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Customized Alarm Settings Benchmark

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Customized Alarm Settings Benchmark Study

A Paper Submitted in Partial Fulfillment of the Requirements for

NURS 5382: Capstone

In the School of Nursing

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Dr. Kathy Hensley

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Executive Summary

Technology is always changing and healthcare must stay up-to-date with the most recent technology for quality and safe patient care. Technology helps to improve efficiency, patient safety, reduce cost, and reduce errors. Although technology intends to improve patient outcomes, unintended situations also occur for patients and care providers as a result of technology (Karapas & Bobay, 2021). Cardiac telemetry monitoring is one technology that plays an important function during hospitalization for the monitoring of heart rates/rhythms, diagnosis of any abnormal heart rhythms, and ensuring medications are working. Clinical alarms are expected to alert caregivers and promote quick responses for patient assessment. However, with continuous telemetry monitoring, these alarms are sounding so frequently that they lead to alarm fatigue for the nurses.

Alarm fatigue is desensitization to auditory stimuli that occurs from sensory overload from frequent noise. It has been linked to adverse events and a considerable number of patient deaths (Karapas & Bobay, 2021). Per Karapas & Bobay (2021), approximately 68-99% of the alarms heard frequently do not require any clinical interventions. The large percentage of non-actionable alarms noticed confirms the need for an improvement in alarm safety. Developing a protocol for adjusting telemetry monitor settings will help reduce alarm fatigue and ultimately improve patient safety.

1. Rationale for the Project

An estimated 85% of alarms heard in the clinical setting are in-actionable or false alarms (Srinivasa et al., 2017). Alarms are intended to alert the nursing staff of a significant clinical event to promote quick response and purposeful assessment. When nurses are subjected to over 700 physiologic monitor alarms for each patient daily, the effectiveness of the alarm is decreased (Srinivasa et al., 2017). When it comes to pre-set physiological monitor alarms, one size does not fit all patients (Cvach et al., 2017). Frequent false alarms are not just a bother for the staff, but can also jeopardize patient safety and effectiveness of care. Because alarm fatigue poses such a safety risk for patients, alarm management has become a Joint Commission National Patient Safety Goal (Srinivasa et al., 2017). Alarm customization could alleviate frequent and unnecessary alarms which leads to noise, distractions, and the possibility for alarm fatigue

The project was based on necessity. According to Harris et al. (2017), studies revealed that of 12,671 alarms heard in a month only 1,326 were considered actionable. With a high percentage of false alarms going off so frequently, nurses tend to not pay as close attention to them as they should because of desensitization. As a result, patients' lives are placed in jeopardy. Implementing a protocol to adjust alarm settings could help empower nurses to make the necessary changes to decrease the risk of alarm fatigue and maintain patient safety.

1.1 Project goals

The overarching goal of this benchmark study was to improve patient safety. More specifically, the goal is to bring awareness to the need and importance of a protocol for adjusting telemetry settings. Increased alarm fatigue results when there is an excessive number of alarms in the clinical area. The desensitization from alarm fatigue or mismanaging of alarms compromises patient safety leading to death or a permanent loss of function (Lewis & Oster, 2019). It has been recognized that communication between colleagues is important in alarm

management because certain patient care activities may produce a false alarm. Alarm management with patient-specific alarm customization will help to reduce alarm signals (Lewis & Oster, 2019).

2. Literature Discussion to Support Project

Srinivasa et al. (2017) took an evidence-based approach using real-time alarm data tracking software to obtain all cardiac monitor alarms over 43 days. Evaluation of the data revealed that clinically irrelevant premature ventricular contractions (PVCs) accounted for over 40% of the alarms. As a result, the settings were changed which significantly decreased the alarm rate by 84%. Harris et al. (2017) performed a descriptive, observational study on inpatients of a critical care unit over 31 days. Four hundred sixty-one patients participated in the study in which 89.5% of the alarms heard were determined to be false. Harris et al. (2017) revealed that certain patient characteristics are more likely to cause an increased number of false alarms. Patients' characteristics such as cardiovascular diagnosis, bundle branch blocks, ventricular paced, respiratory disease, confusion, and mechanical ventilation revealed a statistically significant result with a p -value < 0.05 . Harris et al. (2017) reinforces the theory that the occurrence of false alarms continues to be a problem and there is a need for alarm management. The recommended method for alarm management is to modify patient alarms specific to each patient to help lessen the nuisance of false alarms. Ruppel et al. (2018) conducted a pre/post-intervention study in a 56-bed critical care unit. After installing alarm customization software and gathering data two months before and two months after the installation, nurses reported less time spent on in-actionable or false alarms. Greater than 50% of the nurses also agreed that the software supported setting appropriate alarms and was user-friendly. Brantley et al. (2016) revealed that in the intensive care setting, a great number of

alarms are related to non-ECG physiological parameters such as oxygen saturation levels (SpO₂). The hospital's default low oxygen setting was tailored toward patients with a relatively normal respiratory function when in actuality the majority of the patients in the intensive care unit and some on telemetry units have compromised respiratory functions. After conducting a 15-minute education session on customizing high and low alarm settings for non-ECG parameters, a 39% reduction in SpO₂ alarms was noted (Brantley et al., 2016).

Honan et al. (2015) recognize that alarm hazards are a serious patient safety issue and that nurses are the health care providers most affected by a large number of alarms. Because of the great effect on nurses, they should be more involved in recreating alarm systems and policies. Staff should feel empowered to customize alarms limits when appropriate for each patient and situation (Cvach et al., 2017).

The overuse of cardiac monitoring is yet another factor that can lead to alarm fatigue. Physicians will automatically order for the majority of their patients to be admitted to a telemetry floor when in actuality the diagnosis is not appropriate for that level of care. Alsaad et al. (2017), created a protocol that screened patients that received cardiac telemetry orders to ensure they are being placed in the appropriate setting. This quality improvement resulted not only in a decrease in alarm fatigue but also in a cost reduction. Sendelbach et al. (2015) also recognize that customizing alarms to each patient's condition helps to reduce nuisance alarms by 80-90%. Simply adjusting the size of the rhythm display on the monitor can provide appropriate rhythm analysis. Therefore, avoidable alarms will be reduced. In a survey used by Casey et al. (2018), 84% of nurses stated they knew what caused alarm fatigue but 52% were uncertain how to prevent it. Nurses can easily recognize that the many alarms heard frequently throughout their shifts can lead to alarm fatigue, but they aren't aware of any interventions to help reduce it. This lack of

knowledge by nurses shows an opportunity for improvement to educate and ensure our nurses are up to date with the latest evidence-based practices to prevent alarm fatigue such as alarm customization. According to Cameron and Little (2018), more than 25% of the nurses' response to improving clinical alarm recognition was more education and training. For nurses, learning never ceases. Therefore, the education team should have routine education sessions for nurses for ongoing competencies as well as any new practices.

3. Project Stakeholders

The stakeholders impacted by this benchmark project include the senior leadership team, the patients, nurses, physicians, and risk management. Inter-professional roles needed to represent the team, help monitor the changes to alarm parameters, and verify safe quality patient care include nurses, patient safety officers, biomedical engineers, educators, physicians, monitor technicians, and information technologists. Support from the director and manager of the unit will be necessary and beneficial in the success of the project. Including all parties involved in every aspect of the project will improve collaboration and maintain communication. The nurse educator plays a vital role in the project with the knowledge of best practices and the ability to provide continual education.

4. Implementation

The benchmark project will take place at Methodist Hospital. It will measure the need for a set protocol for nurses to adjust telemetry settings to help in the reduction of alarm fatigue. The project will compare the default telemetry settings on a 38 and 26-bed cardiac telemetry unit, a 22-bed cardiac progressive care unit, and a 12-bed medical ICU. Telemetry units get very busy with the continual influx and dismissal of patients. The patients cared for on this type of unit come in for various cardiac and non-cardiac complaints and range in age from 22-101. With the

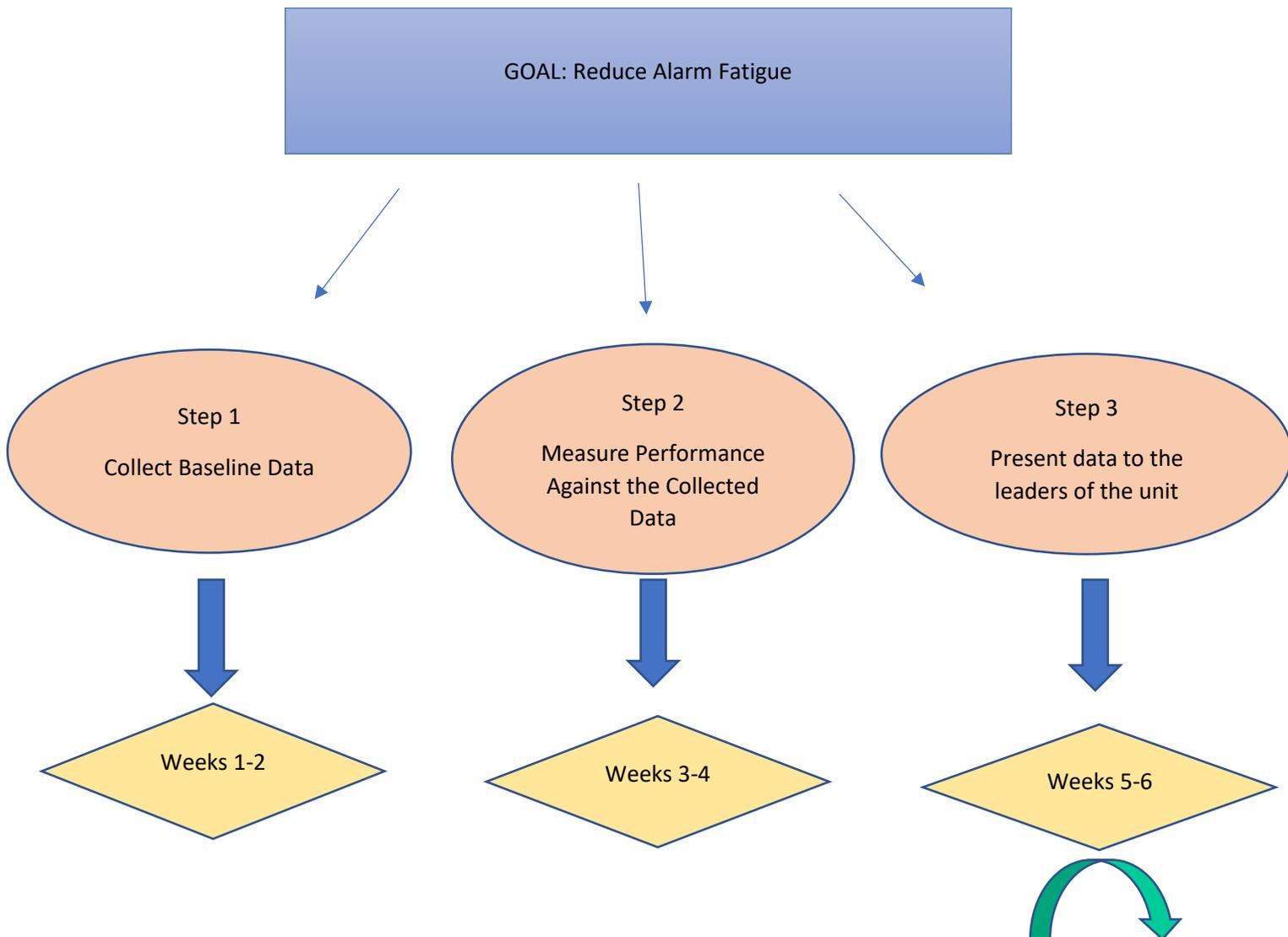
variety in the population and wide age range, default telemetry alarms settings are not appropriate for each person. Nurses find themselves not observing the monitors as often as they should and just depend on the remote monitor technicians to keep them informed of any abnormal rhythms. Nursing staff in the ICU setting are faced with listening to frequent false alarms that are non-actionable (Ruppel et al., 2018). The benchmark project will help show the need for nurses to get more comfortable with telemetry monitoring as well as changing alarm settings.

The current process for telemetry monitoring relies heavily on monitor technicians. Monitor technicians are unlicensed individuals that are in charge of constantly watching monitors and calling the nurses to notify them of any changes. They only know what the default settings should be and aren't familiar with the individual patients at all. Therefore, they may be calling the nurses repeatedly to inform them of an abnormal heart rate that is not abnormal for that individual patient.

5. Timetable/Flowchart

The first phase (week 1-2) for the benchmark project is to collect baseline data. The data needed to explore the PICOT question and build a case for change would be the number of false alarms that are generated from standard alarm settings, the decrease noted in the frequency of false alarms with the customization of alarms, and the nurse's comfort level with customizing the alarms. The data will determine the baseline number of alarms being sent to the clinical staff in a 12-hour shift. The data will look at the number of asystole alarms due to lead failure and review false alarms versus real alarms for sinus brady, sinus tachycardia, supraventricular tachycardia, ventricular tachycardia, and ventricular fibrillation for a week.

The second phase (week 3-4) would be to measure the performance against the collected data, evaluate the responsiveness of the nurses to the alarms, measure the comfort level for the adjustment of alarm settings in the ICU setting, and assess the staff’s experience with alarm fatigue by using a survey. The third phase (week 5-6) would be to present the data to the leaders and explain the need for the modification to the protocol to incorporate the ability of the nurse to customize settings. Education will need to be provided to the staff on the findings of the project and the current telemetry monitoring protocol which encompasses the fundamental safety of telemetry monitoring. Lastly, a survey will be provided to the staff to allow them to have input on how beneficial implementing the project will be for them and the patients.





6. Data Collection Methods

Descriptive analysis was conducted for the number of false or unnecessary alarms to evaluate the effectiveness of the need for a new protocol. The data was collected by conducting two 12-hour observations across three different units including nights and weekends. The data was retrieved by sitting in front of the central monitor on the telemetry units and by watching the monitors of the patients of one nurse in the ICU. The cardiac alarms that were chosen to be included in the observation were those that signified asystole, ventricular tachycardia, high and low heart rates, lead fail, no telemetry, and telemetry low battery (Rayo et al., 2016).

During huddles and staff meetings, the number of false alarms observed during the observational study will be presented to the staff members. Along with the presentation of data, various studies on the effects of alarm fatigue will be discussed. The staff will complete a final survey post-data collection in which the Likert scale will be used to determine the staff's perception of the need for a protocol for nurses to adjust alarm settings. The evaluation results will hopefully answer whether or not the communication and development of a new protocol will impact telemetry and intensive care units to decrease alarm fatigue and improve safety for the staff and the patients.

7. Costs/Benefits

A protocol to allow nurses to customize alarm settings will benefit the organization by decreasing alarm fatigue. The protocol will lead to improved patient safety as well as create a better work environment for the nurses. Telemetry monitoring is often used inappropriately which leads to an increase in false alarms and alarm fatigue. Identifying patients that no longer require cardiac telemetry monitoring and downgrading them to a med-surg level of care can result in a cost reduction of approximately 42% (Alsaad et al., 2017). Insufficient alarm management has led to patient deaths which then leads to lawsuits for negligence. Alarm customization will help prevent unnecessary loss of life and payment settlements.

8. Proposed Outcomes

Health systems are now organized and managed to ensure patient-centered quality care (Melnyk and Fineholt-Overholt, 2015). On cardiac units, general alarm settings for ECG monitoring are not applicable for all patients alike which make customizing them a recommended approach for alarm management. Melnyk and Fineholt-Overholt (2015) tell us that measuring outcomes of practice through available data within the organization should be a very influential change promoter. This customization project will consist of the writing of a policy and procedure for nurses to customize alarm settings. The policy and procedure will allow the nurse to safely alter the telemetry monitor alarms to be patient-specific. The proposed outcome of the project includes increased patient safety with alarm management and a decrease in alarm fatigue.

9. Discussion of Evaluation

After observing the telemetry monitors to identify false alarms, the total number of alarms was divided by non-actionable alarms to identify the percentage of false alarms. Six hundred and twenty-five alarms were observed during the 24 hours of direct observation. The data collected indicated that the percentage of false alarms heard equaled that of 53%. The percentage of low

battery or no telemetry alarms equaled 35%. The results from the data collected did reveal that the number of false alarms is excessive. Twenty nurses have completed the alarm fatigue survey in which 75 percent rated frequent false alarms reduce attention to patient and difficulty in hearing alarms when they occur as most important. The data collected during the observational study and the survey as well as the studies on the effects of alarm fatigue still needs to be presented to staff members. After the data presentation, the staff will need to complete a final survey post-data collection.

10. Recommendations

When it comes to pre-set physiological monitor alarms, one size does not fit all patients (Cvach et al., 2017). The results from the data collected did reveal that alarm management is necessary to help decrease the number of non-actionable or unnecessary alarms heard in a 12-hour time frame. Frequent false alarms are not just a bother for staff but can also jeopardize patient safety and effectiveness of care. Because alarm fatigue poses such a safety risk for patients, alarm management has become a Joint Commission National Patient Safety Goal (Srinivasa et al., 2017). Without alarm customization, frequent and unnecessary alarms will occur which leads to noise, distraction, and the great potential for alarm fatigue. Having a protocol to customize alarm settings will help empower nurses to make the necessary changes to decrease the risk of alarm fatigue and maintain patient safety. More planning will be required for this project to be implemented in the facility however, Recommendations are that this project moves forward. There is great benefit in alarm customization to reduce alarm fatigue and to allow the nurses to care for patients safely. The initiative has been started for a new protocol, and it would be beneficial for the originator to continue to work with the staff, colleagues, physicians, and the leadership team to see this initiative move forward.

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Appendix A

Alarm Fatigue Experience Survey

1. Role

RN

RT

Other (please specify)

2. Unit

Critical Care

ICU / Stepdown

Med Surg

Other (please specify)

Nuisance alarms include: false alarms, erroneous alarms, and any other clinically insignificant alarms that do not require clinical intervention

3. What medical equipment do you believe produces the most false alarms? *(only choose 1 - you will have the opportunity to select another later in this survey)*

Physiological Monitor

Telemetry Monitor

Pulse Oximeter

Ventilators & Respirators

Respiratory Humidifier

Large Volume Infusion Pumps

PCA Infusion Pumps

Feeding Pump

Syringe Pump

Sequential Compression Devices (SCDs)

Convective Warming Unit (Bear Hugger)

Bed Alarms

Other (please specify)

4. Ranking of issues in order of importance

	1-Most Important	2-Somewhat Important	3-Not Important
Frequent false alarms reduce attention to patient	<input type="radio"/> Frequent false alarms reduce attention to patient 1-Most Important	<input type="radio"/> Frequent false alarms reduce attention to patient 2-Somewhat Important	<input type="radio"/> Frequent false alarms reduce attention to patient 3-Not Important
Difficulty in setting alarms properly	<input type="radio"/> Difficulty in setting alarms properly 1-Most Important	<input type="radio"/> Difficulty in setting alarms properly 2-Somewhat Important	<input type="radio"/> Difficulty in setting alarms properly 3-Not Important
Difficulty in hearing alarms when they occur	<input type="radio"/> Difficulty in hearing alarms when they occur 1-Most Important	<input type="radio"/> Difficulty in hearing alarms when they occur 2-Somewhat Important	<input type="radio"/> Difficulty in hearing alarms when they occur 3-Not Important
Difficulty in identifying the source of an alarm	<input type="radio"/> Difficulty in identifying the source of an alarm 1-Most Important	<input type="radio"/> Difficulty in identifying the source of an alarm 2-Somewhat Important	<input type="radio"/> Difficulty in identifying the source of an alarm 3-Not Important
Inadequate staff to respond to alarms as they occur	<input type="radio"/> Inadequate staff to respond to alarms as they occur 1-Most Important	<input type="radio"/> Inadequate staff to respond to alarms as they occur 2-Somewhat Important	<input type="radio"/> Inadequate staff to respond to alarms as they occur 3-Not Important
Overreliance on alarms to call attention to patients' problems	<input type="radio"/> Overreliance on alarms to call attention to patients' problems 1-Most Important	<input type="radio"/> Overreliance on alarms to call attention to patients' problems 2-Somewhat Important	<input type="radio"/> Overreliance on alarms to call attention to patients' problems 3-Not Important

5. Would you like to rank another alarm?

- Yes
- No

Please discuss your understanding and experience with alarm fatigue.

Comments:

<https://www.surveymonkey.com/r/alarm-fatigue>

Appendix B

Project Evaluation Tool

As a participant, please evaluate how helpful this protocol will be based on the information provided. Please rate each section by circling or highlighting the number that best signifies the level of your agreement.

Ratings are: **1=Poor** **3=Average** **5=Excellent**
2= Fair **4= Good**

Education provided	1	2	3	4	5
Data presented	1	2	3	4	5
Patient safety	1	2	3	4	5
Workload	1	2	3	4	5

1. What do you like best about the protocol?

2. What areas have you identified that may need improvement?

3. Comment/Suggestions: _____
