

Aviation industry safety advances can improve hospital alarm design

March 9 2021, by Serena Smith



Drawing a human operator's attention to a meaningful change is the simplest objective for an alarm. However, from a systems-management perspective, this characterization is overly simple. Alarm system objectives need to move beyond an approach tied to responding to single alarms and instead focus on enhancing an operator's (e.g., nurse, pilot) understanding of the monitored system (e.g., patient, airplane). Credit: *Biomedical Instrumentation & Technology* (2021). DOI: 10.2345/0899-8205-55.1.29

Hospital alarms play an important role in patient monitoring, but false alarms and multiple alarms going off at the same time can be challenging to manage—leading to alarm fatigue among nurses. New research from The Ohio State University School of Health and Rehabilitation Sciences found the health care industry can improve hospital alarm design by borrowing from lessons learned by the aviation industry.

The paper, published in the journal *Biomedical Instrumentation & Technology* titled "Lessons from the Glass Cockpit for Innovation in Alarm Systems to Support Cognitive Work," introduces three objectives for hospital alarms that focus on alerting the appropriate clinical team member, prioritizing alarms so the most pressing [health](#) issue is addressed first and providing direction on how to manage the patient's health issue.

"Alarms are used to attract attention, but we believe alarms can also support awareness, prioritization, and decision making," said Emily Patterson, lead author and associate professor in the School of Health and Rehabilitation Sciences. "We aim to provide an approach to hospital alarms that goes beyond notifications and focuses on helping nurses have a better understanding of their patients."

To draw lessons from aviation, the research team conducted a series of meetings among engineers with expertise in alarm design in health care, aviation, nuclear power generation, and military command and control domains. They identified differences in alarm design and use, highlighted common alarm problems and established objectives for alarm systems that support their users. The team determined clinical alarm systems are unnecessarily complex compared to aviation, and that both industries share core safety objectives and challenges.

"We took into consideration the key difference between these two industries—airplanes are assumed to be in good condition and alarms

rare while hospital patients may be unstable making alarms more commonplace," Patterson said. "Both industries require the pilot or nurse to take action to address the issue indicated by the alarm, but clinical teams have more alarms across multiple patients making it difficult to effectively address each one."

Despite their differences, both industry alarm systems trigger false notifications. Multiple alarms going off at the same time may make it hard to discern which alarm requires a rapid response. Other challenges include alarms that require a quick response may be buried by alarms that aren't as pressing, repetitive alarms and some alarms are sent to multiple people, making it unclear who is responsible to address the [alarm](#). These can result in alarms being ignored or missed, potentially putting the patient's health in jeopardy.

"Our recommendation is for medical device manufacturers to redesign alarms into integrated systems that link clinical events and inform the action nurses should take," Patterson said. "Notifications for issues such as dead batteries and patient requests for water or for assistance to go to the bathroom could be routed to other clinical staff, allowing nurses to focus on patient care."

More information: Randall J. Mumaw et al. Lessons from the Glass Cockpit: Innovation in Alarm Systems to Support Cognitive Work, *Biomedical Instrumentation & Technology* (2021). [DOI: 10.2345/0899-8205-55.1.29](https://doi.org/10.2345/0899-8205-55.1.29)

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