AHRQ Grant Final Progress Report

Title of Project: Using Team Simulation to Improve Error Disclosure to Patients and Safety Culture

Principal Investigator: Thomas H. Gallagher, MD

Co-Investigators: Sarah Shannon, PhD
Lynne Robins, PhD
Sara Kim, PhD
Douglas Brock, PhD
Wendy Levinson, MD
Peggy Odegard, PharmD

Team Members: Carolyn Prouty, DVM
Odawni Palmer, BA
Ben Dunlap, BA
Andrew Wright, MD

Organization: University of Washington

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A. Structured Abstract

Purpose: Transparency is the cornerstone of patient safety culture. Yet errors are frequently not disclosed to patients. Emerging trends include using disclosure coaches and conceptualizing disclosure as a team undertaking. Little is known about using simulation to train healthcare workers in disclosure.

Scope: We designed a simulation-based intervention to teach physicians and nurses about team-based error disclosure. We recruited 127 participants and trained 12 disclosure coaches. We created and validated a web tool for measuring the simulation's impact.

Methods: We utilized a quasi-experimental pre-post intervention (38 physicians and 40 nurses) with control group (26 physicians and 23 nurses) design. The simulations and coaching of participants were videotaped and qualitatively analyzed. Intervention participants were interviewed individually about their simulation experience.

Results: Participants found the simulations enjoyable and educational, and they supported the concept of team disclosure. Although encouraging trends were present, neither the web assessment nor the videotape analysis detected improvement in clinicians' skills. Clinicians particularly struggled to respond to patient anger. Interprofessional differences existed in clinicians' comfort with disclosure. Many clinicians failed to explicitly apologize. Products include four peer-reviewed journal publications (including a *JAMA* article), a book and two book chapters, standardized patient case and assessment videos, and a coach training manual.

Key words: disclosure, patient safety, interprofessional, interdisciplinary, simulation

B. PURPOSE

Transparency is the cornerstone of a positive patient safety culture.(1) Transparency following adverse events and errors involves open and integrated communication about the event among healthcare workers, healthcare institutions, and patients.(2) Open communication between healthcare workers and institutions is essential for understanding why the event happened and developing plans for preventing recurrences.(1) Full disclosure of these events to patients is equally important, allowing more informed decision making by patients and preserving trust.(3-5) Yet compelling evidence suggests that current clinical practice falls far short of the goal of transparency following adverse events and harmful errors, especially in the area of disclosing these events to patients.(6,7) Recently, only 30% of physicians who experienced a harmful error in their own care said the error had been disclosed to them, a disclosure rate consistent with several other studies.(8-10) Such breakdowns in transparency not only affect patient outcomes, such as trust, satisfaction, and the likelihood of a malpractice claim, but also reflect lost opportunities to learn from harmful errors and enhance patient safety.(11)

Multiple barriers inhibit communication with patients following harmful errors, such as healthcare workers' embarrassment and fear of litigation.(12) Another critical barrier is the lack of effective programs to train healthcare workers in disclosure. Furthermore, many current disclosure efforts reflect an outdated model that conceptualizes disclosure as solely a doctor-patient interaction. However, disclosure is really a team undertaking, in which the healthcare team must communicate effectively with one another, address issues of blame and responsibility, reconcile conflicting perspectives about what happened, and decide whether and how to disclose the information to the patient. In addition, because disclosure is relatively uncommon for any given clinician, many innovative institutions are providing healthcare workers with just-in-time coaching from disclosure experts to help the team discuss what happened and plan the disclosure.(13) Yet few healthcare workers or coaches have had disclosure training, and they may be ill-prepared for having these challenging conversations with each other and with patients.(14)

Simulation using standardized patients is ideal for training healthcare workers to communicate with one another following errors and to share this information with patients.(15) Just as with technical skills, developing the complex communication skills involved in team communication and disclosure requires practicing in realistic settings and receiving feedback.(16) As pressure to disclose errors accelerates, many hospitals are developing explicit disclosure policies.(17) Yet, absent team communication and disclosure training programs, these efforts are unlikely to succeed. Therefore, we conducted a project with the following **specific aims:**

1. To determine whether team-based simulation training enhances healthcare workers' knowledge, attitudes, and skills in disclosing harmful errors to patients;
2. To determine whether team-based simulation training improves healthcare workers' knowledge, attitudes, and skills about team communication;
3. To determine whether coaches demonstrate enhanced knowledge, attitudes, and skills compared with participants around team-based disclosure conversations.

C. SCOPE

Background

Practitioners face many barriers to disclosing errors to patients, including embarrassment, fear of litigation, and minimal training. Clinicians often lack confidence in their ability to conduct these difficult conversations and fear that disclosure will prompt litigation. Additionally, the emotional distress that often accompanies these events can make it difficult for providers to objectively analyze the event, decide whether disclosure is appropriate, and formulate an appropriate disclosure plan. The consequences of failed disclosures can be substantial, including patient dissatisfaction and loss of trust, an increased risk of litigation, and lost opportunities to learn from such events how to prevent recurrences.

The notion of error disclosure as a team undertaking is also gaining currency, replacing previous views of error disclosure as the responsibility of the attending physicians. Because errors are made by teams rather than individuals, a team approach to error disclosure fits more easily within a blame-free framework for discussing errors. A recent study reported that nurses view the disclosure process as a team event rather than as a

physician-patient conversation though, in reality, they are often excluded from disclosure discussions. This concept of team-based error disclosure also fits with the developing interest in the importance of effective team communication generally, as evidenced by widely disseminated programs such as TeamSTEPPS.(18)

Coaching can enhance team-based disclosure of harmful medical errors to patients. Discussions among team members following an error are often highly emotionally charged. The contribution of a skilled "disclosure coach" (i.e., individuals skilled in disclosure who can provide "just-in-time" training to the involved healthcare workers) to these team conversations can mediate these difficult conversations by helping the team use appropriate conflict resolution and negotiation skills to seek consensus about the nature of the event. Some institutions are training "disclosure coaches" to help clinicians improve disclosure. The National Quality Forum Safe Practice on disclosure explicitly calls on organizations to provide healthcare workers with around-the-clock access to disclosure coaches.(4) However, little has been written to guide efforts to teach effective disclosure coaching techniques or how to conceptualize the role of the disclosure coach in the overall process of communicating with patients about errors.

Despite this developing interest in both team communication and error disclosure, little is known about strategies for training healthcare workers in these skills. Therefore, we undertook a project to determine whether simulation was an effective strategy for improving healthcare workers' team communication and error disclosure skills.

Study participants

We recruited a total of 127 practicing physicians and nurses from four Seattle healthcare institutions to participate in this project. Seventy-eight subjects participated in the intervention group, and 49 subjects were in the control group. The demographics of the study participants are listed in Table 1. The participating healthcare institutions included the following:

- University of Washington Medical Center is a 450-bed academic medical center and tertiary referral center for a five-state region. It is one of two major teaching hospitals for the University of Washington School of Medicine.
- Harborview Medical Center is the King County public hospital and the only Level I adult and pediatric trauma center and regional burn center serving a four-state area. It has 413 beds and is the other major teaching hospital for the University of Washington School of Medicine.

Table 1: Study Participants

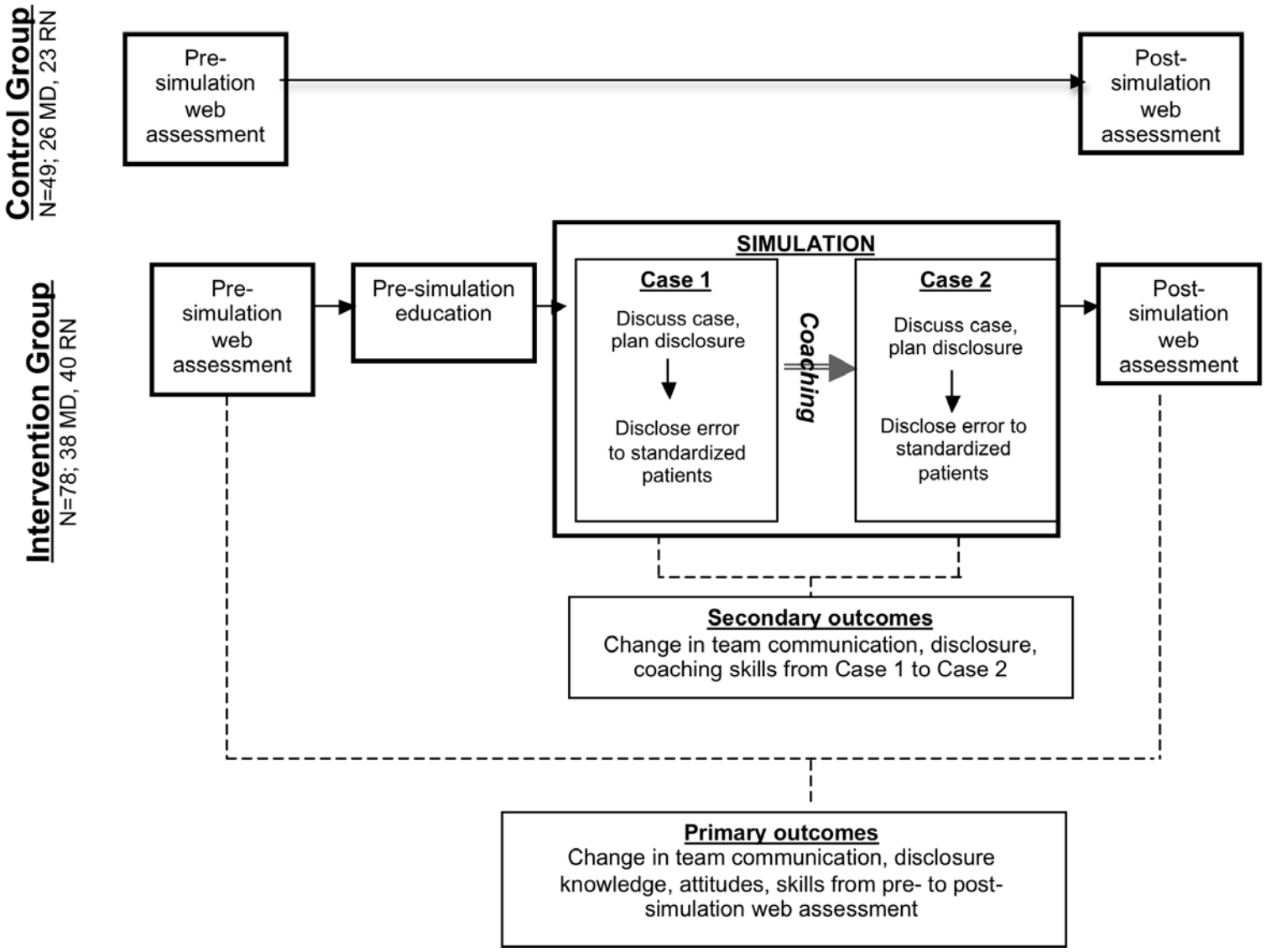
	MDs Intervention (*n*=38)	MDs Control (*n*=26)	RNs Intervention (*n*=40)	RNs Control (*n*=23)
Sex				
Female	17	16	34	23
Male	21	10	6	0
Specialty				
Medicine	23	20	28	16
Surgery	15	6	12	7
Facility				
UWMC	11	15	12	3
HMC	8	6	9	4
VA	9	0	11	12
GHC	10	5	8	4
Ave Age	42	46	47	48
Years in Practice	12	14	19	21
Previous Error Disclosure Training				
Yes	0	4	0	2
No	32	20	35	21
Level of confidence disclosing an error to a patient				
Very high	2	0	1	2
Somewhat high	12	11	10	11
Neutral	18	13	13	5
Somewhat low	0	0	10	3
Very low	0	0	1	2
Participants' reported involvment in prior errors				
Near miss	19	21	22	12
Minor error	25	22	26	16
Serious error	21	17	14	10
None	0	0	2	4
Experience disclosing an error to a patient				
Yes	22	17	5	11
No	10	7	30	12

- Veterans Administration Puget Sound Health Care System provides tertiary care for veterans throughout a four-state area and includes a 291-bed acute care facility.
- Group Health Cooperative is a nonprofit healthcare system providing both medical coverage and care to more than 574,000 members in Washington and Idaho. It is one of the few healthcare organizations in the country governed by consumers.

D. METHODS

This study was a quasi-experimental pre-post intervention with a control group. In our original proposal, we had planned only to recruit an intervention group consisting of 35 physicians and 35 nurses. However, as our study planning progressed, we realized that, without a control group, we would be unable to determine what, if any, change in healthcare workers' team communication and error disclosure skills resulted from the pre- and post-simulation web assessments rather than from the simulation training itself. Therefore, we included a control group consisting of 49 healthcare workers who took the pre-simulation and post-simulation web assessment but did not participate in the simulation training itself. In addition, partway through the project, we deleted aim 3 (comparing coach performance to performance of participants), though we have collected data that allow us to describe coaches' behaviors. Figure 1 depicts the overall study design.

Figure 1: Study Overview



Identification of key skills

The first key step in this project was to develop a list of key overarching team communication and error disclosure skills, a list that would guide that development of the simulation cases, disclosure coaching strategy, design of the web assessment, and our analytic approach. We defined the team communication behaviors that enable or inhibit preparation for and performance of effective team medical error disclosure. We relied on empiric evidence from the literature linking interprofessional communication to patient outcomes as well as on studies that described patients'

Table 2: Key Disclosure Skills

Section	Key Skills
Team Discussion of Error	1. Acknowledges error
	2. Conducts blame-free communication during team conversation
	3. Practices team-oriented communication
	4. Negotiates differences of opinion collaboratively
Team Planning of Disclosure	1. Advocates for full disclosure
	2. Plans roles for disclosure
	3. Plans responses to patient
Team Disclosing Error to Patient	1. Conducts explicit disclosure of error to patient
	2. Responds forthrightly to patient questions about event
	3. Apologizes upfront and early in conversation
	4. Exhibits general communication skills with patients
	5. Conducts blame-free disclosure, acknowledge personal role
	6. Offers plans to prevent future errors
	7. Plans a follow up with patient

preferences for disclosure conversations and associations between effective disclosure with better patient outcomes and improved legal outcomes. Also informing our conceptual framework were studies that reported key elements of disclosing unanticipated outcomes to patients and the importance of team approaches to disclosure of medical errors.

Case Development and Pilot Testing

We developed two surgical and two medical error case scenarios based on actual incidents. As we were designing the cases, we sought to create cases that incorporated the key team communication and error disclosure skills outlined above. In addition, we wanted the simulation for each specialty to involve a basic case (primary patient emotion is sadness) and a more advanced case (primary patient emotion is anger). The premise of the simulations was that the members of a surgical or medical team had recently been involved in a harmful error and therefore needed to meet to discuss the event and how it happened, plan whether and how to disclose the event to the patient, and then perform the disclosure to the patient according to their plan. The main features of the four cases are summarized below. The SP cases are available on request.

1. Missing specimen (surgery, sad patient). Patient undergoes urgent surgery for vaginal bleeding. Suspicious cervical mass removed, leading to significant bleeding. In chaos, mass is inadvertently discarded.
2. Retained sponge (surgery, angry patient). Patient who recently underwent abdominal surgery was found to have a retained surgical sponge.
3. Insulin medication error (medicine, sad patient). Medication error leads to 10-fold insulin overdose, hypoglycemic arrest, full recovery.
4. Blood thinner medication error (medicine, angry patient). Medication error leads to blood thinner overdose, significant episode of gastrointestinal bleeding. Patient recovers, thinks it was an ulcer that caused bleeding.

After the cases were developed, we conducted a series of simulation pilot tests involving 10 healthcare teams to refine the cases and the overall simulation experience.

Description of simulation experience

Healthcare workers in the intervention group first completed the pre-simulation web assessment within the 2 weeks prior to participating in the simulation training. All simulation participants also received a one-page handout describing the simulation and highlighting the key team communication and error disclosure skills we would be teaching. Before beginning the simulation, a member of the research team provided an orienting introduction that reviewed the study logistics. The introduction also introduced the concept of team disclosure and acknowledged that this might not be something participants were used to doing. Participants were urged to give the team disclosure approach a try and to behave as naturally as possible during the simulation.

The simulation itself consisted of two cases. Each case had two primary phases. After reading a case introduction, the physician, nurse, and standardized team member would discuss the case (what happened, was it an error, who was responsible) and plan for the disclosure to the patient. Then, the team would conduct the actual disclosure to the standardized patient. Throughout, the healthcare team was observed by one of the risk manager coaches, who at the conclusion of the disclosure to the patient would offer targeted feedback to the team as described above. The healthcare team would then proceed to case 2, which followed the same sequence (team discussion of the error, planning for disclosure, carrying out disclosure with the standardized patient). At the conclusion of case 2, the disclosure coach would offer summary feedback to the team. At the end of the simulation, the nurse and physician each underwent a debriefing interview by a member of the research team, exploring the realism of the simulation and lessons learned by the participants.

Standardized patient training

We trained actors from EffectiveArts to perform in the roles of a standardized team member and a patient who had experienced a harmful error. The actor who played the role of a hospital administrator/standardized team member was trained to facilitate the physician-nurse teams' interaction using prompts to promote discussion about how the error occurred, whether and how the error should be disclosed, who should disclose the error, and how the disclosure should be performed. By creating this facilitator role, we were able to prompt team

members to anticipate and articulate plans for responding to challenges that had been written into the simulated scenarios (e.g., conflict about the nature of the error, arguments for minimal disclosure to the patient, patients' pointed questions about who was to blame for an error, emotional expressions of anger and mistrust).

Risk manager disclosure coach training

We trained 12 risk managers to provide targeted feedback to team members using an "*Ask-Tell-Ask*" coaching format that would acknowledge and build on the clinical expertise and experience of the professional participants.(19) The method is a variation of the "1-minute preceptor," which combines principles of adult learning with techniques of time-limited teaching and is widely used in clinic settings where feedback and teaching has to be conducted "on the fly." *Ask-Tell-Ask* mirrors Kolb's (20) experiential learning cycle, which depicts learning as a process shaped by learners' evolving understanding. It is also grounded in Knowles' (21) adult learning principles, which hold that adults enter any learning session with a great deal of experience and that learning is enhanced when teachers make the effort to elicit their learners' prior knowledge and beliefs and diagnose their learner needs.

We instructed coaches to listen to team members, customize their feedback, and provide a few learning "pearls" rather than a laundry list of dos and don'ts. We provided a one-page handout outlining the *Ask-Tell-Ask* rubric and identifying a prioritized set of feedback targets based on the key team communcation and disclosure skills outline above.

Team Components of Disclosure

- Anticipate patient reactions: During team planning for disclosure, all team members need to discuss likely patient reactions to the disclosure and plan an effective team response.
- Solicit Multiple Views: During team discussion of the error, teams should solicit every person's view of how the error occurred instead allowing one person to dominate the discussion.
- Respond to Team Member's Emotions: If team members' emotions are not addressed, they may leak into the actual disclosure to the patient.

Content Components of Disclosure

- Make an Explicit Apology: Patients want clinicians to offer an explicit apology for errors. An explicit apology conveys regret and acknowledges team responsibility for the error that was made.
- Respond to Patient Emotion: Patients want to have the professional acknowledge the impact of the event and hearing about the event's impact upon the patient.
- Empathetic Disclosure of Core Content: Patients want an explicit statement that an error occurred; to be told what happened and the implications for their health; and to be given the opportunity to ask questions.

At the outset of any coaching session, a coach would ask the team to reflect on their experiences and their plans for disclosure. Team members' responses gave coaches insight into team members' readiness to perform the disclosure and a means to diagnose an individual's or a team's knowledge about the content and communicative process of an error disclosure event, their beliefs about how the error occurred and what their roles in it were, and their emotional states. Answers given to the "*Ask*" portion of the rubric informed the coaches' instruction or "Tell." During the "*Tell*" portion of a coaching interaction, coaches delivered a limited number of learning "pearls" targeted to team members' specific needs. The final "*Ask*" was comprised of coach/caregiver discussion and planning for the next concrete experience – whether a role play initiated by the coach for further learning or the actual disclosure itself.

The coach training took place in an initial 3-hour training session along with a 90-minute review session and was guided by a 20-page coaching manual. The coaching manual is available upon request.

Overview Of Outcome Measures

We created a variety of metrics to describe the team communication and error disclosure skills in this project, including 1) disclosure web assessment; 2) videotapes of simulations themselves, including team performance in case 1, coaching, team performance in case 2, final coaching; and 3) audiotaped debriefings of both subjects at the end of each simulation.

Creating The Disclosure Web Assessment

Ultimately, an educational intervention to improve healthcare workers' team communication and error disclosure knowledge, attitudes, and skills should predict real-world disclosure conversations. Therefore, the ideal outcome measures of such an educational intervention would be those related to the quality of actual disclosure conversations. However, measures of the quality of actual disclosures were not available at the time of this study. In addition, existing measures of communication skills are extremely limited Therefore, we developed the "Web-based Team-Oriented Medical Error Communication Assessment Tool" as our primary outcome measure. This tool measured physicians' and nurses' disclosure knowledge and skills by asking them to respond to video scenarios depicting hypothetical team error discussions and disclosures. Separate pre- and post-test web assessment modules were created, and each consisted of two main components: (1) video clips that show actors portraying a healthcare team, including a physician, a nurse, and a pharmacist, discussing an error that took place under their care; planning how to disclose the error to the patient; and conducting a disclosure to the patient or family member; and (2) test questions associated with video clips. Each scenario was designed for 15 to 20 minutes of test completion duration. Therefore, participants spent a total of 60 to 80 minutes completing both pre- and post-web assessment scenarios.

Key Development Steps

To create the web-based assessment tool, we develop videotaped case content and wrote assessment questions. The key steps are described below. The process of developing it and some preliminary validation evidence for the web assessment are described in detail in our paper that is *in press* in Teaching and Learning in Medicine.

Step 1. Identifying and Defining Behaviors for Assessment

Effective and ineffective behaviors were identified for three general stages of team disclosure, reflecting the key skills described above: (a) discussion of a medical error, (b) planning of disclosure to a patient, and (c) conducting an actual disclosure. Each behavior can be portrayed positively (done well) or negatively (done poorly). In total, we developed 28 positive and negative behaviors across team discussion of error, team planning for disclosure, and team disclosure to the patient. These behaviors were later embedded in the scripts and guided the writing of test questions.

Step 2. Creating Case Scenarios

Next, we created scenarios in which key behaviors occurred positively or negatively and designed assessment questions to capture examinee's ability to identify the behaviors and evaluate their effects. We developed two error cases portrayed by two different healthcare teams demonstrating varying interprofessional styles. The use of two case topics, each enacted by two different healthcare teams, yielded four scenarios: Team A/drug overdose, Team B/drug allergy, which served as pre-tests; and Team A/drug allergy, Team B/drug overdose, which served as post-tests. The two case topics included (1) a medication overdose scenario involving a female patient receiving a medication too frequently, causing her to fall and hit her head; and (2) a medication allergy scenario involving a male patient who ended up in the ICU after a missed medication allergy.

Steps 3,4. Developing and Filming the Scripts

The scripts included both (1) dialogue serving to provide context to the scenarios and (2) specific dialogue among team members that would be linked to the pre-defined team communication behaviors. Clinician investigators serving as scriptwriters were asked to reflect on the personalities and communication styles of the team members in the script. A specific team behavior was selected and a dialogue was developed to illustrate either a positive or negative instance of each behavior. EffectiveArts, a local professional acting company, provided eight actors and a director to staff Team A and Team B, each composed of actors playing the roles of a physician, a nurse, a pharmacist, and a patient or a patient's daughter. Clinician investigators attended the rehearsals to clarify subtle nuances in the dynamics among interprofessional team members. The web assessment videos are available upon request.

Step 5. Writing Assessment Questions

Our web assessment goal was to capture both knowledge and recognition-level demonstrations of skill as well

as higher-order skills (e.g. describing “most” and “least” effective behaviors) requiring the synthesis and evaluation of information. The assessment included a variety of test formats, including multiple-choice, Likert-type scales addressing global perspectives and open-ended questions. Identical questions were used across all four scenarios. The final question bank included 26 or 27 questions depending on the scenario, including three multiple-choice questions, 16 Likert-type questions, four global open-ended questions, and three or four behavior-specific open-ended questions.

Validation of web assessment

We report results related to reliability, validity, and user acceptability of the test: (1) internal consistency estimates reflect intercorrelations among Likert-type scale items measuring the same construct: planning for a disclosure and the actual disclosure of the error, (2) content validity based on the best evidence we accessed in the literature and perspectives of experts on the team, (3) evidence of convergent and discriminant validity, (4) preliminary assessments of predictive validity, and (5) evaluation by study participants regarding the quality and usability of the assessment tool.

Reliability

Estimates of internal consistency reliability were calculated using data from 128 participants who completed part or all of the web assessment. Coefficient alphas were calculated for multiple subscores and totals. Quantitative score estimates were derived based on seven discussion/planning Likert-type items and eight disclosure Likert-type items per scenario. Likert-type items were dichotomously scored as ‘correct’ or ‘incorrect’ based on modal consensus from expert reviewers with diverse experience in communication and error disclosure. To test the qualitative items, a quantifiable scoring rubric was applied to two open-ended questions for planning and two open-ended items for disclosure for each case (pre and post). Total scores reflecting aggregate scores from the merged quantitative scores and qualitative scores were developed. Table 3 provides a summary of these internal consistency coefficients. Alphas for aggregate total scores were acceptable, although some subscores reveal inadequate internal consistency, suggesting need for further scale refinement.

Table 3: Web assessment internal consistency reliability

Pre Intervention Subscores		**Post Intervention Subscores**	
Quantitative	alpha	Quantitative	alpha
Planning	.60	Planning	.54
Disclosure	.62	Disclosure	.16
Total	.55	Total	.40
Qualitative		Qualitative	
Planning	.55	Planning	.53
Disclosure	.45	Disclosure	.41
Total	.65	Total	.60

Content Validity

Content validity is the extent to which an instrument assesses the relevant domain. We relied on the empiric evidence from team communication and error disclosure literature, experts’ understanding of the domain, and perspectives within our multidisciplinary team for establishing content validity of the assessment instrument. The strongest evidence for the content validity is the expert perspectives built into the design. Our research team includes nationally known authorities on error disclosure, communication, and team behavior. The iterative development process strengthened our belief that the key constructs were covered in the instrument.

Convergent and Discriminant Validity

In describing our data, evidence of convergent and discriminant validity is demonstrated by significant correlations between like constructs across tests (convergent) and reduced correlations between unlike constructs across tests (discriminant). For example, evidence of convergent validity is demonstrated by a significant correlation between a participant’s understanding of disclosure in a pre-test with their understanding of disclosure in a post-test. Conversely, evidence of discriminant validity is given by a reduced correlation when the pre disclosure score is correlated with a post planning score. In examining correlations between the quantitative planning and disclosure scores between the pre and post measures, a predicted pattern was exhibited, with generally stronger correlations between like constructs (pre-post planning, r=.20, p=.03; pre-post disclosure, r=.512, r=.001) than for unlike constructs (pre planning with post disclosure, r=.15, p=.10; pre disclosure with post planning, r=.09, p=.12). A different pattern was noted when examining the pre

and post scores developed from the qualitative open-ended questions. Here, the correlations between pre and post for planning (r=.36, p=.001) and disclosure (r=.29, p=.002) and the cross-correlations for pre planning by post disclosure (r=.41, p=.001) and pre disclosure by post planning (r=.44, p=.001) were all significant. These are preliminary assessments showing only correlations between higher-order scores. Further investigation is required to fully understand the extent to which convergent and discriminant validity have been demonstrated.

Predictive Validity

To assess predictive validity of the web assessment, we developed global rating scales assessing performance observed by trained raters viewing videoed interactions of the physician and nurse participants interacting with a standardized team member and a standardized patient. This provides correlations between the web assessment scores and an external rating of observed behavior. Estimates for internal consistency for the global ratings of the observed behavior were high (alpha = .78-.89). However, correlations between the global scores and the web assessment total and subscores scores were not significant (all p>.10). The high internal consistency of the observed global rating scales suggests that the behaviors reflected in the simulations represent separate constructs from those tested within the web assessment. Conversely, the web assessment may be insufficiently sensitive to predict the behaviors observed in the simulations or the behaviors observed may be too artificial to reflect true participant understanding. Further investigation is needed.

User Evaluation

Data available from 122 users rated the overall quality of the web assessment tool as high (mean=4.2, SD=.60: 1-poor, 5-excellent). They reported that the user interface design was innovative (mean=4.1, SD=.82), intuitive to use (mean=3.9, SD=1.0), and engaging (mean = 4.1, SD=.91). Users positively rated the quality of instructions (mean=4.2, SD=.85), videos (mean = 4.3, SD=.76), acting (mean = 4.3, SD=.74), and case content (mean=4.5, SD=.64).

DATA ANALYSIS

Web assessment (WA) data analysis**:**

The WA consisted of two components: (1) qualitative, open-ended questions that asked a participant to respond to video vignettes, and (2) quantitative items in the form of Likert-type rating scales and multiple-choice questions (MCQs) asking participants to respond to the same video vignettes.

Analysis of qualitative WA data

Qualitative questions explored the participants' assessments of the most/least effective aspects of the team's planning and disclosure as well as elicited their own coaching for the team in response to video segments. Coaching responses are still being coding. For the "most" and "least" effective behaviors questions, individual participant responses were scored subject to a set of criteria developed by our team and reflecting both specific scripted positive and negative behaviors as well as behaviors reported by participants that we had not initially recognized but that emerged as important interpretations of the video vignettes. Using these criteria, we quantified each participant's response, assigning a value of 0 (unacceptable), 1 (acceptable), or 2 (exceptional). Here, we report analyses that used four aggregate scores: (1) pre-planning score, (2) pre-disclosure score, (3) post-planning score, and (4) post-disclosure score. Each score had four parts: scores for the "most" and "least" effective reported behaviors for each of the two cases presented pre and post. Total qualitative pre and post scores were also constructed.

Analysis of quantitative WA data

Quantitative questions explored the participant's assessment of the seriousness of the error and the team members' effectiveness in contributing to avoiding blaming, advocating for full disclosure, and contributing to planning as well as other similar disclosure content-related and team communication-related questions. For each quantitative item a score of 0 (incorrect) or 1 (correct) was assigned based on review by our team and additional outside experts. As a team, each item was reviewed, and each team member responded with their estimate on a five-point Likert-type scale, with response options ranging from not at all effective to extremely effective. Outside experts were asked to review each case online and to provide their responses to

the team. In each case, questions reflected specific behaviors scripted into the video vignettes (e.g. “Truthful communication” and “Team avoids blaming others”). The modal score was then taken from a total of 9 to 12 experts who reviewed each item for a “best” response. Variability across raters was generally low. A second method of determining a correct or incorrect was conducted defining a correct score as one which was within a 95% confidence limit of the expert score. This did not result in more interpretable data and was not used. Total scores were developed for (1) pre score planning quantitative, (2) pre score disclosure quantitative, (3) post score planning quantitative, (4) post score disclosure quantitative, (5) total pre score quantitative, and (6) total post score quantitative.

Global Simulation Coding Items

Global rating scales were developed to assess the overall behaviors of the physician and nurse participants within the simulations and to parallel the microcoding efforts conducted on the video segments. These global scores also provided preliminary external behavioral measures to correlate with the web assessment scores to demonstrate evidence of predictive validity. To assess behavior in the simulations, four global items for the planning phase of the disclosure and six items for the disclosure phase were developed to rate the quality of communication of the physician and nurse acting as a team. Therefore, for each nurse/physician team, we have 20 global ratings of behavior (n=4 planning for case 1 and case 2 and n=6 disclosure items for case 1 and for case 2) representing four subscales (case 1 planning, case 1 disclosure, case 2 planning, and case 2 disclosure). These analyses are only pertinent to the intervention group, because the control group did not complete the simulation intervention.

Video data analysis, coding scheme, and analysis of supercodes

The coding scheme for the simulation video data was developed through a series of steps. First, two experienced qualitative researchers reviewed a subset of the data to develop an initial coding scheme that captured all data. This initial coding scheme was reviewed by the full research team, and revisions were made to reflect their immersion in the data. Next, coding teams applied the scheme to a single video and then met to discuss divergent coding. This resulted in changes to the coding scheme, including combining some codes deemed to be duplicate, adding codes when data were not being adequately captured, and splitting codes into two or more codes when codes were found to be too broad. This process of code revision continued through team coding of additional videos until a) the coding scheme met our criteria of capturing all data and b) we achieved adequate initial inter-rater reliability.

The coding scheme has four sections. Three reflect the key simulation phases: planning, coaching, and disclosure. The fourth coding scheme reflects interactions between the team members and is used across all three phases of the simulations. Once the coding schemes were finalized, coding teams began coding data. AtlasTi was used to facilitate data management. Each video was first divided into six parts: planning, coaching and disclosure for case 1 and case 2. Each part was then segmented into data units ranging from 15 seconds to 2 minutes, with the average data unit around 30 to 45 seconds. Coding was done initially in pairs. Data units were coded segment by segment with disagreements resolved between pairs. Multiple codes were applied to data units to reflect these complex communication events. After training on multiple videos, coding teams began coding video data individually. Challenging data units were reviewed on a regular basis with one of the experienced qualitative researchers who developed the coding scheme. Inter-rater reliability coding was done by double coding videos at regular intervals. For the coaching coding team, all data coding was reviewed and discrepancies were discussed.

Inter-rater reliability on video data coding for the planning and disclosure coding schemes was calculated using the supercode coding scheme (Table 4). After training had occurred with multiple simulations in which coding disagreements were discussed and resolved, coding was done by teams and then by individuals. On three separately coded simulations, coders had 101 opportunities for agreement and chose the same supercode family in 71% for the planning segments. For the disclosure segments, coders had a 73% agreement rate out of 111 opportunities. Inter-rater reliability for coaching coding was addressed by having coders discuss coding discrepancies and questions and resolve disagreements.

Detailed video data analysis, case 1:

Case 1 was carefully analyzed under the supposition that it was a recording of clinician's "natural state," that is, before they had received any training or feedback in disclosure, beyond reading a one-page instructional piece. As we approached this analysis, we understood that analyzing large quantities of qualitative data presents unique challenges. Impressions of differences between groups that are drawn from a thematic qualitative analysis alone are likely to be inaccurate due to biases from particularly positive or negative examples. Not including an analysis of differences between groups misses an opportunity to fully understand the data. We have used an approach that allows comparison between and among groups of qualitative findings. Below, we describe that approach in more detail.

Statistical tests of difference across groups are not appropriate for several key reasons. First, the number of codes attached to a particular data unit is strongly affected by coder characteristics. Coders tend to have stable tendencies to either be "over" or "under" coders (also referred to as "lumpers" or "splitters"). This phenomenon is not reflective of the actual data content and proves difficult to completely eliminate with training. To address this limitation, we assigned coding on an odd/even video to ensure that coder effects were randomly distributed across the dataset. Second, coding of qualitative data is strongly influenced by decisions about the unit of analysis or what amount of data will constitute a codeable unit. The range can be from a word to a paragraph of text data. We addressed this limitation by pre-segmenting the videos so that all coders worked with the same codeable units. Finally, qualitative data deals with conversation, which may vary widely in length while covering the same concept. To state differently, some people are loquacious, whereas others are taciturn. Qualitative code frequencies tend to unavoidably reflect this generally uninteresting fact. We addressed this concern by segmenting the data into codeable units by topic. Hence, when a team was discussing a subject such as prevention of future errors, the segment was not broken until they changed topics. Codes can only be applied once to a segment reducing duplication of codes for teams that chose to talk at length about a possible topic. Even with these limitations addressed as described, frequencies of qualitative codes must be viewed with caution.

Comparing rank ordering of frequencies of qualitative codes for a group of participants provides a method for accounting for the limitations described above while still allowing comparison of qualitative data across groups. Rank orders are a modest form of numeric comparison used in qualitative research involving large numbers of participants and data.(22) Rank orders can allow researchers to avoid drawing biased conclusions.

We analyzed the first case in the simulation, representing the participant's initial abilities to plan and execute disclosure of a medical error using our detailed coding procedure. The detailed coding schemes were analyzed to build conceptual categories (Table 4). These were then linked as supercodes in AtlasTi. Supercodes then were analyzed for occurrence and rank order rating between relevant groups in our sample. Specifically, we wanted to compare medicine versus surgical cases and physician versus nurse participants' communication. Results of the rank ordering and conclusions drawn from the analysis are included in the next section. This results from this detailed video analysis of case 1 was of sufficient value to justify future work conducting a similarly detailed coding and analysis with case 2 data (post coaching simulation).

Table 4: Planning and Disclosure Coding Schemes: Super Code Structure

SUPER CODE	**Individual Codes**
OPENINGS *Getting the conversation started* [Disclosure only]	Introductions: team to patient Beginning with a statement, e.g., "You may be wondering why you ended up in the ICU." Sharing the team's emotional situation, such as "we just feel terrible about what happened to you." Empathizing with patient's possible emotion, such as being scared to wake up in ICU Asking the patient what they remember of what happened Asking the patient about how they are feeling or doing Poising a question to the patient, such as, "I heard you fell; what happened?" An explicit statement that purpose of conversation is to discuss something difficult
DATA *What happened?*	During planning, data gathering about what occurred During disclosure, discussion of what happened, details of event

RESPONSIBILITY AND BLAME *Who did it?*	Continuum of taking responsibility for errors and placing blame: Blame: statements that place blame or that errors were someone else's responsibility Responsibility "I": statements referring to clinician's own responsibility Responsibility "we": statements referring to team's responsibility Responsibility "system": statements discussing role of system in creating context for errors
ERROR NAMED *Was this an error?*	Words such as error or mistake used to describe event Vague words used to describe error, such as "communication problem" or "unfortunate incident"
APOLOGIZING *Saying we're sorry*	Explicit apology as part of disclosure ("I'm sorry we made this error in your care.") Expression of regret, remorse, or sympathy ("We're sorry this happened to you"; "I just feel terrible about this"; "I'm sorry you've been through this ordeal.") Apology offered as a reaction to patient's emotional outburst
DISCLOSURE PLAN *What are we going to say?* [planning only]	Discussion to fully disclose error and details of how error occurred Discussion to disclose error but only partially disclose details of how occurred Discussion of value of full disclosure, honesty, truthfulness
CLINICIANS' EMOTIONAL RESPONSES *How <u>we</u> feel*	Feeling guilty or responsible Feeling bad, terrible, awful Relief that the patient is okay, error was not more serious, etc.
FIXING THE SITUATION *We'll try to fix it*	Prevent: how can we prevent future error/s Money: ensure there are no extra charges related to error Policy: appeal to policies or guidelines to prevent errors Pharmacy: involve pharmacy in prevention discussions Risk managers: involve risk manager in discussions Follow-up meeting: offer future discussion, meeting, phone call
RESPONDING TO THE PATIENT *How does <u>patient</u> feel?*	Patient trust: discussion of patient's potential loss of trust Reassurance - general: general reassurance to the patient Reassurance - okay: reassurance that the patient will have no long-term consequences Reassurance - minimize: reassurances that minimize error or possible consequences Acknowledge: respond by affirming patient's emotional response Argue: respond by arguing with patient's emotional response More facts: respond to patient emotion with more facts Positive nonverbal reaction Negative nonverbal reaction Silence: reacting to emotion with silence

In addition, during the coding process specific segments of the videos were time-stamped for additional analysis and transcription, such as the segments involving apology.

5. RESULTS

<u>Impact of simulation as measured by web assessment</u>

Our hypothesis was that, on the post WA, the intervention group would perform at a higher level than those in the control group. The control group was not random, and some systematic bias may be present. The presence of systematic bias was not demonstrated when looking for differences between the allocation by role (physicians and nurses), discipline (surgery or medicine), or sex to condition. However, the total score generated from the qualitative and quantitative components of the WA showed a significant difference with control group participants, showing higher overall pre scores ($t=2.62$, $p=.01$). This effect was only exhibited in the composite score and was not seen in the four constituent components of the overall pre score.

A summary reportable statistic is provided by a comparison between the post overall score for the intervention group and the post overall score for the control group after controlling for the effects of the pre overall score. An analysis of covariance (ANCOVA) was conducted using the pre-test overall score as a covariate and experimental condition as a fixed independent variable. After removal of the effect of the pre score—which correlated significantly with the post score ($r=.53$, $p=.001$)—condition was not a significant predictor of the post score ($F=.38$, $p=.54$). Other factors might have played a significant role in determining this result, but

univariate tests did not reveal these variables to have a significant association (e.g., role, discipline, sex: all p=NS).

Additional tests: dichotomous items

For each case, participants completed multiple choice questions that required them to describe each case as "not an error," "near miss," "minor error," or "serious error." In both the Dilantin case and the Zosyn case, a negligible number of participants (respectively, 0 or 1) answered "not an error" or "mear miss," allowing dichotomous comparisons between how participants responded to a specific error in the pre test versus how they responded to that same error in the post test. A significant change was noted for the Dilantin case, in which the percentage describing this error as serious increased from 21.9% to 45.6% (p=.001) from the pre to post assessment. However, this effect is confounded in that the case remained the same but the scripts (teams) varied. Additional analysis will determine if these changes can be differentiated across condition.

For each case, participants were also asked to complete a multiple choice question that required them to describe how they would state the apology to the patient. The choices were, "Volunteer that I was sorry," "I am sorry about what happened," or "I am sorry you were harmed," thus varying whether an explicit apology was made. In the Dilantin case, there was a significant change (chi-square=18.3, p=.000) attributable to a 44.0% to 70.6% increase in those stating "I am sorry you were harmed" noted between the pre and post assessment. For the Zosyn case, a significant effect was found (chi square=6.70, p=.010), but the rate at which the more explicit apology was made was not itself a significant change in the proportion (69.8% versus 65.1%, p=NS).

Video analysis, global codes case 1 vs. case 2

Global rating scales were developed to assess the overall performance of the physician and nurse participants within the simulations. These analyses pertain only to the intervention group, because the control group did not complete the simulation intervention. Estimates for internal consistency for the global ratings (planning and disclosure for each of the two cases) of the observed behavior were high (alpha=.78-.89). However, significant differences were not noted between case 1 and case 2 scores (each p=NS).

Detailed Analysis Of Case 1

See Table 5 for a report of frequencies of super codes and rank ordering. Data are presented separately for MDs versus RNs, for planning versus disclosure phase, and for medicine versus surgery cases. Totals are presented also. Key findings are summarized below.

Table 5: Super Code Frequencies and Rank Order

Super Code Groups		**PLANNING: *Medicine Case 1***		**DISCLOSURE *Medicine Case 1***		**PLANNING: *Surgical Case 1 ******		**DISCLOSURE *Surgical Case 1***		**TOTAL PLANNING**		**TOTAL DISCLOSURE**		**TOTAL OVERALL**	
Planning Segment	***Disclosure Segment***	*Freq*	**Rank Order*	*Freq*	**Rank Order*	*Freq*	**Rank Order*	*Freq*	**Rank Order*	Freq	Rank Order	Freq	Rank Order	Freq	Rank Order
---	OPENINGS--MD	---	---	33	*6*	---	---	15	*6***	—	—	77	*6*	—	—
---	OPENINGS--RN	---	---	19	*5*	---	---	10	*2***						
DATA--MD	DATA--MD	9	*8*	27	*8*	14	*5*	30	*3*	59	*6***	73	*7*	132	*6*
DATA--RN	DATA--RN	25	*5***	12	*7*	11	*5*	4	*5*						
RESPONSIBILITY & BLAME--MD	RESPONSIBILITY & BLAME--MD	67	*2*	64	*4*	26	*2***	17	*5*	159	*2*	135	*3*	294	*3*
RESPONSIBILITY & BLAME--RN	RESPONSIBILITY & BLAME--RN	51	*2*	44	*3*	15	*3*	10	*2***						
ERROR NAMED--MD	ERROR NAMED--MD	46	*3*	72	*3*	26	*2***	27	*4*	112	*3*	124	*4*	236	*4*
ERROR NAMED--RN	ERROR NAMED--RN	31	*3*	17	*6*	9	*6*	8	*3***						
DISCLOSURE PLAN--MD	---	35	*5*	---	---	25	*3*	---	---	89	*5*	—	—	—	—
DISLCLOSURE PLAN--RN	---	15	*6*	---	---	14	*4*	---	---						
APOLOGY--MD	APOLOGY--MD	19	*6*	52	*5*	8	*7*	15	*6***	40	*7*	116	*5*	156	*5*
APOLOGY--RN	APOLOGY--RN	8	*7*	41	*4*	5	*7***	8	*3***						
CLINICIAN EMOTION--MD	CLINICIAN EMOTION--MD	17	*7*	30	*7*	12	*6*	13	*7*	59	*6***	56	*8*	115	*7*
CLINICIAN EMOTION--RN	CLINICIAN EMOTION--RN	25	*5***	8	*8*	5	*7***	5	*4***						
FIX IT--MD	FIX IT--MD	96	*1*	80	*2*	57	*1*	41	*2*	282	*1*	177	*2*	459	*1*
FIX IT--RN	FIX IT--RN	88	*1*	51	*2*	41	*1*	5	*4***						
REACTING TO PATIENT--MD	REACTING TO PATIENT--MD	41	*4*	123	*1*	16	*4*	63	*1*	109	*4*	289	*1*	398	*2*
REACTING TO PATIENT--RN	REACTING TO PATIENT--RN	31	*4*	81	*1*	21	*2*	22	*1*						
Column totals		604		754		305		293		909		1047		1956	
MD total comments		330		481		184		221		514		702		1216	
RN total comments		274		273		121		72		395		345		740	
Number of simulation videos		22 simulations				12 simulations				34 simulations					

* Rank order shown separately for RNs versus MDs ** Tied category

Planning phase versus disclosure phase: Interprofessional teams consisting of a nurse and a physician engaged in planning and subsequent disclosure of medical errors. During planning, the topic physicians and nurses focused the most attention on was how to "fix it," including how to prevent future errors for the particular patient and other patients, possible ways to make amends (such as ensuring no additional hospital charges resulting from error), or involving risk management and planning follow-up meetings. This topic was followed in the rank order by discussion of responsibility for the error. Discussions of responsibility involved "I" statements, "we" statements, discussions of how the system contributes to errors, and, occasionally, "you" or blame statements. Some teams successfully negotiated this part of the discussion quickly, with both parties accepting personal responsibility and avoiding blame. Other teams struggled to achieve a mutual sense of trust and responsibility. Teams that were not able to move efficiently through this key step appeared to neglect other important steps in planning or to have these issues resurface during the disclosure in negative ways.

Teams tended to spend less time during planning on considering the patient's reaction to the disclosure event (rank order=4th), yet reacting to the patient's emotions, regardless of whether it was done well or awkwardly, was the top ranked task for the actual disclosure. Similarly, teams tended to spend little time in planning on discussing apology (rank order=7), whereas providing an apology appeared to comprise a more significant amount of their time during the disclosure (rank order=5). Our coaching emphasized incorporating anticipating the patient's emotions and planning the apology as specific aspects of planning. These data confirm the need for and importance of that emphasis.

Medicine versus Surgery Teams: Of the 34 simulations, medicine teams completed 22 (65%), and surgical teams completed 12 (35%). Total number of codes across medicine versus surgical teams were comparable (1358 of 1956 total codes or 69% for medicine versus 598 or 31% for surgical). Surgical versus medicine teams were similar in what they focused on in the planning versus disclosure segments.

Physician versus Nurse Participants: Disclosing errors as an interprofessional team is a relatively new concept. We compared nurse contributions to physician contributions to the communication to consider differences. Medicine physicians contributed similarly to their surgeon colleagues (811/1216=67%, with medicine cases representing 65% of total simulations; 405/1216=33% with surgery cases=35%). However, medical nurses contributed 74% of all comments made by nurses (547/740) yet represented only 67% of the simulations. Surgical nurses were especially reticent during the disclosures, when there were only 72 codes applied to their comments. When they did offer comments during disclosure, they talked about their own emotional reaction to the error and less about how the situation would be "fixed" than physician colleagues did.

Conclusions: The rank order analysis confirmed some initial impressions and debunked others. For example, initial coding included simulations with activated nurses. We initially hypothesized that nurses were more likely to apologize than physicians and more likely to raise the topic of the patient's emotional response to the disclosure event. The rank order analysis did not support these conclusions. Instead, we believe that some clinicians (physician or nurse) are particularly successful at these communication events. During planning, teams that quickly took individual responsibility for the error ("I" statements) moved on to additional topics in their planning including considering the patient's emotional response. Teams that were not able to negotiate this initial step tended to move forward to discussions about "what can we tell the patient for how we will fix it" that mirrored their responsibility-blame discussion. Stated another way, they were not able to shift their focus from themselves to the patient. Another initial impression was borne out by the rank order analysis. Surgical nurses were reticent to participate in the simulations. Reasons might include a prior lack of experience or a more intransigent hierarchical structure. This initial observation was supported by the rank order analysis.

Apology Analysis

We are particularly interested in how teams offer an apology to patients who have experienced an error in their care. We analyzed every simulation for the content, timing, number, speaker, and context of each apology within the error disclosure event. See Table 6 for a summary of a subset of these data.

Table 6: Timing, speaker, and content of first apology during disclosure

	Time of Apology #1	Total # of Apologies	Speaker and Text of First Apology
SIMPLE, DIRECT, AND/OR EXPLICIT APOLOGY			
1	2:25 min	MD-1 RN-3	MD: And so we do appreciate how scary this is, and we really want to apologize; this was a fault of ours in the hospital. You came here expecting to be safe.
2	2:24 min	MD-2 RN-1	RN: Unfortunately, I administered 70 units to you, and I am so sorry, and I…apologize for doing that.
EXPRESSIONS OF REGRET, REMORSE OR SYMPATHY			
3	1:57 min	MD-1 RN-1	MD: And we are sorry. I am very sorry that this happened.
4	1:30 min	MD-2 RN-0	MD: And I want to let you know that I am terribly sorry that you had this happen to you. And it can be serious, but luckily it all worked out okay.
5	0:12 sec	MD-5 RN-2	MD: We just wanted to sit down with you. I'm very sorry we're having to have this conversation.
6	0:40 sec	MD-3 RN-1	MD: And I'm very sorry to tell you that there is…there was a foreign body left in, at the time of the operation.
7	1:58 min	MD-0 RN-2	RN: Well, first of all I'd like to say that I'm really sorry for what happened...it's sort of a system error, but we both feel personally very sorry for what happened.
8	3:18 min	MD-3 RN-2	RN: The nurses came in and relieved each other, there was a shift change, and so we're not sure exactly what happened to the specimen at this point. So, we actually don't have the specimen, and we're sorry….And things like this unfortunately [do] happen, and we're sorry about the fact that we don't have the actual specimen, and we just wanted you to be aware.

Teams varied considerably in how soon they offered their first apology to the patient, ranging from 12 seconds after meeting the patient to 4 minutes 20 seconds into the discussion. [Not all data are included in Table 6 above, which provides information from eight exemplars.] Some teams did not offer an apology at any time in the disclosure. Teams also varied considerably on who offered the first apology. As in other parts of the disclosure conversations, physicians tended to take the lead and usually were the first to offer an apology. However, in about a quarter of the cases, nurses offered the first apology. When nurses offered the first apology, often a considerable period of time had elapsed in the disclosure without an apology occurring (e.g., #2 and #8 above). When nurses did offer the first apology, physician colleagues were likely to offer their own soon afterward. Some teams offered multiple apologies, often from both clinicians (see #5).

Just as the timing of apologies differed considerably, the content of apologies differed. We were interested in explicit, full apologies (as recommended by experts) and expressions of regret, sympathy, and remorse. Responses of patient actors were not analyzed, because actors were scripted to present triggers multiple times regardless of team's skill. Some teams offered an explicit apology for which responsibility for the error was clearly assumed (see #1 and #2). Other teams offered an apology for the event occurring without linking it to their actions (see #3 and #4). Some teams expressed regret for having to have the error conversation (see #5). Others offered an apology but suggested that the event was unavoidable (see #6 and #7). Teams often struggled with wanting to put a positive spin on the situation (see #4) in contrast to teams who were willing to acknowledge the seriousness of the potential situation (see #1).

Having the "words" offers insight into how individual clinicians struggle to communicate their good intentions around apologizing to patients and how interprofessional teams help or hinder that difficult communication. The apology of one team member can act as a catalyst to the team to say the "right thing." These data offer the opportunity to look inside these conversations to discover what those words are.

Coaching Examples

In addition, we reviewed each of the case 1 videos to identify examples of coaching recommendations (Table 7). Future analysis will link specific coaching recommendations with each team's behavior in case 1 and in case 2 to analyze whether healthcare teams were able to successfully implement the coaches' recommendations.

Table 7: Coaching Examples

Coach Pearl or Advice:	Example
Apologize: Explicit, early apology with team accepting responsibility for error	(coach) "Patients really want explicit apologies for errors. If you say, I'm sorry to have to tell you this…" (the clinician finished the sentence) "…it's not the same, as I'm sorry I did this."
Patient's emotion: Respond to patient's emotional reaction appropriately	"She was very emotional, and you went right into a clinical discussion about what had happened. Do you think would have been a little bit more helpful if you had acknowledged how she was feeling and her emotional state?"
Plan ahead: Anticipate and plan for patient reactions during team planning	"What if the patient starts to yell or scream, or what if they get very angry? Trying to anticipate a little bit more from their perspective how they're going to respond."
Words to use: Coaching on specific phrasing to communicate empathy or apology	Coach: "You said, "We made a little bit of a mistake in the OR." RN: "It wasn't a little mistake, it was big." (laughter) Coach: "Yes. At the end of the disclosure you said, "Obviously, It was a big mistake". RN: "I was trying to ease into it because she was already really nervous…" Coach: "Perhaps if you don't try to say what kind of a mistake it was…it was a mistake."

Analysis of debriefings

At the end of each simulation, the participants were interviewed to identify overall lessons learned, attitudes about team disclosure, and their response to the disclosure coaching. The interviews were audiotaped and qualitatively analyzed. Table 8 contains representative results from these debriefing interviews.

Table 8: Debriefing Results

What did participants learn?	What were participants' attitudes about team disclosure?
Surg RN: "I'm going to be much more aware of what I want to say, how I want to say it."	Surg RN: "it's important to work as a team….it helps the team member figure out what went wrong and what we're going to do differently in the future [to talk as a team]."
Surg RN: "I'm confident that I will suggest, let's discuss this, let's work this out and let's be honest."	Surg RN: "[advantage of team disclosure is] knowing what each of the members was planning to discuss, what they were prepared to discuss, what they were planning to say to the patient, and getting an idea of which direction to go, as the patient asked the questions."
Surg RN: "Anticipating reactions of patient – I have always been concerned on what I would say or my responsibilities and not anticipating how the patient might react."	Med RN: "it you have one team member among all the team members who is ready to blame only, then it's going to be a lot of conflicts. But if you have a group of team members to say, '… we're not here to point fingers, we're here to have improvement,' then I think it is great."
Med RN: "We need to come out with the bad news at first, let somebody deal with the appropriate emotional reaction to it and be accepting and being open to their, all their feelings, however they come out."	Med RN: "I think the idea of protecting patients from medical errors has to be a team thing. There's just no way that can happen otherwise."
Med RN: "That it is okay to apologize….I think it's important to disclose, right away, and to go ahead and apologize and not be worried...go ahead and be forthright."	Med RN: "It's helpful to have other people there that have your back but also can see the situation objectively and kind of pick each other up, as you go along."
Med RN: "Having a plan before you go and talk to the patient is really important and being clear about your plan."	Med RN: "If nursing wants to be seen as an equal member of the healthcare team, then they need to be equally accountable for errors that happen…. we need to be represented in the not so nice arenas."
Surg MD: "Considering the benefit of having the nurse there …. and to talk about it beforehand. Before you get into the middle of the situation and don't know how to deal with the question."	Surg MD: "I've never been in a scenario exactly like that, but it is nice to have especially the OR nurse there….I think that it's a great idea because everybody can sort of reassure the patient in their own way or explain something in their own way."
Med MD: "Doing this as a team. I think it's very important, in consulting members of the team, making sure that you have a plan and that all of the members of the team agree upon and are comfortable with [the plan].	Surg MD: "Patient still looks at the attending surgeon to be the sort of spokesman…but in the end, could I have done those by myself? Probably. I think it's a little bit more effective to have extra people there. It also makes the patient a little bit more nervous, because when a big group of people comes in, it can't be good news."

What did participants learn?	What were participants' attitudes about team disclosure?
Med MD: "Big learning point for me was to work with the nurse who was so exceptionally skilled and be able to use her skills in the team.…to see how effectively she could communicate."	Med MD: It keeps you from spending time defending yourself….I think when everybody is there, then everybody knows what happened ,and …everybody gets a chance to explain in their eyes. And I do think it makes you more forthright.

Two additional important themes emerged from the analysis of the debriefing interviews. First, healthcare participants frequently commented about how much more challenging the second case was, which involved an angry patient, compared with the first case that depicted a sad patient (Surg RN: "I thought it was going to go really smoothly, but that one was much harder than the first one." Surg MD: " …The second case was a more difficult patient…."). In addition, nurses commented frequently about their lack of familiarity with disclosure of errors (Surg RN: I am not used to disclosing errors to patients, so this was out of character for me, but discussing the case was something I felt comfortable with. Med RN: [what was the simulation experience like for you?] It was kind of stressful actually…. [Have you ever done it (disclosure) before?] No, I never have. Med RN: It is good exposure for me because most of the time, I haven't had such experiences having to reveal to a patient about we made a mistake….I have seen other people making mistakes, and it has not been revealed to the patient.) Future work will analyze these debriefing interviews in more detail**.**

E. DISCUSSION

We designed and implemented a simulation-based project for training healthcare workers in team error disclosure. We also successfully designed a web-based tool for measuring healthcare workers' team communication and error disclosure knowledge, attitudes, and skills---an instrument that demonstrated sound psychometric properties and high user satisfaction. The physicians and nurses who participated in the simulations found the experience enjoyable and educational and identified multiple lessons learned. However, though a few encouraging trends were present comparing the intervention and control groups' web assessment scores, overall there was no detectable impact on healthcare worker knowledge/attitudes/skills as measured with this tool. It is possible that our web assessment tool was not sufficiently sensitive. However, we believe this negative finding primarily highlights the importance of increasing the intensity of the training intervention. Both physicians and nurses entered the simulation with very little overall disclosure experience, and the concept of team disclosure was new to almost all participants. We have already implemented this lesson in our current AHRQ RO1 studying the impact of disclosure training on actual disclosure.

We also analyzed all the simulation videos to determine whether there was any improvement in participants' performance in the second case versus the first, also with negative results. We believe that the apparent lack of improvement from case 1 to case 2 primarily reflects the fact that we chose to make case 2 significantly harder than case 1. Although providing a progressively difficult learning experience makes sense from an educational perspective, it may have made it harder for participants to demonstrate the learning that was taking place.

Given that participants' performance in case 1 represents their "uncoached" current behavior, we conducted an exhaustive analysis of these case 1 videos. The results highlight important areas for future research. For example, we found that healthcare teams have considerably greater difficulty responding to an angry patient compared with a sad patient. In addition, as with our prior work, we uncovered important specialty differences in how medical and surgical professionals approach team communication and disclosure. Surgical nurses, in particular, were especially reluctant to be active participants in the disclosure process. Although apologies were commonly offered, many were less than the full, explicit apologies that patients desire. In our future analysis of this dataset, we will continue to highlight those aspects of healthcare workers' current approaches to team communication and error disclosure that will need to be incorporated into future training.

This project has multiple limitations. Though we were able to include a control group, the group assignments were not random, which may have introduced bias. All the participants were volunteers from Seattle institutions, which may affect the generalizability of the findings. Although the web disclosure assessment had sound psychometric properties, it has not yet been validated against the gold standard of actual behavior.

Our ongoing work is continuing to explore and extend these important findings. We will continue our analysis of these rich datasets. We expect additional manuscripts to be published from this study describing the impact of the simulation on healthcare workers' team disclosure behaviors, presenting further validation results for the web assessment, describing healthcare workers' attitudes regarding team disclosure, and describing how healthcare workers apologize after errors and how healthcare workers respond to patients' expressions of lost trust. The results from this project have been incorporated into ongoing research studies that Dr. Gallagher is leading with funding from AHRQ, the National Cancer Institute, the Robert Wood Johnson Foundation, the Greenwall Foundation, and the Doctors Company Foundation as well as a project that Dr. Brenda Zierler is leading on interprofessional health professional education that is funded by the Macy Foundation.

F. LIST OF PUBLICATION AND PRODUCTS

Peer-reviewed journal articles

1. Gallagher TH, Denham C, Leape L, Amori G, Levinson W. Disclosing unanticipated outcomes to patients: The art and practice. *J Patient Safety* 2007;3:158-165.
2. Shannon SE, Hardy M, Foglia MB, Gallagher TH. Disclosing errors to patients: Perspectives of registered nurses. *Joint Commission Journal of Quality and Patient Safety 2008:35:5-12*.
3. Gallagher TH. Clinical Crossroads: A 62-year-old woman with skin cancer who experienced wrong site surgery. *JAMA*. 2009;302(6):669-677.
4. Kim S, Brock D, Odegard P, Shannon S, Robins, L, Boggs JG, Clark FJ, Gallagher TH. A web-based team-oriented medical error communication assessment too: Development, preliminary reliability, validity, and user ratings. In press, *Teaching and Learning in Medicine*.

Books, book chapters

1. Truog R. Browning D, Johnson J, Gallagher TH. Talking with patients and families about medical error: A guide for education and practice. Baltimore, The Johns Hopkins University Press. In press.
2. Sara Kim, PhD, Doug Brock, PhD, Tom Gallagher, MD, et al. Developing Online Cases for Teaching Critical Thinking Skills: A Session in Survey of Educational Technology. In Facione N and Facione P (Eds.)*Teaching Critical Thinking and Clinical Judgment in the Health Sciences,* California Academic Press. In press.
3. Robins L, Odegard P, Shannon S, Prouty C, Kim S, Brock D, Gallagher TH. Using simulation and coaching as a catalyst for introducing team based error disclosure. In McKee A, Eraut M (Eds). *Formation and transformation over the lifespan: Innovation and Change. New York: Springer Publishing.* In press.

Selected Invited Presentation

1. Gallagher, Thomas H, "Using Simulation to Enhance Communication Skills in GME." Invited speaker, AAMC Annual Meeting, Seattle WA October 31, 2006.
2. Robins, L, Odegard, P., Shannon, S., Brock, D., Prouty, C., Kim, S., Gallagher, T. "Simulation Training for Team Error Disclosure: Developing the Skills of 'Disclosure Coaches' and Practitioners", Poster presentation, Western Group on Educational Affairs; April, 2008.
3. Brock, D. M., Robins, L.S., Prouty, C., Soule-Odegard, P., Kim, S., Shannon,S., and Gallagher, T. "The standardized team: Implications for the assessment of physician competence." Workshop, CME Congress 2008, May 27, 2008, Vancouver BC, Canada.
4. Gallagher TH. Using simulation to enhance team communication and error disclosure to patients. Invited presentation, 2008 AHRQ Annual Meeting.
5. Gallagher TH, Thomas E, Boothman R, McDonald. Linking Transparency, Patient Safety, and Quality of Care. Invited presentation, 2009 AHRQ Annual Meeting.
6. In addition, Dr. Gallagher has given over 40 invited presentations on error disclosure during this project period, including presentations in Australia, Berlin, London, and Canada and throughout the United States.

Other products

Other grant products include the four standardized patient cases, the web assessment videos, and the coaching manual, all of which are available upon request.

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