Big Data Tackles Alarm Fatigue

One issue that hospitals across the US have to continually deal with is alarm fatigue, which results from well-meaning but often misguided attempts to monitor patient safety. Lucile Packard Children's Hospital at Stanford, for example, has an ongoing pilot project to curb alarm fatigue by redefining guidelines on vital signs that trigger alarms.

The issue is big enough for the Joint Commission to weigh in for accreditation, calling it a "frequent and persistent problem". Last year, hospitals started to be required to establish alarms as a priority. Starting in 2016, hospitals are expected to implement specific measures addressing the matter.

"The issue of alarm fatigue is very real for our patients and their providers," said Dr. Veena Goel, a fellow in clinical informatics and paediatric hospital medicine fellow at Lucile Packard. It is an issue for all hospitals, but with children's hospitals in particular, given the level of complexity for their patients, she added.

"We did an audit of our med-surge floor and found that 2,000 alarms go off any given day. This is just med-surge," Dr. Goel pointed out. Across an entire hospital, the number is significantly higher.

"It is estimated that between 85 and 99 percent of alarm signals do not require clinical intervention, such as when alarm conditions are set too tight," the Joint Commission said in an alert to accredited hospitals. "Default settings are not adjusted for the individual patient or for the patient population; ECG electrodes have dried out; or sensors are mispositioned. As a result, clinicians become desensitised or immune to the sounds, and are overwhelmed by information – in short, they suffer from 'alarm fatigue.'"

The commission also said that its "Sentinel Event database" includes reports of 98 "alarm-related events" between 2009 and 2012, with 80 such events resulting in death, 13 in a permanent lost function and five in unexpected additional care or extended stay.

That means a lot of additional cost in the healthcare systems, in addition to the obvious issues of patient safety.

Part of the problem, Dr. Goel explained, is that every hospital operates according to its own metrics. There is no industry standard, and what triggers an alarm for adult patients at, say, a trauma centre, is different from that of an eight-year old with a chronic or rare condition, or even a healthy eight-year old.

Lucile Packard staff, in response, looked at about 100,000 measures across a 7,000-patient sample size over a year, just on its med-surge floor, to best determine what signs should actually trigger an alarm. Particularly with issues like heart rate and respiratory rate, the differences are often vast, and the hospital was going off of signs not tailored to the patients.

"We stratified it all by age," Dr. Goel noted. "Our vital signs were very different from the ranges we used. If we use these new numbers that caused alarms, 50 percent of all of our kids would alarm. When we created these new data-driven signs, we could drop that number in half – that was enough evidence to say we should change our reference rates."

Essentially, Dr. Goel said the effort is about using the best data to address a vexing problem in healthcare.

"We actually have a really unique system set up through information services," the doctor said. "Every bedside in the hospital downloads its data, including alarm data, on a minute-by-minute basis, into a data warehouse. We learned recently that we have over seven years of minute-by-minute bedside alarm information on every data. It's given us a really unique way to study alarms and make them more meaningful for our patients."

Similar efforts at Cincinnati Children's Hospital and Children's Hospital of Philadelphia have been undertaken to deal with the issue. Lucile Packard hopes to help bring wider attention to the matter upon completing its pilot project, perhaps even helping to craft best practices for children's facilities, according to Dr. Goel.