

Mixed-Realism Simulation of Adverse Event Disclosure

An Educational Methodology and Assessment Instrument

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Introduction: Physicians have an ethical duty to disclose adverse events to patients or families. Various strategies have been reported for teaching disclosure, but no instruments have been shown to be reliable for assessing them.

The aims of this study were to report a structured method for teaching adverse event disclosure using mixed-realism simulation, develop and begin to validate an instrument for assessing performance, and describe the disclosure practice of anesthesiology trainees.

Methods: Forty-two anesthesiology trainees participated in a 2-part exercise with mixed-realism simulation. The first part took place using a mannequin patient in a simulated operating room where trainees became enmeshed in a clinical episode that led to an adverse event and the second part in a simulated postoperative care unit where the learner is asked to disclose to a standardized patient who systematically moves through epochs of grief response. Two raters scored subjects using an assessment instrument we developed that combines a 4-element behaviorally anchored rating scale (BARS) and a 5-stage objective rating scale.

Results: The performance scores for elements within the BARS and the 5-stage instrument showed excellent interrater reliability (Cohen's $\kappa = 0.7$), appropriate range (mean range for BARS, 4.20–4.47; mean range for 5-stage instrument, 3.73–4.46), and high internal consistency ($P < 0.05$).

Conclusions: We have demonstrated a comprehensive methodology using a mixed-realism simulation that engages learners in an adverse event and allows them to practice disclosure to a structured range of patient responses. We have developed a reliable 2-part instrument with strong psychometric properties for assessing disclosure performance.

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Key Words: Patient simulation, Adverse events, Disclosure

The patient-physician relationship is based on trust, loyalty, knowledge, and respect. When adverse events occur, they can test the foundation of that relationship and have lasting consequences for both the patient and the physician.¹ Learning how to effectively disclose to patients and families is a requisite skill in physician education.

Although it has long been recognized that physicians have an ethical duty to disclose adverse events when they occur, recent attention has been focused on the mechanics of an effective disclosure. Many professional bodies have established guidelines, which generally recommend at least 3 components in the process of disclosure: the truth about the incident, an apology, and reassurance that measures will be put in place to prevent recurrence.^{2,3}

Despite ethical imperatives and available guidelines for the process,^{4–8} studies of disclosure have shown gaps between the recommended and actual practice.^{2,9–12} Physicians in practice may not be open, honest, and thorough when disclosing adverse events for multifactorial reasons.¹³ Avoidance of difficult conversations, reluctance to deal with a patient's feelings, fear of litigation, and concern that disclosure will not benefit the patient have been reported as the main causes for physician's failure to discuss adverse events fully and openly with patients.^{14–16}

For many medical trainees, experience with adverse events comes during actual patient care without previous benefit of formal education about the process of disclosure.^{17,18} Like practicing physicians, most trainees feel responsible, experience a strong emotional reaction, and believe that patients should be told of errors in their care, but there is little known regarding their skills in doing so in practice.¹⁹

Various strategies have been used for teaching adverse event disclosure.²⁰ Didactic approaches permit the efficient presentation of core concepts to a large number of learners, but discussion is limited, and there is no opportunity for practice or feedback. Small-group sessions allow the discussion of concepts, skills, and concerns but do not offer opportunity for practice or feedback. Small groups with peer

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role-play (one of the participants acts as patient) add practice of skills with feedback and an insight to the patient perspective but can lack realism owing to the untrained and inexperienced “patient.” A standardized patient (SP)—an actor trained to realistically portray a patient in an education or examination session²¹—is sometimes added to improve realism. Standardized patient sessions may lack engagement because the adverse event is simply described to the trainees and they may have little stake in the course of care. Combining simulation exercises, where clinical care is provided to a mannequin and disclosure of adverse events is then conducted using an SP, so-called *mixed-realism simulations*, have been used to improve the engagement.²² Teaching opportunities during clinical care where an adverse event has occurred are certainly realistic and engaging for a trainee observer; however, they are usually a poor time to allow trainees to practice. They are also rare and happenstance with respect to a particular trainee’s participation and are, therefore, educationally inefficient. Furthermore, asking trainees to perform a procedure (eg, disclosing an adverse event) for the first time, without the benefit of formal instruction and practice, raises ethical concerns and may cause trauma to the trainee and/or patient.

We sought to develop and test a structured technique for learning to disclose adverse events using a mixed-realism model. This technique would involve 4 stages. First, the learners would participate in a realistic simulation using a mannequin patient in an acute care situation where they would become enmeshed in a clinical episode leading to an adverse event. Second, the learner would be asked to disclose the adverse event to an SP or family, wherein the SP would systematically move through epochs of grief response according to the model of Kübler-Ross,²³ namely, denial, anger, bargaining, depression, and acceptance. This disclosure would be video recorded for later evaluation. The third stage would be a debriefing. During the debriefing, the learners would be encouraged to discuss their feelings, explore ideas about disclosing, learn techniques for responding to patient reactions, and reflect on their learning from the exercise. The fourth stage would be for the evaluator to review the video recording of the disclosure and to rate the performance using an assessment instrument.

Thus, the purposes of this study were to (1) demonstrate the feasibility of a structured technique for teaching adverse event disclosure using mixed-realism simulation, (2) develop and begin to validate an instrument for assessing performance, and (3) describe the disclosure practice of a representative cohort of anesthesiology trainees.

METHODS

Subjects

With institutional review board approval, this study was conducted as part of regularly scheduled daylong simulation-based crisis resource management courses at the Center for Medical Simulation in Cambridge, MA. Participants in consecutive courses from November 2008 to December 2011 were included. Forty-two anesthesiology trainees in their third to fourth postgraduate years from 3 different teaching hospitals participated as they were assigned to each simulation course

by their institutions on an availability basis. All subjects had previous experience with similar simulation-based courses because they are required to participate as part of their training on a yearly basis. No subject reported receiving previous specific education on disclosure and apology during their anesthesiology residency. The subjects received no incentive for their participation. The duration of each course was approximately 7 hours, during which the adverse event disclosure case was second or third of 3 to 5 cases.

Disclosure Exercise Design

To evaluate resident’s ability to disclose adverse events, we developed an exercise with mixed realism simulation, divided into 2 parts. The first part takes place in a simulated operating room (OR) and the second part in a simulated postoperative care unit (PACU). For 2 trainees to have the disclosure experience, we had each subject sequentially care for the patient in the OR and then both speak to the patients in the PACU as a pair. Both parts of the exercise were video recorded for debriefing feedback and for this study.

One subject is called to take over anesthesia care of a mannequin patient (Laerdal SimMan 3G, Stavanger, Norway) undergoing gastric bypass surgery from an anesthesiologist (actor) who presumably had started the case. The patient is a 55-year-old man with history of morbid obesity, hypertension, diabetes, and coronary artery disease. During the initial anesthetic care, the patient had a hypotensive episode, and the vaporizer was turned down very low. At the time of handover, the patient is tachycardic and hypertensive, and the displayed end-expired anesthetic agent concentration is relatively low, such that a period of inadequate anesthesia would be plausible. If the subject increases the vaporizer setting, the end-expired anesthetic agent concentration increases slowly. The surgery proceeds uneventfully, and the patient remains reasonably stable throughout. During the operation, the surgeon, the scrub technician, and the circulating nurse (all actors) conduct a lively conversation regarding restaurants, food, and weight control. The conversation is arguably inappropriate, although not exaggerated beyond the boundary of the banter that sometimes occurs in real ORs. At one point in the conversation, one of the actors tries to engage the subject by asking if they have ever been to one of the restaurants being discussed or if they like a certain food or have a restaurant recommendation for the others. Shortly thereafter, one of the actors makes direct reference to the patient’s body habitus by warning someone else not to “wind up like a whale, like this guy.” A second subject is then brought to the OR and asked to take over the case from the first subject who is needed elsewhere (this was done to allow 2 subjects to participate in the case). After the case is handed over to the second subject and the first subject has left the room, the surgeon, scrub technician, and circulating nurse resume the conversation about food and obesity as before. Again, the actors attempt to engage the subjects in the conversation, and the patient’s body habitus is mentioned. This first part of the exercise is ended with the surgery still underway and the patient stable. The 2 subjects and other participants in the course are asked to retire with one of the course instructors for a discussion of the case.

After approximately 5 minutes of discussing the clinical management of case, the second part of the exercise begins. The discussion is interrupted by a telephone call from the PACU requesting that the 2 subjects address a problem with the patient they had just been taking care of. In this part of the exercise, the patient is now an actor rather than the mannequin. During the course of several minutes, the patient actor reveals that he has heard a conversation in the OR regarding food and obesity and believes he was being talked about and made fun of during his surgery. In a semiscripted structured manner, the patient actor displays an appropriate and realistic emotional response to the intraoperative awareness. The scripting is such that the actor displays, in order, 5 stages of grief according to the model of Kübler-Ross²³: denial, anger, bargaining, depression, and acceptance. The content of each stage is prescribed, although the exact script is dictated by the response of the subjects. The content of the stages is as follows: (1) Denial—he expresses disbelief that he could have heard these things as he was told he would be asleep during his operation. He demands the subjects to tell him that he was dreaming. However, he accurately mentions specifics of the conversation including the names of the restaurants and food that were discussed. He claims to recognize the voices of the subjects although he had not met them preoperatively. (2) Anger—he is incensed that professional anesthesiologists could not keep him asleep as they are supposed to do. In addition, he is irate that people were talking about things other than his medical care during surgery and is particularly angry that he was called degrading names. He insistently accuses the subjects of having called him a whale. (3) Bargaining—he wants some retribution for his inappropriate experience such as the people in the room should be disciplined or fired. He tells the subjects that maybe, they should lose their jobs as well. He wonders openly that this probably happens all the time and nothing is done to punish wrongdoers. (4) Depression—he asks tearfully if he should even have undergone the operation. He reveals that he has been made fun of his whole life and fears it will never end if even professionals humiliate him. He tells the subjects that this has been the most difficult decision of his life and now this degradation has happened as a sign that he made the wrong choice. (5) Acceptance—he asks what will happen now. Moreover, he asks if his mother can come visit him in the PACU because they would not let her in before. He alludes to not wanting to be left alone in his grief.

Following the second part of the exercise, one of the instructors conducts a thorough debriefing discussion of the case with the subjects and other participants in the course. Subjects covered are the conduct of the case, causes of intraoperative awareness, professionalism in the OR and the anesthesiologist's role, as well as the disclosure of the adverse event to the patient.

Disclosure Exercise Implementation

The first 6 sessions were used for rater training and had a variety of actors as the patient. The subsequent 15 sessions used in the study had 1 actor as the patient throughout.

To begin to validate the instruments, the 2 investigators served as raters. One of the investigators participated in the adverse event disclosure exercise (D.B.R.) and the other did not (F.M.M.). One of the investigators was also the study actor (D.B.R.).

Assessment Instrument

We developed a paired assessment instrument using both (1) a behaviorally anchored rating scale (BARS for disclosure instrument) to assess the performance on adverse event disclosure and (2) an objective skills measure (5-stage instrument) to evaluate the approach to patient's 5 stages of grief.

The BARS for disclosure instrument comprises 4 elements with multiple dimensions (Table 1).

The 5-stage instrument aims to assess specific disclosure skills of the learner in response to the patient's 5 stages of grief. This rating scale comprised 6 elements with multiple dimensions (Table 2).

All elements and dimensions of both instruments were scored on a 7-point scale (1 being extremely ineffective, 4 being neutral, and 7 being extremely effective). Given that 2 subjects spoke to the patient in the PACU together, it was intended that the subject's combined performance skills would be rated. The video recordings of the first 6 sessions were rated independently using the BARS for disclosure and 5-stages instruments and then discussed extensively to clarify the meaning of specific items on the rating scale and to improve agreement between the raters. After this rater

TABLE 1. BARS for Disclosure Instrument—Elements and Dimensions

Element 1. Establishes an appropriate setting/environment
Optimizes environment for conversation
Commits to respect the patient understanding
Explores concerns and expectations
Element 2. Engages with patient
Brings personal caring and humanity to the conversation
Acknowledges and responds to patient's emotions
Conveys compassion and empathy for the patient suffering
Aligns with patient's perspective
Listens actively and patiently
Uses simple and straightforward language
Facilitates discussion through verbal and nonverbal techniques
Element 3. Disclosure and apology
States clearly the facts as they are known at the present
Sincerely apologize in an appropriate manner
Discusses the adverse event as it impacts in patient's care
Checks the patient's understanding of the information provided
Element 4. Helps patient to achieve or sustain an appropriate approach to the event
Assures that the event will be thoroughly investigated and that all facts will be communicated as they become known
Responds to patient's needs
Assesses whether the existing clinical relationships can be maintained and offers alternatives if appropriate
Offers support services
Explains what will be done to prevent similar events in the future

Raters score each component (element or dimension): 1 (extremely ineffective), 2 (consistently ineffective), 3 (mostly ineffective), 4 (neutral), 5 (mostly effective), 6 (consistently effective), 7 (extremely effective).

TABLE 2. Five-Stage Instrument—Elements and Dimensions

Element 1. Posture toward patient
Assumes a comforting posture
Has an empathetic attitude
Acknowledges and responds to patient's emotions
Uses simple and straightforward language
Listens actively and patiently
Aligns with the patient's perspective
Element 2. Dealing with denial
Respects patient's denial
States clearly the facts as they are known at the present
Checks the patient understanding of the information provided
Element 3. Dealing with anger
Acknowledges patient's anger
Respects patient's anger
Apologizes sincerely
Element 4. Dealing with bargaining
Respects patient's bargaining
Agrees to help solve the problem
Assures that the event will be thoroughly investigated and that all facts will be communicated as they become known
Assesses whether the existing clinical relationships can be maintained and offers alternatives if appropriate
Offers support resources (with respect to bargaining)
Element 5. Dealing with depression
Brings personal caring and humanity to the conversation
Responds to patient's emotional needs
Offers appropriate support
Element 6. Dealing with acceptance
States a plan
Maintains a commitment

Raters score each component (element or dimension): 1 (extremely ineffective), 2 (consistently ineffective), 3 (mostly ineffective), 4 (neutral), 5 (mostly effective), 6 (consistently effective), 7 (extremely effective).

training period, video recordings of the next 15 sessions were rated similarly. After each rater independently completed his assessment, a second step was taken to attempt to reach consensus for each element and dimension.

Statistical Analysis

SPSS 17.0 (Chicago, IL) was used for all statistical analyses. To determine the interrater reliability, we calculated the Cohen's κ coefficient with linear weighting for each session, overall training, and overall study. Agreement was considered moderate for coefficients between 0.40 and 0.60, substantial for coefficients from 0.61 to 0.80, and excellent for coefficients greater than 0.80.^{24–26} Internal validity was demonstrated with Spearman ρ correlation coefficient.

Performances were reported with mean (SD) and skewness coefficients of the elements and dimensions. Spearman ρ correlation coefficient was used to determine changes in the impact of each dimension on the correspondent element.

All tests were 2-tailed and a $P < 0.05$ was considered significant.

RESULTS

Interrater Agreement

Interrater reliability coefficients during the training period varied between substantial and excellent (0.7–1.0). The overall agreement for independent rating during the training period was substantial (Cohen's κ coefficient, 0.75).

Following the independent rating for each session, discussion between the raters to reach consensus was then attempted. Ratings were changed in 71% of the cases but in only 32% by more than 2 units of the 7-point scale.

The interrater reliability for the independent assessment during the study varied between moderate and excellent (0.45–0.9). The overall agreement for the study period was substantial (0.70).

BARS Disclosure Performance Assessment

As seen in Table 3, the mean performance scores obtained for elements within the BARS for disclosure instrument ranged between 4.20 and 4.47. The scores obtained for each element and dimension and the P value of the correlation between each dimension and the correspondent element are also presented in Table 3. All dimensions had a significant correlation coefficient with the correspondent element except dimension 6 (uses simple and straightforward language) on element 2 (engages with patient).

Five-Stage Assessment

The overall scores obtained with the 5-stage instrument ranged from 3.73 to 4.46. The scores obtained for each element and dimension and the P value of the correlation between each dimension and the correspondent element are presented as Table 4. All dimensions had a significant correlation coefficient with the corresponding element.

Specific actions within each dimension were also measured (Table 4).

DISCUSSION

The next generation of physicians must be prepared to properly disclose adverse events and our educational system misses opportunities to instruct medical trainees in disclosure.¹⁷ Disclosures are emotionally charged conversations that require advanced communication skills.²⁷

We have demonstrated a structured mixed-realism exercise to engage anesthesiology trainees in disclosure education. The combination of (1) immersing the trainees in a high-fidelity environment using mannequin simulation where the adverse event occurred and (2) disclosing to an SP who (3) discretely traverses through the Kübler-Ross 5 stages of grief and (4) debriefing the specific skills required in each stage during a disclosure discussion is the anatomy of this structured approach. By experiencing the evolution of the adverse event, we intended for the trainees to have broader understanding of the context, consequences, and issues than if they were given a written case stem before speaking with the SP. Using a semistructured 5-stage grief response for the SP allowed a clear observation of specific skills of the trainee in each of these discrete areas.

We have also developed and begun to validate a new assessment instrument combining a BARS for disclosure and 5-stage assessment instrument. The BARS instrument provided information on the general quality of the disclosure, whereas the 5-stage instrument provided an evaluation of the specific skill behaviors to the patient's grief response. Although there were limitations of the rating instruments, both instruments showed reasonable reliability and sensitivity for their purpose. When the raters did not

TABLE 3. BARS for Disclosure Instrument Scores for 15 Subjects (Elements and Dimensions) and P Value of the Correlation Between Each Dimension and Its Corresponding Element

Element or Dimension	Overall Score, Mean (SD)/ Skewness	P of Correlation With Correspondent Element
Element 1. Establishes an appropriate setting/environment	4.47 (0.99)/+	
Optimizes environment for conversation	4.80 (0.86)/−	0.000
Commits to respect the patient understanding	4.40 (1.35)/−	0.003
Explores concerns and expectations	4.40 (1.24)/−	0.002
Element 2. Engages with patient	4.27 (1.10)/+	
Brings personal caring and humanity to the conversation	4.73 (1.10)/−	0.000
Acknowledges and responds to patient's emotions	4.47 (1.24)/−	0.000
Conveys compassion and empathy for the patient suffering	4.40 (1.24)/−	0.002
Aligns with patient's perspective	4.33 (1.34)/+	0.000
Listens actively and patiently	4.90 (0.99)/−	0.000
Uses simple and straightforward language	4.06 (1.22)/+	0.090
Facilitates the discussion through verbal and nonverbal techniques	4.80 (1.20)/−	0.001
Element 3. Disclosure and apologize	4.40 (1.20)/+	
States clearly the facts as they are known in the present	4.07 (1.48)/+	0.008
Sincerely apologize in an appropriate manner	4.87 (1.40)/−	0.000
Discusses the adverse event as it impacts in patient's care	4.00 (1.36)/+	0.026
Checks the patient's understanding of the information provided	2.60 (0.63)/+	0.004
Element 4. Helps patient to achieve or sustain an appropriate approach to the event	4.20 (1.39)/−	
Assures that the event will be thoroughly investigated and that all facts will be communicated as they become known	3.93 (1.57)/+	0.002
Responds to patient's needs	4.40 (1.24)/−	0.035
Assesses whether the existing clinical relationships can be maintained and offers alternatives if appropriate	2.93 (1.57)/+	0.001
Offers support services	4.60 (1.63)/−	0.023
Explains what will be done to prevent similar events in the future	4.00 (1.36)/+	0.000

Bold indicates statistically significant.

agree (lower κ coefficients), the issue seemed to be related to behaviors missed by one of the raters, to different perceptions of responsibility and/or honesty, to emotionality of raters (as has been demonstrated in patients,¹⁹ rater's interpretation of what was said often seemed to be more important than the actual words) and to the difficulty in rating the most highly subjective dimensions such as the sincerity of an apology. It was also demonstrated that the raters were easily able to close the gaps with a brief discussion while reviewing the video of the educational session to reach a consensus score.

A sample of anesthesia residents engaged in disclosing an adverse event to an SP showed quite a number of skillful actions and behaviors. Overall, residents were mostly effective in optimizing the environment for the conversation, listening actively and patiently, bringing personal caring and humanity to the conversation, apologizing, and offering support services. They do not, however, consistently check the patient's understanding, assess the maintenance of clinical relationships, define a plan for the problem, or convey future prevention strategies.

Trainees performed well introducing themselves properly and validating patient's feelings because alignment with patient's perspective and the respect for the patient's understanding are essential for the reestablishment of trust in an injured patient-physician relationship.²⁸ Few sat down during conversation despite the possibility that this sent nonverbal messages that were neither desirable nor intended.

Although almost all of the anesthesiology trainees apologized, some of the apologies were nonspecific (eg, "sorry

that you feel that way"). One possible explanation for their reluctance is confusion over whether the adverse event was attributable to a technical error of their own. Perhaps, they view the concept of responsibility as that of an individual and not of a team or specialty. In addition, they may have assumed that by apologizing, they would be accepting blame. Physicians are particularly concerned that disclosure may increase the chances of being sued—this is why many physicians never admit their mistakes or accept their responsibility.^{29,30} Rightfully, until formal analyses have been completed, it is usually uncertain as to the exact events that lead to an adverse event.²⁷ Nonetheless, expressing sympathy in the form of an apology regardless of the blame is widely recognized as a desirable component of the disclosure discussion.

There were a number of limitations to our study. First, as in all simulations, it is impossible to know how realistic and engaged the subjects felt and the degree of their treatment of the case as if it was real.³¹ Although we went to great lengths to make the fidelity of the OR experience and the PACU conversation with the SP as high as we could, some subjects could have viewed the occurrence of awareness as unrealistic, the inappropriate conversation as unlikely, or the mannequin patient unable to really hear the conversation. During the debriefings, the participants expressed quite the opposite, but even they might not accurately perceive the effect of their degree of suspension of disbelief on their performance in the disclosure conversation. Second, we have developed only one exercise using mixed realism as a disclosure tool. Although this exercise was very successful,

TABLE 4. Five-Stage Instrument Scores (Elements and Dimensions), Specific Actions, and *P* Value of the Correlation Between Each Dimension and Its Corresponding Element

Element or Dimension	Overall Score, Mean (SD)/Skewness	<i>P</i> of Correlation With Correspondent element	Specific Actions Measured
Element 1. Posture toward patient	4.46 (0.86)/–		
Assumes a comforting posture	4.80 (0.86)/–	0.042	13% sat down 13% kept their arms crossed 87% introduced by name and position
Has an empathetic attitude	4.80 (1.20)/–	0.000	
Acknowledges and responds to patient's emotions	4.67 (1.05)/–	0.000	
Uses simple and straightforward language	4.06 (1.22)/+	0.047	40% used medical jargon
Listens actively and patiently	4.90 (0.99)/–	0.002	
Aligns with the patient's perspective	4.33 (1.34)/+	0.000	
Element 2. Dealing with denial	3.73 (1.10)/+		
Respects patient's denial	4.40 (1.35)/–	0.000	27% validated the emotion
States clearly the facts as they are known in the present	4.07 (1.48)/+	0.000	27% stated an untruth 33% speculated on another explanation
Checks the patient understanding of the information provided	2.60 (0.63)/+	0.035	
Element 3. Dealing with anger	4.40 (1.12)/+		
Acknowledges patient's anger	4.47 (1.24)/–	0.006	60% labeled and validated the emotion
Respects patient's anger	4.33 (1.17)/–	0.000	13% told the patient to calm down 7% got angry with the patient
Apologizes sincerely	4.87 (1.40)/–	0.000	33% apologized once 60% apologized twice or more 33% said they were sorry that the patient felt that way 40% said they were sorry that the adverse event has happened 13% took team responsibility 13% blamed others implicitly 20% blamed others explicitly
Element 4. Dealing with bargaining	3.93 (1.27)/+		
Respects patient's bargaining	3.93 (1.39)/–	0.000	33% ignored
Agrees to solve the problem	4.00 (1.36)/0	0.000	20% postponed decision
Assures that the event will be thoroughly investigated and that all facts will be communicated as they become known	3.93 (1.57)/–	0.000	
Assesses whether the existing clinical relationships can be maintained and offers alternatives if appropriate	2.93 (1.57)/+	0.006	
Offers support resources	4.07 (1.86)/–	0.004	20% offered social support
Element 5. Dealing with depression	4.26 (1.16)/–		
Brings personal caring and humanity to the conversation	4.73 (1.10)/–	0.003	
Responds to patient's emotional needs	4.40 (1.24)/–	0.000	
Offers appropriate support	4.60 (1.63)/–	0.002	
Element 6. Dealing with acceptance	4.06 (1.33)/–		
States a plan	3.93 (1.28)/+	0.007	33% obtained consent 40% agreed to follow up
Maintains a commitment	4.46 (1.68)/–	0.003	20% did not leave without requesting additional support

Bold indicates statistically significant.

others will have to be developed and demonstrated to establish this technique as a best practice. Third, we made no attempt to study the educational effectiveness of the exercise. In future work, we can test the learning in subsequent mixed-realism cases to assess learning as compared with groups having other forms of disclosure education. Furthermore, studies of the effectiveness of the learning in a naturalistic environment are possible. Fourth, all the participants were anesthesiology residents from 3 different, but affiliated, hospitals limiting the generalizability of the descriptive results to other specialties and institutions. Fifth, certain limitations of the rating instruments are apparent.

Because the raters in this study were investigators, a potential bias exists, especially with respect to the ease of achieving consensus ratings. Moreover, the training period might not be representative because the investigators were, of course, already familiar with the instruments. Further validation of the instrument using other cases, more raters, and more subjects from a variety of fields and levels of experience will be the topic of future work.

A structured technique for learning disclosure through simulation-based exercises, debriefing, and assessment of skills may contribute to improving physician's willingness and ability to engage in these difficult conversations.

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