



## Research Article

# Student Nurses Perceptions and Experiences of High Fidelity Simulation use as a Learning Strategy in a Resource Limited Setting

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### Abstract

**Introduction:** High Fidelity Simulation (HFS) is relatively new in sub-Saharan Africa. A number of nursing colleges across a number of countries have been supported to establish HFS laboratories by the Columbia University through the Nursing Education Partnership Initiative (NEPI). The introduction of HFS is raising questions about its suitability and acceptability considering its complex technology.

**Objective:** The aim of this study is to explore the diploma in nursing students' perceptions and experiences of using high-fidelity simulation as a learning strategy in a resource limited setting.

**Methods:** The study used a qualitative descriptive design to describe nursing students' perceptions and experiences. A purposively selected sample of sixteen students participated in three focus group discussions. Data were analysed thematically.

**Results:** Five themes emerged from the data which showed that students had both positive and negative experiences of using HFS as a learning strategy. These themes were authenticity, unique learning opportunities, accessibility, training and transfer skills.

**Discussion:** HFS simulation can be an effective learning strategy if it is better organised, educators and students are trained and best practice guidelines on simulation use are implemented.

### Introduction

High Fidelity Simulation (HFS) is defined as the utilisation of computer software to manipulate a human like manikin to recreate

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authentic clinical scenarios [1,2]. The use of high fidelity simulation is slowly finding its way into sub-Saharan Africa, with support from Columbia University through the Nursing Education Partnership Initiative (NEPI) [3]. Nursing colleges in Lesotho benefited from this project and acquired high fidelity simulation manikins and built simulation laboratories for use of HFS as an educational strategy. Resultantly, HFS was adopted as an educational strategy in the diploma in nursing programme with a conviction that it can improve the quality of learning [4]. While there is so much literature on simulation in general and of late HFS in particular as an educational strategy in nursing globally, HFS is relatively new and there is little evidence available in Africa [3]. In their recent study on HFS with nurse educators van Vuuren et al. called for more research to be done around HFS use in Africa to inform strategies that will improve its use [5]. Therefore the aim of this study was to explore the nursing students' perceptions and experiences of using HFS as learning strategy at a nursing college. The study aimed to illuminate possible improvements in utilising HFS effectively and add to the limited body of evidence on this area in the Sub-Saharan Africa region.

### Background

There are several advantages to the use of HFS in teaching and learning highlighted in the literature. Firstly, HFS can provide additional space for allocating students in the face of decreasing clinical space for student allocation and patient scarcity [6,7]. Secondly, by allowing students to initially practice using HFS patient safety is enhanced as students will come into contact with patients after they have already started practicing [8]. Thirdly, both students and educators have expressed satisfaction with the use HFS, with some self-reported improvement in students' confidence [9]. The last and most important advantage reported is that HFS as an educational strategy promotes active learning, improves competencies in critical thinking, clinical judgement and communication skills [7,10,11]. While the first three advantages have not generated much debate the last one remains a point of discussion.

Existing evidence on the effectiveness of HFS in developing competence among students is currently being challenged. The argument is that existing studies lack robustness and valid methods to conclude that there is real improvement in students' competence. Several authors contend that the improvement in competence attributed to HFS has not been extrapolated to prove any improvement in patient health outcomes [12-15]. A study by the National Council of State Boards of Nursing (NCSBN) showed that replacing clinical hours with HFS yielded similar results as traditional methods of learning [16]. With this debate around the value of HFS, as a learning strategy, it is important for the resource limited sub-Saharan Africa to generate as much evidence around HFS to inform best practices and effective use of HFS.

According to Burch, HFS is expensive to set up and sustain in general for any institution globally [14]. Making an example of Africa, Burch highlighted that South Africa the second largest economy and

richest country in Africa took over ten years to put simulation facilities in place [14]. Simulation in this case referred to simulation in general and not specifically HFS which is the most expensive. However since HFS has been set up in many institutions globally including a significant number of countries in the sub-Saharan Africa, research has moved on to look at the cost effectiveness of HFS rather than debate its cost in isolation [3]. Lavoie and Clarke suggested that investing in high end simulation has no supporting evidence on its effectiveness and it's possible that cheaper forms of simulation could be more effective [17]. This claim is supported by a study by Lapkin and Levett-Jones which suggested that the low cost medium fidelity simulation yielded the same results as compared to high cost HFS [18]. Evidence on effectiveness of HFS remains contentious and requiring further enquiry [12]. Nevertheless, such high level studies were not appropriate in this study setting as HFS had just been introduced and other issues like reaction to HFS and utilisation practices needed to be examined first. According to Cant and Cooper the true value of simulation can only be judged if best practice guidelines are applied [19]. So it was the purpose of this study to initiate a discourse towards improving practice in the use of HFS.

## Reaction to HFS Use

HFS has been received favourably by students and nurse educators and most consider it to have a positive effect on learning [1,20]. In a study done by Munangatare and Naidoo it was found that nurse educators found HFS to be a favourable educational strategy although they felt that they needed more training and develop strategies to effectively utilise it [9]. These findings mirrored another study which showed that faculty members were of the opinion that HFS can improve learning outcomes [21]. Learning outcomes like problem solving and critical thinking skills were perceived to have improved after use of HFS among nursing students [22]. In general several studies have shown that students and nurse educators have expressed satisfaction with HFS and perceived it to be associated with an improvement in self-confidence, clinical judgement and knowledge retention [23,24]. The positivity and acceptability of HFS among the users indicates that they are likely to use HFS with the right attitude which can contribute to effective use.

While there is abundant literature on the reaction to HFS, such literature is mainly outside Africa. There is dearth of literature on HFS in Africa which should be expected given that HFS is new in this context. HFS is a technology driven teaching strategy, and challenges with implementation are common given that nurse educators face a number of obstacles when introducing new teaching strategies [6]. Therefore the success of using HFS in resource limited setting largely depends on proper planning and utilisation that is responsive to the challenges and opportunities presented by HFS as an educational strategy. In addition, many studies did not consider examining how students who are at the point of graduation perceive HFS as an educational strategy. In terms of learning, students at the point of graduation are in transition to professional nursing and they tend to perceive and experience learning differently from other students [25]. In a meta-analysis of studies on HFS it was found that studies which involved senior students and professional nurses produced the greatest effect in evaluation studies [20].

## Conceptual Framework

The conceptual framework applied in this study combined the Kirkpatrick's model of evaluating training programmes and Jeffries

simulation model [26,27]. The Kirkpatrick model was applied in a study on HFS by Shin et al., while the simulation model is broadly applied to guide simulation use and have been used in many studies on simulation [28,29].

According to Kirkpatrick's model, training can be evaluated at four levels namely; reaction, learning, transfer and results. The first level was the focus of this study looking at how students perceived and experienced HFS as a learning strategy. The other levels of evaluation could not be applied in this setting because no evaluations at level one have been done before.

Second level evaluates actual learning by measuring improvement in level of competence, third level examines the extent to which competence is applied in real life situations and level four looks at the impact brought about by the improved competence level in terms of better patient health care outcomes. Looking at level one in this study was important because valid results on the effectiveness of HFS depends on best use, and studies at level one can shape and improve HFS use in learning.

Coming to the simulation model by Jeffries, it has five key components; best educational practices, student factors, educator factors, simulation design features and learning outcomes. Education practices focus on the process of teaching and learning like student-educator relationship, active learning, accommodating different learning style and feedback. The teacher and educator factors imply that the educator should facilitate learning and evaluate it while the student factors pertain to roles of being both an observer and participant in the learning activities. Simulation design feature should align to the above factors as well as promote the attainment of the learning outcomes and allow for effective debriefing. Ultimately the learning outcomes like increase in competence level and student satisfaction with the learning process should be measured against the learning objectives set at the beginning.

Putting the framework into context of this study, students are key participants in the learning process using HFS. The role they play in the learning process strongly depends on the teacher's actions, educational practice and simulation design. This interaction yields the learning outcomes which can be viewed at four levels that correspond to Kirkpatrick's levels of evaluation; reaction, learning, transfer and results. The purpose of HFS is to improve students learning experiences, their learning outcomes, ability to transfer learning into actual practice and ultimately improving patient care outcomes. Studies to evaluate HFS as an educational strategy have done so at these different levels even though most of them did not explicitly state that. The evidence has shown that the results on the effectiveness of HFS simulation are mixed because best practices are not constant. It becomes an important point of departure to always start evaluation of HFS at the reaction level because this can help improve the HFS utilisation making subsequent evaluations more valid and reliable. Therefore this study aimed to evaluate HFS use in a resource limited setting at level one of Kirkpatrick model looking at students factors related to how they perceived and experienced HFS. The students' perceptions and experiences depict their reaction to HFS use in their learning [30].

## Methods

### Design

A qualitative descriptive study was used in this study. The purpose of this study was to describe the nursing students' experiences and

perceptions of HFS use as a learning strategy. Qualitative descriptive design is explained as research that is applied in studies of description in nature [31]. The use of a qualitative descriptive approach is appropriate when data is needed from the people experiencing the phenomenon under study [32]. According to Sandelowski qualitative descriptive method provide more detailed and broad information than other methods such as phenomenology, grounded theory or ethnography [33,34]. Qualitative descriptive research does not seek to discover, explain or understand or to explore the process, but it seeks to describe the perspectives and views of people on a particular phenomenon [35]. The qualitative descriptive design is useful in cases where little evidence is available and when there is need to understand a phenomenon from the perspective of the participants [33]. Furthermore, for a study that was focusing on how students reacted to HFS, the findings from this study are useful in carrying out further evaluations of HFS at higher level of Kirkpatrick model of evaluation.

In summary this study fits into the important tenets of qualitative descriptive design which are; inductive process, subjectivity, descriptive and enhance understanding of phenomenon, researcher as an active participant, groundedness in the data and naturalistic [36]. Firstly, the study of students' perceptions and experiences is inductive in nature since it gives more information on HFS as experienced by the participants. Secondly, perceptions and experiences are subjective and the interpretations of the researcher are also subjective. Thirdly, HFS being a new phenomenon in the study setting, the perceptions and experiences of the students helped to describe and enhance understanding of HFS as a learning strategy. Fourthly, the researcher was an active participant in the study, getting involved in designing the study, collecting data directly from participants and seeking their feedback on interpretations of the data. In addition the starting point of the data analysis was the point of view of the participants with some subjectivity applied by the interpretations of the researcher. Lastly, the study was carried out in the participants' natural setting with data being collected in simulation rooms, after HFS activities.

There are several studies on HFS simulation and simulation in general that have applied the qualitative descriptive design. Adamson and Anderson et al., used a qualitative descriptive approach in their studies on faculty experiences of barriers and facilitators of using simulation and acquisition of simulation skills respectively [37]. Janson et al., also applied the qualitative descriptive approach when investigating the faculty members' perceptions on barriers in using simulation [38]. Similarly, Kaddoura et al., used the approach in exploring the undergraduate students' perceptions on the benefits and challenges of using HFS [39]. Consequently application of the qualitative descriptive approach in this study was justifiable and grounded in the literature.

## Participants

The study population was 107 nursing students at a nursing college and the inclusion criteria were all students in the final year of study in the diploma programme. The final year students were purposively considered to have more experience with HFS as they had used it for more than a year and were considered as more knowledgeable and likely to give thick descriptions of HFS as a learning strategy. The participants were recruited through a group meeting in which the researcher explained the topic of study and procedures to be followed in participating in the study including consent procedures. Information sheets and consent forms were given to all final year students

(n=16) and were asked to go and read and decide if they were willing to participate or not. Those who needed clarifications met with the researcher on returning the consent and clarity was provided before the consent was given. All sixteen students gave consent to participate in the study and the researcher divided them into three focus groups. The researcher considered maximum variations in the groups in terms gender, class performance and age using information that was available to the researcher and which the students agreed on its use. Arranging groups in this way allowed for the required homogeneity and variation required in focus group discussion [40,41].

In terms of the sample size, it was not the number of participants that mattered most but the number of focus group discussions that were required and feasible to reach data saturation. Data saturation is the point in the data collection where the participants are no longer sharing any new information compared to the already available data [40]. Only three focus group discussions were possible, but the analysis of the data showed that acceptable saturation was reached as similar issues appeared in all the focus group discussions. Although an extra focus group would have strengthened the data saturation, it was going to require a group of students that were not exposed to HFS for any significant period of time.

## Data collection procedures

After ethical clearance and permission was given by the National Ethical Clearance and Review Board and the college, participants were briefed on the study and invited to take part. The necessary information and clarifications about the study were provided and the students who opted to be participants signed the informed consent. To ensure ethical practice was adhered to the researcher was not facilitating learning to this group of students. Assurances were given to the students on issues of confidentiality including the limitations associated with focus groups. Contact details were provided for the necessary people the students would contact in case they were negatively affected by participating in the study and their right to withdraw from the study at any time without any risk of prejudice was highlighted. None of the participants raised any concerns and none withdrew from the study. The data collection dates were set in consultation with the students and the clinical instructors who were facilitating simulation activities to ensure that simulation rooms were not booked and coincide with the time for data collection. The focus groups interviews were conducted over a three week period each soon after a debriefing session of HFS, although the perceptions and experiences discussed were not limited to the immediate HFS session. The researcher moderated the focus group discussions while an assistant ensured that rooms were prepared and the recorders captured the data throughout the interview. Each focus group interview lasted between 45 minutes and 60 minutes, the researcher allowed deliberations to go on until a kind of group saturation was reached. Group saturation in this case was described as a point where participants began to repeat issues that they discussed before and no new relevant data were emerging [40]. During the group discussions, participants used numbers to identify each other to ensure that anonymity and confidentiality were maintained.

## Data analysis

Thematic analysis was used to analyse the data and generate themes constituting the nursing students' perceptions and experiences of using HFS as a learning strategy. The recorded data were transcribed

verbatim by the researcher. After transcription, the data were fed into ATLAS.ti qualitative data analysis software to assist in the coding process. Before coding the researcher read the transcript to familiarise with the data. The researcher coded the data independently and the co-coder also coded the data independently, the two then discussed the codes until agreement was reached on the codes. The two then went on to separately generate themes by collapsing the codes into groups and another discussion was done culminating on a consensus on five themes that described the perceptions and experiences of students on use of HFS as a learning strategy.

### Trustworthiness

Dependability, confirmability and transferability were applied in this study to enhance trustworthiness. The similarities and differences of this study findings with literature make the study dependable. By using a co-coder and generating a level of agreement on the codes and themes confirmed the truthfulness of the results. And the thick description of the context, background, methods and findings made these findings transferable to similar contexts [31].

### Findings

This study showed that use of HFS as a learning strategy was perceived and experienced as an authentic, unique learning opportunity which improved learning among nursing students. However challenges like lack of training, limited access and transferability of learning were viewed as drawbacks in HFS use in learning. The uniqueness of these results is in the manner in which the protection of HFS was prioritised over promoting self-directed student learning compromising the effectiveness of HFS use as a learning strategy.

### Authenticity

The majority of the students perceived HFS as a learning strategy that created an authentic learning environment challenging them to practice as if they were in the real clinical area. They found learning using HFS being similar to working with actual patients, pushing the students to perform realistically.

*‘And the way we handle Susie (name of the high fidelity simulator) is just the way you can handle a real patient or human. [P1-FGD]*

For the students, performing as if they were in the clinical areas was a motivator for them to learn. The realism of HFS created positive learning experiences for students that helped them to improve their knowledge, understanding, practical skills and confidence.

*‘It is helping us because we can build confidence’ [P1-FGD3]  
‘With Susie it’s like a human being and you are motivated to practice and this is how it improves our competence’ [P-4; FGD2]*

On the other hand, few students were scared off by the high level of realism in HFS. This created feelings of fear and anxiety compromising students learning. Students either failed to recognise the responses by the high fidelity simulators because of fear or some were frightened by the response hence failed to act appropriately.

*‘Sometimes we are panicking because we think it’s a real patient...’ [P6-FGD2]*

*‘Sometimes I am scared of Susie...’ [P7-FGD1]*

Fear expressed by students can be expected in students who lacked exposure to complex technology.

### Unique learning opportunity

HFS was viewed as a strategy that offered students unique learning opportunities that were otherwise not possible. The excerpts from the students revealed that it was possible to learn experientially which is not possible in the clinical area. During simulation activities students had an experience which allowed them to make mistakes without any fear of harming patients. This motivated the students to practice and made their learning interesting and satisfying.

*‘That was a satisfying experience because I could make mistakes and see where I needed to improve’. [P5-FGD3]*

In addition majority of the students described how the high fidelity simulators could be manipulated to mimic many real clinical situations as a result allowed them to expand their set of skills. Skills such as critical thinking, problem solving and practical skills are generally difficult to learn in real clinical practice without risks but it’s possible to learn such skills with HFS.

*‘Susie can be manipulated to any condition we have to manage so it gives us more skills’. [P3-FGD 3]*

### Access to HFS

While students positively perceived and experienced HFS as an authentic and risk free learning strategy, issues related to accessibility and use of HFS created negative perceptions and experiences. Firstly, most students bemoaned the lack of practising opportunities using HFS. They believed the rules and regulations regarding the use of HFS were too restricting on students making learning using HFS uncomfortable and reducing their level of satisfaction with HFS as a learning strategy.

*‘With Susie we have little access on her’ [P4-FGD 1]*

*‘We were given the rules and I find them much more complicated than when we were using the old demonstration room with the other simulators’. [P6-FGD2]*

Secondly, not all students appreciated or perceived supervision by the educators as good. The students felt that the continuous presence of educators compromised their opportunity to learn experientially and self-directed learning. Presence of the educators although required and rated as good was not always accepted by students.

*‘Sometimes we think we should do it alone without the presence of supervisors although their presence is helpful’. [P4-FGD3]*

*‘It affects our learning negatively because we don’t have access to practice...’ [P5-FGD1].*

### Training

Besides the restricted access to HFS, lack of competence in working with HFS was expressed by many students. The students perceived themselves and their educators as lacking skills to manipulate the high fidelity simulators and using HFS as a teaching and learning strategy. Consequently this affected the students learning experiences negatively.

*‘I wish we can be taught how to manipulate Susie’ [P7-FGD1]*

*‘Our educators some of them do not know how to manipulate Susie because sometimes they have to wait for that one’. [P1-FGD3]*

HFS was being used for the first time at the college so it's not surprising that both students and educators struggled to use it in teaching and learning. This lack of training could be another explanation of why there was excessive restriction on the high fidelity simulators.

### Transfer of learning

While the students experienced authenticity of HFS, coming into contact with real patients changed most of the students' perceptions. The students realised that the high fidelity simulators still lacked the challenges presented by an actual human being and there was need to adjust when faced with real patients. Some students had difficulties in dealing with this change and subsequently altering their perceptions on HFS and its effect on improving competence. Most of the students even considered practice in the clinical area more important than HFS, threatening its need in nursing education.

*"I think it is more important to practice on real patients than on Susie because the challenges you can meet with a real patient differ from challenges you can from Susie". [P5-FGD3]*

*"Susie, I can see her veins are visible, but when I get to the real patient, sometimes I struggle". [P4-FGD1]*

Only a few students reported a different experience with regard to transfer of learning. These students reported finding it easy in real practice to apply skills learnt through HFS. Such a positive experience need further investigation because they offer hope for better use of HFS in learning and possibly better health care outcomes.

*"The procedures we have practiced on Susie, we found it better when practicing on real patients". [P4-FGD-3].*

In summary, this study revealed that nursing students perceived and experienced HFS a useful learning strategy that made learning of nursing skills realistic in a safer learning environment as well as learning certain unique skills that are not possible to learn in real practice. The perceptions and experiences of students also suggested that the effectiveness of HFS use as a learning strategy was affected by limited access and lack of competence in using HFS as a teaching and learning strategy among both students and educators.

### Discussion

The authenticity of HFS experienced by students created a conducive environment for learning practical skills without the restrictions found when working with real patients in practice. Students in this study generally perceived and experienced HFS authenticity in a positive way. Similar findings were shown in the studies by Arthur et al., and Au et al., where students experienced HFS as authentic and a study by Hyden et al., in which students described HFS as realistic [1,16,42]. Due to its realistic nature HFS as a learning strategy tends to promote meaningful learning culminating in better learning outcomes like increase in knowledge, improvement in skills among others. Such findings complement the evidence by Lucas which demonstrated that students gained better skills and confidence as a result of using HFS in learning [43]. On the other hand, some students were scared of high fidelity simulators creating negative perceptions and experiences. This is consistent with Admason and Welman and Spies who found that students experienced fear of high fidelity simulators [3,37]. Similar findings were also demonstrated in another study where students had technology phobia [6].

This study indicated that through HFS simulation students could experience learning in an environment where mistakes were considered as part of learning. This finding supports the studies of Johansson et al., and Au et al., who reported that HFS allowed deliberate practice and making mistakes without fear of harming patients [1,44]. Similarly Sears et al., found that HFS is a safe environment for students to practice [45]. However the making of mistakes made possible by using HFS could be a draw back because students can develop a bad attitude of making mistakes and carry it over to real practice [1].

An interesting finding of this study was students' perceived restricted access to HFS which students considered as limiting to their learning. Lack of trust and fear that students could damage the high fidelity simulators can explain why the educators closely guarded the simulators but in the process compromising learning. The issue of cost of HFS cannot be ruled out as the other driving force to provide extra care to HFS although this has not been discussed in any available literature. One student even highlighted;

*"May be Susie is too expensive." [P1-FGD2]*

Another issue raised in this study was how continuous presence of educators in HFS sessions affected the students' learning. Evidence related to these findings by other researchers showed that issues of being watched either directly or through cameras in HFS caused anxiety and feeling of being overwhelmed [39,46,47].

Findings of this study revealed that low level of skills in using HFS among students and educators negatively affected students' experiences of learning using HFS. These findings are congruent with evidenced which showed that the technology in HFS is challenging [6]. When used by educators without getting sufficient training as is in a number of cases students learning experiences were not good and their perceptions of HFS were negative [48,49]. The evidence from this study further supports the report by Al-Ghareeb and Cooper which indicated that training and support is required when working with HFS [6]. Students in this study had no training or prior experience of using HFS as a learning strategy, therefore the students had to learn how to use HFS while simultaneously trying to learn clinical skills.

The nursing students' perceptions and experiences on the transfer of learning into the clinical area confirmed the existing evidence which showed a mixed reaction. Some students could practice competently on high fidelity simulators but encountered difficulties in doing the same skills on real patients. This confirms the findings of Welman and Spies who found that students felt they could not be as proficient in using skills gained in simulation in real practice [3]. Transfer of learning remains a major issue in the use of HFS with no valid evidence to support that skills gained in simulation can be easily transferred to the real world and result in improvement in quality of health care [14,15]. In addition the failure to transfer skills can be explained by the lack of best practice guide and the lack of skills among educators in using HFS as experienced by students in this study. On the other hand, the other group of students were of the perception that learning through HFS helped them to have a better clinical experience and were able to transfer their skills into the real practice. This supports some evidence which suggested that HFS learning improves application of skills in practice and improves clinical competence [22,24,39].

Overall, the students' perceptions and experiences of using HFS as a learning strategy were mixed. HFS was viewed positively because of its ability to closely mimic real clinical situations, provided opportunities for deliberate practice and making mistakes as well as improving students' skills. On the contrary lack of understanding of HFS use, restrictions in its use and failure to transfer skills into real practice created negative perceptions and experiences of HFS as a learning strategy. By maximising the positives brought about by HFS and eliminating the negatives there is a good chance HFS will be an effective learning strategy in resource limited settings.

### Limitation

By the time the study was done in October 2014 only final year students were included in the study because they were the participants in a position to provide rich data. Future studies should look at all students from year to year three and compare their perceptions and experiences and how they change as they progress. The sample was purposively selected and the study was conducted in one nursing college of nursing and no claim can be made the results represent views and experiences of students in other colleges. A similar study can be carried out in more than one college and many countries in the sub-Saharan Africa. Given that the study was an evaluation at the lowest level of Kirkpatrick model, future research should evaluate the use of HFS as a learning strategy at high levels.

### Implications

This study provided evidence to show that HFS can be an effective learning strategy but its use requires certain conditions to be addressed. The introduction of HFS gave students opportunities to learn nursing skills in an environment that was authentic and safe, where mistakes were part of learning and not malpractice with harmful consequences on patients. Levels of confidence, knowledge, skills and understanding were reported to have improved because of using HFS. In addition other skills like Cardio-Pulmonary Resuscitation (CPR), which students were not able to learn before going to clinical practice, were now being learnt because of HFS. The findings showed that the benefits of using HFS as a learning strategy can be compromised if students and educators lack skills of using HFS as learning strategy. Too many restrictions on using HFS can cause anxiety and fear among students compromising their learning. Furthermore transfer of skills from the simulation to the clinical area is not always possible because the high fidelity simulators cannot completely mimic human beings and simulation environments cannot adequately resemble clinical practice.

Based on these findings it can be suggested that orientation and training should be provided to students and educators on how to use HFS before using it in teaching and learning. It should be accepted that current educators may have not experienced HFS as students and in their training to be educators, and some students in resource limited settings have limited access to technology. Therefore, the technology of HFS is new to both the educators and students, proper training will help to improve the use of HFS.

The cost of HFS is high and it is expected that proper care and use is taken to protect the simulators from improper use and possible damage. Strict rules and regulations while necessary, they should not

instil fear in students and compromise accessibility of HFS students. Doing so will be defeating some of the purposes of HFS as a learning strategy which is to promote self-directed learning and allow deliberate practice. It is proposed that models on simulation use can be adapted to ensure best practice guidelines on simulation are used and at the same time the high fidelity simulators are protected. In some settings there are dedicated technicians who operate and guide users of HFS, availability of such will allow students to access HFS at their own time and recreate clinical scenarios and help them learn better.

### Conclusion

This study described the nursing students' perceptions and experiences of using HFS as a learning strategy. The study findings show that most of the students perceived and experienced HFS as a good learning strategy that creates an authentic learning environment prompting deliberate practice and improvement in their competence. However some of the students had negative experiences and perceptions considering HFS as lacking true human authenticity, created fear among students and the skills gained using HFS not contributing to improvement in clinical competence.

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