The Growing Concern Surrounding Medical ‘Alarm Fatigue’

By: Jillyan Morano
   Director of Clinical Engineering, ABM Healthcare Support Services

Executive Summary

The issue of alarm fatigue and patient safety has become a ‘center stage’ concern for healthcare providers across the country over the last two decades. In fact, the Emergency Care Research Institute (ECRI) named alarm hazards as the #1 Health Technology Hazard in 2013.

The number of alarm signals in healthcare facilities can surpass several hundred per patient each day – which can translate to thousands of alarms on every unit and tens of thousands throughout the hospital. While alarms are an important part of patient care, they can reach overwhelming quantities. So, it's no wonder that clinicians can become desensitized, overwhelmed or immune to the sounds, and can suffer from ‘Alarm Fatigue.’

The risks to patient safety are real. Common injuries resulting from alarm hazards can include falls, delays in treatment, medication errors, or in the worst case – death. The Joint Commission Sentinel Database reports 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 five in unexpected additional care or extended stay. Unfortunately, these occurrences are happening more and more frequently.

In June 2013, the Joint Commission established a new 2014 National Patient Safety Goal (NPSG) to address improving the safety of clinical alarm systems in hospitals. The NPSG requires hospital and critical access hospital leaders to set alarm management as a priority, establish a formal policy and provide staff training around alarm safety.

Alarm Management Overview

Medical Devices with Alarm Capabilities

Advancements in technology have created an environment in our healthcare system in which most medical devices now have some sort of alarm capability. Those devices include:

- Physiological monitors
- Ventilators
- Infusion pumps
- Pulse oximeters
- Bed/Chair alarms
- Patient call systems
- Anesthesia
Infant incubators and radiant warmers
Hyper and hypothermia systems

Alarms in the healthcare setting fall into one of four categories based on priority:

- Crisis
- Warning
- Advisory
- Message

Causes of Alarm Fatigue

As the number of technological devices in the patient care setting continues to rise, so too do the noises and ‘alarms’ those devices emit. But with roughly 350 alarms per patient each day, and with less than five percent of these alarms requiring clinical intervention to avoid patient harm (Association for the Advancement of Medical Instrumentation (AAMI), 2011), clinicians are becoming desensitized, overwhelmed or immune to the sounds, often turning alarms down or even off to cope. This leads to delayed responses to patients, which has the potential to lead to irreversible conditions and even death.

False alarms are the number one cause of ‘alarm fatigue’ as 85-99 percent of alarm signals will fall under the ‘false’ category. False alarms are often caused by poor sensor placement, patient movement and limitations in the device alarm detection algorithm. Further, with the amount of independently designed alarm systems on the market, there is often a lack of integration between devices within a hospital setting. Even if alarms are appropriately tested, these differing, non-integrated devices will still present an issue for clinicians through false alarms.

Exacerbating false alarms are ‘nuisance’ alarms, or what are also referred to as non-actionable alarms within the hospital setting. Nuisance alarms do not require clinical intervention and most are categorized under advisory alarms. In most cases, these alarms are short in duration and correct themselves, yet they still add to the barrage of sounds clinicians face on a daily basis. Certainly, these ‘nuisance’ alarms can show repeated patterns in patients that may be a precursor to a more serious alarm designation, but immediate action is seldom required.

Risks of Alarm Fatigue

It has been well documented that alarm fatigue can endanger patient safety as clinicians either fail to respond to alarms or don’t respond in a timely manner, and the topic has been punctuated by increased media attention in recent years.

1. The Joint Commission Sentinel Database reports 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 five in unexpected additional care or extended stay. This is by no means a comprehensive picture of the issue as many experts believe these data under-report the actual harm in alarm fatigue incidents.
2. The ECRI Institute named “Alarm Hazards” as the #1 issue in its Top 10 Health Technology Hazards for 2013.
The Joint Commission Establishes National Patient Safety Goal on Alarm Management

In June 2013, the Joint Commission approved a new 2014 National Patient Safety Goal (NPSG) to address improving the safety of clinical alarm systems in hospitals and critical access hospitals. The NPSG.06.01.01 will require hospital and critical access hospital leaders to set alarm management as a priority, establish a formal policy and provide staff training around alarm safety.

Elements of Performance and Timelines
In Phase I (beginning January 2014), hospitals will be required to establish alarms as an organization priority and identify the most important alarms to manage based on their own internal situations.

- As of January 1, 2014, clinical leaders should establish alarm system safety as a critical access hospital priority. (Phase I)
- During 2014, identify the most important alarms to manage. (Phase I)
- As of January 1, 2016, establish policies and procedures for managing the alarms. (Phase II)
- As of January 1, 2016, educate staff about the purpose and proper operation of alarm systems for which they are responsible. (Phase II)

According to the Joint Commission, despite having published Phase I and II requirements at the same time in an effort provide complete information about the requirements of NPSG.06.01.01, Phase II requirements could be enhanced depending upon newly emerging evidence about best practices, the field’s experience with Phase I requirements, and other developmental work during Phase I.

Don’t Be Alarmed: Strategies for Prevention and Improvement

In order to understand how to solve some of the issues surrounding alarm fatigue, let’s first take a look at some of key pain points:

**Clinicians’ workloads:** From an ethical perspective, clinicians are in the conundrum of needing to monitor patients to the fullest degree possible. So, we have dual responsibilities of keeping an eye on our patients along with trying to decipher the myriad of noises coming from these devices.

**Equipment Complexity:** As previously noted, there are a number of devices within the hospital setting with alarm capability. Less than five percent of the alarms coming from any of these devices are considered critical. Further, there is often little integration between the devices.

Many manufacturers have expressed an interest in partnering with the healthcare community to put machines in our facilities that strike a balance between necessary monitoring and monitoring overload. In many cases, clinicians simply ask for ‘magic machines’ with all the bells and whistles. This might be nice in theory and can help alleviate liability concerns, but too much complexity often leads to alarm fatigue.

**Lack of Standardization for alarm signals:** Too often, we see different monitoring systems on different units, leading to haphazard alarm management. When clinicians have to play by a
different set of rules for alarm parameters from one unit to another, confusion almost always ensues.

This is an area where manufacturers could potentially help. Some manufacturers have failed to completely embrace the EIC general requirements, tests, and guidance for alarm systems in medical electrical equipment and medical electrical systems. Instead, they are using different terminology to describe alarm signals, confusing end users and making training difficult. But until regulatory authorities force manufacturers to maintain compliance in order to obtain market clearance, little is going to change.

**Liability:** This is possibly the greatest challenge we face in regards to the alarm fatigue issue. Conventional wisdom in the healthcare community says that a false positive is better than a false negative when it comes to alarms, so clinicians want all the ‘bells and whistles’ – to our earlier point. False positives and overwhelming alarm fatigue lead to confusion. Certainly, that confusion can cause problems that could bring liability into play, and that’s a great risk. But false negatives in which an alarm fails to sound during an emergency present far greater liability for healthcare providers.

**Strategies for Improved Alarm Management in the Healthcare Setting**

- Leadership must consider alarm management as a patient safety issue – get buy-in from the CEO, CNO and Chair of Medicine. With the Joint Commission’s NPSG.06.01.01, this should become commonplace.
- Develop a task force to form a strategic approach to solving the alarm management problem. Include physicians, clinical engineers, IT and nurses on the task force.
- Identify the departments or units that have the greatest need for solving the alarm management problem – often ICU would be a good place to start.
- Consult with other healthcare systems that have already undergone the process. Ask them how they studied their own alarm systems. What data was derived and what protocols were subsequently put in place around alarm management.

**A Cause for Alarm – ABM Healthcare Support Services Case Study**

In 2011, based on increased admissions, a hospital in the greater Boston area expanded its physiological monitoring capabilities with additional telemetry channels, continuous vital sign monitors and bedside multi-parameter monitors. This increase in monitoring devices meant an increase in clinical alarms that needed to be interpreted and acted on, thereby increasing the responsibilities and workload of the nursing staff.

To address this challenge, the hospital's senior management decided to take a closer look at its 23-bed telemetry unit. This unit had a diverse patient population (R/O MI, CHF, GI Bleed, and Pneumonia) that required bedside monitoring due to acuity changes.

As a first step, the hospital formed a multidisciplinary task force to take a closer look at its alarm management. The task force included Clinical Engineering, a Nurse Manager and a Nursing Specialist. The hospital then turned to ABM Healthcare Support Services’ clinical engineering team to help create a new alarm management strategy. The objectives of this project included:

1. Decrease alarm fatigue
2. Address staff concerns
3. Observe alarm processes
4. Serve as a trial for other units

As a first step, ABM’s Clinical Engineering team conducted an analysis to investigate best practices in the industry. This provided a baseline of information and processes to model the alarm management practices. An observation of the alarm response process was conducted to determine the extent of the alarm fatigue on the unit and how excessive the nuisance alarms were on the clinicians. These observations also brought to light the delayed responses to alarms and how the responsibility for the alarms was not clearly defined.

Subsequently, a clinical alarm policy was drafted and implemented. The clinical staff was educated on this policy and competencies for the use of the monitoring equipment were revisited.

*How ABM measured the results:*

1. Tallied the different categories and types of alarms over a 20 day period.
2. Recorded alarm defaults and limits.

This data was then analyzed by the task force to determine:

1. Which alarms could be managed
2. Which alarms had clinical significance
3. Which alarm defaults and limits could be changed

In order to measure the results, a pre- and post-intervention study was conducted.

1. There was a 30% reduction in audible alarms
   a. The audible tone of nuisance alarms were eliminated
   b. The risk of alarm fatigue was reduced
2. There was a 70% reduction in Signal Loss Alarms.
3. There was a 57% reduction in Low Battery Messages
   a. The staff proactively changed the batteries in the telemetry boxes
4. 100% of the staff consistently changed parameter levels as the patients’ conditions changed.

*About ABM Healthcare Support Services*

ABM Healthcare Support Services joins together three healthcare services leaders — HHA Services, Healthcare Parking Systems of America (HPSA) and ABM Health to provide each of the services needed to support healthcare’s entire ecosystem—from hospitals to ambulatory surgical centers and medical office buildings. Services provided include clinical engineering & healthcare technologies, environmental services, facility management, food service, hospitality, parking, patient observation & transportation, and security.

*About ABM*

ABM (NYSE: ABM) is a leading provider of facility solutions with revenues exceeding $4 billion and 100,000 employees in over 350 offices deployed throughout the United States and various international locations. ABM’s comprehensive capabilities include facilities engineering, commercial cleaning, energy solutions, HVAC, electrical, landscaping, parking and security, provided through stand-alone or integrated solutions.
About Jillyan Morano

Director Of Clinical Engineering:
Jillyan Morano joined ABM Health Support Services in 2004 graduating from the University of Rhode Island where she received a Bachelor’s in Biomedical Engineering.

In 2007, Ms. Morano received the Unparalleled Excellence Award for sustained performance above and beyond expectations throughout the year.

In 2011, Ms. Morano received her Master’s Degree in Health Administration from Simmons College.

In the fall of 2011, Ms. Morano was recognized as a leader in her field on the topic of clinical alarm hazards and management. She has since contributed to published articles and gives presentations educating health care professionals on the topic.

In 2013, Ms. Morano co-authored an article ‘Service Contracts Management: A Guide for an Effective Process’ and developed a process that is used throughout ABM health Support Services to manage service contracts.

Currently, Ms. Morano is the Director of Clinical Engineering for ABM Health Support Services. She participates in several hospital committees including the hospital task force to improve the alarm management process. Ms. Morano has been instrumental in the convergence of CE/IT strategies, management and implementation of several projects.