



Joint Commission webinar on Alarm Safety transcript - May 1, 2013

Dawn Glossa, director of Communications and Corporate Marketing, The Joint Commission: Welcome to today's webinar on medical device alarm safety in hospitals. The Joint Commission's recent *Sentinel Event Alert* highlights some of the contributing factors and recommends potential strategies for improving alarm safety. Today we look forward to continuing that discussion. I am Dawn Glossa, Director of Communications and Corporate Marketing at The Joint Commission, and I welcome you to the call today. I am pleased to introduce our first speaker, Dr. Ron Wyatt. He's our medical director in the Division of Healthcare Improvement at The Joint Commission.

Ronald Wyatt, M.D.: Good afternoon and good morning, and thank you all for participating in this extremely important webinar. Also, I would like to say a particular thanks to the Patient Safety Advisory Group that's helped the staff at The Joint Commission complete the *Sentinel Event Alert*. Likewise, special thanks to the Association for the Advancement of Medical Instrumentation and the ECRI Institute. So, this is extremely important, and I will say an urgent topic for us to discuss and cover today. Why? Because we know that on any given day there's tens of thousands of alarm signals that go off throughout the hospital. The contributing factors we'll discuss today include clinicians who've become desensitized, overwhelmed, or immune to the sound of the alarm. And I think on a personal level, I recall from practice more than once that I would enter a patient's room and there's an alarm signal going off, and because of various reasons, one being I wanted to finish my exam so that I could get out of the hospital and back to the office, that I would either just turn down or turn off an alarm so that I could finish my examination and move to the next patient, and then let staff know as I exit the room that I had adjusted an alarm. It could be an alarm on a fusion pump or from telemetry. So, what happens or what potentially can happen when we do that, for whatever reason, we can harm patients and sometimes, in fact, it will end up in a patient's death. And as we looked at the Sentinel Event database here at The Joint Commission over a three-year period of time from 2009 to 2012, what we in fact found in that database were 98 alarm-related events, 80 of which resulted in death, 13

permanent harm, and five of those resulted in unexpected additional care or an extended stay.

So, we're talking about a topic that really impacts the well-being and, in fact, the lives of the patients that we're all committed to taking care of. So, during today's webinar, you'll hear some of the recommendations and the solutions, you'll find those in the *Sentinel Event Alert*, and you'll hear more from the experts that are on the phone call today. Also, on Page 3 of the *Sentinel Even Alert*, you'll also see related Joint Commission requirements. And we have experts here in the room today that can assist with any questions around Joint Commission requirements or the standards. So I'll stop there, and I think you're in store for a very informative webinar. Thank you.

Dawn Glossa: Thank you, Dr. Wyatt. Our next speaker is Jim Keller, vice president of Health Technology Evaluations and Safety at the ECRI Institute. ECRI's mission is to benefit patient care by promoting the highest standard of safety, quality, and cost effectiveness through research, publishing, education, and consultation. Jim directs ECRI's internationally-recognized medical device evaluation program, referred to by the New York Times as the country's most respected laboratory for testing of medical products. Welcome, Jim.

James Keller: Thank you very much for inviting me today to this presentation. Dr. Wyatt, I appreciate your comments, and I wanted to say that ECRI Institute is really impressed with the work that The Joint Commission is doing to help raise awareness about what we believe is an important patient safety issue. So if you go to the next slide, you'll see one of the things that we've been doing at ECRI Institute. Many of you probably have heard about something called the Top 10 Healthcare Technology Hazard list that ECRI Institute has been publishing. We've been putting that list out for the last several years, and clinical alarms have been at or near the top of our Top 10 Hazard list basically since we've been producing it. And, you go to the next slide; you'll see our perspective. A little bit was referred to by Dr. Wyatt, but this is an alarming problem. One of the reasons is that more and more medical devices are being used that have alarms. There's more and more patients that are connected to one of many different alarm-based devices, particularly in critical care areas – 150 to 400, or I've even seen numbers like 700 alarms per patient per day can be typical in a critical care setting. And, alarm-

based devices aren't necessarily standardized in many institutions. So you have a nurse who's working in several different areas in the hospital, he or she needs to know how to use several different device types because of that lack of standardization. And there's also flexible alarm setting features in the patient monitoring system, so you may have inconsistent alarm settings across an institution in like care areas.

And all that leads to, if you go to the next slide, alarm fatigue. This was a picture of my mother and my younger son David, and a year ago my mom was in an ICU up in Rhode Island, after suffering a severe heart attack, and thankfully, she survived that and is thriving today. But she was in the ICU for five and a half weeks, connected to a patient monitor, infusion pump, dialysis machine, and so forth, and it was just literally scary to hear all of the alarms going off, and this is from someone who's got quite a bit of experience in working with medical devices. And on this slide, are a couple of blogs that I wrote at ECRI Institute's website. So you're welcome to link to that and get my perspective on my experience with my mom in the ICU.

So on the next slide. Why did we consider alarms as a top 10 hazard? Well, we continue to get a steady flow of problem data through our various problem reporting systems, including our patient safety organization. We are routinely asked by hospitals and other health care organizations to do investigations of serious alarm-related events. ECRI Institute has surveyed hospitals on their perspectives on alarm safety and whether or not they've had problems, and we routinely hear about problems. And it's just a complex problem to solve because of, in particular, the large number of devices that are being used with alarms. Fortunately, there are solutions out there that can help address the problem, and you'll be hearing about that today, for example, from the folks from Boston Medical Center. And I call it the 'front page factor.' This has been on the front of the page of the *Boston Globe* and it's been covered by CNN and many of the other news media, and it's something that different health care organizations are paying close attention to. And you don't want to have your hospital be on the front page of the news because of an alarm-related problem.

Next slide. So here's just a wrap up with important recommendations from ECRI Institute's perspective about alarms, and The Joint Commission is really helping hospitals do this first item, and that's set alarm safety as a top patient safety priority

within your organization. And a good way to start doing that is to understand how alarms are being used in your institution. Do an assessment of specific patient case areas and understand how alarms are used across the different care areas in your institution. What do you clinical staff think about how alarms are being used and how they are working for you in your institution? What kind of problems have you had? Do you have a protocol for establishing alarm safety? Look at standardization of device types in your institution and what kind of training that you're doing for your clinical staff about responding to alarms. And whatever you do, you need to make sure that your clinical staff has good awareness about what your alarm policies will be, and have good buy-in from your clinical staff about your alarm policies.

And, if you go to next slide, you'll see a list of some ECRI Institute-related resources. One of the things that I'll point to which is pretty easy to figure out is the link for our alarm safety resource site. And then, on the last slide are some additional resources for projects or publications that ECRI Institute has been involved in.

And you go to the next slide, number 8, these are other useful resources and projects that ECRI Institute has participated in, for example, a national clinical alarm survey, and the Pennsylvania Patient Safety Authority. And there's a good reference about physiologic alarm management that was put out by the Pennsylvania Patient Safety Authority. And there's a link to an AAMI publication that I was involved in as a presenter. So, with that, I'll pass it back to Dawn.

Dawn Glossa: Thank you, Jim. And I want to let everyone know that the presentations in today's webinar will be posted later. Our next speakers are from Boston Medical Center, a private not-for-profit 496-bed academic medical center in Boston Massachusetts. The hospital is the primary teaching affiliate for Boston University's School of Medicine. They will be discussing their quality improvement alarm management initiative. The goal of the initiative was to improve patient safety on general medical/surgical units by reducing the number of clinically insignificant audible cardiac monitor alarms. I'm going to stop there and let them tell you the rest of the story and share their impressive results. It is my pleasure to introduce Deborah Whalen, Assistant Professor of Medicine, Boston University School of Medicine, and Clinical Service Manager and Nurse Practitioner for cardiology at Boston Medical Center.

Deborah Whalen: Thank you, Dawn. Patty, Jim, and I are very excited to be participating for Boston Medical Center to discuss with you the approaches our telemetry task force team took to better manage cardiac monitor telemetry alarms on our general medical/surgical units. Next slide. Let me first provide an overview on the focus of that initiative. We really wanted to safely decrease audible cardiac monitor alarms on our adult medical/surgical units, while ensuring that all important alarms were captured, displayed, and better heard. To really give you a sense of what the types of alarms were, let me just overview what were the audible alarms seen on these units. First are the crisis alarms. These require staff to view alarms and either respond to the patient for a true alarm, or to take some type of action for clinically insignificant alarms, i.e. adjusting the parameters more appropriately to the patient. Our second group of alarms are warning alarms. These alert staff to potential rate or rhythm violations but do not require staff to take action. They can sound in the background, they can self-reset, and they later often are found at alarm history and may have been missed by staff as clinically significant events. And finally, the other group of audible alarms, they're advisory alarms. These signal lower-level alarm violations and also self-reset.

Next slide. So our QI initiative was prompted by looking through our alarm histories and finding that we often had significant warning alarms that were sometimes missed, only to be later discovered in the alarm history. And again, that came from the fact that these alarms could self-reset, and again, they were at a warning status. The other big piece is we had serial observations by our telemetry team members of nursing staff interacting with cardiac monitor alarms. That sound of the warning alarms are often sounding on our nursing units and had a very delayed response from our staff who are engaged in other important patient care activities. So the warning alarms were not something that people came to immediately address.

With that, let me turn this over to Jim Piepenbrink, who's our Director of Clinical Engineering, who will discuss what some of our actual alarm data showed.

James Piepenbrink: Thanks, Debbie. Our approach to this pilot was to first identify any potential gaps in the technology and the use of telemetry. We needed to understand the process of telemetry at the medical center and how the technology was used in practice.

By taking the alarm data out of the system, this was a critical piece, as we needed the data to help us understand the issues that our staff faces that contributed to the alarm problem. We extracted all alarms for a two-week period prior to the go live and two weeks post-go live to provide a comparison. Our team reviewed and discussed these issues and identified an approach to eliminate clinically insignificant alarms so that we create an environment where actionable alarms could be heard and staff could respond appropriately. We categorized the alarms to identify the type of alarms and the quantity. As you can see, the arrhythmia and rate alarms were great contributors to the alarm issues prior to our default changes. Warning alarms constitute a large percentage of alarms on the unit and we used this baseline data to identify the changes that would be safe and positively impact the environment.

Next slide. This chart demonstrated the team's approach to identify what defaults should change to garner the best reduction in alarm noise while maintaining a safe environment. We also wanted to be certain that we identified the risk associated with each change by showing the transition from the original default to the new default, and what the users could expect as a result. We vetted these changes with our individual units that we were working with our taskforce, so we made the process transparent to all users. We also adopted some changes to the system alerts that are down at the bottom, as they are an important piece of the alarm management strategy. Ideologic changes are obviously important, but changes to the telemetry system are important to assure the staff that there are ways to see how the technology is performing. Socializing the changes across a diverse clinical environment was also an important piece of the pilot, and I'm going to have Patty discuss these in our next few slides.

Patricia Covelle: Thank you, Jim. So, I'm going to talk to you a little bit about designing and its use in the pilot. So, we reconvened our telemetry taskforce multidisciplinary group early on. Prior to looking at the data, obviously, we knew that it was a big problem, a very important problem that was getting a lot of attention nationally, and we knew that we had some missed opportunities when we'd go back and look at patient's histories, things that we didn't necessarily pick up right away. We knew that we had to get buy-in from all stakeholders. And the stakeholders were really BMC senior management, (which took actually no convincing), and our safety and quality patient consult team members, the Department of Medicine, the clinical engineering, the Division of Nursing,

and most important, buy-in from the care teams on the pilot unit. So, like I said, we knew we were on to something really big and really important from a patient safety and quality perspective, and buy-in from senior management was key because we knew that the changes that we were making were really more about changing the culture, the culture on how we interacted with our monitoring systems, who owns them, who can shut them off. We had some issues with how teams rounded near the monitor locations, and so really defining how we addressed each alarm and how we responded to it. We knew we had to take a hard look at our limitations as humans, as you can see with the amount of alarms that were sounding in our units every single day.

So we held focus groups with the Department of Medicine and Surgery, along with the nursing staff, and we used the fishbone analysis to help us tease out where our improvement opportunities were related to managing all the alarms and understanding them better. And our collaborative team really helped us with that. And what we found out was that a lot of the teams really didn't understand; the physicians were responsible for making sure that they had order sets that matched a patient being on a monitor. And we work in a monitored setting. We're clinicians – we want to monitor everything. We had to acknowledge that, that it was really hard for us to let go and to decide what we were going to monitor and not monitor. So we had to educate the staff on how to respond to those monitors. And we had to listen to the staff, who in the beginning were really skeptical about the project. But it came together by just spending lots of time with them and watching them interact with the monitors. They knew we were invested, and they knew that we were committed to making it better – a better day for the patients, a better, safer environment for the staff to work within. And we let them ask lots of questions and we listened to their feedback. In addition, we had to make some revisions to our electronic medical record order sets, so we worked with the IT department which was key to the timeliness of getting those order sets for the pilot, so that it was minimal interruption to the care teams who didn't have to interact so much with the orders and that the orders were kind of default for them. And as well, clinical engineering was a partner to us because they literally had to reset every bedside monitor, and on the telemetry unit, in addition to telemetry boxes that display centrally, we also have dash monitors that travel throughout the whole hospital. So we had to ask clinical engineering to identify a pool of dash monitors that had to have all the defaults changed, along with the central monitors, to the settings we wanted, and that was a big piece of work.

Next slide, please. So the key elements for supporting the pilot, we had local champions throughout the rollout. We had a super user group of local champions; their only cost was to hire nurses who literally were on the unit for 12-16 hours a day to monitor the patients and help the staff with the changes that we made. In addition to that, we were available 24/7. So that means that Jim, Debbie, and I were on call at home, on our cell phones, just to kind of champion the process and to let the nurses know that should they meet resistance with a recommended change – because part of the changes we allowed them to do was to collaborate with the team to make changes and make the defaults fit for a particular location.

So it was really about standardizing what the defaults were, but then customizing them, if you need to elevate the heart rate limit or lower the heart rate limit. And so, sometimes people had discomfort with that, but having us as support 24/7 really helped with that. We also developed a SharePoint site to journal and chronicle the staff observations, which was really important because they would pass off pieces of information from one person to another and really share that information. So, something as minor as we had dash monitors that had different software in them and we realized that the default settings were a little different in each one and they had different capabilities, or it called one alarm in one software one thing and the same alarm in another software dash something else. And so standardizing, again, was really important. But they were the ones who actually picked up these discrepancies. And, Debbie was really the champion on the daily tasks. The daily tasks were something that the staff loved. Debbie would come in in the morning and review with the staff all of the alarm data for the day, because she is that clinical expert on the floor, and she would actually – if there was, for instance, a patient who they really struggled with, she would actually catalogue it, take a picture of it, tell the staff how to interact with it, and get the message out, and that really helped.

Jim will now discuss our outcomes and show you our alarm data.

James Piepenbrink: Next slide, please. So this is sort of where the rubber meets the road. If we were to look at the average two-week period pre-go live and post-pilot, the average number of alarms we saw went from 87,823 to an average of 9,967, which is an

89 percent decrease in audible alarms, which has been pretty spectacular. Next slide. So, as we look at the data, the alarms types between the two two-week period, there were marked changes on the crisis and warning alarms. We increased the acuity on arrhythmia alerts and heart rate from warning to crisis, which accounts for these changes in the two alarm categories. We observed that while the number of alerts dropped drastically, we also had greater response to alerts because those that sounded were all actionable, and the staff were now keenly listening for alarms. Because of the rapid decrease in noise on the unit, they could hear them and act appropriately. An offshoot to this as well was that with the overall reduced noise, we were seeing and hearing system alerts such as off-network and leads-off, as they were previously lost in the noise of the other parameter alarms prior to the change.

Next slide. So when we started looking at the warning alarms to demonstrate the change associated with reducing the number of each type, we can see that bradycardia, tachycardia, and heart rate alarms prior to the pilot were averaging 62,793 per week. After escalating these from warning to crisis and embedding some process control such as improved communication and the enhanced order sets, and the ability for staff to customize per patient, we saw a decrease to an average of 3,970 a week. Patty will now discuss the impact of the pilot with you.

Patricia Covelle: Next slide, please. We wanted to get feedback from the nurses on the floor, and the staff, the physicians, and ask them how were things going. I can tell you that on go-live day, and Debbie and Jim can attest to this, on go live day, Debbie went around, made sure all the order sets matched everything for every single patient, and it was literally like a switch – working with clinical engineering, a flick of the switch, okay we're ready, go live. And we paused and we all waited. And we went from an extremely loud beeping, noisy unit down to nothing, and to the point where it actually made us a little uneasy. We were afraid that the monitors weren't working. And in fact, when we came in the next day, the nurses actually said to us, "We thought the monitors were broken. We kept going to check on the patients because we were afraid." And so this is now what they're saying. "The monitors were an irritant. They no longer seem that way. I can spend more time on patient care instead of answering meaningless alarms." And that was something that we were really hoping to drive home, to give them more time with the patient. "I feel so much less drained going home at the end of my shift." And you

know nurses work 8 and 12 hour shifts, and certainly it's very draining, and all that stimulation can impact how you interact with your patients. So we're pretty happy about that. The next comment was, "This unit is so much quieter than the other unit. As a float nurse, I want to work here." Now that float nurse actually said to me, "I used to hate to come to this floor, because about 90 percent of our patients on that cardiology unit were on a monitor." The monitors were beeping continuously because, as I said, we like to monitor everything. And she said, "I'm telling all the float pool nurses, you have to go to this floor. It's so much better." And lastly, "I didn't think I would ever say this, but the noise has really gone down. The new telemetry parameters seem to really work well. I didn't think it was possible with all the cardiac issues and so many patients. Great job." So we're pretty proud of that.

Next slide, please. And something that we weren't necessarily looking for or appreciating that we were going to see was improvement in our patient satisfaction percentile ranks, the scores. So, like many organizations, we definitely struggle in different domains. And these are percentile ranks, obviously, and you know in that first domain, the nurse domain, the 31st percentile up to the 42nd was what we appreciated when comparing six months pre- to six months post. But what slide I didn't show in here is actually we initially looked at four weeks pre-go live and four weeks post-go live. That's where the most dramatic jump was. I mean, we are only seeing steady improvement now. We're hitting numbers in our percentile ranking for overall assessment, nurse domain, and all that, that we haven't seen ever, probably. So our nurse domain went up dramatically. Our promptness to respond to call went up dramatically when you compared to the four weeks to the six months out, which again, this is only showing 51st percentile to 56th. But the personal issue domain and the overall assessment domain was the ones that we were really most proud of. And we're holding steady there. What we're finding is that we've been able to maintain, and we actually were just awarded a patient satisfaction award that we give out to units who rank high in a percentile. So we're pretty proud of that. Next slide, please. Debbie is going to now talk to you about lessons learned.

Deborah Whalen: I think this is the really important piece. What is the message that you should take away from this? And probably the most important thing is what Jim did in terms of really extracting actual alarm data, and that can be a challenge in terms of getting that from your manufacturers. And now we have access to that in-house. But

really take a look at that actual alarm data. How does it break down? What are the problem areas? And then really look, take time, and we took a couple weeks, having watchers just look at how your nursing staff are interacting with the alarms on a day-to-day basis. What seems to be continually sounding in the background? We had a sense, we knew it was the warning alarms, and actually, we found out pretty quickly when we were watching that it was the tachycardia, bradycardia, and those heart rate parameter alarms.

The next thing is be really careful about audible alarms that have that self-reset capability. Nurses are doing such important work, they don't want to be taken away from important patient care activities. So they hear something, it sounds like a warning, they know they don't have to respond to it right away. They're hoping one of their peers will respond to it. That's the difference between a warning and crisis alarm. Crisis alarm, all our nurses respond. Someone has to answer that alarm and it's everybody's responsibility until it's answered. So once we found that out and really understood that it was the self-reset capability alarms. We knew what the basis of alarm fatigue was at Boston Medical Center.

And then, improved management of your self-resetting audible alarms. Patty showed you that it affected staff satisfaction almost immediately. And patient satisfaction – she said something that was kind of surprising, but we took no other actions to improve patient satisfaction in that time period. So that really points to the fact that that's an opportunity out there to say, patient satisfaction scores are really hard to get at. Is this one of the ways we can all get at that better? And I did a literature review and no one has really looked at clinical alarm fatigue's relationship to patient satisfaction and what they're hearing.

So, those were the lessons learned from us. It's been a great project. The pilot never ended on that unit. That work continues on that unit. We also, internally, were awarded a \$25,000 patient safety grant to roll out to the rest of the institution, which we have done. So now, these are the changes that you do see at Boston Medical Center, and it's been really exciting as we've had visitors come to the medical center and comment on how quiet our environment is. So with that, I'll turn it back to Dawn.

Dawn Glossa: Thank you Deborah, Jim, and Patricia. Your comments have given us all a lot to think about. We would now like to take questions. And due to a large number of participants on today's call, we ask that you limit yourself to one question.

Question: Hi there. I have a question from like a logistics perspective. How did you count all of those alarms? How did you gather that data?

James Piepenbrink: We went into the central stations and we extracted those alarm logs, which are a daily log. We then compiled those into Excel, and then we did some algorithms to extract what the alarm messages were and then catalogued them by the different types, whether it was a system alarm, monitor alarm, arrhythmia, or a rate. And then we counted up each and put them in the appropriate categories. It was very labor intensive.

Question: Did you have any conflicts with other distractions like other alarms, for instance, nurse call?

James Piepenbrink: Certainly, those are things that we have to struggle with. There are infusion pumps, nurse call, as you said, so there are other distractions on the unit. But we found that the monitor alarms seem to be the most egregious in terms of polluting the air, if you will, with the noise. We also, I think, anecdotally found that when we decreased the noise on the unit with the monitoring alarms I think we also saw a decrease in nurse call alerts as well because they wouldn't have to ring multiple times to be heard. So I think that's an offshoot, I hope that answers your question.

Question: How were your nurses receiving these alarms? Were they via a secondary alarm notification system or just from their primary?

James Piepenbrink: Just from the primary. We had marquees for visual, but all of the alarms go to the central stations. We don't use any middleware for any of that.

Question: Regarding the Boston Medical study; does your hospital have a policy on alarm setting?

Deborah Whalen: We do, we have a cardiac monitoring alarm policy where we describe the response to alarms, and that's where we have embedded that the crisis alarms require immediate response and who may answer and silence those alarms.

Caller: So there are no limits though? You don't put that number in black and white.

Deborah Whalen: the limit in terms of what the parameter limits are?

Caller: Yes, the parameter limit.

Deborah Whalen: Our parameter limit for the current project is our heart rate low is 45 and our heart rate high is 130.

Question: My question regards mandated decibel levels. I know that you were reporting quieter units and you were cross walking that with your patient satisfaction scores. Did you look at various decibel levels and what is mandated by the state and regulatory bodies?

James Piepenbrink: We did anecdotal testing of decibel ratings, or readings, rather, looking at pre- and post-pilot. The average numbers were reduced drastically by the changes we made in the monitoring system. But we didn't compare those to any state regulatory requirements or suggestions. That was just an anecdotal test.

Deborah Whalen: I believe that it was the upper decibel, obviously, that got reduced. So our upper decibel level, I believe, went from the mid-80s into the lower 70s.

Question: We were wondering if you had any increase in potential or actual events reported of potential harm once you implemented the pilot?

Patricia Covel: No, we haven't appreciated any events actually.

Question: We were wondering, on the critical alarm levels, we did hear somebody respond to a low of 45 and a high of 130. How does that relate to some of the other

alarms, pulse oximetry, things of that nature, and how can we get standardized for those settings?

Deborah Whalen: One of the things that we found with that – we've been looking at the systems alarms, particularly for pulse oximetry and for blood pressure – one of the things that we found is, remember that those earlier ones are arrhythmia as well as those heart rate parameters were warning, as are those systems for blood pressure and O₂ pulse oximetry. So they were always conflicting and you didn't know, when you heard a warning alarm, which of those it was. Now we know when we hear warning alarms, which are those two beeps, that those warning alarms are coming from an O₂ sat violation or from a blood pressure violation. Our current O₂ sat violation low is an O₂ sat of 90, which we're looking at and thinking about potentially lowering to 88 or 89 percent. And the other, our blood pressure lows and blood pressure highs are pretty standard for the rest of the industry, I think, in terms of what those blood pressure numbers are. But now, our surgical staff is really commenting, we're much better able to hear the O₂ sat and the blood pressure violation.

Patricia Covelle: I think one of our other challenges with the utilization of O₂ sat monitoring, continuous O₂ sat monitoring, is the technology can be uncomfortable for a patient to wear, and again, I think I made the comment earlier that we want to monitor things, right? We're clinicians. We want to know when a patient's in trouble. But, if we're contributing to the noise by putting someone on a continuous O₂ sat that really doesn't require one, who could have intermittent like maybe hourly or every two hourly sats, we're contributing to the problem, right? And so, that's really one of the culture change things that we are asking our nurses to speak with their clinical teams about, you know, does this patient truly need continuous O₂ sat monitoring? So let's monitor the patients who need it and not the ones who don't.

Question: What would you really push us to do? Like where's the real value in this? What do you think we should really start doing right away?

James Piepenbrink: I think it comes down to process. I think it's twofold. The harder one is identifying what patients really need telemetry and then limiting the use of that technology for those patients instead of, if you will, a band aid for all various types of

patients. But I think the other is to really understand the process, how it's used. Understand what the perceived limitations are by your clinical teams, what the expectations are of the system, and then look at that, discuss it, and then measure it. And I think that making that process more transparent really helps any change that you want to do because there's a buy in from the important people that have to use it.

James Keller: I just wanted to chime in on that, that I think one of the most important things that is covered in this *Sentinel Event Alert* on alarms in along the lines of Jim's process question; and a lot of institutions just don't have a good across-the-institution understanding of how alarms are set and then how they're being responded to, and just understanding your environment is a really good first place to start.

Question: We're wondering if there's an adverse event after an alarm has sounded, if you're monitoring or checking these alarms on a per-patient basis, can you wind up falling outside a standard of care because you've modified the alarms beyond what a normal parameter would be?

Deborah Whalen: I don't think so, because we've adapted the defaults of the manufacturer, and we're standardized to the institution. So one of the comments in the earlier presentation was the importance of standardization, so no matter where our nurses go they know what those alarms mean. And in fact, we didn't lower any alarms, we elevated alarms. We elevated alarms to crisis. So we didn't take an alarm to a lower piece outside of what the industry would have made for recommendations. And a lot of people have lowered tachycardia and bradycardia alarms to a lower level. We brought them up to warning because, most of our adverse events prior to the change in the project would have been because they had been preceded by warning heart rate alarms that were too low or warning heart rate alarms that were too high. So we've really improved the standard of care. So I think we would be able to say that pretty confidently, and I think our medical staff and our nursing staff truly believe that.

Question: Do you have centralized or decentralized monitoring systems? And how many channels do you have?

James Piepenbrink: It's decentralized, so it's only on the unit. We don't employ a war room or anything like that. And we have somewhere in the neighborhood of 320 beds with telemetry.

Patricia Covelle: We have 58 adult critical care and six pediatric ICU beds. So we have a lot of monitoring capability within our institution.

Question: Can you just clarify; did you analyze the necessity and utilization of second alarm notification system? And if yes, do you have a second alarm device?

James Piepenbrink: We do not employ a secondary alarm system. The only technology we have outside of the central station is the marquee or marquees on each of the units that provide a digital message of what bed is in alarm and what the alarm violation is. We chose not to layer additional technology on it until we identified and improved process and the alarms to a manageable state, and then we can start thinking about layering additional means of extending those alarms to caregivers.

Question: Did you have a physician champion, and how did the medical staff respond to your study?

Deborah Whalen: We did, one of my physician colleagues. But as Patty said, we did focus groups with the physicians as well as with our resident staff. We are a teaching hospital and academic medical center. So, we really allied with them and also, as we went and did the rollout, we actually spent time also with our surgical colleagues, and again, had some skepticism. But as they saw the data we were able to really work collegially. And having actual raw numbers as data and really talking about that really drove that. So we definitely had physician champions. And as I said, the medical center, which includes the medical executive group, awarded us a \$25,000 grant and really partnered with us.

Question: Did you create two different sounds for the crisis and then the warning system?

James Piepenbrink: No, we used the standard noise and alerts that come from the patient monitoring system. We didn't alter those in any way.

Caller: So are they different?

James Piepenbrink: They are different, yes. The crisis has a different tone in it, and it uses three deeps per alert. The warning has two beeps; but there are distinct sound differences as well.

Caller: When you say you decreased the alarms, is that due to the parameters that you redid?

Deborah Whalen: It was twofold. What happened to the decreasing alarms, one was we changed our parameters. We moved the heart rate low from 50 to 45 and the upper heart rate from 120 to 130. But really, that was a small piece. Really what drove those numbers is the fact that the nurses had to go and respond to those crisis alarms. So they knew that they had to address the crisis alarm. So that then meant that instead of warning alarm resounding when it occurred again, they addressed the crisis alarm and changed the parameters so that crisis alarm did not occur again until there was a clinically significant event.

Question: Could you give us a few more examples of how you changed your order sets? And were they written in stone or were doctors allowed to say, "Nah, I don't want to change that."

Deborah Whalen: What we did with the order set – it was a standard order set – we changed the parameters to the heart rate low of 45 and the heart rate high of 130. But we also put two other things in, and we didn't really highlight that piece. But one is atrial fibrillation. So one of the things we had done is, previously atrial fibrillation in our system has been a message alarm. Now we didn't really talk about messages, but messages are because so many people can be in atrial fibrillation, you don't always want a continuously-sounding alarm. But in atrial fibrillation it had been a message, but we were concerned about that as just being a visual because we wanted people to recognize when people went into episodic atrial fibrillation that that was an important piece. We

didn't want to just capture that in the alarm history, we wanted people to know it as it occurred. So we built in a process for atrial fibrillation. We elevated atrial fibrillation from a message to an advisory with this so that they would get a one-star, a one-beep alarm, they would know this patient was – and it was our only one-beep alarm – that they would know the patient was in atrial fibrillation. But, we wanted to be able to then have, for chronic atrial fibrillation, people to put it back down. So the order set says if the patient goes into atrial fibrillation or rotations in chronic atrial fibrillation, lower the alarm to the non-audible message alarm. It also has another order that says when the patient is in atrial fibrillation, may elevate the heart rate to 10 above what their mean rate is, notify the house staff of the atrial fibrillation episode, and obtain a 12-lead EKG. And the third piece that we had in the order set – so the house officers would check off these orders if they were appropriate for the patient. And the third was that there are patients who have, particularly patients in chronic heart failure, who have ventricular tachycardia. Short runs of non-sustained ventricular tachycardia, that would be a crisis alarm in our current system. So the house officers were able to say, known short runs of non-sustained VT, lower that alarm to a message alarm, meaning that it would be a message alarm. For patients that were having runs less than six beats per minute, no one was permitted to, without actual physical discussion, to lower the v-tach alarm that is greater than six per minute. So those were all built into the order sets so as the house officers were admitting the patients, they could preselect it. And it was always possible for them to change the heart rate parameter low and high to different levels for the patients. But it's been really interesting; they have not done that.

Question: It looked like most of your improvement in the reduction of alarms had to do with heart rate, bradycardia/tachycardia, and HR alarms. In the pre-pilot data were you allowed to adjust those alarms per patient or were they just fixed at the default?

Patricia Covelle: Nurses in collaboration with the physicians could make those adjustments. But there was a lot of hesitation. Again, that culture of 'we want to monitor everything, we want to know about everything.' And then you have to remember, too, that heart rate alarm limits were not at crisis level. So we could easily have missed changes in heart rate limits because they rang off at the warning level, which again, self-resets. So if a patient had a pause or brief episode of bradycardia – if you think if a nurse is in a room and has to come and respond – it could have self-reset before they even got

to address it. Now, the nurses certainly know how to go into alarm histories and review that and they do that, but I think that we could probably safely say that there were alarms that have been missed.

Question: I have heard from a variety of sources on this topic of alarm fatigue and clinical alarms that this topic is going to be a National Patient Safety Goal to be implemented in 2014. And I'd like clarification.

Ronald Wyatt: This is Dr. Wyatt at The Joint Commission. There is a *Sentinel Event Alert* on this topic, and we're beginning to do the pre-work toward a National Patient Safety Goal.

Dawn Glossa: Thank you to everyone who took the time to participate in today's webinar, Dr. Wyatt, Jim Keller from ECRI, and Boston Medical Center's Deborah Whalen, Patricia Covelle, and Jim Piepenbrink, and thanks to all of you who listened in. We do hope it was a value to you. If you do have a question that was not answered today, you can reach out to me via email at dglossa@jointcommission.org, and I will triage your question to the appropriate people. For more information about alarm safety and hospitals be sure to read the *Sentinel Event Alert*, if you haven't already. It is available at www.jointcommission.org. And finally, a link to a replay of today's webinar along with the slide presentations will be posted on The Joint Commission's website within the next week. Thank you again, and have a great day.

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