

Evaluation of Opportunities and Processes For Customizing Patient Specific Alarms

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Introduction

Alarm fatigue plagues hospitals across America, jeopardizing patient safety. Of the 100's of alarms that sound in hospitals,¹ 85-99% are not clinically relevant.² Studies have looked into removing unnecessary heart rate (HR) and oxygen saturation (SpO2) alarms as ways to reduce alarm fatigue, with individualized parameters having great success.^{3,4} Sufficient communication of alarm parameters within the clinical team, however, is critical to this customization of alarm parameters.⁵

Aim

Evaluate current state of alarms and alarms management by physicians and nurses to find opportunities to customize patient specific alarm parameters.

Project Design

A Lean Six Sigma DMAIC methodology was used. In scope for this project were define, measure, and analyze phases.

- **Define**
 - Problem: Alarm Fatigue
 - Goal: Reduce alarms through RN-MD communication and patient specific HR and SpO2 alarm parameters
- **Measure**
 - Observations: 4 inpatient hospital units
 - 1 Med-Surg, 1 ICU, and 2 PCU
 - Interview: 44 nurses surveyed in-person regarding rounding, communication, processes, and alarms
 - Data: 196 patients regarding alarms, monitoring, and orders
- **Analyze** in next slides (improve and control in future)

Figure 1: Alarms Per Patient Per Day

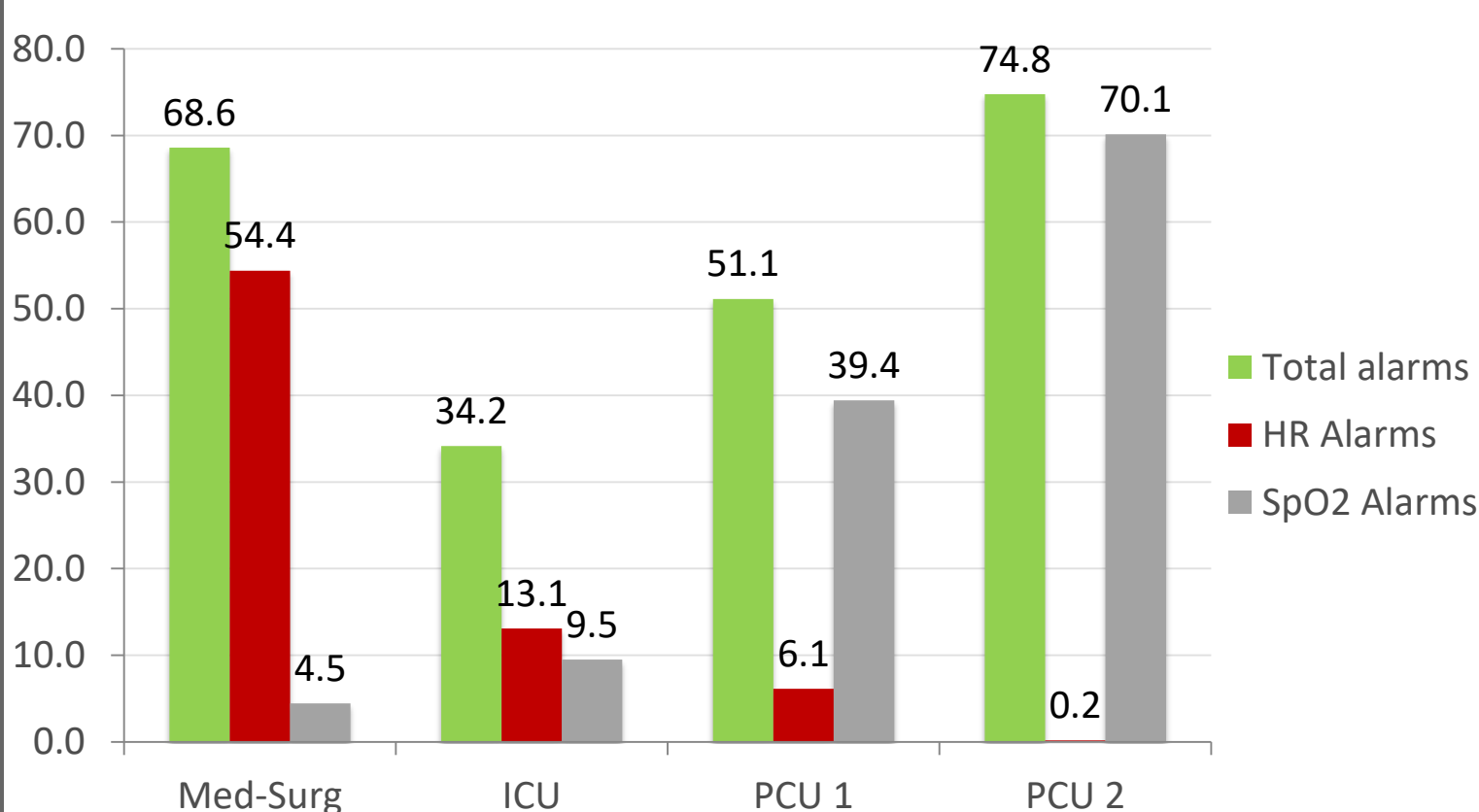


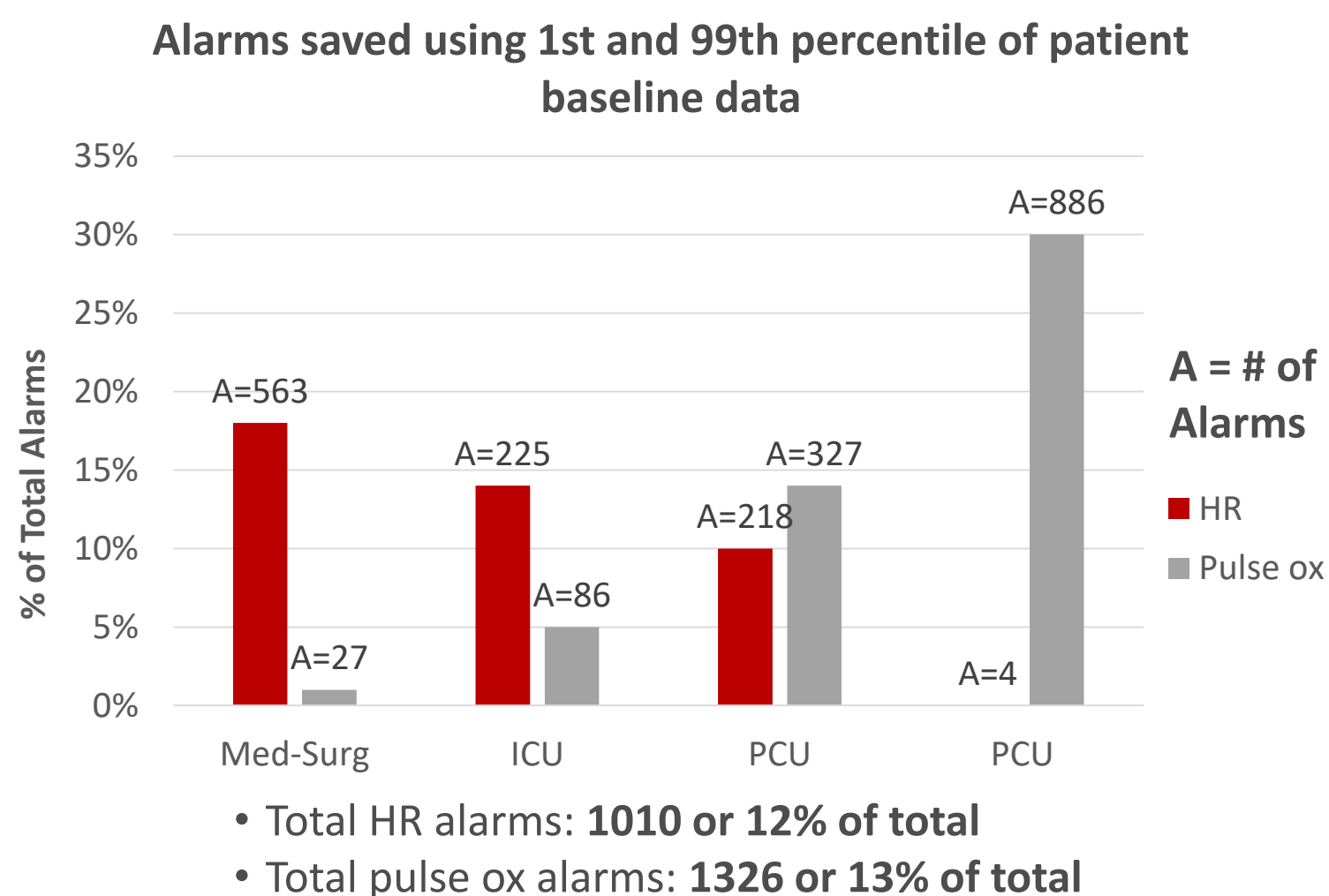
Table 1: Where Do Most Alarms Come From?

	Total Patients	Top 10% of Patients	Top 10% of Patient Alarms	Top 10% of Time (2 hrs)
Med-Surg	56	6	70% (2204)	41% (897)
ICU	52	5	43% (673)	62% (418)
PCU 1	46	5	42% (922)	39% (359)
PCU 2	44	4	76% (2271)	22% (489)

Recommendations

1. Validate method for individualizing HR and SpO2 alarms
2. Explore incorporating consistent discussion of alarms into RN-MD rounding
3. Evaluate opportunities to increase nurse autonomy around alarms
4. Build a more streamlined process of changing alarm limits

Figure 2: Opportunity for Individualized Alarms

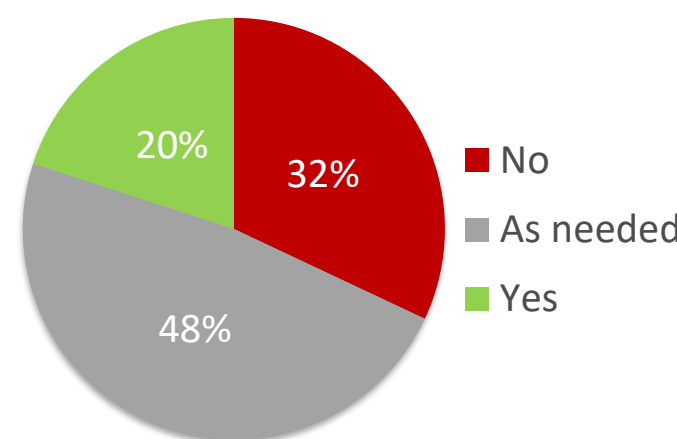


Means to Change Parameters: RN-MD Rounding

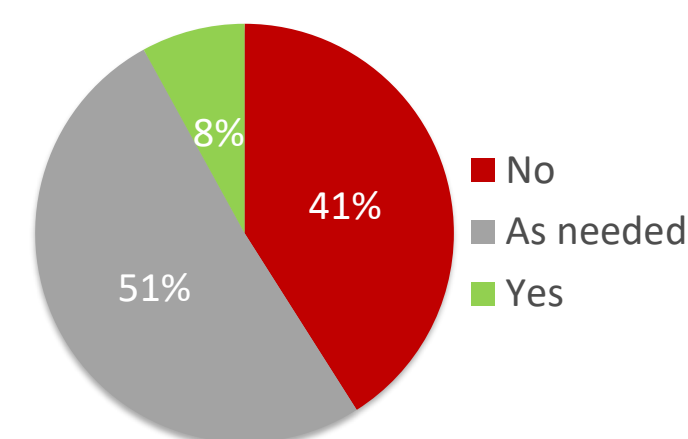
The effect of RN-MD Rounding on Alarms was not significant (P=.294)

- Rounded: 58.47 alarms per patient/24 hours
- Not-rounded: 37.48 alarms per patient/24 hours

Consistent Round Discussion of Continuous Monitoring



Consistent Round Discussion of Alarm Parameters



Means to Change Parameters: RN-MD Communication

RN 8 Steps → MD 8 Steps → RN 11 Steps

Wait for MD

Where process breakdowns: nurse perspective

- Unclear who to contact
- MD often slow to respond, if at all
 - MDs do not acknowledge alarms when on floor or take ownership of alarms

Process workaround

- Nurses change alarms then ask MD (saves 10 steps and time)
 - 37% nurses interviewed called for more nurse autonomy to address problem

Conclusions

- **HR and SpO2 alarms responsible for bulk of alarms**
 - HR responsible for 34% of total alarms (3375)
 - SpO2 responsible for 52% (5134)
- **Areas for improvement**
 - Specific patients at specific times
 - Top 10% responsible for 61% of total alarms (6070)
 - Top 2 hours responsible for 36% of these alarms (2163)
 - Customizing SpO2 and HR alarms could decrease alarms 24% using percentile data, likely more using additional vital sign data and clinical judgment
 - Communication processes need to be more efficient and standardized

References

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3. Welch J. An evidence-based approach to reduce nuisance alarms and alarm fatigue. *Biomed Instrum Technol*. 2011 Spring;Suppl:46-52.
4. Sendelbach S, Funk M. Alarm fatigue: a patient safety concern. *AACN Adv Crit Care*. 2013 Oct-Dec;24(4):378-86; quiz 387-8.
5. Dewan M, Wolfe H, Lin R, Ware E, Weiss M, Song L, MacMurchy M, Davis D, Bonafide C. Impact of a Safety Huddle-Based Intervention on Monitor Alarm Rates in Low-Acuity Pediatric Intensive Care Unit Patients. *J Hosp Med*. 2017 Aug;12(8):652-657.

- Title (15 or fewer words): Evaluation of Opportunities and Processes For Customizing Patient Specific Alarms
- Description (100 or fewer words): Alarm fatigue disrupts provider care and risks patient safety across hospitals. At our institution, we aimed to reduce the number of irrelevant alarms by investigating methods of customizing individual alarm parameters. We found the majority of alarms coming from HR and SpO2 alarms relegated to a small cohort of patients. In concurrence with recent research, using patient baseline data and clinical judgment to set more appropriate parameters for these patients could significantly reduce unnecessary alarms. The process to change alarm parameters, however, also needs modification to reduce barriers and make customizing alarms more efficient and understandable for clinicians.