Simulation as part of programmatic assessment to create an authentic learning experience

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Abstract:

Instructionism and experiential learning are the predominant teaching models in undergraduate obstetics. Challenges such as larger classes, and limited training sites and trainers renders this model inadequate. Simulation provides a safe, authentic environment to facilitate learning. In this action-research-action-learning project undergraduate medical students in their final obstetrics rotation participated in common obstetric scenario simulations. Participants perception of simulation cycles on their learning was assessed.

Twenty students who participated felt that simulation provided a suitable adjunct to the current experiential learning model. Simulation highlighted knowledge-gaps, and also supported theory-practice integration in a logical, sequential manner, applicable in a real-world setting. Simulation provided a safe environment for self-reflection, and cooperative learning, whilst improving knowledge, and developing clinical skills and graduate attributes. Simulation should be incorporated into routine teaching as an adjunct to experiential learning in the clinical attachment in the latter part of the medical curriculum.

Keywords: simulation; obstetrics emergencies; student-centered teaching.

1. Introduction

Sustainable Development Goals 3 and 5 (United Nations: Department of Economic and Social Affairs, 2019) aims to reduce maternal and perinatal mortality by 2030. South Africa is not on parr in achieving these goals (Moodley & Pattinson, 2018), with suboptimal management of obstetric emergencies being a major contributor to poor outcomes. It is the expectation that newly graduated general medical practitioners (GPs) will be able to manage common obstetric emergencies (Gulmezoglu, et al., 2016).

Our institution's medical curriculum is a student-centered, outcomes-based curriculum. The students develop knowledge, skills and attributes, which they scaffold and apply in authentic situations in order to practice their professional roles. Undergraduate obstetrics training includes a 6-week rotation in 3rd year, followed by a 7-week rotation in the 6th year. The 6th year of medical school is a structured apprenticeship, where approximately 500 6th-year-students alternate through 6 rotations in a year (±80 students per rotation). The students work as part of the clinical team thus affording them an authentic learning experience. Currently the 6th year is self-regulated learning facilitated via protocols, videos, and clinical observation. However, current obstetric clinical skills are inadequately taught and assessed (Adam, Lubbe, & van Rooyen, 2021). This may be attributed to the increased facilitator:student ratio (1:26), congestd teaching sites, or learner attributes (apathy).

Currently obstetric emergencies as a clinical subject, employs a behaviouristic-approach where students learn from what they observe. (David, 2019) It is expected that students will take ownership of their learning, engage with the material, learn deeply, and create their own learning opportunities. (Smith & Foley, 2016) Exposure in the clinical environment aims to facilitate theory-practice integration (HPCSA, 2014) (Shukla & Limaye, 2016). Simulation (experiential learning) mirrors real-life situations and can support clinical learning. It furthers improve student engagement for students from diverse backgrounds. (Siassakos, et al., 2011) (Smith & Foley, 2016) (Satin, 2018)

Graduate medical practitioners are expected to manage basic obstetric emergencies (HPCSA, 2014) (Gulmezoglu, et al., 2016). Whilst experiential learning is a suitable approach to clinical medicine (Smith & Foley, 2016), it does not cater for hands-on learning in obstetric emergencies, the latter being unpredictable and require speed and acumen in their management. In a high-pressure emergency setting medical students do not have the luxury to appraise the circumstances and construct a management plan. Simulation as a teaching approach can fill this gap by exposing students to an emergency in a save environment.

The use of high-fidility simulators has gained widespread popularity amongst many medical specialties for training, especially in the pre-clinical years. (Siassakos, et al., 2011) (Satin, 2018) However, they can be costly and thus unattainable for institutions in low-middle income settings. We tested medium-fidelity simulation (Ntlokonkulu, Rala, & Ter Goon,

2018) as part of assessment as and for learning in the management of obstetric emergencies. The purpose was to encourage learning and foster co-operative learning. We explored student satisfaction with the use of medium-fidelity simulation to facilitating learning in obstetrics.

2. Research Question

In student-centered medical education the focus is on students' needs and patient safety. In this study we investigated whether the simulation of common obstetric scenarios, including emergencies, fosters co-operative learning. We also explored the role of self-reflection via review of recordings and peer-reflection with the aid of checklists.

3.Research Design

The design is collaborative action-learning-action-research (ALAR), which includes planned action for improvement (Zuber-Skerritt, 2001), complemented by a multi-methods study. A subject matter expert (SME) compiled clinical simulation scenarios based on expected core clinical competencies (HPCSA, 2014). The simulations were facilitated with the aid of the MamaNatalie Birthing Simulator (Laerdal Medical ®). The simulations were video-recorded, and assessed by means of checklists and memoranda. Teamwork were assessed by students (self and peer-evaluation) and the facilitator. The post-simulation debriefing discussions were also audio-recorded and analysed. Students completed a post-simulation questionnaire assessing their experience and perceived knowledge and confidence gained from the experience. Four ALAR cycles (Figure 1) were conducted during this study.

The Institution's Research Ethics Committee (Protocol 164/2019) approved the study. All students in the current Obstetrics and Gynaecology 6th year rotation (±80 students) were invited to participate in the study. Participation was voluntary and informed consent was obtained prior to the study.

3.1. Data Analysis

Recordings were transcribed, and the investigators immersed themselves in the data to identify potential codes and themes. Facilitators and investigators also kept reflective journals. The investigators engaged in debriefing and triangulation to generate initial codes. Qualitative data was thematicaly analysed, using AtlasTi. Further triangulation and searching for theme connections occurred prior to reviewing and reaching consensus on the themes. Rigour and trustworthiness of the data was ensured by recording (audio-visual) and documentation. Descriptive statistics was used to describe the participants' feedback. Data triangulation was employed to enhance validity.
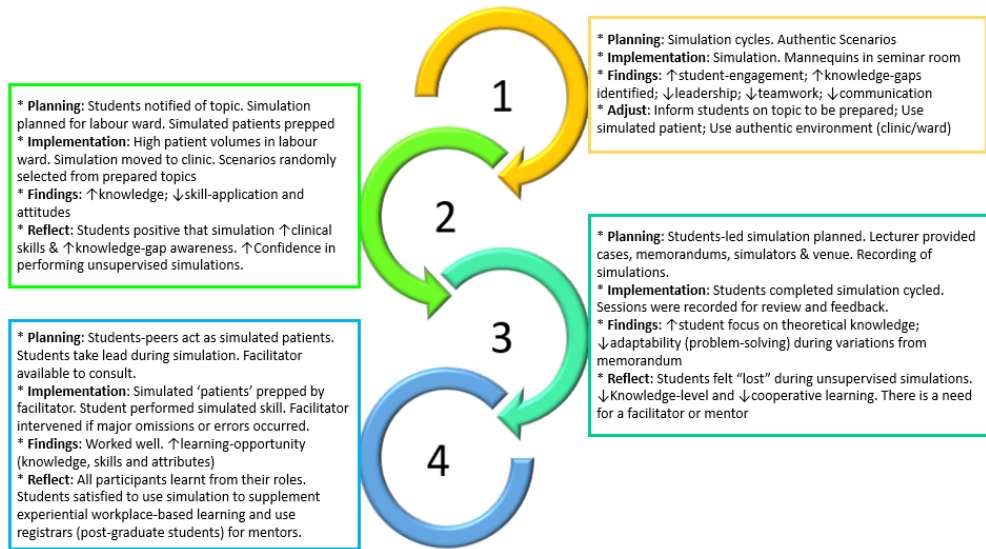
Figure 1: The Collaborative Action Research Process

4. Results

Twenty (25%) of the 80-students invited participated in this ALAR study. Reasons for non-participation included being assigned to a distant hospital, lack of time, busy with gynaecology rotation, and "fear of making a fool of themselves" (Student 5). Students completed a Likert Scale-rated questionnaire pre- and post-simulation (Table 1).

Students experienced the small group tutorials and experiential learning as erratic and sub-standard, as these learning opportunities were dependant on the consultant or registrar that they were assigned to for workplace-based learning rotations. Upon further inquiry, students cited large student groups, high workload demands, and poor definition of learning outcomes and structure of the obstetric rotations as reasons for general student dissatisfaction with the obstetrics learning opportunities. They felt that they "were abused and used as porters and clerks" (Student 3) instead of maximising their experiential learning opportunities. At the start of the study, students felt that more bedside teaching, case-based discussions, and activities that involved critical thinking, and "less time on pulling bloods and putting up drips" (Student 3) would contribute most to improving their satisfaction with the obstetrics rotation. Lack of exposure to holistic patient care seems to be a concern as well "(we) have a lack of exposure because we are outnumbered student to patient ratio especially in management, not in early monitoring so we leave without enough exposure without enough

Table 1: Students perceptions pre- and post-simulation

Question	Pre-simulation (mean, range)	Post-simulation (mean, range)
Rate (1-10) your confidence in manging an obstetric emergency in the labour ward	3 (2-6)	6 (3-8)
How prepared are you to manage the following conditions? (Likert scale 1-5) • Abruptio placenta • Eclampsia • Post-partum haemorrhage • Assisted vaginal delivery	 • 2 (1-3) • 3 (2-4) • 2 (1-3) • 1 (1-2)	 • 3 (2-4) • 3 (2-5) • 3 (2-4) • 1 (1-2)
Rate your perception and emotions during the simulation (Likert scale 1-5) • Feeling helpless • Control of the simulated situation • Ability to recall management protocols • Improvement in confidence • Improvement in communication skills • Positive learning opportunity for obstetrics emergencies • Value of feedback following the simulations		 • 3 (2-4) • 3 (2-4) • 3 (2-4) • 4 (3-5) • 4 (3-5) • 4 (4-5) • 5 (4-5)
Rate your confidence (Likert scale 1-5) • As leader of a team • With communication within a team	 • 2 (1-3) • 2 (1-4)	 • 3 (2-5) • 4 (2-5)

practice in managing…..focus is more on examining a patient and picking up signs and diagnosing…..that is where it stops and that is a bit problematic" (Student 9)

Analysis of the four ALAR cycles highlighted three themes: "theory-practice integration", "role identification", and "student-centered teaching".

<u>Theory-practise integration:</u> Simulation as a means of facilitating learning scaffolds on the student's prior knowledge. Whilst students were confident about their knowledge, simulation highlighted gaps in knowledge, understanding and application. Student 7 said that "as much as you have the knowledge it is useless if you don't practice and continuously applying it". Simulation integrates knowledge and applies it to an authentic clinical scenario, in preparation for the real world. (Student 7: "(in) emergency situations you don't have time to waste on thinking it just needs to flow and that happens through repetitive practice"). Students felt that simulation was an effective means of learning obstetrics in a safe-to-fail environment (Student 13: "I actually like this because it is a non-judgemental environment so I feel we are able to make mistakes "). It was observed that the students reported

engagement and improved retention of knowledge following application in a simulated environment.

In the medical environment, knowledge needs to be applied and translated into skills in the management of a patient. However, medical students have limited opportunities to practice the essential skills required in an emergency in either the skills laboratory or the work environment. Student 3 expressed that "the problem with students is the approach, we don't have the right approach, we don't have all the steps we should take we have the information but they are all scrambled up", supporting the notion that whilst students knew the theoretical management of patients, they were unable to approach a patient in a given scenario in a logical, sequential manner, nor were they equipped with the necessary skills. Simulation provided a safe environment to "make mistakes that we will repeat" (Student 2), without fear of harming a patient or being judged or humiliated.

Simulation demanded that students "think on the spot" which students felt assisted with examination preparation. Following the summative assessment, participants in this study reported that the simulations were a useful learning opportunity that they would recommend to other students.

Role identification: Graduates are expected to have certain attributes in addition to the core knowledge and skills. These attributes are often neglected and under-developed. Simulation provides an opportunity to develop leadership skills and teamwork. Students were reluctant to assume leadership roles in the simulations (Student 1 "It is difficult for me to take myself out of the role of student into the role of doctor") as they were on par with their colleagues and felt uncomfortable taking charge of the clinical situation. Initially, teams were dysfunctional, with poor communication. Self- and peer-reflection illustrated this deficiency, which was improved upon in subsequent simulations. Participants realised the benefit of cooperative learning which they had previously discounted. The simulated environment provided a safe space for collaboration, team bonding and the formation of study groups.

Student-centred teaching: Students felt that the current obstetrics teaching practice was insufficient and required improvement. They felt that clear learning outcomes and formal synchronous learning opportunities across the training platform were required. (Student 13: "This is good but I wish I could do it with all my knowledge….One thing that this situation does it makes you uncomfortable and that is where students learn"). Students felt that more bedside teaching, and feedback and reflection on experiential learning was required.

The attitude towards simulation was positive. Whist some students were anxious and afraid at the beginning, they realised the benefit of simulation for their learning and "got over the initial insecurity, as we are all in it together… to learn from each other" (Student 11). Participants felt that this was a safe learning environment that facilitated consolidation of their knowledge, skills, and attributes in a logical manner that was applicable to the

workplace. The students expressed that this accommodated their learning preferences, as many "learn by doing rather than by reading or listening" (Student 4). Students found this to be a "fun" learning environment. The major limitation to simulation as a means to facilitate learning is availability of students and facilitators. It was suggested that simulation be incorporated into workplace-based learning, facilitated by the registrars to whom the undergraduate students are assigned.

5. Dicussion

Current medical education is based on transmittal teaching methods and workplace experiential learning (Smith & Foley, 2016)   (David, 2019),faced by numerous challenges such as large class sizes, limited training sites and facilitators, large service load, the global pandemic. (Gukas, 2007) (Motala & van Wyk, 2016) The medical educationist is faced with competing interests (clinical work, research, education). Often facilitators of learning are ill prepared for the task and thus it is often difficult to glean support for methods to facilitate learning that do not fall into the transmittal model. Simulation, however has a large body of evidence supporting its positive impact on student achievement in medical education (Kneebone, Weldon, & Bello, 2016) (Smith & Foley, 2016) (Satin, 2018), and in particular obstetrics.

The finding of this study reinforces prior research supporting the ability of simulation as a method to increase student engagement, foster higher levels of learning, increasing student confidence in the clinical scenario, and achieving graduate attributes. Simulation also highlights the importance of indeterminate and opportunistic learning as learners become part of the context and have to make decisions as events unfold. (Hager & Halliday, 2006)

While students in this project did not receive direct instruction in obstetrics, there was theory-practice integration with scaffolding on prior knowledge while exposed to complex, but authentic clinical scenarios. Students who enrolled in the study reported improved attitudes toward novel learning opportunities. Performance on subsequent simulation cycles supports the notion that participants and observers improve their content knowledge, integration and application of knowledge in authentic situations, as well as their attitudes. Certainly if the students find learning opportunities more enjoyable, they will likely be more participative, engaged and thereby improve their performance. Actively engaging students in the simulation learning projects provides students the opportunity to develop skills they may not traditionally have the opportunity to develop (Smith & Foley, 2016). The unpredictability of simulated scenarios allowed students to draw on tacit knowledge, and become attuned to their own values and beliefs in order to make holistic professional judgements and experience indivisualised, often unintended learning. Such adaptability varies amongst students whilst

in the simulation, but is available to those in the observer role, which is unavoidable when there are large student groups. (Kelly, 2016)

Debriefing and feedback following simulations supported effectively analysis and reflection which promotes new awareness of more relevant responses in subsequent clinical encounters. (Kelly, 2016) Participating in simulations, with effective feedback helps students develop contextual content knowledge (Smith & Foley, 2016).

This is an opportunity for students to develop greater capacity to solve problems and think critically, as it provides an opportunity for students to identify a problem that they would likely encounter in the authentic workplace, and then develop and execute a plan to address that problem. Simulation aids helping students move from a predisposition of accepting or never questioning what they see to a position of inquiry and curiosity, through noticing what is occurring in simulation and considering alternative actions and responses.

6. Conclusion

Simulation should be incorporated into routine teaching as an adjunct to experiential learning in the clinical attachment in the medical curriculum for both formative and summative assessments. Simulation laboratories with recording facilities will allow for self-driven learning, self-reflection, and management of large groups with fewer facilitators. Simulation should also be explored as a tool to improve inter-professional care and education.

References

Adam, S., Lubbe, I., & van Rooyen, M. (2021). Do we assess what we set out to teach in obstetrics: An Action Research Study. Afr J Health Professions Educ, 13(2), 118-122. doi:doi.org/10.7196/AJHPE.2021.v13i2.1247

David, L. (2019). "Summaries of Learning Theories and Models," in Learning Theories. Retrieved March 09, 2019, from https://www.learning-theories.com/

Gukas, I. (2007). Global paradigm shift in medical education: issues of concern for Africa. Medical Teacher, 29(9-10), 887-892.

Gulmezoglu, A., Lawrie, T., Hezelgrave, N., Oladapo, O., Souza, J., Gielen, M., & al., e. (2016). Interventions to reduce maternal and child morbidity and mortality. In: Black RE, Temmerman M, Laxminarayan R, Walker N, editors. Reproductive, Maternal, Newborn, and Child Health Disease Control Priorities. (3 ed.). Washington DC, USA: The World Bank, Forthcoming.

Hager, P., & Halliday, J. (2006). Recovering informal learning: wisdom, judgement and community (Vol. 7). Dordrecht: Springer.

HPCSA. (2014). Core competencies for undergraduate students in clinical associate, dentistry and medical teaching and learning programmes in South Africa. Retrieved April, 24, 2022, from

https://www.chs.ukzn.ac.za/Libraries/News_Events/MDB_Core_Competencies_-_ENGLISH_-_FINAL_2014.pdf

Kelly, M, Hopwood, N., Rooney, D., Boud, D. (2016). Enhancing Students' Learning Through Simulation: Dealing With Diverse, Large Cohorts. Clinical Simulation in Nursing. 12. 171-176. 10.1016/j.ecns.2016.01.010.

Kneebone, R., Weldon, S., & Bello, F. (2016). Engaging patients and clinicians through simulation: rebalancing the dynamics of care. Advances in Simulation, 1(19).

MacLeod, A., Kits, O., Whelan, E., Fournier, C., Wilson, K., Power, G., Mann, K., Tummons, J., & Brown, P. A. (2015). Sociomateriality: a theoretical framework for studying distributed medical education. *Academic medicine : journal of the Association of American Medical Colleges*, *90*(11), 1451–1456.

Moodley, J., & Pattinson, R. (2018). Improvements in maternal mortality in South Africa. South African Medical Journal, 108(Supplement 1), S4-S8.

Motala, M., & van Wyk, J. (2016). South African–Cuban Medical Collaboration: students' perceptions of training and perceived competence in clinical skills at a South African institution. South African Family Practice, 58(2), 74-79.

Ntlokonkulu, ZB; Rala, NM; Ter Goon, D. (2018) Medium-fidelity simulation in clinical readiness: a phenomenological study of student midwives concerning teamwork. BMC Nursing, 17:31

Satin, A. J. (2018). Simulation in Obstetrics. Obstetrics and Gynaecology, 132(1), 199-209.

Shukla, S., & Limaye, R. (2016). Graduate Attributes desired for 21st century. Retrieved April 24, 2022, from http://www.srku.edu.in/pdf/3%20%20Graduate%20Attributes%20%20desired%20for%202021st%20century(1).pdf

Siassakos, D., Bristowe, K., Draycott, T., Angouri, J., Hambly, H., Winter, C., Fox, R. (2011). Clinical efficiency in a simulated emergency and relationship to team behaviours: a multisite cross-sectional study. BJOG, 118(5): 596-607.

Smith, M., & Foley, M. (2016).Transforming Clinical Education in Obstetrics and Gynecology: Gone Is the Day of the Sage on the Stage. Obstetrics & Gynecology, 127(4), 763-767.

United Nations: Department of Economic and Social Affairs. (2019). #Envision2030: 17 goals to transform the world for persons with disabilities. Retrieved April 24, 2022, from https://www.un.org/development/desa/disabilities/envision2030.html

Zuber-Skerritt, O. (2001). Action Learning and Action Research: In S. Sankara, B. Dick, & R. Passfield (Eds.), Effective Change Management through Action Research: Paradigm, Praxis and Programs (pp. 1-20). Lismore, Australia: Southern Cross University Press.