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# Interactive Virtual Patient Simulation Enhances Pharmacology Education and Clinical Practice

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**Abstract :** Technology-enhanced education tools are being rapidly integrated into health programs globally. These tools provide an interactive platform for students and can be used to deliver topics in various modes including games and simulations. Simulations are of particular interest to healthcare education, where they are employed to enhance clinical knowledge and help to bridge the gap between theory and practice. Simulations will often assess competencies for practical tasks, yet limited research examines the effects of simulation on student perceptions of their learning. The aim of this study was to determine the effects of an interactive virtual patient simulation for pharmacology education and clinical practice on student knowledge, skills and confidence. Ethics approval for the study was obtained from Griffith University Research Ethics Committee (PHM/11/14/HREC). The simulation was intended to replicate the pharmacy environment and patient interaction. The content was designed to enhance knowledge of proton-pump inhibitor pharmacology, role in therapeutics and safe supply to patients. The tool was deployed into a third-year clinical pharmacology and therapeutics course. A number of core practice areas were examined including the competency domains of questioning, counselling, referral and product provision. Baseline measures of student self-reported knowledge, skills and confidence were taken prior to the simulation using a specifically designed questionnaire. A more extensive questionnaire was deployed following the virtual patient simulation, which also included measures of student engagement with the activity. A quiz assessing student factual and conceptual knowledge of proton-pump inhibitor pharmacology and related counselling information was also included in both questionnaires. Sixty-one students (response rate >95%) from two cohorts (2014 and 2015) participated in the study. Chi-square analyses were performed and data analysed using Fishers exact test. Results demonstrate that student knowledge, skills and confidence within the competency domains of questioning, counselling, referral and product provision, show improvement following the implementation of the virtual patient simulation. Statistically significant ($p<0.05$) improvement occurred in ten of the possible twelve self-reported measurement areas. Greatest magnitude of improvement occurred in the area of counselling (student confidence $p<0.0001$). Student confidence in all domains (questioning, counselling, referral and product provision) showed a marked increase. Student performance in the quiz also improved, demonstrating a 10% improvement overall for pharmacology knowledge and clinical practice following the simulation. Overall, 85% of students reported the simulation to be engaging and 93% of students felt the virtual patient simulation enhanced learning. The data suggests that the interactive virtual patient simulation developed for clinical pharmacology and therapeutics education enhanced students knowledge, skill and confidence, with respect to the competency domains of questioning, counselling, referral and product provision. These self-reported measures appear to translate to learning outcomes, as demonstrated by the improved student performance in the quiz assessment item. Future research of education using virtual simulation should seek to incorporate modern quantitative measures of student learning and engagement, such as eye tracking.

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