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# USING IN-SITU SIMULATION IN UNDERGRADUATE NURSING CLINICAL EXAMINATION: LESSONS AND PERSPECTIVES OF EDUCATORS AND STUDENTS FROM SULTAN QABOOS UNIVERSITY, OMAN

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## Abstract
Undergraduate nursing education traditionally separates theoretical learning from clinical practice, often creating a gap between what students learn and how they apply it in real settings. To bridge this gap, simulation has emerged as a powerful tool for integrating theory and practice while enhancing students' problem-solving skills. In-situ simulation, conducted within hospital environments, was introduced in Fall 2022. The objectives of this study are (1) to explore students' and faculty's experience with using in-situ simulated examinations, (2) to identify challenges and lessons from using in-situ simulated clinical examinations, and (3) to identify strategies to improve in-situ simulated clinical hospital-based examinations. Qualitative data were collected from eight student focus group interviews and eight in-depth interviews involving faculty members. Participants were purposively selected, and informed consent was obtained before data collection. A reflexive thematic analysis approach was used to analyze participant data. In-situ simulation provided authentic, real-life learning opportunities that better reflected clinical realities. The experience was both challenging and rewarding, since hospital-based simulations exposed learners to real noise, distractions, and teamwork dynamics. Educators were also able to assess students' performance under realistic conditions. The study concludes that in-situ simulation should be prioritized in nursing education as it effectively bridges the theory-practice gap and prepares students for the complexities of real clinical environments.

**Keywords:** clinical competence, nursing, nursing education, simulation training, students, teaching methods

## Introduction
Simulation-based education has become a cornerstone in modern nursing curricula, bridging the gap between theoretical knowledge and clinical practice.

Among various simulation modalities, in-situ simulation (ISS)-defined as simulation conducted in the actual clinical environment with real teams and equipment- has gained traction due to its ecological validity and practical relevance (Pritchard & Sirbu, 2024). ISS enables learners to experience high-fidelity, context-rich scenarios that mimic real patient care, facilitating both technical skill acquisition and team-based competencies such as communication and critical decision-making (Gu et al., 2024).

In nursing education, the integration of ISS has been shown to enhance preparedness for clinical emergencies and improve performance in high-stakes evaluations (Tran & Bradley, 2025; Nguyen et al., 2024). Studies have emphasized the value of ISS not only in improving clinical knowledge but also in developing confidence and reducing anxiety among nursing students (Al-Abri et al., 2025). Furthermore, the role of educators in designing, delivering, and debriefing ISS sessions is crucial, influencing both pedagogical outcomes and the sustainability of simulation-based assessment (Notario et al., 2024).

Despite growing global evidence, the exploration of ISS in Middle Eastern academic contexts, particularly within the Gulf region, remains limited. Cultural, institutional, and infrastructural factors shape how ISS is implemented and perceived. In Oman, nursing education has progressively adopted innovative methods; however, what remains unknown are insights into faculty perspectives on ISS-based clinical examinations. This study explored nursing educators' experiences and perceptions of using in-situ simulation as an assessment strategy in undergraduate nursing programs. Understanding these perspectives is essential for developing sustainable, context-sensitive simulation frameworks that align with both global best practices and local educational imperatives. As a unique contribution, these findings demonstrate that In-situ simulation: a) is an effective method for summative assessment; b) requires effective coordination of standardized patients (SPs) in hospital settings for optimal outcomes; c) has implications for responsive institutional policy and faculty workload allocation.

## Method

### *Design*

This study employed an integrated qualitative research design, which offers flexibility by integrating elements of multiple qualitative traditions without being confined to one specific framework (Kahlke, 2014). This approach is especially useful in applied educational contexts, where the aim is to explore subjective experiences and generate practice-relevant insights (Ellis & Hart, 2023). The study focused on understanding clinical nurse educators' perspectives on the use of in-situ simulation (ISS) for undergraduate clinical examinations at Sultan Qaboos University in Oman.

### *Setting and Context*

The research was conducted at the College of Nursing, Sultan Qaboos University, in collaboration with the Sultan Qaboos University Hospital (SQUH) and Sultan Qaboos Comprehensive Cancer and Research Center (SQCCRC). The first in-situ simulated examinations took place at the College of Nursing during the Fall 2022 semester within the Nursing Administration Clinical Course. This innovative approach to student clinical evaluation involved utilizing standardized

patients in actual clinical settings, and this represented a significant pedagogical shift from traditional laboratory-based simulation models.

### *Participants and Sampling*

The study population consisted of nursing faculty involved in clinical teaching and assessment for the Nursing Administration Clinical Course during the study period. A purposive sampling strategy was used to recruit educators by an assigned clinical instructor. The recruited faculty were those who were directly involved in designing, facilitating, or evaluating the ISS-based assessments. Sampling was informed by the information power of participants, a concept that aligns with the concept of data saturation (Malterud et al., 2016; Faulkner & Trotter, 2017; Rahimi & Khatooni, 2024). A total of eight clinical instructors participated as key informants in the study. The eight interviews were considered sufficient as the data reflected homogeneity, focus, and data richness, and it allowed the team to effectively interpret faculty perspectives through dialogic discourse (Sullivan 2012).

### *Data Collection*

Data were collected using semi-structured, in-depth interviews, guided by an interview protocol grounded in the study objectives. The interviews were conducted face-to-face in a quiet, private setting to ensure comfort and confidentiality. In addition, each participant was anonymized using a code that protected their identity. The audio data was carefully stored under password protection, and the field notes were kept under lock by the Principal Investigator to ensure data privacy and allow for further scientific inquiry when the need arises. Each session lasted between 45 and 60 minutes and was conducted in English. Interviews were audio-recorded with participant consent and complemented by detailed field notes taken by the research team. The interview guide explored educators' experiences with ISS, perceived advantages and disadvantages, encountered challenges, and recommendations for improving future simulated assessments. The educators were asked to be objective in their comments.

### *Ethical Considerations*

Ethical approval was obtained from the College of Nursing Research and Ethics Committee at Sultan Qaboos University (CON/DF/2022/12). Participants provided written informed consent prior to data collection. Participation was voluntary, and confidentiality was maintained through the use of code and secure storage of digital files. Participants were also informed of their right to withdraw without any academic or professional consequences.

### *Data Analysis*

Data were analyzed using the reflexive thematic analysis method (Braun & Clarke, 2016; Braun et al., 2016), which entailed six phases: familiarization with data, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and producing the final report. The transcripts were read multiple times by members of the team to ensure immersion. Codes were first independently generated, then collaboratively compared and refined through team discussions. An iterative approach was taken, allowing themes to emerge from the data rather than

imposing them before immersion into the data. In addition, the team also engaged in dialogic coding and reflexivity, besides observing trustworthiness and credibility strategies recommended by Lincoln and Guba (1985), such as peer debriefing and maintaining audit trails. The final themes emerged out of a shared understanding that resulted from the collaborative coding of the team.

**Findings**

A total of eight clinical nurse educators participated in the study, all of whom had supervised and/or evaluated students during both traditional laboratory-based simulations and the newly implemented in-situ simulation (ISS) model using standardized patients in actual clinical settings. A detailed thematic analysis revealed four core themes and associated subthemes that reflect the educators' experiences, insights, and recommendations as highlighted below:

***Theme 1. Enhanced Realism and Clinical Relevance***

Participants overwhelmingly reported that ISS added a dimension of real-world authenticity to the examination process that was previously missing from lab-based simulations.

> *"The realism in ISS is unmatched. The hospital setting, the noise, the unpredictability, it brought out more authentic student behavior" (Participant 3)*

The clinical instructors observed that students demonstrated more situational awareness, professional demeanor, and adaptability when examined in the actual hospital environment. Most clinical teachers reported that examining students alongside the routine ward activities allowed for better assessment of critical thinking and clinical judgment of each student.

> *"In the lab, they are rehearsed. In the ward, they have to think on their feet, and you get to see their actual behaviour." (Participant 1).*

***Theme 2. Logistical and Operational Challenges***

Despite the perceived pedagogical value, educators described multiple logistical barriers associated with conducting ISS, the most outstanding being related to space and coordination.

*Space and Scheduling Conflicts*

The educators reported that some wards lacked private areas to conduct the examination, and sharing clinical spaces with hospital staff required detailed coordination.

> *"It was hard finding an uninterrupted space in the ward, especially during peak hours." (Participant 4).*

Such gaps identified the need for better integration with hospital workflows in the future.

*Standardized Patient Coordination*

The participants reported that while the use of SPs was beneficial, implementing this innovative approach to student evaluation required more training before the actual examination:

> *"Some SPs were unsure how much to say or when to react-it impacted the flow." (Participant 4)*

These limitations highlighted the importance of investing in simulation fidelity, including preparatory sessions for SPs.

***Theme 3. Educator Professional Growth Opportunities***

The ISS experience also prompted educator self-reflection and professional growth. Participants described developing a richer appreciation for assessment in complex clinical contexts.

> *"I learned more about my own biases in clinical evaluation... ISS challenged me too" (Participant 5)*

Educators also appreciated the collaborative debriefing processes, which allowed them to calibrate their evaluations and discuss observed student behaviors from multiple angles.

> *"During the debriefing, I realized how much I could learn from my colleagues' perspectives. It felt like we were all teaching and learning from each other" (Participant 8)*

***Theme 4. Sustainability of Simulated Experiences***

Participants offered clear strategies to enhance ISS as a sustainable examination approach.

*Subtheme 4.1: Institutional Support*

> *"We need administrative backing—dedicated spaces, time, trained SPs, and recognition of the workload." (Participant 3)*

The introduction of ISS was time-intensive and required administrative acknowledgment of faculty effort, suggesting a need for policy integration, including rethinking faculty reward.

*Subtheme 4.2: Structured Orientation for Students and SPs*

The clinical educators emphasized that student preparedness and SP training were both pivotal to the success of ISS.

> *"Some students were nervous. If we orient them better, they'll be more confident." (Participant 2)*

Some suggestions by the clinical educators included conducting simulation readiness workshops and interdisciplinary dry runs prior to high-stakes assessments in the future.

## Discussion

This qualitative descriptive study explored the perspectives of clinical nurse educators on the implementation of in-situ simulation (ISS) using standardized patients (SPs) for undergraduate nursing assessment in Oman. This study was an attempt to address the tension between "realism" in clinical practice and the need for "standardization to ensure assessment validity" in undergraduate education. The findings revealed that educators perceived ISS as a powerful pedagogical tool that enhanced realism, improved assessment of clinical competence, and promoted reflective teaching practice. However, they also acknowledged logistical and operational barriers that require institutional support for better integration.

### *Enhancing Realism and Clinical Relevance*

Educators highlighted ISS as superior to traditional lab-based simulated examination due to its authenticity and contextual fidelity. This finding aligns with reports by Martin, Cross, and Attoe (2020), who noted that ISS offers learners exposure to actual clinical environments, enabling better preparation for real-world scenarios. Similarly, Brandstorp et al. (2016) found that in-situ training fosters more effective learning transfer by embedding simulation within real clinical workflows. ISS in clinical practice is increasingly being used to improve students' professional competencies and to foster interdisciplinary practice because of its positive outcomes, such as improved patient morbidity and mortality, improvement in clinical skills, and better organizational performance (Goldshtein et al.,2019; Martin et al., 2020).

The perceived benefit of ISS in bridging the theory–practice gap has been a persistent theme in the literature. Hashemiparast et al. (2019) reported that disconnects between classroom learning and clinical application remain a challenge in nursing education. ISS directly addresses this issue by allowing students to apply knowledge in realistic, high-stakes environments, promoting decision-making and situational adaptability (Eyikara & Baykara, 2017; Chang et al., 2022). This innovative approach allows for skill enhancement. In further support, Karlsen et al. (2024) in a recent study reported that undergraduate nursing students found ISS as being very instrumental in supporting their learning process, and most importantly, it helped them to firmly connect theory and practice, which ultimately enhanced their overall confidence in performing clinical skills.

### *Logistical and Operational Constraints*

Despite its benefits, educators encountered practical challenges, including space limitations, staffing limitations, financial costs, scheduling conflicts, and the need for better-prepared SPs. These barriers are consistent with those reported by Kurup et al. (2017), who observed that ISS often competes with ongoing clinical activities, making implementation complex in active hospital settings. Similarly, Venkat and Deering (2025) reported that ISS is often affected by barriers such as unit acuity, staffing limitations, financial costs, and scheduling disruptions, which

might make implementation challenging for educators. The scholars recommend that educators seek leadership support and incentivize participation in ISS.

In terms of operations, Fan et al. (2016) emphasized the importance of pre-simulation coordination and rehearsal with SPs to mitigate performance inconsistencies that may affect learner assessment. These findings also support those of Cook et al. (2018), who argued that while ISS is cost-effective in the long run, initial investments in training, faculty development, and interdepartmental collaboration are essential for effective implementation.

***Educator Professional Growth Opportunities***

The findings reveal that ISS served as a platform for faculty learning and introspection far beyond serving as an assessment opportunity in the clinical area. This finding supports Stewart et al. (2017), who describe reflective immersion in authentic contexts as key to advancing pedagogical expertise. Educators in this study reported greater awareness of their own assessment practices and recognized opportunities to recalibrate expectations through collaborative debriefing. These outcomes underscore ISS as not only a student learning tool but also a faculty development strategy, echoing arguments by Lavelle et al. (2017).

In a recent publication, Karlsen et al. (2024) noted that ISS often serves as a bidirectional learning platform, where learners strengthen their clinical judgment and teamwork and related skills, while educators simultaneously refine skills related to debriefing, assessment techniques, and gain systems awareness through structured, psychologically safe, and standards-aligned reflective practice. The researchers conclude that this dual impact justifies positioning ISS not only as a pedagogical method but as a strategic pillar of faculty development (Hallmark et al., 2021; Brazil et al., 2023; Soni et al., 2024).

***Sustainability of Simulated Experiences***

Participants emphasized the importance of administrative support and structured orientation for both SPs and students to ensure the sustainability of simulated earning and assessment. These insights reinforce findings by Goldshtein et al. (2019), who concluded that sustainable ISS implementation requires dedicated resources, leadership backing, and staff recognition. Additionally, Kelsey and Claus (2016) advocate for institution-wide commitment to simulation integration, including formalized policies and logistics frameworks to ensure continuity and quality.

Indeed, recommendations from the current study - including dedicated simulation time in clinical rotations, SP training modules, peer coaching, and workshop-based simulation readiness workshops - reflect strategies advocated in the literature (Mulyadi et al., 2021; Al Gharibi et al., 2021; Soni et al., 2024). For instance, Roussin et al. (2024) emphasize readiness planning to integrate simulation into clinical rhythms rather than treating it as an extraneous activity; such planning ensures simulation is not marginalized but embedded in workflow. Seethamraju et al. (2021) observe that these corrective interventions can enhance educators' facilitation confidence and reflective practice, resulting in better simulation outcomes.

### *Implications for Practice and Education*

The findings of this study have implications for nursing education programs in Oman and beyond. ISS offers a contextually grounded model for evaluating student competence, particularly in high-stakes clinical areas such as nursing administration. Educational leaders should consider embedding ISS into course design and clinical evaluations, ensuring adequate preparation, support, and evaluation mechanisms for all stakeholders involved.

### *Limitations*

This study was limited by its single-site design and relatively small sample size, which may affect the generalizability of findings. However, consistent themes and rich narratives support the credibility of results. Another possible limitation is the social-desirability bias, which might have occurred as the instructors were involved in the ISS. This second limitation was addressed by neutrally framing questions. Future research involving students, multiple institutions, and comparative outcome measures would strengthen the evidence base on ISS efficacy in education.

## Conclusion

This study explored the experiences of nurse educators in implementing in-situ simulation (ISS) with standardized patients for clinical assessments of undergraduate nursing students in Oman. The results affirm that ISS offers a powerful learning and assessment modality by immersing students in real clinical settings, enhancing contextual learning, improving performance realism, and bridging the long-standing theory–practice gap in nursing education.

However, the integration of ISS also revealed logistical, organizational, and faculty development challenges. These underscore the need for a structured, well-supported implementation framework. Faculty development, simulation coordination, adequate SP training, and sustained administrative support emerged as essential factors in successful ISS delivery.

This study provides evidence that ISS not only benefits students but also stimulates reflective practice among educators, making it a dual-purpose innovation for assessment and faculty growth. If carefully planned and supported, ISS can revolutionize simulation-based learning in undergraduate nursing programs in Oman and similar contexts worldwide.

### *Key Takeaways/ Contribution:*

- In-situ simulation enhances assessment authenticity and improves student performance under real-life clinical pressures.
- Educators benefit professionally, using ISS as a tool for reflective practice and instructional refinement.
- Sustainability requires structured support, including administrative alignment, orientation modules, and clear simulation policies.
- Ongoing SP training and calibration are critical for ensuring standardization, fairness, and validity in assessments.
- ISS is best embedded longitudinally, within course curricula, not as a one-time intervention for both in-course skills training and summative student evaluation.

## Ethical Declaration

The study was approved by the Sultan Qaboos University, College of Nursing, Research and Ethics Committee (CON/DF/2022/12), and all participants provided consent to participate.

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## Conflict of Interest

The authors of the manuscript declare no conflict of interest.

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