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Simulation- based education – how to get started

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Abstract

Simulation-based education (SBE) has a long history in medical education. SBE is now widely used to train individuals and teams in technical as well as social and cognitive skills. Much of the simulation literature is developed in well-resourced universities and hospitals with a dedicated simulation center, staff, consumables, and other assets. Looking at simulation from a global viewpoint, simulation centers are very hard to establish since the opportunity cost of investing in simulators, mannequins, equipment, a physical space and staff to run the center, is high. There also exists other barriers, for example time and training opportunities needed to develop expertise amongst simulation educators in the institution. Understanding that fidelity is not equal to benefit and that scenarios can be conducted in actual clinical settings, such as using in-situ simulation, rather than specialist simulation facilities, can help anesthesiologists begin to train using simulation without the need for significant financial investment. We provide practical tips for getting started with SBE and argue that the most important investment is in faculty development and engagement of the team. We also discuss the impact of the COVID-19 pandemic in necessitating the simulation world to be creative and develop new ways to train, for example through remote simulation.

Key words: simulation, SBE, patient safety, anesthesia education, education, medical education, low cost simulation, insitu simulation, faculty development

INTRODUCTION

Although simulation-based education (SBE) has grown in its use in medical education over recent decades, its history can be traced back for centuries, for example using task trainers to practice skills. SBE has been adapted by anesthesia to incorporate opportunity for critical incident training as well as non-technical skills, partly pioneered by Dr. David Gaba at Stanford University, who developed techniques to use a mannequin in the operating room to train teams in handling critical situations that could develop in real life[1]. Inspired by human factors training in aviation, this led to the development of the anesthesia crisis resource management concept[2], which has since been refined and spread to other specialties and settings[3]. Over the years, his team developed the first advanced anesthesia simulator but emphasized that simulation is an education technique and not a technology.

From its first clinical scenarios to the present day, using SBE in this way has revolutionized medical education, including in undergraduate, postgraduate, continuing medical education and multidisciplinary learning. SBE is now widely used to train individuals and teams in technical skills (such as airway management) as well as social and cognitive skills[4,5].

For the purpose of this paper, we define simulation as an educational activity intending to replicate a clinical scenario, partly by using a task-trainer, a mannequin or a simulator, or a patient or an actor. We propose that effective SBE requires:

- An intended focus (for example skill training, application of knowledge and skills, non-technical skills and/or assessment)
- A learning environment (a simulation center or a clinical setting)
- A method or way to recreate a real-life situation (for example a task trainer, a patient, a virtual simulator)
- Trained simulation facilitators

In this paper we intend to discuss each of these in turn.

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What can SBE be used for?
(The intended focus)

SBE enables practice and analysis and evaluation of knowledge, skills and attitudes in real time, without putting patients at risk[6]. As a learning technique it has roots in experiential learning, and can be explained through Kolb's cycle[7] (figure 1). Applying this to SBE, participants have a concrete experience (a learning activity using SBE) followed by an opportunity for reflection (debriefing or feedback). Following this they are able to adapt existing or develop new concepts. They later develop these concepts further by testing them in new situations, either in real life or further SBE.

SBE can be used in multiple areas of anesthetic training (table one). Task trainers have been used for basic and advanced airway management, central line insertion, and regional anesthesia from spinal to specific nerve or plexus blocks[7–9]. Scenarios used to apply knowledge, practical skills and train in decision making (for example in management of the difficult airway), are now embedded in many specialist training programs[10]. It is also frequently used to train teams for example resuscitation, trauma, obstetric and pediatric teams. Simulation training is also important in teaching human factors such as leadership, communication, situational awareness and collaboration[11]. Additionally, SBE is used to train in the use of new technologies like anesthesia machines, infusion pumps or airway devices[12].

SBE can also be used for assessing competencies and decision making in anesthesia, for example in objective structured clinical examinations (OSCEs).

Simulation is also used for organizational learning including analyzing systems to identify latent errors, removing threats and developing patient safety[13], for example using translational or sequential simulation. In these types of simulation, patients or actors may be involved in the scenario and can contribute their feedback in addition to healthcare team members[14]. During the COVID-19 pandemic, the use of simulation has been reported on for preparing staff and analyzing techniques and workflow in organizations[15].

Where can SBE take place?
(The learning environment)

Much of the simulation literature comes from well-resourced universities and hospitals that have a dedicated simulation center, staff, consumables, and other assets[16]. However, considering this globally, simulation centers are very hard to establish due to economical, resource and staff challenges, even though we know that in many cases there is no difference in learning when comparing high-fidelity with low-fidelity equipment[17]. Because of high-cost believed to be associated with SBE, the reality in low- and middle-income countries (LMIC) is that simulation is seen as a luxury and not a necessity. If we know that simulation ensures safer practices[18], we have to find a way to bring this to all those who practice anesthesiology[19].

We argue that the focus should be on creating an appropriate simulation learning environment, not an expensive center equipped with high-fidelity equipment. By starting small scale and not requiring expensive equipment, you get to know the need of your learners and can develop training programs using low-tech tools and with low costs.

Scenarios can instead be run in clinical settings with the equipment being taken into departments and therefore training in the learners´ own environment (in-situ)[20]. In-situ simulation has proven to be less expensive than having a dedicated simulation center, realistic since it runs in the actual clinical setting, and can be used to analyze not only individual and team performance, but also the systems where clinical situations take place[13,21,22].

Another way to start to implement SBE in a cost-effective manner is to start with practical skill training, for example using task trainers, or scenario training using low-tech equipment.

National roll-out of specific courses, where simulation equipment and instructors are taken to places that do not have a simulation center thereby enabling those staff to participate, has also been used successfully[23,24]. A good example of this concept is the SAFE® anesthesia courses (https://safe-anaesthesia.org). These have the

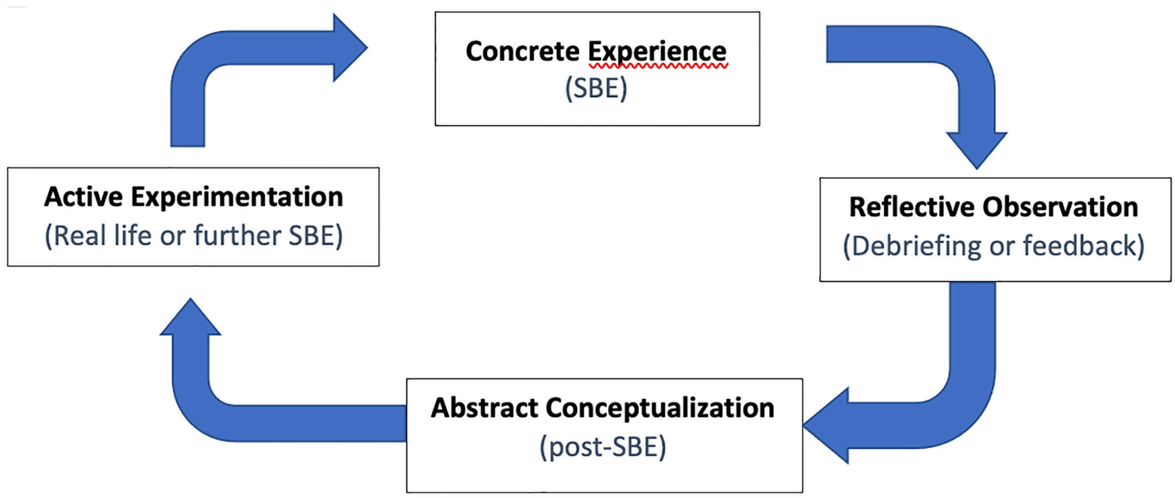


Figure 1: Kolb's cycle of experiential learning and its representation in simulation.

advantage that with one investment in the equipment, many people in multiple hospitals can be trained. Although this enables a wide reach, a disadvantage is that after the course is over, simulation education culture is unlikely to continue at that center without further visits.

Another important strategy to improve cost-effectiveness is to use SBE only for training that would benefit from this teaching technique, for example practical skills, teamworking and human factors training. Training requirements that can be taught effectively using other less resource-intensive means should be taught instead using those activities, leaving the resources and simulation teaching capacity for learning objectives that are best taught through SBE.

How can we recreate a real-life situation?

(The ways or forms)

In agreement with other authors, we find that it is beneficial to use low-tech equipment whenever possible, because this is likely to achieve the same learning objectives without the high-cost, limited session time, or problems with technology distracting from the learning opportunity[25]. A trained simulation facilitator and low-cost methods can compensate for the signs and symptoms that a low-tech simulator cannot provide.

Simulation societies such as the Society for Simulation in Healthcare (SSH), the Latin American Federation for Simulation in Healthcare (FLASIC) and the Society in Europe for Simulation Applied to Medicine (SESAM) are using workshops and online publications to promote innovation and creativity, and to help people interested in bringing simulation to their centers to develop models and ways to perform simulation at a lower cost with more achievable goals. This helps bring what was once a rare and innovative teaching tool into modern medical education in a variety of settings. This, in combination with technologies such as 3D-printing, locally produced models, the use of various materials such as resins, foams and silicones, mobile and web applications to mimic patient monitors, and the use of colleagues and friends as actors, have enabled simulation to come closer to the people[26].

The question of fidelity

The importance of fidelity has been widely explored[25]. In order to better understand the potential that exists when using low-cost tools, it is necessary to understand "realism" as a concept, since simulation by definition is the representation of a real situation.

Perception of reality happens in participants' minds, so is a subjective experience. Fidelity in simulation, in contrast, is referred to as the similarity of simulation with real life. Therefore, realism happens in the participants' minds, and fidelity in the real world.

According to Peter Dieckmann we can think of realism in three modes: the physical, the semantic and the phenomenal[27]. Physical realism is referred to as the similarities that the simulated object has in relation to the real world, for example in a scenario you can use an actual laryngoscope in order to intubate with a real endotracheal tube increasing realism. Despite this however, the plastic mannequin, the dryness of the mouth and the feeling of the laryngoscopy might not be as in real life, therefore limiting physical realism.

Semantic realism is referred as "the portions of the world that are facts only by human agreement" similar to the idea that when A occurs, it will be followed by B[27]. So, for example "if the patient bleeds then blood pressure will decrease" or another example "if I give propofol, then the patient will fall asleep". The more experience the learner has, the more they might demand of semantic realism[27].

Phenomenal realism includes emotions, beliefs and self-awareness. Studies have reported a similar state of emotion during a simulated scenario compared with real life[28]. Living the experience of a simulated scenario generates emotions because of the scenario as well as due to being observed and experiencing a complex clinical situation to solve. Finally, phenomenal realism also concerns the understanding of the phenomena, meaning the participant relates the educational experience to one that will be useful in clinical settings.

These concepts suggest that physical likeliness to real life is not the only factor involved in learning from simulation. Surgeons have known this for a long time now, using basic boxes with cameras and tasks that physically do not look like an organ but that with deliberate practice, help the learner gain an understanding of which skills are needed to perform a laparoscopic procedure[29]. Following this, the next level of training can be conducted on more advanced surgical simulators. Similar to this, in anesthesia simple airway models can be used for learning how to handle the fiberscope for example[30], which can then be followed by practical skills training on more advanced simulators and later on, scenario-based team training. These illustrate examples of training in the basic skills first using relatively low-fidelity, and thereafter higher fidelity options as available.

Fidelity is context-bound and if both facilitators and learners buy in into the scenario in mutual agreement, there is unlikely to be a need for replicating the exact physical characteristics of the real world to achieve the learning objectives[25].

Although we believe that low-fidelity simulation does not limit learning, it may be that the more real the simulation is perceived, the more engaging the learners find the session. Knowing that learner's enjoy realism and that this often comes with increased cost, in situ simulation (for example in the actual operating room) meets multiple needs. Depending on the learning objectives of the scenario and skills to be taught, low-fidelity can be used, for example a full-size or smaller mannequin, a task trainer such as an intubation head (figure 1c) using pillows, a clinical gown and surgical drapes to give the form of a patient, or even a colleague acting. Although fidelity can be low in these methods, the use of the real clinical environment often means realism and engagement may be high.

One risk of in situ simulation documented in the literature is that of expired or unreal medications being taken into the clinical environment for the scenario, then later being mistakenly used after the training on a real patient. It is essential that efforts to check the clinical environment is safe for patient use again after the training are undertaken, and we would recommend never taking training drugs into the clinical environment in order to avoid this risk[23,27].

Information given to the learner about the patient, for example a patient chart or from an embedded simulation participant (for example other faculty or actors) can also help fidelity. A low-cost monitor using a tablet, a smartphone and apps that you can download from the common app stores is also useful, for example the SimMon® app (https://simmon-app.com/). We can also increase fidelity by using low cost methods to represent clinical signs, for example bleeding or rashes (www.opensourcesim.com).

The development of low- tech equipment and the combination with simple guidelines

In many LMIC, basic simulation-based training has been successfully introduced. One example is the Helping Babies Breathe (HBB) project (figure two), with the aim of saving newborn lives. Firstly, a simple guideline to be used to assess the condition of the newborn baby was developed followed by a simple newborn task trainer to train basic skills such as assessment of breathing and heart rate, mask ventilation and suction of the airway. One cause of the success of this project, is that the cost of the training equipment is relatively low.

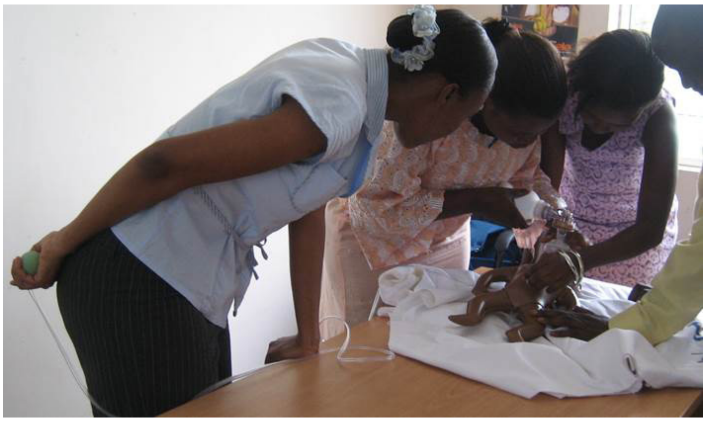
In a cascade model, local facilitators were trained to use the simulator and training tools to teach other colleagues. In a pre-post design large-scale study in Tanzania with observations of more than 6000 deliveries, a 48% reduction in neonatal mortality was demonstrated within the first 24 hours[30]. Factors contributing to this implementation being successful include involvement of all levels of leadership and the multidisciplinary team including government, hospital leaders, midwives and the doctors' association. Last but not the least, the availability and ease of procuring the low-cost equipment was essential[30].

The HBB concept is now available in 77 countries and it has been followed by Helping Mothers Survive, where learners learn safe delivery techniques, removal of the placenta and injection of medications to stop excessive bleeding. Several other programs have been developed based on low-tech solutions directed towards the learners need with successful results also[23], suggesting again that high-fidelity and cost are not requirements for learning.

Competent Facilitators and Staff

As mentioned previously, skilled facilitators are the most important element in SBE. Our recommendation is that this is more valuable than high-tech equipment. A good facilitator can establish a safe learning environment and guide the learners through the scenario by providing the necessary information, especially the signs and symptoms that the simulator cannot give. The facilitator should lead the debriefing session addressing the learning objectives, making room for all learners to join the discussion, and end the session with an application phase where learners can set their own goals and future learning objectives for other scenarios and their clinical practice. In addition, a trained facilitator is important to ensure that debriefing and feedback takes place in a safe learning environment and that psychological safety is maintained.

In most centers, facilitator training courses are run over at least 3-days enabling time to develop experience and get feedback from more experienced facilitators, but combinations of shorter courses and mentoring is also possible. The facilitators are often motivated learners who enjoy and can see the benefit of discussion with peers and reflection for learning.



The World Federation of Societies of Anesthesiologists endorses two courses that teach the basics of simulation. Vital Anesthesia Simulation Training (https://vastcourse.org/) is a short course designed to initiate simulation in LMIC centers and has a train-the-trainers component. Inspire Through Clinical Teaching (https://inspirecourse.com/) is another course that teaches practical teaching skills and includes a full day on simulation-based medical education.

Simulation in the pandemic

Because of concerns of infection transmission to healthcare workers during training, remote methods of simulation training have grown during the COVID-19 pandemic, for example "tele-simulation"[31].

Even though tele-simulation is not new, it has gained presence this last year. In this modality, participants, simulation operators and facilitators are located remotely, interacting on a web communication platform such as zoom®. Some examples of how tele-simulation is performed are:

- Live feed from a simulation center - In some cases, actors can be present in a simulation center interacting virtually with the learners who manage the situation remotely.
- Screening a vital signs monitor - During the virtual session a monitor is shown on the screen and a scenario is presented by a facilitator. Learners will share what they are thinking and suggest actions.
- Use of specific virtual simulation platforms - Simulation companies have developed robust platforms that integrate a virtual patient, a monitor and even an anesthesia machine, for learners to experience diagnosis and decision making.

Even though it is not the same as face-to-face simulation training where learners can interact with the mannequin in a physical space and teams can learn together, both increase in knowledge and participant engagement has been demonstrated in tele-simulation[32]. Even though some discussion can be had about whether this is truly SBE or not, we believe this is a promising educational technique that could be engaging and used well during the pandemic and after, for example by bringing this education technique to remote areas.

Another model for remote simulation has asked learners to practice a skill, such as intubation or proper donning, and then video record it and upload it to a specific website where experienced staff provide feedback. After receiving this feedback learners practiced again and sent back another video for review. Using this model, studies have demonstrated that learners acquired competence. Although this has also been introduced because of COVID-19, it may have a future use in order to bring simulation into more remote settings[33].

Facilitator training courses have also changed during the pandemic. Virtual training and mentorship of facilitators has been successfully used, for example the EUSIM course (https://eusim.org/) or the Harvard Center for Medical Simulation online instructor training course (https://harvardmedsim.org/course-type/online-instructor-training/).

Conclusion

SBE has proven to be useful in anesthesia practice. Even though sometimes it is seen as a luxury, there can be affordable ways to bring it to places where capacity and funding might be scarce. Understanding that physical fidelity and expensive mannequins are not always needed to achieve learning objectives, using low-cost simulators, using actors or standardized patients, and running simulations in-situ can be some of the ways to cost-effectively bring SBE to clinics and hospitals around the globe.

Table 1: Uses of simulation with examples relevant to anesthesia

Use	Examples in anesthesia
Skill training	Direct laryngoscopy, fiberoptic bronchoscopy, central line insertion
Knowledge application and decision making	Knowledge concepts applied to a critical situation in the operating theatre such as anaphylaxis
Human Factors training	Leadership, communication, situational awareness
Learning new technologies	Use of new infusion pumps or a new video laryngoscope
Assessment	Either formative assessment during training or summative assessment such as towards certification
Organizational learning	Identifying latent errors in a hospital operating room
Sequential simulation	Developing patient pathways in healthcare

References

1. Cooper JB, Taqueti VR. A brief history of the development of mannequin simulators for clinical education and training. Qual Saf Heal Care. 2008;13(suppl 1):i11. doi:10.1136/qshc.2004.009886
2. Holzman RS, Cooper JB, Gaba DM, Philip JH, Small SD, Feinstem D. Anesthesia crisis resource management: Real-life simulation training in operating room crises. J Clin Anesth. 2004;7(8):675-687. doi:10.1016/0952-8180(95)00146-8
3. Gaba DM, Fish KJ, Howard SK, Burden A. Crisis Management in Anesthesiology. Elsevier Health Sciences; 2014. http://books.google.com.mx/books/content id=XXtYBAAAQBAJ&printsec=frontcover&img=1&zoom=1&edge=curl&sour =gbs_api
4. LeBlanc VR. Review article: Simulation in anesthesia: state of the science and looking forward. *Can J Anesthesia J Can D'anesthésie*. 2012; **59(2)**:193-202. doi:10.1007/s12630-011-9638-8
5. Cook DA, Hatala R, Brydges R, et al. Technology-Enhanced Simulation for Health Professions Education: A Systematic Review and Meta-analysis. Jama. 2011;306(9):978-988. doi:10.1001/jama.2011.1234
6. Ziv A, Wolpe MPR, Small PSD, Glick S. Simulation-Based Medical Education: An Ethical Imperative. *Simulation in healthcare*. 2006; **1(4)**:252-256.
7. Barsuk JH, Cohen ER, Feinglass J, McGaghie WC, Wayne DB. Use of Simulation Based Education to Reduce Catheter-Related Bloodstream Infections. Arch Intern Med. 2009;169(15):1420-1423. doi:10.1001/archinternmed.2009.215
8. Barsuk JH, Cohen ER, McGaghie WC, Wayne DB. Long-Term Retention of Central Venous Catheter Insertion Skills After Simulation-Based Mastery Learning. Acad Med. 2010;85(10):S9-S12. doi:10.1097/acm.0b013e3181ed436c
9. Morgan PJ, Cleave, Hogg D, DeSousa S, Tarshis J. High-fidelity patient simulation: validation of performance checklists. Bja Br J Anaesth. 2004;92(3):388-392. doi:10.1093/bja/aeh081
10. Rewers M, Østergaard D. The evolution of a national, advanced airway management simulation-based course for anaesthesia trainees. Eur J Anaesth. 2021;38(2):138-145. doi:10.1097/eja.0000000000001268
11. Wayne DB, Didwania A, Feinglass J, Fudala MJ, Barsuk JH, McGaghie WC. Simulation-Based Education Improves Quality of Care During Cardiac Arrest Team Responses at an Academic Teaching Hospital A Case-Control Study. Chest. 2008;133(1):56-61. doi:10.1378/chest.07-0131
12. Gaba DM. The future vision of simulation in health care. Qual Saf Heal Care. 2004;13(suppl 1):i2. doi:10.1136/qshc.2004.009878
13. Long JA, Webster CS, Holliday T, Torrie J, Weller JM. Latent Safety Threats and Countermeasures in the Operating Theater: A National In Situ Simulation Based Observational Study. Simul Healthc J Soc Simul Healthc. 2021;Publish Ahead of Print:1-7. doi:10.1097/sih.0000000000000547
14. Weldon SM, Ralhan S, Paice E, Kneebone R, Bello F. Sequential Simulation (SqS): an innovative approach to educating GP receptionists about integrated care via a patient journey – a mixed methods approach. Bmc Fam Pract. 2015;16(1):109. doi:10.1186/s12875-015-0327-5
15. Espino-Núñez S, Trejo-González R, Díaz-Hernández AE, Rubio-Martínez R. Aprendizaje de una simulación: paciente COVID-19 positivo para cirugía de urgencia. Revista Mexicana De Anestesiología. 2020;43(2):83-85. doi:10.35366/92876
16. Walsh C, Lydon S, Byrne D, Madden C, Fox S, O'Connor P. The 100 Most Cited Articles on Healthcare Simulation. Simul Healthc J Soc Simul Healthc. 2018;13(3):211-220. doi:10.1097/sih.0000000000000293
17. Norman G, Dore K, Grierson L. The minimal relationship between simulation fidelity and transfer of learning. Med Educ. 2012;46(7):636-647. doi:10.1111/j.1365-2923.2012.04243.x
18. Cumin D, Boyd MJ, Webster CS, Weller JM. A Systematic Review of Simulation for Multidisciplinary Team Training in Operating Rooms. Simul Healthc J Soc Simul Healthc. 2013;8(3):171-179. doi:10.1097/sih.0b013e31827e2f4c
19. Turkot O, Banks MC, Lee SW, et al. A Review of Anesthesia Simulation in Low Income Countries. Curr Anesthesiol Reports. 2019;9(1):1-9. doi:10.1007/s40140-019-00305-4
20. Møller TP, Østergaard D, Lippert A. Facts and fiction – Training in centres or in situ. *Trends Anaesth Critical Care*. 2021; **2(4**):174-179. doi:10.1016/j tacc.2012.03.006
21. Lois FJ, Pospiech AL, Dyck MJV, Anaesthesiol DKA, 2014. Is the "in situ" simulation for teaching anesthesia residents a lower cost, feasible and satisfying alternative to simulation center ? A 24 months prospective observational study in a university hospital". Acta Anaesth Belg. 2014;65(2):61-71. https:/ core.ac.uk/download/pdf/34096458.pdf
22. Patterson MD, Blike GT, Nadkarni VM. In Situ Simulation: Challenges and Results. In: Advances in Patient Safety: New Directions and Alternative Approaches (Vol. 3: Performance and Tools). Advances in Patient Safety: New Directions and Alternative Approaches (Vol. 3: Performance and Tools). Advances in Patient Safety: New Directions and Alternative Approaches (Vol. 3: Performance and Tools); 2008. https://www.ncbi.nlm.nih.gov/books NBK43682/

23. Nader M, Tasdelen-Teker G, DeStephens AJ, et al. Simulation Use in Outreach Setting: A Novel Approach to Building Sustainability. Simul Healthc J Soc Simul Healthc. 2021;Publish Ahead of Print. doi:10.1097/sih.0000000000000555

24. Seethamraju RR, Stone KP, Shepherd M. Factors Affecting Implementation of Simulation-Based Education After Faculty Training in a Low-Resource Setting. Simul Healthc J Soc Simul Healthc. 2021;Publish Ahead of Print:1-9. doi:10.1097 sih.0000000000000549

25. Schoenherr JR, Hamstra SJ. Beyond Fidelity. Simul Healthc J Soc Simul Healthc. 2017;12(2):117-123. doi:10.1097/sih.0000000000000226

26. Mooney JJ, Sarwani N, Coleman ML, Fotos JS. Evaluation of Three-Dimensional Printed Materials for Simulation by Computed Tomography and Ultrasound Imaging. *Simul Healthc J Soc Simul Healthc*. 2017; **12(3)**:182-188. doi:10.1097 sih.0000000000000217

27. Dieckmann P, Gaba D, Rall M. Deepening the Theoretical Foundations of Patient Simulation as Social Practice. Simul Healthc J Soc Simul Healthc. 2007;2(3):183 193. doi:10.1097/sih.0b013e3180f637f5

28. LeBlanc VR, Regehr C, Tavares W, Scott AK, MacDonald R, King K. The Impact of Stress on Paramedic Performance During Simulated Critical Events. *Prehospital Disaster Medicine*. 2012; **27(4)**: 369-374. doi:10.1017 s1049023x12001021

29. Kiely DJ, Stephanson K, Ross S. Assessing Image Quality of Low-Cost Laparoscopic Box Trainers: Options for Residents Training at Home. *Simul Healthc J Soc Simul Healthc*. 2011; **6(5)**: 292-298. doi:10.1097 sih.0b013e31821cdb68

30. Ersdal HL, Singhal N, Msemo G, et al. Successful implementation of Helping Babies Survive and Helping Mothers Survive programs—An Utstein formula for newborn and maternal survival. Plos One. 2017;12(6):e0178073. doi:10.1371/ journal.pone.0178073

31. Díaz-Guio DA, Ríos-Barrientos E, Santillán-Roldan PA, et al. Online-synchronized clinical simulation: an efficient teaching-learning option for the COVID-19 pandemic time and: beyond. Adv Simul. 2021;6(1):30. doi:10.1186/s41077-021-00183-z

32. Patel SM, Miller CR, Schiavi A, Toy S, Schwengel DA. The sim must go on: adapting resident education to the COVID-19 pandemic using telesimulation. Adv Simul. 2020;5(1):26. doi:10.1186/s41077-020-00146-w

33. Vera M, Kattan E, Cerda T, et al. Implementation of Distance-Based Simulation Training Programs for Healthcare Professionals: Breaking Barriers During COVID-19 Pandemic. Simul Healthc J Soc Simul Healthc. 2021;Publish Ahead of Print:1-6. doi:10.1097/sih.0000000000000550