The Role of Debriefing in Simulation-Based Learning

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The aim of this paper is to critically review what is felt to be important about the role of debriefing in the field of simulation-based learning, how it has come about and developed over time, and the different styles or approaches that are used and how effective the process is. A recent systematic review of high fidelity simulation literature identified feedback (including debriefing) as the most important feature of simulation-based medical education.[1] Despite this, there are surprisingly few papers in the peer-reviewed literature to illustrate how to debrief, how to teach or learn to debrief, what methods of debriefing exist and how effective they are at achieving learning objectives and goals.

This review is by no means a systematic review of all the literature available on debriefing, and contains information from both peer and nonpeer reviewed sources such as meeting abstracts and presentations from within the medical field and other disciplines versed in the practice of debriefing such as military, psychology, and business. It also contains many examples of what expert facilitators have learned over years of practice in the area. We feel this would be of interest to novices in the field as an introduction to debriefing, and to experts to illustrate the gaps that currently exist, which might be addressed in further research within the medical simulation community and in collaborative ventures between other disciplines experienced in the art of debriefing.

THE BACKGROUND OF SIMULATION-BASED LEARNING

Generally, in simulation-based learning, we are dealing with educating the adult professional. Adult learning provides many challenges not seen in the typical student population. Adults arrive complete with a set of previous life experiences and frames ("knowledge assumptions, feelings"), ingrained personality traits, and relationship patterns, which drive their actions.[2] Adult learners become more self-directed as they mature. They like their learning to be problem centered and meaningful to their life situation, and learn best when they can immediately apply what they have learned.[3] Their attitudes towards any specific learning opportunity will vary and depend on factors such as their motivation for attending training, on whether it is voluntary or mandatory, and whether participation is linked directly to recertification or job retention. Traditional teaching methods based on linear communication models (ie, a teacher imparts facts to the student in a unidirectional manner) are not particularly effective in adult learning, and may be even less so in team-oriented training exercises. The estimated half-life of professional knowledge gained through such formal education may be as little as 2 to 2.5 years.[4] In the case of activities requiring both formal knowledge and a core set of skills, such as Advanced Cardiac Life Support, retention can be as little as 6 to 12 months.[5,6]

Much of the research in teaching adults indicates that active "participation" is an important factor in increasing the effectiveness of learning in this population.[7] In fact, in any given curriculum, learning occurs not only by the formal curriculum per se but informally through personalized teaching methods (informal curricula), and even more so through embedded cultures and structures within the organization (hidden curricula).[8]

Adults learn best when they are actively engaged in the process, participate, play a role, and experience not only concrete events in a cognitive fashion, but also transactional events in an emotional fashion. The learner must make sense of the events experienced in terms of their own world. The combination of actively experiencing something, particularly if it is accompanied by intense emotions, may result in long-lasting learning. This type of learning is best described as experiential learning: learning by doing, thinking about, and assimilation of lessons learned into everyday behaviors. Kolb describes the experiential learning cycle as containing four related parts: concrete experience, reflective observation, abstract conceptualization, and active experimentation.[9] Gibbs also describes four phases: planning for action, carrying out action, reflection on action, and relating what happens back to theory.[10] Grant and Marsden similarly describe the experiential learning process as having an experience, thinking about the experience, identifying learning needs that would improve future practice in the area, planning what learning to undertake, and applying the new learning in practice.[11]

Simulation training sessions, which are structured with specific learning objectives in mind, offer the opportunity to

go through the stages of the experiential cycle in a structured manner and often combine the active experiential component of the simulation exercise itself with a subsequent analysis of, and reflection on the experience, aiming to facilitate incorporation of changes in practice. Simulation offers the opportunity of practiced experience in a controlled fashion, which can be reflected on at leisure. Experiential learning is particularly suited to professional learning, where integration of theory and practice is pertinent and ongoing.[11] In experiential learning, the experience is used as the major source of learning but it is not the only one. Both thinking and doing are required and must be related in the minds of the learner.[10]

The concept of reflection on an event or activity and subsequent analysis is the cornerstone of the experiential learning experience. Facilitators guide this reflective process. Indeed this ability to reflect, appraise, and reappraise is considered a cornerstone of lifelong learning. This is one of the core elements of training in healthcare articulated by the Accreditation Council on Graduate Medical Education in the United States.[12] In practice however, not everyone is naturally capable of analyzing, making sense, and assimilating learning experiences on their own, particularly those included in highly dynamic team-based activities. The attempt to bridge this natural gap between *experiencing* an event and making *sense* of it led to the evolution of the concept of the "postexperience analysis"[13] or debriefing. As such, debriefing represents facilitated or guided reflection in the cycle of experiential learning.

ORIGINS OF DEBRIEFING IN SIMULATION-BASED LEARNING

Historically, debriefing originated in the military, in which the term was used to describe the account individuals gave on returning from a mission.[14] This account was subsequently analyzed and used to strategize for other missions or exercises. This military-style debriefing was both educational and operational in its objectives. Another connotation of debriefing developed out of the combat arena as a therapeutic or psychological association, as sort of "defusing," and aided the processing of a traumatic event with the aim of reducing psychologic damage and returning combatants to the frontline as quickly as possible. In this therapeutic approach, emphasis was placed on the importance of the narrative to reconstruct what happened. This cognitive reconstruction of events was performed in groups so that there was a shared meaning. The participants were brought together to describe what had occurred, to account for the actions that had taken place, and to develop new strategies with each other and the commanding officers.

Another form of debriefing, critical incident debriefing, was pioneered by Mitchell[15] and is used to mitigate stress among emergency first responders. He formulated a set of procedures termed the Critical Incident Stress Debriefing (CISD).[15] CISD is a facilitator-led approach to enable participants to review the facts, thoughts, impressions, and reactions after a critical incident. Its main aim is to reduce stress and accelerate normal recovery after a traumatic event by stimulating group cohesion and empathy.

Dyregrov modified this technique and called it psychological debriefing, designed to take place in the 48 to 72 hours after a traumatizing event in an attempt to assist participants in the cognitive and emotional processing of what they experienced.[16]

Currently, there is concern that an unrealistic expectation of CISD and its usefulness may be developing. A single session approach may be inadequate for certain individuals and situations, particularly as the technique is applied outside the realms for which it was originally designed.[17]

Another origin for the term "debriefing" comes from experimental psychology, and describes the means by which participants who have been deceived in some manner as part of a psychology study are informed of the true nature of the experiment.[18] The purpose of this ethically required debrief is to allow dehoaxing to occur, and to reverse any negative effects the experience may have had.[19]

Each of the three fields have contributed to the development of debriefing in the educational arena, facilitator-led participant discussion of events, reflection, and assimilation of activities into their cognitions produce long-lasting learning.

THE DEBRIEFING PROCESS
Approach to Debriefing

Just as in noneducational debriefing, where there exists an ethical duty of facilitators to set a safe, confidential scene for facilitation, there is the ethical obligation for the facilitator in simulation-based learning to determine the parameters within which behavior will be analyzed, thereby attempting to protect participants from experiences that might seriously damage their sense of self-worth.[20] To ensure a successful debriefing process and learning experience, the facilitator must provide a "supportive climate"[21] where students feel valued, respected, and free to learn in a dignified environment. Participants need to be able to "share their experiences in a frank, open and honest manner."[14] An awareness of the vulnerability of the participant is needed, which must be respected at all times. This is highlighted by a recent study regarding the barriers to simulation-based learning, where approximately half the participants found it a stressful and intimidating environment and a similar proportion cited a fear of the educator and their peers' judgment.[22]

It is essential that the facilitator creates an environment of trust early on, typically in the prebrief session. This prebrief period is a time when the facilitator illustrates the purpose of the simulation, the learning objectives, the process of debriefing, and what it entails. It is the period where the participants learn what is expected of them and sets the ground rules for their simulation-based learning experience. It is also a time for the facilitator to reflect on the learning objectives, and to consider that every participant comes to the simulation with a preceding set of individual frames and life experiences.[2] These previous experiences have an impact on how effective training will be, and need to be taken into consideration irrespective of the debriefing model employed. These frames or internal images of reality, how a person perceives something relative to someone else, affect the way people receive, process, and assimilate information.[2] The simulation sce-

nario and the debriefing techniques employed need to take individual learning styles into consideration.

This factor is illustrated by Kolb with the incorporation of the experiential learning cycle with basic learning styles.[23] Four prevalent learning styles are identified: *diverging, assimilating, converging, and accommodating.* Participants with diverging learning styles use concrete experience and reflective observation to learn. This style facilitates generation of ideas, such as brainstorming. Individuals with this learning style prefer to work in groups, listening and receiving feedback. Individuals with assimilating learning styles prefer abstract conceptualization and reflective observation. They like reading, lectures, and analysis. Converging-styled learners use abstract conceptualization and active experimentation. They like to find practical uses for ideas and theories. In a formal learning setting, they prefer to experiment with new ideas, simulations, laboratory experiments, and practical applications. Accommodating-styled learners use concrete experience and active experimentation. People with this style learn primarily from hands-on experience. In formal learning, they prefer to work in teams, to set goals, to do fieldwork, and to test different approaches to compiling a project. When learning in teams, individuals tend to orientate themselves and contribute to the team learning process by using their individual learning styles to help the team achieve its learning objectives.

Highly effective teams tend to possess individuals with a number of different learning styles. In our experience, pairing appropriately learning-styled individuals may add to the team's performance. Individual learning styles and team composition are important factors for facilitators to consider when choosing which style of debriefing will be most successful for each simulation session. It is also important for facilitators to learn about the characteristics of the group: whether group members know each other, are novices or are experienced, or are new to simulation. The prebrief period can afford the experienced facilitator an opportunity to observe team behaviors and identify learner characteristics early on, and debrief accordingly.

Structural Elements of the Debriefing Process

Despite many approaches to debriefing,[24,25] there are a number of structural elements common to most forms of facilitation. Lederman identified seven common structural elements involved in the debriefing process (Table 1).[18] The first two elements are the *debriefer(s)* and *those to be debriefed.* It is possible for these two to be the same if participants act as their own debriefers.[26] The third element is the *experience*

Table 1. Seven Common Structural Elements Involved in the Debriefing Process[18]

1. Debriefer
2. Participants to debrief
3. An experience (simulation scenario)
4. The impact of the experience (simulation scenario)
5. Recollection
6. Report
7. Time

itself (eg, the simulation), and the fourth is the *impact* this experience has on the participants. The concept of impact is important because adult learners typically need to be emotionally moved by the event, and the event needs to be relevant to their everyday lives to make an impact. The fifth and sixth elements involve *recollection* and *report*. Reporting of the event, although usually carried out in a verbal manner, may be written or involve the completion of a formal questionnaire.[24] The seventh element is *time*: the experience will be seen differently depending on how much time has passed before the debriefing. Although most debriefing approaches are conducted very soon after the experience, some allow more time for formal reflection, with reporting long after the event via a written report of an individual event or through keeping a journal (a written review of educational experiences over a semester).[24]

Models of Debriefing

A number of models exist incorporating these structural elements and describe various debriefing or facilitation styles.[27–29] These models probably all evolve out of the natural order of human processing: to experience an event, to reflect on it, to discuss it with others, and learn and modify behaviors based on the experience. Although reflection after a learning experience might occur naturally, it is likely to be unsystematic. It may not occur at all especially if the pressure of events prevents focusing on what has just transpired. Conducting a formal debriefing focuses the reflective process, both for individual participants and for the group as a whole.

Naturally, debriefings may move of their own power through three phases: description, analogy/analysis, and application. However, without a facilitator participants may have trouble moving out of this first descriptive phase, particularly the active "hot-seat" participant who is emotionally absorbed in the event and is blinkered in their view of what has occurred. The challenge for the facilitator is to allow enough time for defusing to occur, but direct the discussion in a more objective, broad-based capacity. The facilitator needs to move the discussion away from the very personalized account of what the participant thought occurred, to the more global perspective, away from the individual to the group, and the person to the event, but must be cognizant not to cut the participant off, or make him/her feel alienated.

Although the core of the debrief centers on reflection of the active experience and making sense of the event, there are supporting phases that are necessary to allow this reflection and assimilation to occur. These phases of the debrief are described by many authors, and are categorized in different manners. The basic tenets of the various debriefing models have many overlapping elements (Table 2).

An initial phase of identifying the impact of the experience, considering the processes that developed and clarifying the facts, concepts, and principles which were used in simulation is described by Thatcher and Robinson.[27] Lederman describes this phase as the introduction to systematic reflection and analysis that follows the active component of the simulation: "the recollection of what happened and description of what participants did in their own words."[28] Paternek

Table 2. Models of the Debriefing Process

Model
Thatcher and Robinson[27]
1. Identifying the impact of the experience
2. Identifying and considering the processes which developed
3. Clarifying the facts, concepts, and principles
4. Identifying the ways in which emotion was involved
5. Identifying the different views which each of the participants formed
Lederman[28]
1. The introduction to the systematic reflection and analysis
2. The intensification and personalization of the analysis of the experience
3. The generalization and application of the experience
Petranek[29]
1. Events
2. Emotions
3. Empathy
4. Explanations and analysis
5. Everyday applicability
6. Employment of information
7. Evaluation

describes this introductory phase as the description of the events that occurred.[29]

The second phase is described as identifying the ways in which emotion was involved, either individually or for the group;[27] the intensification and personalization of the analysis of the experience, where participants explore the feelings they experienced during the event;[28] or the emotional and empathic content of the discussion.[29]

The third phase involves identifying the different views formed by each participant, and how they correlate with the picture as a whole;[27] the generalization and application of the experience, during which participants attempt to make comparisons with real-life events;[28] a phase of explanations and analysis, everyday applicability and evaluation of behaviors.[2]

Objectives of the Debriefing Session

The design of the debriefing session should be tailored to the learning objectives and the participant and team characteristics. Objectives may be well defined, and specified beforehand, or may be emergent and evolve within the simulation. For well-defined objectives, such as a technical skill or a particular team behavior, the debriefing session affords the opportunity to examine how closely participants' performance has approached a known target, and what needs to be done to bridge any observed gaps between performance and target. It also affords an opportunity to share these objectives with participants. With emergent objectives, participants may be asked to reflect on the observed evolution of the scenario and to see how the behaviors, attitudes, and choices uncovered in the simulation relate to real life situations. When exploring objectives or goals, there are two main questions: 1) which pieces of knowledge, skills, or attitudes are to be learned? and 2) what specifically should be learned about

each of them? In the case of emergent objectives, simulations may be viewed as experiments in which participants try alternative ways of behavior or test new strategies or courses of action. To debrief about such objectives is complicated because there are fewer predefined ideas about how the participants should have acted, so discussion must focus around issues that arise from the events themselves and their meaning to those involved.

Role of the Facilitator in the Debriefing Process

There is a tension between making participants active and responsible for their own learning versus ensuring they address important issues and extract maximum learning during debriefings. Data from surveys of participants indicates that the perceived skills of the debriefer have the highest independent correlation to the perceived overall quality of the simulation experience.[30] As the skill of the debriefer is paramount in ensuring the best possible learning experience, training in facilitation is vital. A number of centers offer facilitation courses providing training in debriefing skills (Table 3).[31] In addition to the formal education of facilitators, techniques such as the pairing of expert with novice facilitators early in their career to give guidance and direction are important. A recent study of facilitation in problem-based learning illustrated that while facilitators felt that a formal training course provided sufficient skills to commence debriefing, it was only with experience, and in the presence of an expert role model that they became more comfortable with the process.[32] In the same study, students commented on the skill of facilitators as being an important factor in the learning process and the credibility of the course. Basic and advanced courses and refresher courses in facilitation are probably universally required.

The exact level of facilitation and the degree to which the facilitator is involved in the debriefing process can depend on a variety of generic factors:

- The objective of the experiential exercise,
- The complexity of the scenarios,
- The experience level of the participants as individuals or a team,
- The familiarity of the participants with the simulation environment,
- Time available for session,
- The role of simulations in the overall curriculum,
- Individual personalities and relationships, if any, between the participants.

Unlike the traditional classroom "teacher," facilitators tend to position themselves not as authorities or experts, but rather as colearners. This more fraternal approach may be most productive where the learning objective is behavioral change. Facilitators aim to guide and direct rather than to lecture. The role of the student or participant in debriefing is expanded from the traditional passive role to one where the skills demanded of them are the ability to critically analyze one's own performance retrospectively—not just what went well but what went wrong, and why it went that way, and to contribute actively to the learning process.

Table 3. List of Institutions and Organizations that Offer Formal Training for the Simulation-based Healthcare Educator[31]

Institution/Organization	Course/Type of Training
Center for Advanced Medical Simulation Karolinksa University Hospital (http://www.simulatorcentrum.se/)	Several courses for faculty training on crisis resource management in anesthesia and emergency medicine.
Center for Medical Simulation, Boston (http://www.harvardmedsim.org/cms/)	A variety of courses including week-long immersive experience for those who want to develop and maintain healthcare simulation programs. Other courses offer training for instructors who teach with simulators, those who have leadership positions.
Hertfordshire Intensive Care and Emergency Simulation Centre, University of Hertfordshire (http://www.health.berts.ac.uk.hicese/)	One-day course for participants to learn how to train and teach with simulators and courses on multidisciplinary simulation-based training.
Mainz simulation Center (http://www.simulationzentrum-mainz.de)	Several "train the trainer" courses covering simulator operations and programming, crisis resource management, teamwork, communication skills, and debriefing techniques.
Mayo multidisciplinary simulation center (http://www.mayo.edu/simulationcenter/)	Courses for participants to develop knowledge and skills in planning, designing, building and maintaining a simulation center.
SIMS Medical Academy (http://www.healthprograms.org)	Beginner and intermediate level courses for participants to learn how to develop and implement patient simulation scenarios into their local curriculum.
Society for Education in Anesthesia (http://www.asahq.org/)	A variety of courses and workshops on developing teaching skills including the use of innovative simulation technologies.
Simulation Center at the VA Palo Alto HCS, Stanford (http://www.med.stanford.edu/VA simulator/)	Faculty development courses on anesthesia and emergency medicine crisis resource management.
TuPass Center for Patient Safety and Simulation (http://www.tupass.com)	Several courses for instructors aimed at the competencies necessary to conduct simulation based training in acute medical care crisis.
University of Miami Michael S. Gordon Center for Research in Medical Education (http://www.crme.med.miami.edu)	Several "training the trainer" courses for participants to learn to use a variety of simulation tools for a wide range of courses (acute stroke, disaster and terrorism response).
University of Pittsburgh WISER (http://www.wiser.pitt.edu/)	A variety of courses covering the foundations for simulation in healthcare, including simulator programming, creating and developing a simulation center as well as faculty facilitator and technical support specialist preceptor training.

This list covers a number of well-known programs, but is not exhaustive. No endorsement of the programs by the Society of Simulation in Healthcare is implied.

Practical Points on Debriefing

There are a number of methods of debriefing, and levels of facilitation that may be employed. Dismukes and Smith, while discussing debriefing in aviation, delineate three levels of facilitation.[33]

High

Participants largely debrief themselves with the facilitator outlining the debriefing process and assisting by gently guiding the discussion only when necessary, and acting as a resource to ensure that objectives are met. Thus, paradoxically the *high* level facilitation actually implies a *low* level of involvement by the facilitator. This level of facilitation—initially described by Carl Rogers— describes the facilitator as a catalyst, allowing clients or students to draw their own conclusions, creating their own prescription for change.[34] He described "core conditions" for the facilitative process, both counseling and educational. These are congruence (realness), acceptance, and empathy. Realness refers to genuine nature of the facilitator. The idea of acceptance is that the learner feels that their opinions are prized, as are their feelings and their person. For the third, empathy, the teacher aims to understand the learner's viewpoint and have sensitivity for it.

Examples of techniques in high-level facilitation would be the use of pauses to allow thoughtful responses and comment, open-ended questions and phrases rather than statements of fact. The artful use of silence is another technique to draw further discussion from the group.

Intermediate

An increased level of instructor involvement may be useful when the individual or team requires help to analyze the experience at a deep level, but are capable of much independent discussion. Examples of techniques used in intermediate-level facilitation would include rewording or rephrasing rather than giving answers, asking questions in a number of ways to a number of participants and changing the tone of questions. Other techniques would be asking one member to

comment on another, or moving around a group asking for input from all team members.

Low

An intensive level of instructor involvement may be necessary where teams show little initiative or respond only superficially. In such cases the facilitator guides the individual or the group through the debriefing stages, asks many questions and strongly directs the nature of the discussion. In low-level facilitation, participants show little initiative and tend to respond only superficially. Here the facilitator may need to be directive to operate a stepwise or pattern of analysis. Examples of techniques used in low-level facilitation would include answering for participants, confirming statements, agreeing, recapping, and reinforcing thoughts and ideas. Other techniques such as active listening, echoing, and expanding on statements and nonverbal encouragement such as nodding, leaning forward, and focused eye contact are useful.

It is probably most beneficial to facilitate at the highest possible level, with the participants independently generating a rich discussion among themselves of all key issues. In our experience in healthcare, this ideal is rarely achieved, especially with relatively junior trainees or with first-time simulation participants of any age. Matching the level of instructor involvement to the nature of the material and the group is critical.

Conversely, there may be a tendency for instructors to debrief at a lower level (with more instructor involvement) than the participant group might really need—that is, to "overinstruct." To ensure that participants become involved at the highest level, a good prebrief is essential. Individuals and teams unfamiliar with this kind of learning may start off a sequence of simulations and debriefings with a need for high instructor input but then become more participant-directed as the day progresses.

Other Styles of Facilitation

Just as different levels of facilitation may be employed to suit the needs of participants, different facilitator techniques may be used to engage participants in the debriefing process. Examples of other styles of facilitation include: *funneling*, where the facilitator guides or funnels the participants, but refrains from commenting; *framing*, introducing the experience in a manner that enhances its relevance and meaning; and *frontloading*, using punctuated questions before or during an experience to redirect reflection. Solution-focused facilitation changes the focus of questions away from problems, and directional-style debriefing is intended to change the way people feel or think.[35]

Techniques such as plus-delta may also be useful. This technique which involves creating two headings or columns entitled delta, the Greek symbol for change, and plus. Under the delta column, the participants or/and the facilitator place all the behaviors/actions they would change or improve on in future, where the plus column contains examples of good behaviors or actions. Different participants can contribute to the critique, which may single out individual or team behaviors. Variations on the technique include placing behaviors or actions that were found to be difficult on the delta column, and easier tasks or behaviors on the plus column, and subsequently discussing why this was the case.

Facilitators at the Karolinska University Hospital in Sweden use a target-focused technique to aid facilitation.[36] Target behaviors are identified prior to the simulation scenario in the prebrief period, and subsequently during the debrief these can be identified and evaluated by facilitators, participants, and by observers. This technique offers a structure for debriefing that may facilitate debriefing by participants.

Facilitators may decide to use different communication styles while debriefing: using commands, cues, or questions. They may also decide to use acceptance and praise or be scolding and corrective.[37] If there are a number of debriefers, they may decide to use opposing styles: "good cop-bad cop" to encourage discussion and cohesiveness within a participant team. A group of debriefers may offer advantages where specific educational or technical points need to be addressed. An expert (expert content debriefer) may debrief on specialized issues and offer credibility to the discussion, particularly where dealing with an experienced group of participants. When a number of facilitators are present, their roles need to clearly described before debriefing commences to avoid excessive facilitator input in discussions. This is particularly pertinent if the principal debriefer is attempting to use techniques such as active listening and silence to encourage group participation.

The Debriefing Setting

The physical environment in which debriefing is conducted is also an important factor. For complex debriefings lasting more than a few minutes, debriefings often take place in a room separate from the active portion of the simulation to allow diffusion of tension and to provide a setting conducive to reflection (this also frees up the simulation room to be set up for the next scenario). However, not all debriefings are held after the simulation, but in certain instances, for example, where the aim is to teach a technical skill or if the team behaviors are seriously flawed, debriefing may occur during the simulation, "in-scenario" debriefing.

The debriefing room should be comfortable, private, and a relatively intimate environment (for example, a large auditorium would typically not be appropriate). The seating arrangement may vary with the style of the debriefing and the degree of facilitation intended. In a more traditional teaching approach, the facilitator may position himself at the head of the table, whereas in a more participant-directed debrief, the facilitator may be seated among the participants, away from the table, out of sight, or indeed even outside the debriefing room. If a larger group is to be debriefed, participants may be separated into smaller groups. Each subgroup might have an individual facilitator, or they might self-debrief initially, and then come together to express their thoughts in a larger group setting.

Steinwachs describes a way of debriefing a larger group, involving the "fish bowl" method.[25] Here a smaller circle exists within a larger circle, and participants may move to the inner circle when they wish to actively participate in the debrief. Steinwachs advises that individuals sit next to each other to avoid creating "energy gaps" (opportunities for dis-

continuity in discussion as one participant is removed from the group as a whole). Irrespective of the type of facilitation models and communication styles used and the physical environment debriefing is carried out in, it is always important to be cognizant of the participants' profiles (eg, novice/expert) in delivering the debrief.

To Debrief or Not?

Although many learning experiences require feedback, debriefing is a special kind of feedback process. If the core objectives are to, for example, teach a technical skill such as intubation or central line placement, does the participant require in-depth facilitation and reflection on the skill to master it? We suggest that the learning objectives, target population, and modalities of simulation will drive whether a debriefing is useful, and if so how in-depth the debriefing process needs to be. Typically topics that may benefit from debriefing are team training, crew resource management skills and multidisciplinary training. Thiagarajan examines this concept of the necessity of the debrief by asking: 1) do participants lack a sense of closure and 2) can we derive useful insights through a discussion of the experience?[38] If so, debriefing should add to the experience.

The Effectiveness of Debriefing Sessions

Although the experience in other high-hazard industries that conduct complex simulations suggests that debriefing is important,[39] what data exist regarding the actual benefits of debriefing? Such questions prompted a survey of debriefing practices in 14 European Simulation Centers to explore what experienced debriefers instinctively felt were important elements of a good debrief, and also what was felt to constitute a poor or harmful debrief.[40] The survey was carried out in response to interest in the topic displayed at a workshop in debriefing at an international simulation education meeting. All respondents claimed that debriefing was the most important part of realistic simulator training, "crucial to the learning process," and if performed poorly could harm the trainee. The majority felt that a thorough prebrief was essential and stressed the importance of confidentiality and creating a non-threatening atmosphere. Elements of a good debrief included the use of open-ended questions, positive reinforcement, the use of cognitive aids, and good use of audiovisual capabilities. Respondents felt that, where possible, facilitation or self-debriefing should be encouraged. Elements of a poor debrief included the use of closed questions, criticism, or ridicule; concentrating on errors; or concentrating too much on the technical points and not enough on crew resource management skills. This survey's findings reinforce common beliefs of experienced facilitators regarding good debriefing.

Intuitively, many instructors feel that such core elements of debriefing are essential but what, if any, empirical data exists to explore the real value of the debrief and the various methods of facilitation? How does one even approach assessing debriefing techniques? Lederman outlined a conceptual process for assessing the effectiveness of the debriefing process, which may serve as a template for future studies.[18] She asks five questions:

1. Were the learning objectives met or enhanced through the debriefing?

2. How was the debriefing conducted considering situational constraints (eg, time, finances, and group structure)?
3. Was the correct strategy used to accomplish the learning objectives given the situational constraints?
4. How uniformly, if at all, was the stated debriefing strategy actually implemented in practice?
5. What, if any, quality management of the debriefing process took place?

These questions can be raised about specific issues and types of debriefing. There are also some more general questions about debriefing:

1. Do all types of simulations need a debrief, and if some do, what benefits have been demonstrated?
2. Is self-debriefing or written debriefing sufficient or is a facilitator really needed?
3. How much, if at all, does playback of simulation video help the debriefing process?
4. Do specific methods of debriefing have specific benefits, or are they all alike?

A number of studies have found the debriefing process beneficial. In a study aiming at improving dynamic decision making and task performance involving computer simulation-based interactive learning environments, Qudrat-Ullah evaluated the usefulness of the debrief.[41] The study assessed participants' skills in a managing a dynamic task, such as playing the role of fishing fleet managers in an environment of over exploitation and mismanagement of renewable resources. Thirty-nine participants were examined over four parameters: task performance, structural knowledge, heuristics knowledge, and cognitive effort. The experimental group received a debrief, whereas the control group did not. Across all four domains the group who were debriefed did better. Similarly in a medical simulation study, Savoldelli et al. found that participant's nontechnical skills failed to improve if they were not debriefed.[42]

As Dismukes et al. state: "When it comes to reflecting on complex decisions and behaviors of professionals, complete with confrontation of ego, professional identity, judgment, motion, and culture, there will be no substitute for skilled human beings facilitating an in-depth conversation by their equally human peers."[43]

How Should We Debrief? Self-debriefing Versus Written/Blog Debriefing Versus Facilitated Debriefing

Increasingly, due to the cost of expert debriefers, there has been an interest in self-debriefing.[44] In fact, in a survey of team versus instructor-led debriefs, pilots surveyed were equally satisfied with both methods.[26] A recent healthcare study looked at the ability of participants to critique their own performance and that of their colleagues, and how that critique was received.[45] Subjects were asked to provide ratings of their own performance and the performance of their peers in a series of simulation scenarios, using an electronic rating system. Rating took place before the formal debrief. In the initial instance, the participants overestimated their performance; in the second instance they underestimated it. However, over time, the trainees' perceptions became closer to that of expert raters. This study suggests a role for struc-

tured self and peer rating, although it is not clear whether participants learned additional insight from their colleagues that they would not have gleaned from the formal facilitated debriefing process. Self- and peer-assessments are often inaccurate, and some degree of expert direction may be required. A recent study evaluating the self-assessment skills of medical students showed that low achieving students score themselves and their peers generously.[46] Standard or satisfactory students tend to be pretty accurate at scoring themselves and their peers and good students underscore themselves, but are accurate regarding their peers illustrating the discrepancy in novice self appraisal. This is not confined to students, but applies across all levels of experience. A recent review of physician self-assessment examining 17 studies concluded a limited ability to self assess.[47]

One approach to encouraging but also directing self and peer debriefing may be to introduce guidelines or aids to self-assessment. A study by Zottmann et al. explored the use of collaboration scripts by observers (nonactive participants in a simulation scenario), to aid in their ability to debrief team members on their performance.[48] A collaboration script is an instruction tool that distributes roles and activities among learners and may also include content-specific support for the completion of a task. Thirty-three medical students were studied and the group was divided into observers who received a collaboration script and those that did not. In this study the collaboration script illustrated individual and collaborative elaboration of Crew Resource Management (CRM) key points and learning outcomes (CRM skills). Objective (individual notes during observation phases) and subjective data (self-assessment and CRM skills) were analyzed for both groups. Initial results indicated positive effects of the collaboration script learning process. Scripted learners made more notes regarding CRM during the observation and felt more active in the debriefing process. Collaboration scripts may help make passive learning situations during observation phases more active and focused, and may encourage "passive" participants to contribute to the debriefing process. Schwid et al. evaluated whether screen based anesthesia simulation with a written debrief improved subsequent performance in a mannequin-based anesthesia simulator and found it superior in preparing the participants for mannequin-based simulation to traditional learning techniques.[49] The study, however, did not examine whether the written debrief or the practice session on the screen based system was responsible for the improved performance in the mannequin-based simulation.

Elaborating on the role of the written debrief, Petrenak, over a 20-year teaching period, encouraged his students to maintain a journal examining their educational experiences concerning 8 to 12 simulations played in a semester.[24] After attending one of his simulation workshops, students were encouraged to write a letter on the experience which was mailed to them 2 to 3 months later. This technique allows reflection on learning over time free from the "ridicule or rejection" of traditional debriefing. It is also in essence a form of self-debrief. Perhaps the modern-day "blog," although not providing feedback as such, may also play a role in this self-

reflective and peer-appraisal approach, although it remains to be tested a scientific fashion.

Is Video Playback Beneficial?

Many sites conducting team-oriented simulations in healthcare, whether for single disciplines or for combined teams, use video playback as an aid in debriefing.[33] In a study evaluating the role of video playback in producing sustained behavioral change, Scherer et al. studied surgical residents' trauma resuscitation skills.[50] Over a 6-month period, resuscitations were taped and reviewed. For the first 3 months, team members were given verbal feedback regarding performance and their behavior failed to change. In the second 3-month period, video playback and verbal feedback were combined, and within 1 month, behavior improved and was sustained for the duration of the study. The advantage of video playback is not seen consistently. A study by Savoldelli et al. assessed debriefing with or without video playback in their study of 42 anesthesia residents.[42] Participants who underwent debriefing improved more than those who did not, but there was no difference whether the debriefer used video playback or not. This was similar to the findings in the Beaubien study.[26] In fact, in Savoldelli's study, there was a trend towards greater improvement in participants who received an oral debriefing rather than an oral debriefing with video playback. This may have been related to a reduced actual instruction time for the video playback group, or the potential distractive nature of the video itself.[42] Still, video playback may be useful for adding perspective to a simulation, to allow participants to see how they performed rather than how they thought they performed, and to help reduce hindsight bias in assessment of the scenario. Further, the optimal use of video is currently an art, not a science. If lengthy or unrelated video segments are played, it may stifle discussion of the key issues, and may detract from the focus of the debriefing session.

Participants often want to see video footage and enjoy doing so. In a study by Bond et al. using simulation to instruct emergency medicine residents in cognitive forcing strategies, about half the participants said that they would have liked video playback, although it was not available.[51] Interestingly in this study, the participants received a traditional oral debrief, but also a PowerPoint presentation and didactic lecture as part of their simulator learning experience. It seems likely that the use of mixed media modalities and strategic use of video replay may be useful, especially as participants undergo repeated simulation experiences over time and are able to extract more out of debriefing sessions. Video playback of other simulation sessions and their debriefings may also play a role in teaching both behavioral and technical skills. A library of "classic vignettes" may be a useful way of elaborating not only on teaching points but also in illustrating debriefing techniques.

Does Effectiveness of Debriefing Depend on the Debriefing Technique Used?

Debriefing is classically described as nonjudgmental in its approach, with the facilitator seen as colearner rather than expert or authority. But is this actually the best approach to ensure that learning objectives are met? Do participants like

an open method of learning or do they prefer it to be more directed? What methods leads to the greatest improvement in skill and behavior? Although very few learners will respond well to a humiliating style of debriefing, they may find that debriefings that avoid analysis or criticism result in a failure to learn anything at all. It was with this in mind that Rudolph and colleagues developed the concept of debriefing with "good judgment," which focuses on creating a context for the adult learner to learn important lessons, and incorporate them into cognitions while amalgamating new information with their prior frames/life experience.[2] Participants may feel that this approach enables them to acquire knowledge in a structured manner, but having enough freedom to explore the personal nature of their experience and incorporate what they learn into their own practice.

In certain instances, participants prefer a more technical debrief to a cognitive one. In a study involving 62 emergency medicine residents who were randomized to receive either a technical/knowledge debriefing (ie, one covering medical subject matter) or a cognitive debriefing (ie, describing the concept of vertical line failure or other models of cognitive error),[52] the technical debriefing was better received by participants. This may be in part due to the fact that this type of debriefing is more familiar to the resident, being more akin to the traditional teaching process, where the teacher is the expert and imparts their knowledge in a more linear manner. The authors of this study suggest a combination of approaches may be beneficial in practice.

Do Debriefers Practice What They Preach About Debriefing?

Lederman's construct for assessing the debriefing process looks at whether instructors actually implement the debriefing strategy they set out to perform.[18] Just like the participants who are reconciled with what they did and what they actually thought they did when viewing video feedback, facilitators can view their debriefing technique, and reconcile how the debriefing session actually unfolded rather than how they presumed it did. A study that assessed debriefings in 36 US airline crews, illustrated that most facilitators talked more than any of the crew members.[33] Instructors asked a larger number of questions, averaging close to one per minute. Half the content of the debriefing centered on discussing the crew's performance, and crew members tended to give neutral responses concerning their performance. Instructors failed to pause, or use silence to encourage crew participation. The average duration of the debrief was only 31 minutes, probably not allowing for in-depth analysis.

Dieckmann et al stress the importance of regular feedback, using video footage to appraise oneself and fellow instructors.[53] They have also devised a simple tool for observing and evaluating instructor practices during the debriefing process, and the roles played by participants and their degree of participation during the debriefing phase. This tool, designed for formative evaluation, feedback, and discussion uses Microsoft Word to collect the desired information. The reviewer observes the debriefing process. Instructor, participants, nurse, and consultants, for example, are assigned a letter such as Instructor = I, Anesthesiologist = A. The reviewer presses and holds the relevant key on their laptop as long as a partic-

ular person is talking. Because holding a key down generates a fixed rate of repetition of that character, this can be used as a simple means to capture the duration of utterances addressed to each party. The final data is entered into a spreadsheet and the proportion of talking time taken up by each individual can be viewed, as can the patterns of communication.

Feedback on debriefing performance may also be achieved by inviting other specialists in the area, such as psychologists or anthropologists, to comment on either live or videotaped practice. Regular appraisal of debriefing skills is necessary for every facilitator, both on a local level, and by attending regular refresher facilitation courses and workshops globally.

Translating Debriefing from the Simulator World to the Real Clinical World

The concepts of briefings and debriefings apply not only to simulated environments but also to real operational worlds. Aviation has stressed preflight briefings and postflight debriefings as a method of information exchange, team building, and quality management.[33] The same approaches are being adapted to healthcare settings. In situ simulation in "real-life settings" or the debriefing of "real-life" events, such as in the study by Scherer et al., illustrate the effectiveness of debriefing in changing patterns of behavior.[50] Curricula that teach staff physicians to debrief their subordinates are another example of this trend. Blum et al., in their simulation courses for faculty anesthesiologists, include one scenario which involves debriefing a resident regarding a medical error.[54] At the end of the course and 1 year later, participants were requested to complete a questionnaire on their experience. Participants felt more equipped to debrief a resident immediately following the simulation course than before it, and this was maintained even 1 year later. This study also illustrates that although faculty may debrief well after real-life events, the practice is not as prevalent as residents may find useful.

This is reiterated in a study by Tan, who audited the practice of debriefing after critical incidents for anesthetic trainees by postal survey.[55] Debriefing after a critical incident was perceived by most trainees to be useful, although 36% had never been debriefed. Trainees ranked their preferred content for debriefing as "anesthetic issues," followed by "psychologic impact," "patient issues," and "surgical issues." Almost half did not feel supported by their department after a negative outcome incident. Trainees who were debriefed felt more supported by their senior colleagues. This study suggests that to have maximum effect, these facilitated team debriefings should be performed after real patient care situations, not just training exercises. This would reinforce the lessons learned in simulation and have the best chance of improving behavior, and strengthening departmental cohesiveness between staff and residents.

Future Research on Debriefing

This review illustrates some of the gaps that exist in our understanding of the role of debriefing in simulation based learning: fundamental issues such as whether debriefing is always required and, if it is, what are the most effective techniques to achieve a particular learning objective? How or should debriefing in teams differ from individual debriefing,

or debriefing novices differ from debriefing more experienced participants? How do we effectively evaluate the success of particular debriefing techniques and the use of auxiliary aids, such as video playback in the learning process as a whole? A primary area of research would be the development of models and theories of debriefing specifically within the field of simulation-based learning. Analysis and evaluation of debriefing models using common metrics, both quantitative and qualitative, would be beneficial to compare with other educational methods and techniques. Large, well-designed, high-powered collaborative studies within the simulation community both medical and nonmedical may provide an avenue to explore some of the current pertinent questions in simulation-based learning.

CONCLUSION

It is widely accepted that debriefing is the "heart and soul" of the simulation experience.[40] Currently, there is an increasing body of work exploring the role and effectiveness of debriefing in an objective manner in the learning process. To date, only a small proportion of this has reached peer-review journal publication, but the ever-increasing presentations of techniques, methods, and assessment of the process at international meetings on simulation in healthcare are encouraging.

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