The Stats on the Desats: Alarm Fatigue and the Implications for Patient Safety

Levi Disrud, Alex Borgen, MFA, Becky Christnacht, Hannah Anderson, Jenny Ng, Joel Weller, Dr. Peter Noseworthy MD, Halley Davison, Danielle O'Laughlin, PA-C, MS, Rachesl Olson, MSc, PhD.
Division of Heart Rhythm Physiological Monitoring and Interpretation Lab, Division of Mayo Clinic School of Health Sciences - PA Program
Site: Mayo Health System, Rochester, MN

INTRODUCTION

BACKGROUND

Many healthcare facilities are now faced with staff shortages across the nation and an increased amount of workload. One of the main problems is an increased amount of alarm alerts causing alarm fatigue for the staff. The present technology at many facilities is outdated and Masimo offers noninvasive and continuous monitoring technologies. The Masimo system examines the oxygen, pulse rate and perfusion index readings, with a breakthrough technology to measure through motion and low perfusion. The system determines how care is facilitated based on patient-specific SPO2 monitoring indications. Masimo generates alarms when the patient goes outside the set parameters. Initially, we thought implementing: a streamlined communication method, a designated paper-trail for patient monitoring, staff education, and establishing roles for all team members involved in Masimo patient care.

Our goal is to look at interventions that may help decrease the number of alarms thereby reducing alarm fatigue to provide better patient care.

GAP IN KNOWLEDGE

The gap in quality for Masimo monitoring at the Mayo Clinic lacks an efficient way for monitoring technicians (techs) to alert nursing staff of critical alarms. Currently, no standard communication method is in place for patient-care teams to call the techs when alarms are false or self-resolving.

RESEARCH QUESTION

What is the root cause of alarm fatigue?

Improving signage, reducing the number of patients on Masimo, and educating staff will reduce alarm burden.

METHODS

All measurements were recorded on Fridays, AM and PM, each a duration of two hours. The alarms were categorized as manually snoozed alarms or self-resolved alarms. The sample size was the number of patients on Masimo for that time period.

Alarms and number of patients were recorded pre-intervention. Based on initial data, the group met to discuss interventions to reduce alarm fatigue. Stakeholder input was given in the initial meeting, and timely communication was identified as a major concern from both groups.

The first intervention was to improve signage on the SpO2 monitor cart to patient care teams to contact the techs. Measurements were attained as outlined above. Surveys were sent to the techs at the completion of each intervention.

The second intervention utilized the secure chat function in Mayo's electronic medical record, Epic. Using a template script, techs messaged nurses to inquire about Masimo discontinuation for patients who had been stable. The nurse decided if the patient met criteria for discontinuation and contacted service accordingly. Data was collected in the same manner as previously stated and in conjunction with the first intervention.

BASELINE

AVERAGE SELF RESOLVED ALARMS: **121** (N=43 PATIENTS)

AVERAGE SNOOZED ALARMS: **38** (N=43 PATIENTS)

3 ALARMS PER PATIENT PER HOUR

75% OF ALARMS ARE PATIENT RESOLVED

AVERAGE RED ALARMS: **159** (N=43 PATIENTS)

RESULTS

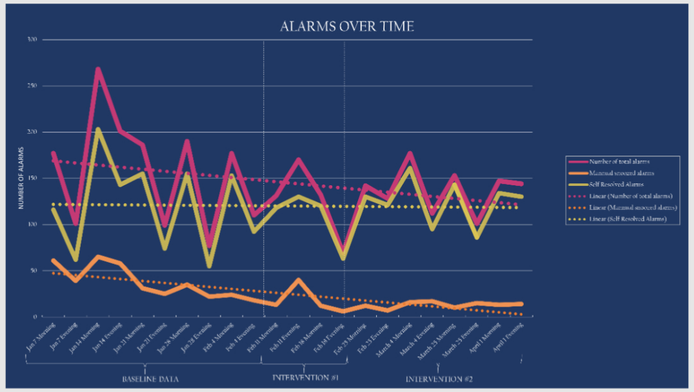

Figure 1 : Alarms Over Time. Demonstrates number of alarms over time through the baseline data collection, intervention #1 and intervention #2 data collection. Includes total alarms, manual snoozed alarms, self resolved alarms, and trend lines for each.

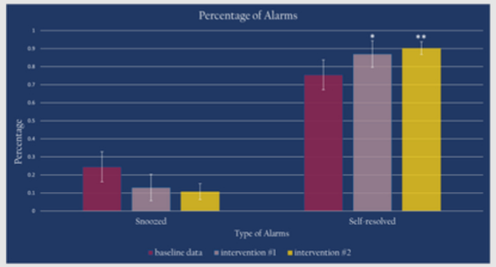

Figure 2: Mitigation efforts of Alarm Fatigue. The average baseline data (n=10), intervention #1 (n=4) and intervention #2 (n=8) are depicted with standard error bars. * indicates a p-value less than 0.05, ** indicates a p-value less than 0.005 compared to baseline data.

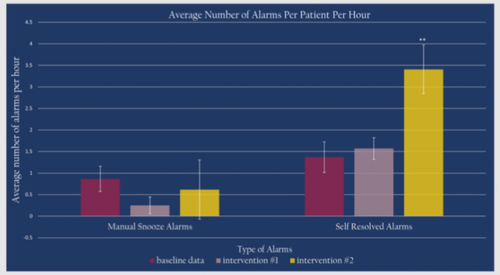

Figure 3: Average Number of Alarms Per Patient Per Hour. Average number of snoozed versus self-resolved alarms per patient per hour for baseline data (n=10), intervention #1 (n=4), and intervention #2 (n=8) are depicted with standard error bars. * indicates a p-value less than 0.05, **indicates a p-value less than 0.005 compared to baseline data.

INTERVENTION 1

AVERAGE SNOOZED ALARMS: **18** (N=34 PATIENTS)

AVERAGE SELF-RESOLVED ALARMS: **108** (N=34 PATIENTS)

AVERAGE RED ALARMS: **125** (N=34 PATIENTS)

INTERVENTION 2

AVERAGE RED ALARMS: **138** (N=37 PATIENTS)

AVERAGE SELF-RESOLVED ALARMS: **125** (N=37 PATIENTS)

AVERAGE MANUALLY SNOOZED ALARMS: **13** (N=37 PATIENTS)

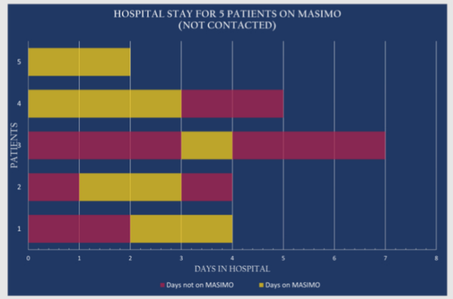

Figure 4 :Hospital Stay for 5 Patients on Masimo (Not Contacted). Hospital stay for 5 random patients on Masimo who were not contacted for our intervention.

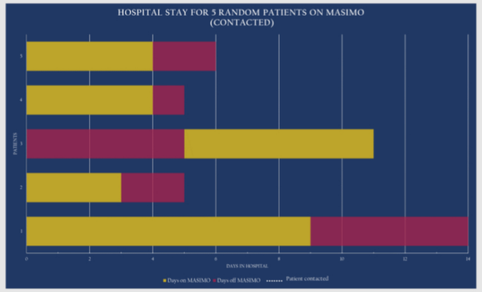

Figure 5: Hospital Stay for 5 Random Patients on Masimo (Contacted). Hospital Stay for 5 Random Masimo patients who were chosen for Intervention number 2.

CONCLUSION

Masimo monitoring and alarm fatigue at Mayo Clinic is a complex issue with many moving parts. The number of alarms is directly related to the number of patients on continuous monitoring at the hospital. Theoretically, discontinuing eligible patients would lead to reduced alarms, but this was complicated by the monitoring system, communication between staff, and the ordering/discontinuing process in Epic. Much of the frustration from staff stems from the cumbersome nature of communication with the phone system between nurses and techs.

Manually snoozed alarms were reduced after both interventions, achieving a net reduction of 16.9% alarms. Systemic change is needed to reduce alarms, improve communication, and improve work unit culture for those involved in Masimo monitoring. Alarm fatigue is a significant problem in healthcare that needs to be addressed at Mayo to ensure patient safety, decrease staff burnout, and improve the sensitivity of SpO2 monitoring to detect emergencies.

DISCUSSION

SIGNIFICANCE

The project's aim was to reduce alarms by 20%. Targeting the number of monitored patients was the most promising intervention to reduce alarm fatigue. Though we were unable to attribute exactly what the precipitating agent was, this data was statistically significant and could be a source of investigation. Possible theories include: new signs were effective, patients contacted staff to initiate faster intervention, or nursing is responded faster.

When evaluating the second intervention, inconsistencies were observed in Epic such as: continuous monitoring order placement and discontinuation from provider to provider.

LIMITATIONS

Alarm fatigue reduction is complex and requires evaluation from multiple perspectives. The process was limited by technology limitations, effectiveness of designed workflows, time constraints and interprofessional communication.

FUTURE CONSIDERATIONS

Improve strategies to communicate discontinuation of monitoring and order entry on Epic.

Develop a prompt for providers via Epic to assess the need for continued SpO2 monitoring for patients.

Integrate an efficient communication system, such as Vocera, which would allow for direct contact between the techs and nursing staff.

REFERENCES

1. Bach, T. A., Berglund, L.-M., & Turk, E. (2018). Managing alarm systems for quality and safety in the hospital setting. *BMJ Open Quality*, *7*(3). https://doi.org/10.1136/bmjoq-2017-000202
2. The Joint Commission. (2021). *National Patient Safety Goals Report: Effective January 2021 for the Hospital Program*. Retrieved April 7, 2022, from https://www.jointcommission.org/-/media/tjc/documents/standards/national-patient-safety-goals/2021/npsg_chapter_hap_jan2021.pdf
3. Perla, R. J., Provost, L. P., & Murray, S. K. (2013). Sampling considerations for Health Care Improvement. *Quality Management in Health Care*, *22*(1), 36–47. https://doi.org/10.1097/qmh.0b013e31827deadb
4. Philips Clinical Services. (2017.). *5 facts about alarm fatigue*. Retrieved April 7, 2022, from https://www.philips.com/c-dam/b2bhc/master/landing-pages/clinical-services/clinical-services-5-facts-about-alarm-fatigue-final.pdf
5. Ruskin, K. J., & Hueske-Kraus, D. (2015). Alarm fatigue. *Current Opinion in Anaesthesiology*, *28*(6), 685–690. https://doi.org/10.1097/aco.0000000000000260
6. Sendelbach, S., & Funk, M. (2013). Alarm fatigue: a patient safety concern. *AACN Advanced Critical Care*, *24*(4), 387–388. https://doi.org/10.1097/NCI.0b013e3182a903f9