Virtual Reality Simulation: Enhancing Content Knowledge and Clinical Judgement

Kimberly Martin, BSN, MSN-ED, RN, OCN – Faculty, Brandon Baker, MHCI - Sr. Program Manager-Innovative Technologies

AdventHealth University

Introduction

Nursing students learn and assimilate information more effectively in clinical settings. Physical clinical sites are at a premium and can be difficult to procure. Simulation can be used to supplement clinical setting challenges, though face-to-face simulations can be limited because of time and personnel constraints. Virtual reality (VR) simulations offer learners an impactful way of associating content knowledge with real-world clinical scenarios, enhancing clinical judgment and knowledge retention. Key barriers to simulation use are improved as minimal equipment and space is required.

Objectives

1. Upon completion, participant will be able to list barriers to clinical experiences.
2. Upon completion, participant will be able to describe how virtual reality simulations enhance learner clinical judgment.
3. Upon completion, participant will be able to identify ways virtual reality simulations preserve resources.

Project Design and Implementation

Design: The design for this project was a qualitative exploratory pilot study with additional quantitative system metrics.

Approach: Constructivist Learning Theory

Using Jean Piaget's theoretical framework of Cognitive Constructivism, the immersive environment of virtual reality allows learners to interact with realistic settings and manipulate virtual objects similar to the real world. Learners build knowledge based on their experiences and interactions. In VR, this emphasizes learning through doing, exploration, and problem-solving. This further enhances clinical judgment and decision-making, preparing learners for successful NCLEX completion and practice.

Setting: Faith based institution satellite campus in Denver, Colorado.

Target Population: Nursing students in two cohorts *(N=32)* enrolled in an undergraduate program who participated in virtual reality simulations between February 2022 and November 2024.

Method:

Using immersive virtual reality environments designed by Oxford Medical Simulations©, learners interacted with realistic settings and were able to manipulate virtual objects similar to the real world. The processes involved were (1) learners were exposed to the content in the scenarios during didactic, (2) learners were introduced VR equipment and interface, including a non-immersive tutorial. (3) Learners engaged in an immersive tutorial prior to the simulated scenario, then immersed in the chosen scenario. (4) A guided debrief and reflection embedded in the scenario was answered by learners to promote metacognition and feedback on learning process and perceived cognitive gains was collected. Additionally, a group debrief using INACSL Best Practice Standards for Debrief was conducted. Once the debrief was concluded, the scenarios were repeated to see if scores improved.

Methodology

Data Collection Methods:

Data collection methods included observations and narrative data for qualitative measures and system metrics to determine improvement of scores.

Data Analysis:

Qualitative data: Thematic analysis (Atlas.ti software)

Quantitative data: Analysis of undergraduate prelicesure nursing students score improvements after completing the scenario once and repeating scenario, determined by system metrics from Oxford Medical Simulations©.

Results

Thematic analysis identified the common themes from the two pilot groups as follows:

- Navigational and Time Management Challenges
- Physical and Comfort Related Concerns
- Realism and Immersive Learning Experience
- Learning and Critical Thinking
- Frustration with Tools and Analytics
- Desire for Additional Interaction and Flexibility

Overall, the qualitative data analysis identified a need for enhanced training in SBAR communication, and emphasized the importance of task focus and delegation in team-based settings. Efficiency and timing improvements were also highlighted to enhance future experiences. While feedback was generally positive, with a strong desire for more VR engagement to further refine skills and boost confidence, there were concerns about physical discomfort, visibility issues, and the need for better navigation and time management.

Additional highlights from students include:

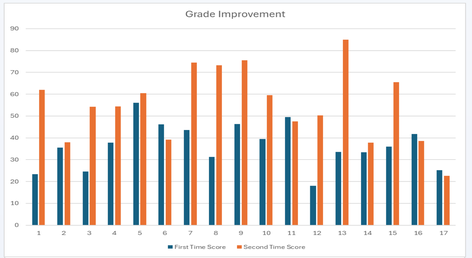
- **Repetition improves confidence and performance:** Several students noted feeling more confident and performing better on their second try, indicating that repetition and familiarity with the simulation can improve the learning experience.
- **Virtual simulation is a valuable learning tool:** Many students found the simulations to be a valuable learning experience, with some even preferring them to traditional computer-based V-SIMS. The immersive nature of the simulations was frequently praised.
- **Technical difficulties can hinder the experience:** Technical issues like freezing or difficulty navigating the simulation were pain points for some students, which caused frustration and impacted their ability to fully engage with the learning scenario.
- **Time management is a challenge:** A recurring theme in the feedback was the challenge of time management. Students often felt rushed, which led to missing important steps or feeling overwhelmed.

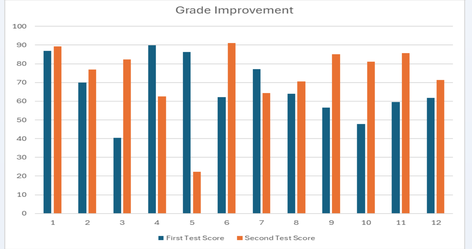
Results

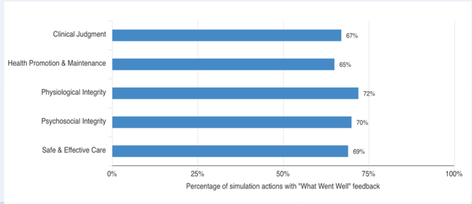
- **Anxiety decreases with familiarity:** Students reported feeling less nervous and more comfortable as they became more familiar with the simulation environment and the scenarios.
- **Simulation helps identify knowledge gaps:** The simulations effectively highlighted areas where students needed improvement, such as assessment skills, prioritization, and medication administration.

Quantitative Data:

Using system metrics from Oxford Medical Simulations© of learner scores after two attempts, it was noted that most students in both groups improved their scores. Additional metrics include data on aspects of the scenario correlation with NCLEX Categories.







Conclusions

With current staffing challenges in area hospitals and increased numbers of nursing programs needing clinical placements, procuring the required number of clinical hours on site can be difficult. Virtual simulation offers a compelling opportunity to supplement traditional clinical hours by providing a realistic, immersive learning environment that enhances critical thinking, decision-making, and multitasking skills. It allows students to engage in complex clinical scenarios without the risks associated with live patient care, fostering a safe space for practice and skill refinement.

The ability to replicate diverse situations, alongside the flexibility of self-paced learning, empowers students to hone their expertise while building confidence. While challenges like physical discomfort and navigation difficulties need addressing, the benefits of virtual simulation—such as improved task management, enhanced communication practice (e.g., SBAR), and increased learning opportunities—make it a valuable tool in preparing future healthcare professionals. As technology evolves, virtual simulation has the potential to significantly complement clinical education, offering students both a broader scope of experience and the ability to repeat scenarios for mastery, all within a controlled, accessible environment.

References

Brown, K. M., Swoboda, S. M., Gilbert, G. E., Horvath, C., & Sullivan, N. (2022). *Integrating virtual simulation into nursing education: A roadmap* . Clinical Simulation in Nursing, 72, 21–29. https://doi.org/10.1016/j.ecns.2021.08.002

Brown, K. M., Swoboda, S. M., Gilbert, G. E., Horvath, C., & Sullivan, N. (2023). *Curricular integration of virtual reality in nursing education.* Journal of Nursing Education, 62(6), 364–373. https://doi.org/10.3928/01484834-20230110-01

Godbold, R., Cairnduff, K. (2024). *Group virtual reality simulation in the adult nursing curriculum: student and lecturer experiences.* British Journal of Nursing, 33(19),922-929. https://doi.org/10.12968/bjon.2024.0069

INACSL Standards Committee (2016). *INACSL standards of best practice: Simulation debriefing*. Clinical Simulation in Nursing, 12(S), S21-S25. http://dx.doi.org/10.1016/j.ecns.2016.09.008

Thampinathan, S. (2022). *The application of the constructivism learning theory to physician assistant students in primary care.* Education for Health, 35(1), 26-30. https://doi.org/10.4103/efh.EfH_333_20

ACKNOWLEDGEMENTS

We would like to express our sincere gratitude to Oxford Medical Simulation© and AdventHealth University for providing the invaluable opportunity to participate in this pilot simulation. Their collaboration and support have been instrumental in creating an innovative and immersive learning experience that has contributed greatly to the growth and development of nursing education. The opportunity to engage in this cutting-edge virtual simulation has not only expanded the scope of our clinical training but also empowered us to explore new avenues for improving patient care and decision-making skills. We look forward to continued partnerships that further enhance the future of medical training and simulation-based learning.