CHAPTER 18

Designing simulation-based learning activities: A systematic approach

Debra Nestel & Suzanne Gough

KEY MESSAGES

- The literature reports many approaches to designing simulations and simulation frameworks.
- Systematic approaches can assist the quality of the educational experience.
- Irrespective of simulation modality, professional discipline and setting, there are commonalities in simulation-based education.
- Phases of simulation include preparing, briefing, simulation activity, debriefing/feedback, reflecting and evaluating.

Overview

In this chapter we provide an overview of simulation practices relevant for any immersive simulation experience. We start by describing a simulation framework used in a national training programme in Australia (NHET-Sim): preparing, briefing, simulation activity, debriefing/feedback, reflecting and evaluating. We illustrate the simulation phases using a hybrid simulation for learner surgeons in a formative assessment. We acknowledge that there are many approaches and offer this as one that has widespread application.

Introduction

The literature offers several valuable approaches to designing simulation-based learning activities. For example, Jeffries published a simulation framework for application in nursing education [1]. Dieckmann based his framework on interprofessional mannequin-based

simulations [2], while Gough describes a framework for simulation derived from her studies in cardiorespiratory physiotherapy education [3]. Although from different professional practices and based on different simulation modalities, these frameworks have commonalities that reflect effective educational design. Systematic approaches to simulation design can strengthen practice and promote learning [4, 5]. Chapter 2 acknowledges theories that inform healthcare simulation education, including deliberate practice, which offers further guidance to simulation practice.

Simulation practices are also informed by standards offered by professional associations (see the additional resources at the end of this chapter). These standards have relevance at different levels of application: centre, programme, scenarios, facilitators and so on. Our focus in this chapter is consideration of simulation design at the level of the individual simulation event.

We use a systematic approach offered by a national simulation educator programme in Australia [6]. The NHET-Sim programme was designed for individuals working with any simulation modality, in any setting and across professions. The systematic approach focuses on the design of simulation events rather than a whole curriculum, but can be scaled to accommodate the system in which the simulation event is to be located; that is, the broader workplace and curriculum activities of the learners. The phases enable practitioners to share a common language for designing and communicating about simulation-based education (SBE). We illustrate this systematic approach with a simulation designed to support trainee surgeons in managing effective communication with a patient undergoing removal of a mole (Box 18.1).

Box 18.1 An example of a hybrid simulation using the NHET-Sim programme's six phases.

Preparing

Topic
Removal of a mole

Summary
Mr Brian Remington has come for removal of a mole on his upper arm. He is cooperative, although anxious because his sister died from malignant melanoma and he is concerned this may be a melanoma. The surgeon will explain the procedure, inject anaesthesia and close the wound.

Learning objectives
Trainee surgeon demonstrates competence in:
- Identifying the correct patient
- Explaining the procedure
- Identifying and acknowledging the patient's concerns
- Making empathic statements
- Communicating with the patient while operating
- Communicating with the nurse
- Checking the patient knows the next steps

Requirements

Simulated patient	Dissection and
Nurse to assist	suturing instruments
Simulated patient's	Specimen container
notes/patient chart	for pathology
Barrier sheet	Trolley
Fenestrated drape	Suturing pack
Mole model/skin pad	Sutures
Velcrose holder	Sterile gloves
Procedure/operating	Local anaesthetic –
room	Lignocaine 1% plain
Chairs	Syringes (5 ml and
Procedure couch	10 ml)
Mole skin pad with	Needles (green and
perspex holder	blue)
Fenestrated	Sharps container
adhesive disposal drape	Bin

Task for trainee surgeon
Mr Brian Remington has come to the day surgery clinic for removal of a mole on his arm. You are required to manage the consultation and remove the mole.

Information for the simulated patient (SP)
You are Mr. Brian Remington, aged 56, and you have come for removal of a mole on your upper right arm. You are cooperative, although anxious because your sister died from malignant melanoma four years ago. The surgeon will explain the procedure, inject anaesthesia and close the wound. The learning objectives are as listed earlier.

Behaviour
You are cooperative and communicative, but you have an underlying worry about cancer.

SP questions and prompts
Answer the trainee's questions honestly, but do not elaborate information unless the trainee facilitates this by pausing and staying with your answers. While the trainee is removing the mole, mention that your sister died of skin cancer. If the trainee acknowledges what you have said, then go on to ask if your mole could be malignant. Our experience is that often the trainees do not hear or acknowledge your comment while they are operating.

If information is not presented about the removal of the stitches, ask about what happens next towards the end of the interaction. 'Do these stitches just dissolve?' 'How do I get them removed?' Other questions to ask across the interaction, depending on the flow of communication, include: 'What exactly is a mole?' 'Why do people get them?' 'Will it come back?' 'Will I get others and what should I do about it?' At some point touch the drape while the trainee is watching unless they have already asked you not to do so.

In addition to considering the communication issues that occur during the procedure, there are a number of other points in playing this role. The trainee needs to inject local anaesthesia prior to the mole being removed. The injection will sting, so grimace. Sometimes trainees ask you to look away, but you need to watch so that you can respond at the precise moment. The trainee will wait a short time (a couple of minutes) and then is likely to test the site for numbness by poking around it with a blunt instrument. If asked if you can feel anything, say 'no'.

The trainee will use a cutting instrument to remove the mole and then stitch it closed.

Do not engage the nurse in conversation unless the trainee promotes discussion.

You are concerned that you may have cancer and also about the scarring on your arm ('I remember my sister had a great hole on her shoulder. It was really disfiguring.')

History of present illness
You first noticed the mole six months ago. Two weeks ago, you visited your general practitioner (GP). Your GP assessed the mole and believes that it is benign, but has referred you to the hospital for removal of the mole. The mole has not

grown in size since you first noticed. You are concerned that it might be cancer because of your sister's history.

Past medical history
Nothing significant.

Social history
You are a landscape gardener – you will need to get back to work. Your parents are alive and have no health problems. You sister had a mole on her left shoulder for several years, but it changed about two years before she died. 'She had it removed a couple of years before she died, but obviously it had already become malignant. It was terrible. Still is difficult. Her kids are managing though. Amazing what kids can handle.'

Family history
You are married to Susan and a father of two boys, Joseph (aged 14) and Lewis (aged 16).

Considerations in playing this role
You will have a suture pad velcroed around your right upper arm (wear a short-sleeved top that is not bulky) and the pad will have a surgical drape covering it to create the impression that the mole is on your arm. The pad has a hard perspex backing to protect your arm and can get uncomfortable, so we will remove it whenever possible.

Briefing
The facilitator briefs the trainees. In addition to the usual actions described in the text, including sharing the learning objectives, the facilitator seeks the following information:
- Have you done this procedure before? In the skills lab? With real patients? How did it go?
- How are you feeling? How confident are you? How competent do you think you are at this? What are the most likely challenges you will face? How do you think you will deal with them? Have you conducted any similar procedures? Are there similar skills needed for this procedure? How easy/hard will it be to use them here?
- What did you do well the last time you did this procedure?
- Did you have any particular difficulties? If so, what were they?
- What are you most hoping to learn?
- What would you like us to observe?
- From the patient's and nurse's perspective, is there anything you would like feedback on?

The facilitator allocates tasks for the observers (other trainees).

Simulating
The facilitator observes.

Debriefing/feedback
The focus of the debriefing/feedback relates to exploring how the trainee felt during the procedure, what went well and identifying what did not go so well/as planned. The facilitator should invite the SP and observer trainees to offer their perspective and draw on information from any observational rating tool (Table 18.1). This is crucial for developing the trainees' insight. Self-regulated learning goals may be discussed and, where a trainee has indicated specific points to be observed, feedback should be provided, drawing again on the SP and observers. Finally, how will the trainees make use of the experience? It is important to make a summary of what has been discussed and refer trainees to review any digital resources provided (e.g. a DVD of the simulation). Alternatively, other debriefing tools can be used to structure the discussion [7,8].

Reflecting
During the debriefing/feedback, ask learners to think about how they may apply this learning experience to their practice. What is similar? What is different? What conditions will align? What will be different? How will they check on whether they are progressing? What further practice do they require?

Evaluating
Faculty including SPs and learners will be asked to consider the extent to which the simulation event enabled them to meet the learning objectives. For the faculty, was there enough time?

Source: Adapted from a scenario developed for the ICARUS research project, Imperial College, London. Authored by D. Nestel, R. Kneebone and R. Aggarwal.

Figure 18.1 illustrates the phases and their cyclical relationship. The figure appears in its most basic form and can be adjusted to accommodate contextual variations. The *preparing* phase refers to all the activities that take place before the simulation event starts, such as identifying learners' needs; setting learning objectives; designing the scenario, sourcing simulators, medical equipment, props and so on; booking rooms; recruiting and identifying faculty, confederates and simulated patients (SPs); scheduling the learners; catering and so on. The range of tasks will depend on the local simulation facility and practices.
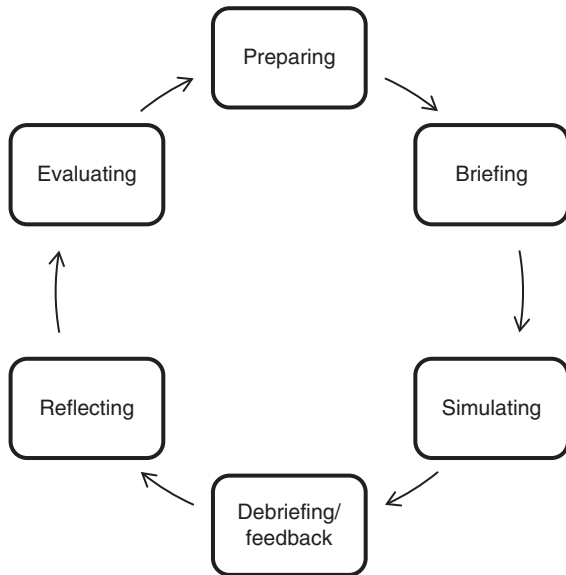
Figure 18.1 Phases in simulation design. Source: Adapted from the NHET-Sim Programme.

In our example, the activities associated with *preparing* will include identifying competencies required for learners, their prior experiences, anticipated challenges for learner(s) and so on. Given that the scenario (in Box 18.1) involves communication, an SP-based scenario is most likely to be appropriate, and because the task involves a procedural skill that can be easily simulated with a task trainer, a hybrid simulation will be suitable. The scenario will need to be developed to offer a level of sufficient challenge to learners. When working with groups of learners, this is complex because of variation in their levels of experience with the procedure. Approaches to scenario design vary and when SP based usually include an SP role in which the character and personal history of the SP are set out, as well as clinical features relevant to this particular scenario [3, 6]. To ensure that a patient voice is represented, seeking advice from lay people and SPs is important to ensure authenticity and feasibility. The SP will need to be trained to play the role, including in the extent to which standardization is important. As this scenario is being used in a formative assessment, a tight 'bandwidth' of performance will be less important than if the scenario was a summative assessment. The scenario may trigger an emotional response for the SP that could make their performance unsettling for them, so they will need to be asked whether they think they will be able to manage. Approaches to training SPs are beyond the scope of this chapter, but refer to the additional resources.

The simulated setting in which the simulation takes place will need to be created, and consumables and other medical equipment checked for availability and functionality. It is important to do a 'run-through' of the whole procedure to ensure that the timings are appropriate for the task. Positioning of the SP and equipment within the setting will also need to be tested to ensure that observers have audiovisual access. The debriefing will be facilitator led and observers will use the rating form in Table 18.1. In this scenario, the SP will provide verbal feedback on the learner's performances with respect to the learning objectives. The facilitator will assist them in sharing this information using a protocol.

The *briefing* phase is given relatively little attention in the literature, but is really important in setting up valuable learning experiences [3]. To other faculty and SPs, the briefing will include the learning objectives, the learners' characteristics, logistics such as time frames, starting, pausing and ending the simulation activity, simulator programming, technical support, communication with the control room, audiovisual capacity, debriefing and feedback processes, reflective exercises and evaluation forms. Additionally, during the briefing it can be important to explore faculty's prior experiences of the scenario and their feelings about it. An opportunity for final questions can ensure smooth functioning. Sometimes SPs are briefed separately to learners for their first encounter within the simulation. Briefing learners will include most of these elements and may also include inviting learners to set their own goals relative to those prescribed and their experiences [9]. We provide an example in Box 18.1.

Orientation of learners to the simulation is important. This will include explicit discussion on what is similar and what is different to reality. This is linked to what is called a *fiction contract*.

Some learners find simulation stressful and it may be important to normalize the experience during the briefing. This involves acknowledgement that learners often find simulations stressful. Creating a safe learning environment involves several strategies and learner-centred attitudes from faculty. This can be achieved through several strategies, including clear explanation of the

Table 18.1 Observational rating form.

Patient-focused communication skills for procedural skills	Not done	Done incorrectly	Done correctly
Opening			
1 Greeting	0	0	1
2 Introduction	0	0	1
– full name			
– role	0	0	1
3 States purpose of procedure	0	0	1
4 Assesses patient's understanding of procedure	0	0	1
5 Establishes consent/agreement to proceed	0	0	1
6 Asks if patient has any questions	0	0	1
7 Asks if patient has any worries or concerns	0	0	1
During procedure			
8 Explains procedure appropriately	0	0	1
Closure			
9 States what has been done	0	0	1
10 States what will happen next	0	0	1
11 Checks patient's comfort	0	0	1
12 Checks patient's understanding	0	0	1
13 Asks if patient has any questions	0	0	1
14 Thanks the patient	0	0	1

Appropriate use of non-verbal communication (e.g. eye contact, body language, touch, facial expressions)

Not at all		Sometimes		Consistently
1	2	3	4	5

Responds to patient's verbal cues (e.g. questions, requests for explanations, worries)

Not at all		Sometimes		Consistently
1	2	3	4	5

Responds to patient's non-verbal cues (e.g. facial expression of discomfort)

Not at all		Sometimes		Consistently
1	2	3	4	5

Appropriate use of silence

Never		Sometimes		Always
1	2	3	4	5

Uses unexplained jargon

Throughout		Sometimes		Not at all
1	2	3	4	5

Interrupts patient appropriately

Never		Sometimes		Always
1	2	3	4	5

Makes empathic statements

Never		Occasionally		Throughout
1	2	3	4	5

Shows warmth

Never		Occasionally		Throughout
1	2	3	4	5

Perception of clinician's anxiety

Very anxious		Moderately anxious		Not at all anxious
1	2	3	4	5

Overall rating of patient-centred communication skills

Very poor		Satisfactory		Excellent
1	2	3	4	5

Comments:

simulation phases and their responsibilities in each, clarity over who is observing, what will happen with audio-visual recordings, confidentiality among those involved, seeking their buy-in with respect to doing their best, the orientation or familiarization of the simulators and setting.

During the *simulation activity* the learner(s) participate in the simulation. It is important to indicate a clear start to the simulation and observe for the physical and psychological safety of those within the simulation [5]. Minimal talking is often desirable to facilitate acute observation. Encouraging observers to make notes to enable specific feedback during debriefing can be valuable (see Box 18.1). If there is a pause and discuss option, then enact it as planned. Respond to cues for finishing the scenario. Depending on the simulation modalities, during the simulation activity cues may need to be pre-programmed onto the simulators (e.g. mannequin) and/or given to confederates, SPs and learners [4, 5]. Facilitators often develop their own approach to notation (electronic or hand written) and should be ready to commence as the simulation starts.

Once the simulation is over, observations of participants and observers can be really important in helping the facilitator to frame the opening debriefing statements. During this transition period there can be a lot of emotion expressed that is relevant to the debriefing and feedback. Encouraging participants to regroup and spend a few minutes thinking about what has just happened can be useful, including asking them to think about what worked well and what could have been improved. If observer tools are being used, then this is a good time to complete them (an example is provided in Box 18.1).

On ending the scenario, participants move to the debriefing room. It is helpful to organize the physical space, paying attention to seating arrangements, whiteboard and/or TV screen if video-assisted debriefing is used. As facilitator, it is helpful to have the learning objectives in your notes in order to stay focused. It is easy to be completely sidetracked by participants' responses. Remember to turn off recording devices. Follow the processes outlined in the briefing, although flexibility is also important to ensure learner-centredness. Invite observers, confederates and SPs to participate. Use opportunities, especially for communication-based scenarios, to rehearse micro elements of the scenario. This can be a valuable way of getting observers involved.

The *debriefing and feedback* phase complements the briefing, almost as bookends to the simulation activity. See Chapter 21 for further information. This phase is often reported to be the most important part of SBE that leads to learning [10–12]. Facilitators explore participants' feelings, address goals and learning objectives, seek other perspectives, summarize, affirm positive behaviours, explore unplanned issues and seek to establish new goals [13]. One goal of the debriefing is to promote reflection. However, we include this as a separate phase to highlight the importance of the locus of control for learning residing with the learner once they have left the simulation event.

Evidence of the effectiveness of debriefing has been reported [10, 11, 13–17]. Debriefing formats vary and debriefing is usually undertaken immediately after the simulation event (warm) or delayed (cold) [18]. Formats can be relatively unstructured to highly structured. Examples of debriefing tools, including the *diamond debrief* [7] and others, are provided in the London Handbook of Debriefing [18]. Similarly, debriefer rating tools such as the Objective Structured Assessment of Debriefing [6, 7, 18] and The Debriefing Assessment for Simulation in Healthcare [19] have been developed to provide evidence-based guidelines for conducting debriefings in simulated and real clinical settings. Guidelines for video-assisted debriefing have been published [20–23], but their optimal use remains unclear.

For the *reflecting* phase, learners (usually individually) are encouraged to make sense of the simulation in the light of their own experiences and those they plan. Similarly, faculty and SPs are encouraged to reflect on all facets of their contributions too. Reflecting is usually an individual activity; while debriefing is often collective and connected to the simulation activity, reflecting has a wider reach. During briefing, learners can be informed of reflecting activities and reinforced after the debriefing. Of course, there is overlap between these phases and reflecting can occur before the debriefing. There are several approaches to reflecting that have been adopted in SBE [24–26].

Learners can be directed to evidence their reflective practice following simulations by uploading and tagging digital learning resources (audio, photographs, video and podcasts etc.), within an e-portfolio [3] or blogs, social networking sites and wikis. Permissions need to be considered with respect to use and storage of these

images. A case study using video reflexivity following simulation is provided in Chapter 23.

Evaluating refers to the success and limitations of the session in meeting its goals, rather than assessment of the individual. This phase benefits from the involvement of all stakeholders, although in practice it is often only learners, faculty, confederates and SPs who participate. It is well recognized in the literature and evident in simulation frameworks that evaluation is a crucial element of driving improvements in education, healthcare practice and ultimately patient care [1, 3].

While it is essential to consider the degree to which the SBE intervention has supported learning, meaningful evaluations require more sophisticated methods. Complex learning interventions require equally complex evaluations, using qualitative and quantitative methods to draw on multiple sources and triangulating data alongside exploring multiple levels of impact.

Conclusion

This chapter has introduced systematic simulation practices relevant for any immersive simulation experience. We acknowledge the restriction of the depth and detail permitted within the chapter, in relation to the phases and theoretical approaches underpinning the design, development and evaluation of SBE. However, reference has been made to other chapters within this book where more specific detail and examples can be located. This chapter has explored a systematic approach offered by an Australian national simulation educator programme and provided exemplar resources in Box 18.1.

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Additional Resources

1 http://www.inacsl.org/i4a/pages/index.cfm?pageid=3407: A link to the standards associated with simulation as proposed by the International Nursing Association for Clinical Simulation and Learning.

2 http://www.sih.org: The Society for Simulation in Healthcare, for core standards and teaching and education standards.

3 www.spn.org: The Simulated Patient Network, a website that provides information for training simulated patients to participate in simulations.