

# What's the Problem with Clinical Alarms in Hospitals



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The two cases represent common situations involving faulty alarms that contributed to tragic adverse events where skilled and well-intentioned health care providers were misled by these alarms. Nursing and medical staff diligently responded to the alarms initially, but they had to make a conscious decision to shut off the alarms because of the repeated faulty signals without taking alternative monitoring measures. In both cases, there were two common observations: Faulty signals and alarm fatigue. (1)

Many medical devices have alarm systems; among them are bedside physiologic monitors that include ECG (electrocardiogram) machines, pulse oximetry devices, and monitors of blood pressure and other parameters; bedside telemetry; central station monitors; infusion pumps and ventilators. These alarm-equipped devices are essential to monitor patients in hospital settings and clinicians depend on these devices for information they need to deliver appropriate care and to guide treatment decisions. However, these devices present a multitude of challenges and opportunities for improvement in health care organizations.

The Joint Commission's Sentinel Event database includes reports of 98 alarm-related events between January 2009 and June 2012. Of the 98 reported events, 80 resulted in death, 13 in permanent loss of function, and 5 in unexpected additional care or extended stay. Factors that contributed to alarm-related sentinel events include:

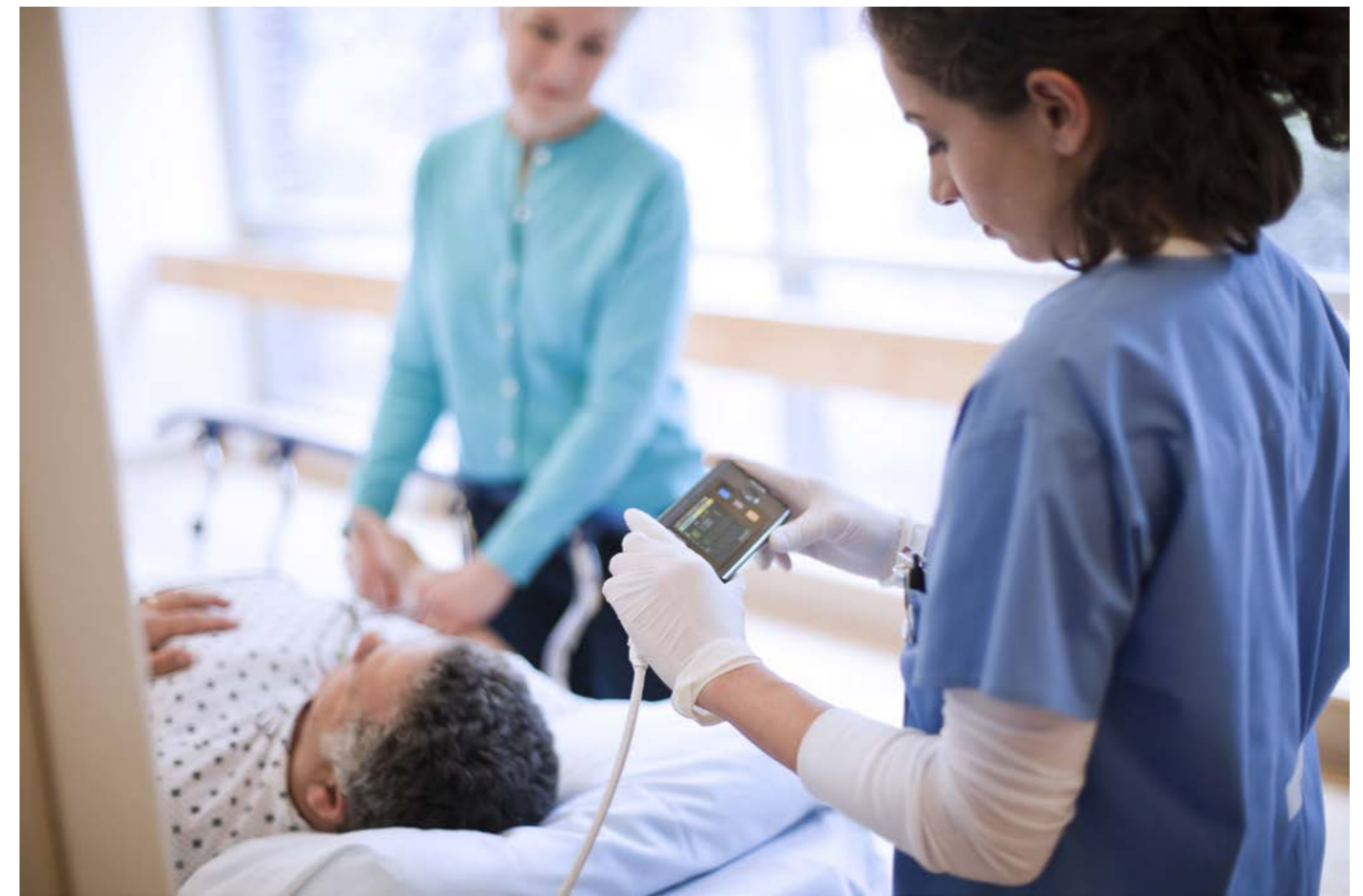
1. Alarm fatigue – the most common contributing factor
2. Alarm settings that are not customized to the individual patient or patient population
3. Inadequate staff training on the proper use and functioning of the equipment (e.g., inconsistent team training, response, and interpretation of alarm signals)
4. Inadequate staffing to support or respond to alarm signals
5. Alarm conditions and settings that are not integrated

## Case #1: Reported by the Patient Safety Net of the Agency for Healthcare Research and Quality (AHRQ):

*A 54-year-old man with hypertension, diabetes, and end-stage renal disease was admitted to the hospital with chest pain. He was diagnosed as having a non-ST segment elevation myocardial infarction (NSTEMI), admitted to the observation unit, and placed on a telemetry monitor. Overnight, the patient's monitor was constantly alarming with warnings of "low voltage" and "asystole." The bedside nurse initially responded to these alarms, checking on him several times and each time finding him to be well. The resident physician was also notified and checked the patient he felt the alarms were misreading the telemetry tracings and no specific action was taken. Few hours later, the patient was found pulseless in his bed.*

## Case #2: Reported by the Patient Safety Net of AHRQ:

*A 60-year-old man was admitted to the intensive care unit after sustaining a head injury. There was a system failure in the monitors and false alarms were sounded many times which lead the nursing staff to turn off the alarm signal. Few hours later, the patient developed cardiac arrhythmias and oxygen desaturation. The nursing staff failed to attend to the patient on time and he passed away.*



- with other medical devices  
6. Equipment malfunctions and failures. (2)

**So in spite of the many advantages of the clinical alarms, two main drawbacks have been identified and require our attention: False alarms and fatigue.**

## False Alarms

In order to determine the effect of false alarms on adverse patient events, a recent study of alarm accuracy was conducted on 461 patients in intensive care units over a period of 1 month. It was found that as many as 90% of alarms are false or don't require any immediate action and that low-voltage QRS complexes were a major cause of false cardiac monitor alarms. In hospitals, alarms on patient-monitoring devices create a lot of noise day and night—beeping, pinging and ringing so often that doctors and nurses ignore them, turn them off, or just stop hearing them.

## Alarm Fatigue

Alarm fatigue occurs when clinical healthcare professionals become desensitized by countless alarms when they are false or clinically irrelevant. Nurses and physicians are expected to monitor alarms and respond to them when the need is indicated. In intensive care settings within the hospital, it is estimated that we are faced with nearly 190 audible alarms each day for each patient many of which are either false or irrelevant. The biggest harm can result from alarm fatigue when a patient develops a fatal arrhythmia or significant vital sign abnormality that is not noticed by the clinical staff.

Clinicians should take few steps to prevent or overcome alarm fatigue and respond to alarms that truly indicate a change in condition in a timely manner by modifying the alarm settings to suit the patient's cardiac condition and ensure accuracy. In addition, nurses and other healthcare providers at the bedside can take steps to improve the

usefulness of alarms. They can review their hospital alarm default settings to determine whether some audible alarms that do not warrant treatment can be changed to inaudible text message alerts. Clinicians (nurses, physicians, and monitor watchers) in hospitals should receive special training on how to interact with monitoring devices in order to improve their awareness of the importance of clinical alarms. Attempts should be made to reduce the span of individual monitoring sessions to avoid alarm fatigue and maintain a high level of concentration.

### Joint Commission Sentinel Alert # 50

On April 8, 2013, The Joint Commission released Sentinel Event Alert Issue 50 on “medical device alarm safety in hospitals. In the alert, The Joint Commission notes that “while these alarm-equipped devices are essential to providing safe care to patients in many health care settings . . . [they] present a multitude of challenges and opportunities for health care organizations when their alarms create similar sounds, when their default settings are not changed, and when there is a failure to respond to their alarm signals”. During the following year, The Joint Commission assigned alarm safety as a National Patient Safety Goal to highlight the importance of developing institutional policies and practice standards to improve awareness of this problem and design interventions to reduce the burden to clinicians, while ensuring patient safety. (3)

### ECRI - Top 10 Health Technology Hazards

In January 2016, ECRI Institute (formerly the “Emergency Care Research Institute”) released its annual list of top 10 health technology-related hazards aimed at identifying possible sources of danger or difficulty with certain technologies so that healthcare facilities can take steps to minimize the likelihood of the related adverse events. A missed alarm was rated as the second on the list:

1. Inadequate cleaning of flexible endoscopes before disinfection can spread deadly pathogens
2. **Missed alarms: “Patients have died or have been seriously injured due to a failure to recognize and respond to an actionable clinical alarm condition in a timely manner. This could be due to an alarm condition that is not detected by a medical device (such as a physiologic monitor, ventilator, or infusion**

**pump), or when a condition is detected, but it was not successfully communicated to the medical staff, or when a condition is communicated, but is not appropriately addressed due to a failure to notice the alarm or by medical staff blatantly choosing to ignore an alarm.”**

3. Failure to effectively monitor postoperative patients for opioid-induced respiratory depression
4. Inadequate surveillance of monitored patients in telemetry settings
5. Insufficient training of clinicians on operating room (OR) technologies
6. Poor alignment between the configuration of a health IT system and facility workflow
7. Unsafe injection practices
8. Gamma camera mechanical failures
9. Failure to appropriately operate intensive care ventilators
10. Misuse of USB ports. (4)

### Take-Home Points

Alarms should never be completely silenced. Clinical staff should identify opportunities to make the best use of alarms in the monitoring and care of their hospital patients. Clinical staff should learn how to tailor alarm thresholds to an individual patient to avoid an excessive number of alarms and alarm fatigue. Smarter technology and more-precise monitoring practices may help to prevent false alarms, alert nurses to true emergencies, and identify deteriorating patients before an alarm signals a crisis.

### References

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