161_f_scenario-healthcare

# A guide for developing high-fidelity simulation scenarios in healthcare education and Continuing Professional Development

Guillaume Alinier
University of Hertfordshire, United Kingdom

The development of appropriate scenarios is critical in high-fidelity simulation training. They need to be developed to address specific Learning Objectives, while not preventing other learning points to emerge. Buying a patient simulator, finding a volunteer to act as the patient, or even obtaining ready-made scenarios from another simulation centre are rarely insurmountable challenges. The issue often lies in how to use or adapt these for your own purpose; with your team, facilities and resources, but primarily for your learners. There is limited published information in the area of scenario preparation for healthcare education and Continuing Medical Education (CME) or Continuing Professional Development (CPD). This article is a guide for clinical tutors, standardized patient trainers, and patient simulator operators on how to script scenarios. It contains practical sections such as how to decide on the Learning Objectives to be addressed, how to script and organize your scenarios, and how to pitch the suitable level of details to make the scenarios appropriately realistic.

KEYWORDS: High-fidelity simulation, Patient cases, Scenario-based simulation, Scenario preparation, Script development, Simulation-based training, Storyboarding

The adoption of simulation is still spreading worldwide and it is now used in a broader range of disciplines than ever before. However, a lack of guidance about some aspects of the development and implementation of simulation training in healthcare education and for Continuing Medical Education (CME) or Continuing Professional Development (CPD) has been identified. An increasing number of simulation centers and universities are offering training courses and credit-bearing modules at postgraduate level for clinicians and technicians aspiring to become qualified simulation instructors or specialists (Alinier, 2007a; Dieckmann & Rall, 2008a; Fanning & Gaba, 2007; Issenberg, 2006; Vollmer, Mönk, & W., 2008). Such courses are very informative and valuable for the participants' development towards becoming better equipped educators. However, the course contents and important tips always remain a mystery to many of the simulation community and other simulation enthusiasts as very few elements are published in peer reviewed media such as academic journals. New

comers to the world of simulation training need support in designing their scenarios and the Learning Objectives of simulation sessions for the benefit of their students.

The aim of this paper is to present a concise guide for the development of clinical scenarios for simulation training irrespective of the discipline of the intended participants. The content of this guide, while also referring to other sources of inspiration, is based on my experience. I have been developing and running simulation training sessions for residents and qualified healthcare professionals or undergraduate students from a wide range of disciplines (paramedic, pharmacy, physiotherapy, medicine, radiography, and adult, mental health, learning disability, and children nursing) for the last 9 years (Alinier, 2007a) on a uni-professional and multi-professional basis.

## Defining a scenario

In healthcare education, a scenario could be defined as a patient case with a main storyline and having the aim of bringing out specific Learning Outcomes for the participants and observers. As suggested by Nadolski et al. (2008), scenarios can be *modeled on real life situations that often include a sequence of learning activities that involve complex decision making, problem solving strategies*, *intelligent reasoning and other complex cognitive skills. Students are left in charge to deal with complex problems according to professional or scientific standards. Real life situations display ambiguity and conflicting information and offer a large degree of freedom. Often complex real-life problems (also referred to as "cases") are likely to involve several participants* (p340). When running a scenario-based simulation session, on the basis of the learning goals, a limited or selected amount of information is usually communicated to the participants just before they start dealing with their case. This allows for an enquiry process to start whereby the participants can gradually collect more information about the current situation from the patient, the patient file, others involved in the scenario, or results from medical investigations they order.

---

AUTHOR'S NOTE: I would like to express my greatest gratitude to Dr David Charles Lee who was a talented colleague always ready to help and who provided some valuable feedback on the first draft of this paper as a naïve reader and English native but who unexpectedly passed away before I had the chance to show him the final proof of this paper. Furthermore I wish to extend a special thank you to the reviewers of this paper and more especially Dr Peter Dieckmann for his useful comments and dedication.

---

Letting the participants know in advance how the patient condition is going to develop by for example revealing that the scenario Learning Objective is the management of a “can’t intubate, can’t ventilate” situation would simply make them lose the benefit of being able to understand by themselves what is happening and what they should be doing. The briefing that scenario participants will usually receive immediately before the start of their scenario may consist of a brief and contextualized situation or patient information outline in the form of a hand over, a physician referral letter, or the transcript of an ambulance dispatch call centre. Additional information is usually provided as the participants take a patient history or start exploring the patient’s file. During simulation exercises, a certain degree of flexibility needs to be built into the scenarios as they need to dynamically adapt to the participants’ actions or requests (Borodzicz, 2004). This may be by making the patient deteriorate more rapidly or slowly than planned (Figure 1), or by getting one of the actors on the scene to steer the course of the scenario back on track by helping the participants without adopting a teaching modality, but remaining in their acting role.

Guillaume **Alinier** is a Reader in Medical Simulation at the University of Hertfordshire where he developed a large multiprofessional simulation centre. He received a National Teaching Fellowship from the Higher Education Academy in 2006 for his work in Teaching and Learning through simulation. He teaches on programmes ranging from medical technology through to patient safety at under/postgraduate levels. His main interests reside in the training of simulation facilitators and organizing high-fidelity simulation sessions for multiprofessional clinical teams and final year healthcare students. Contact: HICESC, University of Hertfordshire, College Lane Campus, Hatfield, HERTS, AL10 9AB, UK.
+44(0)1707286395 (t); g.alinier@herts.ac.uk;
http://www.health.herts.ac.uk/hicesc

Figure 1

## Learning Objectives

All scenarios should be developed with a few specific Learning Objectives in mind for the participants (Fanning & Gaba, 2007). Depending on the expected duration of the scenario, the number of key Learning Objectives usually varies between one and four. These should be relevant and of an appropriate level for the participants involved and may range, for example, from human factors (Leonard, Graham, & Bonacum, 2004) issues such as “Recognizing a crisis situation and calling for help”, “Dealing with a difficult patient or co-worker”, “Planning and anticipating”, through to more specific medical or clinical issues such as “Managing a patient with acute asthma”. When developing Learning

Objectives for trainees, it is advisable to refer to the participants' educational curriculum, and more particularly to their expected program Learning Outcomes. When designing the scenarios for a group of qualified practitioners it is recommended to carry out a training needs analysis, or contact their line manager, such as the head of a unit, so the Learning Objectives can be tailored and themed appropriately. This might not always be a small exercise, but it has a great impact on the participants' learning experience and should be part of every training

Real-life cases are often a good starting point for the development of scenarios, as they often teach us good lessons. These good lessons can be translated into Learning Outcomes or learning points, which in turn may be derived into Learning Objectives. They may be simplified if originally too complex, or modified, if additional learning points need to be introduced (Murray, 2004). At times the same clinical scenario may be slightly modified and given a different patient name so its actual structure remains unchanged (

**Guillaume Alinier** is a Reader in Medical Simulation at the University of Hertfordshire where he developed a large multiprofessional simulation centre. He received a National Teaching Fellowship from the Higher Education Academy in 2006 for his work in Teaching and Learning through simulation. He teaches on programmes ranging from medical technology through to patient safety at under/postgraduate levels. His main interests reside in the training of simulation facilitators and organizing high-fidelity simulation sessions for multiprofessional clinical teams and final year healthcare students. Contact: HICESC, University of Hertfordshire, College Lane Campus, Hatfield, HERTS, AL10 9AB, UK. +44(0)1707286395 (t); g.alinier@herts.ac.uk; http://www.health.herts.ac.uk/hicesc

Figure 1), but a different context or background is introduced.

While a scenario is running, the original Learning Objectives should never be forgotten. This may require the active involvement of one or more actors on the scene of a scenario (Seropian, 2003). They are often referred to as "plants" or "confederates" and are usually members of the simulation team (Dieckmann, Gaba, & Rall, 2007) or can in some cases be participants taking in turn a confederate role over the different scenarios run during the session. This very point emphasizes the importance of clearly communicating the complete script of the scenario in advance to all the members of the simulation facilitation team, or individually and rapidly briefing any participant acting as a confederate before the scenario in which they will be involved. This prevents the actors, whether they are members of the simulation team or participants, from giving confusing information to the scenario participants. It is also useful to be able to discreetly

communicate with the actors involved in the scenario via an ear piece connected to a walkie-talkie or more advanced wireless communication system if required.

Because of the dynamic nature of simulation-based training a number of other valuable learning points will emerge during the scenarios. These may arise from the participants' mistakes or resourceful actions, interactions with their co-workers, the patient, their relatives, or the equipment, and should also be discussed during the debriefing as they contribute greatly to the overall learning experience (Ziv, Ben-David, & Ziv, 2005).

From the facilitators' perspective, knowing the anticipated specific Learning Objective(s) of a scenario helps determining how to design the scenario and where or when the scenario should end. However, these should never be revealed in details to the participants before the scenario debriefing so there remains an element of surprise as the scenario unfolds and so they can learn from the experience. You may however provide your participants with broad Learning Objectives by remaining general so they cannot exactly anticipate what will happen in the scenarios. You may inform them for example that the Learning Objective of the session is the management of acutely ill patients rather than telling them it is about the management of different cases of hypovoleamia. If conflict resolution or learning how to challenge a senior colleague are some of your Learning Objectives, you may put it to them as being improving communication and team working skills.

Once a set of appropriate Learning Objectives has been identified, the scenarios can be developed for the session. If you are expecting to run a high-fidelity simulation session (Alinier, 2007b; Issenberg, McGaghie, Petrusa, Gordon, & Scalese, 2005; Issenberg & Scalese, 2007; Maran & Glavin, 2003) you should make sure that the Learning Objectives are of an appropriate level and relevant for your participants. The latter should also possess the skills and knowledge required to tackle the scenarios without constant help, unless their role is actually to manage a team of "helpers" or to recognize that they should be calling for more senior assistance and that is built into the scenario with the intervention of a confederate in the form of a more senior helper.

## Participants' engagement: experiential learning versus passive learning

The more realistic one is trying to make the scenarios, the longer they will take to prepare and the more demanding they will be to run in terms of human and physical resources. This is mainly due to the fact that the team facilitating the simulation experience will need to continuously respond to the participants' actions and requests, and adjust to the situation. Running a high-fidelity simulation session corresponds to the upper right hand corner of the diagram presented in Figure 2. This figure is an orthogonal representation of the participants' learning engagement (experiential or passive) in a simulated event

(scenario) or single skill acquisition context versus a participant/student or trainer-led facilitation approach. In high-fidelity simulation participants are involved in a student-led learning experience. In this instance, although an outline series of events has been planned by the facilitators, the participants are in control of their own actions, and as a consequence they have a significant influence on the direction and possibly the outcome of their scenario. The type of participants' involvement in a task or scenario is directly related to the learning that takes place with these individuals. Their involvement in a student-centered or led activity (Experiential learning, Figure 2) contributes to the participants' ability to concentrate and become absorbed in what they are doing (Garris, Ahlers, & Driskell, 2002) and enhances their learning experience. This maximum "extent of direct participation in simulation" by the scenario participants is also referred to as an immersive learning experience (Gaba, 2004, p. i4).

The more empowered the participants feel, the more unprompted actions and decisions they will make, and the more realistic the scenario will inherently become in their eyes. It is then that participants can more easily relate the simulated experience to their everyday clinical practice. This experiential learning experience must then be reinforced and analyzed with the participants through a debriefing process that is as, if not more, important than the experience itself as it helps them to reflect about what happened, and to understand and assimilate the Learning Objectives (Lederman, 1992).

Figure 2

**Scripting a scenario**

When designing a scenario it helps to think of it as a flow chart as illustrated in the example in

Guillaume **Alinier** is a Reader in Medical Simulation at the University of Hertfordshire where he developed a large multiprofessional simulation centre. He received a National Teaching Fellowship from the Higher Education Academy in 2006 for his work in Teaching and Learning through simulation. He teaches on programmes ranging from medical technology through to patient safety at under/postgraduate levels. His main interests reside in the training of simulation facilitators and organizing high-fidelity simulation sessions for multiprofessional clinical teams and final year healthcare students. Contact: HICESC, University of Hertfordshire, College Lane Campus, Hatfield, HERTS, AL10 9AB, UK. +44(0)1707286395 (t); g.alinier@herts.ac.uk; http://www.health.herts.ac.uk/hicesc

Figure 1. Although you would expect participants to take the scenario in a particular direction, it may not be the case, and you should anticipate what else they might do to fully develop the script, and include all eventualities where you would like to end the scenario. This is especially important if the person controlling the patient simulator does not have a clinical background or a limited knowledge of pharmacodynamics. Deciding whether you should allow the patient to die or not at the end of any scenario would be the subject of another paper in itself, but one should certainly consider the psychological state of the participants involved in the scenario at the time and how they would cope. On the other hand one may argue that we should not make participants believe that all patients survive as this may portrait a false impression of real patient care. One of the Learning Objectives of your simulation session may in fact be to reenact a patient's death experience to your participants irrespective of how they manage the scenario so they are forced to being the ones breaking the bad news to the patient's relatives and learn from it.

After you have defined your learning goals and designed the overall scenario around them, the script of the patient case needs to be developed (See Appendix). The first element, irrespective of the environment, is to decide on the initial physical condition of the patient by determining its vital signs, physical appearance, and context. Then, whether it is through a provoked event during the scenario or by another process part of the patient medical condition or history, you need to decide how the patient's health or mental status is going to develop. Key physiological parameters, as well as levels of consciousness of the patient, need to be determined for critical stages of the scenario. Similarly you may impose limits on the time the patient remains in a particular stage before his/her condition starts to further degrade or improve once the appropriate treatment has been given. The scenario script may also impose limitations on when, for example, blood results, crossed-matched blood, medications, or medical devices are made available to the participants to force them to consider other actions.

Another important dimension of scripting a scenario relates to the physical considerations, not only about the environment in which the scenario should be taking place, but also how the simulated patient (actor) or patient simulator (mannequin) should appear. The scenario script should contain information about the position (on the floor, sitting up in bed…), the clothing (torn trousers, patient gown…), and specific props that need to be in position before the start of the scenario (hearing aids, drugs, glasses, helmet…).

## How realistic should the scenarios be?

One of the aims of running high-fidelity simulation sessions is for participants to acquire experience in a safe environment. The scenarios and a wide range of elements around them need to be fairly realistic to help participants

"suspend disbelief" (Alinier, 2007b; Beaubien & Baker, 2004; Rudolph, Simon, & Raemer, 2007) so that the use of their cognitive, clinical and non-technical skills can be observed in a safe and controlled environment. A certain level of realism from a range of aspects is required so that the participants can more easily consider the situation and patient as real and hence behave and initiate treatment as they would do in an actual clinical situation (Issenberg & Scalese, 2007).

The use of colleagues or professional actors to play the role of relatives or other healthcare workers helps to set the tone during scenarios by getting the participants to engage with the "patient" (patient simulator/mannequin or simulated patient/actor) in a more natural manner rather than as a subject of conversation or assessment. Similarly the "patient" or person speaking for the patient simulator needs to engage in an acting mode to convey the pain, emotions, anxiety, or stress to the participants. This needs to be clearly defined in the scenario script as will be discussed later.

Another important area that helps to set the scene for participants relates to the physical environment and the props. This includes the equipment, the patient file, the patient physical presentation (clothing, make-up, injuries…), the dress code of the participants (uniforms, scrubs…), and the room and its ambient noise. However one needs to impose a reasonable limit on the level of realism that is to be achieved as it may be in vain and possibly defeat the Learning Objectives by becoming a distraction for the participants who may be pushed to pay too much attention to details unrelated with the intended Learning Objectives. For example, pre-cannulating the patient and only revealing it when asked by the participants may save some time during the scenario if that particular technical skill is not one of the Learning Objectives. Similarly, when your participants request for the patient to have an X-ray, you can "speed up time" and give it to them within a few minutes without actually having to involve a radiographer and a mobile X-ray machine.

As clearly stated by Dieckmann et al. (2007) it is not uniformly the case that more realism helps to achieve better educational goals. However greater engagement may lead to improved learning and longer retention of information (Hannafin & Hooper, 1993). The right balance needs to be achieved between the realism of the scenarios and the added value for the participants' educational experience. To summarize this point, as expressed by Chow and Naik (2008); *We can't perfectly duplicate or replicate reality with simulation and we don't need to, but we can present cues that are sufficiently realistic to get buy-in and elicit desired actions and behaviors from the learner. A fake wound on the mannequin's back with a bloody sheet underneath and a low blood pressure should lead the learner to believe there is significant blood loss occurring with their patient.* Attaining the appropriate level of realism will help participants engage in the scenario by making unprompted actions and hence benefit from experiential learning.

## Preparing scenarios in an organized manner

A scenario contains a range of elements that can be divided into sections as suggested by Seropian (2003) and presented in Table 1. To prevent any confusion between scenarios it is preferable to use different patient names, even if some scenarios have very subtle variations, such as the level of difficulty. The patient's name can then be used by the facilitators to refer to the scenario without giving away any information to the participants as to what may be happening in the next scenario (Dieckmann & Rall, 2008b). Labeling the different elements of each scenario such as patient files, lab results, ECGs, X-rays, CT and MRI scans with colored and shaped stickers in addition to the patient's name helps to differentiate them rapidly when tidying up at the end of a session, and hence prevent errors (which is one of the issues that we try to address with participants through simulation to improve patient safety!).

Table 1

Objectives

The "Objectives" section should contain the expected Learning Objectives for the participants as well as the particular group of participants for whom the scenario is intended and their required level of experience. The Learning Objectives can be divided into two sections which are Clinical/Medical Learning Objectives and Human Factors (Leonard et al., 2004) Learning Objectives. The target group of participants may be a multi-professional group and as they all may not necessarily start being involved in the scenario at the same time, this would need to be clearly indicated in the scenario script. Staggering the arrival of the participants into a scenario increases the opportunities for them to practice particular communication techniques. This can be observed when they perform a handover or simply inform their colleague about the current situation by, for example, using a situational awareness tool such as the SBAR (Situation-Background-Assessment-Recommendation) (Leonard et al., 2004) and later discussed during the debriefing. The participants who are not involved in the scenario from the beginning should not stay in the observation room or be present during the scenario briefing. They should remain on standby in a waiting area, where they may receive a more succint scenario briefing and may be given a task to carry out until they are called in by their colleagues or until indicated in the scenario script.

Personnel and equipment

The "Personnel and equipment" section should not be considered as a wish list when developing a scenario, but rather take into consideration the resources available and other elements that can easily be sourced or produced. That section should have a clear list detailing the actors and props required as

well as how the patient should be dressed and prepared in general. The information should include if, where and how make-up or bandages should be applied. Similarly other elements which may be connected to the patient should be enumerated and may include for example: wound drain, central line, epidural, fluids, urinary waste bag, monitoring, or cervical collar. This section should also list small and large specialized elements that will be required during the scenario such as traction or vacuum splints, resuscitation trolley, ventilator, anesthetic machine, or mobile X-ray machine, and even whether the patient should be on a bed or trolley. For some scenarios it is useful to create individual props boxes so they can contain special items such as MediAlertTags, the patient wallet with a list of medication, pack of cigarettes, a box of pills, a bag of peanuts, the patient name tag, or altered ventilation circuits or endotracheal tubes. Many of these specific items can also be labeled with colored and shaped stickers.

Computer set-up and operator instructions

The "Computer set-up and operator instructions" should contain a detailed script of the expected physiological changes of the patient depending on the treatment provided by the participants, as succinctly illustrated in Figure 1. Key stages, which form the core part of the scenario, should be highlighted and notes may be added for the operator about the effect of other drugs the participants may potentially administer. This is especially useful if the operator has a technical rather than clinical background.

Paperwork and supporting documentation

All patient files and investigation results should be included in the "Paperwork and supporting documentation" section. This allows for any paperwork with patient identification to be classified and is particularly useful for scenarios where you want to allow participants to identify trends on the patient's observation chart over the last few days or hours. If you also use electronic documentation for images such as X-rays or ECGs instead of hard copies, a dedicated folder should be created on your computer, a copy of which could be attached to the physical scenario folder in the form of a memory stick or CD-Rom. Using an emulated electronic patient record monitor or clinical data station (Alinier, 2008b; Taylor, 2008) to display information such as X-rays, ABGs, CTGs, and fetal heart rates has proved very useful to the realistic progression of the scenarios.

Context

The "context" section should contain information about the scenario with varying degrees of information. It should contain the participants' briefing information to set the scene without providing too much information. The other important elements are:

- the patient script, so that whoever is speaking as the patient can, for example, respond to the participants' questions regarding their symptoms, allergies, medication, previous medical history, last intake, and events leading to their chief complaint ("SAMPLE"). This script should inform the patient as to how they should speak; in full sentences or not, expressing pain or discomfort, be confused, calm or aggressive.
- the briefing or script for the actors. Each actor needs to know if they have additional information to provide to the participants if asked for and if they are meant to be fairly active and helpful, experienced, or only do what they are told to do by the participants as inexperienced healthcare professionals.

Other sections

The remaining sections will need to be periodically updated as they relate closely to the Learning Objectives of the scenario and may include teaching material ("Knowledge and teaching information") that can be used to guide the debriefing. The "References" section will point the facilitators to the source of the teaching information included and other relevant teaching material or data. The section for "Notes" may include comments about how the scenario generally runs. Common mistakes made by participants can be recorded in that section and used as additional learning points for the debriefing. Issues relating to the scenario setup can also be described to inform future use of the same scenario.

If you do not intend to spend so much time developing each scenario into an individual folder format, another very useful model script, several of which can be integrated into a single folder has been proposed by Dieckmann and Rall (2008b). A revised version of its main components is presented in the Appendix and the original version can be freely downloaded from their simulation centre website (http://www.tupass.de/downloads/scenario.html). The revised version contains, in the form of a table approximately four-page long, all the elements presented earlier. Another template, with a slightly different structure has been developed by Duke University and is also available on their website (http://simcenter.duke.edu/SimTemplate0408.doc).

## Rehearsing scenarios

Before running any newly developed or adopted scenario with real participants, it is strongly advisable to pilot it with some colleagues to ensure no element has been forgotten, all required resources are available, and that it can run smoothly and realistically. These colleagues should include not only the facilitator or clinical tutors but also the members of your simulation centre technical team or whoever will be controlling your patient simulator, Audio/Visual system, setting up the scene, or applying the make-up. All staff eventually involved in running the scenario for the real participants should familiarize

themselves with it. Any of them may make useful suggestions to improve the scenario from a logistical or learning experience point of view. Rehearsing a scenario when it is first developed may also help to determine if it needs to be pre-programmed in whole, partly, or not at all.

### How should the patient simulator be controlled during a scenario?

The Hertfordshire Intensive Care Emergency Simulation Centre (HICESC) (Alinier, 2007a) is primarily equipped with Laerdal Medical® patient simulators (SimMan™ and SimBaby™) which are intermediate/medium-fidelity patient simulators, also known as script-based simulators as opposed to high-fidelity patient simulator which are fully interactive and operate autonomously from mathematical physiological models defined by the patient profile and the medications and treatment it receives (Alinier, 2007b). Hence the following suggestions may not be readily applicable to simulators which are not script operated. These script-based patient simulators rely on an operator and can be controlled in different ways during scenarios. You may either run them with a "Pre-Programmed scenario", "On-the-fly", or a mixture of both.

Operating the patient simulator with pre-programmed scenarios requires a lot of preparation and near real time "dry runs" to debug the scenarios and ensure they run smoothly and that the physiological parameters change realistically. The most likely participants' actions need to be anticipated and built into the scenario as a chain of events with different pathways as illustrated in the example on

**Guillaume Alinier** is a Reader in Medical Simulation at the University of Hertfordshire where he developed a large multiprofessional simulation centre. He received a National Teaching Fellowship from the Higher Education Academy in 2006 for his work in Teaching and Learning through simulation. He teaches on programmes ranging from medical technology through to patient safety at under/postgraduate levels. His main interests reside in the training of simulation facilitators and organizing high-fidelity simulation sessions for multiprofessional clinical teams and final year healthcare students. Contact: HICESC, University of Hertfordshire, College Lane Campus, Hatfield, HERTS, AL10 9AB, UK. +44(0)1707286395 (t); g.alinier@herts.ac.uk; http://www.health.herts.ac.uk/hicesc

Figure 1 or using handlers which are programmed to automatically generate the expected changes on the physiological parameters. Although initially time-consuming in terms of programming, this mode of operation is less demanding during the actual scenarios and allows more time for the patient simulator operator to observe the participants, to concentrate on speaking as the patient, and to control the cameras if the system permits. To achieve a greater

level of consistency in running a scenario for different groups of participants, such as in a research context, the programming of scenarios might be a requirement to increase the reproducibility of the physiological changes.

When controlling the patient simulator on-the-fly, although less preparation is needed beforehand, running the scenarios is more demanding for the patient simulator operator. This mode of control should only be adopted by people who are very familiar and agile with the patient simulator interface, and have sufficient knowledge about the effect of the drugs that participants are likely to administer. With this mode of operation it is almost imperative to have a "second pair of eyes" in the control room to make sure all participants' actions and communications have been taken into consideration to progress the scenarios accordingly and to inform the debriefing on issues which may otherwise be missed.

Using a mixture of both approaches works very well and has been adopted by a number of simulation centers for certain scenarios. For example, in the case of a patient suffering from an anaphylactic reaction, the deterioration of the patient could be programmed as a script ,with trends and frames for example, while the recovery would be controlled manually ("on the fly") to exactly match the treatment provided by the scenario participants as their actions cannot always be exactly anticipated. Another scenario example where such approach could be used is with a pregnant woman suffering from pre-eclampsia and having seizures. For that situation the pre-programmed scenario consists of simply three components. Firstly the initial patient physiological parameters of a pre-eclamptic patient. Secondly, the parameters when the patient starts fitting which renders the blood pressure and pulse oximetry unrecordable on the monitor (blood pressure set to zero), while the ECG trace shows muscular artifacts (if the leads have been applied). Lastly, the parameters of the patient recovering from the pre-eclamptic fit.

## Conclusions

Running high-fidelity simulation sessions requires a lot of preparation hence the need to properly develop a script for each scenario with corresponding Learning Objectives and debriefing points. The information presented in the folder sections described earlier in this paper can be used as a guide to complete the boxes of the proposed scenario script table in the Appendix. This scenario script should be a useful resource for all simulation enthusiasts. It can be used as a template to normalize the preparation of scenarios scripts.

Last-minute improvisation of scenarios is not recommended unless you work as part of an established and experienced team of simulation facilitators who can readily adapt to new situations and rapidly find any resources that may be required. Taking part in a clinical simulation session and having the

opportunity to take part in a range of scenarios can be an enriching and valuable experience. One also needs to realize that, as powerful a learning experience as it can be, it can also be a tool with destructive powers if not facilitated or used appropriately. The potentially negative impact of simulation training may occur before the debriefing of a scenario, simply through the way a scenario is ended by the facilitating team, either as the "voice of God" from the control room or by one of the actors. Whether it is with a positive, neutral, or negative outcome for the patient, the scenario should ideally not be ended while the participants are still actively providing care, but rather at a stage where they may have transferred the care of the patient to another unit, when the patient has recovered, or when consensus has been reached by the clinical team as to what should be done for the patient. Apart from the actual scenarios, much of the organization and structure of a session can be used repeatedly regardless of the group of participants. The recipe to running a successful simulation session can be presented as a series of steps (Alinier, 2008a), but these should ideally be preceded by every member of the facilitation team having undertaken a "train the trainer" or simulation facilitator training course to ensure quality control and consistency in the way the session (scenarios and debriefings) is facilitated.

## References


Alinier, G. (2007a). Enhancing trainees' learning experience through the opening of an advanced multiprofessional simulation training facility at the University of Hertfordshire. *British Journal of Anaesthetic and Recovery Nursing, 8*(2), 22-27.

Alinier, G. (2007b). A typology of educationally focused medical simulation tools. *Medical Teacher, 29*(8), e243-250.

Alinier, G. (2008a). Learning through play: Simulation scenario = obstacle course + treasure hunt. In R. R. Kyle, Murray, W.B. (Ed.), *Clinical Simulation: operations, engineering, and management* (First ed., pp. 745-749). San Diego: Academic Press.

Alinier, G. (2008b). *A touch of added realism: simulated electronic patient record monitor*. Paper presented at the Abstract proceedings of the 14th Annual Meeting of the Society in Europe for Simulation Applied to Medicine, 19-21 June 2008.

Beaubien, J. M., & Baker, D. P. (2004). The use of simulation for training teamwork skills in health care: how low can you go? *Quality & Safety in Health Care, 13 Suppl 1*, i51-56.

Borodzicz, E. (2004). The missing ingredient is the value of flexibility. *Simulation & Gaming, 35*(3), 414-426.

Chow, R. E., & Naik, V. R. (2008). Realism and the art of simulation. In R. R. Kyle, Murray, W. B. (Ed.), *Clinical Simulation: operations, engineering, and management* (pp. 89-94). San Diego: Academic Press.

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

Dieckmann, P., & Rall, M. (2008a). Becoming a simulator instructor and learning to facilitate: The Instructor and Facilitation Training (InFacT). In R. R. Kyle & W. B. Murray (Eds.), *Clinical Simulation: Operations, Engineering and Management* (pp. 647-6520). San Diego: Academic Press.

Dieckmann, P., & Rall, M. (2008b). Designing a Scenario as a Simulated Clinical Experience: The TupASS Scenario Script. In R. R. Kyle & W. B. Murray (Eds.), *Clinical Simulation: Operations, Engineering and Management* (pp. 541-550). San Diego: Academic Press.

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

Gaba, D. M. (2004). The future vision of simulation in health care. *Quality & Safety in Health Care, 13 Suppl 1*, i2-10.

Garris, R., Ahlers, R., & Driskell, J. (2002). Games, motivation, and learning: A research and practice model. *Simulation & Gaming, 33*(4), 441-467.

Hannafin, M. J., & Hooper, S. R. (1993). Learning principles. In M. Flemming & W. H. Levie (Eds.), *Instructional message design: Principles from the behavioral and cognitive sciences* (pp. 191-231). Englewood Cliffs, NJ: Educational Technology Publications.

Issenberg, S. B. (2006). The scope of simulation-based healthcare education. *Simulation in Healthcare, 1*(1), 203-208.

Issenberg, S. B., McGaghie, W. C., Petrusa, E. R., Gordon, D. L., & 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.

Issenberg, S. B., & Scalese, R. J. (2007). Best evidence on high-fidelity simulation: what clinical teachers need to know. *The Clinical Teacher, 4*, 73-77.

Lederman, L. C. (1992). After the game is over. *Simulation & Gaming, 23*(2), 143-144.

Leonard, M., Graham, S., & Bonacum, D. (2004). The human factor: the critical importance of effective teamwork and communication in providing safe care. *Quality & Safety in Health Care, 13 Suppl 1*, i85-90.

Maran, N. J., & Glavin, R. J. (2003). Low- to high-fidelity simulation - a continuum of meddical education? *Medical Education, 37*(Suppl. 1), 22-28.

Murray, W. B. (2004). Simulators in Critical Care Education: Educational Aspects & Building Scenarios. In W. F. Dunn (Ed.), *Simulators in Critical Care and Beyond* (pp. 29-32). Des plaines: Society for Critical Care Medicine.

Nadolski, R. J., Hummel, H. G. K., van den Brink, H. J., Slootmaker, A., Kurvers, H. J., & Storm, J. (2008). EMERGO: A methodology and toolkit for

developing serious games in higher education. *Simulation & Gaming, 39*(3), 338-352.
Rudolph, J. W., Simon, R., & Raemer, D. B. (2007). Which reality matters? Questions on the path to high engagement in Healthcare simulation. *Simulation in Healthcare, 2*(3), 161-163.
Seropian, M. A. (2003). General concepts in full scale simulation: getting started. *Anesthesia & Analgesia, 97*(6), 1695-1705.
Taylor, T. (2008). How to create a Clinical Data Station for Use in a High Fidelity Medical Simulation Lab. *Simulation in Healthcare, 3*(2), 128-130.
Vollmer, J., Mönk, S., & W., H. (2008). Staff education for simulation: Train-the-trainer concepts. In R. R. Kyle, Murray, W. B. (Ed.), *Clinical Simulation: operations, engineering, and management.* (pp. 625-642). San Diego: Academic Press.
Ziv, A., Ben-David, S., & Ziv, M. (2005). Simulation based medical education: an opportunity to learn from errors. *Medical Teacher, 27*(3), 193-199.

**Guillaume Alinier** is a Reader in Medical Simulation at the University of Hertfordshire where he developed a large multiprofessional simulation centre. He received a National Teaching Fellowship from the Higher Education Academy in 2006 for his work in Teaching and Learning through simulation. He teaches on programmes ranging from medical technology through to patient safety at under/postgraduate levels. His main interests reside in the training of simulation facilitators and organizing high-fidelity simulation sessions for multiprofessional clinical teams and final year healthcare students. Contact: HICESC, University of Hertfordshire, College Lane Campus, Hatfield, HERTS, AL10 9AB, UK. +44(0)1707286395 (t); g.alinier@herts.ac.uk; http://www.health.herts.ac.uk/hicesc

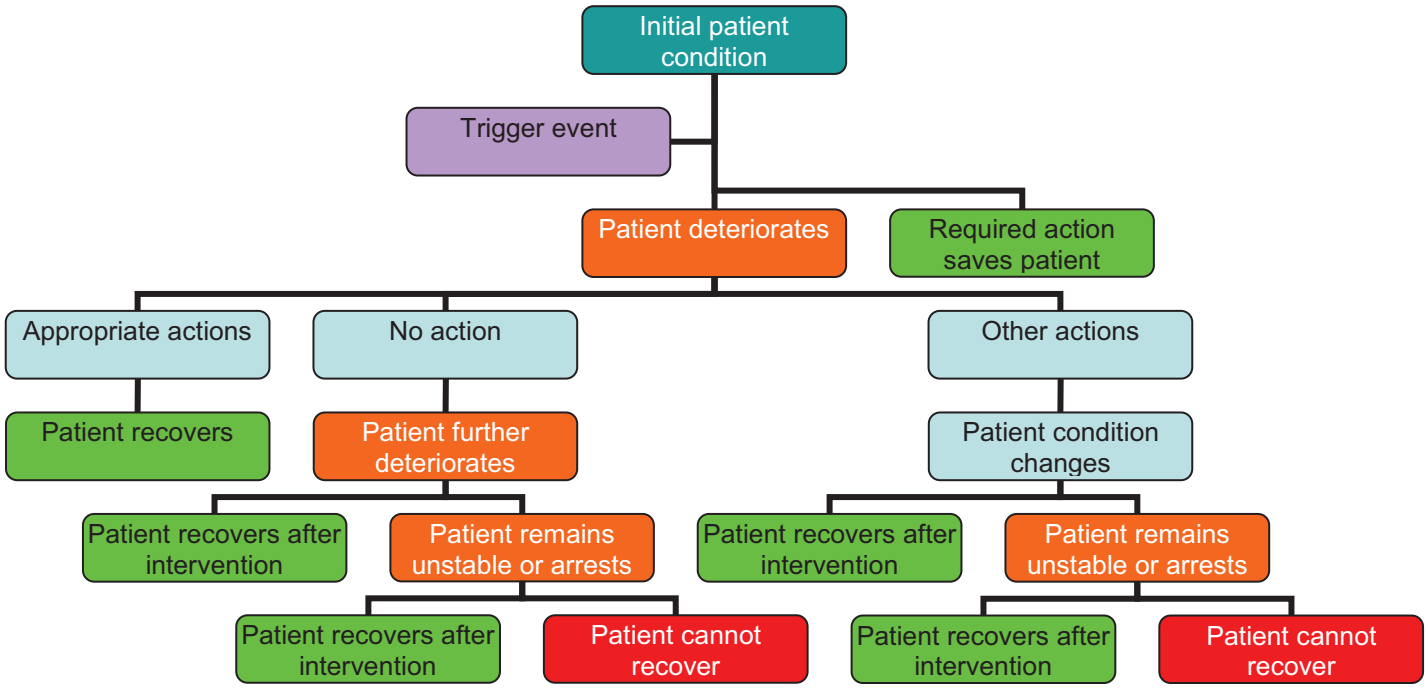


Figure 1: Example of scenario structure illustrating different possible pathways depending on the participants' actions and where the patient may recover, remain unstable or pass away.

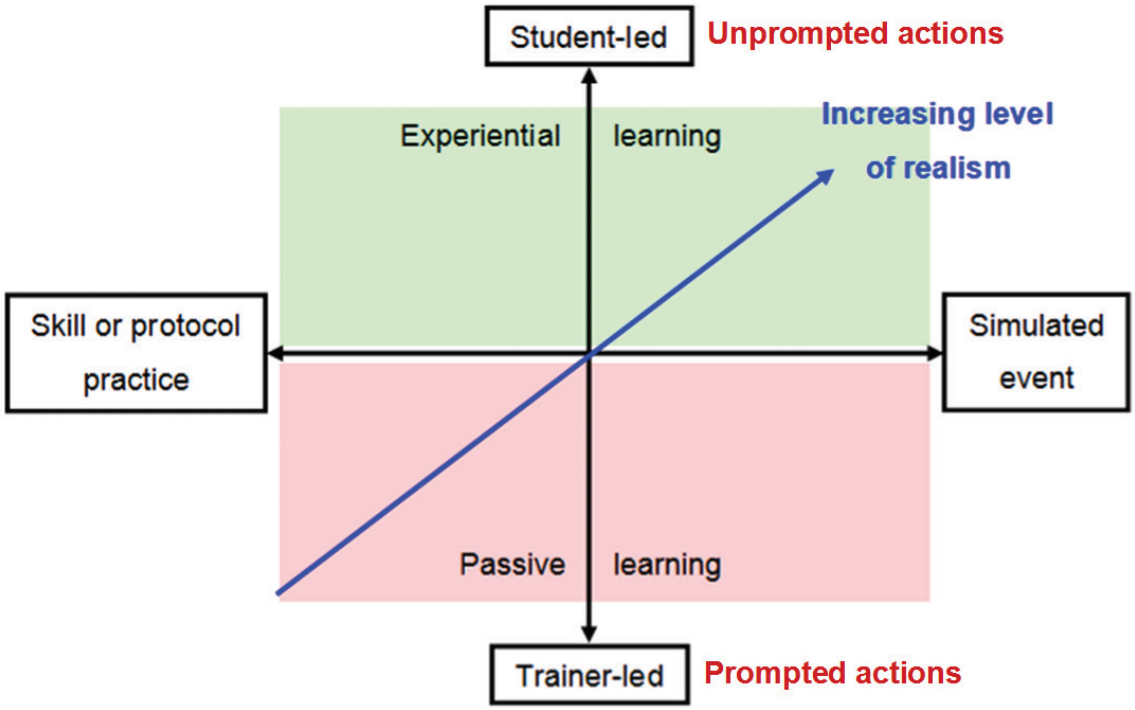


Figure 2: Diagram representation of the expected level of scenario realism according to the participants' involvement.

| Scenario folder sections: | |
|---|---|
| 1 | **Objectives** (Scenario title, intended audience, expected learning points) |
| 2 | **Personnel and equipment** (Actors, props, patient preparation and make-up) |
| 3 | **Computer set-up and operator instructions** (Physiological parameters at key stages, expected treatment) |
| 4 | **Paperwork and supporting documentation** (Patient charts, ECG, X-rays…) |
| 5 | **Context** (Includes actors and patient scripts, and participants' briefing information) |
| 6 | **Knowledge and teaching information** (May include teaching slides and handouts) |
| 7 | **References** (Related to educational objectives of the scenario and teaching information) |
| 8 | **Notes** (suggestions for further improvement of the scenario, common errors made by participants…) |

Table 1: Summary of suggested scenario folder sections by Seropian (2003).

Appendix: Adapted scenario script (Dieckmann & Rall, 2008b).

Patient Name: _____

**Scenario Script**

Keep confidential from participants in order not to spoil their learning experience

Scenario designer: _____

Contact info in case of questions:
Phone: _____
Email: _____

This scenario has been programmed: Y / N / N/A
File name: _____

| **Quick reference: Patient name** | | | | |
|---|---|---|---|---|
| Key issue(s) of case: | Clinical/Medical:<br>-<br>- | Human Factors:<br>-<br>- | | |
| Learning Objective(s) & Debriefing Points: | Clinical/Medical:<br>-<br>- | Human Factors:<br>-<br>- | | |
| Brief Narrative Description for the scenario organizers: | | | | |
| Staffing/Participants and numbers: | Simulator team roles: | Target participants: | | |
| Case Briefing: | For all participants: | For observers only: | For scenario participants only: | For scenario participants on standby: |
| Instructions for all actors | | | | |
| Relative: | | | | |

Co-worker 1:

Co-worker 2:

Narrative description of scenario with script for patient and actors

Patient script:

- Speech: Unresponsive | Not able to speak | Sleepy | Quiet | Calm | **Normal** | Breathless | Confused | Incoherent | Angry | Rude | Loud | Express pain | Crying
- Previous Medical history:
- Age:
- Weight:
- Marital status:
- Job & hobby:
- Smoking/drinking habits:
- Family medical history:
- Lifestyle:
- …

Relative script:

Co-worker 1 script:

Co-worker 2 script:

| | |
|---|---|
| Patient / Mannequin preparation: | Make up:<br><br>Wounds/Dressings:<br><br>Current monitoring applied: |
| Props needed: | |
| Room and equipment setup: | Environment simulated:<br><br>Specific setup:<br><br>Equipment required:<br><br>Equipment they cannot access: |
| Medical documentation needed: | A&E admission document \| Patient file \| Referral letter<br>Medication list \| Operation report \| Personal letter |

| | | |
|---|---|---|
| | Radiological report | Laboratory results |
| Initial physiological parameters: | HR:<br>BP:<br>Temp:<br>Other parameters: | Rhythm:<br>$SPO_2$:<br>$CO_2$: |
| Simulator operation and physiological parameters (Scenario flowchart or script with reference to Set/File/Image): | | |

| (Depending on the scenario a different set of results may be required at different times) | | | |
|---|---|---|---|
| Lab results: | Set 1: | Set 2: | Set 3: |
| ECGs: | File 1: | File 2: | File 3: |
| X-ray/Scans: | Image 1: | Image 2: | |
| Other results: | | | |
| Teaching information or guidelines and references: | | | |
| Notes: | | | |

| Learning Objectives of scenario and main debriefing points: | |
|---|---|
| Clinical/Medical-related: | Human factors-related: |