

**National Patient Safety Foundation
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Poster Abstract

IMPACT OF CLINICAL ALARMS ON PATIENT SAFETY

Overall summary of project:

Clinical alarms warn caregivers of immediate or potential adverse patient or technical conditions. In order to be truly effective, alarms must be accurate, intuitive, and provide alerts which are readily interpreted and acted on by clinicians in an appropriate fashion. Clinical alarms and their shortcomings have been the topic of numerous studies and analysis in the literature. The Joint Commission on the Accreditation of Healthcare Organizations (Joint Commission) established a National Patient Safety (NPS) goal in 2002 to improve the effectiveness of clinical alarms. This goal was removed for hospital organizations in 2004 and incorporated into the Joint Commission standards. Despite some technological and healthcare improvements related to efforts to meet the NPS goal, adverse patient events continue to occur related to alarm system design and performance, care management and the complexity of the patient care environment.

In 2004, the *American College of Clinical Engineering Healthcare Technology Foundation* started an initiative to investigate clinical alarms issues and identify areas for improvement. As part of these efforts, a white paper was published reflecting: 1) a review of the literature on clinical alarm effectiveness, 2) an analysis of adverse event databases, 3) prior efforts to improve alarms through technological, standards, and regulatory means, and 4) forums, meetings and a survey of 1,327 clinicians, engineers, technical staff and managers. The Food and Drug Administration (FDA) Manufacturer and User Device Experience (MAUDE) adverse event database shows an increase in the number of death and serious injury reports with the term "alarm" in the problem description. Of particular value in this regard is the survey response from nursing personnel who represented the majority of the respondents to the survey, and the majority of personnel tasked to respond to alarms. A large portion of the respondents identified false and nuisance alarms as a significant problem which occur frequently, disrupt patient care, reduce trust in alarms and cause caregivers to sometimes disregard them. At a minimum, false alarms are distracting and can interfere with clinicians effectively performing other critical tasks. They also contribute to nurse desensitization to alarms, such that alarms for 'real' events are less likely to catch the attention of staff. While some amount of false and nuisance alarming may be inevitable, there must be improvement from the current situation in order for alarms to be more effective. This improvement lies in the hands of device manufacturers, institutions and clinicians.

Furthermore, healthcare organizations and clinicians should recognize the limitations of current alarm systems and utilize them only as one tool in the overall assessment of patient condition. Hospitals must recognize the complexities of clinical alarm management and devote the

necessary resources to develop effective management schemes. Clinicians should also take an active role in learning how to use equipment safely over its full range of capabilities. Effective education and training must take place to better understand proper operation, the implications of mis-configuration or defeating alarms, and the limitations of current alarm systems. Greater development and use of standards (such as IEC/ISO IEC 60601-1-8) offers the opportunity to eliminate some elements of confusion over what different alarms mean, as well as how they are operated.

The poster session presents a summary of the AHTF effort, including the results of the survey of 1,327 healthcare staff, and specific recommendations for improvement.

Application of project to patient safety:

Clinical alarms are a key patient safety area for improvement. Adverse events resulting in death and serious injury are known to occur due to failure related to clinical alarms utilization. Although some improvements have been made in the care management area due to focus by the Joint Commission., adverse events persist. Furthermore the number of devices with alarms continues to increase, compounding the problem. Efforts must be taken to reduce false and nuisance alarms, improve training, and develop better standards.

Future directions:

Future directions are aimed at awareness, a focused effort towards the reduction of false alarms via industry, care management and education, alarm data standards, additional publications of survey data, and facilitating all constituents involved with clinical alarms to meet and develop action plans to address key issues.