Sequential simulation used as a novel educational tool aimed at healthcare managers: a patient-centred approach

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ABSTRACT

Background A new challenge for healthcare managers is to improve the patient experience. Simulation is often used for clinical assessment and rarely for those operating outside of direct clinical care. Sequential simulation (SqS) is a form of simulation that re-creates care pathways, widening its potential use.

Local problem Numbers, outcome measures and system profiling are used to inform healthcare decisions. However, none of these captures the personal subtleties of a patient's experience.

Intervention 56 students attended a teaching module using SqS and facilitated workshops as part of their induction week on an MSc International Health Management course. The workshop was voluntary and was offered as an opportunity for the students to gain an insight into the UK health system through the medium of simulation.

Methods An evaluation survey incorporating quantitative and qualitative student feedback was conducted. Descriptive statistics were generated from the quantitative data, and thematic analysis was undertaken for the qualitative data.

Results There was strong agreement for the acceptability of the workshop approach in relation to the aims and objectives. Likert scale (1–5) mean total=4.49. Participants responded enthusiastically (revealed through the qualitative data) with ideas related to perspectives sharing, understanding healthcare management and processes and the consideration of feasibility and practicalities. They also suggested other applications that SqS could be used for.

Conclusion The SqS approach has demonstrated that simulation has a wider potential than for clinical assessment alone. Further studies are required to determine its potential uses and affordances beyond its current format.

INTRODUCTION

Healthcare managers have a new challenge when redesigning and transforming healthcare services. No longer can healthcare systems be managed from a purely practical perspective; in contrast, the healthcare experience also needs to be considered. However, this is much harder to define, and therefore a different approach is required.

Currently, numbers, outcome measures and system profiling are drawn on to inform healthcare decisions made. However, none of these captures the personal subtleties of a patient's experience, let alone how to manage and improve their experience amidst the complexities surrounding a clinical pathway.[1 2]

Computer-based simulation is widely used to address healthcare organisational challenges. This approach can range from spreadsheet models to discrete event simulation and virtual reality gaming in order to plan and manage a range of healthcare needs and priorities.[3 4] Physical simulation, where real clinician's environments and props are used is conducted mainly for healthcare professional training and assessment. However, there have been some attempts to widen physical simulations scope, such as through testing new facilities and organisational resilience through in-situ simulations.[5 6]

Sequential simulation (SqS) is the physical re-enactment of care pathways, bringing together clinicians, physical environments, actors and simulation tools and scenarios. It is a way of bringing together the complexities of a care pathway and healthcare system, incorporating the people who populate it (clinicians, healthcare personnel, patients and public), alongside their expertise, experience, emotions and needs.[7 8]

Previous applications of the SqS tool have included: to engage front-line staff and patients in the design of new models of care[9]; to test and evaluate the intervention of a new diagnostic breath test for oesophageal cancer[10]; to train general practitioner receptionists and pharmacists around integrated care and their role within it[11 12]; to train nurses and healthcare assistants on the deteriorating patient; to train multidisciplinary teams across an entire hospital on end-of-life care and as a fundraising tool for a paediatric intensive care unit that revealed the current difficulties faced, to potential donors.

These applications have engaged a range of stakeholders to consider the entire pathway for a particular objective through the medium of simulation; termed SqS. Thus, the application of simulation has been widened from that of traditional training and assessment to that of strategising, engaging, testing and evaluating from a broader perspective—that of the care pathway.

In this paper, we explore UK and international students' perspectives on the use of SqS as a novel educational tool for understanding and redesigning complex healthcare systems and clinical pathways and incorporating management-oriented

solutions for healthcare delivery. In doing so, we draw on an *MSC International Health Programme* students' evaluations of SqS as a teaching tool and their perspectives about potential applications for SqS using a pragmatic mixed-method approach.

INTERVENTION

A workshop was used as an intervention to use SqS as a tool to engage future healthcare managers with the objectives of (a) redesigning a care pathway process and (b) providing an opportunity for participants to use their management skills, with particular consideration given to local initiatives and cost implications.

The aim of the SqS was to generate a care pathway scenario that would provide an opportunity for the students to identify elements of redesign opportunities and apply their management skills. The SqS was therefore designed to replicate a real patient's care pathway, incorporating salient points into the scenario which ensured redesign opportunities.

A heart attack care pathway was chosen; as in clinical terms, it is highly complex, involving various presenting symptoms and diagnostics. It requires a coordinated, integrated care approach. From the onset of pain to paramedic assessment, the transfer to a Heart Attack Centre (HAC) through to the cath lab for the procedure, and finally, postprocedure considerations. This also includes the consideration of call to balloon times, onset of patient pain to cath lab times, door to balloon times and arrival at 24 hours HAC to cath lab.

The Heart Attack SqS was designed to involve family support, triage and patient/clinician communication, to aid the subsequent group discussion. These aspects of the pathway were highlighted due to recent emerging evidence around the lack of psychological support that patients and family receive during their care, often leading to increased postcare costs (eg, depression, anxiety and post-traumatic stress syndrome).

UK guidelines recommend person-centred care, where treatment and care should take into account people's needs and preferences, with the opportunity to make informed decisions about their care and treatment, in partnership with healthcare professionals. Good communication between healthcare professionals and the person with chest pain is, therefore, essential, and it should be recognised that the person may be anxious, particularly when the cause of the chest pain is unknown.[13] According to the National Institute for Health and Care Excellence guidelines, options and consequences at every stage of the assessment and investigation process should be clearly explained. Furthermore, guidelines recommend that families and carers should have the opportunity to be involved in decisions about treatment and care: 'Families and carers should also be given the information and support they need' (p. 7).[13]

SqS design

Heart Attack SqS and scenario

Students watched the complex care pathway presented through an SqS (see figure 1) that was specifically generated to provide an opportunity for students to identify elements for redesign and opportunities for reflection and incorporation of management-orientated solutions aligned with the course objectives.

The heart attack care pathway consisted of Home --> Paramedic/Ambulance service --> Emergency assessment in a heart attack care centre --> Catheterisation lab --> Ward.

Distributed simulation (portable and affordable simulation backdrops and props) was used to re-create the pathway within a room with capacity for 60 students in an acute London hospital (see figures 1 and 2).[14] Simulated patients were used to portray a wife and husband (heart attack victim). Real clinicians performed the role of paramedics, nurse and cardiologist. The simulation lasted for 30 min, condensing time to highlight the key aspects of the pathway (table 1).

Workshop design

Following the SqS all students took part in facilitated discussions to identify issues that arose in the cardiac pathway and were subsequently split into three groups of 20–22 to identify potential solutions.

After 90 min, students presented their solutions to the wider group, after which a broader group discussion was facilitated by the course leads centred around the management-orientated course objectives such as wider implications for UK and international care pathways, considerations of pathway costs, and potential applications for SqS in clinical and management contexts in the UK and international settings.

Figure 1 Ambulance, ward and cath lab represented in the form of a sequential simulation.

Figure 2 Sequential simulation of heart attack pathway.

METHODS
Sample
Fifty-six students attended a teaching module involving SqS and facilitated workshops as part of their induction week on an *MSc International Health Management* course. The workshop was voluntary and was offered as an opportunity for the students to gain an insight into the UK health system through the medium of simulation.

Of the 56 students attending, 17 were male and 39 were female. Three were national students (UK) and the rest international. Professional backgrounds attending the workshop included accounting and finance, biological and biomedical sciences, bioprocessing, biotechnology, business, dentistry, economics, healthcare, history, management, engineering, nutrition, pharmacology, political sciences and psychology.

Evaluation tool
An evaluation survey was purposely designed to incorporate quantitative and qualitative student feedback, providing an opportunity for the triangulation of results.

The quantitative component of the survey comprised a 24-item five-point Likert rating scale (1=strongly disagree, 5=strongly agree). The items explored (a) utility of the SqS for learning and enhancing understanding of UK healthcare systems, clinical pathways and cardiac pathways; (b) utility of SqS for highlighting strengths and weaknesses, and identification of problems and potential solutions for the cardiac pathway; (c) utility of SqS as an aid for discussion in the subsequent workshop and group discussions; and (d) overall utility of SqS as a teaching tool.

The qualitative component of the survey allowed students the opportunity to provide more detailed, open-ended perspectives about (a) implementation of the SqS themes in future studies, (b) usefulness of the SqS format and how it could be applied to other contexts and (c) general feedback.

Quantitative analysis
Descriptive statistics (mean and SD) were calculated for each of the Likert scale results.

Qualitative analysis
Thematic analysis of the questionnaires open-ended questions was conducted per question. Main themes and subthemes were identified and grouped accordingly.

RESULTS
56 students completed the evaluation surveys at the end of the workshop, with a response rate of 100%. Two researchers (SMW and TK) checked the data for consistency when uploading and analysing.

Quantitative findings
Overall, participants slightly to strongly agreed with the statements presented (mean total=4.49). The strongest agreement was for the 'SqS for learning and enhancing understanding of UK healthcare systems, clinical pathways and cardiac pathways' (combined question mean of 4.6) and 'SqS as a teaching tool' (combined question mean of 4.6). The least agreement was for the 'SqS as an aid for discussion in the subsequent workshop and

Table 1 Design of the Heart Attack sequential simulation (SqS) and salient cues for subsequent group discussion

SqS scene	SqS participants	Salient cues for subsequent discussion	Learning objectives
Patient collapse	Patient, carer (trained actors)	► Wife talking to husband about what they will have for lunch (bacon sandwich)	Lifestyle issues
Paramedic arrival and assessment	Paramedics, patient, carer	► Paramedics acquire information from patient and wife ► Verbal handover via mobile phone from Paramedic to Coronary Care Unit nurse ► Wife allowed to travel in the ambulance with them	Identification of family support, triage approaches and patient–clinician communication
Paramedic transfer of patient to 24 hours heart attack treatment centre	Paramedics, patient, carer	► Technical terminology between paramedics and Coronary Care Unit team (phone call)	Identification of family support
Handover between paramedics and clinicians	Paramedic, patient, carer, nurse, clinician	► Cardiologist reliant on paramedic and patient for information and decision-making ► Limited support for wife ► Technical terminology between paramedics and clinicians ► Wife increasingly distressed	Identification of family support, triage approaches
Cath lab procedure and waiting room	Cath lab: patient, nurse, clinician Waiting room: carer	► Communication between clinicians and patient minimal ► Wife not updated during this time	Identification of family support and patient–clinician communication
Ward consultation	Patient, nurse, carer	► Information of who will now be involved in the patient's pathway given ► Appropriate referrals made ► Support to family not discussed	Identification of family support, triage approaches and patient–clinician communication

Table 2 Quantitative evaluation results (mean, SD)

	Students' evaluations (n=56)
	Mean (SD)
Students' evaluations of SqS for learning and enhancing understanding of UK healthcare systems, clinical pathways and cardiac pathways	
The SqS was useful for my learning of UK healthcare systems	4.63 (0.62)
The SqS was useful for my learning of UK clinical pathways generally	4.50 (0.71)
The SqS was useful for my learning of UK cardiac pathway	4.52 (0.69)
The case study presented in today's SqS enhanced my understanding of UK cardiac pathways	4.57 (0.68)
The SqS approach helped me to visualise how the cardiac pathway might look in practice	4.71 (0.53)
From today's SqS I believe my knowledge of the cardiac pathway has improved	4.41 (0.83)
Students' evaluations of SqS for highlighting strengths and weaknesses, and identification of problems and potential solutions	
The SqS successfully highlighted strengths and weaknesses in the cardiac pathway	4.27 (0.73)
The SqS enabled me to identify problems in the cardiac pathway	4.23 (0.81)
The SqS enabled me to identify potential solutions to improve the cardiac pathway	4.23 (0.79)
Students' evaluations of SqS as an aid for discussion in the subsequent workshop and group discussions	
The SqS allowed me to feel confident in my ability to address issues in the subsequent work of the workshop	4.12 (0.85)
The SqS helped me to get my points across in the subsequent workshop	4.39 (0.71)
Students' evaluations of SqS as a teaching tool	
The SqS and workshop facilitated my thinking of the wider implications for healthcare management systems	4.71 (0.50)
The SqS and workshop enhanced my understanding of management in applied healthcare contexts	4.40 (0.81)
Overall, I feel that the SqS is a useful approach for learning about healthcare systems	4.73 (0.52)
The SqS and workshop today will better prepare me for understanding healthcare systems generally	4.43 (0.81)
The teaching module today was more useful than attending a didactic lecture	4.57 (0.63)
The SqS approach is an appropriate teaching tool for this module	4.70 (0.54)
I intend to reflect on the themes of today's SqS and implement them in my future studies	4.64 (0.55)

Five-point Likert rating scale: 1 = strongly disagree, 5 = strongly agree.

group discussions' questions (combined question mean of 4.2) (table 2).

Qualitative findings
Fifty-one (91%) of respondents left written feedback for the question '*Please describe below how you would implement the themes of today's SqS in your studies*'. Five themes were

identified by two researchers (SMW and TK). Table 3 describes the themes identified and illustrates with selected quotes.

Fifty-three (95%) of respondents left written feedback for the question '*Please describe how useful you think the SqS format is and how it could be applied in other contexts*'. Five themes were identified and are presented in table 4.

Table 3 Themed responses to how students would implement the themes generated from the sequential simulation (SqS) into their studies

Theme	Citations
By providing different perspectives	▶ 'There are a lot of perspectives I never thought of. They helped me to take into account other points of view from clinicians to pharmacists etc.' ▶ 'I could put myself in the shoes of a healthcare professional and see how the process can be improved from the management perspective.' ▶ 'For me it was very important because I always look from a nurse perspective. At the start I was focus [sic] on the nurse role and at the end of the session I was already thinking of costs, implementation, education, awareness etc. So, these themes will help me to think in a more wider and bigger perspective and starting to move out of my 'only background' look and approach.'
Feasibility/practicalities	▶ 'It would enable me to consider when thinking about potential strategies how practical its application is.' ▶ 'I think the workshop today helped me to tap into an important factor with the delivery of healthcare services—feasibility. The concept would be a key for me to bear in mind at all times during my study with health management.' ▶ 'When looking at a budget a hospital is provided with, the issues addressed (such as staffing and logistics) in today's SqS would definitely be useful and helpful.'
SqS applications	▶ 'Use it as an example to illustrate some ideas. Use it as a tool in prevention/training ….' ▶ 'Future pathway management/production using simulation. Critical analysis.' ▶ 'Cost effectiveness. Education. Pathway streaming. Physicians having examination.'
Healthcare management and processes	▶ 'The SqS helped me understand the processes regarding the healthcare system in the UK. I would implement it in my studies as a proof that improvements to the system are possible for both time and cost effectiveness.' ▶ 'As a manager I think it is a powerful tool in training patients and clinicians but more importantly I think it works to designing operating processes that adapt well to a specific layout of hospital. Also, work to train non-clinicians like receptionists and janitors.' ▶ 'For me it was really useful to think about simulation not only as an educational tool but also as a tool for redesigning processes and innovative interventions.'
Providing insight into healthcare processes	▶ 'By getting to know the healthcare system, and the pathways and processes, it's a great tool to properly manage a healthcare institution.' ▶ 'I will use this as an insight of how healthcare practices are done in the UK in comparison to those in my home country. Indonesia.' ▶ 'It provided fantastic opportunity for students from a wide diversity of subjects to have an understanding on healthcare, especially for me without any expertise on medical or pharmacy. Really useful as a starting point.'

Table 4 Themed responses to how useful students felt the sequential simulation (SqS) format is and how it could be applied in other contexts

Theme	Citations
Education/training	▶ 'It is very useful as it is easy to understand, remember and implement the learnings in this format.' ▶ 'Being able to visualise the process in action makes it easier to understand and see how simulations can be applied in other contexts such as public awareness, that is, response to emergency situations or for training purposes and reinvention/improvisation of pathways and processes.' ▶ 'The SqS format is very useful, not only for training staff but also administrative staff who may not be aware of the clinical complexities of different scenarios.'
Public health	▶ 'Public health: I feel the fear factor of watching a live MI would be a very powerful obesity campaign for example. staffing issues.' ▶ 'Health education to general population—prevention—faster reaction.'
Other clinical contexts	▶ 'It is very useful to give orientation about situations that may have severe impact or be likely to happen, for example, code blue fire emergency.' ▶ 'It could be for other types of diseases, like chronic one or even acute (like asthmatic attack).' ▶ 'I think it is a very refreshing way to extend the use of simulation beyond clinical assessment.'
Patient communities and perspectives/public engagement	▶ 'The SqS would be useful for everyone as it provides a general overview of what's happening behind the scenes.' ▶ 'Is really nice that we can gain contact with clinicians in real field who have experience. Education to public would be possible to apply.' ▶ 'The idea that this could be used as a product to enhance public knowledge is fascinating. This could be filmed and then become available to clinicians and the public.'
Management and optimising pathways	▶ 'It's pretty useful for developing soft skills and also for bringing the whole healthcare group in sync. Helps in minimising unwanted worries in the chain of command.' ▶ 'I think it was extremely useful for exploring everyone's view and important for setting direction in consideration of business concepts. It can be applied in most high stress contexts for management of risk and error.' ▶ 'The SqS format could be useful to put things together when we are aiming to integrate processes and intervening not only in clinical context but also in management scenarios.' ▶ 'However, from a management perspective, the SqS enables me to identify areas where the medical services could be improved on, for example, patient family could be informed better and improved customer services.'

Thirty-five (63%) of respondents left written feedback for the question 'Please use the space below to add any other feedback or comments about today's SqS'. Four themes were identified and are presented in table 5.

DISCUSSION

There was high level of agreement on the use of SqS for learning and enhancing understanding of UK healthcare systems, clinical pathways and cardiac pathways, for highlighting strengths and weaknesses, and identification of problems and potential solutions, as an aid for discussion in the subsequent workshop and group discussions, and as a teaching tool question means scored above four on the Likert scale. The qualitative component of the survey allowed for expansion on why respondents rated the approach so highly.

When respondents were asked how they would implement the themes identified in the SqS into their studies, they responded enthusiastically with ideas related to perspective sharing, understanding healthcare management and processes, and the consideration of feasibility and practicalities, and suggesting other applications.

When asked to describe how useful the SqS format was and whether they thought it could be applied in other contexts, participants responded that it was extremely useful and that they could envision a wide range of applications from education/training and public health to public/patient engagement, management and the optimisation of care pathways for a range of micro-clinical and macro-clinical contexts.

The final comments section of the questionnaire revealed a sense of gratitude from participants towards receiving the workshop. Improvements were only suggested in terms of the physical environment, not the design of the SqS or the workshop itself. Further comments on learning opportunities and different potential applications were made, revealing an appetite for more examples of this kind.

Between the high level of agreement from the quantitative results of the survey to the positive responses related to healthcare management and beyond, the workshop appears to have met its original objectives and has been rated highly in the process. Particular strengths appear to be the perspective-sharing component and the opportunity to optimise a range of care pathways. Adapting and tailoring SqS to different

Table 5 Themed responses to how useful students felt the sequential simulation (SqS) format is and how it could be applied in other contexts.

Theme	Citations
Praise	▶ 'The SqS is very good. I hope Indonesia will have this kind of module in the future.' ▶ 'Lovely, beneficial, and iterative. Please continue running this simulation:).' ▶ 'The staff, actors, doctors were all super helpful and were able to describe the procedure effectively well to non-UK students.'
Learning opportunities	▶ 'It would be interesting to see how the qualitative insights learned from the simulations can be quantified for decision making at the management level.' ▶ 'I would like to learn more about management and administrative actions going on in the background rather than clinician in gown.'
Improvements	▶ 'The SqS was definitely very useful. Maybe a bit more time on the workshop. I liked the fact that it's done during induction week as well.' ▶ 'For a larger audience, the ease of visualising the simulation should be considered in setting of the room (eg, use of a hall with step ladder sitting).'
Different applications	▶ 'It could be useful to explore simulation for chronic conditions which are the significant challenge for health systems in a lot of countries. The complexity of chronic conditions could be greatly explained with SqS.' ▶ 'It has enormous potential in management education. So managers can have a wide perspective of how different scenarios can play out.'

clinical specialties would therefore enable a range of pathways to be considered.

CONCLUSION

In conclusion, this workshop has been a useful exercise that has shown the potential for simulation, its applications and, in particular, for SqS to be used in other contexts outside of its traditional setting of the healthcare domain, yet with healthcare remaining at its core. This pilot study has therefore been successful, and further studies would strengthen its acceptability and applicability in this context.

The SqS approach has demonstrated again that simulation has a wider potential than for clinical assessment alone. Further studies are required to determine its potential uses and affordances beyond its current format. A programme of workshops that could be evaluated on a larger scale would be the next step in determining its usefulness alongside testing the other applications suggested.

Limitations

Although this study does not provide generalisable results due to its evaluative nature, it does pave the way forward for a different approach to the use of simulation that is beyond healthcare professionals' needs alone. Due to this study being a pilot and first attempt at using healthcare simulation in this format, it was conducted during the student's induction week. This may have affected the results as the students hadn't been fully engaged at this point in the programme's management processes content. Further studies should aim to place the intervention at different points in the student's educational programme, aiming to assess its effectiveness and timeliness.

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