


Figure 1 Adverse-event-related yearly costs for a hospital with 50 medical-surgical floor beds and 350 patients per month

- Use of CM reduced the cost of adverse events, saving \$4,495,572 (cost saving in 97.8% of simulations).
- Improved patient outcomes with CM were indicated via:
 - **Fewer unplanned ICU transfers** (Figure 2A)
 Basecase: 31 fewer; PSA: Reduction in 87.2% of simulations
 - **RRT activations** (Figure 2A)
 Basecase: 310 fewer; PSA: Reduction in 85.6% of simulations
 - **General care floor days** (Figure 2B)
 Basecase: 1,458 fewer; PSA: Reduction in 99.2% of simulations
 - **ICU days** (Figure 2B)
 Basecase: 539 fewer; PSA: Reduction in 100% of simulations

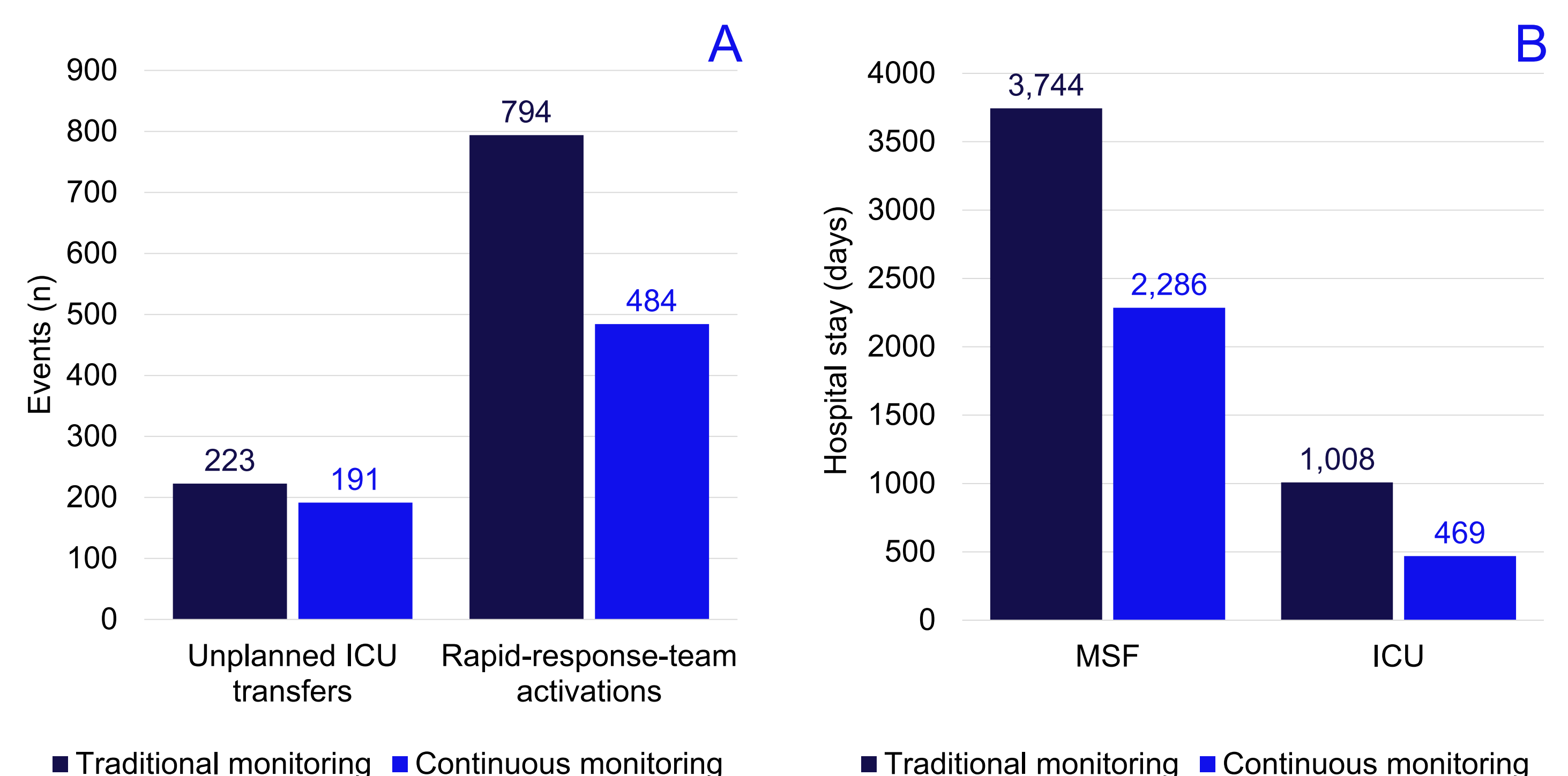


Figure 2 One-year clinical outcomes for a hospital with 50 general care floor beds and 350 patients per month A Escalation of care events B Length of stay