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The Use of Micro-Debrief in Simulation-based Learning for Medical Students

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Abstract

With traditional Simulation-Based Learning (SBL), most of the feedback and performance frames are usually discussed at the end of the session during 'debrief'. This is known as "terminal debrief". Another mode of debriefing which is gaining traction is "within simulation debrief", which is also known as micro-debriefing. This usually takes place during certain customized stages of the simulation event or activity. The use of micro-debrief with rapid cycle deliberate practice may represent an alternative when training medical students. As they are novices, and still building up their armamentarium of skills, knowledge and capabilities, these strategic 'stops' help make handling the whole scenario or activity more manageable. This is especially so with the smaller bite-size sharing and feedback, the reduction in cognitive load, the distributed information sharing, with facilitated focused reflection. These factors may make assimilation of knowledge and information more palatable for the students. Moreover this technique can be applied to skills-based training, hybrid simulation and clinical scenarios execution. In fact it is also possible to use micro-debrief with computer-based simulation, virtual simulation, communications training and scenarios involving standardized patients.

Keywords: Simulation-based learning; Micro-debrief; Rapid cycle deliberate practice; Medical students

Introduction

Over the decades, there has been much changes and evolution to the model of teaching and learning in Medicine. From the teacher being 'the sage on the stage', it is now very much a learner-centric focus, with adult learning approaches [1,2]. Even as the principle of 'apprenticeship training in medicine' is still applicable, its mode of execution has changed from the days of old [3,4]. Variations of models such as direct observation, simulation-based learning, flipped classroom model, immersive learning and hybrid models of learning are amongst some that are being utilized currently, either singly or in combination [5,6]. With challenges such as the COVID 19 pandemic, more technology-driven, virtual and remote models are also evolving rapidly. These are often used as preliminary training before the face to face components of training practice can be executed at a suitable time [6-9].

Simulation-Based Education (SBE) represents an instructional technique that is increasingly used to help trainees safely gain competence without harming patients. It can be used for a spectrum of skills training such as procedural skills, communications, and inter-professional team case management. With SBE, it is about suspension of disbelief, deliberate and repetitive practice in order to achieve mastery. To date, there is no 'gold standard' on the best technique to teach procedural and practical skills, but simulation does offer an immersive, experiential educational exposure that, when coupled with other aspects of learning (such as prior reading on the procedure, didactic sessions, watching videos or observing faculty perform the procedure), integrates the whole educational journey [10-12]. Performing procedural skills is fundamental to medical practice. Thus, when competency-based training is planned, there must be the capability for transfer of the acquired simulated skills to the real life situation with actual patients. Trainees and learners know that during simulation, they can stop at any time, repeat and redo the procedures, until they are familiar with the micro-steps involved [10,12]. The same principles apply when running simulated scenarios and codes. With traditional simulation-based learning, most of the feedback and performance frames

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are usually discussed at the end of the session during 'debrief'. This is also known as "terminal debrief" [13-16]. Another mode of debriefing which is also used is "within simulation debrief". This refers to the micro-debriefing which takes place during certain customized stages of the simulation event or activity [17,18].

Rapid Cycle Deliberate Practice with Micro-Debrief

Deliberate Practice (DP) refers to individualized training activities specifically designed by a faculty, supervisor or coach to improve certain aspects of performance through repetition and successive refinements. The prerequisite is that individual learners would have to monitor their performance, skill and understanding with concentration, effort and commitment [12]. DP is utilized in a significant proportion of simulation based learning. The learner learns most during debriefing sessions, which is traditionally conducted at the end of the simulation scenario or activity. Learners are led through 'reflection-on-action' by the faculty [13,14]. Debriefing is an important strategy in improving performance. It is central to learning during SBE. It can also be applied to real life, day-to-day situations, where debriefing can be conducted after handling resuscitations or challenging cases. The dialogue between two persons, or more, during debriefing explores and discussed the thought processes and action involved in the simulation activity, identifying what went well and what did not. It will also help determine opportunities for improvement, whether at the individual or team levels [12,14,17,18].

With Rapid Cycle Deliberate Practice (RCDP), the debriefing is conducted in several steps and at the strategic points throughout the simulated activity. These 'micro-debrief' stops are conducted with sharing of 'bite size' inputs and information, demonstrating certain skills as needed and providing incremental inputs with each debrief stop. The process is done systematically for learners to understand and assimilate the relevant information [19-21]. Some studies have shown this is superior to the traditional method of terminal debrief [22-26]. This appears to be especially so for skills acquisition. RCDP is planned so that the learner can be exposed to handle a wide range of difficulty of the procedure, can vary their practice time accordingly and customize their own learning strategies to maximally benefit. The repetitive part of doing this can help create muscle memory, each time it is done [19,21, 25,26]. There is faculty or expert feedback at each of these micro-debrief sessions and dual-direction interaction is possible, such that any clarifications can also be done at these points. The learners' perspectives are also heard and explored as needed. They will have the opportunity to repeat their performance after the feedback or micro-debrief has been shared. These subsequent steps and performance provides the chance to correct any errors or unacceptable skills, in the rightful way, step by step, with the facilitator observing. For this to be effective, there must be psychological safety amongst the learners, as they are coached by the faculty and facilitators [10,16,27].

Rapid cycle deliberate practice can however, be quite disruptive and may cause some to lose their train of thought as they proceed with the scenario. Some may feel they are interrupted of the continuity of the scenario and may find some challenges to adapt and re-align again, time after time. Understandably, this will take more time to conduct. Whilst some learners feel secure with the faculty being in the room and directing them at multiple strategic points, others may actually prefer to be allowed to proceed. The latter may be the case with more senior learners, who tend to be more independent and

have acquired a certain level of competence. The short and long term impact of rapid cycle deliberate practice with micro-debrief will need to be studied in more detail.

Simulation for Medical Students

Medical students today are exposed to simulation-based training from their first year in medical school. Some examples of these include training with part task trainers, task trainers, standardized patients, hybrid simulation and attending the basic cardiac life support course in the earlier years. Usually, simulation to learn the management of full clinical scenarios are introduced in the later years, in alignment with their various clinical postings at the hospitals and clinics. When students come for their Emergency Medicine (EM) posting, they will be exposed to SBE in the form of skills training as well as clinical scenario management. They will be given an orientation to the simulation laboratory and its capabilities, the high fidelity manikin and its functional demonstration, as well as how simulated scenarios are conducted. This helps enhance their understanding and familiarization with the principle of how higher fidelity simulation scenario is conducted; from pre-briefing to the simulation scenario and the debriefing [9-11,28,29]. Their knowledge armamentarium is also still developing and they are pegged at the novice level of training. In view of this, it was decided that it would be more practical to have micro-debriefs in their simulation training [18,21,25].

Methodology: Preparing for Use of Micro-Debrief in Simulation

Preparation and conceptualization for medical students SBE

In planning the simulation training for our medical students, certain modifications and customization were incorporated:

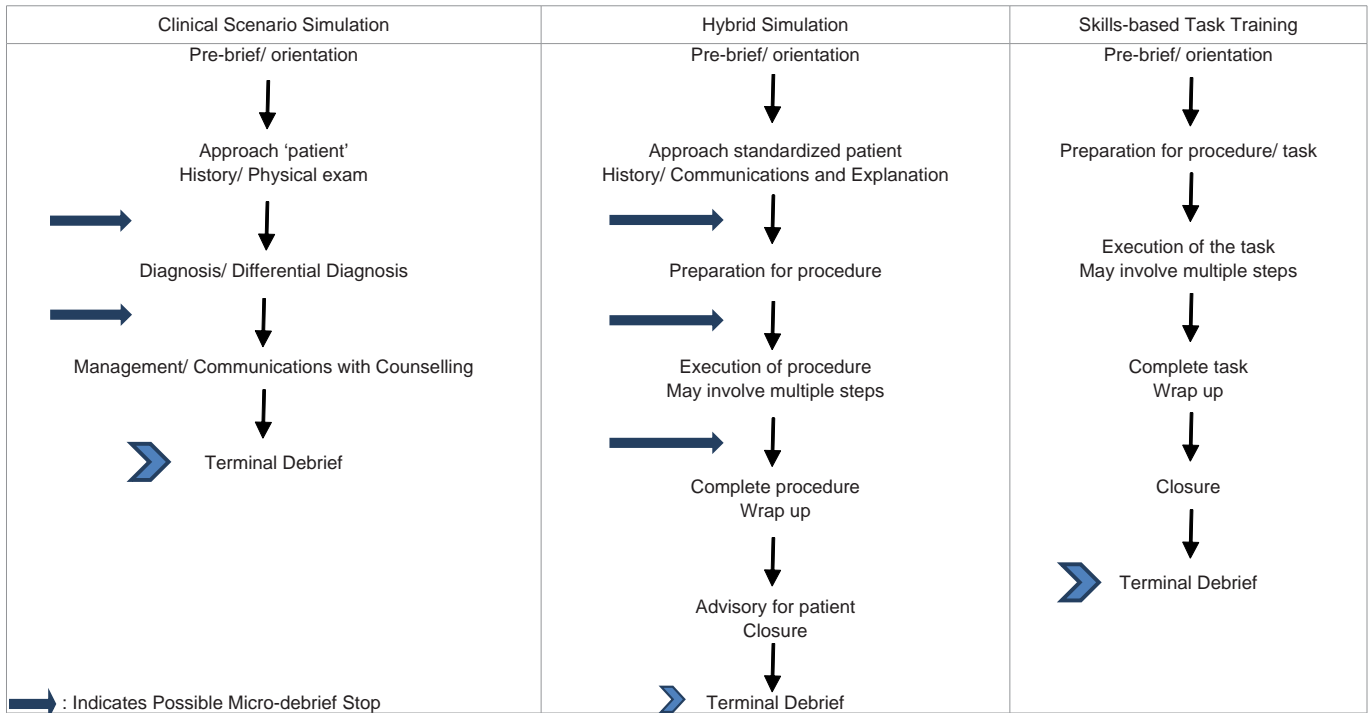
It was important to ensure adequate guided 'touch and feel' pre-brief session and a longer familiarization period in the simulation laboratory with the simulation equipment.

Preparing simpler clinical scenarios first and then gradually introducing more complex elements/ scenarios was useful as a strategy to enable running in and getting used to. The simple clinical scenarios focus on one clinical problem at a time. These would include scenarios to manage acute exacerbation of asthma, managing an end stage renal failure patient with hyperkalemia, handling a patient with acute ST-segment elevation acute myocardial infarction and other one-clinical-problem scenarios. This was done in order not to present cognitive overload thus, allowing time for students to really understand each clinical problem and assimilate their learning. At the same time, for those who were new to simulation, it gave them time to familiarize themselves with the equipment and environment [30-32].

The gradual escalation to more complex scenarios represented the next phase. This is where the students will need to handle more issues in each patient. This introduction will be guided by how they progress with the simpler scenarios. Some groups of students were able to grasp the concepts faster and they can then be exposed to the more complex scenarios earlier. An example of the progression to more complex scenarios would be:

- a. Managing a patient with acute abdomen.
- b. Managing a patient with acute abdomen, with bleeding per rectum and hypotension, responsive to fluid resuscitation.
- c. Managing a patient with acute abdomen, with hematemesis

Table 1: Possible micro-debrief stops during simulation activities and training for medical students. These micro-debrief stops are useful for: 1. Reflecting on the right way of managing or doing a procedure with creation of muscle memory 2. Providing expert/ faculty feedback in real time and 3. Inculcating psychological safety amongst medical students.



and malena, who is hypotensive and has ongoing bleeding, requiring blood products.

Having the faculty in the simulation laboratory or room, together with the students during the scenario is the other modification. In this case, the faculty will be really up close and personally present. They can provide a sense of calm and psychological comfort for the students. In the usual simulation, the faculty would be behind the one-way mirror, observing the performance and making notes for terminal debrief. There is some flexibility here for groups that are more advance and the faculty can move out earlier.

Using micro-debriefing technique instead of terminal debrief may require more practice time and more individualized learning, thus it may be more labor intensive for the faculty. Micro-debrief allows for more distributed practice, with gradual introduction of incremental amounts of information [14,18,21].

Micro-debrief during simulation

The micro-debrief process aims to provide the stimulus to reflection and learning, in a step by step, systematic way and in shorter cycles. This way, the information shared is given in smaller bite-size, which can help to reduce cognitive load, and increase understanding. As such, there may be less rote learning and future regurgitation without understanding [12,16,17,19,22]. The ability to have repetitions and help students learn from mistakes can gradually increase their confidence levels. This is also very useful for skills-based tasks and procedures as the repetitions come with the hands-on practice and the ‘touch-and-feel’ experience [18,19,22,23,27] (Table 1). This helps students with retention as well as assimilation of more complex tasks and processes. As there are multiple steps involved in micro-debriefing, the students and facilitators have more communications, more opportunities to ask questions, make clarifications and interact. This also helps the faculty to know the

students better, get a grasp of their strengths, fears and weaknesses. The students can then eliminate their doubts immediately and not have to wait till the end of the session or at times, even wait for another suitable occasion to ask their questions. The group of students learning together can form stronger bonds and improve their team-based learning and communications. Most importantly, the students can be made to feel at ease and psychologically safe with the facilitator in the learning environment [24,27].

During the simulation scenarios, these micro-debrief stops, are used to share small details and correct practices as needed (Table 1). At times, if these are left to the terminal debrief stage, they are often forgotten and over-shadowed by the bigger tasks and more apparent errors. These smaller stops also have the students take in information in smaller chunks to reduce cognitive fatigue. Terminal debrief is conducted at a time when the students start to ‘switch off’ after some heavy cognitive load during performance of the simulation scenario and they may experience mental fatigue. Terminal debrief does not however, disrupt the flow of the scenario or events in the activity. When students are unsure of how to proceed with certain scenarios, they may reach a stage of uncertainty. With the traditional terminal debriefing method, they may just go on and wait until final debrief to learn the right way to do it. With micro-debrief, they can stop at that stage and be appraised on how to proceed, how many different options they may have at that stage and so on. The unlearning of the erroneous method and then relearning the accurate step happens more immediately, facilitated by the faculty. They then get to re-do the activity with the corrected steps/ action in place. This can be a powerful intervention step [33]. After all, this does follow closely the real-life practices our students and learners are subjected to, where, they are not left alone to manage patients but the faculty will be alongside them to provide inputs and advice as appropriate. There is also a higher level of psychological safety with the faculty in the same room, guiding them [10,16,33].

Faculty preparation

When there are different faculty involved in the simulation, it will be useful to have a pre-simulation briefing for all to align the facilitators' approach and actions. Even the number of micro-debrief stops can be discussed but there should be some degree of flexibility allowed in view that different groups of students will perform differently. The depth of discussion at each micro-debrief stop may also be discussed. Faculty can come up with the list of important pointers that must be shared but the process may have some differences according to the style each faculty adopts. Thus, the choreographing should not be too rigid, yet still enable some degree of standardization across faculty. Faculty should also be reminded of the difference between debrief and feedback. Feedback is usually a one-way conveyance of inputs to the learner whilst debrief allows for bidirectional discussion, interaction and reflection. Knowing and being aware of this can optimize the micro-debriefing experience for learners [33-35].

In micro-debrief, the usual principles of debriefing applies, for example, debriefing with good judgement, using advocacy inquiry style of questioning, keeping the interactive session cordial, non-judgmental and maintaining emotional and psychological safety of learners [13-16,25,27,28]. Faculty will be able to gauge the ability of the teams/ learners as they move along in the scenarios and customize accordingly [36].

How to choose the stops in micro-debrief

The number of stops for micro-debrief should be just right. Having too few may not make the impact intended, whilst too many can be disruptive and time-consuming. The focus at these stops must be on reflection, coaching, correcting errors and misperceptions, demonstrating the correct actions as well as providing updated information [21,25,34]. Faculty can explore the mental model and clinical reasoning process of the learners and see if they require realignment. In using this approach, it is also possible to ascertain the level of development of clinical reasoning the students possess, whether they are able to apply principles of pattern recognition, whereby they recognize some semblance to previous cases they may have seen or managed [28,29,33,37-42]. It is important to always review the learning objectives to ensure focus.

The following represents some points whereby a "stop" may be required for micro-debrief of the medical students:

Inability to proceed on the right track as required, perhaps leading to diagnostic errors, premature closure or lack of knowledge.

Disorganized, haphazard or not systematic in approach.

Fixation errors.

Errors of omission (not doing something that should be done or not including something that should have been included).

Errors of commission (performs an incorrect or additional step which is irrelevant or even harmful).

Biases eg. Cognitive bias, anchoring, tunnel vision.

Other factors, as deemed necessary by the supervising faculty.

Other Applications of Micro Debrief

Micro debrief can be customized for use in several other context. It can be used in computer-based simulation. This is simulation done without direct face-to-face contact but on a virtual platform. With this

type of simulation, there must be a greater amount of time allocate for instructions and pre-briefing to ensure clarity. This is especially so because participants and faculty are not together in the same space. Thus, as the scenario is being rolled out and the 'patient' managed by the participants playing their assigned roles, stops to perform micro debrief for the students will be very useful for learning to take place in segmented phases [43,44].

In cases or scenarios using Standardized Patients (SP), it is also possible to apply the micro debrief model. The SPs must be given adequate pre-briefing. They must be appraised that they may be required to re-play the scenario several times if RCDP is being applied as well. It will also be helpful to give them sufficient time and hand over the scripts early for their familiarization. During the micro debrief stops, the SPs can also be called upon to provide inputs and share their perspectives. This can be helpful to the students, as it is similar to getting 'feedback' from an actual patient [45].

For communications training, these micro debrief stops can be very useful to help direct or align the trajectory of the conversation. In these 'cases', the students may be 'communicating' with SPs or virtually, with avatars. A wide variety of communications scenarios can be written, such as breaking bad news, informing death, calming anxious relatives, informing a patient of a serious illness or other scenarios. Micro debrief will allow for breaks at strategic points to highlight, share and expand on certain aspects of the content, or even just as a 'pause-stop' to pace the conversation. This is applicable both virtually or in a face-to-face training [46-48].

Conclusion

Learning involves a change in capabilities of a student to be able to perform a skill or task, understand a topic or mount an appropriate behavioural response in education. All these can be achieved *via* various methodologies, including simulation-based learning. The immersive environment offering experiential learning and repetitive practice is conducive. Micro-debrief, used in the context of RCDP offers an option to reinforce and strengthen learning and clinical reasoning for medical students.

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