EEDUSIM
training in hEalthcare EDUcation with SIMulation

Erasmus+

training in hEalthcare EDUcatIon with SIMulation

EEDUSIM PROJECT HANDBOOK

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INTRODUCTION

Dear reader, welcome to this handbook!
This publication embodies the results of the EEDUSIM project, a two-year ERASMUS+ partnership cooperation project aimed to foster the adoption of simulation in healthcare education.

Simulation is a powerful educational tool that allows students to experience procedures and situations that they will encounter in their future professional life from the safety of a learning environment that is built to foster the acquisition and the practice of technical and soft skills without exposing students and patients to physical and psychological risks.
Although the use of simulation in healthcare education is not a novelty, it is still largely underused due to resource constraints and lack of knowledge: on one hand educators still ignore the full potential of this tool and tend to resort to standard and traditional teaching methods, on the other hand the use of simulation requires costly investments that are not always possible.

This handbook is the contribution that the participants to the EEDUSIM project, training in hEalthcare EDUcation with SIMulation, made with passion to try to address this situation by 1) creating a course that improves the competences of the educators, teaching them how to implement simulation in a healthcare education curriculum and 2) creating and making available course materials that will help educators in delivering such a course or crafting their own course to successfully educate new facilitators and spread the adoption of this important training methodology.

What is this?

This handbook comprises two sections: theory and practice.
The theory section contains all that we believe is necessary to learn to become a successful facilitator. The section is divided into 8 units, covering all the basics aspects of using simulation, from Unit 1 - Essential Elements of Clinical Simulation to Unit 8 - Running a Simulation Center

The practice section contains materials that can be used to deliver a training course to train educators. It is the result of the actual delivery of two pilot courses attended by 25 students each. It details the program, the activities and the contents used.

Who is this for?

The course contents provide all the basic knowledge needed to become a facilitator, an educator that uses simulation to train technical and soft skills in healthcare.

The course, however, is intended to be used by experienced educators to train inexperienced personnel to a basic level. The materials and the references in this handbook can be used to deliver a 5-days or 7-days basic training course following the programs in the “practice” section, or can be used to craft a personalized course, by using a selection of the materials or extending them with other resources.

The EEDUSIM project

The EEDUSIM project, training in hEalthcare EDUcation with SIMulation is a two-year long project funded under the Partnership Cooperation action of the ERASMUS+ Programme, Project number 2022-1-IT02-KA220-HED-000088870.

The project team included 3 HEIs (Higher Education Institution), 1 Industrial Partner and 2 Associated Partners.
The three HEIs were the University of Padova, Italy, the Ludwig Maximilian University of Munich, Germany (Ludwig-Maximilians Universitaet) and the Emil Palade University of Tirgu Mures, Romania (Universitatea de Medicina, Farmacie, Stinte si Tehnologie George Emil Palade din Tirgu Mures. The spanish company Metamedicsvr was the industrial partner and CESI in Lugano, Switzerland and SESAM, the European society of simulation in medicine, were associated partners.
The project was coordinated by the Department of Medicine of the University of Padova.

The project started in September 2022, and after one year of designing and crafting the course materials, these have been reviewed by a panel of external experts and then revised.
In 2024, with the improved contents ready, the project delivered its first pilot course, to put to test the whole course. The course opened in January 2024 with an online part covering the theory and a practical part in Padova, from Sunday the 18th to Sunday the 25th.
A second pilot course started in August 2024, with the practical part done in Lugano, from Monday the 9th to Friday the 14th. After the completion of each pilot course, we collected feedback both from the trainees and the trainers and all we revised all the contents accordingly, to finally produce the version of the course embodied in this handbook.
The course with all the contents and all the materials used are now EU Open Educational Content and have been made freely available online for anyone, like you, who wants to put them to good use.

Acknowledgements

The course, this handbook, and in general the whole project, are the result of the work of many people. We would like to thank all those who contributed to the project in different ways and shared with us these two years of challenges, efforts and satisfactions. Among all of them, we would like to thank some people in particular, for their special contribution and commitment to the project. You can find their names here, in alphabetical order:

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Turucz Emilia

Narrators
The theoretical part of the course is covered by video lessons recorded by the team members. Despite the production of those video was a collaborative effort, here we want to mention those who narrated the videos:

Beatriz Zambrano
Cristian Boeriu
Giulia Mormando
Marc Lazarovici
Sandro Savino

The course materials have been reviewed by a panel of external experts. We would like to thank them for their important contribution to elevating the quality of our work. These are their names, in alphabetical order:

Carla Sa Couto
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Stefan Gisin
Todd Chang

Project Partners

THEORY

Dear students, welcome to the first part of the course designed by the EEDUSIM Project.

In this first part of the course, you will learn all the theoretical background that you need to become a great healthcare educator using simulation.

The theoretical part is divided into 8 units, which you will find below. They comprise both pre-recorded lessons, written summaries and reading materials. The units are numbered from 1 to 8, and that's the order that we suggest following.

UNIT 1 - Essential Elements of Clinical Simulation

This unit delves into the fundamental components and key principles that form the backbone of clinical simulation in healthcare education.

UNIT 2 - The different simulation modalities

Many frameworks have been proposed to describe the different modalities in which simulation in healthcare can take place; starting from the work by Chiniara et al, in this unit you will learn about procedural training, high and low fidelity simulations and the use of new technologies such as Augmented and Virtual Reality.

UNIT 3 - Scenario Design in Simulation

Designing a simulation scenario is a complex activity whose result can directly influence the outcomes of the simulation. Deciding what should happen during a simulation should take into consideration many aspects, the first being the learning objective and the target audience. In this unit we will learn how to properly design a scenario for healthcare education.

UNIT 4 - Basics of Feedback and Debriefing

There is a saying among educators that a simulation is just an excuse to do debriefing. This sentence underlines the central role that debriefing has while using simulation for healthcare education. In this unit you will learn the fundamentals of debriefing.

UNIT 5 - Evaluation Methods in Simulation

Simulation is an educational tool that can be used both for teaching and for assessment. In this unit we will learn how we can use simulation to evaluate the trainees.

UNIT 6 - Simulated/Standardized Patients (SPs)

This unit delves into the use of Simulated/Standardized Patients (SPs) in training, examining the integration of realistic role-playing scenarios to enhance learners' clinical and interpersonal skills.

UNIT 7 - Implementing Simulation in the Curriculum

In this unit, educators learn strategic approaches for seamlessly integrating simulation into the curriculum, covering aspects such as scenario development, resource allocation, and aligning simulation activities with educational objectives.

UNIT 8 - Running a Simulation Center

A simulation center is the home of simulation: it houses the educators, the staff, the equipment and the students and it is the place where simulation (mostly) happens. In this unit we will learn what it means to run a simulation center, which operations take place there and how to manage them.

UNIT 1 - Essential Elements of Clinical Simulation

Welcome to Unit 1 on the Essential Elements of Clinical Simulation. This unit will give you a brief insight into the fundamental components and key principles that form the basis of clinical simulation in healthcare education.

In unit 1 you will gain an insight into the history and role of simulation in healthcare education and the social and cognitive skills related to errors and patient safety. To give you a more practical insight, we have also documented a day of a simulation facilitator in a short video.

Contents

The contents of this unit will be presented as follows:

Presentations:

- Cognitive and Social skills (23 min)
- Role and History of simulation (26 min)

Articles:

- The Future in Simulation in Health Care (Gaba 2004) (Mandatory)
- Medical teamwork and the evolution of safety science (Neuhaus 2019) (Mandatory) File
- A Computer-Controlled Patient Simulator (Denson 1969) (Supplementary)
- 4 Medical error—the third leading cause of death in the US (Makary 2016) (Supplementary)

Other videos:

- A day in the life of a facilitator (12 min)

Bibliography

1. Gaba DM. The future vision of simulation in health care. Qual Saf Health Care. 2004 Oct;13 Suppl 1:i2-10. doi: 10.1136/qhc.13.suppl_1.i2. PMID: 15465951; PMCID: PMC1765792.

2. Neuhaus, C., Lutnæs, D.E. & Bergström, J. Medical teamwork and the evolution of safety science: a critical review. Cogn Tech Work 22, 13–27 (2020). https://doi.org/10.1007/s10111-019-00545-8

3. Denson JS, Abrahamson S. A computer-controlled patient simulator. JAMA. 1969 Apr 21;208(3):504-8. PMID: 5818529.

4. Makary MA, Daniel M. Medical error-the third leading cause of death in the US. BMJ. 2016 May 3;353:i2139. doi: 10.1136/bmj.i2139. PMID: 27143499.

Cognitive and social skills: Errors and patient safety

Narrator

Marc Lazarovici

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Summary

This lesson discusses the importance of cognitive and social skills, in addition to medical knowledge, for avoiding errors and improving patient safety in healthcare settings.

Errors are common in complex systems like healthcare, often occurring not due to lack of knowledge but due to the complexity itself, communication issues, and problems with team management and coordination.

Cognitive and social skills complement medical expertise and are crucial for patient safety. These skills fall under the framework of Crew Resource Management (CRM) and include communication, situational awareness, teamwork, decision making, and leadership abilities.

In the lesson we analyze the successful emergency landing of US Airways Flight 1549 on the Hudson River. Despite both engines failing after a bird strike, effective CRM skills like clear communication between the pilots, seeking inputs from team members, and well-coordinated roles between pilots and cabin crew led to this extremely challenging situation having a good outcome with no fatalities.

This emphasizes that good outcomes require coordinated teamwork rather than just the skills of an individual. In the Flight 1549 case, while the captain's ditching was crucial, the first officer's timely reference materials and the cabin crew's evacuation management were equally vital.

Studies have demonstrated the benefits of CRM/team training in healthcare settings. One study found it reduced severe ICU complications by 30% and avoidable complications overall. Another showed it decreased nursing staff sick leave from 8% to 3% and reduced turnover rates. An organization calculated over a three-year period, team training for 3,000 employees provided a highly positive return on investment.

In conclusion, cognitive/social skills like communication and teamwork, along with medical knowledge, are critical in improving patient safety and dedicated team training on these skills can significantly benefit healthcare organizations.

The role and history of simulation in healthcare education

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Narrator

Marc Lazarovici

Summary

Traditional teaching methods like lectures and bedside teaching, although used for millennia, do have their limitations, where learners may not get sufficient exposure or hands-on experience. Simulation can help overcome these limitations by providing a safe learning environment without risk to real patients.

Simulation has in fact a long history in training, going back to ancient times with devices like acupuncture models in China and birthing simulators used by midwives in 18th century France. Aviation has extensively used simulators for pilot training for decades.

In healthcare, early computer-based simulators emerged in the 1960s for teaching anesthesia procedures. Modern simulation centers now use high-fidelity manikins, virtual reality, augmented reality and sophisticated scenarios to teach everything from basic skills to complex team coordination and crisis management.

Simulation can be used in two different modalities: one is the skill training focused on teaching specific procedures/techniques and the second is team training which emphasizes cognitive skills like communication, situational awareness and decision making within an interprofessional team environment. These two different modalities of simulation can be used to tailor the teaching to different levels of learners - from beginners learning basic maneuvers to advanced specialists practicing crisis management.

To design an effective simulation-based training the key principles to keep in mind are:

- Ensuring a psychologically safe learning environment
- Defining clear learning objectives based on needs analysis
- Employing the right simulator fidelity for the learning goals
- Following a structured approach with pre-briefing, theoretical input, skills demonstration, scenario, debriefing

- Video recording for self-reflection
- Trained facilitators skilled at debriefing

Of course, it is important to acknowledge that simulation too has its limitations: it cannot fully replicate the complexity and unpredictability of real clinical situations. Simulation augments but does not replace the need for actual clinical experience.

A day in the life of a facilitator

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Narrator

Marc Lazarovici

Summary

This video talks about the typical activities and responsibilities of a facilitator conducting a healthcare simulation course over the course of a day.

Before the course starts, facilitators have many administrative tasks to complete - meeting as an instructor team, going through the course structure and materials, setting up the classroom and simulation environment.

When participants arrive, the facilitators welcome them, provide organizational information about the day's schedule, and present theoretical background on simulation, crisis resource management (CRM), and medical errors. This lays the foundation for the simulation exercises and debriefings.

Next is the familiarization phase, where facilitators demonstrate how the simulator manikin and any other medical equipment works. This is crucial for participants to understand how to properly interact with the simulated environment.

The core component is the simulation of clinical cases. Facilitators closely observe participants, take notes on relevant points for debriefing, provide lab data/findings at the right moments, liaise with the sim technologist running the manikin's responses, all while being unobtrusive in the simulation room.

After each case, facilitators lead the debriefing - a moderated group discussion and reflective learning conversation, sometimes aided by video recordings of the simulation. Their role is to guide participants' self-reflection, point out key situations, maintain a pleasant discussion atmosphere, and keep the debriefing focused while respecting time limits.

This cycle of case simulation and debriefing continues per schedule. At the end, facilitators secure the sim environment, gather materials, and obtain course feedback from participants.

As the video shows, a day in the life of a facilitator is much longer than participants, arriving earlier for preparation and staying later for clean-up and it has plenty of responsibilities to juggle to ensure an effective, psychologically safe simulation-based learning experience.

UNIT 2 - The different simulation modalities

Welcome to Unit 2 about the different simulation modalities. In this unit you will learn how simulation in healthcare can be declined in many ways and will get to know about procedural training, high and low fidelity simulations and the use of new technologies such as the VR.

In an influential article by Chiniara et al [1], the authors propose a conceptual framework to assists educators in selecting characteristics for the best design of simulation training interventions; this framework describes an educational activity using healthcare simulation by using of four progressive levels, that are:

- the instructional medium
- the simulation modality
- the instructional method
- the presentation

In their work, the authors stress that the selection of the appropriate media and simulation modalities should be based on the learning outcomes: the decision to use simulation as an instructional medium should be based on the analysis of the characteristics of acuity (severity) and opportunity (frequency) of the specific events that are the desired focus of training and propose a matrix of zone of simulation to guide the instructors in the selection of the appropriate training method.

The framework identifies four different simulation modalities: procedural simulation, computer-based simulation, simulated clinical immersion, and SP, with the added methodology of hybrid simulations. Each is best suited for specific competency domains or learning outcomes.

In this unit we will learn about:

- Procedural Training and Task Trainers (called Procedural Simulation in the framework)
- Screen-based and VR simulations (called Computer-based Simulation in the framework)
- High (or not so high) fidelity simulation, that will be discussed in
    - how much technology is good for simulation
    - how much fidelity is good for simulation

Contents

The contents of this unit will be presented as follows:

Presentation:

- How much fidelity is good for simulation (23 min)
- How much technology is good for simulation (20 min)
- Procedural training and task trainers (10 min)
- Screen-based and VR simulations (40 min)

Articles:

1. Taxonomy and conceptual framework (Chiniara 2013) (Mandatory)
2. How low can you go (Beaubien 2004) (Mandatory)
3. other optional references: see bibliography

Bibliography

1 Gilles Chiniara, Gary Cole, Ken Brisbin, Dan Huffman, Betty Cragg, Mike Lamacchia, Dianne Norman & Canadian Network For Simulation In Healthcare, Guidelines Working Group (2013) Simulation in healthcare: A taxonomy and a conceptual framework for instructional design and media selection, Medical Teacher, 35:8, e1380-e1395, DOI: 10.3109/0142159X.2012.733451

2 Beaubien JM, Baker DP. The use of simulation for training teamwork skills in health care: how low can you go? Qual Saf Health Care. 2004 Oct;13 Suppl 1(Suppl 1):i51-6. doi: 10.1136/qhc.13.suppl_1.i51. PMID: 15465956; PMCID: PMC1765794.

Other references used in the videos

Rudolph JW, Simon R, Raemer DB. Which reality matters? Questions on the path to high engagement in healthcare simulation. Simul Healthc. 2007 Fall;2(3):161-3. doi: 10.1097/SIH.0b013e31813d1035. PMID: 19088618.

Dieckmann, P. (2005). “Ein bisschen wirkliche Echtheit simulieren” Über Simulatorsettings in der Anästhesiologie. [Online: http://docserver.bis.uni-oldenburg.de/publikationen/dissertation /2005/diebis05/diebis05.html] Oldenburg: Universität, Dissertation.

Chang, Todd & Gerard, James & Pusic, Martin. (2016). Screen-Based Simulation, Virtual Reality, and Haptic Simulators. 10.1007/978-3-319-24187-6_9.

Gaba, DM (2004). The future vision of simulation in health care. Qual Saf Health Care 2004;13 (Suppl 1):i2–i10. doi: 10.1136/qshc.2004.009878

Gupta S, Wilcocks K, Matava C, Wiegelmann J, Kaustov L, Alam F. Creating a Successful Virtual Reality-Based Medical Simulation Environment: Tutorial. JMIR Med Educ. 2023 Feb 14;9:e41090. doi: 10.2196/41090. PMID: 36787169; PMCID: PMC9975916.

Jessica M. Phillips, Mary G. Harper, Holli A. DeVon, Virtual Reality and Screen-Based Simulation Learner Outcomes Using Kirkpatrick's Evaluation Levels: An Integrative Review,Clinical Simulation in Nursing, Volume 79, 2023, Pages 49-60, ISSN 1876-1399,https://doi.org/10.1016/j.ecns.2023.02.008.

Sayed Azher, Amanda Cervantes, Caroline Marchionni, Keerat Grewal, Hugo Marchand, Jason M. Harley, Virtual Simulation in Nursing Education: Headset Virtual Reality and Screen-based Virtual Simulation Offer A Comparable Experience, Clinical Simulation in

Nursing,Volume 79, 2023, Pages 61-74,ISSN 1876-1399, https://doi.org/10.1016/j.ecns.2023.02.009

Jones, J.; Wilkins, M.; Caird, J.; Kaba, A.; Cheng, A. & Ma. I.W.Y. (2017). An experimental study on the impact of clinical interruptions on simulated trainee performances of central venous catheterization. Advances in Simulation,2 (5), DOI 10.1186/s41077-017-0038-1

Weaver, S.J.; Dy, S.M.; Rosen, M.A. (2014). Team training in healthcare: a narrative synthesis of the literature. BMJ Quality & Safety, 23, 359-372.

Wang Z, Liu Q, Wang H. Medical simulation-based education improves medicos' clinical skills. J Biomed Res. 2013; 27(2):81–84.

McClelland, D. C. (1973). Testing for competence rather than for "intelligence." American Psychologist, 28(1), 1–14. https://doi.org/10.1037/h0034092

Nasir ANB, Ali DF, et al. Technical skills and non-technical skills: predefinition concept. Presentation at the IETEC'11 Conference, Kuala Lumpur, Malaysia. 2011.

Prineas, S., Mosier, K., Mirko, C., Guicciardi, S. (2021). Non-technical Skills in Healthcare. In: Donaldson, L., Ricciardi, W., Sheridan, S., Tartaglia, R. (eds) Textbook of Patient Safety and Clinical Risk Management . Springer, Cham. https://doi.org/10.1007/978-3-030-59403-9_30

Engel N, Patey R E, Ross S, Wisely L. Non-technical skills BMJ 2008; 337 :0812454 doi:10.1136/sbmj.0812454

Helyar V. Flight school:learning lessons from aviation BMJ 2006; 332 :0606252 doi:10.1136/sbmj.0606252

Rosendal AA, Sloth SB, Rölfing JD, Bie M, Jensen RD. Technical, Non-Technical, or Both? A Scoping Review of Skills in Simulation-Based Surgical Training. J Surg Educ. 2023 May;80(5):731-749. doi: 10.1016/j.jsurg.2023.02.011. Epub 2023 Mar 9. PMID: 36906398.

Gilles Chiniara, Gary Cole, Ken Brisbin, Dan Huffman, Betty Cragg, Mike Lamacchia, Dianne Norman & Canadian Network For Simulation In Healthcare, Guidelines Working Group (2013) Simulation in healthcare: A taxonomy and a conceptual framework for instructional design and media selection, Medical Teacher, 35:8, e1380-e1395, DOI: 10.3109/0142159X.2012.733451

https://bemedskilled.com/gp

Ellinas H, Denson K, Simpson D. Low-Cost Simulation: How-To Guide. J Grad Med Educ. 2015 Jun;7(2):257-8. doi: 10.4300/JGME-D-15-00082.1. PMID: 26221446; PMCID: PMC4512801

May BJ, Khoury JK, Winokur RS. Tools for Simulation; Low Budget and No Budget. Tech Vasc Interv Radiol. 2019 Mar;22(1):3-6. doi: 10.1053/j.tvir.2018.10.002. Epub 2018 Nov 2. PMID: 30765073

Nachshon A, Mitchell JD, Mueller A, Banner-Goodspeed VM, McSparron JI. Expert Evaluation of a Chicken Tissue-based Model for Teaching Ultrasound-guided Central Venous Catheter Insertion. J Educ Perioper Med. 2017 Jul 1;19(1): E503. PMID: 28377943; PMCID: PMC5327868

https://lowcostsim.wordpress.com/

https://simghosts.org/

How much fidelity is good for simulation

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Narrator

Marc Lazarovici

Summary

Fidelity is a multi-dimensional concept in healthcare simulation that goes beyond just the physical resemblance of equipment to the real counterpart. The various facets of fidelity include the fidelity of the equipment itself, the simulated environment, the conceptual clarity in representing the underlying clinical condition, and ultimately, the psychological or emotional fidelity in replicating the real-life experience for the learners.

A useful framework proposed by Dieckmann separates the "sim center level" which is the literal representation of the simulation tools (e.g. this is a clicker) from the desired "scenario level" where learners treat these as the intended objects/procedures (e.g. an ultrasound probe). Effective facilitation involves setting an immersive scene that allows learners to transition and remain engaged at the scenario level, suspending disbelief about the literal nature of the simulation tools.

Achieving an appropriate level of fidelity is a nuanced process that requires an adaptive approach mapped to the specific learners and learning objectives, rather than defaulting to maximum fidelity. For novice learners, low fidelity setups like static models or part-task trainers may be more suitable to avoid cognitive overload. As learners gain experience, the level of fidelity can be gradually increased in complexity and realism.

The degree of fidelity should also align with the learning objectives. High equipment fidelity may be unnecessary for certain procedural skills. Instead, the focus should be on providing realistic perceptual cues most relevant for the skills being taught, even if through low-cost solutions. Subject matter experts can provide valuable inputs on the essential details that help reinforce immersion and fidelity for learners.

In many cases, combining different modalities like manikin-based simulations augmented with simulated patient actors, part-task trainers, artificial fluids etc. can help achieve the desired

realism within technological limitations. For certain scenarios, taking the simulation outside of the center into real-world settings like outdoor environments or confined spaces can incorporate realistic environmental constraints.

Ultimately, the goal is to strike a balance in fidelity - achieving sufficient psychological realism and immersion to effectively meet the learning objectives without being overwhelmed by unnecessary complexity. Considerations of cost-effectiveness in achieving sustainable and reproducible solutions are also important.

References

Rudolph JW, Simon R, Raemer DB. Which reality matters? Questions on the path to high engagement in healthcare simulation. Simul Healthc. 2007 Fall;2(3):161-3. doi: 10.1097/SIH.0b013e31813d1035. PMID: 19088618.

Dieckmann, P. (2005). “Ein bisschen wirkliche Echtheit simulieren” Über Simulatorsettings in der Anästhesiologie. [Online: http://docserver.bis.uni-oldenburg.de/publikationen/dissertation/2005/diebis05/diebis05.html] Oldenburg: Universität, Dissertation.

How much technology is good for simulation

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Narrator

Marc Lazarovici

Summary

When it comes to healthcare simulation, there exists a broad spectrum of technology that can be employed - ranging from low-tech manikin-based simulations to sophisticated virtual and augmented reality environments. The level of technology required is closely tied to the specific learning objectives, whether focused on individual procedural skills or complex team-based crisis scenarios.

A key consideration is striking the right balance between technological capabilities and learner needs. For novice learners, low-fidelity part-task trainers or static models may be more appropriate to avoid cognitive overload. As learners progress, technological fidelity can be increased gradually to match their level of experience and ability to handle complexity. However, excessive realism through technology is not always necessary or desirable if it does not directly contribute to the core learning goals.

Effective healthcare simulation requires seamless integration of different technological components - the simulator itself, the simulation environment/space, and the audiovisual systems employed for recording/debriefing. These components need to complement each other like well-oiled cogs to create an immersive learning experience.

At the same time, overreliance on technology can be limiting. Simulation facilitators must be prepared for technological failures and have creative low-tech alternatives to adapt and continue delivering valuable learning experiences. This may involve tapping into learners' imagination using everyday objects to recreate cognitive loads rather than solely relying on high-fidelity simulators.

The true power of simulation lies not in the technology itself, but in the ability of skilled facilitators to thoughtfully blend available technological aids with effective instructional design to achieve specific learning objectives. Simulation happens foremost in the minds of participants, with technology playing an enabling but supportive role.

A judicious approach is required, mapping the various dimensions of technological fidelity (equipment, environment, conceptual clarity, psychological realism) to the learner levels and prioritizing only the most relevant aspects. Cost-effectiveness in achieving sustainable, reproducible solutions is also an important consideration.

In essence, technology in healthcare simulation should be viewed to an end rather than an end in itself. The focus must remain on constructing an engaging, psychologically realistic learning experience tailored to the participants' needs, creatively blending technological aids when required but not becoming enslaved to them. Skilled facilitators who can adapt and innovate when needed are the core drivers of effective simulation-based training.

References

Beaubien JM, Baker DP. The use of simulation for training teamwork skills in health care: how low can you go? Qual Saf Health Care. 2004 Oct;13 Suppl 1(Suppl 1):i51-6. doi: 10.1136/qhc.13.suppl_1.i51. PMID: 15465956; PMCID: PMC1765794.

Procedural training and task trainers

Procedural training and task trainers

UNIT 2

Narrator

Giulia Mormando

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As educators, the first aim of our job is to improve the competence of our students [1]. That is, to improve their skills, their ability to perform well as healthcare professionals.

When talking about skills we know that these are broadly divisible in two categories [2]: technical skills and non-technical skills. Technical and procedural skills refer to the ability to perform specific tasks or procedures, such as inserting a catheter or administering medication, or to operate equipment or technology, such as a ventilator or an ultrasound machine. Non-technical skills (NTS), can be defined as a constellation of cognitive and social skills, exhibited by individuals and teams, needed to reduce error and improve human performance in complex systems. NTS have been described as generic 'life-skills' that can be applied across all technical domains and are deemed to be 'non-technical', in that they have traditionally resided outside most formal technical education curricula [3].
To train a proficient healthcare professional it is necessary to train both the technical and the non-technical skills [4,5,6]

Procedural training and task trainers are used to train specifically the former: technical skills. To train NTS other types of simulation are used, that will be explained in other sections.

According to the framework proposed by Chiniara et al [7], procedural simulation is one of the modalities of simulation and focuses on acquiring and improving procedures and technical skills. Its main characteristic is that it allows the learner to replicate specific behaviors and movements inherent in the real-life counterpart. It also allows the learner to train in the specific sequence of actions – procedures – that are required to appropriately perform a specific technical skill.

In procedural training the learning objective is to train or retrain the learner on a single, specific task, allowing the training of specific psychomotor skills and their associated procedures.

This requires the use of a trainer (called task trainer or skill trainer) that is a synthetic or wet training device specifically designed for this purpose.
These types of trainers usually reproduce a part of the human body (hence they are also called part task trainer, or PTT), provide a “good enough” realism (e.g. they reproduce the landmarks needed in the procedure), are not very complex technical wise and therefore they are also usually cheap if compared to whole-body manikins used in other type of simulations.

Low-fidelity mannequins and task are ideal for teaching basic skills such as airway management, CPR, injections, blood draws, bladder catheter in male and female, gynecologic procedures and lumbar punctures, procedural trainers and imaging equipment for ultrasound-guided procedures such as renal biopsy and thoracentesis.

There are many different types of task trainers, possibly one for each of the most common procedures, with more vendors offering similar products.
Without the aim to be complete, we can list, as an example:

- trainers for venous and arterial access, central and peripheral
- trainers for semeiotic (auscultation, palpation)
- trainers for ultrasound training (these are also called phantoms)
- wearable trainers (e.g. for breast examination) to be used on manikins or persons
- trainers for catheterization
- trainers for intubation, ventilation, cricothyrotomy
- trainers for surgical procedures, suture

To design and implement a good procedural training simulation, we need to take these steps:

- decide the training goal, that is, which procedure we want our learners to train on;
- choose the appropriate skill trainer to use;
- learn how the skill trainer works, and how to perform that procedure in that skill trainer and in the reality, to infuse specific knowledge and tricks to learner;
- list and prepare all the other materials that are used during the procedure;
- decide how to evaluate and / or give feedback to learners.

Of course, the trainers need to be proficient in performing the procedure as well as in operating the task trainer and knowing its limitations.

Advantages and disadvantages

Compared to other types of trainers, especially whole-body manikins, procedural trainers are usually cheaper, more robust and durable, built to withstand multiple training sessions, more compact, not very complex and thus less prone to breaking. Since task trainers are built specifically to simulate one or just a few procedures, they sport a good-enough to good realism and mostly they perform well what they have been built for.
Task trainers allow to replicate multiple time the same procedure with no variation, thus allowing the students to go through the same exercise more than once, refining their skill.
Due to the repeatability of the exercise, task trainers are also a tool to assess and evaluate the proficiency of a student in a particular skill and give objective feedback.

Assessment through procedural training can be done for example using an observatory grid, checklists and rating scales.

One of the main disadvantages of procedural training is quite resource intensive, requiring a time to perform the simulation higher than in other types of training.
This is due to the fact that each learner has to physically try the procedure that is the object of the training, often requiring to be closely supervised by the teacher.
Hence procedural training requires a high teacher to student ratio, usually 1:1 at least during the performing of the exercise, and group exercises, that are used in other types of training to reduce this ratio, here cannot be used.
To speed up things it is possible to have many students training at the same time, but this requires the purchase of more skill trainers and an increased number of staff attending the students' training.

Another disadvantage of skill trainers is that since each task trainer is built to allow training in one or just a few procedures, it is required to purchase many different trainers to cover all the possible procedures that we aim to train our students on.
This can be heavy on the budget, thus reducing the ability to purchase multiple copies of the same trainers that would allow to speed up the training of many students at once, requires the faculty to be trained in the operation of many different task trainers, and finally can bog down the storage room of even the bigger of the centers.

Future directions and emerging trends

The miniaturization of electronics and lower prices for technology will not play a big role in the future development of procedural training, as most of the skill trainers are not based on high technology but are rather static (e.g. a venipuncture trainer) and will mostly benefit from an improvement on the material used in their build (e.g. more skin like silicon).

Newer technologies, however, play a role in a novel trend regarding procedural training, that is the hybridization of the skill trainer with mixed reality (MR). Recently some vendors started to market hybrid solutions in which the trainee interacting with the skill trainer wears a virtual reality (VR) or augmented reality (AR) headset. Thanks to the headset, the trainee can visually interact with a virtual environment and at the same time, thanks to the skill trainer, has physical, real, feedback.
For instance, thanks to MR, an abdominal examination trainer that represents the torso of a patient, is augmented so that the trainees can see the whole virtual patient and interact with it [8].
Thanks to the spreading of MR technologies, soon we will see an increase in the number of hybrid products of this kind, that conjugate MR and task trainers.

The fact that task trainers are designed to train for a single specific task and hence they are usually not very complicated from a technology point of view, make them the ideal candidate to be made "in house".
Due to their low complexity, in fact, it is possible to create some skill trainers by yourself, by using some ingenuity and simple do-it-yourself (DIY) techniques [9].

Reports of the use of these low-cost solutions and their effectiveness can be found in literature [10,11], and online it is possible to find an increasing number of guides, instructions and reference materials [12,13] to make your own task trainers.
To produce DIY skill trainers requires some extra equipment, some skilled operators, some extra time, patience and care and surely is less easy than buying a product commercially available; nevertheless, it is an option that could allow simulation centers with tight budget to implement their simulation equipment at a small price and could foster interdisciplinary cooperation (e.g. between medical and technical staff).

References

1. McClelland, D. C. (1973). Testing for competence rather than for "intelligence." American Psychologist, 28(1), 1–14. https://doi.org/10.1037/h0034092

2. Nasir ANB, Ali DF, et al. Technical skills and non-technical skills: predefinition concept. Presentation at the IETEC'11 Conference, Kuala Lumpur, Malaysia. 2011.

3. Prineas, S., Mosier, K., Mirko, C., Guicciardi, S. (2021). Non-technical Skills in Healthcare. In: Donaldson, L., Ricciardi, W., Sheridan, S., Tartaglia, R. (eds) Textbook of Patient Safety and Clinical Risk Management. Springer, Cham. https://doi.org/10.1007/978-3-030-59403-9_30

4. Engel N, Patey R E, Ross S, Wisely L. Non-technical skills BMJ 2008; 337 :0812454 doi:10.1136/sbmj.0812454

5. Helyar V. Flight school: learning lessons from aviation BMJ 2006; 332 :0606252 doi:10.1136/sbmj.0606252

6. Rosendal AA, Sloth SB, Rölfing JD, Bie M, Jensen RD. Technical, Non-Technical, or Both? A Scoping Review of Skills in Simulation-Based Surgical Training. J Surg Educ. 2023 May;80(5):731-749. doi: 10.1016/j.jsurg.2023.02.011. Epub 2023 Mar 9. PMID: 36906398.

7. Gilles Chiniara, Gary Cole, Ken Brisbin, Dan Huffman, Betty Cragg, Mike Lamacchia, Dianne Norman & Canadian Network For Simulation In Healthcare, Guidelines Working Group (2013) Simulation in healthcare: A taxonomy and a conceptual framework for instructional design and media selection, Medical Teacher, 35:8, e1380-e1395, DOI: 10.3109/0142159X.2012.733451

8. https://bemedskilled.com/gp

9. Ellinas H, Denson K, Simpson D. Low-Cost Simulation: How-To Guide. J Grad Med Educ. 2015 Jun;7(2):257-8. doi: 10.4300/JGME-D-15-00082.1. PMID: 26221446; PMCID: PMC4512801

10. May BJ, Khoury JK, Winokur RS. Tools for Simulation; Low Budget and No Budget. Tech Vasc Interv Radiol. 2019 Mar;22(1):3-6. doi: 10.1053/j.tvir.2018.10.002. Epub 2018 Nov 2. PMID: 30765073.

11. Nachshon A, Mitchell JD, Mueller A, Banner-Goodspeed VM, McSparron JI. Expert Evaluation of a Chicken Tissue-based Model for Teaching Ultrasound-guided Central Venous Catheter Insertion. J Educ Perioper Med. 2017 Jul 1;19(1):E503. PMID: 28377943; PMCID: PMC5327868

12. https://lowcostsim.wordpress.com/

13. https://simghosts.org/

Screen-based and VR simulations

Narrator

Beatriz Zambrano Serrano

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Summary

Medical education has undergone a significant transformation, driven by advancements in technology and the need for more efficient and effective training methods. While manikin-based simulation has long been the gold standard for clinical training, its resource-intensive nature has led to the exploration of alternative approaches.

Virtual simulations involve computer-based scenarios that replicate clinical situations through interactive software. These simulations can range from basic computer programs to advanced platforms that incorporate multimedia elements, such as videos, graphics, and interactive interfaces. Virtual simulations have gained popularity in medical education due to their flexibility, cost-effectiveness, and ability to replicate diverse clinical scenarios. These simulations provide learners with opportunities to practice clinical decision-making, critical thinking, and problem-solving skills in a risk-free environment. In recent years, a wide variety of simulations have been developed.

Virtual Reality (VR) vs. Screen-Based Simulations

Virtual reality (VR) and screen-based simulations differ primarily in their level of immersion and interaction. Virtual reality creates a fully immersive environment by placing users within a computer-generated world through specialized headsets, enabling them to perceive and interact with a 3-D space as if it were real. This immersive experience includes head tracking and spatial sound, fostering a strong sense of presence. Screen-based simulations, such as traditional video games or simulations, are displayed on a 2-D screen and typically rely on keyboard, mouse, or controller inputs for interaction. While they offer visual and auditory engagement, they lack the same level of immersion and physical presence that VR provides, and instead offer a program that is less technologically complex and more familiar to users.

Virtual Reality (VR) Simulations

VR simulations take virtual learning to the next level by immersing learners in a fully digital environment through specialized VR headsets. These simulations aim to replicate real-world scenarios by creating a sense of presence, allowing learners to interact with objects and environments in a natural and immersive manner.

Effectiveness:
VR simulations offer an unparalleled level of immersion, enabling learners to practice skills in a highly realistic environment. They have been particularly valuable in training for surgical procedures, patient communication, and even addressing psychological conditions through exposure therapy.

Advantages:

- Realistic Immersion: VR simulations provide an immersive experience that closely replicates real clinical environments, enhancing the transferability of skills.
- Hands-On Training: Learners can perform procedures and tasks using virtual tools, mimicking real-world scenarios without risk to patients.
- Innovative Possibilities: VR enables the creation of innovative scenarios that may be challenging to replicate using traditional methods.

Limitations:

- Cost and Accessibility: VR technology can be costly to implement, including the expense of VR headsets and development of simulation content.
- Motion Sickness and Discomfort: Some users may experience motion sickness or discomfort when using VR, impacting the learning experience.
- Technical Complexity: Developing VR simulations requires specialized skills and ongoing maintenance.

Screen-Based Simulations

Screen-based simulations, also known as desktop simulations, occur on traditional screens such as computers, tablets, and smartphones. These simulations offer interactive experiences using multimedia elements, though they do not provide the same level of immersion as VR.

Effectiveness:
Screen-based simulations are well-suited for scenarios that require visualization, data analysis, and decision-making. They offer a practical and accessible way to engage learners in a wide range of medical contexts.

Advantages:

- Accessibility: Screen-based simulations are more accessible due to their compatibility with widely available devices.
- Cost-Effective: Developing screen-based simulations is generally more cost-effective compared to VR simulations.

- Familiarity: Learners are accustomed to interacting with screens, reducing the learning curve associated with new technologies.

Limitations:

- Limited Immersion: Screen-based simulations lack the depth of immersion provided by VR simulations, potentially reducing their effectiveness for certain skills.
- Less Realistic Experience: Interactions may feel less natural and lifelike compared to VR simulations.
- Reduced Engagement: Users might be more prone to distractions when using screen-based simulations.

The evolution of medical education has led to the exploration of various simulation methods to enhance clinical training. Manikin-based simulations have been the gold standard due to their hands-on nature and haptic feedback. However, resource intensity has prompted a shift towards virtual simulations that offer flexibility and cost-effectiveness. Within virtual simulations, the distinction between VR and screen-based simulations highlights the trade-offs between realism, accessibility, and immersion.

While VR simulations provide the highest level of realism and immersion, they come with technical complexity and cost considerations. Screen-based simulations offer accessibility and familiarity, making them suitable for certain skills and scenarios. As technology continues to advance, the interplay between these simulation methods will shape the future of medical education, providing a dynamic and evolving landscape for training healthcare professionals to provide high-quality patient care.

References

1. Chang, Todd & Gerard, James & Pusic, Martin. (2016). Screen-Based Simulation, Virtual Reality, and Haptic Simulators. 10.1007/978-3-319-24187-6_9

2. Gaba, DM (2004). The future vision of simulation in health care. Qual Saf Health Care 2004;13 (Suppl 1):i2–i10. doi: 10.1136/qshc.2004.009878

3. Gupta S, Wilcocks K, Matava C, Wiegelmann J, Kaustov L, Alam F. Creating a Successful Virtual Reality-Based Medical Simulation Environment: Tutorial. JMIR Med Educ. 2023 Feb 14;9:e41090. doi: 10.2196/41090. PMID: 36787169; PMCID: PMC9975916

4. Jessica M. Phillips, Mary G. Harper, Holli A. DeVon, Virtual Reality and Screen-Based Simulation Learner Outcomes Using Kirkpatrick's Evaluation Levels: An Integrative Review, Clinical Simulation in Nursing, Volume 79, 2023, Pages 49-60, ISSN 1876-1399, https://doi.org/10.1016/j.ecns.2023.02.008

5. Sayed Azher, Amanda Cervantes, Caroline Marchionni, Keerat Grewal, Hugo Marchand, Jason M. Harley, Virtual Simulation in Nursing Education: Headset Virtual Reality and Screen-based Virtual Simulation Offer A Comparable Experience, Clinical Simulation in

Nursing,Volume 79, 2023, Pages 61-74,ISSN 1876-1399, https://doi.org/10.1016/j.ecns.2023.02.009

6. Jones, J.; Wilkins, M.; Caird, J.; Kaba, A.; Cheng, A. & Ma. I.W.Y. (2017). An experimental study on the impact of clinical interruptions on simulated trainee performances of central venous catheterization. Advances in Simulation,2 (5), DOI 10.1186/s41077-017-0038-1

7. Weaver, S.J.; Dy, S.M.; Rosen, M.A. (2014). Team training in healthcare: a narrative synthesis of the literature. BMJ Quality & Safety, 23, 359-372

8. Wang Z, Liu Q, Wang H. Medical simulation-based education improves medicos' clinical skills. J Biomed Res. 2013; 27(2):81–84

UNIT 3 - Scenario Design in Simulation

Welcome to Unit 3 on Scenario Design in Simulation. In this unit you'll delve into the core principles and methodologies of scenario creation within the realm of simulation. Our focus is to provide you with a robust foundation in designing scenarios, emphasizing the necessity to tailor and adapt these principles to align with the specific training objectives and professional context of your target audience.

Whether you're creating simulations for healthcare, aviation, business, or any other field, the skills you acquire here will empower you to craft effective and engaging simulations that resonate with and meet the unique needs of your learners. Join us to unlock the potential of simulations in achieving remarkable training outcomes!

Contents

The contents of this unit will be presented as follows:

Presentations:

- Video on Scenario Design in Simulation (44 min)

Articles:

1. The Future Vision of Simulation in Health Care (Gaba 2004) (Mandatory)
2. Simulation-based medical education: an ethical imperative (Ziv 2003) (Mandatory)
3. There's no such thing as "nonjudgmental" debriefing: a theory and method for debriefing with good judgment (Rudolph 2006) (Mandatory)
4. Simulation-based learning: Just like the real thing (Lateef 2010) (Mandatory)
5. Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review (Issenberg 2005) (Mandatory)
6. The art and science of debriefing in simulation: Ideal and practice (Dieckmann 2009) (Mandatory)
7. Essentials of Scenario Building for Simulation-Based Education (Huffman 2016) (Supplementary)

Further reference:

- Simulation Scenario Template File

Bibliography

1. Lateef, F. (2010). "Simulation-based learning: Just like the real thing." Journal of Emergencies, Trauma, and Shock, 3(4), 348. This paper discusses the general utility and approach of simulation in medical training, offering insights into how to construct effective educational scenarios.

2. Ziv, A., Wolpe, P. R., Small, S. D., & Glick, S. (2003). "Simulation-based medical education: an ethical imperative." Academic Medicine, 78(8), 783-788. This foundational text explains the ethical importance of simulation in medical training, which is useful when considering the design and objectives of medical scenarios.

3. Issenberg, S. B., McGaghie, W. C., Petrusa, E. R., Lee Gordon, D., & Scalese, R. J. (2005). "Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review." Medical teacher, 27(1), 10-28. This systematic review is crucial in understanding the components of high-fidelity simulations that contribute to effective learning in medical education.

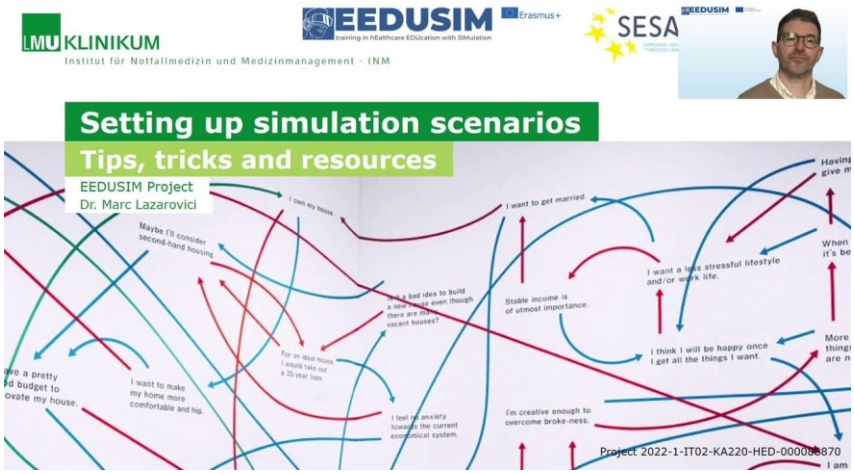
4. Gaba, D. M. (2004). "The future vision of simulation in healthcare." Quality and Safety in Health Care, 13(suppl 1), i2-i10. David Gaba is a recognized leader in the field of healthcare simulation, and this work is essential for understanding the broader vision of simulation in healthcare education.

5. Rudolph, J. W., Simon, R., Dufresne, R. L., & Raemer, D. B. (2006). "There's no such thing as "nonjudgmental" debriefing: a theory and method for debriefing with good judgment." Simulation in Healthcare, 1(1), 49-55. This article provides a deep dive into the theory and methodology behind effective debriefing, a critical component of the learning process in medical simulations.

6. Dieckmann, P., Molin Friis, S., Lippert, A., & Østergaard, D. (2009). "The art and science of debriefing in simulation: Ideal and practice." Medical Teacher, 31(7), e287-e294. This source focuses on the strategies for debriefing within medical simulations, highlighting best practices and common challenges.

Huffman, J., McNeil, G., Bismilla, Z., Lai, A. (2016). Essentials of Scenario Building for Simulation-Based Education. In: Grant, V., Cheng, A. (eds) Comprehensive Healthcare Simulation: Pediatrics. Comprehensive Healthcare Simulation. Springer, Cham. https://doi.org/10.1007/978-3-319-24187-6_2

Scenario Design in Simulation: Tips, Tricks and Resources



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Narrator

Marc Lazarovici

Summary

At the heart of any healthcare simulation experience are the scenarios that drive the learning activities. A well-designed scenario provides a realistic clinical context with a clear storyline and specific learning objectives. Crafting immersive, relevant scenarios aligned with intended outcomes is both an art and a science.

The Scenario Fundamentals

A healthcare simulation scenario is essentially a detailed patient case aimed at enabling targeted learning goals for participants. It combines a clinical situation or condition with a defined sequence of events over time. The scenario should present challenges that require participants to apply their knowledge, skills and behaviors to manage the simulated patient crisis or condition.

Establishing clear, measurable learning objectives is the critical first step. The objectives define the purpose of the scenario and drive all other design decisions. Objectives may focus on specific medical knowledge and procedures, teamwork skills like communication and leadership, or a blend of clinical and behavioral competencies.

Scenario Flow and Events

With learning goals established, the next step is mapping out the scenario flow - the sequential states the patient will progress through and the associated clinical data like vital signs. This timeline of events incorporates decision points where participant actions will trigger different

branches. Techniques like tables, graphs or the SimCanvas approach can be used to visually depict the scenario progression.

The scenario flow should have an appropriate level of difficulty, complexity and realism for the target learners. It must be possible to complete it within the allotted time. Overly obvious or obscure conditions should be avoided unless directly aligned with objectives. Scenarios requiring effective teamwork and closed-loop communication tend to be most effective.

The Learning Environment

Designing an authentic, immersive scenario environment is critical for establishing the "fiction contract" - the participants' willing suspension of disbelief that the simulation is real. The scenario space, equipment, props, and personnel like confederates playing roles must be carefully considered. The degree of physical and emotional realism should match learning needs while avoiding psychological overload.

Flexibility and Backups

Even meticulously planned scenarios rarely unfold exactly as scripted. Participants may take unexpected actions or struggle with certain objectives. Scenarios should build in flexibility to adapt to changing circumstances during the simulation. "Lifeline" options like new information from confederates can help reorient participants. Having backup strategies is essential when core learning objectives are not being met.

An Iterative Process

Developing high-quality scenarios is an iterative process of design, implementation, evaluation and refinement. After initial drafts, scenarios benefit from pilot testing to identify gaps and areas for improvement. Based on findings from actual implementations, learning objectives, environmental details and event sequences can be modified for an optimal experience.

Scenario design is both a challenge and an opportunity in healthcare simulation. When done well, it provides a robust, standardized experience that safely immerses learners in realistic clinical situations. With thoughtful planning and flexibility, scenarios can consistently deliver valuable learning in line with defined objectives.

Some tips to design an effective scenario are:

1. Start with clear, relevant learning objectives that are achievable, measurable, and free of internal contradictions.
2. Choose an appropriate level of difficulty that challenges learners but doesn't overwhelm them.
3. Ensure the scenario can be realistically completed within the allotted time.
4. Build in flexibility to adapt if participants take unexpected actions.
5. Plan "lifesaver" options like new information from confederates to reorient participants.
6. Test complex scenarios beforehand to identify any issues with setup or achieving learning goals.
7. Consider setup and reset times when designing environmentally rich scenarios.

8. Use an iterative cycle of design, implementation, evaluation and refinement.
9. Adhering to the "fiction contract" by acknowledging simulation isn't reality but treating it as such.

Here there are some pitfalls to avoid while designing a scenario:

1. Rare or obscure clinical conditions - Unless training on that specific rare condition is the objective, these make for poor scenarios as they are not representative cases.
2. Overly obvious scenarios with only one course of action - These turn into more of a skills trainer rather than facilitating effective team training and decision-making.
3. Relying too heavily on subtle physical findings - Simulators may not replicate certain findings realistically, leading to frustration.
4. Scenarios that are emotionally overwhelming - Excessive emotional stress can inhibit learning if not balanced with psychological safety.
5. Letting the simulated patient die unnecessarily - This can feel like a "trick" unless dealing with death is an explicit objective.
6. Internal contradictions in learning objectives - For example, being extremely thorough yet very fast creates an impossible scenario.

References

- Simulation Scenario Template File

UNIT 4 - Basics of Feedback and Debriefing

Welcome to Unit 4 on the Basics of Feedback and Debriefing.
Throughout this unit, you'll explore the fundamental principles and strategies integral to effective feedback and debriefing processes.

Our aim is to provide you a solid understanding of these concepts, emphasizing the importance of customizing and applying these strategies to suit the specific levels of training and professional backgrounds of your target audience.

Whether you're involved in education, healthcare, corporate training, or any field that benefits from structured feedback, this course will enable you to enhance the learning experience and achieve your educational goals through impactful feedback and debriefing techniques.

Contents

The contents of this unit will be presented as follows:

Presentations:

- Basic concepts and ideas (44 min)
- The wide world of options and flavours (50 min)

Articles:

1. Embracing informed learner self-assessment during debriefing: the art of plus-delta (Cheng 2021) (Mandatory)
2. Promoting Excellence and Reflective Learning in Simulation (PEARLS) (Eppich 2015) (Mandatory)
3. ‘The Diamond’: a structure for simulation debrief (Jaye 2015) (Mandatory)
4. CRM training for pediatric: a review for instructions (Cheng, 2012) (Mandatory)

Other videos:

- Simulation documentary (5 min)

Bibliography

1 Cheng, A., Eppich, W., Epps, C. et al. Embracing informed learner self-assessment during debriefing: the art of plus-delta. Adv Simul 6, 22 (2021). https://doi.org/10.1186/s41077-021-00173-1

2 Eppich W, Cheng A. Promoting Excellence and Reflective Learning in Simulation (PEARLS): development and rationale for a blended approach to health care simulation debriefing. Simul Healthc. 2015 Apr;10(2):106-15. doi: 10.1097/SIH.0000000000000072. PMID: 25710312

3 Jaye P, Thomas L, Reedy G. 'The Diamond': a structure for simulation debrief. Clin Teach. 2015 Jun;12(3):171-5. doi: 10.1111/tct.12300. PMID: 26009951; PMCID: PMC4497353

4 Cheng A, Donoghue A, Gilfoyle E, Eppich W. Simulation-based crisis resource management training for pediatric critical care medicine: a review for instructors. Pediatr Crit Care Med. 2012 Mar;13(2):197-203. doi: 10.1097/PCC.0b013e3182192832. PMID: 21499181

Rana SC, Francis U, Zavi L, Ella S, Honein-Abou Haidar G, Peter D. Cultural differences in simulation debriefing: A qualitative analysis. Heliyon. 2023 Mar 25;9(4):e14904. doi: 10.1016/j.heliyon.2023.e14904. PMID: 37064463; PMCID: PMC10102195

Geert Hofstede, Culture's Consequences: Comparing Values, Behaviors, Institutions, and Organizations Across Nations, Sage 2001

Ulmer FF, Sharara-Chami R, Lakissian Z, Stocker M, Scott E, Dieckmann P. Cultural Prototypes and Differences in Simulation Debriefing. Simul Healthc. 2018 Aug;13(4):239-246. doi: 10.1097/SIH.0000000000000320. PMID: 29672469.

Abulebda K, Auerbach M, Limaiem F. Debriefing Techniques Utilized in Medical Simulation. [Updated 2022 Sep 26]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK546660/

Grant VJ, Robinson T, Catena H, Eppich W, Cheng A. Difficult debriefing situations: A toolbox for simulation educators. Med Teach. 2018 Jul;40(7):703-712. doi: 10.1080/0142159X.2018.1468558. Epub 2018 May 23. Erratum in: Med Teach. 2022 Sep;44(9):I. PMID: 29792100.

Simon R, Raemer DB, Rudolph JW. 2010. Debriefing Assessment for Simulation in Healthcare (DASH)© Rater's Handbook. Center for Medical Simulation, Boston, Massachusetts https://harvardmedsim.org/wp-content/uploads/2017/01/DASH.handbook.2010.Final.Rev.2.pdf

Cheng A, Palaganas J, Eppich W, Rudolph J, Robinson T, Grant V. Co-debriefing for simulation-based education: a primer for facilitators. Simul Healthc. 2015 Apr;10(2):69-75. doi: 10.1097/SIH.0000000000000077. PMID: 25710318

Rudolph JW, Simon R, Raemer DB, Eppich WJ. Debriefing as formative assessment: closing performance gaps in medical education. Acad Emerg Med. 2008 Nov;15(11):1010-6. doi: 10.1111/j.1553-2712.2008.00248.x. Epub 2008 Oct 20. PMID: 18945231

Rudolph JW, Simon R, Dufresne RL, Raemer DB. There's no such thing as "nonjudgmental" debriefing: a theory and method for debriefing with good judgment. Simul Healthc. 2006 Spring;1(1):49-55. doi: 10.1097/01266021-200600110-00006. PMID: 19088574

Debriefing: Basic Concepts and Ideas

CLICK OR SCAN THE QR CODE TO SEE THE ONLINE VIDEO

Narrator

Marc Lazarovici

Summary

Debriefing is a critical component of simulation-based education, providing a structured opportunity for participants to reflect on their experience and cement new learning. As a facilitator, your role is not to teach but to guide learners in extracting insights through a collaborative analysis of the scenario experience.

Before the substantive debriefing discussion, invest significant time upfront in intentionally creating a conducive learning environment. Explicitly explain the structure, phases and expected timeframe so participants understand what to expect. Outline ground rules like maintaining confidentiality of the discussions and engaging in mutually respectful dialogue.

Most critically, work to create a psychologically safe context where learners feel able to openly share thoughts, question assumptions, admit errors and be self-critical without fear of embarrassment or retaliation. Reassure them this is not an evaluative exercise but a formative opportunity for growth. Encourage an atmosphere of candid curiosity.

The Debriefing Structure

While there are various models described in the literature, a typical healthcare debriefing follows a structured sequence with phases like:

1. Reaction Phase - Allow participants to share their initial emotional reactions to the scenario to "cool down" before analytical discussion.
2. Descriptive Phase - Reconstruct a shared mental model by going around and having each person describe what they experienced and the key events/decisions as they perceived them.

3. Analytical Phase - The core of the debriefing. Facilitate self-reflection and analysis by exploring the reasoning behind participants' actions/decisions. Use advocacy-inquiry, describing what you observed non-judgmentally before asking an open-ended question to understand their thought process. In this phase, if available, it is possible to use video segments to reinforce insights.
4. Summarizing Phase - Consolidate and summarize the key lessons, take-aways and insights from the group discussion. Have participants articulate the most salient messages they will take back into their real practice.

Throughout, your role is to use open-ended questions, allow silences for deeper reflection, rephrase or re-ask questions as needed, and gently guide the discussion while avoiding lecturing or making judgments. Support the group's analysis but avoid appropriating the conversation.

Addressing Gaps and Errors
Inevitably, participants' performance during scenarios will have lapses, gaps or errors. View these not as failures but as extremely valuable learning opportunities. Use an "advocacy-inquiry" approach to raise and explore them:

1. Describe the specific performance gap or error you observed as objectively as possible without judgment.
2. Share your perspective on the potential consequences or impact of that action matter-of-factly.
3. Then explore the participant's reasoning and mental model through a curious, non-threatening question like "I'm interested to understand more of what was going through your mind at that point..."

This honest yet non-threatening approach promotes self-reflection and mutual understanding over defensiveness. Be sure you also reinforce positive performance by highlighting exemplary actions and having the individual(s) analyze what made it effective.

Facilitating an effective debriefing requires developing a distinct skillset of establishing a safe environment, using observation and curious questions to prompt self-critique, and adeptly managing group dynamics. With practice, you can guide participants in extracting profound insights from scenarios while fostering an environment of trust, analysis and growth.

Debriefing: The wide world of options and flavours

CLICK OR SCAN THE QR CODE TO SEE THE ONLINE VIDEO

Narrators

Marc Lazarovici

Christian Boeriu

Summary

In this video, Marc Lazarovici and Christian Boeriu discuss different methods and considerations for effectively facilitating debriefings after a simulation scenario.

Debriefing is universally recognized as the most critical component in simulation, as it is where profound learning occurs and, at the same time, the most challenging aspect of simulation-based education.

There are many reasons why leading effectively a debriefing is difficult:

- facilitating group discussions and self-reflection is inherently challenging
- managing group dynamics is complex: disengaged learners, dominating participants, or defensive reactions to critiques can hinder the outcome of the debriefing
- debriefings need to strike the right balance between creating a psychologically safe environment for self-critique while still addressing performance gaps.

Some structured approaches can assist the facilitator in delivering the debriefing, but nevertheless, a distinct skillset and a “facilitative mindset” quite different from didactic teaching is required.

Among the many aspects that a facilitator needs to keep in mind while preparing for a debriefing, there is one that is quite interesting, this being an European course and thus aimed at different national realities, and that is cultural difference.
Studies [1,2] in fact show that cultural differences can influence the debriefing process.
In [1] the authors did a survey among facilitators in countries with different PDI (PDI, or Power distance, is one of the parameters used in [3] to describe cultural differences among

countries). They show that depending on the value of this parameter, the facilitator may be viewed by participants as more of an instructor/teacher (high power distance) or more of a facilitator/coach (low power distance).

For example, Romania has a very high-power distance index of 90 compared to Germany at 35. This suggests hierarchies tend to be steeper in Romania, so a facilitator may be viewed more as an authority figure.

Similarly, in some cultures participants may be less familiar or comfortable with the open critique and self-reflection involved in debriefings. The facilitator needs to account for these cultural tendencies and adapt debriefing approaches accordingly, rather than using a one-size-fits-all method.

Common Debriefing Methods

Thinking about all these aspects can make the facilitator feel like a boat lost in the sea. Thankfully there are some structured approaches that help to guide the facilitator to the harbor of a good debriefing.

In the video we talk about three different structured approaches:

- Plus-Delta
- PEARLS
- Diamond Model

Plus-Delta

Plus-Delta [4] is quite a simple method and focuses on self-assessment. It can be used to help the participants to reflect on the whole event or a part of it and to think about their performance. The participants are asked to identify:

- Plus: What went well during the scenario
- Delta: What they would do differently next time

Compared to other methods it is less structured, it is more a strategy that helps the learners to analyze their own performance through these two lenses.
Its straightforward nature makes it also useful for debriefing skills-based scenarios.

PEARLS

PEARLS [5] stands for "Promoting Excellence and Reflective Learning in Simulation".
This approach allows self-assessment by the learners and guides the facilitator in moderating the session to promote critical reflection. Despite it is not meant to be used to provide teaching, it also allows for the flexibility that is sometimes needed to give direct feedback or to engage focus teaching.
It provides a comprehensive framework with different approaches for each phase:

- Reaction phase: Learners share initial emotional reactions
- Description phase: Reconstruct a shared mental model of what happened
- Analytic phase: The core self-reflection and analysis using different techniques selected by the facilitator based on needs:
    - Self-guided analysis prompts like Plus-Delta
    - Focused facilitation with approaches like "advocacy-inquiry"

    - Direct instructive feedback if necessary
- Summary phase: Consolidate key lessons and take-aways

PEARLS allows flexibility to use various techniques while providing an overall structure to the debriefing.

Diamond Model

Diamond Model [6] is based on the technique of description, analysis and application along with aspects of the advocacy-inquiry approach and of debriefing with good judgment [7].
It is an approach that helps the facilitator to structure the discussion, also visually, and to avoid the danger of the debriefing being dominated by the discussion on technical skills.
This model aims to structure the debriefing discussion flow into three distinct phases:

- Description: Participants describe their perspective of key events
- Analysis: The facilitator guides an in-depth exploration of thought processes behind actions/decisions using techniques like "advocacy-inquiry"
- Application: Consolidating how lessons can be applied to future practice

The Diamond model provides specific phrasing examples for facilitators to use during each phase. Its phased approach helps maintain a productive analytical discussion flow.

There are many more methods that help the facilitator during the debriefing [8], indicating a different number of phases. Regardless of what you use, it is very important to use one structure and stick to it.

While the approaches above are meant for educational purposes, we would like to also point out another approach, developed to perform clinical debriefing, that can be used in day-to-day practice. It is the TALK method, and it was developed in a European project. All the details on this methodology can be accessed online on: www.talkdebrief.org

Addressing Challenging Situations

Despite the structured approach used, some difficult situations can arise in debriefing. Disengaged learners, conversation dominators, upset participants, defensive learners, aggressive participants can happen and be quite challenging to manage. The paper [9] provides some techniques to adopt, and we invite you to read the article.

In general, we can indicate proactive approaches to avoid to incur in challenging situations, and reactive approaches to mitigate these when they happen.

Proactive Approaches:

1. Set the right environment and expectations from the start. As Dr. Blazevic states, how you initially brief participants and establish psychological safety is crucial. Make it clear this is a formative learning experience, not a competition or evaluation. Ensure the physical environment is comfortable as well.
2. Be mindful of your own body language and attitude as the facilitator. Avoid coming across as judgmental or creating an adversarial atmosphere that could put participants on the defensive.

3. Be intentional about group formation. Disruptive group dynamics may arise from how participants are distributed if there are pre-existing tensions or conflicts.
4. Use the "fiction contract" approach. Explain upfront that you know the simulation isn't reality but ask participants to treat it as such to maintain an immersive learning environment.

Reactive Techniques:

1. Normalization - Reframe a participant's reaction as a normal response that others experience as well. This can help defuse defensiveness.
2. Validation - Acknowledge the legitimacy of a participant's feelings or perspective, even if you disagree.
3. Generalization - Broaden the perspective of a situation a participant is fixated on as something that applies more universally.
4. Name the dynamic - If a difficult situation like a dominating participant arises, directly name and acknowledge the dynamic you're observing. This opens it up for discussion.
5. Use "advocacy-inquiry" - This three-part technique promotes self-reflection over defensiveness:
    - Describe the observed behavior objectively
    - State your perspective on its impact matter-of-factly
    - Then use a non-judgmental, curious question to explore their reasoning

The overall goal is to be proactive in establishing a supportive learning environment, but also have a toolkit of techniques to productively manage problems or tensions if they do arise.

Wrap up

To conclude, we can summarize the “secret of success” in debriefing as [10]:

1. Create a good learning atmosphere and psychological safety. Establishing an environment where learners feel comfortable being open, self-critical, and engaging in candid discussions is paramount. This involves setting clear expectations, ground rules, and a supportive tone.
2. Create and keep up a learning context. After all, this is why we are doing simulation.
3. Provide a clear structure and stick to it. Using a structured approach like PEARL, Plus-Delta, Diamond, etc. rather than an unstructured conversation is recommended. Having and adhering to a defined debriefing structure helps facilitate productive discussions.
4. Support and encourage interesting conversations. While using a structure, facilitators should allow interesting discussions to unfold organically through self-reflection. Asking open-ended questions and allowing silences for deeper thinking promotes insights.
5. Identify and properly address performance gaps. When learners make errors or demonstrate performance gaps, use techniques like "advocacy-inquiry" to explore their reasoning in a non-judgmental way before providing critiques.
6. Highlight and reinforce good performance. In addition to addressing gaps, facilitators should make a point to identify exemplary actions and have learners analyze what made those performances effective.

References

1 Rana SC, Francis U, Zavi L, Ella S, Honein-Abou Haidar G, Peter D. Cultural differences in simulation debriefing: A qualitative analysis. Heliyon. 2023 Mar 25;9(4):e14904. doi: 10.1016/j.heliyon.2023.e14904. PMID: 37064463; PMCID: PMC10102195

2 Ulmer FF, Sharara-Chami R, Lakissian Z, Stocker M, Scott E, Dieckmann P. Cultural Prototypes and Differences in Simulation Debriefing. Simul Healthc. 2018 Aug;13(4):239-246. doi: 10.1097/SIH.0000000000000320. PMID: 29672469

3 Geert Hofstede, Culture's Consequences: Comparing Values, Behaviors, Institutions, and Organizations Across Nations, Sage 2001

4 Cheng, A., Eppich, W., Epps, C. et al. Embracing informed learner self-assessment during debriefing: the art of plus-delta. Adv Simul 6, 22 (2021). https://doi.org/10.1186/s41077-021-00173-1

5 Eppich W, Cheng A. Promoting Excellence and Reflective Learning in Simulation (PEARLS): development and rationale for a blended approach to health care simulation debriefing. Simul Healthc. 2015 Apr;10(2):106-15. doi: 10.1097/SIH.0000000000000072. PMID: 25710312

6 Jaye P, Thomas L, Reedy G. 'The Diamond': a structure for simulation debrief. Clin Teach. 2015 Jun;12(3):171-5. doi: 10.1111/tct.12300. PMID: 26009951; PMCID: PMC4497353

7 Rudolph JW, Simon R, Dufresne RL, Raemer DB. There's no such thing as "nonjudgmental" debriefing: a theory and method for debriefing with good judgment. Simul Healthc. 2006 Spring;1(1):49-55. doi: 10.1097/01266021-200600110-00006. PMID: 19088574

8 Abulebda K, Auerbach M, Limaiem F. Debriefing Techniques Utilized in Medical Simulation. [Updated 2022 Sep 26]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK546660/

9 Grant VJ, Robinson T, Catena H, Eppich W, Cheng A. Difficult debriefing situations: A toolbox for simulation educators. Med Teach. 2018 Jul;40(7):703-712. doi: 10.1080/0142159X.2018.1468558. Epub 2018 May 23. Erratum in: Med Teach. 2022 Sep;44(9):I. PMID: 29792100

10 Simon R, Raemer DB, Rudolph JW. 2010. Debriefing Assessment for Simulation in Healthcare (DASH)© Rater's Handbook. Center for Medical Simulation, Boston, Massachusetts https://harvardmedsim.org/wp-content/uploads/2017/01/DASH.handbook.2010.Final.Rev.2.pdf

Simulation documentary

CLICK OR SCAN THE QR CODE TO SEE THE ONLINE VIDEO

Narrator

Marc Lazarovici

Summary

A typical simulation at the sim center in Munich begins with a pre-simulation briefing, where the healthcare team participating in the simulation along with the debriefer/facilitator go over the details of the clinical case they will be running.

After the briefing, the healthcare professionals enter the simulation room, which is set up to mimic a real clinical environment with a mannequin patient already prepared with monitoring equipment attached.

As the team orients themselves and gets ready, we see the control room where two people - the facilitator and operator - are running the simulation technology. Their role is to observe and control what happens during the scenario while marking relevant scenes to reference later.

The team in the simulation room works through the clinical case just as they would a real patient, getting all information from the simulated environment without any direct interaction from the facilitators. The control room can fully observe their actions through one-way mirrors and video cameras.

After completing the simulation scenario, the team moves to a debriefing room set up as a meeting room. Here they participate in the debriefing session, sitting in a semi-circle and engaging in a facilitated discussion led by the debriefer.

The debriefing follows a structured approach with several phases. It begins with participants describing the situation, then analyzing the main issues or problems that occurred. The facilitator moderates but the goal is for participants to discuss more than the facilitator lectures.

Finally, the debriefing session wraps up with participants summarizing the key "take-home" messages and lessons from the experience.

UNIT 5 - Evaluation Methods in Simulation

Welcome to Unit 5 on the Evaluation Methods in Simulation. Medical simulation is a powerful method both for training and assessing healthcare professionals in various domains and contexts. However, using simulation for evaluation purposes requires careful planning, design, and implementation to ensure validity, reliability, and fairness. This unit provides an overview of the key principles and practices for conducting simulation-based assessment in healthcare.

Contents

The contents of this unit will be presented as follows:

Presentations:

- Assessment in simulation (40 min)

Reading

- Different aspects of assessment in SBME
- Advantages of OSCE Evaluation Method

Bibliography

Issenberg, S. B., McGaghie, W. C., Petrusa, E. R., Lee Gordon, D., & Scalese, R. J. (2005). Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. Medical teacher, 27(1), 10-28

McGaghie, W. C., Issenberg, S. B., Cohen, E. R., Barsuk, J. H., & Wayne, D. B. (2011). Does simulation-based medical education with deliberate practice yield better results than traditional clinical education? A meta-analytic comparative review of the evidence. Academic Medicine, 86(6), 706-711

Dieckmann, P., Gaba, D., & Rall, M. (2007). Deepening the theoretical foundations of patient simulation as social practice. Simulation in Healthcare, 2(3), 183-193

Van der Vleuten, C. P. M., Schuwirth, L. W. T., Driessen, E. W., Govaerts, M. J. B., & Heeneman, S. (2010). 12 Tips for programmatic assessment. Medical Teacher, 32(6), 482-485

Rudolph, J. W., Simon, R., Dufresne, R. L., & Raemer, D. B. (2007). There's no such thing as "nonjudgmental" debriefing: A theory and method for debriefing with good judgment

Yardley, S., & Teunissen, P. W. (2017). Kirkpatrick's levels and education 'evidence'. Medical education, 51(5), 498-502

Motola, I., Devine, L. A., Chung, H. S., Sullivan, J. E., & Issenberg, S. B. (2013). Simulation in healthcare education: A best evidence practical guide. AMEE Guide No. 82. Medical Teacher, 35(10), e1511-e1530

Ziv, A., Wolpe, P. R., Small, S. D., & Glick, S. (2003). Simulation-based medical education: An ethical imperative. Simulation in Healthcare, 1(4), 252-256

Harden, R. M., Stevenson, M., Downie, W. W., & Wilson, G. M. (1975). Assessment of clinical competence using objective structured examination. BMJ, 1(5955), 447-451

[Maran, N. J., & Glavin, R. J. (2003). Low- to high-fidelity simulation - a continuum of medical education?. Medical education, 37, 22-28

Brett-Fleegler, M., Rudolph, J., Eppich, W., Monuteaux, M., Fleegler, E., Cheng, A., & Simon, R. (2012). Debriefing Assessment for Simulation in Healthcare: development and psychometric properties. Simulation in Healthcare, 7(5), 288-294

Cook, D. A., Brydges, R., Ginsburg, S., & Hatala, R. (2015). A contemporary approach to validity arguments: a practical guide to Kane's framework. Medical Education, 49(6), 560-575 https://doi.org/10.1111/medu.12678

Brennan, R. L. (2001). Generalizability theory. Springer-Verlag

Assessment in Simulation

CLICK OR SCAN THE QR CODE TO SEE THE ONLINE VIDEO

Narrator

Christian Boeriu

Summary

Simulation serves several key roles in healthcare education - teaching technical and non-technical skills, system testing, and perhaps most critically, competency assessment. However, assessment introduces an inherent paradox compared to simulation's typical use for formative, non-judgmental training in a psychologically safe environment.

The Assessment Paradox
During educational simulations, facilitators provide non-judgmental feedback within a safe context where the artificial nature is acknowledged. Learners understand this is not reality. However, when using simulation for assessment purposes, participants are under psychological pressure with pass/fail consequences. The lack of realism becomes irrelevant - skills and competencies must be demonstrated regardless of the artificial environment.

This apparent contradiction highlights the importance of adequate simulation experience to bridge the gap. With repeated practice, learners become immersed and can suspend disbelief about the simulated setting, allowing their true abilities to be assessed accurately.

Formative vs. Summative Assessment
Two forms of assessment can be conducted through simulation: formative and summative. Formative assessment is diagnostic in nature, providing feedback to gauge progress and guide future learning activities. The criteria are learner centered. In contrast, summative assessment systematically evaluates a learner's overall achievement state against defined, public criteria at designated intervals.

While both have a role, the high-stakes nature of summative assessments amplifies the need for sufficient formative practice to ensure validity of the evaluation. Excessive artificiality can undermine an assessment's rationale.

The OSCE Approach

One of the most valuable assessment tools in healthcare simulation is the Objective Structured Clinical Examination (OSCE). OSCEs provide numerous advantages:

- Standardized approach ensuring fairness and reliability
- Comprehensive evaluation of clinical reasoning, communication, procedures, teamwork
- Safe environment for learners to demonstrate skills without risk
- Immediate individualized feedback while experience is fresh
- Structured tools and clear performance criteria promote objectivity
- Flexibility in designing scenarios tailored to diverse learning needs
- Efficiency for large-scale education programs
- Identification of specific competency gaps for remediation

Rigorously designing and conducting OSCEs according to best practices is crucial for effective assessment of healthcare professionals.

At the University of Medicine, Pharmacy, Science and Technology of Targu Mures, simulation-based assessments using OSCEs are integrated throughout the medical curriculum - for medical students in their fourth year, during the five-year emergency medicine residency program, and as part of the national emergency medicine board examination.

Both formative and summative simulation-based assessments are employed, with OSCE practices standardized across teaching hospitals. This comprehensive integration underscores the value placed on simulation as an assessment methodology.

Optimizing Simulation Assessment

While powerful, simulation assessment also has limitations like manpower needs, technical requirements, and potential realism pitfalls to mitigate. Establishing an educational framework, comprehensive facilitator training, and a culture of reflective practice are essential for optimizing its effectiveness.

Simulation cannot replace clinical experiences but serves as an invaluable risk-free arena to validate competencies before and throughout healthcare professionals' careers. Leveraging its assessment capabilities is vital for ensuring a skilled, proficient workforce providing safe patient care.

Different Aspects of Assessment in SBME

Simulation-based medical education (SBME) has burgeoned into a cornerstone for training healthcare professionals, from students to seasoned practitioners. Through high-fidelity manikins, computer-based simulations, and virtual reality, learners engage in a safe and controlled environment that fosters skill acquisition, decision-making, and reflective practice, without compromising care [1]. Yet, for this educational approach to be efficacious, its assessment methodologies must be both rigorous and robust.

In this text we provide the reader with a list of topics and suggested readings about the evaluative frameworks underpinning SBME, emphasizing the methodologies to ascertain the validity, reliability, and educational impact of these simulation modalities.

Evaluation Methods in Simulation-Based Medical Education

Direct Observation - One of the most traditional methods, where an instructor observes a learner's performance during a simulation and provides feedback.[2]

Checklists - Standardized lists of actions or considerations specific to a scenario or skill, allowing for consistent and objective evaluation.[3]

Global Rating Scales - General assessments of performance often based on broader categories like "communication" or "clinical reasoning".[4]

Self-assessment - Encourages reflective practice and helps identify areas for improvement from the learner's perspective.[5]

Video-assisted Debriefing - Utilizes video recordings of the simulation to facilitate feedback and discussion.

360-degree Feedback - Collects evaluations from multiple sources, including peers, instructors, and sometimes even standardized patients.

Ensuring the quality, efficacy, and relevance of simulation experiences requires meticulous evaluation. The diverse methodologies encompassing this evaluative spectrum are detailed below.

Kirkpatrick's Four-Level Model

The Kirkpatrick Model is a widely used model for evaluating the effectiveness of training programs. It consists of four levels of evaluation: Reaction, Learning, Behavior and Results. The model specifies that each level should be evaluated in order, using data from the previous levels to inform the next level's evaluation. Adapted for SBME, Kirkpatrick's model [6] provides the following hierarchy for evaluating our training programs:

Level 1 - Reaction: Measures learners' satisfaction and perceived relevance.
Level 2 - Learning: Assesses knowledge, skills, and attitude changes.
Level 3 - Behavior: Evaluates transfer of skills to the clinical setting.
Level 4 - Results: Measures patient outcomes and healthcare system impact.

While reaction (Level 1) is easy to measure, results (Level 4) are the most challenging as it requires isolating the effects of training amid other organizational factors.

Formative vs. Summative Evaluation

Formative Evaluation - This ongoing feedback helps learners identify areas of improvement during their training. Examples include debriefing sessions and constructive feedback during or immediately after simulation scenarios [7].

Summative Evaluation - Used to assess a learner's competency, typically at the end of a training program. Examples include objective structured clinical examinations (OSCEs) and high-stakes certification assessments [8].

Objective Structured Clinical Examinations (OSCEs)

OSCEs, traditionally used in clinical exams, have been adapted for SBME. They provide standardized scenarios where learners' clinical skills are assessed using specific criteria, ensuring both reliability and objectivity [9].

Talking about assessment, we usually think about the evaluation of learners. Assessment, however, is an activity that it is important to carry on also on the side of the educators, evaluating what we do and how we do it.

Fidelity Assessment

Fidelity, the degree to which the simulation replicates reality, is pivotal. High-fidelity simulations, like manikin-based simulations, are compared against low-fidelity tools, like task trainers, to discern the impact on learning outcomes [10].

Feedback and Debriefing Evaluation

Post-simulation debriefing is vital for reflection and learning. Evaluating the quality of debriefing, through tools like the Debriefing Assessment for Simulation in Healthcare (DASH), ensures effective feedback and learner insight [11].

Validity and Reliability in SBME

Ensuring validity and reliability is paramount. The Messick framework, a predominant approach in SBME, integrates various validity types, including content, response process, internal structure, relation to other variables, and consequential validity [12].

Reliability, on the other hand, emphasizes consistency. Generalizability theory, which assesses the reliability of performance assessments in SBME, is instrumental in this domain [13].

Challenges and Future Directions

Despite its potential, medical simulation evaluation isn't without its challenges. Some of these include:

- The potential for observer bias in direct observation methods.
- Difficulty in standardizing checklists and rating scales across different institutions.
- Balancing the depth and breadth of feedback to maximize educational impact

Though SBME has transformative potential, challenges like technological costs, faculty development, and scenario standardization persist. Furthermore, while evaluation methods are advancing, more research is needed to correlate simulation proficiency directly with improved patient outcomes.

SBME stands as a paragon of modern medical education, synthesizing experiential learning with patient safety. However, its true value is contingent upon rigorous evaluation methods, ensuring that healthcare professionals are not just trained, but are competent, reflective, and patient-centered.

References

[1] Issenberg, S. B., McGaghie, W. C., Petrusa, E. R., Lee Gordon, D., & Scalese, R. J. (2005). Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. Medical teacher, 27(1), 10-28

[2] McGaghie, W. C., Issenberg, S. B., Cohen, E. R., Barsuk, J. H., & Wayne, D. B. (2011). Does simulation-based medical education with deliberate practice yield better results than

traditional clinical education? A meta-analytic comparative review of the evidence. Academic Medicine, 86(6), 706-711

[3] Dieckmann, P., Gaba, D., & Rall, M. (2007). Deepening the theoretical foundations of patient simulation as social practice. Simulation in Healthcare, 2(3), 183-193

[4] Van der Vleuten, C. P. M., Schuwirth, L. W. T., Driessen, E. W., Govaerts, M. J. B., & Heeneman, S. (2010). 12 Tips for programmatic assessment. Medical Teacher, 32(6), 482-485

[5] Rudolph, J. W., Simon, R., Dufresne, R. L., & Raemer, D. B. (2007). There's no such thing as "nonjudgmental" debriefing: A theory and method for debriefing with good judgment

[6] Yardley, S., & Teunissen, P. W. (2017). Kirkpatrick's levels and education 'evidence'. Medical education, 51(5), 498-502

[7] Motola, I., Devine, L. A., Chung, H. S., Sullivan, J. E., & Issenberg, S. B. (2013). Simulation in healthcare education: A best evidence practical guide. AMEE Guide No. 82. Medical Teacher, 35(10), e1511-e1530

[8] Ziv, A., Wolpe, P. R., Small, S. D., & Glick, S. (2003). Simulation-based medical education: An ethical imperative. Simulation in Healthcare, 1(4), 252-256

[9] Harden, R. M., Stevenson, M., Downie, W. W., & Wilson, G. M. (1975). Assessment of clinical competence using objective structured examination. BMJ, 1(5955), 447-451

[10] Maran, N. J., & Glavin, R. J. (2003). Low- to high-fidelity simulation - a continuum of medical education?. Medical education, 37, 22-28

[11] Brett-Fleegler, M., Rudolph, J., Eppich, W., Monuteaux, M., Fleegler, E., Cheng, A., & Simon, R. (2012). Debriefing Assessment for Simulation in Healthcare: development and psychometric properties. Simulation in Healthcare, 7(5), 288-294

[12] Cook, D. A., Brydges, R., Ginsburg, S., & Hatala, R. (2015). A contemporary approach to validity arguments: a practical guide to Kane's framework. Medical Education, 49(6), 560-575 https://doi.org/10.1111/medu.12678

[13] Brennan, R. L. (2001). Generalizability theory. Springer-Verlag

Advantages of OSCE Evaluation Method

The Objective Structured Clinical Examination (OSCE) is a widely recognized and effective evaluation method used in medical and healthcare education. OSCEs are particularly advantageous when employed in simulation-based learning environments. This document aims to provide an exhaustive overview of the advantages of using the OSCE evaluation method in simulation scenarios.

1. Standardized Evaluation

OSCEs offer a standardized approach to assessing learners' skills and competencies. They provide a structured and consistent evaluation process across different simulation scenarios, ensuring fairness and reliability. By utilizing standardized checklists, rating scales, and evaluation criteria, OSCEs eliminate biases and promote consistent assessments, leading to more reliable results.

2. Comprehensive Assessment

OSCEs provide a comprehensive evaluation of learners' abilities. They can assess a wide range of skills, including clinical reasoning, communication, physical examination techniques, procedural skills, teamwork, and professionalism. The OSCE format allows for the assessment of multiple competencies simultaneously, enabling educators to gain a holistic understanding of learners' performance.

3. Realistic Simulation

Simulation-based learning offers a safe environment for learners to practice clinical skills without endangering patient safety. OSCEs within simulations allow learners to encounter realistic patient scenarios, enhancing their ability to apply knowledge and skills in a context that closely resembles real-world clinical settings. This realism helps bridge the gap between theoretical knowledge and clinical practice.

4. Immediate Feedback

One of the key advantages of OSCEs in simulations is the ability to provide immediate feedback to learners. Instructors can offer constructive feedback immediately following each OSCE station, allowing learners to reflect on their performance while the experience is still fresh in their minds. This prompt feedback facilitates the identification of strengths and areas for improvement, promoting continuous learning and skill development.

5. Objective Evaluation

The OSCE evaluation method promotes objectivity by employing structured assessment tools and clear performance criteria. With predefined checklists and rating scales, evaluators can objectively score learners' performance based on specific indicators and benchmarks. This objectivity reduces subjectivity and inter-rater variability, ensuring fair and unbiased evaluations.

6. Flexibility and Adaptability

OSCEs in simulation offer flexibility in designing scenarios that cater to diverse learning needs. Educators can create simulations that align with different levels of learner expertise, progressively increasing the complexity and difficulty of scenarios. OSCEs also allow for scenario customization, enabling instructors to focus on specific skills or competencies based on individual learning objectives.

7. Enhanced Confidence and Competence

Repeated exposure to OSCEs in simulations contributes to increased learner confidence and competence. By practicing in a controlled environment, learners can refine their skills, enhance their clinical decision-making abilities, and build self-assurance. This increased confidence transfers to real clinical encounters, improving patient care and overall professional performance.

8. Efficient Assessment Process

OSCEs offer an efficient assessment process, particularly in large-scale educational programs. Multiple learners can be evaluated simultaneously at different stations, optimizing the use of time and resources. OSCEs can also be easily standardized across different training sites, allowing for consistent evaluations and facilitating the comparison of learner performance.

9. Identification of Learning Gaps

Through OSCEs in simulations, educators can identify specific areas where learners may have knowledge or skill gaps. The evaluation process highlights deficiencies in learners' performance, enabling targeted interventions and personalized learning plans. OSCEs aid in identifying areas for improvement at both individual and programmatic levels, enhancing the overall quality of education and training.

The OSCE evaluation method, when implemented within simulation-based learning environments, offers numerous advantages for assessing learners' skills and competencies. Standardization, comprehensive assessment, realistic simulation, immediate feedback, objective evaluation, flexibility, enhanced confidence and competence, efficiency, and identification of learning gaps are key benefits of utilizing OSCEs in simulation scenarios. By leveraging the strengths of OSCEs, educators can enhance the learning experience, promote skill development, and prepare learners for real-world clinical practice.

UNIT 6 - Standardized / Simulated Patient in Simulation

Welcome to Unit 6 dedicated to the Standardized Patient in Medical Simulation. The use of standardized patients in healthcare education dates back to the 1960s and since then gained acceptance and it is now firmly incorporated into simulation practices. In this comprehensive program, we delve into the crucial role of standardized patients (SPs) in medical education and training.

This unit is designed to guide you through the intricacies of effectively utilizing SPs in simulations, offering an in-depth understanding of how they contribute to a realistic, safe, and effective learning environment. You'll learn about the selection, training, and utilization of standardized patients, along with strategies to maximize their impact in simulating real-world clinical scenarios. This course is ideal for medical educators, simulation coordinators, and healthcare professionals seeking to enhance their skills in creating authentic, patient-centered learning experiences. Join us to explore the dynamic world of standardized patients and transform medical simulation into a powerful educational tool.

Contents

The contents of this unit will be presented as follows:

Presentations:

- Standardized / Simulated Patient in Simulation (25 min)

Articles:

1. The Association of Standardized Patient Educators (ASPE) Standards of Best Practice (SOBP) (Mandatory)
2. An overview of the uses of standardized patients for teaching and evaluating clinical skills (Barrows, 1993) (Supplementary)
3. From standardized patient to care actor (Hardee, 2005) (Supplementary)
4. Following the threads of innovation (Wallace, 2008) (Supplementary)

Further reference:

- Standardized Patient Case Template

Bibliography

1 Lewis, K.L., Bohnert, C.A., Gammon, W.L. et al. The Association of Standardized Patient Educators (ASPE) Standards of Best Practice (SOBP). Adv Simul 2, 10 (2017). https://doi.org/10.1186/s41077-017-0043-4

INACSL Standards Committee (2016, December). INACSL standards of best practice: SimulationSM Simulation design. Clinical Simulation in Nursing, 12(S), S5-S12. http://dx.doi.org/10.1016/j.ecns.2016.09.005

Cleland JA, Abe K, Rethans JJ. The use of simulated patients in medical education: AMEE Guide No 42. Med Teach. 2009;31(6):477-486. doi:10.1080/01421590903002821

2 Barrows, H S. An overview of the uses of standardized patients for teaching and evaluating clinical skills. AAMC. Academic Medicine 68(6):p 443-51, June 1993

3 Hardee JT, Kasper IK. From standardized patient to care actor: evolution of a teaching methodology. Perm J. 2005 Summer;9(3):79-82. doi: 10.7812/TPP/05-030. PMID: 22811638; PMCID: PMC3396073.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3396073/

4 Peggy Wallace. (2008) "Following the Threads of an Innovation: The History of Standardized Patients in Medical Education". Published online by the Association of Standardized Patient Educators (ASPE). Accessible online at: https://web.archive.org/web/20081228115335/http://aspeducators.org/wallace.htm

Kreith A L, Memoirs of a Simulated Patient: What Physicians Can Learn from Actors. Virtual Mentor. 2003;5(12):577-579. doi: 10.1001/virtualmentor.2003.5.12.msoc1-0312. Accessible online at: https://journalofethics.ama-assn.org/article/memoirs-simulated-patient-what-physicians-can-learn-actors/2003-12

Books:
Dudley, F. (2012). The Simulated Patient Handbook: A Comprehensive Guide for Facilitators and Simulated Patients (1st ed.). CRC Press. https://doi.org/10.1201/9781315383774

Nestel, D. F., & Bearman, M. L. (2015). Simulated Patient Methodology: Theory, Evidence and Practice. Wiley-Blackwell. https://doi.org/10.1002/9781118760673

Using SPs in Simulation

EEDUSIM training in hEalthcare EDUcation with SIMulation

Erasmus+

STANDARDIZED PATIENT

UNIT 6

Narrator

Sandro Savino

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Summary

In healthcare simulation, standardized patients (SPs) offer a powerful modality that goes beyond traditional manikin-based scenarios. A SP is an individual trained to portray an actual patient case consistently and realistically within the simulation context. By interacting with an SP, learners can practice competencies in both technical and soft skills in a way that is different from what is possible by using manikins.

During an SP encounter, learners interact with the SP just as they would with an actual patient, including taking a history, performing physical examinations, and determining a diagnosis or treatment plan. After the scenario, the SP transitions into providing valuable firsthand feedback about the learner's performance, communication approach, and areas for improvement.

The use of SPs provides several key advantages over manikin-based simulations.

Development of Communication Skills
Interacting with an SP allows learners to hone vital communication skills in a way that manikin-based scenarios cannot. These include verbal communication (open-ended questioning, active listening), non-verbal skills (eye contact, body language), building patient rapport and trust, and demonstrating empathy - all essential for effective patient-provider relationships.

Realistic Patient Interactions
Unlike manikins, SPs can respond spontaneously and engage in free-form dialogue, replicating the unpredictable nature of real patient encounters. This dynamic interaction challenges learners to apply their clinical knowledge flexibly while also managing the interpersonal aspects of the patient interaction.

Constructive Feedback
After each SP encounter, learners receive detailed, firsthand feedback about their performance from the SP's perspective as the 'patient'. This unique vantage point provides

insights into how the learner made the patient feel during the interaction, allowing valuable self-reflection.

Evaluation of Competencies
When appropriately trained, SPs can provide reliable evaluation of learners' competencies using standardized assessment tools. This allows formative feedback as well as summative assessments of skills like history-taking, patient education, and diagnosis.

SPs go for different names: standardized patient is usually used for scenarios in which the SP is supposed to perform the same scenario in a consistent manner multiple times, e.g. during an assessment of a class of students. The name simulated patient is used when the SP has more freedom in the interaction with the learner and the scenario is more open to e.g. during the simulation of more advanced learners. Sometimes the SP does not perform the role of a patient, e.g. the SP is the father of the patient (either played by a manikin or another SP); in this case the term simulated participant can be used to better describe his role.

When preparing SP-based scenarios, there is a critical aspect to consider that is missing in manikin-based simulation: the training of the SP.
According to the ASPE Standards of Best Practice, this training has two main focuses: portraying the patient's role realistically and consistently, as well as providing constructive feedback and performance evaluation.

Sufficient time must be allocated for thorough training of the SP before the simulation.
The simulation faculty must develop comprehensive case materials, including the patient's presenting complaint, medical history, symptoms, physical findings, and expected course of treatment, to allow the SP to portray the patient. Also, evaluation instruments and learners' training protocols need to be discussed with the SP before the simulation starts. Careful planning of the SP training is hence necessary.

In general, for the portrayal of the patient, the SP must be prepared on:

- In-depth review of case materials
- Mastering symptoms, emotional expressions, response patterns
- Practicing consistent, standardized performance
- Handling learner questions/actions appropriately
- Physical safety considerations (avoiding risky simulations)

Furthermore, to allow the SP to provide feedback and evaluation, it is necessary to prepare the SP on:

- Overview of learning objectives and competencies
- Use of assessment tools (checklists, rating scales, etc.)
- Best practices for providing feedback
- Skills to evaluate (history-taking, patient education, etc.)
- Remaining objective and unbiased

The Association of Standardized Patient Educators (ASPE) produces a standard of best practice providing clear and practical guidelines for educators who work with SPs. Also, the

International Nursing Association for Clinical Simulation and Learning provides useful guidelines for the use of SP in simulation. We invite you to read both documents [1,2].

The ASPE standards [1] provide a comprehensive framework for SP-based simulation across five domains: safe work environment, case development, training, program management, and professional development. Underlying principles emphasize psychological safety, authentic case content, consistent role portrayal, structured feedback, quality management, and continuous improvement.

While SPs enable highly realistic patient interactions, there are some limitations compared to manikin-based simulations. SPs cannot simulate abnormal vital signs or physical findings of diseases. Furthermore, SPs cannot undergo any invasive procedures for ethical reasons. To overcome these limitations, it is possible to use some tools and approaches.

Simulated medical devices can be used to display customized patient data during the scenario. Examples include virtual patient monitors showing programmable vital signs, simulated stethoscopes, ultrasound probes, otoscopes etc. and, in the near future, augmented reality/mixed reality displays. These technologies allow learners to perform assessments and receive realistic feedback as if examining an actual patient with the specified condition.

Another approach is using wearable accessories that can be attached to the SP to simulate physical findings. These can take the form of skin pads, 3D-printed attachments simulating anatomical abnormalities or vests/suits allowing palpation of masses or other findings.
Also the use of moulage should be considered to enhance the realism of the simulation.
The use of wearable pads can allow the learners to perform invasive procedures (eg. intravenous access).

In cases where SPs have limitations, a hybrid approach combining SPs and manikins can be employed. The SP could initiate the scenario, then transition to a manikin when invasive procedures are required, or abnormal vitals/findings need to be portrayed.

Standardized patients remain an invaluable simulation tool by bridging the gap between theoretical learning and authentic patient care experiences. When properly trained using established best practices, SPs provide a safe, standardized yet highly realistic method to cultivate essential clinical skills, communication competencies, and professional behaviors in healthcare learners before engaging with real patients.

References

1 Lewis, K.L., Bohnert, C.A., Gammon, W.L. et al. The Association of Standardized Patient Educators (ASPE) Standards of Best Practice (SOBP). Adv Simul 2, 10 (2017). https://doi.org/10.1186/s41077-017-0043-4

2 INACSL Standards Committee (2016, December). INACSL standards of best practice: SimulationSM Simulation design. Clinical Simulation in Nursing, 12(S), S5-S12. http://dx.doi.org/10.1016/j.ecns.2016.09.005

UNIT 7 - Implementing Simulation in the Curriculum

Welcome to Unit 7 on the Implementation of Simulation in the Curriculum.
Throughout this unit, you'll gain insights into the principles of effective simulation implementation, including planning, development, and evaluation strategies. We will explore how simulations can be seamlessly incorporated to enhance learning outcomes, foster practical skills, and provide immersive experiences across various disciplines.

Contents

The contents of this unit will be presented as follows:

Presentations:

- Implementing simulation in the curriculum (32 min)

Reading:

- see bibliography

Bibliography

Steadman, Randolph H, and others, 'Incorporating simulation into the medical school curriculum', in Richard H. Riley (ed.), Manual of Simulation in Healthcare, 2 edn (Oxford, 2015; online edn, Oxford Academic, 1 Jan. 2016), https://doi.org/10.1093/med/9780198717621.003.0010

INACSL Standards Committee, Charnetski, M., & Jarvill, M. (2021). Healthcare Simulation Standards of Best Practice® Operations. Clinical Simulation in Nursing, https://doi.org/10.1016/j.ecns.2021.08.012

Fanning, R. M., & Gaba, D. M. (2007). The role of debriefing in simulation-based learning. Simulation in Healthcare, 2(2), 115-125

Dieckmann, P., Gaba, D., & Rall, M. (2007). Deepening the theoretical foundations of patient simulation as social practice. Simulation in Healthcare, 2(3), 183-193

Gaba, D. M. (2004). The future vision of simulation in health care. Quality and Safety in Health Care, 13(suppl 1), i2-i10

McGaghie, W. C., Issenberg, S. B., Cohen, M. E. R., Barsuk, J. H., & Wayne, D. B. (2011). Does simulation-based medical education with deliberate practice yield better results than

traditional clinical education? A meta-analytic comparative review of the evidence. Academic Medicine, 86(6), 706-711

Kneebone, R. (2003). Simulation in surgical training: educational issues and practical implications. Medical Education, 37(3), 267-277. https://doi.org/10.1046/j.1365-2923.2003.01440.x

Lateef, F. (2010). Simulation-based learning: Just like the real thing. Journal of Emergencies, Trauma, and Shock, 3(4), 348–352. https://doi.org/10.4103/0974-2700.70743

Issenberg, S. B., McGaghie, W. C., Petrusa, E. R., Lee Gordon, D., & Scalese, R. J. (2005). Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. Medical Teacher, 27(1), 10-28

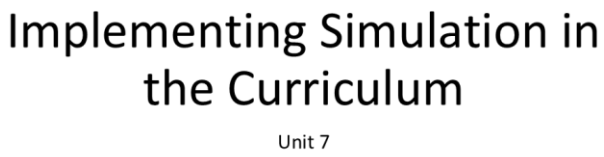
Cook, D. A., Brydges, R., Hamstra, S. J., Zendejas, B., Szostek, J. H., Wang, A. T., Erwin, P. J., & Hatala, R. (2013). Comparative effectiveness of instructional design features in simulation-based education: systematic review and meta-analysis. Medical Teacher, 35(1), e867-e898. https://doi.org/10.3109/0142159X.2012.714886

Harrop, James MD; Lobel, Darlene A. MD; Bendok, Bernard MD; Sharan, Ashwini MD; Rezai, Ali R. MD. Developing a Neurosurgical Simulation-Based Educational Curriculum: An Overview. Neurosurgery 73():p S25-S29, October 2013. doi: 10.1227/NEU.0000000000000101

Leung FH, Martin D, Batty H. A theory-based curriculum design for remediation of residents' communication skills. Med Teach. 2009 Dec;31(12):e555-9. doi: 10.3109/01421590902849529. PMID: 19995156

Kaufman, D. M., & Mann, K. V. (1999). Teaching and learning in medical education: How theory can inform practice. In Association for the Study of Medical Education, 7-30

Implementing Simulation in the Curriculum



Narrator

Sandro Savino

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Summary

This chapter outlines the key considerations for implementing simulation into an existing curriculum. What we mean by implementing simulation into a curriculum is to move from the design of isolated simulation exercises to a comprehensive approach that pushes the adoption of simulation as a teaching tool across the entire educational program.

This is more of an advanced topic, intended for educators with an extensive knowledge of both the different tools and methodologies offered by simulation, the existing curriculum and the educational context. Depending on the size of the curriculum, it can be a daunting task, and it is advised to undertake it within a team.

The integration of simulation-based education into healthcare curricula requires careful planning and execution.

Steps

Assessing needs and setting objectives

The first step is to identify where simulation can add value and enhance learning in the current curriculum. This involves pinpointing areas where students struggle with abstract concepts or have limited practical application opportunities due to safety or feasibility constraints. Gathering input from student representatives, reviewing course satisfaction data, and exploring literature on previous implementations can guide this needs assessment process.

Once gaps are identified, it is crucial to define specific, measurable, achievable, relevant, and time-bound (SMART) learning objectives that simulation can address. Well-crafted objectives target precise areas for improvement and allow progress tracking, aiding in justifying resource allocation.

Simulation design

So far we learnt the different modalities that simulation offers. Once the gaps have been identified it is time to select the most correct type of simulation to adopt to bridge them. Different simulation modalities (manikin-based, standardized patients, skills trainers, etc.) are suited for various learning objectives and require different types and amounts of resources. Careful modality selection aligns the simulation approach with the targeted competencies, learner levels, and available resources.

Simulations must be designed to align with learning objectives and learner levels. Factors like complexity, timing within the curriculum, medical terminology, and knowledge requirements should be calibrated appropriately.
Similarly, designing the simulation the resources required and those available must be balanced. The number of students involved and the number of simulation devices used are directly connected to the time available for each student to practice in one hour of lesson; the same goes for the number of devices, that relates to the number of training staff needed.
Planning of the simulation should also consider time requirements, encompassing registration, pre-work, equipment preparation and post-event activities like debriefing and feedback collection.

Simulation Logistics and Resource Management
Implementing simulation at a curriculum level often involves large student cohorts that can quickly overwhelm faculty and facility resources. Strategic scheduling becomes paramount to maximize utilization while ensuring a meaningful learning experience for all participants.
Some of the tasks to plan are:

- Room allocation, to ensure sufficient dedicated spaces for simulation scenarios, debriefings, and preparatory activities based on curriculum needs.
- Equipment procurement: Forecasting requirements for manikins, task trainers, consumables etc. and developing procurement plans aligned with budgets.

When planning for a big number of simulation activities, it is also necessary to factor in equipment maintenance, implementing schedules for preventive maintenance, repairs, and timely replacements to minimize downtime.

Evaluation, Feedback, and Continuous Improvement
Simulation allows for both student evaluation and soliciting feedback on the implementation process itself. Regularly collecting student and faculty perspectives enables continuous refinement of content, materials, and logistics. An iterative approach, guided by data-driven insights, is a key for sustainable curriculum integration. Tracking progress and achievements with objective measurements can help in justifying the costs and the efforts.

Challenges

Integrating simulation into a curriculum is a difficult activity that requires overcoming many challenges, among which are the large amount of resources needed, in terms of money, time and staff, and the required change of old habits.

High Cost of Simulation Technology

While simulation equipment can be expensive, there are strategies to manage costs effectively. Starting with a modest setup and scaling gradually allows building capabilities over time. Seeking sponsorships, grants, or educational project funding can provide financial support for technology acquisition. Getting stakeholders involved, for example demonstrating the "wow factor" of simulation through immersive experiences can help garner support and funding.

When purchasing technology, it is beneficial to invest in versatile simulators that can serve multiple purposes across various courses, making the expense easier to justify; also, sometimes top-tier devices are not necessarily the best: buying two lower tech manikins at the cost of one high tech simulator can be wiser in terms of resource management.

Time Required for Curriculum Integration

Adapting curricula to incorporate simulation is undoubtedly time intensive. Securing buy-in from educators is crucial, as they must dedicate efforts to revise existing materials and teaching approaches. Leading by example and involving faculty in simulation design/delivery can foster engagement.

Offering turnkey solutions where the simulation faculty handles the bulk of preparatory work can lower barriers to adoption. As educators experience the benefits firsthand, their willingness to invest time in curriculum transformation may increase.

Time Required for Simulation

Integrating simulation-based education across a comprehensive curriculum presents significant logistical challenges: aspects like required equipment, room allocations, facilitator staffing, and scheduling demand strategic decision-making to optimize resource utilization and achieve the desired learning objectives while operating within practical constraints.

Strategies to reduce resource burdens include:

- Parallel simulations, running multiple simultaneous scenarios in different rooms/areas to accommodate more students concurrently.
- Student rotations, scheduling student groups to cycle through simulation activities, allowing more efficient use of limited resources like manikins or standardized patient actors.
- Pre-briefing, where the students receive materials before the simulation and arrive at the day of the activity already prepared and ready to start, optimizing the time available for the training experience.

Faculty Training and Peer Education

Building a robust faculty team for simulation-based education is an ongoing challenge. Strategies include internal training cycles, where senior faculty train newer members, and the innovative use of peer-to-peer education models. Vertical (senior students teaching juniors) and horizontal (same-level students teaching different topics) approaches can reduce facilitation needs while enhancing student engagement.

Staff Availability

Having adequate staffing for simulation design, facilitation, technical support, and administrative tasks is an ongoing need, as faculty turnover is common. Implementing internal training cycles with senior members mentoring newer facilitators can be a cost-effective solution. Peer-to-peer education models, where students themselves are trained as co-facilitators, can supplement faculty resources. Vertical (senior students teaching juniors) and horizontal (same-level students teaching different topics) peer-to-peer can reduce facilitation needs with the added bonus to promote active learning

Partnering with other departments or institutions to share training resources and best practices can also ease faculty development burdens. Continuously advocating for simulation and celebrating successes helps attract new faculty interested in this teaching modality.

Change Management

At its core, integrating simulation requires managing change within an established educational culture. Clear communication about the pedagogical benefits, continuous stakeholder involvement, and celebrating early wins are crucial for gaining widespread acceptance.

Identifying champions among faculty and learners who can advocate for simulation can accelerate cultural adoption. Piloting simulations in specific courses before broader implementation allows demonstrating value and refining processes.

Overcoming inertia and skepticism is an ongoing process that requires perseverance, data-driven advocacy, and a commitment to continuous improvement based on feedback from all stakeholders.

UNIT 8 - Running a Simulation Center

Welcome to Unit 8 on Running a simulation center. There are a number of different factors that contribute to the successful operation of a medical simulation center, where healthcare professionals can refine their skills, learn new procedures and practice team interactions using high-tech manikins and virtual reality technology.

This unit will provide a brief insight into these factors and deliver a guide to managing these advanced learning environments.

Contents

The contents of this unit will be presented as follows:

Presentations:

- Management of a Simulation Center (51 min)
- What does it take to be professional? (15 min)
- Accreditation: How to ensure quality? (25 min)

Reading:

- See bibliography

Bibliography

Seropian M, Lavey R. Design considerations for healthcare simulation facilities. Simul Healthc. 2010 Dec;5(6):338-45. doi: 10.1097/SIH.0b013e3181ec8f60. PMID: 21330819

Cook, D. A., Hatala, R., Brydges, R., Zendejas, B., Szostek, J. H., Wang, A. T., ... & Hamstra, S. J. (2011). "Technology-enhanced simulation for health professions education: a systematic review and meta-analysis." JAMA, 306(9), 978–988

SESAM Accreditation of Simulation Based Educational Institutions – Principles
https://www.sesam-web.org/accreditation/

Al-Elq, A. H. (2010). "Simulation-based medical teaching and learning." *Journal of Family & Community Medicine,* 17(1), 35–40

Lateef, F. (2010). "Simulation-based learning: Just like the real thing." *Journal of Emergencies, Trauma, and Shock,* 3(4), 348–352

3. McGaghie, W. C., Issenberg, S. B., Petrusa, E. R., & Scalese, R. J. (2010). "A critical review of simulation-based medical education research: 2003–2009." *Medical Education,* 44(1), 50–63

Palaganas, J. C., Maxworthy, J. C., Epps, C. A., & Mancini, M. E. (2015). "Defining excellence in simulation programs." Lippincott Williams & Wilkins

Gaba, D. M. (2004). "The future vision of simulation in healthcare." Quality and Safety in Health Care, 13(suppl 1), i2–i10

Ziv, A., Wolpe, P. R., Small, S. D., & Glick, S. (2003). "Simulation-based medical education: an ethical imperative." *Academic Medicine,* 78(8), 783–788

Cook, D. A., Hatala, R., Brydges, R., Zendejas, B., Szostek, J. H., Wang, A. T., ... & Hamstra, S. J. (2011). "Technology-enhanced simulation for health professions education: a systematic review and meta-analysis." JAMA, 306(9), 978–988

Motola, I., Devine, L. A., Chung, H. S., Sullivan, J. E., & Issenberg, S. B. (2013). "Simulation in healthcare education: A best evidence practical guide. AMEE Guide No. 82." Medical Teacher, 35(10), e1511–e1530

Management of a Simulation Center

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Narrator

Marc Lazarovici

Christian Boeriu

Summary

Operating a successful healthcare simulation center requires a careful balance of multiple components working in synergy. This chapter outlines the key aspects to consider when managing and running an effective simulation program.

Human Resources

At the core of any simulation center are the people - the human resources that bring it to life. This includes a diverse team of instructors, facilitators, technicians, and support staff, each playing a vital role.

Technicians are invaluable members, responsible for ensuring the technology and equipment function seamlessly. Beyond technical expertise, fostering a collaborative relationship between technicians and instructors is crucial. Clear role definitions, mutual respect, and open communication channels help create a cohesive team dynamic.

Continuous training and development of faculty is another priority. Implementing internal training cycles, where experienced staff mentor newer members, can be an effective approach. Additionally, exploring innovative peer-to-peer education models, where students themselves are trained as co-facilitators, can supplement faculty resources while enhancing learner engagement.

Materials and Infrastructure

A simulation center requires a range of physical resources, including manikins, task trainers, medical equipment, and consumables. Proper storage, maintenance schedules, and redundancy planning are essential for smooth operations. Anticipating technology refresh cycles and budgeting for upgrades is also necessary to prevent obsolescence.

Securing adequate funding is an ongoing challenge. A multi-pronged approach can involve cost recovery through course fees, seeking project grants or sponsorships, and leveraging partnerships with other institutions or industry. Careful financial planning and exploring diverse funding sources are key to sustaining and growing the center's capabilities.

The center's physical infrastructure, including room layouts, audio-visual systems, and amenities, should be designed to support the intended simulation modalities and learner cohort sizes effectively.

Marketing and External Relations

Promoting the center's offerings and cultivating a strong brand presence are vital for attracting participants and maintaining a competitive edge. A clear marketing strategy, tailored to the target audience, should leverage various channels such as social media, websites, press features, and industry events.

In today's digital landscape, a professional and up-to-date website is essential: an outdated or neglected website can convey an unfavorable impression, so regular updates and a user-friendly design are paramount. Additionally, leveraging social media platforms can further amplify your marketing efforts and engage with your target audience. However, pursuing “old-style” media coverage through local newspapers, scientific/medical publications, and other relevant press should not be underestimated as it can introduce your offerings to a wide audience in a credible, third-party manner.

Developing a cohesive public image through consistent branding and messaging is also important. This may include considerations like team uniforms or dress codes, though the ultimate decision should balance institutional policies and team preferences.

Maintaining positive relationships with parent organizations or academic institutions is equally crucial. This could involve representation on internal communication platforms, collaborative projects, or shared resource utilization.

Course Offerings and Logistics

A well-planned course calendar, with clear information on offerings, registration processes, and pricing, is essential for smooth operations. Pricing models may vary based on factors like exclusivity, market positioning, cost recovery needs, and competitive landscape.

For large student cohorts, meticulous resource planning is necessary to optimize utilization while achieving learning objectives within constraints. Strategies like streamlined facilitation through pre-briefing, dedicated familiarization sessions, and thoughtful scheduling of parallel activities can help reduce resource burdens.

Research and Academic Integration

Many healthcare simulation centers have opportunities to engage in research activities, which can yield academic outputs and additional funding sources. However, this requires dedicated resources and a careful balance between teaching and research priorities.

Fostering collaborations with academic partners, industry, or other institutions can create synergies and expand research possibilities. Involving team members in research projects can also enhance professional development and contribute to the broader knowledge base in healthcare simulation.

Continuous Improvement

Regular evaluation, feedback collection from learners and faculty, and iterative refinement of processes are vital for continuous improvement. Embracing a data-driven approach, guided by insights from all stakeholders, enables sustainable growth and ensures the center remains at the forefront of healthcare education.

What Does it Take to be Professional?

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Narrator

Marc Lazarovici

Summary

In the realm of managing and operating simulation centers, the pursuit of professionalism is paramount to attaining true organizational excellence. This chapter delves into the intricate balance between structured organization and adaptive flexibility that underpins professionalism.

The metaphor of a well-oiled clock is often used to represent an idealized level of organization. However, as humorously depicted in an extract of the movie “The Incredibles”, an excess of rigid organization can paradoxically hinder progress and stifle the very excellence it aims to cultivate. True excellence, as Peter Dickman eloquently stated, "lies in the capacity to adapt successfully to the dynamic variations of any situation."

Professionalism transcends mere appearances or superficial markers. It is a state of being, manifested through competent actions and an unwavering commitment to delivering one's best. Akin to a finely tuned orchestra, professional organizations harmonize their efforts through a judicious blend of structure and creative latitude.

To embody professionalism, organizations must establish a robust framework tailored to their unique context. This entails clarifying the governing rules, be they external regulations or internal codes of conduct. Additionally, a clear delineation of the target audience and the corresponding resources – personnel, facilities, and materials – is crucial. However, this framework must be imbued with sufficient flexibility to accommodate the inevitable ebbs and flows of real-world scenarios.

Once an organization has internalized professionalism, the question arises: should it actively showcase this achievement to external stakeholders? Various avenues exist, including sought-after accreditations, quantifiable metrics such as scientific output, or public recognition through ratings and awards. Whichever path is chosen, the motivation must be carefully examined to ensure alignment with the organization's core values and objectives.

For those pursuing accreditation, programs at national, specialty, or international levels are available. The process is rigorous, requiring a meticulous examination of existing processes and a lengthy preparation period. Notable accrediting bodies include the Society for Simulation in Healthcare (SSH) in the United States and the Association for Simulated Practice in Healthcare (ASPiH) in Europe.

Accreditation: How to Ensure Quality?

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Narrator

Marc Lazarovici

Summary

The Society for Simulation in Europe (SESAM) has established a comprehensive accreditation program to promote excellence and standardization in the rapidly growing field of healthcare simulation across the continent. The program was developed by a group of enthusiasts over 3 years, with the first centers accredited in 2018. This chapter explores the rationale, development, and implementation of this accreditation process.

SESAM Accreditation Principles

The accreditation program is underpinned by two sets of principles: core values and scope. The five core values are:

1. Promoting patient safety and quality improvement
2. Basing educational activities on robust educational principles
3. Offering high-quality learning opportunities
4. Ensuring psychological safety at all times
5. Demonstrating professionalism in all activities

The scope principles relate to the practical application of these core values, encompassing areas such as course design and planning, teaching and support organization, debriefing and feedback methods, educational management and leadership, and the relationship to research and evidence-based practice.

SESAM Accreditation process

A key tenet of the SESAM accreditation is the recognition that there are multiple valid approaches to meeting the principles, rather than a single prescriptive method. The program acknowledges and embraces the diversity of practices across Europe, focusing on understanding the rationale and context behind each center's approaches.

During the accreditation process, centers are required to provide detailed descriptions of how they address each principle within their specific environment. The emphasis is on demonstrating alignment with the principles' intent, rather than adhering to a rigid set of requirements.

The accreditation process begins with centers submitting comprehensive documentation outlining their practices and alignment with the principles. This documentation is thoroughly reviewed by auditors for completeness and adherence to the provided structure.

A crucial component is the site visit, during which auditors observe real educational activities, engage with staff and learners, and gain insights into the center's operational realities. This immersive experience allows for a deeper understanding of the center's context and challenges, fostering a collaborative dialogue between professionals.

Throughout the process, auditors maintain an open and inquisitive mindset, recognizing that they too can learn from the diverse practices encountered. The accreditation is not a pass-or-fail examination but rather a constructive exchange aimed at promoting reflection, continuous improvement, and the sharing of best practices. By critically examining their practices, norms, and values against established principles, educators and administrators gain valuable insights into areas for enhancement. This fosters an environment of ongoing learning and adaptation, ensuring that the center remains responsive to evolving educational needs and technological advancements.

Positive Effects

At its core, the SESAM accreditation program is driven by the overarching goal of promoting patient safety and enhancing the quality of healthcare delivery. By emphasizing robust educational principles, high-quality learning opportunities, and the application of evidence-based practices, accredited centers contribute to the development of a skilled and competent healthcare workforce. This, in turn, translates into improved patient outcomes and a higher standard of care across healthcare systems.

The accreditation process represents also a significant professional achievement and a source of pride for simulation educators and staff. The rigorous standards and peer-review process validate their expertise and commitment to their field. This recognition can foster a sense of accomplishment and motivation, encouraging further professional growth and the pursuit of innovative teaching methodologies.

PRACTICE

Dear educators, welcome to this second section of the handbook of the EEDUSIM project.
This section is intended for educators as it contains information relevant for the delivery of a training course in healthcare simulation.

We divided the handbook into a theory and practice section as we believe that both theory and practice are incredibly important in the training of a facilitator.
In our idea, the trainee should attend the theory part online prior to the delivery of the practical part, that happens in person.

Generally, basic train-the-trainer courses last between 1 and 3 days, in which both theory and practice are explained. In this handbook we describe longer and richer courses, with a theory that could take around one month to complete online and the in person practical part that is 5 or 7 days long.

Of course it is not mandatory to follow this program: the theoretical part could comprise only a selection of the topics in the theory section of this handbook and the practical part could include only some of the activities listed below.
It is up to you to choose what fits best your learning objectives, and to craft a training course suitable for your learners and the resources you have available.

How to prepare a successful course

Based on our experiences, here are some tips to keep in mind when planning your course that could improve your training and the experience of your learners.

- Prepare tags with names for each participant and each of the faculty members and staff involved
- Foster networking and group works
- In the activities balance the groups for experience and mixed backgrounds
- Organize social event
- Organize an opening event

About the contents

These contents reflect the two pilot courses that were delivered during the EEDUSIM project. The first pilot course started in January 2024 with the opening of the online platform for the theory part, and the practical took place in Padova February 2024. The second course started in August 2024 with the online part and the practice was done in Lugano in September 2024. Both courses were attended by 26 trainees.

This part of the handbook contains the experience gained and lessons learned during these courses.

In the week program of both courses there is a space dedicated to an official opening ceremony. Planning such an event was instrumental during the EEDUSIM project to bring some visibility to the project and to the topic of simulation among institutional stakeholders.

Planning for a similar event also in your course could be useful if you like the opportunity to shine some light on your work as an educator for example to increase the awareness of what you do; in such a case do not forget to invite all the important stakeholders. Even without important people coming, a lower tone event could be planned, as an extended ice breaking moment among the participants. Of course, if you plan to deliver the training course on a regular basis, there is probably no purpose for it.
In this case, the time allocated for the opening event could be rather used

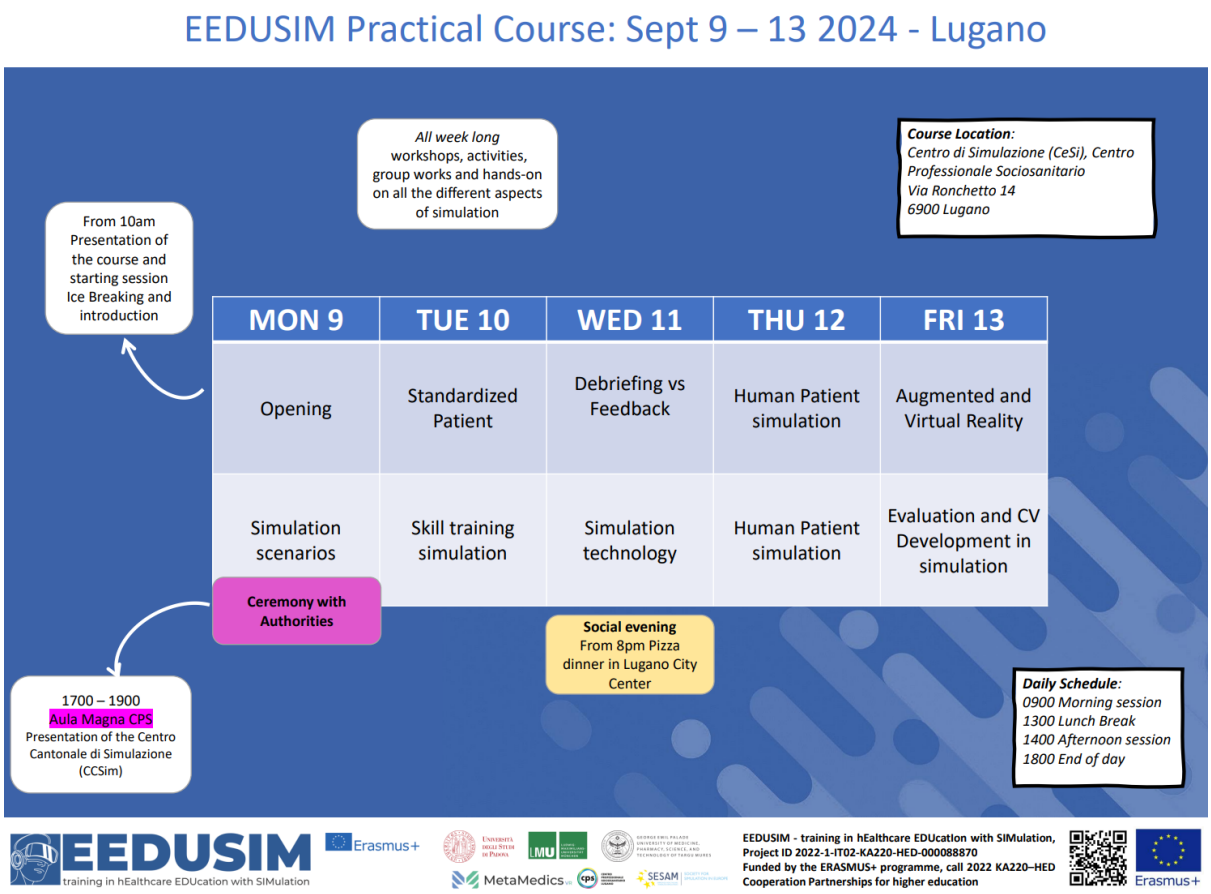
- to do a quick summary of the theory
- to start with one of the activities of the program
- to shave some hours off the program on the first day starting later to allow people to arrive on location or shortening the day for an easy start of the week course.

5 DAYS COURSE

This chapter describes how to deliver a train-the-trainer course in 40 hours.
Ideally the course could start on Monday and end on Friday, so taking a whole work week, 5 days, 8 hours per day.

Overall week program

The dates refer to the pilot course delivered in Lugano, from the 9th to the 14th of September 2024.



The program encompasses:

- an official opening event
- one full day dedicated to HF simulation
- one social event

Activities

Schedule and breaks

The courses are designed for 4h of morning sessions, a lunch break of 1h and 4h of afternoon sessions (ideally 9-18 course). Plan 30 minutes break halfway through the morning and the afternoon of each day.

Opening event

It is always important to give recognition to both the participants in the training, the staff involved in the training and to the activity itself.
In case it is the first time you organize the course, or you have some special guests, do not hesitate to plan for an opening event or opening ceremony: this will give visibility to your activity and your work and make the people involved feel part of something bigger.
In case the course is scheduled on a regular basis, a formal moment to declare the beginning of the course is always advised, but it can be low-profile.
If the course involves foreigner participants or people not knowing your simulation center, a tour of the facilities is advisable, so that people will know where to go the following days. In general, it is also a good idea to give a summary of the course program.
During the opening event the faculty introduce themselves and ask the same to each participant. The faculty should enquire about the previous experience of each participant in order to divide them into balanced groups for the group activities of the following days.

Simulation scenario

This session will cover the basis of scenario development (Unit 3). A summary of the content in the theoretical online course about this topic is given at the beginning of the session. Then the participants are divided into groups (we advise max 5 people per group) and given a scenario design action card (see below).
Then each group will design a scenario, according to the card given. Facilitators will roam in the room, monitoring each group and helping if needed. After an allotted time, one person for each group will present the scenario designed to the other group in a plenary session in which the facilitators will promote a discussion.
The session should last about 3 hours: 30 minutes for the summary, 1 hour for the scenario design, 1.5 hours for the presentation and discussion of the scenarios designed.

Standardized Patient

This session allows direct experience with standardized patients. The session should last a whole morning or afternoon (4 hours) with a 30-minute break in the middle. The session starts with a 30-minute recap of the theoretical background, that is covered in the online course (Unit 6), with participants and faculty discussing and sharing questions and experiences.

Then the participants are divided into two groups, A and B. Group A will design a scenario and group B will deliver two simulations with an SP, with debriefing and discussion. After 1.5 hours the groups have a 30-minute break and then exchange roles.

This scheduling minimizes the number of simulated patients and simulation rooms needed to one, but on the other hand the scenarios designed by the participants are not used while the faculty is required to prepare the scenarios used in the simulation in advance. If enough resources are available, it is possible to plan the session with both groups designing the scenario first and then delivering it, using each one SP and one simulation room.

If available, the simulation with the SPs could use some device to enhance the performance of the SPs (e.g. virtual patient monitors) and / or allow invasive procedures on them (e.g. add on skill trainers), giving the participants the opportunity to see this type of devices in action.

Skill training

In this session the participants will familiarize themselves with the skill trainers (Unit 2). This session starts with an introduction in which a summary of the contents in the theoretical course is given, followed by the explanation of the session and the division of the participants in two groups A, B.
Then the group works start: participants in group A will be tasked to prepare a course with a skill trainer, while those in group B will have an hands-on session with multiple task trainers; group A and B will later exchange roles.
Group A is divided into 2 sub-groups A1 and A2 and an action card will be assigned to each of them. Each action card lists a target audience, a learning goal and a defined skill trainer: each small group must design a skill training course coherent with this information. Each group has 1 hour to design the course, then 15 minutes to present the designed course to the other group. The facilitators will help in the design and foster discussion during the presentations.
Group B is divided into 4 sub-groups B1, B2, B3, B4; each of them is assigned to a different skill trainer station, that has a specific skill trainer and its instruction manual. Each sub-group has 30 min to learn how to use the skill trainer and test it. Then B1 will explain to B2 the skill trainer and vice versa, while the same will happen between B3 and B4; this should take 15 minutes. After that, B1 and B2 will take the stations of B3 and B4 and vice versa and the exercise is repeated for another 30 minutes plus 15 minutes of explanation. At the end of the 1.5-hour session all the participants will have learnt how to use 4 skill trainers (2 with hands-on experience, 2 being taught by another group).

The number of sub-groups for A and B can be changed according to the number of participants. The numbers above fit the case of 28-30 participants in total, with A and B of 14-15 participants each, 7-8 people working on each action card and 3-4 people working on each skill trainer.
The total duration of the session is a whole morning or afternoon (4 hours), with the introduction taking 30 minutes, two 1.5 hours group work moments and a 30-minute break between them.

Debriefing

Debriefing is one of the most important aspects in simulation, and this topic is one of the most sought-after by the students. In this session participants will be introduced to the art of debriefing in a guided manner; due to its relevance, this same topic will also be practiced during other sessions of the practical course.
The session starts with a recap of the contents presented in the theoretical course (Unit 4) that will offer the chance for the faculty and the participants to exchange questions and firsthand experiences. After that the participants will spectate 2 simulations with debriefing; these however will not be real simulation, but “simulated” simulation. Those taking part in these simulations will be actors or faculty members (better if not known by the participants) that are instructed to make some errors during the simulation and / or to behave in a scripted way during the debriefing. The purpose of this exercise is to give the chance to the participants to watch a difficult debriefing unfolding, with actors playing taciturn or aggressive roles, and discuss the technique to cope with such an event.
The session is scheduled to last a whole morning or afternoon (4 hours) with a 30-minute break in the middle. This should fit a 45-minute introduction and 3 simulations, with debriefing and discussion of 45 minutes each and leave space for the 30-minute break.

Simulation technology

This session will provide a basic knowledge of the technology involved in simulation. This will help future trainers to understand the different features of different manikins. This session is optional and should be planned according to the time available and the focus of the course.

We experimented with two different ways to deliver this session: a more classical frontal lesson about technology and a more hands on lesson. The session should last around 1.5 hours.

In the session in the form of a lesson, an expert in technology talks to the course participants. To make the lesson more interactive, it is advised to plan one or more group exercises during the session that can otherwise become boring to some of the participants.

- Exercise one: manikin game. The participants are divided into groups. Each group is assigned a list of names of manikins. Each group must find out information about the manikins assigned and then prepare a small report that will be given to the other groups at the end of the exercise.
- Exercise two: cable game. A box of cables is brought into the room, with a mix of different types of cables. Participants are requested to identify the cables. The identification can be guided by asking them to choose an answer from a list of 4 answers. The use of software like Wooclap or Kahoot can make this game more enjoyable.

The contents of this session are not covered by the theoretical course. Reference materials can be downloaded from the course materials of the project website.

In the hands-on session the participants are divided into 3 groups and will rotate in three rooms, with three different focus: in one a short version of the frontal lesson takes place, focusing on the basics of technology, in another the participants will enter a control room and learn about the software and hardware used there, in the third room the participants will learn

about manikins and the control software. The groups will change rooms every 30 minutes, for a total duration of the session of 1.5 hours.

HF Simulation / Human Patient Simulation

High Fidelity simulations are the other topic mostly sought after by the participants of this type of courses; also, this type of exercise allows the participants to experience and discuss many fundamental aspects of simulation (scenario design, simulation delivery, debriefing). Hence it is advisable to schedule as many sessions as possible on this topic, but to plan them at a later stage of the course, when all the basic aspects have already been seen.
Sessions on HF simulations are also those requiring most of the resources (control room, simulation room, scenarios, manikins, equipment, faculty staff…) and so they need to be planned according to the resources available. Usually most of the participant would like to take part to the simulation; however, to have them spectate the simulation is an important learning moment as gives them the chance to observe the simulation from a detached point of view and allows to use less resources.

We designed this session as follows: it starts with a familiarization with the simulation room and the manikin; after that the first simulation starts.
During each simulation a group of 4-5 people will be in the simulation room, a group of 4-5 people will be in the control room / be the confederate, while all the other participants will watch the simulation. The group in the control room will deliver the scenario (15 minutes) and then also debrief the scenario (45 minutes). After the debriefing, the faculty will debrief the debriefing and foster a discussion on how the simulation wen overall.
After the scenario ends, part of the faculty will also prepare the simulation room for the next scenario
Each simulation should last around 1 hour and 20 minutes, with 15 minutes for the scenario, 45 minutes for the debriefing and 20 minutes for the debriefing of the debriefing.

The session can be repeated according to the time available. The faculty needs to prepare in advance the scenarios to be used during the session, tailoring them to the participants' level.

Computer based / AR / VR / MR

In this session the students will have first-hand experience with computer based and AR / VR / MR simulations, whose theoretical background is covered in Unit 2 of the online course. Due to the need for special equipment (hardware and software) and setup (e.g. spaces, internet connection, …) this session should be planned according to the resources available at the simulation center.
The session should accommodate these moments:

- A lesson on the technological background; this is useful to help the participants to grasp the jargon of this field and to differ the different technologies available on the market and to give them a perspective about advantages and disadvantages of the different extended reality solutions; a presentation for this purpose can be downloaded from the course materials of the project website
- One or more hands-on exercises with specific technology, according to those available on premises.

The session could be organized as follows: the participants are divided into 4 groups, A, B, C, D; group A will attend the lesson on technology, while group B will experience simulated VR scenarios using Oculus Quest headsets, group C will experience AR scenarios using HoloLens headset and group D will experience software-based simulation running on a computer. Each group will swap with another group every 45 minutes, with a 30-minute break after the first 2 swaps.

While planning this session, please consider the time needed to familiarize the participants with these technologies. Before any VR simulation, it is advisable to plan a tutorial to let the participants acquaint themselves with the headsets and check their well-being during the session.

Evaluation and Curriculum development in simulation

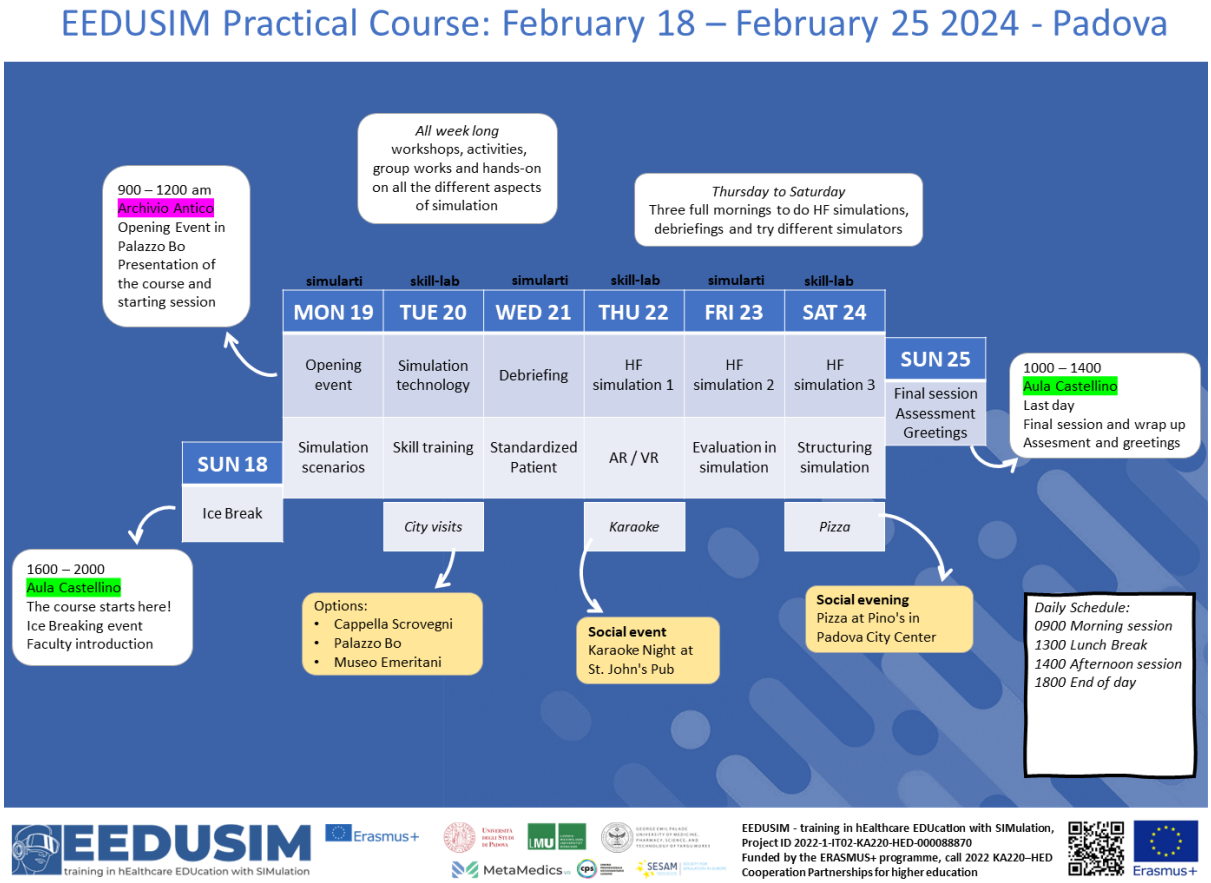
This session lasts 4 hours, with a 30-minute break in the middle.
The contents of this session are a short version of what can be done in a longer course (see below, the 7 days course) and it encompasses Unit 5 and Unit 7 of the online course.
The session is a group exercise: the participants are divided into groups (around 8 people per group) and each group is tasked to design a curriculum for a specific learning objective and an OSCE sheet for assessment. The learning objective (e.g. a specific skill or procedure) should be chosen by the faculty according to the background of the participants, grouping them by similar specialty.
The session starts with a quick recap of the OSCE methodology, then the participants are divided in groups and given 2 hours to design the curriculum and the OSCE sheet. In the last hour of the session each group will present its design to the other groups and discuss it with the help of the faculty.

7 DAYS COURSE

This chapter describes how to deliver a train-the-trainer course in 56 hours.
One possibility is to have the course start on Monday and end on Sunday, taking a whole week, 7 days, 8 hours per day.
We found it better to anticipate the start of the course on Sunday afternoon; giving still plenty of time to the people to arrive, and then shortening the last day, on the following Sunday, to let people have time to travel back home. In these two days the program is “softer”.

Overall week program

The dates refer to the pilot course delivered in Padova, from the 18th to the 25th of February 2024.



The program encompasses:

- an official opening event
- three mornings devoted to HF simulation
- some social events throughout the week

Daily program activities

The activities of the 7-day program are similar to those of the 5-day program. Given the increased time available, some extra sessions are present and the topic of HF simulation has been covered in more sessions.

Ice break

During the ice break session, the course participants are welcome, the faculty staff introduce themselves, and then each participant introduces him/herself. To ease the ice breaking, a set of ice breaking questions can be prepared (see list below) and randomly assigned to every person.
This moment is also useful for the faculty to understand the background of the participants and to know better their specialty, in order to evenly divide the different professions into the groups that will perform the group activities during the week.
If time and available spaces allow it, a small snack can be planned after this session, as a more informal moment to let participants get to know each other.

HF Simulation

If time allows, it is possible to plan more sessions about HF simulation, following the same design described above (see 5 days course). In our 7 days course we planned 3 mornings, and each morning we used a manikin of a different brand. This required us to schedule a new familiarization moment every morning and allowed our participants to gather experience on different equipment.

Evaluation in simulation

In this session the participants will practice the contents of the theoretical course in Unit 5. This session is scheduled to last a whole morning or afternoon (4 hours) with a 30-minute break in the middle.
The session starts with a summary and review of the contents of the online course, so that the students can ask questions to the faculty about them and share some real applications out of their experiences. This should last about 1 hour.
The participants are then divided into 4 groups: each group is assigned a written scenario, and they are tasked to write an OSCE sheet about it in one hour time. After one hour a 30-minute break is advised. After that, each group will have around 10 minutes to describe what they designed to the other groups. A plenary discussion closes the session.

Structuring simulation

This session covers the two most advanced topics of the course: how to implement simulation in the curriculum (Unit 7) and how to manage a simulation center (Unit 8).
This session is optional and should be scheduled according to the time available and the level of the participants; for beginners, it should probably be left out in favor of a longer session on debriefing or on HF simulations. If planned, it is advisable to schedule it toward the end of the course, once all the basic aspects have been already seen.
The session is 4 hours long, with a 30-minute break in the middle that divides it into two parts, one about Unit 7 and one about Unit 8.
For the management of a simulation center part, we invited some experts to talk about their experience in their simulation center. This offered the students three different perspectives.
For the curriculum development, we devised a group activity: after a brief recap of the content of Unit 7, the participants were divided into 4 groups and each of them was tasked to design a curriculum for a specialty. The specialty and the division into groups was chosen by the faculty grouping them by similar background.

Final session

The final session is the wrap-up moment for the course.
During this session there should be space for open questions from the participants or to present the results of group activities.
It’s also the moment to collect feedback from the participants on the course; if a structured questionnaire is used, it is possible to add questions to investigate not only the perceived usefulness of the course but also the perceived level of competence and compare it to the result obtained from the same questionnaire at the beginning of the course (e.g. during the ice breaking session).
Finally, it’s a moment for the greetings, a final group picture, and to exchange contacts to establish networks for future collaborations.

REFERENCE MATERIALS

Ice breaking questions

Ice breaking questions are a powerful tool to let people start to open up at the beginning of the course, paving the way to a more open and conscious participation in the following activities.

Ice breaking questions could be printed on little cards that can be randomly extracted.
Many lists of these questions can be easily found on the internet.
Here is a selection that we used successfully.

1. If you were stranded on a desert island, what object would you take with you?
2. As a child, what did you want to be when you grew up?
3. What is your favorite film quote?
4. What is your favorite travel destination?
5. If you could have a superpower, which one would you like to have?
6. If you had to live in a Disney movie, which one would you choose?
7. If you were an athlete, what would be your background song when you step onto the field?
8. If you won a million euros, what is the first thing you would do?
9. What is your desktop or mobile phone wallpaper? Why did you choose this image?
10. What would you title your autobiography?
11. If you had to talk like a cartoon character for the rest of your life, who would you choose? Try to imitate it.
12. If you could go to dinner with a historical character, who would it be?

Action cards

To download all the action cards, click here.
The archive contains:

- Cards for the scenario design
- Cards for the skill trainer

Action cards for the scenario design exercise: each group should design a high fidelity / human patient simulation on the assigned topic and for the assigned learning goal and target audience.

Follow the indications of this action card to create a simulation scenario

Target: emergency residents (teams of 4)

Topic: head injury in elderly patient

Goals: - management of a head injury
- communication with other specialists

Setting: Pre-hospital

Follow the indications of this action card to create a simulation scenario

Target: newly hired nurses in an emergency department (teams of 3)

Topic: recognition of priorities during the early stages of critical patient

Goals: - recognition of priorities
- close loop comunication

Follow the indications of this action card to create a simulation scenario

Target: medical students (teams of 4)

Topic: cardiac arrest

Goals: - recognize cardiac arrest
- call the emergency number
- leadership

Follow the indications of this action card to create a simulation scenario

Target: nursing students (teams of 3)

Topic: allergic reaction

Goals: - managment of allergic reaction
-woarkload distribution

Follow the indications of this action card to create a simulation scenario

Target: internal medicine resident (teams of 4)

Topic: sepsis

Goals: - management of sepsis
- antibiotic managment
- revaluation

Follow the indications of this action card to create a simulation scenario

Target: interprofessional (doctors, nurses, socio-medical operator, teams of 4)

Topic: cardiac arrest

Goals: - managment of cardiac arrest
- High quality CPR
- early help call

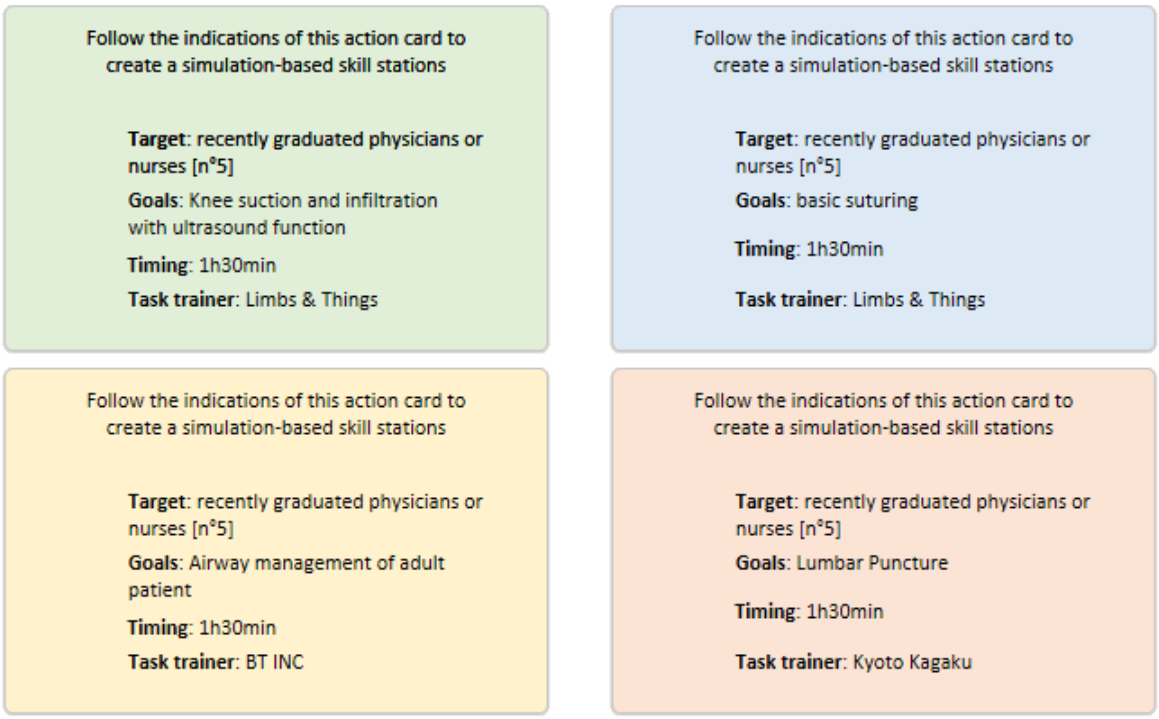
Follow the indications of this action card to create a simulation scenario

Target: interprofessional (doctors, nurses, team of 3)

Topic: respiratory distress

Goals:
- Management of respiratory failure
- Effectively communicate with patient to keep informed, relieve anxiety and support active participation in care as able.

Action cards for the skill trainer exercise: each group should design a skill training session using the assigned skill trainer, learning goal and target audience.



Scenario canvas

There are many types of scenario canvas that can be used to describe in a structured way a simulation scenario and its development. Here is the canvas linked in the theory lessons in Unit 3.

- Simulation Scenario Template File (Unit 3)

Scenario cases

To download the cases, click here.
The archive contains:

- Cases for the standardized patient
- Cases for the simulated debriefings
- Cases for the HF / Human Patient simulations

Feedback

Surveys are a powerful tool to collect feedback from your participants. At the end of the course, it is always a good idea to ask your learners to evaluate your work: how they liked the course,

what they liked best, what could be improved. Following the hints received you will be able to tune the training little by little and craft a better course.

Although your course might not need a final assessment of the students, it can also be interesting to ask your students to evaluate what they have learned. It could be also more interesting if you remembered to ask them to assess their level of competence before the course, to then compare the results.

You can download the template of the surveys used during the pilot courses of the EEDUSIM project here.

- Competence Pre and Post module
- Session Feedback Module

Finally, do not forget to collect feedback also from all the staff involved in the delivery of the course. As educators in healthcare simulation, we should be the first to use this powerful tool and reap its benefits.