

Patient Safety Tip of the Week

February 21, 2017 Alarm Fatigue in the ED

Ten years ago in one of our first columns we presented a case resulting in the death of a young patient in the emergency department (ED) because of alarm fatigue (see our April 2, 2007 Patient Safety Tip of the Week “[More Alarm Issues](#)”). In the investigation of that case we found that the volume of certain alarms were turned down, not just once but many times. In the root cause analysis of that case two major contributors were faulty ED design and an ED culture that had accepted turning down alarm volumes to avoid distraction. In both the literature and our own subsequent experiences we’ve encountered numerous instances where well intentioned healthcare workers have similarly turned off or volumed down alarms, putting patient safety at risk. While alarm fatigue is a complicated issue, site and equipment design and the culture of safety are only parts of the puzzle. The sheer volume of alarms is a major contributing factor and multiple studies have demonstrated that very large percentages of alarms are triggered for reasons that do not lead to any clinical intervention. So reducing unnecessary use of alarms is one of the key strategies to managing alarms and reducing alarm fatigue.

In our many discussions on alarm fatigue we have noted that a reduction in the number of patients unnecessarily on telemetry or cardiac monitoring is one of the best ways to reduce alarms and thereby reduce alarm fatigue (see our Patient Safety Tips of the Week for July 2, 2013 “[Issues in Alarm Management](#)” and August 16, 2016 “[How Is Your Alarm Management Initiative Going?](#)” for good summaries). We’ve noted the ACC/AHA Practice Standards for Electrocardiographic Monitoring in Hospital Settings ([Drew 2004](#)) and how adherence to those standards has helped many hospitals significantly reduce unnecessary use of telemetry.

Typically it is much harder to get physician buy-in into **discontinuing** telemetry or cardiac monitoring. We physicians often think “this will be an added measure of safety just in case…” We tend to think there is no downside to our own patient being continued on monitoring, without realizing the impact that unnecessary monitoring has in contributing to alarm fatigue which may adversely affect multiple other patients.

While much of our discussion on alarm fatigue has focused on inpatients and ICU patients, the ED (emergency department) is another area prone to alarm fatigue. Patients being evaluated for chest pain are commonly placed on cardiac monitors while they are being evaluated. In addition to contributing to alarm fatigue, unnecessary cardiac monitoring utilizes valuable resources that could be better used for other patients. Given that the incidence of arrhythmias is actually low in such patients, one group of clinical researchers developed a tool to help physicians determine which patients could have their cardiac monitoring discontinued in the ED ([Gatien 2007](#)). The Ottawa Chest Pain Cardiac

Monitoring Rule is a very simple rule, based on only two parameters. It states that a patient (in the ED) with chest pain can be removed from cardiac monitoring on initial physician assessment if:

- the patient is currently chest pain free
- and the patient's electrocardiogram is normal or has nonspecific changes (no signs of acute ischemia; infarction; bundle branch block; prolonged QRS, QT or PR interval; left ventricular hypertrophy with strain; arrhythmia; or paced rhythm)

That clinical decision rule was developed from analysis of 992 consecutive chest pain patients were monitored in the ED, of whom 14% and 12% had myocardial infarction and unstable angina, respectively. There were only 17 patients (1.7%) with serious arrhythmias detected in the ED. The rule developed had 100% sensitivity for serious arrhythmias. The authors estimated that applying this rule would have allowed physicians to immediately remove 29% of patients from cardiac monitoring.

We have not seen widespread adoption of the decision rule in practice in ED's. But now the same group of Canadian researchers has prospectively validated the tool ([Syed 2017](#)). A total of 1125 patients with chest pain seen in 2 busy ED's in Ottawa, Ontario were enrolled in the study, 71% of whom were monitored during their ED stay. Only 15 (1.9%) had an arrhythmia within 8 hours that required intervention. The clinical decision rule detected all 15 for a sensitivity of 100% without missing any patients. Specificity was 36.4% but the negative predictive value was 100%. So their results were almost identical to those found in the original derivation study. The authors note that application of the decision rule would have allowed 36% of all such ED patients to have been removed from cardiac monitoring.

Remember, this rule applies to chest pain patients seen in the ED. It does not apply to patients in other settings, such as inpatient or ICU settings, or to ED patients with other problems. Note also that the rule does not determine which patients should initially be placed on cardiac monitoring. Rather, the rule applies to discontinuation of such monitoring. Also, it does not mean that such patients are ready for discharge from the ED. It simply means they can be moved to a non-monitored part of the ED, freeing up resources for other patients to use.

The authors cannot explain the inordinately long period between the derivation study and this validation study. Also, this current study was performed in the same hospital system that was used for the original study. So validation in other patient populations in other hospitals would be very helpful. So US hospitals – get with it! Do a multi-hospital validation study. Who could argue against a decision rule so simple to administer which has the opportunity to reduce unnecessary utilization of resources and reduce the risk of alarm fatigue?

The ED is relatively neglected in the literature on alarm fatigue. One particularly good article was in Patient Safety and Quality Healthcare by Kathryn Pelczarski of the ECRI Institute ([Pelczarski 2013](#)). While that article describes many of the elements we use in alarm management initiatives in general, it does a good job of pointing out some of the

issues that are unique to the ED environment. One example is failure to put the bedside monitor in stand-by mode when the monitor is only being used for vital sign spot checks rather than continuous monitoring. Similarly, failure to put the bedside monitor in stand-by mode when ED patients go off to radiology or elsewhere for testing, as they commonly do. And many ED's have to make use of stand-alone monitors rather than monitors connected to a central monitoring site. Many of these may be in more remote areas in which it is difficult to hear alarms or in isolation rooms where it is also difficult to hear the alarms. The article has good recommendations regarding alarm notification processes, designation of responsibility, and escalating response procedures.

We do have caveats on a couple of the recommendations in the Pelczarski article. One is the recommendation of moving non-networked monitors closer to the nurse's station or centers of activity so the alarms can be better heard. That was actually a root cause in our 2007 column and several other cases we've seen (proximity to the nurse's station or areas where physicians and nurses are busy writing notes or using computers led to workers turning down the volume of the alarms). Second, though we fully endorse use of technology (eg. pagers, messaging apps, etc.) to send alarm alerts to the people who need to respond, don't assume nothing can go wrong (see our February 9, 2016 Patient Safety Tip of the Week "[It was just a matter of time...](#)").

Our Patient Safety Tips of the Week for July 2, 2013 "[Issues in Alarm Management](#)" and August 16, 2016 "[How Is Your Alarm Management Initiative Going?](#)" are good places to start to get recommendations on alarm management.

Prior Patient Safety Tips of the Week pertaining to alarm-related issues:

- March 5, 2007 "[Disabled Alarms](#)"
- March 26, 2007 "[Alarms Should Point to the Problem](#)"
- April 2, 2007 "[More Alarm Issues](#)"
- June 19, 2007 "[Unintended Consequences of Technological Solutions](#)"
- April 1, 2008 "[Pennsylvania PSA's FMEA on Telemetry Alarm Interventions](#)"
- February 23, 2010 "[Alarm Issues in the News Again](#)"
- March 2, 2010 "[Alarm Sensitivity: Early Detection vs. Alarm Fatigue](#)"
- March 16, 2010 "[A Patient Safety Scavenger Hunt](#)"
- November 2010 "[Alarms in the Operating Room](#)"
- February 22, 2011 "[Rethinking Alarms](#)"
- February 2013 "[Joint Commission Proposes New 2014 National Patient Safety Goal](#)"
- May 2013 "[Joint Commission Sentinel Event Alert: Alarm Safety](#)"
- July 2, 2013 "[Issues in Alarm Management](#)"
- August 2013 "[Joint Commission Formalizes 2014 NPSG on Alarm Management](#)"
- February 4, 2014 "[But What If the Battery Runs Low?](#)"
- October 2014 "[Alarm Fatigue: Reducing Unnecessary Telemetry Monitoring](#)"
- December 15, 2015 "[Vital Sign Monitoring at Night](#)"

- February 9, 2016 “[It was just a matter of time...](#)”
- August 16, 2016 “[How Is Your Alarm Management Initiative Going?](#)”

References:

Drew BJ, Califf RM, Funk M, et al. Practice Standards for Electrocardiographic Monitoring in Hospital Settings. An American Heart Association Scientific Statement from the Councils on Cardiovascular Nursing, Clinical Cardiology, and Cardiovascular Disease in the Young: Endorsed by the International Society of Computerized Electrocardiology and the American Association of Critical-Care Nurses. *Circulation* 2004; 110: 2721-2746

<http://circ.ahajournals.org/content/110/17/2721.short>

correction January 25, 2005; *Circulation* 2005; 111: 378

<http://circ.ahajournals.org/content/111/3/378.5>

Gatien M, Perry JJ, Stiell IG, et al. A clinical decision rule to identify which chest pain patients can safely be removed from cardiac monitoring in the emergency department. *Ann Emerg Med* 2007; 50: 136-143

[http://www.annemergmed.com/article/S0196-0644\(07\)00160-6/pdf](http://www.annemergmed.com/article/S0196-0644(07)00160-6/pdf)

Syed S, Gatien M, Perry JJ, et al. Prospective validation of a clinical decision rule to identify patients presenting to the emergency department with chest pain who can safely be removed from cardiac monitoring. *CMAJ* 2017; doi: 10.1503/cmaj.160742, published 30 January 2017

<http://www.cmaj.ca/content/189/4/E139>

Pelczarski KM. Addressing Alarm Problems in the Emergency Department. *Patient Safety & Quality Healthcare* 2013; May/June 2013

<http://www.psqh.com/analysis/addressing-alarm-problems-in-the-emergency-department/>



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