

National Clinical Alarms Surveys – 5 years Comparison of Issues, Improvements and Priorities

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Abstract— The environment at the point-of-care in hospitals contains an increased number of annunciators in the form of bells, beeps, buzzers and flashing indicators most of which are used to communicate changes in the acuity level of patients or in the systems that support the management of their condition. The source for these alarms can be patient-related, use-related or equipment-related and at times can be the result of combined contributions. Alarms have the clear purpose of improving patient care by calling care provider’s attention to a situation that may require his or her intervention; however they lack the ability to prioritize this messaging to care providers who must discern whether these annunciations are clinically significant and necessitate timely intervention. Because of the widespread use of alarms, the occurrence of an alarm can have a widely varying degree of urgency. This can be particularly unfortunate when an alarm is misinterpreted as not being important when in fact it is. To better understand the contributing issues and their rate of change, the Healthcare Technology Foundation (www.HTF.org) conducted two national surveys about 5 years apart. The results of the first survey in 2006 (1327 responses) pointed mostly to the concern about the frequent occurrence of nuisance or false alarms. Five years later, in 2011, the results (4287 responses) of the second National Clinical Alarm survey showed similar responses having the highest concern for frequent false alarm that do not contribute to better care. The majority of care providers reported, again, that at lack of trust and care disruption are the two most frustrating parameters of alarm management.

Keywords— Alarms, patient safety, adverse event, nuisance alarms, alarm survey.

I. INTRODUCTION

Alarm systems are found on all critical care devices in hospitals ranging from simple alerts to complex alarm systems associated with multi-parameter physiological monitoring systems. Adverse events related to clinical alarms in healthcare are all too common. From 2005-2008, the Food and Drug Administration received 566 reports of patient deaths related to alarms on monitoring devices [1]. Although alarms are intended to protect patients, contributing factors such as environmental noise, poor alarm or human factors device design, the lack of standardized alarm priori-

ty systems, use error, and the phenomenon of “alarm fatigue” lead to adverse events. Alarm fatigue results from staff being overwhelmed constantly by non-actionable alarms leading to a delayed response to the alarm or alarms being ignored or turned off. The ECRI Institute ranked Alarm Hazards as the number one healthcare technology threat for 2012 [2].

In 2005-6, the Healthcare Technology Foundation (HTF) performed the first national survey of clinical alarm issues receiving 1327 responses from healthcare personnel. The results were incorporated into a white paper – **Impact of Clinical Alarms on Patient Safety** [3]. Peer review papers were also published with complete references found at the HTF Clinical Alarms webpage www.thehtf.org.

The HTF Clinical Alarms Task Force conducted a national re-survey of the healthcare field to determine changes in the profession’s perception of clinical alarm issues, improvements made at their facilities, and priorities for future action. The re-survey took place over the period August 8 – September 10, 2011. The survey included 25 multiple choice questions regarding perceptions, experiences, and practices. Lastly, responders were asked to prioritize the most pressing clinical alarm issues requiring improvement from nine areas. Comment fields were provided for many questions for free form annotation from respondents.

II. RESULTS

A. Demographics

4,278 healthcare personnel responded to the survey. There were 3192 free form comments to the questions. Nearly all responses were from acute care hospitals. There was a strong response from the ICU and Respiratory departments. In terms of job title, a significant response was received by Respiratory Therapists with 2071 individuals answering the survey questions (Figure 2). Nursing also had a high response with 1650 RN, LPN, nursing aides, and clinical managers taking the survey. More than three-quarters of all responders were experienced staff with 11 or more years of work in the field.

B. Responses

Twenty questions used a scale from *Strongly Agree to Strongly Disagree* to gauge the surveyed individual's answers to specific questions.

Very high agreement (greater than 90% agree or strongly agree) was shown with the questions:

Alarm sounds and/or visual displays should differentiate the priority of the alarm/be distinct based on the parameter or source.

High agreement (66-89%) was shown for the following questions:

Nuisance alarms occur frequently/disrupt patient care/reduce trust in alarms/cause caregivers to turn off alarms

Alarms are adequate/ have distinct outputs

Smart alarms would be effective to reduce false alarms/improving response to alarms

There is a requirement in the institution to document and set alarms for each patient

Majority agreement (50-65%) was shown for the following questions:

Confusing to determine which device is in alarm

Central alarm management/alarm integration and communication and policies and procedures are effective

Low Agreement (33-49%) was shown for the following questions:

Joint Commission guidelines have reduced adverse events

Environmental background noise has interfered with alarm recognition

Very low agreement (0-33%) was shown for the following questions:

Setting alarms is complex

Newer monitoring systems solve alarm problems

Frequent instances have occurred where alarms could not be heard

Individuals were also asked to prioritize a list of nine issues. The issue with the highest priority (33% rated number 1) was

Frequent false alarms, reducing attention/response to alarms that occur

Other high ranking areas were *Inadequate staff to respond to alarms, difficulty in hearing alarm, and over reliance on alarms to call attention to patient problems*

The lowest ranked priority was *Lack of training on alarm systems*

Additional questions included:

Has your institution experienced adverse patient events in the last two years related to clinical alarm problems?
YES: 18%, NO: 33%, NOT SURE: 49%

Does your institution utilize "monitor watchers" in a central viewing area to observe and communicate alarm conditions to caregivers? YES: 47%, NO: 44%, NOT SURE: 9%

Has your institution developed clinical alarm improvement initiatives over the past two years?

YES: 21%, NO: 31%, NOT SURE: 48%

Has your institution instituted new technological solutions to improve clinical alarm safety?

YES: 19%, NO: 35%, NOT SURE: 46%

C. Comparison between 2006 and 2011 surveys

A majority of the responders to the 2006 survey was Registered Nurses (RN) at 51% while in the 2011 survey the majority was Respiratory Therapists at 51%.

Nuisance alarm frequency and disruption of patient care had a lower agreement in the 2011 survey. Also, alarm setting was viewed as less complex in 2011.

There was less agreement in 2011 regarding the effective use of clinical alarm management policies and procedures and institutional requirements for setting alarms.

III. CONCLUSIONS

The key results and recommendations of the task force included:

1. A high priority must be placed on the reduction of nuisance alarms. Manufacturers, clinicians, healthcare leadership, government agencies, and clinical engineering must focus on this area. As has been discussed in numerous professional and lay press articles, nuisance alarms lead to alarm fatigue and adverse events.

2. The very high level agreement with Question 6 — "*Alarm sounds and/or visual displays should be distinct based on the parameter or source.*" points to consideration by standards organizations to discuss this requirement for future systems.

3. Smart alarms are viewed as being advantageous in reducing false alarms and improving response to alarms. This area needs novel solutions to develop new methods that leap frog current technology.

4. Central alarm management is viewed as advantageous and many institutions utilize monitor watchers. Hospitals should consider this approach in the developing alarm strategies.

5. Clinical alarm improvement efforts need to be stepped up in healthcare institutions. The responses show a minority of hospitals addressing this need.

6. Adverse events related to clinical alarm issues were reported by 1 in 5 responders. This causative factor of adverse events may not be fully reported to the FDA.

7. A large proportion of the responders were unsure if adverse events had occurred in the last 2 years and unsure if there had been new solutions to improve alarm safety at their facility. Improved and open communication is needed in healthcare related to these critical issues.

A systems approach is needed to address the complexities of clinical alarm issues in healthcare. The effort needs to involve all stakeholders in developing solutions.

ACKNOWLEDGMENTS

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- Jennifer Jackson, BSBME, MBA, CCE, Director, Clinical Engineering & Device Integration, Cedars Sinai Medical Center, USA
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- James P. Keller, MSBE, VP Health Technology Evaluation and Safety, ECRI Institute, USA
- Paul Sherman, CCE, Senior Biomedical Engineer, Department of Veterans Affairs, USA
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Sponsoring organizations

- Association for the Advancement of Medical Instrumentation (AAMI)
- American College of Clinical Engineering (ACCE)
- Philips Healthcare

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- Association for the Advancement of Medical Instrumentation (AAMI)
- American College of Clinical Engineering (ACCE)
- American Association for Respiratory Care (AARC)
- American Association of Critical-care Nurses (AACN)
- Food & Drug Administration/MEDSUN
- ECRI Institute
- Medical Equipment & Technology Association (META)
- Department of Veterans Administration
- 24x7 Magazine

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