



Simulation

Simprovisation: A model for student-led simulation

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Simprovisation harnesses the principles of socially constructed learning and andragogy, encouraging learners to address their own learning requirements

SUMMARY

Background: Simulation is well established in medical education, with scenarios designed by faculty members to elicit specific learning outcomes. We describe and evaluate a learner-led style of simulation-based education that puts learners in control of the day. Simprovisation harnesses the principles of socially constructed learning and andragogy, encouraging learners to address their own learning requirements. Participants are divided into two groups. They are asked to consider their learning needs and are provided with resources and faculty member support to write two simulation scenarios. Faculty members

remain available to guide scenario writing and offer 'micro-teaching' on required topics. The groups then swap and participate in the scenarios written for them by the opposite group. Each scenario is followed by a structured debriefing, providing opportunities for participants to share their learning from the scenarios.

Methods: We delivered Simprovisation to 62 participants ranging from fourth-year medical students to junior doctors. We conducted pre- and post-course questionnaire surveys and invited participants to focus groups to discuss their experiences.

Results: Our feedback questionnaire shows 100% of 58

respondents found Simprovisation useful, and 95% were able to meet at least two out of three self-determined learning outcomes. Thematic analysis of focus group transcriptions showed that participants valued group-based work and setting their own learning objectives. They found writing simulation scenarios to be challenging, but a valuable source of learning, and reported being more engaged compared with previous simulation study days.

Conclusions: Simprovisation is an innovative style of simulation-based education that allows learners to effectively define and address their own learning needs.

INTRODUCTION

Simulation is a well-established teaching method in medical education and is used to teach, practise and improve technical skills, as well as an aid in considering human factors.¹ Most commonly, participants perform a series of pre-selected clinical scenarios, each followed by a structured debriefing. Scenarios are often designed to elicit specific learning points in relation to learners' curricula.²

Improvisation is an innovative style of simulation-based education centred around self-directed learning. Candidates are divided into two equally sized groups (A and B), and then spend the morning (approximately 2 hours) writing two simulation scenarios aligned with their own learning needs, with faculty member support. In the afternoon, group A will participate in the scenarios written by group B, and vice versa. Each simulation scenario is followed by a structured debriefing.

Our hospital uses the Diamond or EDCBA (experience/express emotions, description of events, clinical clarification, analysis of behaviours and action for future practice) structured debriefing models to debrief simulation scenarios.^{3,4}

The educational theory behind Improvisation

Improvisation takes its theoretical basis from Piaget's concepts of constructivism and Knowles' assumptions of andragogy.^{5,6} Social constructivism suggests that learning can be built upon existing knowledge, through interaction between learners.⁵ Knowles developed assumptions about adult learners being self-directed, motivated, problem-centred, ready to learn and bringing prior experience to educational settings.⁶ Improvisation aims to harness these characteristics

in order to deliver an effective learning experience.

Published work has demonstrated the value of peer-led exam question writing for medical students.⁷ 'Student-created' simulation scenarios have also been described,⁸ but there are no published articles that describe and evaluate study days that are similar to Improvisation.

Structure of the day

Improvisation brings together participants of a similar level to

learn from each other, with support from faculty members. The day is split into four phases: briefing; scenario writing; scenario performance; and structured debrief. Box 1 describes how each phase is designed and delivered.

Resources are provided to help write scenarios: flip charts; pens; computers with internet access; and investigation results templates. 'Decision trees' are flow diagrams designed to stimulate thought on how clinical decisions affect the patient's

Participants are encouraged to share their learning from the morning, and to discuss the technical and non-technical learning points

Box 1. The four main phases of a Improvisation study day

1. Briefing

Students are contacted prior to the study day and are briefed on the format of the session. They are encouraged to bring their own resources (handbooks, laptops, etc.) to use on the day.

The day begins with a briefing explaining how simulation is used as a learning tool and emphasises the importance of human factors. The structure of the study day is reiterated, and the participants are reassured about its formative nature. A faculty member leads a site and equipment orientation. This includes an overview of the technical factors that affect the writing and performance of the scenarios, and clarifies the functions of the simulation manikin.

2. Scenario writing

Participants are divided into two equally sized groups and then aim to create scenarios that last 10–12 minutes, usually centred around acutely unwell patients or communications scenarios.

Participants are encouraged to explore the pathological, physiological and pharmacological aspects of scenarios, and to prepare investigation results such as blood gases, radiographs and blood tests. Faculty members encourage participants to consider how human factors elements can be introduced into scenarios. The introduction of angry patients, or obstructive colleagues can stimulate participants' thoughts on how they might address these situations.

Faculty remain available to help guide the scenario writing to ensure they maintain educational value, as well as being feasible to deliver.

3. Scenario performance

Students participate in scenarios created by the opposite group. A member of faculty usually participates as an 'embedded practitioner' within the simulation room. Though acting in role as a member of the healthcare team, the embedded practitioner has prior knowledge of the scenario objectives and can provide additional information or guidance to participants if needed.

4. Structured debrief

Participants are encouraged to share their learning from the morning, and to discuss the technical and non-technical learning points they aimed to address by writing the scenario for their peers. Facilitators aim to stimulate discussion, but allow participants to lead the debrief and participate in the peer-learning environment we aim to create.

... 100% of participants found the session useful, and 98% found writing simulation scenarios to be educationally valuable

condition. An example is shown in Figure 1. Faculty members maintain a presence to offer 'micro-teaching' on specific areas.⁹

METHODS

We delivered Simprovisation to 62 participants ranging from Year-4 medical students to junior doctors over seven study days from November 2017 to June 2018, with between four and 12 participants per study day. The first four study days were advertised as optional sessions, which students or junior doctors could sign up to. The last three study days (May–June 2018) were a mandatory part of the final-year medical student education programme at our hospital. All 34 final-year medical students at our hospital from May to June 2018 attended study days.

Questionnaire surveys

Pre-course questionnaires using open and closed questions were used to enquire about any prior experience of writing simulation scenarios and students' intended learning outcomes for the day. Post-course questionnaires used Likert scales and closed questions to enquire about how useful and enjoyable the day was, and how many of their learning outcomes were met.

Focus groups

Two focus groups conducted by KB were held in June 2018. Students were invited to focus groups at the study day, and later e-mailed reminder invitations. Semi-structured questions were used to explore the value and challenges of writing simulation scenarios, the simulation itself, and students' experiences of the debriefing, having written simulation scenarios. Focus groups were recorded with written consent. Following transcription, an inductive thematic analysis was conducted to elicit themes around the educational experience and the value of Simprovisation.¹⁰

Ethical approval

Full ethical approval was granted by the medical school. Ethical approval was deemed not required by our hospital ethics committee, as this study was classed as a service improvement initiative.

RESULTS

Questionnaire surveys

Participants were asked to complete pre-course questionnaires enquiring about their prior experience of writing simulation scenarios and to set three learning outcomes for themselves. Faculty members did not see answers to pre-course questionnaires until the study day

had finished. We had a response rate of 94% (58 respondents).

A total of 47 (81%) participants had no prior experience of writing simulation scenarios; 95% of participants met at least two of their three learning outcomes. Figure 2 illustrates responses to the post-course questionnaire: 100% of participants found the session useful, and 98% found writing simulation scenarios to be educationally valuable and would recommend Simprovisation to colleagues.

Focus groups and thematic analysis

A total of seven final-year medical students attended the two focus groups, with five in the first focus group and two in the second focus group.

Three main themes emerged from the data analysis:

- aligning learning with needs;
- educational benefits of the process of Simprovisation; and
- the role of faculty members.

These are discussed below in more detail and are illustrated further in Box 2.

Aligning learning with needs

Students responded positively to self-directed learning and found value in addressing their own learning needs according to the requirements of their future clinical practice, whereas others used the opportunity to address previous difficulties encountered in examinations or clinical encounters. Students found the peer-learning environment educationally valuable. A number of students used the scenario writing exercise to clarify aspects of their future professional roles as newly qualified doctors.

Educational benefits of the process of Simprovisation

Students found writing simulation scenarios challenging, in

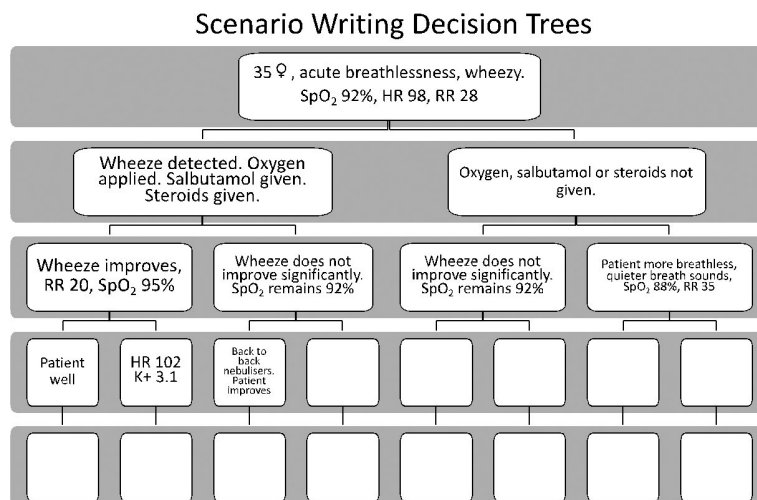


Figure 1. 'Scenario Writing Decision Trees' as provided to candidates to aid with writing scenarios. Candidates are encouraged to consider the outcomes of not only correct treatment, but also incorrect or no treatment. We show here an example of a patient who presents with an acute exacerbation of asthma, and possible outcomes of each action. K+, blood potassium level; HR, heart rate; RR, respiratory rate; SpO₂, peripheral capillary oxygen saturation.

Box 2. Major themes and comments emerging from the thematic analysis of focus groups 1 and 2 (FG1 and FG2)

Theme 1: Aligning learning to needs

Sub-themes	Student comments
Address learning needs for clinical practice	'We decided to do things that would be useful for us starting F1, so we wrote a list ... emergency presentations that we should know and would be useful for us to revise' (FG1)
Address previous difficulties	'We found [a] question that involved electrolytes that we've all done recently and all struggled with, then we went down that route' (FG1)
Benefits from group learning	'We were able to learn from the people who had come up with scenarios and had experienced those difficulties that we then faced' (FG2)
Clarify professional roles as newly-qualified doctors	'We used the backup of [faculty] to be like 'actually that's outside of the scope of what you'd expect your good junior doctor to be able to do ... actually, no, I wouldn't expect my junior to be able to do that' (FG2)

Theme 2: Educational benefits of Simprovisation

Sub-themes	Student comments
Writing scenarios was challenging, but educationally useful	'... the most useful part of the day on reflection ... I need to really think about in detail "what would the obs be? If I did this, what would happen?" ' (FG2) 'I think it is useful ... I felt a little bit pressured for time' (FG1)
Writing scenarios as a source of learning	'... it was very useful to get a deeper understanding of both the pathology that was going on and also the procedures ... to know how and when to put into place procedures, treatments, treatment plans and liaise with other services' (FG2)
Writing scenarios resulted in greater engagement compared to standard models of simulation	'it's a high-intensity engagement ... and you're more actively thinking about things' (FG1) 'I think the writing is very positive because it makes you more engaged' (FG1)
Some students worried about giving feedback, though others felt they could offer more support	'If you know the scenario ... you can give better feedback and be more engaged' (FG1) 'I also felt a little bit reserved about giving my feedback because I felt I wasn't really in a place to judge because I had more knowledge than they did' (FG1) 'It was more reassuring for the people that had participated in the scenario ... [for us] to say that even if you didn't go all the way to the end of the scenario that we had written, that it didn't matter' (FG1)

Theme 3: The role of faculty members

Sub-themes	Student comments
Neutral arbiters	'I found tricky ... deciding amongst the group on scenarios that we agreed with ... it was helped by having [faculty] there to guide us' (FG2)
Ensure simulation scenarios were feasible, realistic and fulfilled learning objectives	'[Faculty] have an understanding of the logistics of running a scenario, where we don't. That's really useful' (FG2) 'It was useful ... for someone to come in and [say] "that would not happen in real life" ' (FG2)
Source of knowledge and teaching	'we had doctors with ... significant amounts of experience ... able to give us mini-teaches' (FG2)
Provide resources to aid writing and performing of scenarios	'useful in just creating resources. Made us think ... "if we went down this route, what would we need?" ' (FG2)

'If you know the scenario ... you can give better feedback and be more engaged'

terms of accounting for feasibility, realism and time pressure; however, they found the exercise

to be a good source of learning. Many students reported that as a result of writing simulation

scenarios, they felt much more engaged with the study day, and particularly with the debriefing.

'it's a high-intensity engagement ... and you're more actively thinking about things'

Some students felt anxious about giving feedback, concerned that they would appear judgemental, although others felt that their knowledge of the scenario that they had written meant that they could be more supportive to their peers.

The role of faculty members

Students perceived faculty members as neutral arbiters, who could settle disagreements and ensure simulation scenarios were feasible, realistic and fulfilled learning outcomes that were aligned with their curriculum and learning needs. They were seen as a valuable source of knowledge and teaching on technical and non-technical topics, as well as providing resources to aid in the writing and performing of scenarios.

DISCUSSION

We describe an innovative method of delivering simulation-based education that shows evidence of allowing learners to comprehensively define and address their own learning needs in a group setting, regardless of any prior experience of writing simulation scenarios. This aligns strongly with Knowles' assumptions of andragogy, placing the adult learner in control of the learning outcomes for the day, as well as developing the findings from student-led question-writing initiatives.^{6,7}

Placing the learner in control of the content of the study day is the principal difference between Improvisation and standard models of simulation. We found that medical students were able to highlight and address particular learning needs, in both technical and non-technical domains, that may not have been fully covered through our existing portfolio of simulation scenarios designed for final-year medical students. We have demonstrated that learners are able to use the opportunity to build on existing

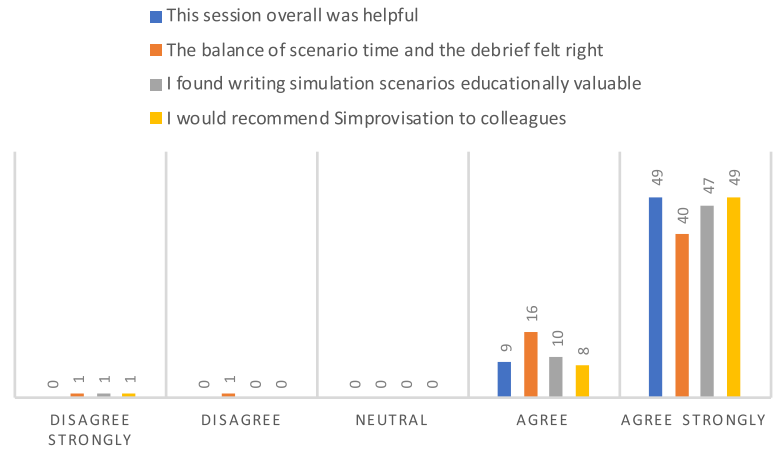


Figure 2. Candidate feedback from post-course questionnaire. A graph showing responses to post-course questionnaires (n=58 respondents).

knowledge and share this learning with their peers. Our students report being significantly more engaged for longer periods of the day in comparison with standard models of simulation-based education.

Improvisation builds on work by Oldenburg et al., who used scenario writing as a learning tool for nursing students and reported an improved understanding of the subject and professional growth.⁸ We have overcome a number of logistical challenges reported by Oldenburg et al., such as faculty member time restrictions and mechanisms to include each student in simulation scenarios.⁸ We have developed a full-day model that allows faculty members and learners the necessary time, expertise and equipment to design educationally valuable and feasible simulation scenarios; however, we encountered logistical challenges in securing multidisciplinary attendance at study days, and relied more heavily on embedded practitioners to ensure that the scenarios remained feasible.

Study limitations

The original nature of Improvisation means that our programme has not been repeated across a range of centres; however, our findings were consistent for a range of medical

students and junior doctors, suggesting that Improvisation may have educational benefits at different levels, as well as resonating with previous work by Oldenburg et al., which suggests that there may be a degree of generalisability.⁸ Our relatively small focus groups may be regarded as a potential weakness, but our thematic analysis findings regarding educational experience and value are in keeping with the Likert scale scores from our post-course feedback questionnaires, derived from a much larger pool of respondents.

Improvisation places specific demands on faculty members. The nature of writing and delivering simulation scenarios in a short time span means faculty members need experience of designing and facilitating simulation days, in order to foresee which scenarios may bring challenges in terms of feasibility and which hold the greatest educational value.

Future directions

Improvisation is now established in the final-year medical student programme at our hospital as the standard form of simulation-based education. Our intention is to follow-up final-year medical students towards the end of their first year as doctors, in order to review the effect that Improvisation has had on their transition to clinical practice.

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