Training and implementation of simulation-based education in low-resource settings: Nurse educators' experience

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Background. Simulation-based education (SBE) is an approach to training health professionals using standardised patients and human patient simulators. There is abundant literature on the benefits of SBE in nursing but literature on the training of nurse educators on the method, especially in sub-Saharan Africa (SSA), is relatively scant. Studying staff training models and experiences is necessary to support the widespread adoption of SBE in SSA.
Objective. This study sought to explore the perceptions of nurse educators who participated in a pioneering project at Biaka University Institute of Buea, to integrate SBE into the undergraduate nursing curriculum in Cameroon.
Methods. A descriptive phenomenological design was used to capture participants' lived experiences. Eligible participants were selected using purposive sampling. Data were collected through semi-structured interviews and a focus group discussion, and thematic analysis was conducted using Nvivo 11.
Results. Three themes emerged from the data. SBE was still perceived as novel and the SBE training as comprehensive because it included both theory and practical sessions. Educators were able to contextually implement simulation, safely use standardised patients, and creatively improvise to accommodate the lack of equipment. Participants experienced benefits of SBE application to students and the institution including improvement in the clinical skills of academic staff implementing the method.
Conclusion. A comprehensive SBE training programme can prepare nurse educators in resource-limited settings to effectively implement contextualised models of SBE. Further studies should analyse SBE training models for nurse educators and the effectiveness of contextual adaptations in SBE implementation.

Keywords. Clinical simulation, nurse education, simulation-based education, staff development, Cameroon.

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From the 1960s through the early 2000s, nursing education in Cameroon was provided by the Ministry of Health, on a hospital-based model.[1] Regional hospitals hosted nursing schools and learning time was split between the classroom and hospital wards. This emphasis on bedside nursing was disrupted with the liberalisation of higher education in 2001.[2] Newly created nursing schools regulated by the Ministry of Higher Education used a training model that included bedside nursing and emphasised competencies in education, research, application of science, etc.[2] Clinical internships emphasised in both models, provides a 'wide breadth of learning opportunities, allowing students to practice skills; increase clinical judgment and critical thinking; interact with patients, families, and members of the health care team; apply didactic knowledge to experience; and prepare for entry into practice.'[3] Currently, the number of schools and students keeps rising without a corresponding increase in hospitals, resulting in increasing competition for few placement sites. Hospitals sometimes have more students than patients, leading to disproportionately many students undertaking learning with a complement of fewer patients, thus overwhelming the patients. This imbalance raises questions about patient safety and the quality of clinical learning. Institutions sometimes resort to using distant hospitals as a solution, thus increasing the financial burden on students. This burden might affect the quality of placement learning as the institution might lack sufficient funds for regular placement supervision visits. Simulation-based education (SBE) can potentially address the challenges of limited placement sites.

SBE is an approach that allows students to experience the representation of a real event, and to practice, learn, assess or understand systems or human actions.[4,5] With SBE, facilitators use low-, medium- and high-fidelity mannequins as well as standardised patients (SP) to simulate real-life situations to support learning in the health professions. SBE improves experiential learning by creating opportunities for immediate feedback.[6] Compared with traditional clinical teaching, SBE is more effective in teaching a wide range of skills.[7] Growing evidence also suggests that SBE is better than problem-based learning regarding assessment and management skills in clinical emergencies[8] and of the effectiveness of SBE, though the bulk of this is from resource-rich settings.[6] However, SBE is expanding in Sub-Saharan Africa (SSA), with established centres in Kenya, Ethiopia, Malawi, Rwanda, Sierra Leone, Tunisia, Tanzania and Uganda.[9]

Emerging literature from SSA indicates that SBE has benefits and challenges in low-resource settings. These include: repetitive practice, patient safety, reflective learning, and calm learning environments.[10] In addition, some SSA educators consider SBE to be a valuable paedagogic tool,[11] feasible for implementing in low-resource settings and that improves knowledge and teamwork skills.[12] Despite these benefits, challenges to SBE implementation remain, including large student

numbers and difficult curricular integration.[11] Limited finance, and a lack of trained educators and equipment,[13]also limit SBE implementation. Some of these challenges might be resolved by using nurse educators who are highly competent in SBE.

The widespread adoption of SBE in SSA has not yet been achieved[11] despite growing literature from the region. In most SSA studies, the focus is on the perceived benefits and challenges of the method[6,10,11] or on teaching specific clinical skills.[9,10,14] There is limited focus on faculty development regarding SBE and sustaining its implementation for effective learning. The present study sought to explore nurse educators' perception of their training on the SBE method, and their initial implementation experience within a low-resource setting. The study was conducted among nurse educators who participated in a pioneer SBE programme at the Biaka University Institute of Buea (BUIB), Cameroon, with the support of Drexel University, Philadelphia, USA.

Research questions

1. What were the participants' perceptions of the SBE training process?
2. How did participants initially implement SBE?
3. What were the participants' perceived benefits of implementing SBE?

Methodology

Setting

BUIB is a private university in Buea, Cameroon, established in 1998. It has one of the largest nursing schools in the country. In 2017, with help from Drexel University, Philadelphia, USA, nurse educators at BUIB pioneered the integration of clinical simulation into the undergraduate nursing curriculum in Cameroon.

Design

A descriptive phenomenological design was used in order to capture participants' lived experiences and perceptions of their training in SBE and later implementation of SBE.

Population and sampling

The simulation team had 13 nurse educators trained in applying SBE. To participate, educators had to be part of the original 2017 cohort. Those trained after 2017 were excluded because they enrolled when SBE had already been implemented. Using purposive sampling, seven eligible educators were invited by telephone to participate. Five consented while two were unavailable.

Data collection

Data were collected through phone-based semi-structured individual interviews (SIIs) for Research Question (RQ) 1 and virtual focus group discussion (FGD) for RQ 2 and 3. Both tools were piloted and revised before implementation. SIIs were guided by an interview schedule designed to capture each participant's experience of the SBE training. The research questions served as root questions, with follow-up questions being asked to elicit further clarification. FGD was used for RQ 2 and 3 to generate more depth and insight into their shared experience because the participants implemented SBE as a team. SIIs lasted between 30 minutes and one hour. FGD was virtual owing to COVID-19 prevention protocols and lasted 90 inutes. A trained interviewer conducted the SII and FGD in English and audio-recorded each session.

Data analysis

The researchers listened to the audio recordings individually and made notes on their observations. Recordings were later transcribed verbatim into Word and imported into NVivo 11 for thematic analysis. Each researcher read through the transcripts and reflected on their observations. Coding was done in two stages – open and axial coding. *In vivo* coding was applied during open coding because a predetermined coding framework risked not adequately capturing the voices of participants who had no prior SBE experience. During axial coding, connections and patterns between codes were identified to create subcategories. Researchers discussed these patterns and categories and agreed on the emerging themes relating to the research questions.

Ethical considerations

Participants gave signed consent after receiving an informed consent statement outlining their rights and other important information about the study. Ethical approval was also obtained from the Institute Review Board of BUIB (Ref. no. 2019/0005/BUIB/IRB).

Results

The themes and subthemes are shown below on Table 1.

Perception of SBE training

Participants found the SBE training challenging because the concept was new and the content comprehensive. The content covered SBE and its benefits, including strategies to implement and facilitate student learning during SBE.

> *The training was kind of challenging because it was new to us.* (Int2:9)
>
> *They took us through the definition … benefits…how to carry out simulation and how to manage, how to teach students under simulated conditions.* (Int3:2)

Table 1. Summary of results

Themes	Sub-themes
Perception of SBE training experience	New and challenging concept
	Offered educators opportunities to practice
	Changed misconceptions about SBE
SBE implementation strategy	Structured on the semester calendar
	Use of patient scenarios
	Orientation and debriefing
	Splitting large classes
	Improvising
	Hospital rotation
	Protecting SPs
	Continuous improvement
Perceived benefits of simulation	Improved patient safety
	Improved student learning experience
	Improved learner confidence
	Improved critical thinking and decision-making skills in students
	Improved staff clinical skills
	Provided relief from overcrowded clinical training sites
	Provided external validation of training quality

SBE = simulation-based education; SP = standardised patient.

The training style caused participants to experience SBE as students. This hands-on approach allowed faculty not only to prepare scenarios but also to practice and be evaluated just as students would. This approach enhanced their ability to facilitate SBE.

We practiced, we were doing moulage and things like that, so we were actually trained, and evaluated in the end just as we now evaluate the students. (Int3:3)

The training prepared us as facilitators. (Int2:8a)

The training changed participants' misconceptions about SBE. Prior to training, they believed that SBE could not be implemented in contexts such as theirs, characterised by limited faculty understanding of the method and large student numbers.

In 2016, when Dr Maboh and Mr Mofor came in with the idea of simulation … I thought it will be impossible to accomplish … because of the large number of students and little or no knowledge to go about that on the side of the instructors. (Int5:1)

Implementation of SBE

Participants designed an SBE schedule based on the university's semester system. Two simulation sessions (entire package of SBE activities for each semester) were scheduled annually, with one in each semester. Session One was a prerequisite for Session Two.

We are teaching them in sessions. Session One is for first semester, Session Two which is the second semester, carries the students to the second part of what they started in the first semester. (Int1:1)

Participants developed patient scenarios to be practised using human patient simulators or trained patient actors (standardised patients (SPs)) for each simulation session. The students read the scenarios and accompanying instructions and then conducted the simulation encounter.

Scenarios are written … they read their scenarios and then practise … using SPs or mannequins. (Int2:4)

Each simulation activity began with an orientation session that prepared students for the activity. Identified knowledge gaps in students were dealt with at this time in short lectures. Debriefing was held after each activity to guide students' reflections on their learning.

When they come, we brief them, we prepare them for the tasks they will be seeing. (Int2:2)

We had to give them a little theory on some details which they may not have had during regular class time, which enabled them to better participate in the simulation. (Int3:6)

At the end of every exercise … we ask what they think, how they felt in the process, whether objectives were met. (Int2:5)

Participants observed that large classes impeded learning, so they had to split these classes into smaller groups. For example, classes with more than 200 students were split into groups of 50 to facilitate learning.

When the number of students is very large, learning becomes difficult. So we grouped the students – am talking of about 200+ students – into smaller groups of about 50 each. (Int3:1)

Participants were able to improvise when the lack of equipment prevented a more standard learning environment. For example, adapting chair arms for injections and using any working tap on campus to practice handwashing before returning to the lab.

Simulation [began] *in 2017, when we had to train the students on handwashing, we had to go around the school premises and any tap we could identify, we practiced it there … today, there is a sink in the simulation unit. We used arms that are not real arms, set up arms on chairs for children* [students] *to set up infusions and things like that … we had no good manikins that we could demonstrate anything really reasonable.* (Int3:5)

Protecting SPs from injury was a key component of simulation planning. Facilitators excluded invasive procedures (e.g. catheterisation) for SP scenarios and were always ready to step in if the SPs were at risk.

There is no invasive procedure and anywhere they are going wrong, you can actually step in and correct them. (Int2:6)

Because SBE took place in labs on campus, hospital rotations were included in the simulation schedule to expose learners to real-life clinical situations.

The programme was such … they were also going through the hospital … [to] *have an idea of what the hospital is truly like.* (Int3:4)

Participants reported adopting a strategy of continuous improvement. This strategy allowed them to leverage the experiences acquired each year, to improve session organisation, facilitation, resource harnessing, and student engagement the next year.

We have evolved from 2016. Each year, there's something new to add which gets closer and closer to what actually simulation is. (Int3:13)

We learned from our past experiences on how we should organise, distribute students, skills to teach and how we should go about teaching them, how we can get resources to implement sessions, how we can get the students engaged. (Int4:6)

Perceived benefits of simulation

Participants reported that implementing SBE proved beneficial to patients, students, staff and the institution.

Participants believe that patients could be exposed to injury and even death from errors made by students practising on them. SBE safely prepares students prior to patient encounters, thus minimising the risk of patient injury.

Somebody who is dead is dead, be it as a result of medical or nursing error or whatever. So we want to make sure that before students meet real-life patients, they should be at a level that certain errors cannot easily be made. (Int3:8)

Participants observed an improvement in learners with SBE. Students could learn at their own pace and practise repeatedly without putting patients at risk until they mastered a skill.

It allows them to make errors and correct themselves since they are not working on actual patients … and the students can learn at their own pace. (Int2:2)

Students … practice over and over, until they have got the dexterity they want to acquire. (Int4:8)

Participants believe that SBE improved students' self-confidence. This is attributed to skill mastery from the numerous SP interactions that learners have prior to meeting real patients.

They are working on SPs … building their skills, taking away nervousness. (Int2:9)

Simulation helps students to build their confidence in each skill practiced, as they practice it over and over before going to practice on real patients. (Int5:8)

Participants reported that patient-based scenarios helped students to make better decisions about the management of patients, thus improving their critical thinking and decision-making skills.

It also gives them an opportunity to think and make clinical decisions about the patient's condition. So it helps them to do critical thinking and to make decisions. (Int2:6)

SBE was also beneficial to the facilitators themselves who observed improvements in their practice skills. As most of them work full-time in academia, implementing SBE helped these facilitators to revise their clinical skills and consequently their teaching skills.

It reminds you of the things that you don't get to do every day because you are in the classroom as a teacher … it helps you to perfect and fine-tune your skills and then transfer those skills to the students. (Int4:7)

For the institution, SBE reduced dependency on the few overcrowded hospitals used for clinical teaching, thus increasing the quality of practice learning for their students.

The limited hospital facilities in our area are often crowded by many nursing students from different institutions thus limiting learning opportunities. (Int5:1)

The institution has also benefited from external validation of its training quality. Participants reported that hospital staff had observed better clinical performance from the students who experienced SBE as compared with other students.

I get from the horses' mouth i.e. the nurses, general supervisors, that 'How do you see these students? How do you compare them with others?' They all say they have been so positive, giving good results and that they are seeing the difference. (Int5:9)

Discussion

This study sought to explore nurse educators' perception regarding SBE training, and the initial implementation experience of the SBE method within a low-resource setting. This is important for institutions in similar settings that might perceive SBE adoption as beyond their capabilities.

The facilitators had limited knowledge about SBE methodology and found the training challenging because it was the first time that SBE was being implemented in their setting. This supports the perception that SBE is still a relatively new concept in SSA,[6] especially with respect to its feasibility. These knowledge gaps can be filled through comprehensive training that includes theoretical and practice components. Therefore, after studying the concept, facilitators practice implementation from both the learner and facilitator perspectives. This approach drives active learning and skill performance.[15] In addition, experiencing SBE from both lenses, increased facilitators' self-confidence in implementing the method. In a previous study, nurse educators described SBE as 'intimidating and providing inadequate training and knowledge.'[16] This perception is probably aggravated by the prevalence of Western SBE literature with insufficient contextualisation for Africa.[17] However, as the current study indicates, contextualised training reduces scepticism about SBE feasibility in resource-limited settings.

The implementation of SBE can accommodate local realities while retaining the core elements of the method. Some of these core elements evident in the study findings included developing patient scenarios, using SPs while maintaining their safety, creating groups for effective facilitation, conducting post-activity debriefing, and developing a structure that blends with the rest of the academic programme. Large groups of students were managed by developing an effective rotation plan that included the clinical environment. Even with the necessary resources, studies show that effective planning is essential for successful simulation.[17] In addition, technological support and adequate equipment are also necessary.[18] However, creative improvisation by facilitators in limited-resource settings can help them navigate the lack of equipment. They can adapt local materials as well as write scenarios based on their available resources. Facilitators can also incorporate short lectures as needed during simulation to maximise learning. The effectiveness of these improvisation techniques should be further explored in future studies. A strategy to actively incorporate ongoing learning into future SBE sessions as shown in this study potentially improves quality over time.

The study findings confirmed many of the already identified benefits of SBE, including improved patient safety, improved learning outcomes, and improved self-confidence in students.[15,18,19] In addition to these points, SBE provided a solution to the challenge of finding adequate placement sites for the large student population. This confirms that in such situations, SBE could be a 'lifesaver.'[20] Implementing SBE could improve external stakeholders' perceptions of the quality of teaching at the institution, giving external validation of the programme. However, the most notable benefit of SBE identified in the study is the improvement of clinical skills in facilitators themselves. This has implications for academic staff who rarely find the time for clinical practice as well as for staff development programmes.

The above findings should not be generalised. The study was limited to participants' experience of their first encounter with SBE. There was no attempt to assess the implementation of SBE or its effectiveness. However, enough insight is provided to enable readers in similar contexts to make judgments as to how important the findings could be in their settings.

Conclusion

Firstly, training perceived by staff as comprehensive can convince educators that SBE is feasible in low-resource settings. Secondly, SBE could be adaptively implemented to maintain its core elements while adding improvisations to accommodate available resources. Thirdly, SBE is not only beneficial to the institution and students but also helps to improve clinical skills of the academic staff who implement it. Lastly, further studies should conduct in-depth analysis of SBE training models for nurse educators and also explore the effectiveness of improvisation strategies in SBE implementation.

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Conflicts of interest. None.

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