Key factors in the promotion and obstruction of simulated learning in practice: an overview

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Abstract

Background: Simulation has been part of clinical skills education since 1950s. However the use of simulated learning as a popular educational methodology is becoming widespread due to several drivers aimed at improving patient safety and learner competence. The aim of this study was to firstly examine the best available evidence on the critical factors promoting simulated learning in clinical practice. And secondly, to identify and analyse the perceived barriers hindering the effect of simulated learning.

Methods: A quasi experimental pre-test post-test design was employed to compare learner perception of barriers hindering the simulated learning experience. A total of eighty two post registration staff attending a clinical skills training programme participated in the study.

Results: Pre-test findings revealed that the following barriers were perceived as significant by more than half the sample population; identified lack of familiarity with the equipment (65.4%), fear of looking foolish (62.2%), inaccurate reflection of ability (57.3%), time pressures in undertaking the skill efficiently (56.1%), deficient knowledge in undertaking the skill correctly (54.3%), intimidating environment due to practice being observed (53.6%), lack of realism (51.8%) and fear of peer judgements (50%). The post-test results interestingly revealed significant changes in perception scores for most of the identified barriers. The success of simulated learning as an educational methodology relies on a carefully planned and appropriately implemented learning experience featuring the key characteristics that promote its effectiveness.

Conclusion: The success of simulated learning as an educational methodology relies on a carefully planned and appropriately implemented learning experience featuring the key characteristics that promote its effectiveness.

Key words

Factors, promotion, obstruction, simulation, learning.
Background

The use of simulation in clinical skills education is becoming more and more popular and increasingly recognised to enhance acquisition of clinical skills prior to clinical exposure proving advantageous over traditional methods of teaching. Despite better understanding of the factors promoting simulation based education in healthcare, research evaluating perceived barriers of simulated learning is lacking. Thorough understanding of these barriers is essential to facilitate effective learning and augment acquisition of clinical skills. The main aim of this study is to determine the factors which promote and hinder the use of simulated learning in clinical practice through two specific objectives. Firstly, to identify and provide evidence to substantiate the use of simulation in clinical skills education by exploring the key drivers facilitating simulated learning. And secondly, to examine the learners’ perception of potential barriers impacting the effectiveness of simulated learning.

Literature Review

The search was conducted in the following databases MEDLINE, EMBASE, CINAHL, AMED and BNI using the search command simulat* AND learn*. The articles were limited to English and accessed for the period 2000-2013. The search criterion was not restricted to any one particular health care profession and included literature in all areas of health care education. For the purpose of this review, in relation to clinical skills training the simulations that were reviewed included low to medium fidelity simulations.

Benefits of simulated learning

Simulated learning enables learners to practice clinical skills and acquire competence without posing risks to patients (Wilford and Doyle, 2006; Decker et al., 2008; Prescott and Garside, 2009; McCaughey and Traynor, 2010); can offer learners individualised educational experiences promoting active learning through participation (Issenberg et al., 2005); increase in the degree of retention of what has been learnt when using simulation along with transfer of acquired skills to the real life situations Kuduvalli et al. (2009); integration of theory with practice leading to improved learning and acquisition of skills (Maran and Glavin, 2003; McCullum, 2007; Prion, 2008); facilitates opportunity for both formative and summative assessment of competence (McGaghie et al. 2010) along with opportunity for standardisation in assessment for all learners using reliable outcome measures (Issenberg et al., 2005). Simulated learning involves a complex set of learning features that are both active and passive such as observation, deliberate practice, cooperative learning, dialogue, debrief and feedback that can be explained through the various frameworks of learning theories. However it is the combination of a variety of approaches used that is likely to increase the chance of learning occurring. Students learn in three ways: through participation in the simulated experience, observation of the experience and debriefing, which strengthens student’s progression and mastery of learning (Seropian et al., 2004). The growth of simulated learning in practice over the last four decades have been endorsed by key drivers from a strategic and political perspective (NIHR, 2011), (Donaldson, 2009), professional regulations (NMC, 2005), (DoH, 1999) as well as changing societal expectations. In addition to the national and international drivers a number of key factors have promoted the widespread introduction of simulated learning in health care education.

Critical factors leading to successful simulated learning

Deliberate practice is identified as a key characteristic of simulated learning involving intense skill repetition within a controlled domain through appropriate learner engagement and feedback resulting in improved skill performance. Engaging in repetitive practice for intended cognitive and psychomotor skills can result in the acquisition of skills over shorter periods of time as compared to exposure from routine clinical experience (Wayne et al., 2006). Likewise the discussion between the educator and the learner is crucial for critical reflection where the learner is able to make sense from the learning experience. The Best Evidence Medical Education (BEME) simulation review by Issenberg and colleagues in 2005 identified debriefing as one of the critical factors for promoting learning.
Debriefing which focuses only on positive aspects of a learning experience has been recognised by learners to be less beneficial (Lasater, 2007). However, critical to the reflective process is the use of non-judgmental debriefing which allows the learner to derive meaning from their assumptions and understandings (Rudolph et al., 2007) without the fear of looking foolish in front of others. In instances where learning experience produces such negative effects for the learner, facilitators have a vital role to guard negative learning (Hertel and Millis, 2002) by providing immediate correction following the error.

Key characteristics of faculty therefore desired for an effective simulated learning experience should encompass personality, teaching ability, competence, interpersonal skills, evaluation methodology and integration of realism. Correspondingly, the quality of higher education learning environments to a large extent is dependent on the educational design. Therefore emphasis should be placed to design the learning methodology on principles of learner centred approach facilitating deep learning. Another key factor entails the availability of appropriate equipment and resources for facilitating effective simulation (Seropian, 2004).

Several components of the simulated learning environment such as the physical space, equipment, personnel can all have an impact on the participants experience hence careful consideration of these factors should be undertaken prior to the learning experience. Another key feature includes the use of simulator fidelity due to the perceived ability to generate cognitive and behavioural responses as seen in the real world. Research commends the use of simulators as a useful adjunct to clinical skills education in enhancing learning (Issenberg et al., 2005; Lasater, 2007a). There is a wide range of simulator fidelities which are accessible for the teaching and learning of clinical skills such as part task trainers, screen based systems, virtual reality, and standardised patients. Another unique characteristic of simulated learning is the flexibility in adapting various learning strategies for clinical skills education. The strategy is often defined by identified learning outcomes and availability of resources and can be designed to include large and small instructed led group teaching or independent individual learning (Issenberg and Scalese, 2007).

**Methods**

A quantitative structured quasi experimental methodology using pre-test-post-test study design was employed due to the practical difficulty in randomly assigning the participants to experimental and comparison groups. The study was conducted at the Clinical Skills Training Unit within a large Acute Teaching Hospital in the North West. Following approval by the local NHS Research and Development department and review by the Research Ethics Officer a 15 item questionnaire was distributed to 82 staff attending peripheral cannulation training. Requirement of the training for all learners to participate in simulated learning ensued in the adoption of convenience sampling. The questionnaire was developed by the author and piloted with eight learners from another cohort to ensure lucidity and absence of ambiguity of the items. The survey was self-administered and anonymous and participation was voluntary. The questionnaire was designed to gather information about demographics, previous experiences and perceived barriers of simulated learning. The questionnaire was designed using a 4 point Likert scale. Data was analysed using the SPSS Version 20.0 software. The Wilcoxon pair wise signed ranks tests were used to compare the difference between pre and post simulation responses. Changes in perception scores were summarised as the direction of change, including participants with non-missing responses at pre and post training. Scale item with p values of less than 0.05 was considered to be statistically significant.

**Findings**

A total of 60 nurses, 14 healthcare support workers and 8 allied health professionals returned the questionnaire indicating a response rate of 100%. Out of the eighty two participants, the vast majority were female (95%). Most of the participants (43.9%) were in the age range of 20-29 followed by (24.4%) in the age range of 30-39. The number of participants without prior experience of simulated learning was comparatively more (60.5%) than participants with prior experience of simulated learning (39.5%). Table 1 summarizes the demographics.
Table 1 - study demographics

<table>
<thead>
<tr>
<th>Participant characteristics</th>
<th>Frequency</th>
<th>Percent (%)</th>
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<tbody>
<tr>
<td>Gender</td>
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<tr>
<td>Female</td>
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<td>Age (Years)</td>
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<tr>
<td>20-29</td>
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<td>30-39</td>
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<td>40-49</td>
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<td>50-59</td>
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<tr>
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<td>Health Care Support Workers</td>
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<tr>
<td>No</td>
<td>49</td>
<td>60.5</td>
</tr>
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Overall for the general questions, key barriers perceived on the pre-test included time pressures in undertaking the skill (56.1%, n=46), deficient knowledge in undertaking skill correctly (54.3%, n=44), intimidating environment as practice observed (53.6%, n=44), hesitancy in clarifying doubts in front of peers (52.4%, n=43) and inadequate feedback from educator due to group size (30%, n=24). Interestingly (68.8%, n=22) of participants without prior experience of simulated learning perceived the deficiency of knowledge in undertaking the skill as a barrier in comparison to 45.8%, n=22) of participants with prior experience. Among the responders in the age range of 50-59 years (72.7%, n=8) of participants perceived deficient knowledge in undertaking the skill and likelihood to feel hesitant in clarifying doubts in front of others (72.7%, n=8) as a key barrier. Likewise participants in the age range of 30-39 years perceived the environment as intimidating due to practice being observed (63.6%, n=7) as well as time pressures in undertaking the skill (61.1%, n=22). Overall, participants perception of barriers for the general questions in relation to job role presented mixed results. Deficient knowledge in undertaking the skill (75.0%, n=6) and time pressure (62.5%, n=5) was perceived as the main barrier by majority of Allied Health Professionals (AHPs). Nursing staff identified intimidating environment (60.0%, n=36), time pressures and likelihood to clarify doubts in front of peers (55.0%, n=33), and inadequate feedback from trainer due to group size (32.8%, n=19) as the main barrier for simulated learning. Principal barriers perceived by healthcare workers included deficient knowledge (78.6%, n=6), likelihood to feel hesitant in clarifying doubts in front of peers (57.1%, n=8) and time pressures in undertaking the skill efficiently.

Overall for the fear of questions on the pre-test identified the fear to look foolish (62.2%, n=51), fear of inaccurate reflection of ability (57.3%, n=47) and fear of peer judgement (50%, n=41) as the key perceived barriers. Interestingly participants with prior experience identified fear of looking foolish (59.2%, n=29), inaccurate reflection of ability (57.1%, n=28), and peer judgement (49%, n=24. Participants without previous experience of simulated learning also identified three of the barriers in the same sequence; looking foolish (65.6%, n=21), inaccurate reflection of ability (56.3%, 18) and peer judgements (50%, n=16). Overall, the majority of the participants who perceived barriers in relation to fear of questions were in the age range of 50-59 years. Interestingly the fear to look foolish (66.7%, n=40) and fear of educators judgements (32.2%, n=19) was perceived as the main barrier perceived by nursing staff. Whereas the fear of inaccurate reflection of ability (75.0%, n=6) and negative transfer of learning (50.0%, n=6) was identified as the main barrier by Allied Health professionals. The fear of peer judgement and inaccurate reflection of ability (57.1%, n=8) was perceived as the main barrier by the Healthcare support workers.

Overall for the lack of questions the key barriers identified by the learners included lack of familiarity with the
equipment (65.4%, n=53), lack of realism (51.8%, n=42) and lack of opportunity for practice on simulator (43.2%, n=35). The findings were concurrent in relation to participants with and without prior experience of simulated learning. Overall, the majority of participants who perceived barriers in relation to lack of question were in the age range of 50-59 years. Among the responders both nursing staff and allied health professionals identified the lack of familiarity with equipment (62.7%, n=37) and lack of adequate opportunity for practice (42.4%, n=25) as the main barrier. The lack of realism was perceived as a barrier by allied health professionals in contrast to the health care support workers who perceived the lack of sufficient resources as the principal barrier.

Discussion

Out of the 82 participants, majority of the respondents were female (95.1%) in comparison with their male counterparts (4.9%). With nursing being a mainly female dominated profession the sample was found to be representative of the sample population in terms of gender. The participants were primarily in the age range of 20-39 years (64.3%) which is typical of the current workforce within healthcare due to large numbers of experienced staff either retiring or moving to new roles. Most of the responders were nursing staff (73.2%) in comparison to healthcare support workers and allied health professionals. This could be explained due to increase in the number of nurses assuming a range of clinical skills as extended roles.

From the list of fifteen potential barriers divided in three different categories, eight were perceived as a major barrier by more than half of the participant population. About two thirds of the respondents (65.4%) identified lack of familiarity with the equipment (simulator) as a common barrier. Two fifths of the sample population perceived barriers including feeling hesitant to clarify doubts in front of peers (43.4%) and lack of sufficient opportunity for adequate practice on simulator (43.2%). The barrier identified by less than one fourth of the respondents included lack of sufficient resources (24.4%) in undertaking the simulated learning. The post-test responses showed significant drop in percentage for all identified barriers with lack of realism perceived as the key barrier. The fidelity of simulation is often reliant on the skill and the method in which the simulator is used and essentially influences skill transfer (Druckman and Bjork, 1994). Several studies have highlighted that transfer of skills can be achieved for procedural skills using basic simulators (Teteris et al., 2012). However it is vitally important to ensure that skills learned on a simulator are transferred effectively from the simulator to clinical practice. Participants in this study perceived the negative transfer of learning as significant barrier in the pre-test response. Yet, the post-test perception scores were markedly reduced following the simulated learning experience which demonstrates the effectiveness of deliberate practice and appropriate feedback.

Fear of looking foolish was perceived as a major barrier by significant proportion of the sample for both pre and post-test responses. Interestingly no significant statistical difference was found in the pre-test response for this barrier based on prior experience of simulated learning. This could be explained due to the fact that most participants undertaking the skill might be junior staff with a lack of experience or in case of senior participants may feel worried about looking less knowledgeable in front of the juniors. Familiarity with the simulator is also important for the learner to be motivated in engaging with the learning experience and relates to the notion of a comfortable learning environment. The findings for the lack of familiarity question revealed a significant change of perception scores from pre-test to post-test. A possible explanation for the change in scores could be the result of a well facilitated pre-briefing session introducing the participant to the simulator prior to the simulation encounter thus reducing participant's apprehension of this perceived barrier.

Analysis of barriers identified by participant characteristics

Compared to other staff groups the allied health professionals perceived time constraints as a significant barrier. This observation is however limited due to the limited number of allied health professionals participating in the study. There was no substantial difference in findings based on participant's prior experience for the time pressure question. There might be a need to evaluate the participants feedback around timing allocated in relation to group size to lessen this barrier and provide a valuable learning experience. Surprisingly, participants in the age range between 20-29 years and 50-59 years perceived the lack of time as significant barrier when
compared to participants in the age range between 30-49 years. This could be elucidated owing to the fact that middle age participants form the bulk of the existing workforce within the organisation. Deficiency in knowledge was yet another significant barrier identified by majority of participants mainly within the healthcare support worker group. This could be attributed to the lack of underpinning knowledge in relation to the skill along with the fact that intravenous cannulation is still classed as an extended role for many non-medical staff groups. There was no significant difference in perception scores based on participant’s prior experience of simulated learning. Scores in relation to age revealed that older participants perceived the knowledge deficiency as a barrier in comparison to the younger participants. Interestingly, the findings also did not reveal any statistical difference in the perception scores for lack of willingness to engage in simulation question between experienced and non-experienced participants. Nonetheless in relation to age, older participants perceived this as barrier more than the younger participants. It was remarkable to note that none of the allied health professionals perceived this as a barrier in comparison to the other staff groups. Possibly this could be explained from the need to learn the new skill as cannulation is undertaken by a limited number of allied health professionals depending on their role in comparison to nursing and healthcare support staff. Barriers such as lack of opportunity to practice, inadequate feedback from the educator, hesitant to clarify doubts in front of peers, lack of sufficient resources were perceived as insignificant following the simulated learning experience. This could be explained due to the possibility of being offered ample opportunity for practice. Analysis of the data for post-test responses reported significant changes in perception scores following the simulated learning experience for all of the perceived barriers. The results were encouraging to find that with a properly designed simulated learning environment the perceived barriers could be markedly reduced which in turn can provide a meaningful learning experience for the learners. These results also highlight the importance of recognising and addressing these barriers in order to optimise the effectiveness of the simulated learning methodology.

This research has few limitations. Due to lack of a control group, the quantitative findings did not allow further exploration as to whether the direction of change in perception scores was secondary to the simulated learning experience. It was conducted in a single site and included only three of the staff groups participating in the clinical skill training. Hence the generalizability of the findings to other disciplines or practitioner groups undertaking the skill may be obscure. Furthermore, the study relied on a convenience sample of participants enrolled on the training programme as it was not possible to recruit participants due to logistical reasons. The use of pre and post questionnaire to assess learner perception of barriers is also open to random error though every attempt was made to ensure the validity and reliability of the instrument. Thus an improved method of evaluation might improve the confidence in the findings. Largely, however the findings have provided a good overview of the factors hindering simulated learning in practice.

Conclusion

Simulated learning is an educational methodology proven to help learners transform the manner in which they acquire knowledge as established from the review of literature. This however involves ensuring an apt curriculum design featuring the key factors promoting learning using this methodology. Equally, factors highlighted as perceived barriers must be considered for future development of simulation training programmes within clinical skills education to establish a positive learning experience for the learners.

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References


