



# Alarm Management Interventions Impact on Alarm Fatigue

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## Background and Significance - *The boy who cried wolf*

The number of audible alarms that go off in hospital settings can be overwhelming, especially in intensive care units (ICU), where patients are ordinarily attached to several monitors simultaneously. These monitors and medical devices - such as vital sign monitors, bed sensors, and IV pumps - are meant to be crucial indicators of a patient's status or that action needs to be taken. "Research indicates that **72% to 99% of all alarms are false**" (Alarm fatigue, 2019) or "**deemed not actionable**" (Seifert, 2021), however, and this has created a significant patient safety and nurse issue. Alarm fatigue is defined by the American Association of Critical Care Nurses "as a sensory overload that occurs when clinicians are exposed to an excessive number of alarms, which can result in **desensitization to alarm sounds and an increased rate of missed alarms**". (Alarm fatigue, 2019) The Joint Commission reported 80 patient deaths that were associated with alarm-related sentinel events during the years 2009 to 2012 (Stringer, 2022), and the Emergency Care Research Institute listed alarm fatigue as "**one of the top 10 health technology hazards in 2020.**" (What is alarm fatigue?, 2022)

## Methods

**PICOT:** *In Intensive Care Units, can implementing an alarm management program effectively reduce alarm fatigue in ICU nurses?*

**Databases:** PubMed, OneSearch, and Google Scholar

**Keywords:** "ICU", "nurse", "alarm fatigue", "alarm management", "alarm settings"

**Exclusion criteria:** Published prior to 2015, not enough information to ensure good quality of research, limited relevance to the research topic, literature reviews

**Results:** The five studies chosen include two randomized trials, one cross-sectional survey and multicenter study, one quasi-experimental study, and one quality improvement project.

## Evidence Summary

Authors	Type of Study	Intervention	Results	Rating
Lewis et al., 2019	Quasi-experimental study	Implementation of the "CEASE Bundle" - a set of patient care, alarm parameter, and training interventions	<b>Total number of auditory monitor alarms decreased 30.45%</b> (from 52,880 to 36,780) over 30 days.	II
Casey et al., 2018	Cross-sectional survey and multicenter study	Completion of the Health Technology Foundation 2011 Clinical Alarms Survey	52% of ICU nurses do not know or were <b>uncertain how to prevent alarm fatigue</b>  No association between knowledge of how to prevent alarm fatigue and years of experience, educational level, gender, department, or job title	III
Bi et al., 2020	Randomized, single-blind trial	Alarm management training twice a week for 15-45 minutes (compared to hour-long sessions every 2 weeks in the control group).	The intervention led to a <b>7-point decrease in alarm fatigue</b> and a decline in the number of total alarms by 63 per bed per day, compared to a 0.1-point drop and no statistical change in the control group.	II
Sendelbach et al., 2015	Quality improvement project	A set of patient care and monitor adjustment interventions related to ECG use	<b>80-90% reduction in ECG alarms</b>	V
Warakomska et al., 2019	Randomized trial	Setting SpO <sub>2</sub> alarm trigger thresholds 2 unit wider	<b>69% reduction in the frequency of SpO<sub>2</sub> alarms</b>  <b>41% less total time with active alarms</b>	II

\* All studies confirmed that any changes to alarm settings did not threaten patient safety

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## Summary and Conclusions

- Alarm fatigue can be reduced in an ICU setting by applying interventions at the unit level.
- Conducting training on just monitors themselves has a significant impact on reducing the number of nonactionable alarms and alarm fatigue among critical care nurses.
- For the studies that implemented several interventions simultaneously, follow-on research should be conducted to determine which of the interventions had the most positive impact, and which interventions (if any) had no effect.
- Customization of alarm parameters to the individual patient was an intervention that has promise, but requires more evidence before implementing. A study should be created to focus on looking at varying patient conditions and testing alarm parameters to find the most effective combination.
- There is a lack of understanding of alarm fatigue prevention among the entire nursing profession, from frontline to management.

## Implications for Nursing and CNL Practice

### Simple interventions to immediately reduce alarm fatigue

- Proper skin preparation before applying electrodes
- Routine electrode changes
- Setting SpO<sub>2</sub> alarms to trigger just 2 units above and below target range. For instance, if target range for patient oxygenation is identified on a unit as 90-100%, then the alarm management program would call for nurses to set SpO<sub>2</sub> alarms to trigger at 88 and 102%.

### Education and Training

- Any practice changes should be prefaced with an explanation to staff of how it will reduce alarm fatigue.
- Implementing a format of shorter more frequent training sessions is crucial to effectively reducing alarm fatigue.
- Training should include how to properly implement alarm management interventions, operate and adjust settings on monitors, and accurately read electrocardiographs and other patient information being displayed.

### The CNL Role

- Once there is more evidence on customization of alarm parameters to specific patients, the CNL should formulate an interdisciplinary team to create a protocol for the customization of alarm parameters based on patient status.
- Creating and managing a training program within these guidelines would be an ideal task for the CNL.

