

How to HEEAL: A Patient and Peer-Centric Simulation Curriculum for Medical Error Disclosure

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Abstract

Introduction: Medical errors are an unfortunate certainty with emotional and psychological consequences for patients and health care providers. No standardized medical curriculum on how to disclose medical errors to patients or peers exists. The novel HEEAL (honesty/empathy/education/apology-awareness/lessen chance for future errors) curriculum addresses this gap in medical education through a multimodality workshop. **Methods:** This 6-hour, two-part curriculum incorporated didactic and standardized patient (SP) simulation education with rapid cycle deliberate practice (RCDP). The morning focused on provider-patient error disclosure; the afternoon applied the same principles to provider-provider (peer) discussion. Summative simulations with SPs evaluated learners' skill baseline and improvement. Formative simulations run by expert simulation educators used RCDP to provide real-time feedback and opportunities for adjustment. Medical knowledge was measured through pre- and postintervention multiple-choice questions. Learners' confidence and attitude towards medical errors disclosure were surveyed pre- and postintervention with assistance of the Barriers to Error Disclosure Assessment tool, revised with the addition of several questions related to provider-provider disclosure. **Results:** Fourteen medical students participated in this pilot curriculum. Statistical significance was demonstrated in medical knowledge ($p = .01$), peer-disclosure skills ($p = .001$), and confidence in medical error disclosure ($p < .001$). Although there was improvement in patient-disclosure skills, this did not reach statistical significance ($p = .05$). **Discussion:** This curriculum addresses the need for designated training in medical error disclosure. Learners gained knowledge, skills, and confidence in medical error disclosure. We recommend this curriculum for medical students preparing for transition to residency.

Keywords

Medical Error, Clinical Skills Assessment/OSCEs, Communication Skills, Emergency Medicine, Quality Improvement/Patient Safety, Simulation, Standardized Patient

Educational Objectives

By the end of this activity, learners will be able to:

1. Describe the current recommendations regarding medical errors and their impact on patients and colleagues.
2. Demonstrate improved skill in disclosing medical errors to patients.
3. Demonstrate improved skill in disclosing medical errors between peers.

4. Demonstrate improved confidence in disclosing medical errors to patients.
5. Demonstrate improved confidence in disclosing medical errors to peers.

Introduction

Medical error is an inevitability with lasting effects on both patients and health care providers. The frequency and severity of this type of error are not fully known, but recent national findings highlight medical errors as the third leading cause of death in the United States.¹ Multiple national medical committees have released official recommendations regarding error disclosure.²⁻⁴ The Joint Commission has specifically recommended the disclosure of sentinel events, as well as errors of omission, unintentional acts, and those in which the intended outcome is not achieved.³ Literature from patient and patient family reports

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has outlined specific content to include in disclosures: explicit statement of error, information surrounding what the error was and how it happened, and what will be done to prevent it in the future.⁵ Disclosures should also include a sincere apology,^{5,6} and it has been suggested that nonverbal communication, such as empathy, may assist with healing and improve patient-provider relationships.⁷

Despite exhaustive research and administrative effort to identify and remedy medical errors, physicians still often fall short of patient expectations for error disclosure.^{6,8,9} Inadequate error disclosures can lead to second victims, resulting in harm to injured patient family members.¹⁰ Many health care providers remain uncertain about when and how to disclose medical errors in the setting of ethical quandary.¹¹⁻¹³ While several studies about medical error disclosure have been published, a standardized curriculum has yet to be implemented.^{11,12,14,15}

Medical error disclosure does not exist only within the patient-provider relationship; there is also an important connection formed when another health care provider discovers an error or is brought in to assist with a resulting patient complication. Many providers are familiar with (and likely dread) the “Remember that patient?” conversation. Some data exist on what physicians perceive to be the preferred method for offering feedback to other providers during challenging patient encounters; however, these same physicians do not meet their own desired standard.¹⁶ Currently, there are no published curricula for addressing how to discuss medical errors between colleagues.

Our curriculum seeks to standardize the medical error disclosure conversation in the patient-provider relationship using the self-reported preferences of patients and their families. We incorporated that framework to design a novel format for discussing medical errors between colleagues (provider-provider). Through this two-part curriculum, we hope to normalize the discussion of medical errors to improve interpersonal relationships, optimize learning opportunities, and ultimately create a shame-free environment as it relates to error disclosure. While several published curricula on medical error disclosure are available in *MedEdPORTAL*,¹⁷⁻²¹ we feel that ours meets a specific need through its use of mixed didactic format, utilization of rapid cycle deliberate practice (RCDP)²² for immediate feedback and continued practice, and inclusion of disclosure between peers. Additionally, although well-reviewed mnemonics exist for bad news disclosure,²³⁻²⁶ they do not specifically address situations where the medical field may have done something to the patient, where a health care team member is not just a liaison, but a contributor, with potential trust loss.

The HEEAL curriculum was developed to incorporate all required components of comprehensive error disclosure. The HEEAL mnemonic stands for honesty/empathy/education/apology-awareness/lessen chance for future errors. The HEEAL curriculum was introduced as a voluntary pilot curriculum for fourth-year medical students during the second half of the academic year. Currently, Indiana University School of Medicine students do not have formalized education in medical error disclosure. Based upon the success of this novel pilot program, the HEEAL curriculum is under consideration for permanent adoption into the standard curriculum. The HEEAL pilot, as described below, took place in January 2021.

Methods

Curriculum Development and Pilot Testing

This novel curriculum was designed as the capstone project for one of the Indiana University School of Medicine 2019-2020 medical simulation fellows. Development of the project began in April 2019. A literature review discovered robust data on patient preferences and concerns surrounding medical communication. However, we found little peer-reviewed evidence on the effectiveness of medical error disclosure and even less on peer-to-peer communication of medical error. Additionally, this review identified no widely utilized standardized curriculum for medical error disclosure. To address this gap, we designed the HEEAL curriculum.

The HEEAL curriculum was designed in a stepwise fashion utilizing Kern’s six-step approach.²⁷ All concepts were reviewed by our institution’s risk-retention group, as well as a faculty MD/JD with experience in medical malpractice law.

Fourth-year medical students were enrolled on a volunteer basis through email recruitment. The pilot took place in January 2021 and was trialed in a tertiary-care, university-affiliated teaching hospital simulation lab.

Each learner completed a total of six simulations, four summative (pre- and postintervention for both patient and peer disclosure) and two formative. Summative cases were scored by standardized patients (SPs) immediately following completion of the case. Formative simulation cases were run in groups of two to three learners in the RCDP format. Formative cases were led by simulation-trained faculty (Lauren Falvo, Rami Ahmed, and Dylan Cooper) with experience in RCDP and difficult news disclosure education.²⁸

All SPs underwent a separate 4-hour training session to review the checklist, highlight and demonstrate critical actions within the

case, and standardize the SP emotional responses throughout the case. Thirteen experienced and formally trained SPs were utilized in these cases: eight SPs for the family member simulations and five peer-age SPs for the peer cases. Three simulation-trained peer-age physicians (recent/current simulation fellows) also served as SPs in the peer cases. All SPs had prior checklist training and objective structured clinical exam (OSCE) experience. Each case was reviewed line by line and rehearsed within the group. Examples of ideal, acceptable, and substandard responses were provided by a practice learner, and SPs had the opportunity to practice and modulate their emotional responses to a standardized, but genuine, performance.

All simulations were run in an OSCE format with audio and video recording in the room. Learners were presented with a door note (Appendix A) containing relevant chart information and a summary of the patient's presentation/exam findings/clinical course. Any clarifying questions were answered prior to dispatching learners to their simulations, and learners were provided with a copy of the door note for reference during their simulation. All learners performed their cases simultaneously.

Case and Checklist Design

Six cases focusing on errors commonly seen in medicine were developed for the pilot curriculum: three patient-based simulations and three peer-based simulations, with two of the cases addressing different disclosure scenarios related to the same medical error (Appendix A). Patient-based simulations included (1) ordering a documented allergic reaction-causing medication, (2) administering a contraindicated medication, and (3A) missing a critical diagnosis. Peer-based simulations included (3B) delayed diagnosis with poor outcome, (4) misdiagnosed sign-out, and (5) inaccurate sign-out.

Two competency checklists (Appendix B) were designed for this curriculum, one for HEEAL 1.0 (patient disclosure) and one for HEEAL 2.0 (peer disclosure). The goal of these checklists was to assess the use of appropriate verbal and nonverbal cues in the setting of error disclosure, as described by the HEEAL mnemonics. These checklists underwent multiple rounds of review by simulation and medicolegal/risk-retention experts prior to their finalization.

Workshop Logistics

This 6-hour workshop was piloted over 2 days with a total of 14 participants. No prework was required to participate as a learner. Students began the morning with a basic introduction to the curriculum and anticipated timeline. All students then immediately

completed an individual OSCE-style summative simulation (case 1). Following this simulation, the learners completed their preintervention confidence survey and multiple-choice question (MCQ) knowledge testing, while SPs graded their skills using a standardized checklist. Following these evaluations, learners were introduced to the HEEAL mnemonic as a novel concept for disclosing medical errors to patients (HEEAL 1.0) through a 30-minute lecture (Appendix C). Learners received a laminated pocket card (Appendix D) of the HEEAL mnemonic for continued reference throughout the day.

To solidify the concepts introduced in the lecture, learners next participated in a formative simulation (case 2), run as an RCDP simulation with an SP and a simulation-trained faculty serving as a facilitator and debriefer. Simulation faculty self-identified strategic times during the simulation and paused the case to provide immediate positive reinforcement for excellent performance or feedback on how to improve a specific aspect of the performance. The simulation faculty then rewound the case by telling the SP to go back 1-2 minutes, offering an opportunity for the student to establish their understanding of the feedback by demonstrating improved performance during the simulation. Students then ideally demonstrated their skills through a postcurricular summative simulation with no pauses or feedback (case 3A).

Immediately after the third simulation case, students transitioned into a second room for a new summative simulation scenario (case 3B), where they had to disclose the same medical error from case 3A, now with the responsible colleague (portrayed by an SP medical provider) rather than the patient's family. Following this case, learners participated in a second 30-minute lecture, HEEAL 2.0, a variant of the HEEAL mnemonic designed for medical error disclosure to colleagues (Appendix E). Students practiced this curriculum through a second formative RCDP simulation (case 4). Lastly, students completed a final summative simulation (case 5). While SPs graded their checklist, students completed their postintervention confidence survey and MCQ knowledge testing. Students were invited to fill out an anonymous course evaluation (Appendix F) prior to closing remarks. The [Figure](#) shows the flow of the day, and Appendix G provides further timeline details.

Evaluation Approach

Learners were evaluated on confidence, knowledge, and performance related to medical error disclosure. Pre- and postintervention confidence was assessed using a revised version of the validated Barriers to Error Disclosure Assessment (BEDA) tool,²⁹ utilized with author permission. Five additional

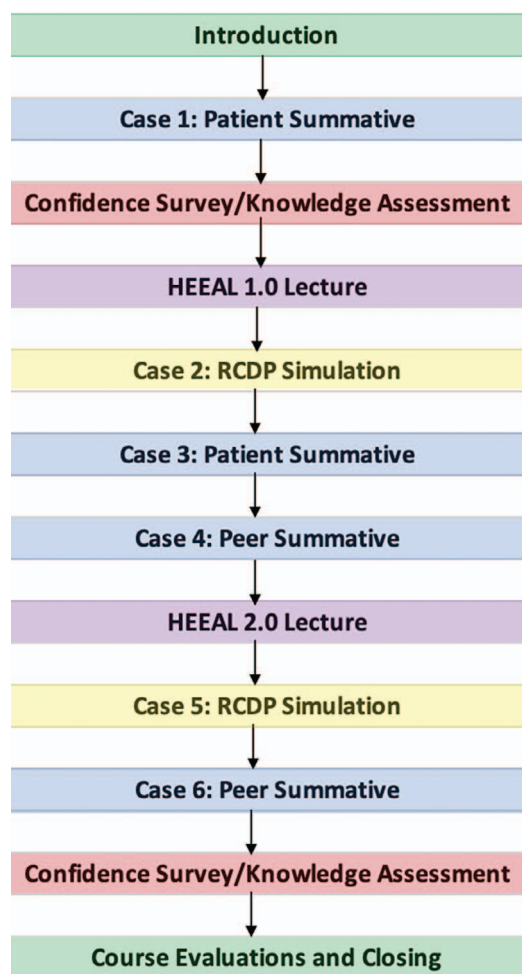


Figure. Flow of the formative and summative components of the HEAL curriculum. Abbreviations: HEAL, honesty/empathy/education/apology-awareness/lessen chance for future errors; RCDP, rapid cycle deliberate practice.

novel questions were added to this tool to gauge learner experience with peer-peer error disclosure (Appendix H). The tool was divided into two parts—perceptions of medical error disclosure and perceived barriers to medical disclosure. Our curriculum focused on perceptions of medical error disclosure, as our objectives were not to make systematic changes to address barriers (e.g., litigation, fiscal repercussions, institutional support). Assessment was measured by the completion of pre- and postintervention MCQs (Appendix I), designed by simulation faculty and piloted by nonparticipating fourth-year medical students. Skills assessment was evaluated by means of a standardized checklist, completed by trained SPs immediately after cases 1, 3, 4, and 6. Please refer to the Case and Checklist Design section, above, for additional details regarding checklist creation.

Data Collection

All learner evaluation data (MCQs, confidence assessment, and checklist performance) were entered electronically in real time. Summative simulation performances were audio and video recorded and stored in an encrypted database preestablished in our simulation center.

To ensure internal grading consistency, a randomized sample of 15% of the summative simulations were regraded by simulation faculty using video recording. These scores were then analyzed for interrater reliability.

Our confidence assessment, the revised BEDA questionnaire, was divided into two portions—personal perceptions of error disclosure (comfort, support, familiarity) and perceived barriers to error disclosure (fears/concerns). The revised BEDA scores for each portion were calculated separately to capture the changes in learners’ perceptions of error disclosure.

Analysis

The Wilcoxon test was used to estimate differences between pre- and postintervention scores. Interrater reliability was estimated using a simple kappa coefficient. All statistical analyses were completed using SAS version 9.4.

Ethical Review

This project did not meet the definition of human subject research and was exempt from institutional board review.

Results

Fourteen students participated in this curriculum, with a 100% completion rate in all measurable data.

As shown in Table 1, learners demonstrated statistically significant improvement in their knowledge as measured by MCQs ($p = .009$), their peer-disclosure skills ($p = .001$), and their confidence in medical error disclosure ($p < .001$). Participants demonstrated improvement ($p = .05$) in patient-disclosure skills. There was no statistically significant improvement in confidence

Table 1. Total Scores

Measure	Median (Minimum-Maximum)		p^a
	Preintervention	Postintervention	
Patient sum (performance)	19.0 (16.0-22.0)	21.0 (16.0-23.0)	.05
Multiple-choice questions	8.0 (6.0-9.0)	9.0 (7.0-10.0)	.009
Peer sum (performance)	14.0 (10.0-17.0)	17.0 (13.0-18.0)	.001
BEDA 1 (perceptions)	45.5 (39.0-50.0)	55.5 (50.0-63.0)	<.001
BEDA 2 (barriers)	27.5 (12.0-54.0)	29.0 (16.0-60.0)	.46
Confidence	19.5 (15.0-26.0)	32.0 (26.0-38.0)	<.001

Abbreviation: BEDA, Barriers to Error Disclosure Assessment.
^aEstimated using the Wilcoxon test.

as it pertained to barriers to error disclosure. To ensure reliability in our evaluations of learner skill, we calculated a simple kappa coefficient for both peer and patient disclosures (.38 and .33, respectively; Table 2). In Table 3, we separately evaluated our add-on questions from the revised version of the validated BEDA tool and found that learners had statistically significant improvement in their confidence disclosing medical errors between peers.

At the course’s completion, students were invited to anonymously provide feedback in an open-response postcourse evaluation. This evaluation was completed by 100% of the course’s participants, and pertinent feedback included the following:

- Strong positive feedback for the use of RCDP in teaching medical error disclosure.
- Incorporate this into the formal medical school curriculum [multiple requests].
- Include feedback from the SP after summative cases.
- Include a group debrief at the end of the course for emotional decompression.

Discussion

We designed a standardized curriculum for medical error disclosure, with the novel inclusion of medical error disclosure discussion between peers. Using mixed didactic and simulation-based content, fourth-year medical students were introduced to the nuances of medical error disclosure and provided with tools for improving communication. By using small-group RCDP, students were able to watch their peers’ approach to these conversations and receive real-time feedback from content experts. The HEEAL curriculum was designed to evaluate changes in learners’ confidence, knowledge, and performance. These were measured through the revised BEDA tool (with additional items added for provider-provider disclosure comfort), a 10-question multiple-choice test, and standardized observational checklists, respectively. All methods of evaluation were noted to have statistically significant improvement.

Regarding the confidence assessment, our learners reported significant positive changes in their perception of error

disclosure, specifically noting significant improvement in their confidence in their own ability to disclose errors. By experiencing this mixed-format curriculum, which utilizes lecture to lay foundational knowledge and then immediately applies it in formative simulation with real-time feedback, learners cover the entirety of Bloom’s taxonomy,³⁰ starting with basic remembering/understanding and culminating in creating their own organic phrases to utilize in these conversations. The lack of statistically significant improvement in confidence regarding barriers to error disclosure was an expected finding as external barriers are not typically resolved with educational interventions.

Improvement in knowledge was evaluated and measured by our MCQs, designed specifically to be a mix of need-to-know fact recollection and applications to clinical context. Students had a reasonable foundation of knowledge prior to our curriculum but were still noted to have statistically significant improvement in their MCQ scores postintervention. This was most likely due to the content of the HEEAL lectures themselves, which emphasized clear definitions of medical error, its prevalence, and its consequences.

Simulated performance improvement was demonstrated in both the patient and peer cases. Learners notably struggled more in the precurriculum peer case, with that evaluation having the lowest simulation score overall, but were also noted to have the largest numerical improvement from pre- to postcurriculum. Practicing this skill in an RCDP format was identified as a strength of the curriculum by our learners, who expressed an appreciation for the real-time feedback and the opportunity to adjust their delivery while also learning from their peers. RCDP is our preferred method for simulating emotion-laden conversations, as it allows students to pause, collect themselves, and reflect while the feelings and stressors are still palpable. RCDP creates a psychologically safe environment where students can take a time-out if needed and decompress. Stronger emotions can portend stronger memory performance; the immediate feedback in RCDP can also limit perpetuation of bad habits in error disclosure.

The HEEAL curriculum addresses a critical gap in medical education—the ability to name and address inevitable errors in patient care. Medical student interest in this curriculum was apparent, as students were willing to use their limited free time to trial the curriculum. Reception to the curriculum was overwhelmingly positive, both in the anonymous evaluations and in person. The curriculum developers have received additional emails from medical students inquiring about future opportunities

Table 2. Interrater Reliability Between Standardized Patients and Checklist Creator

Measure	Estimate ^a	95% Confidence Limit
Patient sum	.38	.17-.60
Peer sum	.33	.13-.53

^aEstimated using the simple kappa coefficient.

Table 3. Peer-Peer Experience and Confidence

Item	Preintervention		Postintervention		p ^a
	No. (%)	Median (Minimum-Maximum)	No. (%)	Median (Minimum-Maximum)	
Have you ever disclosed a peer's error to that peer?	10 (71)		N/A		
Have you ever disclosed a peer's error to others?	13 (93)		N/A		
I am confident in my ability to disclose a peer's medical error to that peer.		3.0 (1.0-4.0)		4.0 (3.0-5.0)	.006
I am not sure of the etiquette to disclose another colleague's error to that colleague. ^b		2.0 (2.0-3.0)		4.0 (3.0-5.0)	<.001
Fear of damaged relationship with peers.		2.0 (1.0-4.0)		2.0 (1.0-5.0)	.33

^aEstimated using the Wilcoxon test.

^bReverse coded.

to take the course or incorporate it into their formal curriculum. Student suggestions for finessing the course included dividing it over 2 days and incorporating more feedback from the SPs after their encounters. The use of RCDP was thought to be a very effective and concise way to deliver the necessary information and practice.

Future endeavors include introducing the curriculum on a larger scale within our medical school and expanding to other medical schools for validation. Further growth of and changes to the curriculum include a postevent debrief to help de-escalate stress/emotions and the addition of medical malpractice experts to the lecture portion. We also plan to incorporate SPs to give feedback during the RCDP formative simulations. Of note, our simulation cases do not include a case where the medical error is disclosed directly to a patient. Rather, we have disclosures to patient family members or the parents of a minor. Future iterations will include direct disclosures to patients.

This curriculum has several limitations. Our learner sample size was limited by resources and availability during the COVID pandemic, which affected our ability to draw generalizable conclusions. There was no clinical follow-up to determine either the efficacy of the curriculum at the patient bedside during the learners' intern year or learners' skill retention. The curriculum represents guidelines for medical error disclosure based on best practices and expert opinion, but there is no fully agreed upon or accepted method for disclosing medical errors. The curriculum cannot account for variance in apology laws/medicolegal practice across the United States. Additionally, while the curriculum addressed medical errors as multifactorial in nature, reviews root cause analysis, and discusses the importance of emotional check-ins, there is no formalized portion specifically addressing resources available for mental health and wellness care. We recommend this be added in future iterations of the curriculum. We recognize that not all institutions may have the support

available to run this curriculum in its entirety. We ran it during a Transitions to Residency education block in the setting of other didactics/procedural skills. Future iterations of the curriculum could include a deeper discussion of how medical error can occur and what systems are in place to promote patient safety.

This curriculum provides an effective solution for the lack of standardized training in medical error disclosure. The novel approach to conversation training between patient-provider and provider-provider addresses the need for a comprehensive communication-based curriculum for senior medical students. At the completion of the curriculum, learners demonstrated improved confidence, knowledge, and performance in the execution of error disclosure to both patient families and to peers. Medical students are limited in their opportunities to practice and perfect communication skills within both patient and peer conversations. This curricular gap leaves future physicians vulnerable to the potential negative impacts of medical error disclosures. Given our promising results, the HEEAL curriculum is an effective curricular element and should be incorporated broadly into medical education. It also serves as a model for future communication workshops to improve the patient-provider and provider-provider relationship.

Appendices

- A. Door Notes & SP Training Materials.docx
- B. Medical Error SP Checklist.docx
- C. HEEAL 1.0.pptx
- D. HEEAL Pocket Card.pdf
- E. HEEAL 2.0.pptx
- F. Course Evaluation.docx
- G. HEEAL Sample Timeline.pdf

H. Revised BEDA Tool.docx

I. Multiple-Choice Questions.docx

All appendices are peer reviewed as integral parts of the Original Publication.

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Prior Presentations

Falvo L. Hey, remember that patient? How to HEEAL: a medical error disclosure curriculum. Presented at: Indiana University School of Medicine Department of Emergency Medicine Scholar's Day; May 2020; Indianapolis, IN.

Falvo L. Hey, remember that patient? How to HEEAL: a medical error disclosure curriculum. Presented virtually at: International Meeting on Simulation in Healthcare (IMSH); January 2021.

Falvo L. How to HEEAL. Presented virtually at: Society for Academic Emergency Medicine (SAEM) National Conference; May 2021.

Ethical Approval

The Indiana University School of Medicine Institutional Review Board deemed further review of this project not necessary.

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