Welcome to “Research in an Acute Care Setting.” My name is Jessica Maples. I am the bariatric coordinator at Covenant Health. Another member of our team is Jamie Roney. Hi, I'm Jamie Roney. I am the sepsis coordinator at Covenant Health in Lubbock, Texas, and we have a group of our research team here today to talk to you about some of the research we have been doing, so Erin... I'm Erin Whitley. I'm a clinical nurse educator at Covenant Health and here's the last team member that is with us today. Hi, I'm Kim Stunkard. I'm a nurse professional development specialist, also at Covenant Health. Jamie, do you want to get us started?

Jamie Roney: Sure. We want to just talk to you today about some of the research we are doing in our acute care setting. We are just nurses like you guys are. We never thought, I don't think, a year or two ago, that we would be in the middle of a research project, but we found ourselves with a burning need to do some work and to get that work out there to other health care professionals to help impact practice and patient outcomes. So what our research is around is the use of a modified early warning scoring or MEWS tool, and we want to introduce how we conceptualized that tool and how we tested that tool for reliability, usability and acceptability. A little bit of background on the MEWS tool. MEWS started out at Early Warning Scoring System, or EWSS, overseas, and it was developed as an attempt to increase the identification of the at-risk patient for deterioration before they actually started crashing. It has now been modified, so anybody who has modified that original tool that is out there in the literature, it is now called a MEWS tool -- it's a modified early warning scoring tool. The MEWS tools can look different because people have made various modifications to that tool, and what we want to talk to you about is really the modifications we, as a health system and as a team, made to the MEWS tool and for identifying that at-risk patient.

So, again, a little bit about our background. Do you want to tell them, Kim, how we started out with a shared governance approach to this? Kim Stunkard: Absolutely. I think we were really thinking about getting the bedside nurse involved from the beginning, and what better way to do that than to approach our shared governance and anybody who wants to know what a shared governance model is,
it's basically staff nurses who affect the care they give and the policies and procedures that guide their practice. So, our shared governance meeting was made of members of bedside nursing who saw these patients. Our approach was to take it to them and let them come up with an idea and how they wanted a tool to look, so they would be the ones that would actually be using it in practice.

Jamie Roney: And, did we do anything innovative with our tool, Jessica?

Jessica Maples: We did. I think that one of the great things that the shared governance team was able to identify was that we looked at... did a little bit of a lit search... not as much an extensive one as we did later, but initially they looked at a few articles and found that what was in the articles they looked at was that they were just looking at oxygen saturation for one of the components of identifying an at-risk patient, and our nurses said, "Well, I would worry just as much about a patient that had a 97% oxygenation rate if they were on... I’d still worry about them if they were on 100% non-rebreather." So, rather than just focusing on that O2 sat, they really wanted to look at oxygen delivery method and see how much oxygen they were needing; how much assistance they were needing. So, I thought that was pretty smart. I don't know that we, as a research team, would have come up with that same insight, so I think it was valuable.

Jamie Roney: So that is one example of ways that we modified what's out there in a way that, to us now, is clinically significant. Because it does make a difference if you are satting 100% on BiPAP versus 100% on 2 liters per minute, and most of the tools out there look at that oxygen saturation versus the oxygen delivery. Were there any other innovations that we made, Miss Erin?

Erin Whitley: Well, I think you can probably speak better to it than I can, but the other great idea that the shared governance team had was to include sepsis screening into our tool. They've added checking the lactate; they've added the search criteria so that's included; you don't have to have another screening tool to check the patient for sepsis; we can do it all in one swoop.

Jamie Roney: Very good. A little bit of background with what led us to looking at this... It is that our health care costs are rising; our mortality rates associated with sepsis are rising; and we needed a screening tool to identify the sepsis patient, but there are also screening tools out there to identify the at-risk patient, so as Erin said, it was nice that the shared governance team was willing to combine the two. So, we weren't asking our staff to use two different screening tools. And they didn't have to do that, but they chose to do that, and they did include even the lactate and the white blood cell count in their screening, so they adjusted those vital sign parameters to match that of the SIRS or systemic inflammatory response screening that we see with sepsis. An example of that is most of your tools will start with a heart rate of 100; they took that heart rate and moved it to 90, because that's where our systemic inflammatory response syndrome (SIRS) starts.

We also wanted to improve the quality and outcomes of our patients at the hospital where we work, and we, on our team, used our chief medical officer, our chief nursing officer, and me, the director of quality and sepsis coordinator, these ladies are clinical educators, charge nurses, members of the rapid response team, were on that shared governance team, staff nurses, and even staff physicians in
helping us develop the tool that we are using or that we developed in our algorithm. We really were committed to finding solutions to early identification of the at-risk patient.

Jessica Maples: Jamie, I think it's important, when other hospitals or healthcare systems are looking at implementing something like this, I think it's so smart to start with getting “buy-in” and getting peoples’ ideas, because if you skip that step... we, by all means, did not do everything in the right order, but if we would have skipped that step, I don't think we would buy-in to the implementation and use of the tool like we really want, but if you allow people to have a voice and be part of the decision-making, I think it makes a big difference.

Jamie Roney: I think we are going to see that or hear that again when we start talking about our reliability testing, how their input is so valuable and what we’ve developed in our end product. So what really is the background for all of this, Miss Erin, or what was our problem that you saw that led us to really focus on this tool?

Erin Whitley: What I saw was from a conference (an educational conference that Kim and I attended), was just nurses, nurse educators, talking about evidence-based practice and nursing research and getting involved and having your hospital involved and your staff involved. So, we felt a real drive and need to get our staff and ourselves involved in nursing research and using evidence-based practice and doing literature reviews and all of those things. So, we came back and we saw the MEWS that you were working on with the shared governance team and we thought, “Wow, what a great way to impact nurses; to impact the patient; and to really make a difference and let the nurses being involved and see us getting involved and see that it's all doable.”

Jamie Roney: I will say, Erin, you were probably the most excited and emotionally moved by the whole idea, because you guys came back... you and Kim, from a conference with fires lit in making a difference in practice at the bedside. I think transforming care at the bedside is very important for what we’re doing. As sepsis coordinator, I was excited about it because we have nationwide, internationally, an issue with sepsis. Sepsis is a killer. In our health system, when we looked at our DRG's 870 to 872 (which had to so with sepsis), we saw that over 1700 patients a year are dying of sepsis that are coding out in those DRG's, which gives us a mortality rate of 21%. That's one-in-five of our patients with sepsis dying. And our cost to treat them is higher than the national average (it's about 7,000 to 14,000), so could we do something different to lower that cost to treat and increase their chance of surviving sepsis? So, to me it was an opportunity to combine a huge effort that I'm passionate about, an effort that you’re passionate about, with truly putting the patient at the center of what we’re doing. I think some of our background is very important. The fact that sepsis kills 29% to 50% of patients and it costs the United States about $17 billion a year, which is 2.5% of all the expenditures for health care go to the sepsis patient population. Again, with mortality rates as high at 50% and costs to treat as high as they are, it really is a significant impact for clinicians and patients.

Again, we talked a little bit about how we approached our project and about the challenge of identifying that at-risk patient prior to rapid response team usage, and activation, and the often-missed
Erin Whitley: Well, the aim of our research really, ultimately, is to identify the at-risk patient and hopefully impact the mortality of our patients -- save some patient lives.

Kim Stunkard: I think it's important also to realize that any patient that codes outside of an ICU has a far less chance of survival. Their chances decrease greatly when they are not in an ICU and I think that coming up with a tool like this and researching really about what a modified early warning system should look like and how it should point out a patient, would really hopefully decrease our chances of out-of-ICU codes due to cardiac and respiratory arrest as well as identifying a septic patient.

Jamie Roney: And I read somewhere where someone said (and I can't really remember who it was; if you do, please say so), but there should be nobody ever code outside an ICU, but it's out there as a statement that no one should ever have to code outside an ICU. We should always identify them early enough to see that. Can you tell us what we found in the literature about that and how early we start seeing the signs of deterioration?

Jessica Maples: Signs of deterioration can show up even 24 hours ahead of time. So, it means if we can empower our bedside nurses with a tool like this that will help them really easily and quickly and in a standard way identify just those key things that could show that this patient is going in the wrong direction, then maybe we can get them to the appropriate level of care; maybe we can involve other people and prevent them from having that deterioration progress or get them the treatment they need so even if they continue to progress, they'll be in the right setting. I think this is huge and I think one of the things that our shared governance team was really smart to do was (because they knew all of this), they even chose the right units, I think, to trial out this tool.

Jamie Roney: Tell us about that. How did they select those units?

Jessica Maples: They selected the units based on their use of the rapid response team. So, the unit with the highest utilization was chosen and the unit with the lowest utilization of our rapid response team was chosen. Interestingly, there is a correlation there because the units that use our rapid response team the most have lowest number of codes outside the ICU, probably because those patients get transferred to the appropriate level of care. And the opposite was true -- our units that had the lowest utilization of the rapid response team had the highest number of codes outside the ICU. So, it tells us that if we do something different, not just utilize the rapid response, but if we do something else, maybe we can make an impact, too.

Jamie Roney: Do you remember, Kim, what we found in the literature about the use of rapid response team as far as the results from our literature review, or Erin?

Kim Stunkard: I think it's interesting because in our hospital we were really bad about utilizing the rapid response team as a code team, which is not why they are there. They shouldn't be responsive or reactive to a situation that is already too late. They should be coming into a situation much earlier.
And the use of a modified early warning scoring tool and other areas that we saw early on is the idea of bringing the rapid response team in to do proactive rounding -- to really look at patients before they get to the level of arrest or even worse. So, I know that rapid response teams are very much in place. We don’t want to attempt to create a tool that replaces them because their clinical judgment is always going to be key in any health system. I think it’s really about a tool that will help the bedside nurse know when they need to seek out help and when they need to be concerned. I also feel it's important because a lot of nurses, especially new nurses, have not developed that instinct to know. Sometimes you just feel like something is wrong, but you can’t put your finger on it. A lot of times it’s subtle changes that a nurse might never think to point out, but it might be a handful of things have changed just a little bit and it would never identify in any other way other than using a modified early warning scoring tool so that you could actually approach a physician and say, "Your patient is not doing very well." Instead of having to say, "I don't know why and I can't put my finger on it," you can actually say, "This is what I've come up with as far as scoring them."

Erin Whitley: It gives some facts to your “gut” feeling. It's interesting... one of the articles we looked at, (if you all remember), said that MEWS was proven to be more accurate than the “gut” feeling. Nurses live by our “gut” feeling. We have that "Something's wrong; I don't know what it is." Maybe the patient is just talking about some bad things and giving you that bad vibe, but MEWS was proven to be more accurate than the “gut” feeling. Another interesting thing in our literature review was the mixed results -- some places saw a big increase in their rapid response team use; some saw a decrease in their rapid response team use. So, we were really concerned that our rapid response team use was going to go sky high once we got this rolled out to the whole hospital, so we were looking to see, and we saw it was really kind of mixed.

Jamie Roney: Interestingly, as Erin mentioned, referring to the one study that compared “gut” instinct to scoring of patients did show that the scoring of physiological change has far outweighed the “gut” instinct of a nurse. Although it was one study, it has not been replicated yet, that has a huge impact. But I think what else you said was, we saw mixed usage. Sometimes when they introduced MEWS, it increased rapid response team usage. Some of the studies we looked at it decreased, and we kept hearing this mixed message during our literature review. One of the things we noticed in our pilot units is the same thing. Our pilot unit that used rapid response team the most now uses it less; and our pilot unit that used it the least now uses it more, which possibly explains the results from our literature review and the evidence that is out there. It really probably does depend on how you use the rapid response team when you start using the tool. Even within our own institution, we have seen mixed results with usage. So, it’s very interesting. Thank you for bringing that up from our literature review.

Our aim was truly to develop a standardized process to proactively identify 100% of our at-risk patients for deterioration by November of 2012. So, what we really did was we took quantification of our assessment findings, our vital signs, our lab values, our physical and neurological assessments, and confirmed those through an extensive literature review. Usability and reliability of the resulting modified early warning scoring, or the MEWS tool, was tested using a scripted simulation, which we are going to talk to you about a little bit more, to minimize our variables and a convenient sample of the bedside nurses on the units where this was going to be deployed. Again, we've talked about our pilot
units. We did choose three units to pilot it, and we haven’t yet reached the point in our research where we’ve rolled it out throughout our hospital, but again we strategically chose those units as you heard from Jessica, Erin, and Kim. And again, as Erin said, it replaced our “gut” instincts in nursing with a quantified and standardized approach to patient assessment findings that really guided clinical judgment and improves the communication among the healthcare team. I don’t think we’ve said that enough, but our score actually ties to an algorithm, and what we know from The Joint Commission is the number one cause of sentinel events is communication breakdown. This tool actually guides communication. If they follow the associated algorithm with the tool, they are going to be communicating with the charge nurse; with the rapid response team; with the physician; and with those people, thus positively impacting our failure to rescue; our failure to communicate; and our failure to plan which are huge when it comes to our sentinel events.

So, again, do you want to talk a little bit on the conceptualization of the tool, even before we tested it, what it looked like? I know we had several conversations and maybe one of those conversations I should direct to you, Jessica, is even the conversation of should it be in an electronic health record versus a piece of paper.

Jessica Maples: Interestingly, we are right on the cusp of the transition from primarily all paper with the exception of our emergency department that has already transitioned to an electronic health record. Right now we are all paper and in a few months we will be all electronic. So, we wanted to be thinking of how this would impact things when we moved to an electronic health record, but it’s a challenge and I think it is something that we’ll still consider and still get feedback from our shared governance team as we move forward into implementation and we look back and review this after it’s implemented. But I think it’s valuable to have it as a piece of paper, because it’s just so easy for you to see and to share, and as nurses we want to be advocates for patients and when it’s a piece of paper that you can say, “Right here -- this bright red color tells me something is wrong, and it should also tell you something’s wrong.” I think so far we’ve found it valuable for it to be on a piece of paper.

Jamie Roney: I agree. And I think we just want to share one graph with you. This is a graph of our activation of rapid response team and our testing of the tool. When you look at this graph, every dot on there is a change to the tool that we made based on our plan-do-check-act cycle of change. So, when you look at every change we made to the tool when we tested it, you see that our reliability or the amount of activation of the rapid response team appropriately went up with the findings or with the changes that we made, so we truly did continuously improve our tool as we went and as we tested. We’ll go into more detail about those changes. But just to show you the impact of making changes and looking at results and making changes based on results.

Again, we wanted to really introduce you guys to the conceptualization of our tool and we’re going to follow this. We want to talk to you about our testing of our tool, which is exciting, too; but I hope you have a better understanding of just the conceptualization of the tool. Again, we measured our changes to our tool with a plan-do-check-act cycles of change; reliability testing which we’re going to talk about; and show that it really truly impacted... the changes to the tool impacted the results that we
got. We also have lots of positive compliments and comments from the staff on the tool as we were testing it. So, the next thing we really want to talk to you about is truly the reliability testing of the tool.

“There’s No MEWS Like Good MEWS”

Jamie Roney: Now, we really want to go into the testing of this tool that we developed and our research that we started. Erin (so wittily) says, "There's no MEWS like good MEWS." So, we want to talk to you about our reliability, usability, and acceptability testing of the modified early warning scoring tool that we've been talking about. Again, there are a few things we want to tell you about this. We want to talk to you about the value of the tool itself, and the components that are necessary for its success. We want to talk to you about the strategies necessary for successful implementation of a MEWS system or any clinical assessment tool that you may want to research in your institution, and we want to describe the need for reliability testing and articulate the importance of using controls in planning out that research. I think if there is one thing we as a team have learned is that there is a lot to be said about planning and research, and it's a slow road to China -- you don't do research quickly. Erin, do you want to tell them about our hospital and our research setting?

Erin Whitley: Sure, we work at Covenant Health and that's where our research has been done -- Covenant Health in Lubbock, Texas. We are a Christian-based organization (Catholic-Methodist blend). We have about 977 licensed beds. We work off two campuses. We have an adult campus and then a women's and children's campus. We have 5000+ employees, 600 physician staff, and we have an average daily census of about 500. Lubbock, itself, has a population of about 230,000. Covenant serves a 62-county region in West Texas and Eastern New Mexico, so we do serve a very large area.

Jamie Roney: In case you don't know where West Texas is, Jessica, would you like to kind of explain to them based on the map of Texas where we're located?

Jessica Maples: When you think of Texas and you think of the top, we're just almost in that top and so we're just east of the Texas/New Mexico border. We get lots of patients from New Mexico as well and we are kind of in the plains/panhandle area.

Jamie Roney: Great -- so maybe that gives you guys a better understanding of where we conducted our research and what kind of institution we are. We are a fairly large... as you can tell by our licensed bed size, a very large institution, but I think research can be done by anybody. So, don't let that intimidate the fact that you too can apply evidence-based practice at the bedside, wherever it is that you work.

Erin Whitley: Many of the articles we looked at, actually, were done in very small, rural facilities in Europe, so anybody can do it.

Jamie Roney: I think it can be done. So, why did we look at MEWS? Kim, tell them why we looked at MEWS, again, just to reinforce this.
Kim Stunkard: We looked at MEWS because we really wanted to decrease the number of codes we saw outside the ICU. We really wanted to be able to identify patients when they first began deteriorating so we could move them to the appropriate level of care. Research has shown that any patient that codes outside an ICU in a non-ICU setting, definitely their mortality rates dramatically increase because they just... staffing is different; they are just not equipped to handle the excess of care that goes along with a patient who is arresting. So, that was really one of the important things. We also really wanted to incorporate a way to look at the patient that might be septic. So, it was really about finding a tool that put all of that together in a way that a nurse could easily identify (according to color) the level of deterioration that their patient was facing.

I found it interesting in doing literature review that there really is no evidence behind the practice of rapid response team usage. And I think that's one of the things that prompted me to put this research team together was, “You mean there’s no evidence to say that rapid response team usage actually decreases mortality, decreases cost, decreases length of stay? Wow.” So, there were two organizations that really put out a “call to action” and I think Erin can speak to that.

Erin Whitley: We were answering a call from the Institute for Health Care Improvement and the Agency for Health Care Research and Quality.

Jamie Roney: So, again, to reiterate Kim and Erin, this is really a “call to action” because while we know the rapid response team plays a critical role in saving patients' lives, the MEWS system could help that and take it to the next step, which is just truly identifying these patients earlier, which is exactly what Kim said. And if we identify them earlier, we are hoping we save more lives -- bottom line. So, the MEWS helps build reliability in the rapid response team and attempts to guarantee that no at-risk patient for deterioration gets missed. I know that Jessica would like to talk to this... How did we start originally with our research? What did we have to do first of all?

Jessica Maples: Very first of all we had to figure out really what was our burning question, and so we went through and said, “What's the population of interest that we really want to look at and what intervention are we going to be looking at and what's our comparison group. Then what outcome are we hoping for.” Then we took it a step further and we said, “What's the time frame that we really want to measure?” So, if we really have a strong, concise, clear question, then it helps guide us in finding literature that relates to what we're really looking for and it tells us if there are any gaps out there. So, we compare what we find to our original question and know if what we're doing is something unique and original.

Jamie Roney: So... very important. We did. We developed that clinical research question. I know Erin and I spent many a night on the phone about our articles we were reading and looked at the articles, and as Jessica said, we took those articles and we compared the research results to our actual question and did they answer the question? Did they not? Did they partially answer the question? What were the weaknesses and what were the gaps? I think in doing that as, again, novice nurses who don't work in an academic setting really helped us to understand the research process better and truly helped us identify evidence that's out there that's reliable and credible. And some of those we just
discarded because they weren't worthy of our consideration addressing our PICO question. Again, we
had institutional barriers that we wanted to anticipate. But truly, we divided or designed our research,
and again, I think someone said this earlier; we did this in the wrong order. But after we started, we
said: “We want to do this and we want to do it right and we want to share our results.” When we
looked at designing the research, we started a little late, but we did design the phases of research that
we wanted to do.

Phase One that we already talked to you about was the MEWS tool conceptualization, and we
did that from March 2012 to July 2012. What that included or involved was that preliminary literature
review; shared governance team's development of a process to identify that at-risk for deteriorating
patient; and the tool created for measuring the physiologic findings with an inclusive algorithm that
guides a result-based action by the bedside nurse. That tool conceptualization, as we said, we left it a
paper tool, and I don't know that we said it, but we color-coded it. I think you alluded to it with red, but
we color-coded it where, if the patient is just fine -- they are green; if we should keep a closer eye on
them -- they are yellow; if they are a little bit sicker -- they're an orange; and if there is action required
immediately -- they are red. So, it was very much almost like a stop sign approach but very color-coded
in our algorithms that we looked at. So, that paper-based tool was a scoring grid and color-coded. Some
of the things we noticed early on was it may be hard to keep up with what line you're on, so we
made every other line a different color. And we really did our best to make it a user-friendly tool as far
as looking at it.

Some of the other discussions we had were: “Where do we put the tool? Is it a permanent part
of the record? Is it not?” And we let our shared governance team come up with those answers. “How
often do we score them?” Interestingly enough, our med-surg nurses only wanted to score them once a
shift. Our rapid response team members of the shared governance team really fought hard to make it
every four hours. So finally, the med-surg representatives conceded that, “Yes, this really should be
done every four hours.” So there was a lot of thought process involved in that conceptualization piece.
We even wrote the initial policy of how to use the tool. So, it's one thing to develop it, but then what do
you do with this piece of paper? And that's where the shared governance team in that very first part did
a really good job.

Phase Two is where we decided we would like to research it. This is kind of where we brought
other people in and it's not that the shared governance isn't really involved anymore, but they really are
not. The shared governance team helped us develop the tool; now we had the tool and, as a team, we
wanted to take that further. You'll hear some shared governance in our testing, but primarily they are
not part of the research team at this point. This is where we took it as a group and wanted to do this
right. We didn't know exactly how to do it right; we just wanted to do it right. So, I don't know... Kim,
do you want to talk about...

Kim Stunkard: Yes. I don’t think any of us had really ever done research. I think maybe we had
looked at articles before, but really not known where to go with that. So, our very first task was to seek
out somebody who was very knowledgeable in research. We actually found a professional research
instructor who was able to help us along the path and really be an advisor and be a key piece of our
team, and really helping us know where we needed to go; what we needed to look at; really, how to focus our efforts so that we were actually making a difference. Without the input of our advisor, we would still be at square one trying to figure out where to go from here. So, she was very key.

Jamie Roney: Does anybody else want to say anything about our research mentor?

Erin Whitley: Well, we, of course, just love her to death. I remember when we first all decided... we sat down and we said, "Yeah... let's do research on this." And then I think we all kind of looked at each other and said, "Well, what do we do now?" So, we went to some of our leaders of the hospital and they recommended that we speak to one of the instructors.

Jamie Roney: One of the instructors was one of the instructors at one of our local universities that has a school of nursing. Do you want to say anything?

Jessica Maples: I just think it's been really valuable to have someone that, as we are actually all going to graduate school right now, so it was something we were learning about, but implementation and knowing it are different, and to have someone you could go to that could serve in an advisory role and still really be a participating team member, she allowed us to have control of decision-making and do things on our own, but it was nice to have someone to go to to guide us and have questions answered, and to tell us, "You can do it; you can do it; keep going."

Kim Stunkard: I think it was also important to have a fresh set of eyes that didn't come from the same backgrounds that we did. You know, we're all... we all have backgrounds in hospital education and she really approached things from a different, analytical, very informed, rational way, whereas sometimes we would get bombarded with not necessarily emotional but attached ideas because we worked in the health system that we were researching the tool in, so I think it was nice to have her outside opinion.

Erin Whitley: She would propose something and I know a few times we've said, "Oh, no, we'll never be able to do that, we can't do that." And she would say, "Well, let's just try; all we can do is..." She is very much an encourager, a cheerleader, a motivator. And it's interesting... you say we're all in graduate school now. We were not all in graduate school when we started, so be careful about what you might be getting yourself into by getting involved in research, because Jamie was the only one in graduate school when we started. Now we all are.

Jamie Roney: And I think it's been very helpful to apply what we're learning in school to our practice and it definitely hard wires. I think the key here is that you put together a great research team like the one sitting at this table; I would like to say, and align yourselves with the right people, which again, we're talking about another valued member of our research team, and again, this is not the entire research team. We had a multi-disciplinary team. Our chief medical officer; we had a respiratory therapist; again we have an outside agency, which is a professor of nursing research; but again, align yourselves with the right people, because you can do this, and if you don't know the answers, there are always people you can reach out to and get the answers and get the support. But again, thanks to
Google, which is not a scientific search, but thanks to Google, you can really go out there and seek opportunities to align with people that may be interested in what you are interested in researching.

But we did go a little backwards. In our Phase Two is where we did our MEWS comprehensive literature review. This is where we did an extensive literature review. We developed the PICO -- the population intervention comparison control outcome, and time frame of interest as a group. We identified the gaps as we sat down and looked at those articles, compared them to our PICO question. We actually validated our MEWS physiologic findings in measurements through that. We found out things about respiratory rate is not accurately counted. In fact, about 22% of all respiratory rates are accurately counted by clinicians. That's huge. As nurses and as consumers of healthcare and as practitioners, how many people do we work alongside that don't take the time to actually count respirations? So, some huge findings in our literature review, but it did help us identify physiologic findings and validate that. It also validated our patient population selected for use. We could take this so far. There are ER's using this, or emergency rooms using this tool to decide where to place patients; outpatient settings using it to decide in EMS, whether to admit the patient; but we needed to focus on what we wanted to focus on, so we really chose our focus of our research and again, if you've ever asked a clinical question or a research question, you find out you have five more questions and other interests and you want to go other directions, but it kept us focused in that Phase Two.

Phase Three is our MEWS tool pilot, which we talked about, too. We started that in July 2012 when we piloted our MEWS tool. Our MEWS tool design changes and revisions were made first, based on feedback from our pilot units. Because we started our pilot units before we truly decided to start the research team. So, again, it was a backwards approach, and we've chosen to keep those three pilot units, as we catch back up on the back end with what we should have done to begin with. But we made some changes based on the feedback from those pilot units. But then, based on our guidance of our nice advisor, we decided we really truly needed to test the tool and test it in the right way and do it through a plan-do-act-check cycle of change and make changes, which led to Phase Four, which is really what we want to talk to you about now, which was our MEWS tool reliability and usability testing. We did that in October 2012 and now currently working on presenting the information we found in the United States and internationally. We're presenting our research findings both at the International Research Congress for Sigma Theta Tau International as well as we presented it at Institute for Health Care Improvement in December of 2012; and we're going to present it at a Breakthrough’s Premier Conference in San Antonio. So, we've been able to take our initial findings and give those findings to you guys and to other clinicians with the hope of keeping going. So, really our Phase Four was the testing of the tool.

I know with our reliability testing, we wanted to decrease any variables that we would find. So, how did we eliminate any extraneous variables, Erin?

Erin Whitley: Well, it would probably take all of us saying all the ways we did that. We were kind of meticulous about it, I think. Originally, when people showed up to the simulation center, we used simulation to do our reliability testing. We screened our participants to make sure they had had no exposure to the MEWS tool. If they were from a pilot unit, they could not participate, because we
wanted fresh eyes on this. We wanted to get good data. If they had ever been trained on the MEWS tool, they were eliminated from our research and we told them, “Thank you very much.” So that was one way that we used a control in our testing.

Jamie Roney: And then the scenarios we set up, Kim?

Kim Stunkard: Yeah, we actually came up with scenarios where our vital signs, any of our therapies, our white blood cell count, and our lactates were set so that we would be testing people with the same answers. So, basically there would be no variable where they might assess one thing one way, and then the next person comes in and assesses it a different way. That’s why we opted to use mannequins as opposed to people, because somebody might have a conversation with the patient and the patient might say something that would change the outcome of what they would score the patient as. It was really important to make sure that every aspect of our scenarios was set; that it was the same from person-to-person-to-person, so that we would eliminate those variables in scoring.

Jamie Roney: And we really, as you said, did a great job of limiting those variables on assessment and focused the testing just on the tool itself. So, they didn’t have to use any of those assessments.

Kim Stunkard: Right, I think it was important to not be testing their assessment skills.

Jamie Roney: Do they know how to take a blood pressure?

Kim Stunkard: Exactly, but rather that we were testing them on what they did with the information and how they filled the tool out.

Jamie Roney: And Jessica, with a background in education, as all of us have, it was very hard originally, because our original plan... would you like to tell them about our original plan for testing the tool in regards to education on the tools used or how to complete the tool?

Jessica Maples: Originally, we thought it would be best if we could just really do some good education because as educators, we think, “Well, they need to be thoroughly knowledgeable; we need to give them the answers to the test, in great detail, before we let them use it.” Our advisor said, "Limited verbal communication" because again that would make it inconsistent. What I say and what you say might be different from time-to-time; even what I say from person-to-person could be different. Really, she wanted us to focus it on very limited verbal interaction and to have a written description of what was there. But I think it’s also important to say, although I loved that we were very consistent and we limited variability there, I think it’s important to say that we had... we were really specific on things. For instance, “the urine output, within a urinal.” And they didn’t have to measure what that amount was. We had it labeled. So, there really was just everything spelled out for them so if they could read, then they could come up with the right answer. Interestingly, we did find that even though we thought, "Oh, everything is perfect," as we went through testing, we found out we could modify things and make it even more reliable or there were some variables that you just can’t completely eliminate.
Erin Whitley: Yeah, one of the other points was trying to eliminate the verbal interaction, was if the person had any prior experience with us. So, if we had had them in a class previously (we are all educators and they didn't enjoy our class); or we had to speak to them about a difficult subject or something. If we had had some kind of previous interaction with them, that can even influence how they would score, how they would go through the scenario, the feedback they would give us after the scenarios, so that was another way we would tried to control the interaction as much as possible.

Jamie Roney: And that actually became one of our plan-do-act-check cycles of changes, because we originally tested... we had 55 nurses go through our scenarios, but we only ended up with a final number of 25, and one of the changes we made was based on the written education, and I think I'll let Erin talk about that.

Erin Whitley: Well, we started out with the written education that we gave them and they could all read it, and go through it. A few people did okay, but they weren't really seeming to quite get it and it just kept sticking with us, as educators, we really needed to educate. This isn't how we would roll a tool out if we were rolling it out in the hospital for them to use. We would educate them to the best of our ability. So, finally we decided, as a group, that as long as we scripted the education and we stuck to that script, that no matter who was reading it, if we stuck to the script it would be very controlled and it wouldn't hurt our results.

So, after we did that and after we scripted our education scenarios, we wound up with five scenarios eventually that they went through -- one for each color, green, yellow, orange and red -- in an education scenario. Once we added that, we really did start to see that they were getting it, because during that education scenario, we walked them through filling out the tool. At the end we said, "Now, do you have any questions before you go to do the scenarios on your own?" Then from that point on, we did not help them during their scenarios.

Jamie Roney: And I think this little human interaction, or controlled human interaction, prevented bias; it insured standardization; and it provided reproducibility. So, it actually was a part of our reliability of our tool. Can someone, a clinician, take this tool and complete it accurately and get the right results and reproduce that with another clinician without us having to prompt and guide and it truly did focus on the piece of paper itself.

Erin Whitley: I think another thing about the reproducibility, as we did not do all of our testing, by any means, in one day, and we were not all there each day. There was no way that could happen. So, with the reproducibility, it all needs to be very clear and very written out so that if one member of the team isn't there, the others can carry on. I know there was one day that I had been in the ER the night before so you all had to do it without me and it was very stressful but you all got it done and you did great. So, that's another thing about having everything controlled -- everything written out. Everybody on the team has to know what's going on so that it can carry on if one team member isn't there.

Kim Stunkard: I think we even went to the nth degree in that we understood that once they had run through the scenario once, they would have knowledge of it, which meant that every scenario they
did after, they would get better and better at using the tool. So, Erin realized early on that it was important that we switch the scenarios and not ever do them in the same order, so that this first scenario wouldn't always be the worst one that they did, and the last scenario always be the best, because they had actually gotten the hang of how to use the tool. So, we began to alternate as well in the scenarios they actually ran so that we would get good results.

Jamie Roney: Hopefully, you guys can see the thought process that we put into our testing and would warrant you or any other research, to put in that kind of thought, to the point of if they don't like me and I tell them something, will that influence the testing results; and mixing up the order of the scenarios; and there are just so many variables and so many things to think about and we would just come up with one in the middle of the night and text each other, "Oh, yeah, did we think of this? Did we think of that?" And interestingly, the first day of testing I think we only ran three people through and we called a halt and pulled the panic cord. We stopped all research; two of us ran to graphics to make changes to the tool immediately and I don't remember where the other two ran. Erin Whitley: One person ordered pizza as we were hungry, and I don't remember the other one.

Kim Stunkard: We created a new scenario.

Jamie Roney: So we immediately had to adapt to the poor results we got with just our first few testers through our scenarios.

Erin Whitley: And we were really worried that we had messed everything up, that our research was done. We called our mentor and she said, "No, you're doing just perfect, you're doing wonderful." Plan-do-act-check – you’re going to have mistakes.

Kim Stunkard: And I think it's important for us to realize... I think we tended to take things kind of hard. If something didn't work out, I know that we were so disappointed. I know there were times in the simulation lab that something wouldn't go the way it was supposed to, and I know Erin would get really frustrated and think, "It's never going to work." But it's really about not taking anything to heart, but understanding it was just research and there were going to be changes and there were going to be things that didn't work. That was part of the learning was in finding things that didn't work, because had we never tested it, had we not ever done this, we would have rolled out a tool and had to go back after we had educated a ton of staff members without ever having realized, “Oh, we really needed to change this.” So, I think that was really important, too.

Jamie Roney: And I think I panicked at the idea that we would run out of test subjects, because our target group of testing was the people who worked the floors where the tool would be used. So, every time we made a change to the tool, we had to start from scratch to try to get the magic number of testing to making it truly statistically significant. At some point we’re like, "There just aren't that many nurses and are we going to run out of nurses?" I know some of your hospitals may not have 55 nurses that you guys could test something on in a target audience. Luckily we work at a fairly large hospital, so we did that well.
Jessica Maples: Thank you so much for your time today. We hope you have found some valuable lessons that you can put into your practice. And again, on behalf of our MEWS research team, my name is Jessica Maples; I’m Jamie Roney; I’m Erin Whitley; and I’m Kim Stunkard. Thank you so much for your time.

Presenters: Roney, Maples, Whitley, and Stunkard

SLP: 042914 (Revised/edited)

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