Modern monitoring systems contribute to alarm fatigue in hospitals

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Largest study on hospital alarm fatigue records more than 2.5 million alarms in one month

(Chapel Hill, N.C. – Dec 4, 2014) – Jessica Zègre-Hemsey, a cardiac monitoring expert at the University of North Carolina at Chapel Hill, and her colleagues at the University of California San Francisco, revealed more than 2.5 million alarms were triggered on bedside monitors in a single month – the first figure ever reported from a real-world hospital setting.

Alarm fatigue occurs when nurses and other clinicians are exposed to a high number of physiological alarms generated by modern monitoring systems. In turn, alarms are ignored and critical alarms are missed because many alarms are false or non-actionable.

The work, the first of its kind to investigate the frequency and accuracy of alarms, addresses a growing patient safety issue that has gained national attention in recent years when a patient died despite multiple alarms that indicated low heart rate. The issue also addresses hidden downsides to modern monitoring technologies.

"Current technologies have been instrumental in saving lives but they can be improved," said Zègre-Hemsey, who is an assistant professor at the UNC-Chapel Hill School of Nursing. "For example, current monitoring systems do not take into account differences among patients. If alarm settings were tailored more specifically to individuals that could go a long way in reducing the number of alarms health care providers respond to."

Zègre-Hemsey and her colleagues collected alarm data on 461 adults in five intensive care units at the UCSF Medical Center for a period of 31 days. Zègre-Hemsey was one of four scientists who analyzed the alarms and helped to determine if they were true or false.

Investigators analyzed a subset of 12,671 arrhythmia alarms, which are designed to alert providers to abnormal cardiac conditions, and found 88.8 percent were false positives. Most of the false alarms were caused by deficiencies in the computer's algorithms, inappropriate user settings, technical malfunctions, and non-actionable events, such as brief spikes in heart rate, that don't require treatment.

A potential solution the researchers suggested would be to design monitors that could be configured to individual patients. No two bodies are exactly the same, and if the monitors could be adjusted to a patient's unique vital signs, the machines would not mistake a normal condition for an abnormal one. A "gold standard" database of annotated alarms could also help developers create computer algorithms that are less sensitive to artifacts.

According to Zègre-Hemsey, reducing alarm fatigue will ultimately require strong collaborations between clinicians, engineers, and hospital administrators as well as additional research.

"Alarm fatigue is a large and complex problem," she said. "Yet the implications are far-reaching since sentinel events like patient death have been reported. This is a current patient safety crisis."

The study was led by primary investigator Barbara J. Drew at UCSF. Co-authors on the paper include UCSF researchers Patricia Harris, Daniel Schindler, Rebeca Salas-Boni, Yong Bai, Adelita Tinoco, Quan Ding, and Xiao Hu from the UCSF department of physiological nursing and Tina Mammone from the UCSF department of nursing.

-Carolina-

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