Examining the Effectiveness of Debriefing at the Point of Care in Simulation-Based Operating Room Team Training

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Abstract

Objectives: We examined the extent to which characteristics of effective debriefing were observed when conducting high-fidelity, simulation-based operating room (OR) team training under tight time constraints in the actual OR. **Methods**: The entire OR general surgical staff at an academically-affiliated hospital participated in half-day training sessions. After-action debriefing discussions regarding teamwork followed each of two immersive scenarios. Sessions were videotaped and then assessed by two trained, independent raters using an instrument based on characteristics of effective debriefing. Calculation of Kappa coefficient was used to determine inter-rater reliability. Descriptive statistics were calculated. **Results**: Introductions, rapport-building, and identifying intentions for behavior change were very positive features of the sessions. Most other item mean scores (e.g., process and closure characteristics) were at or slightly below the scale midpoint. **Conclusion**: Effective debriefing can occur even when time and space are limited. However, careful attention to questioning and facilitation skills is essential.

Introduction

Promoting teamwork among health care professionals has become an important national priority. For example, the Joint Commission has included teamwork training as part of its patient safety curriculum.[1] In addition, the Institute of Medicine (IOM) has made interdisciplinary teamwork one of its five core competencies for health care professionals.[2] The Agency for Healthcare Research and Quality (AHRQ) has supported research into the relationship between teamwork and patient safety.[3] AHRQ has also partnered with the Department of Defense (DoD) to create a team-based training system known as TeamSTEPPS™ to promote behavioral skills among health care providers at the point of care.[4]

Background

The development of teamwork skills has become recognized as a set of learned behaviors and attitudes that should be included in formal education programs. For example, the Accreditation Council for Graduate Medical Education (ACGME) has placed considerable emphasis on teamwork in its expectations for teaching and assessing residents' acquisition of core competencies.[5] Particular attention to teamwork training has focused on targeting high risk,

highly dynamic health care specialties, such as emergency medicine,[6, 7, 8] obstetrics,[9, 10] and surgery.[11, 12, 13]

Improving teamwork in the operating room (OR) environment is especially important given the role that confusion,[14, 15, 16] poor communication,[17] and disruptive behavior[18] can play in that setting. Interactive group sessions have been used successfully to promote team-based attitudes and interaction at several institutions,[10, 11] but high-fidelity simulation-based interdisciplinary team training may offer some significant advantages. For example, it uses realistic scenarios and immediate after-action debriefing discussions. This enables participants to become immersed in a realistic environment where they can learn and practice team skills.[19, 20] Furthermore, the simulated environment allows teams to fully realize and learn from the consequences of their actions in ways that would not be possible in situations involving real patients.[18] Finally, it exposes teams to rare clinical events in which prior experience could positively impact patient care.[18]

To date, most interdisciplinary OR team training has been limited to specially constructed simulation suites.[21, 22] Only rarely has it been conducted within an actual OR environment.[23,24] Such point-of-care simulation training has several advantages, including greater accessibility for clinicians, adaptability in scheduling, the opportunity for systems-based learning, an immersive environment, and standardized regional training.[22]

Feedback (including debriefing) has been identified as an essential component of simulation-based training. As an experiential learning approach, debriefing facilitates participants' ability to relate their training experiences to daily practice.[25] In fact, debriefing is widely accepted as the most essential component in simulation-based training.[26] In simulation-based training, the primary objective of debriefing is to engage participants in reflective critique and discussion regarding their performance during simulation scenarios and how they can improve targeted content and skills. Essential components of debriefing include description, analysis, and application.[27]

This article presents the results and insights gained from examining the effectiveness of debriefing sessions that were conducted as part of OR teamwork training sessions implemented at the point of care with actual OR teams in a busy OR department of an academic medical center.[28] The primary purpose of the study was to examine the extent to which critical characteristics of effective debriefing discussions were observed across the training sessions that were conducted. Each training session (i.e., scenarios and debriefing) was conducted in an actual OR within a time-compressed format that fit within the everyday operations of the OR department. Cramped quarters, time pressures, dynamic schedule changes, and limited access to audiovisual technology were potential impediments to achieving effective debriefing discussions.

Review of Relevant Literature

Learning in simulated environments should be self-directed, and participants should engage in debriefing discussions among themselves with the facilitator serving as a resource person. A facilitator is a helper and enabler who assists participants in achieving learning objectives.[29] In most training settings, the facilitator needs to be skilled in managing time and promoting reflection and group interactions necessary for effective debriefing, but he or she does not need

to have the technical expertise of the trainees involved in the scenarios. When participants are not familiar with training content (e.g., specific teamwork competencies and behaviors) or with how to engage in the process of debriefing and reflective practice,[30] the facilitator's role becomes particularly important to the reflective practice and performance improvement process.[31] In a high-fidelity simulation setting, the facilitator often plays the dual role of facilitator and trainer.[32]

Relative to the training situation in this study, Smith-Jentsch and colleagues[33] emphasize that the main function of teams engaging in effective debriefing is to integrate experience with concepts transferable to the real OR setting. In effective debriefing sessions, participants are guided to assess the effectiveness of their own performance and that of the team, provide constructive feedback, and correct any unsafe OR teamwork behaviors so that the team will be effective in the real OR setting.

The facilitator plays a key role in focusing the discussion on the training scenario by creating a comfortable environment where the participants are encouraged to self-correct.[33] Most debriefing processes and methods used in health care settings have been adapted from the aviation industry, including the use of a structured method for debriefing.[34] Additional insights regarding the characteristics of successful debriefing sessions have been gained from reviewing publications pertaining to effective facilitation techniques and small group learning.

Our review of the literature on aviation, small group teaching, and successful facilitation identified the following common characteristics associated with effective debriefing:[25, 32, 34, 35, 36, 37, 38]

- Creating a friendly atmosphere.
- Concentrating on key learning objectives.
- Facilitating self-assessment and disclosure.
- Pointing out unsafe teamwork behaviors.
- Having an open discussion with appropriate questions.
- Engaging in shared reflection and critique.
- Employing strategies to facilitate active engagement and ideas for improvement.
- Managing time constraints.

This literature also revealed that effective debriefing sessions include three parts: the introduction, the actual debriefing discussion, and closure. Within the debriefing discussion, four phases are associated with effectiveness: engagement, focus, reflection, and critique.

Although the characteristics of effective debriefing and how it enhances learning have been discussed in the professional literature, how the process of debriefing affects learning in high-fidelity, simulation-based training is still not well understood.[25, 39] Given the time and space constraints in which our use of simulation-based learning was implemented at the point of care, it was important to systematically assess the extent to which the debriefing component was reflecting the attributes most often associated with effective practice. The next section describes our approach.

Methods

In this section, we describe two sets of methods. First, we provide a brief description of the System for Teamwork Effectiveness and Patient Safety (STEPS) training innovation, including the mobile mock operating room (MMOR) configuration and the formats used for conducting training scenarios and debriefing discussions. Second, we describe the methods pertaining to the evaluation of debriefing effectiveness, including instrumentation, data collection, and data analysis.

Prior to implementation, we obtained institutional review board (IRB) approval at an exempt status as part of a larger research protocol targeting simulation-based training and assessment. Although similar approval was not required by the hospital-based research and compliance office, we initiated and maintained open and ongoing communications with these groups to keep them fully informed and to facilitate positive relationships and cooperation.

STEPS Training

With support from AHRQ, the first training module of the STEPS program was implemented in March 2007 with all staff surgeons, surgery residents, circulating nurses, anesthesiologists, nurse anesthetists, and surgical technologists on the general surgical OR teams at a 157-bed academic affiliated State-run hospital. The STEPS training module targeted nine teamwork competencies as listed in Table 1. In a half-day format (approximately 3 hours), the training session consisted of two immersive high-fidelity, simulation-based scenarios, that were each followed by a focused and structured debriefing discussion to promote reflective practice and performance improvement in teamwork skills. The five debriefing objectives that were targeted are also listed in Table 1.

Each participant attended at least one of the 11 training sessions held over a 30-day period. OR teams consisted of a nurse anesthetist, circulating nurse, surgical technologist, and surgeon. The two staff anesthesiologists were available on call into the simulation environment for each session. This set-up reflected their oversight role within the OR department for actual cases. When the three staff surgeons participated in the training, they were partnered with a junior surgical resident [i.e., postgraduate year (PGY) 1 or 2]. Senior residents (PGY 3-5) participated in training teams as the sole surgeon. Individuals were assigned to training sessions by being assigned to the OR in which the training was scheduled. For example, staff in this OR department check the assignment board each morning to learn in which OR they will work. Two half-day sessions were conducted on each day that STEPS training was scheduled. Thus, two teams were posted for the STEPS designated OR, one for the morning and the other for the afternoon.

Mobile Mock Operating Room (MMOR) Model

Taking the STEPS training module to the point of care and conducting sessions within the actual OR was possible with the use of a novel MMOR model,[22] which we adapted from our simulation center-based virtual operating room (VOR) configuration.[20] The MMOR combined a portable

Table 1. Teamwork competencies targeted in STEPS training and objectives of debriefing discussions

Teamwork competencies
• Shared mental model • Situational awareness • Anticipatory response • Open communication • Role clarity • Flattened hierarchy • Cross monitoring • Resource management • Mental rehearsal
Debriefing objectives
By the end of the debriefing discussions, participants will be able to: • Engage in shared reflection and critique • Define highly adaptive team function • Define and illustrate teamwork competencies • Compare and contrast effective and ineffective examples of teamwork competencies using their clinical experience • Apply teamwork competencies learned in the STEPS training to their everyday clinical work

computer-operated mannequin (Medical Education Technologies Inc., [METI], Sarasota, FL) with an inanimate laparoscopic cholecystectomy model (Simulab Corporation, Seattle, WA). These two simulators were housed within the actual OR, and all other equipment and supplies were provided by the hospital. A compact video recording and playback system was located unobtrusively within the MMOR. Each training session was recorded in its entirety (both scenarios and debriefing discussions).

Simulation-Based Training Format

Two of four possible patient scenarios were used for each training session. Cases were selected to minimize repetitive exposure to the participants. These authentic patient scenarios were developed using a patented software interface that reduced operator influence on the progress of the simulation.[40] The scenarios were designed to simulate authentic patient situations and included features that would facilitate observation of OR team members' behaviors associated with teamwork competencies (e.g., shared mental model, mental rehearsal, situational awareness, role clarity, open communication, resource management, anticipatory response, cross-monitoring, and flattened hierarchy).

For example, an airway obstruction would create opportunities for team members to anticipate further problems and engage in communication about how to respond to the next issue. Patient problems and other features, such as issues related to instrumentation, medication errors, or patient chart or laboratory result issues were also included as needed in scenarios to prompt teamwork issues. Among the cases used in training were patient situations that included the onset of malignant hyperthermia, unstable intraoperative cardiac arrhythmias, anaphylactic shock, and septic shock.

Prior to implementation, a general orientation to the simulation equipment, STEPS program, and training session ground rules (e.g., behavioral expectations, confidentiality of training experiences, and security for content of training scenarios) was conducted with all participants in a general session. Individuals had an opportunity to interact briefly with the human patient simulator, learn its capabilities (and limitations), and ask questions about the training that would be implemented.

Each half-day training session began with a brief introduction that revisited the simulator function and ground rules for scenarios. Training sessions lasted up to 3 hours. Each of the two scenarios was followed by an after-action debriefing discussion. Within the training session, each scenario was introduced and initiated by giving team members the patient chart and instructing them to proceed as they would with a real patient.

After-Action Debriefing Format

Each training session included two after-action debriefing discussions within the MMOR, with each one immediately following the completion of a scenario (Figure 1). The same facilitator (JTP), a general surgeon with a background in medical education, led each training session (scenarios and debriefing discussions). Specific open-ended questions were used to target the debriefing objectives and teamwork competencies (see Table 1) and to encourage reflection on specific scenario events and relevant individual and team behaviors preceding or resulting from these events. These team reflections were then linked to nine teamwork competencies and their effects on patient safety. Video-recorded scenarios were used in the after-action debriefing discussions. For example, selected video-vignettes of specific events or behaviors were played to facilitate participants' reflective critique and discussion of key teamwork competencies and strategies for improvement.

Consistent with our findings in the literature, the debriefing component of the training session consisted of three distinct parts: the introduction, the debriefing process, and the summary or closure. The debriefing process was further conceptualized in terms of the following four phases:

- **Engagement.** The facilitator used an open-ended question (e.g., "How did it go?" or "What do you think happened?") to immediately engage the entire team in reflecting on their individual and team performance during the scenario.
- **Focus.** The facilitator quickly introduced and offered brief definitions of specific teamwork competencies and asked participants to identify particular examples of corresponding behaviors from the training scenario.

Figure 1. This photo shows the beginning of an after-action debriefing following the conclusion of a simulation-based scenario. The nurse anesthetist (far left) engages with the facilitator (arms spread in background) as the surgeon (second from right) and scrub technologist (far right) look on. The circulating nurse (foreground) completes breakdown of the field as she listens. An analyst/recorder (behind facilitator) assists with recording the debriefing session and observing interactions.

- **Reflection and critique.** Participants were encouraged to reflect on the various teamwork competencies and how these could be used to enhance teamwork effectiveness.
- **Application to everyday practice.** The facilitator encouraged participants to identify skills or behaviors related to one or two teamwork competencies that they intended to improve in the actual OR environment (e.g., commitment to behavior change).

Evaluation of Debriefing Effectiveness

The data set for examining the debriefing process was made up of the video-recorded debriefing discussions from each of 11 training sessions. Two videos were available from each training session (N = 22). All videos were examined for completeness. A video was considered complete if it included all of the debriefing activities from the opening statement to closing comments with clear image and audio quality. Any videos that did not meet these criteria were deemed technically inadequate and excluded from analysis.

To assess the effectiveness of debriefing sessions systematically, a 25-item, observation-based assessment instrument was developed and used to reflect the essential characteristics of effective

Table 2. Summary of descriptive statistics for assessment of debriefing effectiveness during the introduction of debriefing discussions

Item statement	Mean[a] (± SD)	Mode
At the beginning of the session and prior to initiating the debriefing discussion, to what extent was each of the following accomplished effectively?		
1. Purpose and objectives of the debriefing session were clear	3.61 (0.78)	3
2. Facilitator introduced self, including a brief personal background, as needed	4.89 (0.32)	5
3. All participants introduced themselves or they knew each other already	4.94 (0.24)	5
4. Structure and process (e.g., use of a particular approach) of the session was clear	1.44 (0.62)	1
5. Allocated time and planned use of time was clear	1.72 (0.75)	1
6. Participant expectations were clear (e.g., ground rules, engagement, and confidentiality)	1.72 (0.82)	1
7. Rapport was established prior to initiating the debriefing discussion	4.56 (0.62)	5
8. Participants' questions and comments were addressed	4.50 (0.51)	4

a A Likert-type response scale was used for all items (1 = "Not effective at all" to 5 = "Highly effective")

debriefing environments evidenced in the professional literature on debriefing, small group teaching, and discussion facilitation.[25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39] The instrument included three sections, each one corresponding to one of the three portions of a debriefing session (Introduction, Debriefing, and Closure). Tables 2, 3, and 4 show the instrument items by section.

Using the results of our literature review, the assessment instrument included items that represented the characteristics most commonly associated with effective debriefing environments, regardless of the content, participants, or setting. Conceptually, and consistent with the general research on effective learning environments, the instrument was designed to focus on the debriefing environment as a whole, rather than simply on isolated behaviors demonstrated by the facilitator or participant behavior.

A focus on the environment recognized the interactive and dynamic nature of debriefing as a learning process. A Likert-type response scale was used for all items (1 = Not effective at all to 5 = Highly effective). Item groups on the instrument corresponded to the three parts of the debriefing discussion: the introduction (Table 2), the debriefing process (Table 3), and closure (Table 4).

Table 3. Summary of descriptive statistics for assessment of debriefing effectiveness during the actual debriefing process

Item statement	Mean[a] (± SD)	Mode
Throughout the debriefing discussion, to what extent was each of the following accomplished effectively?		
9. Motivated participants to be actively engaged in reflection, collaboration, and constructive critique	2.89 (0.68)	3
10. Used nonverbal strategies (e.g., appropriate eye contact) to facilitate active engagement	3.44 (0.70)	3
11. Used equipment and teaching/learning materials effectively to enhance learning	3.50 (1.10)	3
12. Solicited strategies and ideas for improvement (and offered suggestions when needed)	3.06 (0.73)	3
13. Used open-ended questions to facilitate appropriate problem solving, divergent thinking, and interaction among participants	3.11 (0.76)	3
14. Clarified content when misunderstanding or confusion occurred	3.83 (0.38)	4
15. Demonstrated priority for self-reflection (e.g., encouraged participants to solve own questions and problems)	2.11 (0.58)	2
16. Did not interrupt participants' contributions or interfere with productive interactions	2.39 (0.78)	2
17. Encouraged participants' critique, enhancement, and expansion of each others contributions	2.11 (0.58)	2
18. The session proceeded at an appropriate pace (i.e., not too fast or too slow)	3.07 (0.77)	4

a A Likert-type response scale was used for all items (1 = "Not effective at all" to 5 = "Highly effective")

Further, assessment decisions were contextually based. For example, if it was clear to the observer that all participants already knew each other and the facilitator (and vice versa), then taking time to conduct personal introductions was rated as ineffective. In the same situation, if the facilitator verified that everyone knew each other and demonstrated familiarity with participants' names and roles, or it was clear to the observer that everyone knew each other already, then skipping the personal introductions would be considered effective. Consequently, there was no need to include ratings on the scale for "not applicable" or "not observed." An iterative process of review and refinement was used to finalize the instrument.

Training in the application of the assessment tool was completed, and supplemental written annotation and guidance were used to structure the videotape assessments. Two researchers completed several cycles of observing and rating videos from pilot training sessions completed prior to the STEPS implementation. Independent ratings were discussed to examine supporting rationales to clarify items and enhance accuracy and inter-rater agreement. Assessments of debriefing discussions were initiated after satisfactory inter-rater agreement for rating decisions

Table 4. Summary of descriptive statistics for assessment of debriefing effectiveness during the closure portion of debriefing discussions

Item statement	Mean[a] (± SD)	Mode
At the end of the debriefing session, to what extent was each of the following accomplished effectively?		
19. Participants identified features of the groups' debriefing interactions that were done well	1.61 (0.61)	2
20. Participants assessed factors that enabled or impeded their success, as appropriate	2.78 (0.94)	3
21. Participants discussed ways in which the training could be conducted more effectively	2.33 (0.73)	1
22. Participants revisited important points or asked followup questions to ensure that learning was achieved	2.78 (0.81)	3
23. Participants identified specific intentions or ways to improve future performance using knowledge/skills targeted by the session	3.72 (0.57)	4
24. Summary and closure of the session included specific attention to how learning could be applied to daily practice (e.g., influence of organizational facilitators and barriers)	3.72 (0.89)	4
25. Closure included appropriate communication of appreciation for commitment to learning and participation in training and debriefing activities	1.94 (0.87)	2

a A Likert-type response scale was used for all items (1 = "Not effective at all" to 5 = "Highly effective")

and rationale were achieved. The two researchers observed each videotaped debriefing discussion and then independently completed the assessment instrument before proceeding to the next videotaped debriefing discussion.

Descriptive statistics, including item mean, standard deviation, frequency count, and percentage were calculated. Item mean scores were used as the basis of the debriefing effectiveness evaluation. Inter-rater reliability was examined by calculating a Kappa coefficient.

Results

Ten of the 11 training session videos satisfied the inclusion criteria for analysis. Because each videotaped training session included two debriefing discussions, we were able to complete two independent assessments for 20 debriefing discussions. All of the videos were scored by the same two independent raters within a 1-week period. Good inter-rater reliability was achieved (Kappa coefficient = 0.71).

Descriptive statistics are summarized in Table 2. Five of the eight items included in the "Introduction" part of the debriefing discussions were observed as effective or highly effective (range, 3.61 – 4.94). These items related predominantly to establishing rapport and purposes for learning. The remaining three items represented structural or organizational characteristics (e.g.,

ground rules, use of time) that were either absent or observed as occurring ineffectively in the videotaped debriefing discussions (range, 1.44 – 1.72).

As shown in Table 3, descriptive statistics for the Debriefing Process part of the sessions revealed that 6 of the 10 characteristics of effective debriefing were demonstrated either effectively or highly effectively (range, 3.06 – 3.83). Use of nonverbal strategies to enhance active engagement of participants (item 10) and clarification (item 14) were among the characteristics demonstrated most effectively during the debriefing process. Mean scores were only slightly above the midpoint for management of pace (item 18) and use of strategies to gain participants' commitment to change (item 12). Four items relating to the critical analysis and reflective aspects of debriefing (items 9, 15, 16, and 17,) were observed to be less effective (range, 2.11 – 2.89).

Finally, Table 4 provides a summary of descriptive statistics regarding closure at the end of the debriefing discussion. Positive demonstration of characteristics related to content summary and performance improvement intentions (items 23 and 24) were observed in debriefings across 10 training sessions (mean rating for each = 3.72). Although not completely ineffective, less emphasis was observed for characteristics related to reflection and feedback on the debriefing process itself and how this could be improved (items 19, 20, 21, and 22, range, 1.61 - 2.78). In addition, results for item 25 revealed that debriefing sessions did not routinely include attention to affective elements of debriefing that promote and reinforce learning and participation.

Discussion

High-fidelity, simulation-based training has become a popular strategy for enhancing content knowledge and skill performance across a wide variety of audiences and settings. In recent years, interest in simulation-based training has been increasing as an approach to enhancing teamwork and patient safety. Because of its experiential nature, high-fidelity, simulation-based, interdisciplinary team training requires an effective debriefing for optimal learning and impact on improving everyday practice. In fact, debriefing is often considered the most essential component of simulation-based learning.[25] Without effective debriefing, the usefulness of the simulation format is substantially limited.

To date, most initiatives involving high-fidelity simulation have occurred in center-based environments, where training occurs in a simulated clinical setting. In addition, the debriefing is typically conducted in a nearby location (e.g., a classroom or conference room), where a large screen-based video playback system is available, and participants can be comfortably seated and can see and hear each other and the video display easily. Finally, this setting affords considerable flexibility in allocating sufficient time to fully conduct debriefing discussions. For example, debriefing discussions might last anywhere from 30 minutes to 2 hours or more—depending on the length of a scenario-based training experience—in order to allow training participants sufficient time to fully debrief (disclose and discuss) their training experience using video playback of all relevant scenario vignettes.

In contrast, taking the simulation-based training to the point of care requires fitting the learning experiences within the context of the everyday workplace. Despite the perceived benefits of

conducting training at the point of care (e.g., convenience, enhanced authenticity, and potential for impacting everyday practice), implementing the STEPS program meant dealing effectively with significant time, schedule, space, and technologic constraints. Because debriefing was such a critical aspect of learning in the STEPS training and situated in the actual OR via our MMOR configuration, this study sought to identify those characteristics of effective debriefing discussions that were evidenced in the sessions, as well as other characteristics that require further attention and refinement of structure and processes for both scenario and debriefing components of the training session.

While a three-member team managed each training session, one person served in the dual role as trainer for scenario and facilitator for debriefing in our STEPS training. (Another member managed videotaping and data collection, and a third person operated the simulator.) Whether the same or separate individuals fulfill trainer and facilitator roles, there still needs to be a balance between content focus and structure (i.e., trainer role)[27] and enabling strategies to enhance participants' reflection and insights from their experiences (i.e., debriefing facilitator).[31] When a single person fulfills both roles, the complexity of managing multiple tasks simultaneously (e.g., managing organization and implementation of scenarios, writing notes, and/or inserting bookmarks to label video segments for debriefing) can also be quite challenging. In addition, progressing from the scenario immediately to the debriefing discussions leaves little time for organizing key points and selecting video vignettes to structure the debriefing. Breaking down the MMOR to prepare for the next scenario and to quickly vacate the OR at the end of the day sometimes interfered with full participant engagement (Figure 1) and contributed to even less time for the second debriefing discussion in the afternoon training session.

Upon closer examination of the results for all aspects of the debriefing discussion (Tables 2, 3, and 4), coupled with our own debriefing of implementation, it became clear that time and space constraints played a role in the less effective presence of certain characteristics of effective debriefing environments (e.g., strategies to encourage collaborative reflection and participants' expansion of each other's contributions, items 9, and 15-17; characteristics associated with closure, Table 4, items 19-24; higher instances of facilitator interruption of participants' contributions, Table 3, item 16). Consequently, given the time and space constraints associated with debriefing at the point of care, we saw a need to carefully examine the structure of the debriefing facilitator guide and consider how other members of a training team might contribute to preparation and actual facilitation of the debriefing discussion.

Results of this study provide clear evidence that a structured approach to the debriefing process is critically important when time and flexibility are substantially limited.[32] That is, much like a teacher's lesson plan, a facilitator guide can enhance effective use of time and space and ensure that sufficient opportunity is afforded for learners to use reflection and critical analysis of their actions.

Similarly, a facilitator guide should not "script" the debriefing process. Instead, it should provide sufficient discussion prompts and tools to ensure that participants are actively engaged in shared reflection, critical analysis, and application to everyday practice, and that time and pace are managed effectively. In this way, debriefing discussions do not become too "stiff" and are less

at-risk for the facilitator assuming a lecture approach. Such a guide would also be important when different individuals fulfill the facilitator role across training sessions.

Finally, a facilitator guide becomes particularly important when facilitators or participants are not highly experienced in using debriefing discussions. Although the facilitator in our study had several years of previous experience in clinical teaching, experience with this specific approach to debriefing facilitation was limited. Consequently, a guide and practice contributed to both increased ease and effectiveness. Thus, regular use of a consistent guide could also contribute to increasing the use and effectiveness of debriefing as a method for enhancing knowledge and skills.

Another key to effective debriefing observed in this study was the creation of a learning environment that was safe, respectful, courteous, and conducive to candid critique and reflective practice. For example, the characteristics of effective debriefing shown in the items in Table 2 contribute to establishing rapport, communicating clear expectations, and providing appropriate assurances for confidentiality. The importance of these characteristics should not be underestimated, especially when new staff members are involved in training and debriefing. While not reflected in the assessment of the debriefing videos, our direct observation during the actual sessions revealed several instances when new OR staff participated in training. Other, more experienced staff members sometimes served an important role in supporting new team members and contributed to the facilitator's efforts to ensure a safe environment for all participants.

Adequate time for debriefing discussions is an important consideration that influences many aspects of effectiveness. A common recommendation that is widely accepted in education and training is to plan debriefing sessions for a time period that is at least equal to or greater than the time spent in the stimulus experience (i.e., simulation-based training scenario).

From the outset, we recognized that we would not have much more than equal amounts of time for the debriefing and scenario components. Variations in the time a team needed to take scenario to its natural conclusion sometimes provided formidable challenges for completing the debriefing discussions. Thus, a clear focus on all characteristics of effective debriefing becomes critically important, and specific efforts to incorporate those characteristics in a structured debriefing facilitator guide are necessary.

In addition, the results of the videotape analyses and our own reflection on participants' contributions to the debriefing discussions suggested that individuals could benefit substantially from prior education and preparation in how to participate in debriefing discussions. For example, clarifying what is expected could streamline the characteristics associated with the Introduction (Table 2). Similarly, education about the various elements of debriefing and how a team engages in this process could facilitate participants' taking a more active role in the various aspects of reflective practice without having to rely on the facilitator to initiate as many prompts (e.g., open-ended questions, Table 3).

Finally, with an enhanced knowledge of how effective debriefing discussions are conducted, participants would come to debriefing discussions better prepared to use reflection and critique

to improve individual and collective performance, both in the debriefing process and in everyday work performance. If participants were well-prepared to use debriefing strategies, the use of available time would be enhanced as well.

Conducting the debriefing discussions at the point of care in the actual OR presented several physical and technologic challenges to achieving an optimal debriefing environment for high-fidelity, simulation-based training:

- The confined physical environment of the OR limited our options for video recording and playback equipment. For example, we could not bring a projection screen into the OR for viewing videotaped team performance. Consequently, we had to rely on viewing selected video vignettes on a computer monitor. In addition, the physical arrangement of the OR limited opportunities to use other teaching and learning materials (e.g., whiteboard or flip chart).
- The physical arrangement of the OR also did not allow all participants to be seated during debriefing discussions. Since the debriefing discussions were rather short, standing did not appear to interfere with participants' involvement in the debriefing process. However, participants sometimes had difficulty positioning themselves to see the video playback, and at the same time, see and hear everyone else in the group. The same was true for the trainer/facilitator. Difficulties related to where participants stood or sat during the debriefing discussion also affected the facilitators' ability to gain and sustain participants' attention and engagement during debriefing.
- Time was a substantial factor for both scenario and debriefing components of the STEPS training. For example, it was important to ensure that training occurred only within the elective surgery hours, avoided the need for employee overtime, and accommodated the regular rhythm of employees, cases, and general operations within the OR department. Consequently, the sessions had to adhere to a strict schedule that did not allow the flexibility for debriefing that has been typically associated with simulation-based training. When scenarios extended beyond their allocated time, after-action debriefings had to be correspondingly condensed to maintain a constant overall time for the session as a whole.

Although the point-of-care debriefing had its challenges, several important advantages were observed:

- Debriefing in the actual clinical environment was useful in promoting self-reflection and linking actual behaviors to teamwork concepts.
- Because debriefing immediately followed completion of the scenario and was conducted in the same setting, participants were able to accurately recall behaviors and events without much reliance on the video vignettes to trigger discussion of teamwork competencies and ways to improve performance.
- Being in the same environment where they worked everyday also facilitated participants' abilities to visualize themselves at work, both in terms of individual and team-related skills.
- The reduced need for video replay proved to be particularly beneficial, given the technologic challenges mentioned previously, and it increased time for discussion that otherwise would have been used to play video vignettes.

- Finally, an important benefit of conducting both scenarios and debriefing in the OR was participants' reflection on and identification of other features influencing effective teamwork and patient safety that were not necessarily directly related to teamwork competency. For example, during debriefing discussions, some teams identified where needed equipment and supplies were located before a real-life crisis occurred for which they might be required. Prior to the training, and particularly the debriefing discussions, these OR staff members did not know where certain equipment and supplies were kept or that they even existed.

In summary, the results of this study suggest that all of the characteristics identified for effective debriefing are important and reasonable to expect in simulation-based training conducted at the point of care, even in the face of substantial time and space constraints. Results of the videotape analysis demonstrated that several characteristics were easier to achieve than others (e.g., rapport, clarification, applying training content to everyday practice).

Because the results and our experiences suggest that the benefits of simulation-based training and debriefing conducted at the point of care outweigh the challenges, we are continuing to evaluate and refine the STEPS training and MMOR configuration to address characteristics that were more difficult to achieve (e.g., increased engagement in reflective practice strategies, preparation of participants in the process of using debriefing, and closure characteristics).

Recently, we completed an end-of-year-1 data collection that included participants' feedback on STEPS training and several measures targeting teamwork effectiveness in the real work setting, including direct observations of patient cases in the OR. Results of these data analyses will begin to show the extent to which training scenarios and debriefing at the point of care influences improvements in OR teamwork effectiveness. In the upcoming year, we will be replicating a refined version of the STEPS program at another hospital and look forward to examining its effectiveness.

Conclusion

Conducting training (and debriefing) at the point of care can present substantial challenges, especially when facing time, space, and technologic constraints. However, careful attention to the characteristics of effective debriefing when planning and implementing training sessions can enhance success in achieving desired outcomes. Effective debriefing is a dynamic process that requires participants, trainers, and facilitators to be actively involved and to contribute specific perspectives and behaviors. In addition, the organizational context in which training scenarios and debriefing are situated contributes substantially to the structure and process of training at the point of care. As simulation-based team training matures and as it becomes incorporated into health care at the point of care, the effective use of debriefing discussions will be important to achieving training and performance goals in a variety of settings. Thus, continued development, evaluation, and refinement of appropriate point-of-care models are needed. Our STEPS program provides one such model from which future development can evolve.

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