Making It Stick: Keys to Effective Feedback and Debriefing in Surgical Education

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Introduction

Surgery often relies on the "art of healing," since its practitioners draw frequently on intuition, experience, and "feel" to treat patients under their care. Likewise, effectively passing onto the next generation the knowledge and skills required to practice surgery involves the "art of teaching." If done properly, such teaching can produce the cherished "*eureka!*" moment in the learner in which the knowledge or skill is embedded into his/her memory. This epiphany typically occurs during a moment of feedback or debriefing following an educational endeavor.

Whether consciously or unconsciously, surgical educators engage in some form of feedback and/or debriefing every day they interact with students/trainees. The informal discussion reviewing technical points of a just completed operative procedure and the structured review after a simulation-based exercise are but two examples of these educational opportunities involving teacher and learner. Unfortunately, surgical educators often receive little or no training or instruction regarding the most effective manner in which to give feedback or debrief. Much like surgical students are expected to know knot tying and suturing without much instruction, surgical educators are assumed to have mastered the skills of providing effective feedback and debriefing. The result is the neglect of these important skills in surgical education courses and training. Surgical education's transition from the apprenticed-based model of Halsted [1–3] to a more objectives-based curricular model [4] has compounded this deficiency. Combined with fewer clinical opportunities to learn due to work-hour restrictions [5, 6] and patient safety and financial concerns [7, 8], each educational experience must be optimized to get the most learning from it. Thus, learning how to provide effective feedback and debriefing provides some of the biggest "bang for the buck" in surgical education.

The use of simulation-based training (SBT) has been at the forefront of the transformation of surgical education into the objective-driven curricular structure in the twenty-first century. SBT's benefits are manifold in surgical education, ranging from improved technical performance in the OR [9, 10] to more safe and effective teamwork [11–13]. In addition, the high technology component of SBT, with its virtual reality machines and computer-based manikins, lends a certain *caché* to the field, drawing attention from surgical educators to incorporate these components into training. Consequently, work in the development of SBT in surgical courses and residencies has concentrated disproportionately on simulators, scenarios, and curricular development rather than providing effective feedback and debriefing. This fact persists even though feedback and debriefing have been identified as key elements in SBT's utility [14, 15]. This chapter will try to address this deficiency by elucidating key practices and principles related to giving effective feedback and debriefing in surgical education. First, it will provide definitions for both terms and provide a theoretical framework related to their use. Next, it will attempt to identify key best practices for optimizing trainee/student learning using either technique. Finally, it will delineate several concrete examples of their use in current health educations training.

Feedback and Debriefing in Context

Defining Feedback and Debriefing

Although they are often used synonymously by educators and surgeons alike, the terms *feedback* and *debriefing* describe different concepts and have different origins in the English language. The word *feedback* first arose in 1920 in electronics to describe "the return of an output signal to the

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input of an earlier stage" [16]. From this origin, it was expanded in 1955 to include "information about the results of a process" [16]. Among its contemporary uses, the definition most germane to this chapter would be the following: "the transmission of evaluative or corrective information about an action, event, or process to the original or controlling source…" [17]. Thus, *feedback* in surgical education involves the instructor/teacher providing information back to the learner related to his/her knowledge, skills, or attitudes (KSAs) related to a performance, event, exam, rotation, or the like.

Debriefing, on the other hand, is the gerundive of the verb *debrief*, which was coined in 1945 to describe the process of "obtain[ing] information (from someone) at the end of a mission" [18]. Such an etymology belies its military origins during World War II when post-mission accounts began to be used for both operational and educational benefit [19]. In current usage, "to interrogate (as a pilot) usually upon return (as from a mission) in order to obtain useful information" is still the most common definition for debrief [20]. For this chapter, the definition "to carefully review upon completion" is more apropos [20]. *Debriefing* in general, therefore, involves a more comprehensive process than just providing *feedback*, even though giving feedback is clearly an important subset of this process. Thus, feedback and debriefing are part of a continuum of providing information to a learner. Feedback is more unidirectional and specific, whereas debriefing is bidirectional and reflective. Nonetheless, each format can cross over into the other, since their theoretical underpinnings follow similar cycles of cognition (Fig. 1).

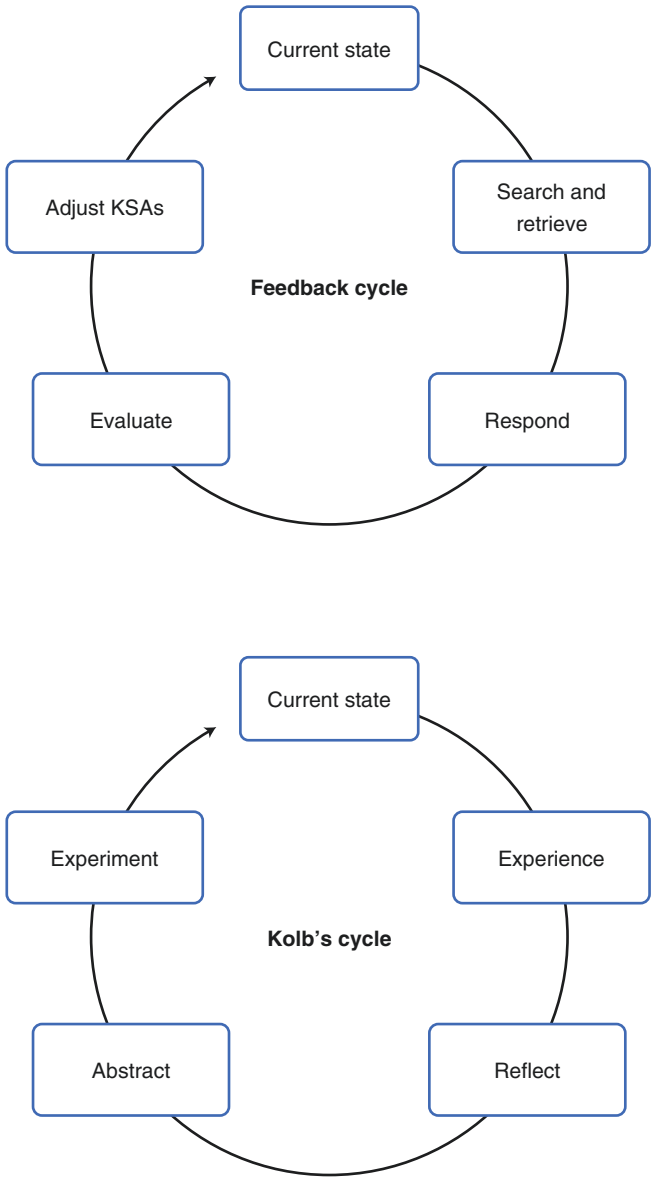

Fig. 1 Feedback and experiential learning cycles

Feedback and Types of Assessment: Formative Versus Summative

Feedback in the context of an educational activity is often based on an instructor's assessment of the learner related to the knowledge, skill, or attitude being demonstrated. It is thus crucial to understand the types of assessment that can be undertaken and how they might inform how the feedback is delivered. Assessment provided during an educational encounter can impact the learner in a wide variety of ways, depending on the context of when it is given and its purpose [21]. *Formative* assessment [21–23] is more focused on providing specific, data-based information to the learner regarding his/her progress toward a particular or overall learning objective or expected level of achievement. In this setting, an instructor's feedback may highlight weaknesses in performance and suggest tasks and objectives to help improve them or to reach predetermined benchmarks. Such formative assessment typically occurs during a practice session or established educational activity, is informal in nature, does not involve grades, involves low-inference measurements, and is low stakes. *Summative* assessment, on the other hand, is a more formal, graded activity that typically occurs outside of an educational event. It is based on high-inference measurements and is high stakes in nature (e.g., determining advancement to a higher level) [21–23].

Although feedback might be given in conjunction with summative assessment, the lion's share of feedback in SBT in surgical education is given in relation to formative assessment. Providing it in an effective manner, therefore, is essential in order to optimize learner progress in surgery, especially since its intent is to change the learner's behavior in order to achieve a learning goal [24]. Key to having such ability is to understand how feedback works in a contextual framework.

Feedback Frameworks

Several frameworks have been developed to contextualize how feedback works. Bangert-Drowns et al. [25] proposed a useful five-stage cyclical feedback process similar to Kolb's learning cycle [26] in which the learner starts at a current state, is prompted to undergo search and retrieval strategies through questioning by the instructor, provides a response, evaluates the response based on instructor feedback, adjusts KSAs based on the evaluation, and thus enters a new current state (Fig. 1 [25, 26]). Through this iterative process, the learner is guided toward the educational objective (i.e., the clear, specific goal) of the feedback episode.

Three learner conditions are needed for feedback to be effective: *motive*, *opportunity*, and *means. Motive* reflects the fact that the learner recognizes the need for the feedback. *Opportunity* emphasizes that the feedback needs to be timely in order for the learner to act upon it. Finally, *means* indicates that the learner must be willing and able to use the feedback to improve [24].

Thus, in order to be effective, the learner must understand the feedback, accept it, and be willing to act upon it [27]. Additionally, Kulhavy and Stock [28] have emphasized that effective feedback contains two important elements: verification and elaboration. Verification involves the act of confirming to the learner whether an answer is correct or incorrect. This verification can be explicit in nature (i.e., a positive check mark) or implicit in character (i.e., a poor outcome in an SBT scenario based on incorrect decisions). Elaboration describes the manner in which information is conveyed to the learner in order to provide cues to guide the learner to the correct answer. It can be directive or facilitative in quality.

Narciss and Huth [29] developed a framework for designing feedback based on instructional context, learner characteristics, and elements of the feedback. Instructional features such as objectives, tasks, and obstacles combine with learner goals and objectives, prior KSAs, and motivation to exert an influence on the feedback based on its content, function, and presentation. They have shown that such systematic design for feedback has positive effects on learners' accomplishments and motivation. Thus, by targeting key instructional and learner features, feedback can be tailored to enhance its effectiveness.

Theoretical and Structural Elements of Debriefing

Unlike *feedback*, which focuses on verification and elaboration of information to a learner in an often one-way direction to help improve learning and performance, *debriefing* is an interactive process of bidirectional reflective analysis [30]. In essence, it is a process to facilitate learners' analysis, interpretation, and assimilation of events during an educational encounter in order to move them from simply *experiencing* these events to *making sense* of what has occurred [19]. In this manner, the learner is prompted by a facilitator to engage in self-reflective practice to identify and resolve gaps in KSAs or performance. This interactive process, if done correctly, can produce powerful, positive responses in learners, leading to enhanced adoption of KSAs and improvements in clinical performance.

The educational effectiveness of debriefing can be found in its theoretical underpinnings, especially when it is employed during SBT. At its essence, the process of debriefing is embedded into Kolb's theory of experiential learning (Fig. 1 [25, 26]) [19, 26]. This cyclical process of learning begins when a learner undergoes a concrete experience (i.e., a simulation-based scenario). This experience leads to reflection and observation which in turn prompts abstract conceptualization of new rules and principles. These new rules and principles are then tested through active experimentation by the learner, leading to new concrete experiences. In this cycle, the debriefing process corresponds to the reflection on events and the formation of new principles. Such *reflection on action* is an important component of Schön's concepts regarding reflective practice [31]. This type of reflection occurs after an event such as a SBT experience and can be combined with or replaced by *reflection in action* in which learners "think aloud" during an SBT episode. The key to learning is thus the self-reflection and conceptualization, highlighting the fact that a scenario or SBT serves as a catalyst for the actual learning that occurs during a debriefing.

As described by Lederman [32], any debriefing contains seven common structural elements: the debriefer, participants, learning scenario or experience itself, impact of the scenario, recollection, report, and time. These structural components can further be categorized into three overarching elements related to (1) people involved in the debriefing (i.e., the facilitator and the learners, which could be one and the same if the debriefing is self-directed), (2) events related to the debriefing (i.e., the scenario/learning encounter and its impact on the learner), and (3) experience of debriefing itself (i.e., recollection, report, and time). These structures are the scaffolding upon which the debriefing process is constructed, promoting the self-reflective learning that is such a powerful educational tool. Paragi et al. [33] divide this process into three major components: (1) an introduction, (2) the debriefing itself, and (3) a closure. The second component is further subdivided into four aspects: (1) engagement of the learner, (2) focus on the events, (3) reflection and critique, and (4) application to everyday practice. It is within this construction that the learners pass through the various phases of the debriefing process.

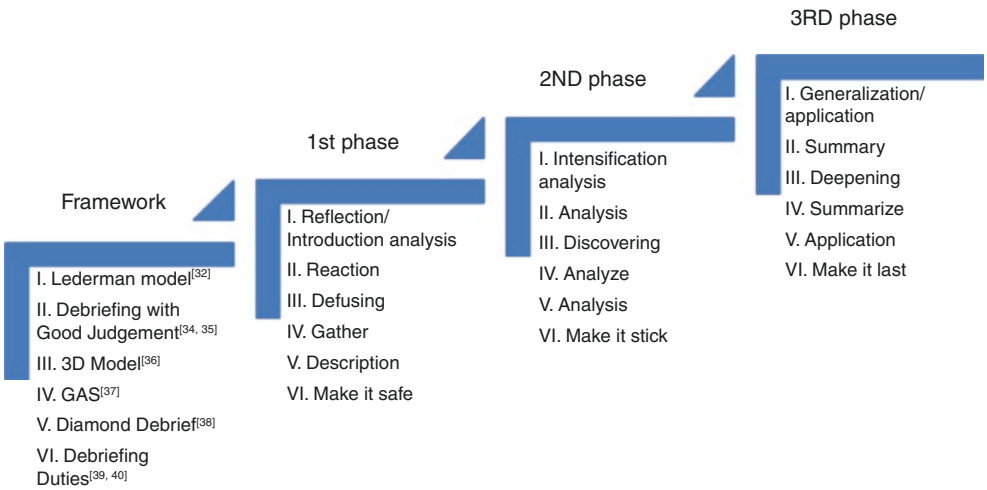

Fig. 2 Three-phase models of debriefing

Phases of the Debriefing Process

The educational power of debriefing rests in the structured process by which the learners respond to, interpret, and apply experiences to gain KSAs and improve performance. In healthcare and beyond, multiple models have been proposed to describe this learning process. A large number of these frameworks consist of three distinct phases which more or less align with one another (Fig. 2 [19, 30, 32, 34–40]). Several multiple phase frameworks have also been proposed [19, 30], but they too can often be aligned into three main groupings. For example, the Healthcare Simulation After Action Review's (AAR's) [41] seven phases can be clustered as follows: (1) define rule, explain learning objectives, benchmark performance, (2) review expected actions, identify what happened, examine why things happened the way they did. and (3) formalize learning. Likewise, Petranek's seven "Es" [42] can be clumped into three: (1) events, emotions, empathy; (2) explanations and analysis, everyday applicability; and (3) employment of information, evaluation.

Rudolph et al.'s [34, 35] three-step model, debriefing with good judgment, is one of the most concise and useful in delineating the necessary phases through which a learner proceeds during a debriefing. First, he/she must react to the experience by discussing emotional responses. Next, he/she proceeds to analyze the experience, identifying gaps in performance and formulating solutions. Finally, he/she undergoes a summary of what happened, formulating lessons learned for application in practice. Thus, through this reaction, analysis, and summary process, the learner is able to make sense of what happened and how it can be applied.

The debriefing duties model [39, 40] is another framework that has utility, especially for those beginning in debriefing. This model delineates three key duties that a facilitator should undertake to lead learners through a debriefing process. Each duty corresponds to key components of the debriefing process. The first duty is for the facilitator to *make it safe*. This step involves creating a learning environment in which learners feel psychologically safe to speak up without retribution [19, 30]. In general, the facilitator can help create such an environment by demonstrating respect to learners and focusing on the *debriefing process* itself rather than people [43, 44]. The second duty of the facilitator is to *make it stick*. This step entails engaging the learners in Schön's reflection on action to analyze and synthesize their experience in relation to the learning objectives of the training session [40, 43, 45]. The final duty for the debriefer is to *make it last* by eliciting a commitment from each learner to a change in behavior based on their analysis and synthesis [33, 40].

Best Practices for Feedback and Debriefing

Giving Effective Feedback

Although seemingly straightforward to do, giving effective feedback can be a difficult undertaking, especially for a surgical educator who has not had any formal training in the process. Fortunately, research into how to give effective feedback has revealed best, and worst, practices (Table 1) [24, 27, 46]. Keys to enhancing learning include providing feedback that is unbiased, objectives-based, clear, actionable, based on understandable measurements, consistent with other feedback, manageable, and timely. The timing of feedback should be based on the nature of the task and the complexity of what is being taught. Immediate feedback is most useful for difficult tasks, motor skills/procedural learning, and conceptual knowledge. Delayed feedback works for simple tasks, and it seems to promote transfer of learning [24].

Table 1 Best practices related to giving effective formative feedback [24–26]

Best practices (What should be included)	Worst practices (What should be avoided)
Related to *clear goal*	Having *no goal* or related to *vague* goal
Tangible and transparent results	*Extensive error analyses*, *diagnosis*
Actionable objectives	*Normative comparisons*, *progressive hints*
User-friendly delivery, *unbiased* in character	*Loaded terms*, *biased* delivery
Timely	*Interrupting* learner, *poor timing*
Ongoing in nature	*Threats to self-esteem*
Consistent in character	*Discouraging* learner
Elaborated information in *manageable units*	*Praising* learner
Focus on task	*Focus on person*

Nicol and Macfarlane-Dick [47] have emphasized that giving effective feedback is instrumental in helping to promote self-regulated learning by learners. They have delineated seven practices for giving good feedback. These principles include making sure to clarify good performance, facilitate self-reflection, provide high-quality information regarding learning, encourage dialogue around learning, encourage positive self-esteem, provide opportunities to close performance gaps, and provide information to help shape teaching. By following these best practices, they argue that learning will be enhanced, since self-regulated learners have been shown to be higher achievers due to persistence, resourcefulness, and higher confidence levels.

Learner characteristics have also been found to influence how to give the most effective feedback. For high-achieving learners, facilitative feedback given in a delayed fashion seems to be effective. On the other hand, low-achieving learners require immediate feedback that is directive, employs elaboration, and employs scaffolding of information. Finally, specific and goal-directed feedback should be given to learners with low-learning orientations (i.e., trying to achieve learning goal) and/or high-performance orientations (i.e., aiming to please others) [24].

In the surgical educational literature, Jensen et al. [48] demonstrated that providing feedback is valued by both surgeons and residents. Unfortunately, a true disconnect exists between them in that surgeons believe that they provide enough in the operative setting, whereas residents crave more. This perceived gap in the amount of feedback provided extends as well to the timeliness and quality of the feedback provided. Interestingly, Kannappan et al. [49] have shown that medical students perceive that both positive and negative feedback related to technical skills acquisition can be potent motivators. Additionally, Cortes et al. [50] have demonstrated the superiority of verbal feedback from experts over computer-generated feedback on motion efficiency for third year medical students learning technical surgical skills. Boyle et al. [51] illustrated the benefit of combining standardized, timely (i.e., proximate) feedback with SBT. Such feedback improved the learning curve and reduced the error rates of surgical residents undergoing a virtual reality hand-assisted colectomy. Soucisse et al. [52] reached similar improvements in technical ability after providing video-based feedback. Surgical residents who received such one-on-one feedback had better technical scores when performing an intestinal anastomosis compared to those who did not. Providing quality feedback has also shown benefits beyond technical skill acquisition. Garner et al. [53] showed that immediate feedback improved faculty-student dialogue on surgical clerkships. Finally, Yule et al. [54] have extended the benefit of feedback to the acquisition of nontechnical skills when it is combined in a coaching framework.

Evidence Base for Effective Debriefing

As with feedback, best practices have been identified for providing effective debriefing. For example, in a recent critical review on debriefing in healthcare, Sawyer et al. [30] identified seven process elements of a debrief that they viewed as essential for making it effective. Three of these elements help set up the debriefing process and, hence, typically occur at the beginning of the learning intervention/debriefing itself. They include establishing an environment of psychological safety, an assumption that all learners are trying to do their best and want to improve, and delineating the basic set of rules related to the debriefing. The remaining four elements involve the debriefing process itself. They relate to establishing a shared understanding of the events that took place, addressing key learning objectives, asking open-ended question, and using periods of silence to elicit learner reflection and response.

Within the surgical education literature, Ahmed et al. [55] identified best practice guidelines for debriefing in surgery by conducting semi-structured interviews of surgical educators and residents in the United States, Britain, and Australia. Arora et al. [56] then combined this work with an extensive literature review to develop an evidence-based, end-user-informed assessment tool for debriefing, the Objective Structured Assessment of Debriefing (OSAD) instrument, which incorporated eight key features of effective debriefing and behavior-based anchors using a Likert scale (Table 2 [55–57]). As a result, the OSAD can serve as a debriefing guide/script for a facilitator, self-assessment tool for improvement, or observer-based instrument for giving feedback. The eight elements of the OSAD can be grouped into clusters based on Paragi et al.'s [33] structure and the duties of debriefing framework [39, 40] to show when each particular component of the debrief should be particularly emphasized (Fig. 3 [33, 39, 40, 55–57]).

Other debriefing assessment tools that have been published in the healthcare literature include the Debriefing Assessment for Simulation in Healthcare (DASH) [58] tool and the Peer-Assessment Debriefing Instrument (PADI) [59–61]. Each of these instruments emphasizes particular components of effective debriefing that a facilitator should strive to include. Brett-Fleeger et al. developed the DASH through theory elaboration. In this iterative process, they combined a review of existing debriefing assessment tools, two from fields outside healthcare and three from within healthcare (including the OSAD), with semi-structured interviews with debriefing facilitators in the United States, Europe, and Australia to create a seven-point Likert-type scale with six domains of best practice. These domains were behaviorally anchored activities of an effective debriefer: (1) establishes an engaging learning environment, (2) maintains an engaging learning environment, (3) structures debriefing in an organized way, (4) provokes engaging discussions, (5) identifies and explores performance gaps, and (6) helps trainees achieve or sustain good future performance. Saylor et al. drew on prior tools such as the OSAD and DASH to help develop the PADI using a Delphi technique in order to identify eight key areas of effective debriefing for their four-point peer assessment instrument. These domains included the following: (1) structure and organization of the debriefing, (2) verbal and nonverbal communication, (3) setting the stage and ground rules for the debriefing session, (4) talking about defusing (dealing with the emotional aspects of the simulation), (5) recapping the simulation experience, (6) reflecting on action (facilitating learner's self-reflection), (7) facilitating learner's connection of simulation experience to clinical practice, and (8) summarizing, providing key takeaway points for the learner. As with the OSAD, each of these instruments can be used as a guide for conducting an effective debrief and as a tool for feedback. In addition, most of the domains can be clustered around the components of a debriefing structure to demonstrate where they should be emphasized. In this manner, novice facilitators can not only know the key elements of an effective debrief, but they can understand when to focus on each one.

In addition to the above-mentioned elements of effective debriefings, research has also focused on adjuncts and techniques to optimize learning during a debriefing. Useful adjuncts to assist with teaching during a debriefing include involving a co-debriefer to provide another viewpoint and

Table 2 Objective Structured Assessment of Debriefing (OSAD) instrument

Approach	Manner in which the facilitator conducts the debriefing session, their level of enthusiasm and positivity when appropriate, showing interest in the learners by establishing, and maintaining rapport and finishing the session on an upbeat note
Establishes learning environment	Introduction of the simulation/learning session to the learner(s) by clarifying what is expected of them during the debrief, emphasizing ground rules of confidentiality and respect for others, and encouraging the learners to identify their own learning objectives
Engagement of learners	Active involvement of all learners in the debriefing discussions, by asking open questions to explore their thinking and using silence to encourage their input, without the facilitator talking for most of the debriefing, to ensure deep rather than surface learning occurs
Reaction	Establishing how the simulation/learning session impacted emotionally on the learners
Reflection	Self-reflection of events that occurred during the simulation/learning session in a step by step factual manner, clarifying any technical clinical issues at the start, to allow ongoing reflection from all learners throughout the analysis and application processes, linking to previous experiences
Analysis	Eliciting the thought processes that drove a learner's actions, using specific examples of observable behaviors, to allow the learner to make sense of the simulation/learning session events
Diagnosis	Enabling the learner to identify their performance gaps and strategies for improvement, targeting only behaviors that can be changed, and thus providing structured and objective feedback on the simulation/learning session
Application	Summary of learning points and strategies for improvement that have been identified by the learner(s) during the debrief and how these could be applied to change their future clinical practice

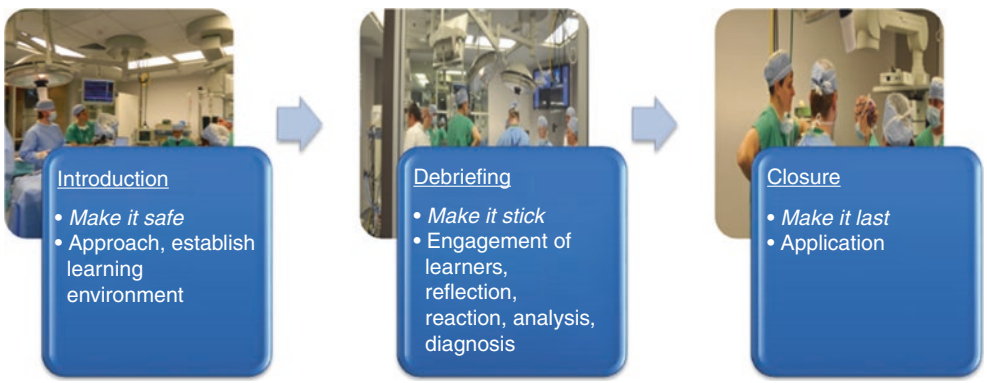

Fig. 3 OSAD within the debriefing structure

help manage learner needs, following a debriefing script to guide the facilitation, and employing video review to highlight key performance issues [30]. Although still somewhat controversial, recent evidence suggests that video review does not convey any advantage compared to debriefing without it [62, 63]. Certain techniques related to a facilitator's conversational approach during a debriefing have demonstrated effectiveness in enhancing learner acquisition of KSAs (Table 3 [19, 21–23, 30, 34, 35, 44, 64, 65]).

Debriefing adjuncts and conversational approaches provide facilitators with tools to help overcome the inevitable obstacles and challenges that may arise during a debriefing. According to Kolbe et al. [66], these barriers can exist at the individual, team, or organizational level. Individual-based obstacles include cognitive biases, errors of attribution, lack of familiarity with the debriefing process, lack of knowledge on the subject (e.g., human factors, teamwork), and a focus on people and actions rather than meaning. Team-based barriers include group think (i.e., sharing only information that is consistent with existing views), lack of psychological safety among certain members, avoiding new information or undiscussable topics, and a reluctance to communicate explicitly among team members. Finally, organizational obstacles include lack of support, lack of follow-up, lack of confidentiality, and avoidance of undiscussable topics (i.e., the proverbial elephant in the room about which no one will speak). Any of these situations can impede the effectiveness of a debriefing, and, as a result, they should be avoided.

Finally, the timing and style of a debriefing can impact effectiveness, given the situation and skill being taught. For post-event debriefing, facilitator- and self-guided reflections can be undertaken. In a review of facilitator- versus learner-guided debriefing formats, Cheng et al. [67] emphasized that each has its advantages in certain contexts. For example, facilitator-led debriefings are particularly useful in time-pressed situations in which learners have little relevant background or clinical experience or in cultural situations where deference to superiors is strong. Learner-led debriefings, on the other hand, are more suited for situations in which time is not an issue, and learners have a high degree of relevant background or clinical expertise or cultural backgrounds in which subordinates have limited dependence on superiors. Either way, both types of leading a debrief have demonstrated effectiveness in behavioral skills training [68, 69]. Within-event debriefing involves a facilitator-led "stop and go" process in which the action is stopped, a debriefing is undertaken, and then the action is resumed. This style of debriefing is less effective for surgical skills acquisition compared to traditional post-event debriefing [70].

Table 3 Conversational approaches to enhance learning during a debriefing

Conversational approach	Examples	Technique
Learner self-assessment	Plus/delta (+/Δ) [19, 30]	Asking open-ended questions regarding what went well (i.e., plus) and what could be changed (i.e., delta) related to the learning activity
Directive feedback	Formative feedback [21–23]	Providing specific, data-based information to the learner regarding his/her progress toward a particular or overall learning objective or expected level of achievement
Focused facilitation	Advocacy inquiry [30, 34, 35]	Advocating debriefer's observation of an action and then inquiring about the learner's frame of mind about the particular action
	Guided team self-correction [30, 64]	Learners are asked to compare their performance during the learning activity to against a prespecified model of performance and are then guided to self-correct their actions
	Circular questions [30, 65]	Asking a third learner in a learning activity to comment on the relationship between two other learners who also participated in the learning activity in order to "circle back" and comment from an outside perspective on an activity in which they participated

Examples of Feedback and Debriefing in Surgery and Simulation

Tools Used in Surgery

As mentioned at the beginning of this chapter, feedback and debriefing are often used synonymously, although they have different meanings and origins. Nonetheless, they form a continuum of providing information to a learner. Hence, certain tools/structures for one could potentially have utility for the other. For example, the difference between directed feedback and performing a micro-debriefing during a learning activity may be simply due to the degree to which the learner's perspective is explored [71]. This case is certainly true in surgical education for two scripts that can be used for either giving feedback or to facilitate a more reflective debriefing.

The first of these tools, developed by Ahmed et al. [72], is denoted by the acronym *SHARP*. It is a five-step process for providing feedback or conducting a debriefing after a surgical educational experience. It begins before the encounter when the instructor and learner mutually *set learning objectives* for the activity at hand. After the learning event, it then proceeds to an assessment by the learner regarding the question "How did it go?" Next, the instructor and learner *address concerns* raised by the learner, and, then, they *review learning points*. Finally, they *plan ahead* by identifying actions that can be taken to improve future performance. Developed from the OSAD elements for effective debriefing, the

SHARP has been shown to improve both the frequency and quality of debriefing in the operating room setting [57, 72]. Its concise, compact nature makes it an attractive instrument for conducting both feedback and debriefing in surgical education.

The second of these scaffolds for giving effective feedback and debriefing is the laparoscopic colectomy (Lapco) train the trainer (TT) format for teaching in surgery. Created by Mackenzie et al. [73] in order to improve the quality of teaching in the English national laparoscopic colorectal training program, it consists of a three-part process known as set, dialogue, and closure. The set occurs before the learning event and involves the instructor and learner "aligning agendas" by agreeing upon learning objectives for the activity. In addition, the instructor works to remove any potential mental or ergonomic situations that would serve to distract the learner. The dialogue is the structured manner in which feedback is given during the learning event and is denoted by the acronym *SIX STEPS*. The instructor first halts all activity by saying "*stop*." Next he/she *inquires* about what the learner is thinking regarding his/her activity. Following the response, the instructor *explains* what he/she sees as the issue and then proceeds to provide *structure teaching* related to it. Then, the instructor *elicits* a check from the learner by having him/her repeat back what was taught. Finally, the instructor allows the learner to *proceed if safe* to do so. In essence, the dialogue represents a process of Schön's reflection on action, and it could be classified as what Eppich et al. have termed a micro-debriefing [71]. This blending of feedback and debriefing demonstrates their similarities. The closure is a post-procedure/training debriefing in which the instructor encourages the learner to reflect on what went well, what could be improved, and guides him/her to an overall "take home" message delineating what to work on related to the training. By using this framework, instruction for the training exercise is consistent, predictable, and standardized. It has even been successfully adapted for use in a cadaveric hands-on course held at the annual meeting of a national surgical society [74].

Formats Used in Simulation in Healthcare

A large number of debriefing formats have been developed for use in simulation in healthcare. They typically follow a three-phase model in which the reflection moves from emotional response through analytical understanding to commitment to change (Fig. 1). In addition, multiphase models such as TeamGAINS [62], Promoting Excellence and Reflective Learning in Simulation (PEARLS) [75], and Healthcare Simulation AAR [34] are also available. Each one is designed to promote the reflective practice by the learner that will lead to identification of performance gaps and the formulation of action plans to address them. Some formats have been designed for a particular setting. For example, TeamGAINS focuses on providing a structure for SBT of healthcare teams [62]. Other formats, like Healthcare Simulation AAR, have been adapted from other industries [34]. All of them serve as a scaffold on which the facilitator can construct an effective debriefing session in order to optimize learning. Thus, a facilitator can choose that format most conducive to the SBT session being taught. In addition, he/she can enhance a format's effectiveness by adopting debriefing adjuncts and conversational approaches that will elicit the greatest learner response for the particular group and SBT event.

Faculty Development

Both feedback [76] and debriefing [14, 15] have been recognized as essential components for the utility of SBT. Yet, determining the type and method of feedback/debriefing that is most effective for improving performance has been, and still remains, a top research need in surgical education [77, 78]. Additionally, the various formats of debriefing available have led to questions of whether "one size fits all" for SBT activities for advocates of a particular framework [79]. Combined with the fact that many faculty are lacking in formal or even informal training in how to give effective debriefing, the need for adequate and effective faculty development in this important area of surgical education is evident. Facilitator training has been recognized as an essential ingredient for successful educational outcomes [43]. In fact, it is commonly performed in other high-risk industries in order to ensure effective debriefing [80].

To date, educators in healthcare and surgery have attempted to address this need for faculty development in effective feedback and debriefing in various manners. Offerings can range from formal multiday courses [81] to online modules [82]. Another more innovative example is the development of so-called Debriefing Olympics [83]. In surgical education, faculty time is limited, and their availability is constrained by clinical responsibilities. Thus, they typically do not have time to be gone for extended periods of time. A potential solution to this problem which has had some success has been the development of workshops dedicated to teaching debriefing techniques and concepts at national surgical educator meetings [40, 84].

Each of the above faculty development formats has its advantages and disadvantages in terms of time requirement, cost, availability of expert faculty, and effectiveness. What, then, is the best way to go about developing faculty in feedback and debriefing? In a review of the current status of faculty development in debriefing for SBT, Cheng et al. [79] delineated five key components of an ideal program in training faculty in effective debriefing: (1) a course to teach various methods of debriefing together with opportunity for deliberate practice, feedback, and actual debriefing; (2) sum-

mative assessment of debriefing performance using established debriefing assessment tools; (3) formative assessment of debriefing performance with expert feedback; (4) peer feedback of debriefing performance; and (5) opportunity for self-assessment of debriefing performance with structured group feedback. Following one or more of these five suggestions when developing a curriculum in debriefing would surely enhance its effectiveness.

Conclusion

Feedback and debriefing are recognized as essential components for successful surgical educational outcomes. Although often used as synonyms, feedback and debriefing are better understood as points on the continuum of providing useful information to learners in order for them to achieve learning objects and goals. Feedback is most commonly used in everyday teaching and consists of specific, data-measured information related to a particular goal or objective that is timely, actionable, clear, and manageable. Debriefing involves a bidirectional reflective learning process that is part of the Kolb's experiential learning cycle. Its structure consists of an introduction, the debriefing itself, and a closure. Its process has typically been described as a three-phase model in which the learner first reacts emotionally to the learning experience, proceeds through understanding the meaning of the experience, and finishes by devising a strategy by which to improve performance in the future. Effective debriefings are characterized by eight key elements: approach, establishment of a learning environment, engagement of learners, reaction, reflection, analysis, diagnosis, and application. These elements can be grouped into three debriefer duties: making it safe, making it stick, and making it last. In surgical education, the SHARP tool and the Lapco TT teaching format can be used for giving directed feedback as well as debriefings. In SBT, many debriefing formats are available as well as conversational approaches and debriefing adjuncts. The best format to choose often depends on the nature and context of the SBT experience, and melding them often can enhance learning. Faculty development in giving effective feedback and debriefing is needed to give more surgical educators the KSAs necessary to optimize learning in today's challenging healthcare environment.

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