Ventilator Alarm Survey

What’s That Sound I Hear?

by Debbie Bunch

If you’re in the typical ICU, it’s probably an alarm

Step into any ICU in the country and you’re likely to be met with a cacophony of sound. Phones ring at the nurses’ station. Health care professionals hurry about their daily tasks. And in between it all are the sounds of alarms going off in patients’ rooms, alerting clinicians to everything from profound hypoxemia to a lost pulse oximetry signal because the finger probe has fallen off the patient.

The problem for busy clinicians is determining which alarms require their immediate attention and which don’t. That was the crux of a recent survey conducted by the Healthcare Technology Foundation (HTF) with support from the AARC and eight other organizations, including the U.S. Food and Drug Administration, ECRI Institute, and the U.S. Department of Veterans Affairs.

RTs lead the pack

“This is the second time the survey was conducted,” explains HTF Secretary Jennifer Ott, MSBME, CCE, project manager at Northstar Management Company in St. Louis, MO. “The first clinical alarm survey was conducted in 2005–2006 and was an initiative to improve patient safety by identifying issues and opportunities for enhancements in clinical alarm design, operation, responses, communication, and appropriate actions to resolve alarm-related events.”

Modern medical technology is great, but all the buzzing and beeping that goes along with it is enough to make the average clinician (and patient) long for a little peace and quiet.
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WHAT RTs HAD TO SAY

The clinical alarms survey conducted by the Healthcare Technology Foundation last fall garnered an overwhelming response from respiratory therapists, who made up 63% of the sample. Here are the RT-specific results from a rough review of data filtered for respiratory care:

RTs FELT THE MOST IMPORTANT ISSUES CONCERNING ALARMS WERE:

1. FREQUENT FALSE ALARMS that led to reduced attention (27.2%)
2. DIFFICULTY UNDERSTANDING the PRIORITY of an alarm (18.1%)
3. DIFFICULTY IDENTIFYING the SOURCE of the alarm (16%)
4. INADEQUATE STAFF to RESPOND to alarms (14.8%)
5. DIFFICULTY in HEARING ALARMS when they occur (14.6%)

At the time, the perception at the HTF was that alarms were causing problems, but the extent to which those problems were affecting patients and caregivers had yet to be determined. The 2011 survey, which is available at www.thehtf.org, sought to further clarify the issue in advance of the Association for the Advancement of Medical Instrumentation’s Medical Device Alarms Summit held in October 2011. “The HTF Clinical Alarm Task Force felt it beneficial to re-survey at the five-year interval to determine changes in the profession’s perception of clinical alarm issues, improvements made at their facilities, and priorities for future action.”

The initial survey was conducted without direct input from the AARC but still garnered a respectable response rate from respiratory therapists nationwide, who made up 14% of the sample. With the AARC’s support, the HTF heard from RTs loud and clear last fall. “In the 2011 survey, HTF emphasized contacting more professional groups to complete the survey, thus the initial contact with AARC,” says Ott. “This prompted an overwhelming response from RTs, 63% or 2,071 completed surveys.” RTs constituted the largest group of respondents, followed by nursing at 31% or 1,324 completed surveys. “We truly appreciated the effort AARC made in sharing the announcement and encouraging their members,” says Ott.

Room for improvement

Overall results from the 2011 survey suggest much work needs to be done to bring clinical alarms in line with patient safety. Nearly one in five respondents reported adverse events related to alarms in their facilities, and nuisance alarms were cited as a problem in deterring an effective response to meaningful alarms. Respondents also agreed strongly with the statement that “alarm sounds and/or visual displays should be distinct based on the parameter or source” and favored the use of smart alarms, central alarm management, and clinical alarm improvement efforts. (See sidebar above and on page 41 for respiratory therapist-specific results.)

AARC members agree there is room for improvement. “There are far too many devices that have alarms, and with all alarmed devices there are too many false alarms,” says Lorraine Bertuola, BA, RRT, director of clinical services/respiratory therapy at Respiratory Health Services in Towson, MD. “Clinicians have a tendency to tune out the alarms that are not as important, thus allowing alarms to continuously alarm. This is disturbing and annoying to our patients.”

Keith Lamb, RRT, an RT II at Christiana Care Health System in Newark, DE, and chair of the AARC’s Adult Acute Care Section, says the biggest problem he sees with alarms is the inability of clinicians to immediately recognize and differentiate between those that are important and those that are not. “Since RTs often cover multiple areas, they rely heavily on nurses who are in closer proximity to the patient to recognize important alarms and relay them to the RT appropriately. This (continued on page 42)
RTs Weighed in on SPECIFIC ISSUES in the General Comments Section as Well:

- RTs felt all nuisance alarms should be investigated and defended the reasoning behind alarms, but they also felt proper alarm setting by patient condition would reduce the potential for nuisance alarms. However, they noted that some RT procedures, such as ventilator weaning and treatments, cause alarms that can be silenced only for short periods, leading to further desensitization.

- Most RT concerns focused on alarms outside the ICU setting or in isolation rooms or other locations where closed doors or far proximity from the nurses’ station would prevent alarms from being heard and responded to, pointing to the need for integrated systems that can help triage alarms from remote locations.

- RTs raised concern about further integration that could potentially make the alarm problem worse, noting in one case, “Alarms for alarms, really?!”

38.7% said ENVIRONMENTAL NOISE competed with alarms, but 44.8% did not think this was a problem.

61% felt ALARM INTEGRATION and COMMUNICATION SYSTEMS were BENEFICIAL for alarm management, and 77.1% thought SMART ALARMS would be the most effective in REDUCING FALSE ALARMS and improving clinical response.

ALARM POLICIES and DOCUMENTATION were followed at over 75% of the RTs’ facilities.

52.2% felt CENTRAL ALARM MANAGEMENT would be HELPFUL in alarm management but noted the DESIGN of such a system should ALLOW FOR DIRECT CAREGIVER CONTACT with the alarm rather than a delayed interpretation and response.

71.5% felt NUISIBLE ALARMS OCCUR FREQUENTLY, 66.4% said they DISRUPT PATIENT CARE, and 75.5% said they cause REDUCED TRUST and inappropriate turn off.

44% DID NOT KNOW of any clinical ALARM ISSUES in their facilities, but 16.5% said there had been issues.

66.7% felt STAFF WERE SENSITIVE to alarms and RESPONDED QUICKLY, and 71.9% said RT equipment has DISTINCT SOUNDS AND DISPLAYS. However, if the device count increased and competing alarms existed, 50.2% believed alarm confusion could occur.

49.4% were NOT AWARE of any ALARM IMPROVEMENT INITIATIVES in their facilities over the last year. Those who were aware of alarm improvement initiatives said most initiatives were related to POLICY or DOCUMENTATION, with a few mentioning CENTRAL ALARM WATCHING and/or eICU (electronic ICU). Technology revolved around alarm integration with nurse call and other central monitoring opportunities.

62.1% felt alarms are RELATIVELY EASY TO SET, and 74.4% said RT-related ALARMS ARE ADEQUATE. However, 28.7% felt that there have been frequent instances where alarms were missed.
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needs to be done in order to avoid the ‘little boy who cried wolf’ syndrome in which providers become complacent about responding to alarms when they have been needlessly summoned repeatedly to respond to alarms.”

Cynthia White, BA, RRT-NPS, FAARC, an RT-III at Cincinnati Children’s Hospital Medical Center in Ohio and chair of the AARC’s Neonatal-Pediatrics Section, calls for measures to ensure relevant alarms are not dismissed and says that is what’s happening now in her hospital’s unique pediatric transitional care center, which serves as an 18-bed long-term ventilator and tracheostomy unit. “Having extra alarms in this setting, such as continuous end tidal CO₂ monitoring and all the ventilators connected into the callbell system, has been a priority,” she says. “The intention of these alarms is to recognize a ventilation or decannulation emergency more rapidly.” The hospital has also incorporated cameras in every room and has trained monitor techs to watch them 24/7. Clinician response time and alarm validity are being measured to facilitate a more efficient response as well.

Toss the bathwater, keep the baby

Solving the nuisance alarm problem is certainly central to improving patient safety in the ICU. But while no one wants to be the “little boy who cried wolf,” no one wants to be the clinician who misses an important alarm either. RESPIRATORY CARE Editor in Chief Dean R. Hess, PhD, RRT, FAARC, assistant director of respiratory care at Massachusetts General Hospital in Boston, believes in erring on the side of caution.

“I would venture to guess that tens of thousands of lives have been saved as the result of an appropriate response to an alarm,” he says. “So let’s not throw out the baby with the bathwater.” He also notes that just because an alarm may be labeled a “nuisance” doesn’t mean it is a false alarm.

“The ventilator will not alarm ‘High Pressure’ if the pressure is low. It will not alarm ‘High Rate’ if the rate is slow,” he continues. “The ventilator is just a dumb machine. It cannot distinguish high pressure because the patient is coughing or high pressure due to a life-threatening tension pneumothorax. Either way, it demands clinician intervention — despite the fact that the high-pressure alarm due to coughing or asynchrony may be a nuisance for the clinician.”

A few good ideas

Dr. Hess believes part of the solution lies in ensuring ventilator and other alarms are set per the clinical needs of the patient rather than per unit policy, which is often the case.

“Often there is no distinction made between the patient with severe respiratory failure and the patient nearing the time of extubation. An alarm that might signal a life-threatening event in one case might be a nuisance in another case.”

Lorraine Bertuola agrees. “I believe device alarms should be re-evaluated and only critical alarms should trigger audible alarms. This will eliminate many of the nuisance alarms heard throughout the clinical environment.” For example, she suggests a feeding tube pump does not need an audible alarm. Instead, this alarm could be registered as a flashing light on a device panel. Other devices could be handled similarly, helping clinicians focus on only the meaningful alarms and helping patients sleep better at the same time.

Keith Lamb would like to see alarms engineered so that their tone and volume are keyed to the acuity of the alarm situation. “For example, a lost pulse oximetry signal alarm would be notably different from that of an actual reading demonstrating profound hypoxemia. A single high-pressure alarm would be different from a constant low-pressure alarm, etc.”

Dr. Hess envisions a single device that could capture all of the alarms and make better sense out of them for the clinician. “One approach that has not been taken to my knowledge is the use of a device — let’s call it an ‘alarm box’ — that takes the alarm inputs from multiple devices and filters them to a single alarm. The clinician could program which alarms (individually or in combination) would be high, medium, and low priority.” That would overcome the current situation in which alarms are set by device manufacturers without regard to other devices and clinicians who set alarms without regard to other clinicians. “Such a device could also be moved away from the bedside to minimize alarming the patient with the alarms,” he says.

The ball is rolling

The HTF’s Jennifer Ott notes that alarm hazards came in at number one on the ECRI Institute’s 2012 Top 10 Health Technology Hazards list and says solving the problem will take input from clinicians, manufacturers, regulatory groups, and others. The survey conducted by her organization last fall and presented at the Medical Device Alarms Summit in October was an attempt to start the process. “Our next goal is to continue to analyze the data and continue to work with various clinical stakeholders like the AARC to develop white papers, peer-reviewed publications, articles, etc.,” she says. “We look forward to further collaboration.”