FINAL GRANT REPORT

Title: Using Military & Aviation Simulation Experience to Improve Rural Obstetric Safety

Grant Award #: 5U18HS015800-02

Grantee Institution: Oregon Health & Science University (OHSU)

Principal Investigator: Jeanne-Marie Guise, MD, MPH, OHSU

Co-Investigators:	Shad Deering, MD, Madigan Army Medical Center Nancy Lowe, CNM, PhD, FACNM, University of Colorado, Denver
Team Members:	
Consultants:	Linda Connell, PhD, NASA Barbara Kanki, PhD, NASA
Neonatal Rescuscitation Expert:	Linda Wallen, MD, OHSU
Project Coordinator:	Patricia Osterweil, BS, OHSU ChristenO'Haire,PhD,OHSU
Lead Statistician:	Motomi Mori, PhD, OHSU
Statistician:	Hong Li, MD, MSPH, OHSU
Counselor:	Jillian Romm, OHSU

Project Period: 9/1/2005-6/30/2009

Federal Project Officer: Eileen Hogan

Acknowledgement of Agency Support: This project was supported by AHRQ grant 5U18HS015800-02. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the Agency for Healthcare Research and Quality.

ABSTRACT

Purpose: To improve the process of obstetric care and promote safety in rural communities through simulation and team training.

Scope: Labor and delivery units are high-risk, high-cost environments in which decisions, mistakes, and delays can have tragic consequences. In our nation's rural hospitals, staff must possess the skills and resources needed to manage obstetric emergencies despite the infrequency of these events; these locations offer the ideal setting to improve safety through obstetric team simulations.

Methods: Three specific aims were proposed:

I. To develop and test an obstetric safety toolkit - CORDS

II. To implement and evaluate CORDS in rural settings

III. To explore the ability of information technology (IT) to create a statewide safety culture and to expand the reach of simulations

Results: This project accomplished the following: 1) provided a toolkit that can be used across the country to improve the process of care and promote safety, 2) demonstrated how to use IT and simulated education to support a statewide safety culture, and 3) modeled how to utilize and evaluate the effectiveness of simulations to learn new teamwork skills and enhance the process of care and safety in rural healthcare systems. Overall, we found that the CORDS program substantially reduced medication errors and improved teamwork skills of experienced nursing and physician providers. Furthermore, these skills were retained and applied to new situations up to 1 year following initial training.

Keywords: Patient Simulation, Medical Errors, Patient Care Team, Obstetrics, Interdisciplinary Communication, Professional Competence, Program Evaluation, Quality of Healthcare, Clinical Competence, Safety, Rural Hospitals

PURPOSE

The goal of this project was to bring simulation technology and team performance training, proven in aviation, the military, anesthesia, and other limited areas of medicine, to improve the process of obstetric care and promote safety in rural communities.

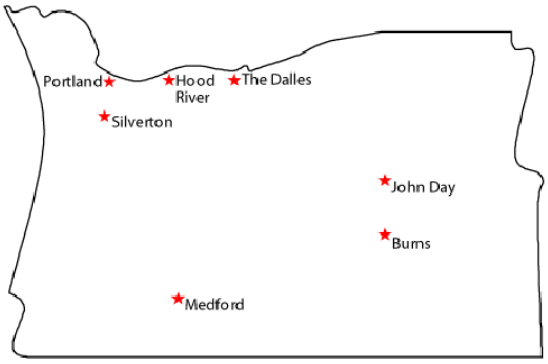
SCOPE

Labor and delivery units are high-risk, high-cost environments in which decisions, mistakes, and delays can have tragic consequences. In our nation's rural hospitals, staff must possess the skills and resources needed to manage obstetric emergencies despite the infrequency of these events. More than 75 infants die each day in the United States. JCAHO estimates that 2/3 of cases of neonatal death or permanent disability during childbirth are attributable to human factors such as communication errors, and almost half are due to issues of staff competency. [1-4] Rural hospitals with limited resources and few providers face considerable challenges in providing emergency obstetric services as required by the Emergency Medical Treatment and Labor Act (EMTALA). This demanding structure, requiring nurses and support staff to maintain skill levels and clinical competency in obstetrics despite limited hands-on experience, offered the ideal setting to improve safety through obstetric team simulations. Crew resource management (CRM) and medical simulations have been recommended by the IOM, JCAHO, and AHRQ as safe practice interventions to reduce errors and risks associated with the process of care.[5]

To date, most simulation programs require that interested individuals attend training at a large simulation center, often located in a university setting in a metropolitan area. Travel to these centers may not be feasible for many providers in rural or remote areas due to geographic isolation and costs. In many disciplines, the curriculum is not standardized, precluding comparisons of effectiveness. In addition, many of these programs focus on technical skills within one discipline. Similarly, the focus on technical proficiency, though easier to measure, does not mimic the clinical setting, where many highly trained professionals must work together in a coordinated and efficient fashion to achieve the optimal outcome.

This proposal combined crew resource management (CRM) and simulation expertise from NASA and the US military, educational and research expertise from academia, and the safety focus of all three to bring simulations where they were desperately needed: the frontline of clinical care in rural America. We capitalized on the groundswell of community interest (every health system invited eagerly participated), professional support (NASA, US military, and national professional organizational leaders), and our own local telemedicine and IT expertise and united the community to promote, continue, and expand a national obstetric safety culture. We developed and validated an easy-to-use tool to objectively measure teamwork and developed a standardized curriculum in CRM team performance and technical proficiency training in simulated obstetric emergencies. Furthermore, both the chosen simulator and the standardized video curriculum were tested in six rural practice settings so as to provide a team teaching tool for this resource-challenged area of medicine.

Participants: Clinical teams from six geographically diverse Oregon community hospitals participated (see Figure below). Hospitals ranged from critical-access frontier rural hospitals to larger community hospitals, and practice types ranged from Midwifery to Family Medicine to OB/GYN.



METHODS

Hypothesis

Coupling simulation and crew resource management (CRM) training through a standardized **C**urricula for simulated **O**bstetric emergency **R**esponse **D**rills & **S**afety (CORDS) will improve the process of obstetric care (by improving team response times as well as technical and nontechnical performance) and patient safety in rural hospital settings.

Specific Aims

To address the hypothesis above, we proposed and completed the following specific aims:

I) Develop and test an obstetric safety toolkit - Curricula for simulated Obstetric emergency Response Drills & Safety – CORDS

a. Develop educational toolkits simulating common obstetric emergencies

We proposed to develop educational modules to improve team performance and technical proficiency through the simulation of obstetric emergencies that present high risk for human errors. The modules presented a video with the following components: 1) discussion of the role of teams in responding to emergencies; 2) presentation of the theory, principles, and practice of crew resource management and simulated obstetric drills; and 3) presentation of examples of good and bad performance in simulated scenarios.

b. Test the educational modules for their ease of use and instructional validity

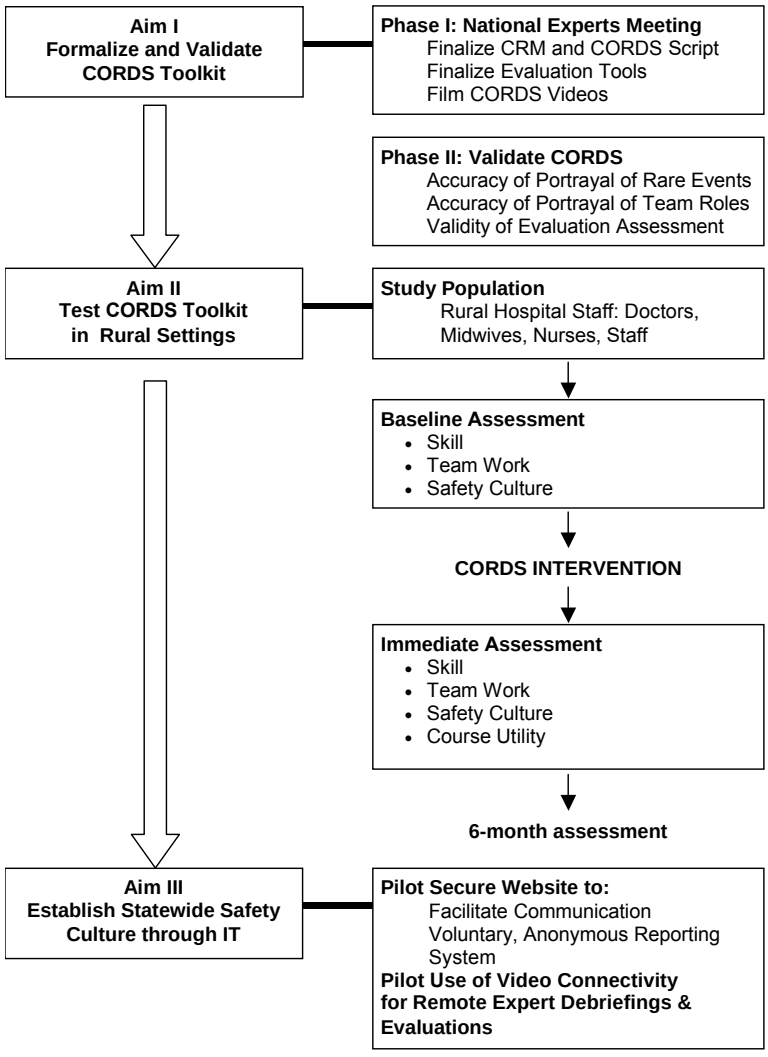
We tested each module and simulation within a controlled university environment across several disciplines, including midwifery, obstetrics, family medicine, nursing, and other hospital personnel, to ensure accuracy in portrayal of the clinical situation and ability to test team performance.

II) Implement and evaluate CORDS in rural settings - We administered the obstetric emergency simulation drills in six rural settings in Oregon using the AHRQ-funded Oregon Rural Practice Network (ORPRN) and other rural community practices and hospitals. We measured team performance during obstetric emergencies and educational effectiveness for each module in each setting and assessed the frequency of simulations required to maintain clinical, technical, and team proficiency.

III) Explore the ability of information technology (IT) to create a statewide safety culture and to expand the reach of simulations - We explored the use of IT to unite a statewide safety culture through the establishment of a secure website to facilitate communication concerning obstetric safety and create a system to allow voluntary, anonymous reporting of close calls and troubles with team responsiveness. The purpose was exclusively to learn more about vulnerable situations and create future simulations to promote optimal process and outcomes.

Study Flow

The main focus of this proposal was Aim II (e.g., studying the feasibility and usefulness of a standardized simulated obstetric emergency curriculum that combined simulation and CRM in a rural setting). Aim I included the precursor steps necessary to enact Aim II (including the development and pre-testing for evaluation issues and validity of the scenarios). Aim III explored the potential for IT to expand the reach of simulations and to facilitate a statewide safety culture. This focus allowed for the orderly progression of our study.



Specific Aim I
Test CORDS modules for their ease of use and instructional validity

Study Design: Development and Validation Pilot Study

All obstetric simulation scenarios were developed by an interdisciplinary team. The clinical curriculum was based on ACOG guidelines for diagnosis and treatment of obstetric emergencies.

Our team developed simulation scenarios and didactic educational programs for several of the most common and dangerous obstetrical emergencies and CRM. All scenarios were designed to provide healthcare professionals with the tools they desire for the common situations they fear most.

Simulated obstetric emergencies were pre-tested at OHSU. Ten response teams consisting of OB providers and nurses ran through the emergency simulation on NOELLE® twice without a CORDS intervention (pediatric resuscitation teams were involved and assessed when called). Trained evaluators evaluated each group performance using the situation-specific checklist. This allowed us to adjust for performance improvements that come from comfort with the mannequin and enabled us to more accurately determine the effect of the CORDS intervention (see Aim II intervention details). A second set of teams proceeded through all obstetric emergency scenarios in exactly the same way that the rural hospital teams were expected to proceed. That is, 1) at baseline each participant completed a teamwork evaluation and safety culture evaluation; 2) teams ran through the first set of simulations without any training, and evaluators rated individual and team performances using the appropriate scenario checklist; 3) teams then viewed CORDS curriculum and were debriefed on their group simulation; and 4) teams then ran through simulated scenarios again, and evaluators rated individual and team performances using the appropriate scenario checklist. Participants were asked about the face validity of the scenarios to depict situations in real life; completed the CORDS evaluation; and provided feedback directly to the investigators on the content and format of the simulation and didactic video and then suggested alternative wording or conduct for that as well as the survey tools.

Objective Teamwork Evaluation Tool: CTS™

A major limitation to improving human factors and teamwork is the paucity of objective, validated measurement tools. We sought to develop and validate an easy-to-use tool to measure teamwork factors and their contribution to overall team performance in both simulation and clinical settings. Our goal was to develop a tool that could be used in the field to assist in debriefing team simulations and also by clinical teams to evaluate teamwork skills in routine and emergent clinical care. Needing a quick and easy tool that both clinicians and researchers could use to quickly perform 360 evaluations of clinical teamwork, we developed and validated the Clinical Teamwork Scale™ (Guise JM, 2008). CTS begins with a global assessment of teamwork and then progresses through five conceptual domains known to constitute teamwork (i.e., communication, situational awareness/resource management, decision making, role responsibility [leader/helper], and patient friendliness). It is available on our website www.storc.org and resulted in a manuscript (Guise JM, 2008).

Specific Aim II

Implement and evaluate CORDS in rural settings

Study Design: This was a single-arm intervention study implemented at six rural sites in Oregon: Burns, John Day, Medford, Silverton, Hood River, and the Dalles. A total of 126 participants (41 provider teams) during Visit I at the site underwent the CORDS intervention and were evaluated for team performance at baseline (prior to the CORDS intervention, immediately post intervention). A total of 77 participants in 26 matched teams during Visit II were evaluated at a second site visit approximately 9-12 months post intervention. Teams typically consisted of one OB provider and one or two nurses (depending on local structure of clinical teams).

CORDS was implemented at Visit I, and the first phase of training and simulations (clinical topics and CRM/team training modules) was conducted between November 2006 and March 2007. The curriculum consisted of three simulations: a standard vaginal delivery (used only to acquaint participants to the manikin), shoulder dystocia, and postpartum hemorrhage; a module on CRM training (approx. 8 minutes); and two clinical didactics specific to obstetric emergencies (approx. 4 minutes each). Simulations occurred *in situ* on the hospital Labor and Delivery Unit. Team debriefing occurred after each simulation, and a CORDS evaluation was completed at the end of training.

The focus of Visit II was to determine the effectiveness and efficacy of the training program. To optimize the evaluation of the training curriculum, each team again participated in two simulations, one that combined the two emergencies from Visit I to examine retention and a new scenario to test application of principles to new settings. This training was conducted between October 2007 and March 2008. Visit II's first simulation combined two scenarios from the first site visit: a shoulder dystocia delivery that led to a postpartum hemorrhage due to uterine atony. The second simulation was an eclampsia simulation. These were chosen because hemorrhage and hypertensive diseases are the leading causes of maternal mortality in the US and the world and represent the leading cause of admission to an ICU. Additionally, eclampsia was chosen because treatment involved medications, and we were curious about the impact of training on the reduction of medication errors. Team debriefing, didactic presentations, and final evaluation were conducted in the same manner as in Visit I. An evaluation of Visit I was also included.

The effectiveness of the CORDS intervention was assessed by measuring the change in the following primary outcomes, as measured at Visit I and II: (1) global scores of team performance; (2) technical skills; (3) time taken to execute procedures; (4) number of actions, omissions, and inappropriate actions; and (5) usefulness and applicability to rural healthcare teams. The secondary outcomes included change in organizational culture score and detailed team performance, including recognition, situation, role knowledge, and effective communication. In addition to the assessment of the team performance, each participant was provided his/her assessment of the course overall, usefulness in practice, satisfaction and comfort with scenarios, overall feeling for improved teamwork, and feeling that simulations may prevent an adverse outcome. Analyses included paired t tests and McNemar's tests.

Limitations

This project was very successful. We aimed to capture a diversity of practice types, ranging from CNM to FP to OB and from frontier rural to larger hospital settings, to improve generalizablility and to truly understand whether the simulation and team training were valuable throughout the spectrum of care types. Through this, we were able to determine that there was a value to simulation and team training across practice types and settings, but we do not have power for any one practice type or role to understand in detail which items are specifically more valuable to one provider type or setting over others. This would be a good topic for future research. We experienced the challenges that other researchers encounter in conducting community-based research. First, rural communities experience high rates of turnover. Over the 1 year between our initial visit to sites and follow-up, 1/3 of providers moved out of the rural communities. Because our inclusion criteria for participating in the follow-up study required that the team leader (provider) and at least one nurse had to participate in the initial simulation and training, this directly impacted the number of team pairs who completed the entire study. Second, our study team was geographically distant and administratively separate from the test sites.

Because of this, and because of the unique nature of rural practice, scheduling and travel were somewhat challenging. Scheduling for rural providers was understandably restricted due to their limited backup and critical need for their services. Even after schedules were confirmed, unexpected challenges occurred. Such an example is that half the nursing staff at John Day was out due to an illness, and one of our participating teams had to cancel. At another location, during the time we were on location, they had a groundswell of laboring and critical patients such that we had to terminate our sessions a day early. Rural-specific issues included foul weather (many locations are across mountain passes) and even deer hunting season, decreasing the likelihood that some rural physicians would be available for training. However, despite these challenges, we did complete our study successfully, and the rural sites were incredibly appreciative of the opportunity to participate. Similarly, our research team became inspired by the dedication and palpable respect we witnessed at some of our rural sites. This research was a meaningful project for both study participants and researchers alike.

Specific Aim III
Explore the ability of information technology (IT) to create a statewide safety culture and to expand the reach of simulations

In 2006, we established a secure website at the following URL: www.storc.org or www.obsafety.org. Since that time, interest has steadily grown from 1-2 web requests for specific information per month to 1-2 per week.

In 2007, after conferring with leaders at the NASA Ames Research Center on the Aviation Safety Reporting System (ASRS) and the Patient Safety Reporting System (PSRS), we launched our Obstetric Safety Reporting System (OBSRS) on our secure website. The voluntary, anonymous reporting system provides a mechanism for the identification of safety issues, a forum for sharing potential solutions, and a global culture of safety for childbearing women and their infants.

We constructed the system with the following levels of security:

- **Anonymity.** We have specifically designed the reporting system as an anonymous system. Structured fields obtain safety information without identifiers.
- **Unintentional identifiers removed prior to data storage.** Within 24-72 hours, reports were read by reporting staff to assess the veracity of the report and to remove any identifiers that may have been unintentionally entered prior to storing in the database.
- **Data encryption for the highest level of electronic security.** Even though reports are anonymous, we used the highest level of data encryption (the same that is used by e-commerce and other highly secure electronic data transmissions) for report transmission and storage. We chose Verisign to provide our data encryption, reported in 2006 to be the most trusted symbol of web security and the data encryption chosen by NASA's Aviation Safety Reporting System.
- **Complete lack of IP address tracking.** We did not track IP addresses (computer identifiers), and we had absolutely no way of knowing where reports originated from. Each report was completely anonymous.
- **Robust data storage security.** De-identified data were stored in a password-protected database behind a robust firewall. Data access was limited to authorized STORC staff.

As with most reporting systems, the first 3 to 10 years following release have the lowest user trends. Our first statistics were posted and are downloadable from our website. We have continued to focus on publicizing the website in general and the OBSRS in particular.

On our website, we have also established a safety and simulation bibliography for key readings in the field patient and obstetrical safety. Via the website, people can nominate articles for inclusion.

We also secured a URL specifically for OB simulations (www.obsimulation.org) that describes our goals for this project and some photos of the simulations in action.

RESULTS

Overall

We successfully accomplished the following: 1) development of a toolkit that can be used across the country to improve the process of care and promote safety, 2) demonstration of the use of IT and simulated education to support a statewide safety culture, and 3) modeling of how to utilize and evaluate the effectiveness of simulations to maintain technical skill levels and enhance the process of care and safety in rural healthcare systems.

AIM I: Development and Pilot Validation of Curriculum

Objective Teamwork Evaluation Tool: CTS™

We conducted a pilot validation study. Standardized videos were created demonstrating poor, average, and excellent teamwork among an obstetric team in a common clinical scenario (shoulder dystocia). Three evaluators, all trained in CRM and unaware of assigned teamwork levels, independently reviewed videos and evaluated teamwork using the Clinical Teamwork Scale. Statistical analysis included calculation of the Kappa statistic and Kendall coefficient to evaluate agreement and score concordance among raters, and the Interclass Correlation Coefficient (ICC) to evaluate inter-rater reliability. The reliability of the tool was further evaluated by estimating the variance due to each component of the tool based on generalizability theory. **Results:** There was substantial agreement (Kappa 0.78) and score concordance (Kendall coefficient 0.95) among raters as well as excellent inter-rater reliability (ICC 0.98). The highest percentage of variance in scores among raters was due to rater/item interaction.

FIGURE 1. CTS – Clinical Teamwork Scale™ (Global)

Clinical Teamwork Scale

Overall	**Not Relevant**	**Unacceptable**	**Poor**			**Average**			**Good**			**Perfect**
1. How would you rate teamwork during this delivery/emergency?	☐	0	1	2	3	4	5	6	7	8	9	10

Communication	**Not Relevant**	**Unacceptable**	**Poor**			**Average**			**Good**			**Perfect**
Overall Communication Rating:	☐	0	1	2	3	4	5	6	7	8	9	10
1. Orient new members (SBAR)	☐	0	1	2	3	4	5	6	7	8	9	10
2. Transparent thinking	☐	0	1	2	3	4	5	6	7	8	9	10
3. Directed communication	☐	0	1	2	3	4	5	6	7	8	9	10
4. Closed loop communication	☐	0	1	2	3	4	5	6	7	8	9	10

Situational Awareness	**Not Relevant**	**Unacceptable**	**Poor**			**Average**			**Good**			**Perfect**
Overall Situational Awareness Rating:	☐	0	1	2	3	4	5	6	7	8	9	10
1. Resource allocation	☐	0	1	2	3	4	5	6	7	8	9	10
	Yes	**No**										
2. Target fixation	☐	☐										

Decision Making	**Not Relevant**	**Unacceptable**	**Poor**			**Average**			**Good**			**Perfect**
Overall Decision Making Rating:	☐	0	1	2	3	4	5	6	7	8	9	10
1. Prioritize	☐	0	1	2	3	4	5	6	7	8	9	10

Role Responsibility (Leader/Helper)	**Not Relevant**	**Unacceptable**	**Poor**			**Average**			**Good**			**Perfect**
Overall Role Responsibility (Leader/Helper) Rating:	☐	0	1	2	3	4	5	6	7	8	9	10
1. Role clarity	☐	0	1	2	3	4	5	6	7	8	9	10
2. Perform as a leader/helper	☐	0	1	2	3	4	5	6	7	8	9	10

Other	**Not Relevant**	**Unacceptable**	**Poor**			**Average**			**Good**			**Perfect**

1. Patient friendly	☐	0	1	2	3	4	5	6	7	8	9	10

Additional Notes:

AIM II: Implement and Evaluate CORDS in Rural Settings

Participants: In total, 113 nurses and providers from six hospitals participated and evaluated the course during the initial visit. Twenty-two teams (66 nurses and providers) consisting of 12 OB or CNM provider-led teams and 10 FP provider-led teams completed both initial and follow-up visits. Among the six hospitals, two had fewer than 50 deliveries per year, two had between 50 and 399, and two exceeded 400 deliveries per year. The mean age of participants (nurses and providers combined) was 42.2 years (range 23-61).

Over 94% of participants reported that the program was useful and likely to improve teamwork, communication, and safety.

Principal Findings and Outcomes
We are still writing and submitting manuscripts relating to our data.

- Simulation of obstetric emergencies with team training is valuable to all maternity providers and across all care settings.

- Medication errors were not rare even among experienced teams.

- The CORDS program substantially reduced medication errors made by teams during our postpartum hemorrhage scenario.

- The error protection mechanisms that the teams had learned were even evident in a completely new medication-related scenario that we felt to be much more complex than postpartum hemorrhage.

- Teamwork skills, including consistent use of team language, were evident on the second visit, indicating that learned behaviors were retained. The teams consistently, comfortably, and spontaneously used teamwork language to debrief their incidents and were largely able to conduct debriefings themselves during second visits.

- Interdisciplinary *in situ* simulation of obstetric emergencies and team training was highly valued at all sites. The course was highly valued for improving individual job performance, teamwork and communication, OB emergency preparedness, and patient safety.

- Lower-volume delivery units prefer more frequent training than do higher-volume units.

- Mobile training is particularly suited to physicians who are less likely to travel for training.

Scenario-Specific Information:

- There was a trend toward improved response times at baseline among teams who received team training prior to the shoulder dystocia.

- A 30% improvement in time was achieved from delivery of head to delivery of body after team training and initial simulation (P<0.05, one-sample t test) during shoulder dystocia simulation.

- Management of PPH improved significantly following team training across all measures, including recognition and time to deliver each medication.

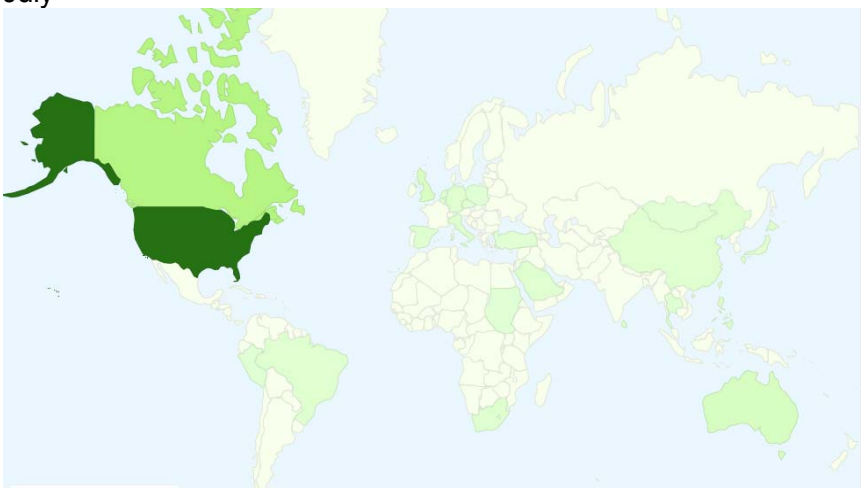
- Teamwork and safety behaviors were applied to a new scenario that was conducted in follow-up visits.

Because some of these data are embargoed by journals, as they are submitted manuscripts or are planned to be submitted as manuscripts, we present general findings rather than details that will be found in the completed articles.*

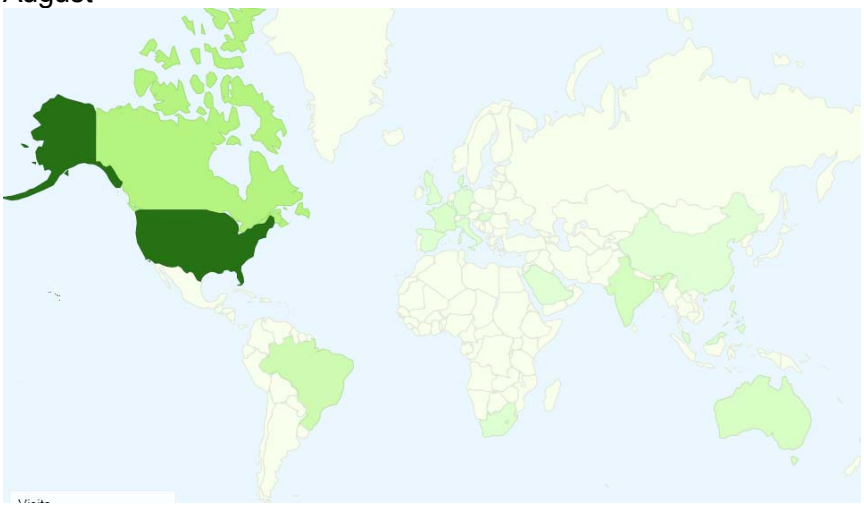
AIM III: Explore the Ability of Information Technology (IT) to Create a Statewide Safety Culture and Expand the Reach of Simulations

We successfully built a website to support a safety culture and for anonymous reporting of obstetric safety events (www.storc.org; www.obsafety.org). The website averages in excess of 150 visits per month, and 80-85% are new visits each month. The website has received substantial international interest, with visits from the following countries/regions in the past 3 months: Australia, Brazil, Canada, Denmark, Germany, India, Philippines, Poland, Russia, Saudi Arabia, Spain, South Africa, South Korea, Taiwan, UK, and US. The distribution of people visiting the website are presented graphically for the past 3 months.

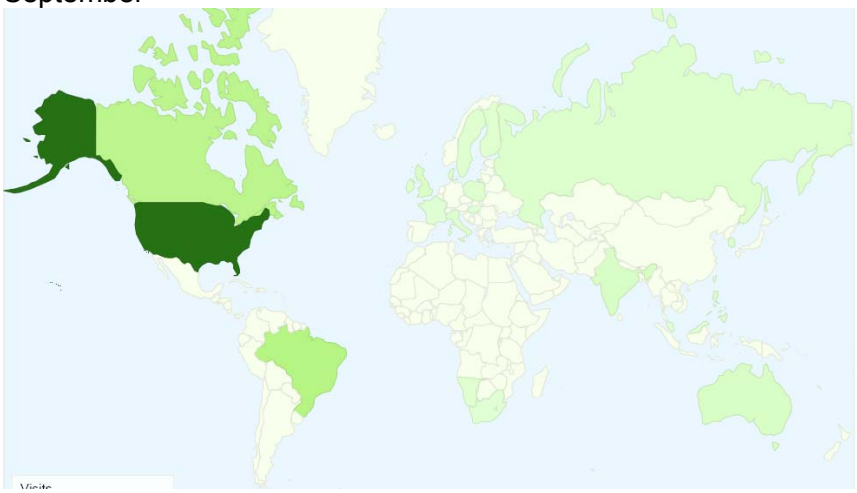
July



August



September



Conclusions & Implications

It has been widely recognized that failures in teamwork and communication are key contributors to patient safety. As such, teamwork has become a focus of medical education and the simulation. However, if team performance cannot be accurately assessed, it is not possible to document improvements in behavior nor to assess the relative contribution of teamwork to actual clinical errors. Prior tools were developed largely for video review or detailed research purposes and were designed for use among experts; thus, they were not easily used by clinical staff. In order to evaluate teamwork in clinical practice, it is important to have a tool that clinicians can use to evaluate teamwork at the point of care. The Clinical Teamwork Scale (CTS), developed in Aim I, is a brief, straightforward, valid, reliable, and easy-to-use tool to measure key factors in teamwork in simulated and clinical settings. Several people from the US and around the world have contacted us, stating that they are using CTS for their education and quality improvement needs. This is a large step toward understanding how simulation

resembles clinical care and objectively measuring the value of interventions designed to improve teamwork.

Simulation of obstetric emergencies and teamwork training are highly valuable measures to improve safety and quality across maternity provider types and practice settings. In particular, *in situ* simulation offers the ability to evaluate the practices and systems issues in delivering care at the sharp end and, as such, offers an efficient mechanism to provide important education and also to improve clinical safety. Although this mechanism is preferable to community practices, as (particularly in remote rural settings) travel for education is quite burdensome to communities, sustaining this requires a trained mobile simulation team that is willing to travel.

PUBLICATION AND PRODUCTS

Publications

Guise JM, Deering SH, Kanki BG, Osterweil P, Li H, Mori M, Lowe NK. Validation of a tool to measure and promote clinical teamwork. *Simulation in Healthcare*. Winter 2008;3(4):217-23.

Aim I - This article described the initial validation of the CTS-Clinical Teamwork Scale. CTS allows for an objective evaluation of teamwork during simulations. We have made CTS available as a direct download from our websites www.storc.org and www.obsafety.org. The CTS is currently being used in a large multi-centered study of mobile simulation throughout the DOD led by Dr. Shad Deering. Overall, CTS is being used by several clinical, nursing, and research groups across the country.

Aim III - Guise JM, Lowe NK, Connell L. Patient Safety in Obstetrics: Learning From Other High-Risk Fields. *Nursing in Women's Health*. 2008 Jun;12(3):208-15.

This article was the cover story for the Association of Women's Health, Obstetric, and Neonatal Nurses (AWOHNN) National Convention issue. It described safety reporting systems from various fields (Aviation, Fire Fighting, and the VAMC) and the process by which the OB Safety Reporting system was developed. This was a tremendous opportunity for OB Safety Reporting.

Aim II - Guise J-M, Lowe N. Do You Speak SBAR? A Safety Series. *JOGNN*. 2006;35(3): 313-14.

This editorial article described the standardized framework to improve effectiveness of communication among healthcare team members so as to improve patient safety. JOGNN is a publication of the Association of Women's Health, Obstetric, and Neonatal Nurses (AWHONN). As a JOGNN Editorial, this has the potential to truly influence adoption and dissemination of the SBAR framework and to improve communication among nurses and other healthcare providers.

Manuscripts Submitted or in Process

Guise, JM, Lowe, N, Deering, S, Osterweil, P, Irwin, L, Blaser, M, Meteer, L, Kanki, B: STORC Mobile Obstetric Emergency Simulation and Team Training to Improve Teamwork and Safety in Hospitals.

This manuscript describes the development of the CORDS program, a standardized mobile emergency simulation and teamwork training program designed to improve clinical teamwork and safety in obstetrics, the toolkit, and lessons learned.

In December 2008, it was submitted to the *Joint Commission* for publication consideration.

Marshall N, Vanderhoeven J, Li H, Eden K, Segel S, Guise JM. Impact of simulation and team training the recognition and management of postpartum hemorrhage.

These data demonstrated improvement in response to postpartum hemorrhage after simulation and team training. The study was well received at the 2009 American College of Obstetricians and Gynecologists Annual Meeting.

Guise JM, Osterweil P, Li H, Motomi M, Weck K, Lowe N. Results of a Multi-Center Study of Mobile OB Emergency Simulations and Team Training.

This was submitted as a manuscript that received favorable reviews from the journal *Obstetrics & Gynecology*; however, they asked for more data from other parts of the study. We are revising the paper to include additional data as they requested and plan to resubmit.

Posters

Guise JM, Deering S, Kanki B, Osterweil P, Li H, Mori M, Stanford S, Lowe N. STORC OB Safety Initiative: Validating a Tool to Evaluate Team Performance. 2006. The 27th Annual Meeting for the Society of Maternal Fetal Medicine in San Francisco, 2007.

Guise JM, Deering S, Kanki B, Osterweil P, Li H, Mori M, Lowe N. STORC OB Safety Initiative: Validity and Reliability of Rating Clinical Teamwork Using the Clinical Teamwork Scale. 13th Annual Meeting of the Society in Europe for Simulation Applied to Medicine, 2007, Copenhagen, Denmark.

Guise JM, Deering S, Kanki B, Osterweil P, Li H, Mori M, Stanford S, Lowe N. STORC OB Safety Initiative: Validating a tool to evaluate team performance. 27th Annual Meeting Society for Maternal-Fetal Medicine, 2007, San Francisco, CA.

Guise JM, Osterweil P, Li H, Mori M, Lowe N. Results of a multi-center study of mobile OB emergency simulations and team training. The 56th ACOG Annual Clinical Meeting, 2008, New Orleans, LA.

Vanderhoeven J, Marshall N, Segel S, Li H, Osterweil P, Guise J. Evaluating in-situ simulation and team training on response to shoulder dystocia. SMFM 29th Annual Scientific Meeting 2009.

Marshall N, Vanderhoeven J, Li H, Eden K, Segel S, Guise J. Impact of simulation and team training on the recognition and management of post-partum hemorrhage. American College of Obstetricians and Gynecologists 57th Annual Clinical Meeting in Chicago, Illinois, May 2-6, 2009.

Presentations

Guise, JM. Mobile Obstetric Simulation & Team Training. Sibley Hospital, DC. February 28, 2008. This was an opportunity to describe and promote the CORDS program (newly coined as Mobile Obstetric Simulation and Team Training) to a new institution.

Guise, JM. Mobile Obstetric Simulation & Team Training. BEST Foundation. Bergen, Norway. November 3, 2007.
This was an opportunity to promote the CORDS program to Norway. Nationally, Norway utilizes simulation in all but one of their hospitals for trauma training. Key representatives were interested in bringing the CORDS program to their hospitals to address their concerns with the high risks associated with obstetrics.

Guise, JM. Mobile Improving Clinical Teamwork: Activating Teams to Improve Teamwork and Evaluating What Matters and What Works? AHRQ Annual Conference. September 28, 2007.

This conference was key in publicizing the CORDS program nationally.

Guise, JM. Two oral presentations were given. One focused on the CTS tool, and the other reviewed unique issues relating to mobile simulation programs. Society in Europe for Simulation Applied to Medicine 13th Annual Meeting, Copenhagen, Denmark, June 19-20, 2007.

This was an opportunity to internationally disseminate our CTS tool and promote our program for possible collaboration with institutions and centers in other countries.

Guise, JM. Meet the Experts Panel, National Patient Safety Foundation Annual Congress, May 4, 2007.
This conference provided a national forum to present our CTS tool and program and promote collaboration with other centers and teams.

Guise, JM. STORC OB Safety Initiative: Team Training & Simulation–What Really Matters? Northwest Physicians OB Collaborative, Portland, Oregon, April 21-22, 2007.
This meeting provided a forum for us to increase state awareness of our program.

Guise, JM. Obstetric Emergency Simulation and Team Training. Society for Maternal Fetal Medicine 27th Annual Meeting, San Francisco CA, February 7, 2007.
This international meeting increased the visibility of our program throughout the Maternal Fetal Medicine profession.

Guise, JM. Using simulators to train for obstetrical emergencies. NW Update in OBGYN and Women's Health, Portland, Oregon, October 21, 2006. This regional meeting provided a forum for presenting the use of simulation in obstetrics to improve care.

Guise, JM. Oregon Perspective; Care During Pregnancy. Oregon Women's Health Policy Summit, Portland OR October 20, 2006.
This statewide meeting provided a forum for discussing the use of simulation in obstetrics to improve care.

Guise, JM. CORDS: Simulation Training for Neonatal and Obstetrical Emergencies. Northwest High-Risk Perinatal Update, Portland, Oregon, October 13, 2006.
This regional meeting presented a forum for presenting the CORDS study and provided visibility for the program.

Guise JM, Osterweil P. Increasing Patient Safety in Obstetrics: Team Training in Action, Innovations Café; Increasing Awareness of Obstetric Safety, Innovations Café. AHRQ Patient Safety and Health IT 2nd Annual Conference, Washington, DC, June 2006.
Both presentations provided forums for discussion and dissemination of information about improving obstetrical patient safety.

Conference Displays
National Patient Safety Forum (NPSF) Congress, Annual Meeting, Nashville, TN, May 14, 2008. Invited participant at the Meet the Experts "booth." This was an opportunity to display video and hard copy information and data describing the the STORC Mobile Obstetric Emergency Simulation and Team Training program (originally developed as CORDS). This was a good opportunity to discuss our program and other simulation programs with AHRQ simulation grantees and with a wide variety of NPSF Congress attendees.

Hosted Conference
Patient Safety Forum, Portland, Oregon, October 6, 2006. Medicine IS Rocket Science. Invited NASA safety experts to speak about aviation and patient safety and facilitate interdisciplinary OHSU-VA campus-wide discussion about the vision and mission of safety. A roster of those interested in collaboration was developed and distributed to encourage the growth of the community.

Webinar
Guise, J-M, Oregon Office of Rural Health Flex Webex Learning Series, February 3, 2009. STORC: State Obstetric & Pediatric Research Collaborative.
This was a 1-hour, web-based training session that was specifically designed for healthcare providers at Oregon's Critical Access Hospitals. It presented simulation and team training as potent tools to improve hospital safety. This was an excellent opportunity to describe our experience developing, implementing, and evaluating a mobile obstetric simulation and team training program for rural settings. It was also an opportunity to highlight the Clinical Teamwork Scale (CTS) and to encourage healthcare teams at rural hospitals to use the CTS to evaluate their hospital's teamwork performance. It also promoted use of our website www.storc.org and www.obsafety.org. as a resource to improve obstetrical safety.

Manuals
A CORDS CRM Manual was developed and given to each site. We also provided a copy of the ACOG Obstetric Emergencies textbook for each site. These are resources for continued learning at each of our CORDS sites.

Collaboration
Department of Defense - Madigan Army Medical Center received a grant from AHRQ and the DOD to test a mobile simulation OB program throughout multiple military sites. They are using our Clinical Teamwork Scale (CTS) tool for evaluators and participants to measure teamwork during the simulations.

REFERENCES

[1] Sentinel Event Alert: Preventing infant death and injury during delivery. Joint Commission Perspectives. 2004;24(9):14-5.

[2] Root Causes of Maternal Deaths & Injuries. The Joint Commission Journal on Quality and Patient Safety. 2007.

[3] Forster AJ, Fung I, Caughey S, Oppenheimer L, Beach C, Shojania KG, et al. Adverse events detected by clinical surveillance on an obstetric service. Obstetrics and Gynecology. 2006 Nov;108(5):1073-83.

[4] White AA, Pichert JW, Bledsoe SH, Irwin C, Entman SS. Cause and effect analysis of closed claims in obstetrics and gynecology. Obstetrics and Gynecology. 2005 May;105(5 Pt 1):1031-8.

[5] Shojania KG, Duncan BW, McDonald KM, Wachter RM. Making Health Care Safer: A Critical Analysis of Patient Safety Practices. Evidence Report/Technology Assessment No. 43 (Prepared by the University of California at San Francisco–Stanford Evidence-based Practice Center under Contract No. 290-97-0013), AHRQ Publication No. 01-E058. Rockville, MD: Agency for Healthcare Research and Quality; 2001.