

## Applying Simulation-Based Digital Teaching Plans and Designs in Operating Medical Equipment

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**Abstract :** Background: The Emergency Care Research Institute released a list for the top 10 medical technology hazards in 2017, with the following hazard topping the list: 'infusion errors can be deadly if simple safety steps are overlooked.' In addition, hospitals use various assessment items to evaluate the safety of their medical equipment, confirming the importance of medical equipment safety. In recent years, the topic of patient safety has garnered increasing attention. Accordingly, various agencies have established patient safety-related committees to coordinate, collect, and analyze information regarding abnormal events associated with medical practice. Activities to promote and improve employee training have been introduced to diminish the recurrence of medical malpractice. Objective: To allow nursing personnel to acquire the skills needed to operate common medical equipment and update and review such skills whenever necessary to elevate medical care quality and reduce patient injuries caused by medical equipment operation errors. Method: In this study, a quasi-experimental design was adopted and nurses from a regional teaching hospital were selected as the study sample. Online videos instructing the operation method of common medical equipment were made and quick response codes were designed for the nursing personnel to quickly access the videos when necessary. Senior nursing supervisors and equipment experts were invited to formulate a 'Scale-based Questionnaire for Assessing Nursing Personnel's Operational Knowledge of Common Medical Equipment' to evaluate the nursing personnel's literacy regarding the operation of the medical equipment. From March to October 2017, an employee training on medical equipment operation and a practice course (simulation course) were implemented, after which the effectiveness of the training and practice course were assessed. Results: Prior to and after the training and practice course, the 66 participating nurses scored 58 and 87 on 'operational knowledge of common medical equipment,' respectively (showing a significant statistical difference;  $t = -9.407, p < .001$ ); 53.5 and 86.3 on 'operational knowledge of 12-lead electrocardiography' ( $z = -2.087, p < .01$ ), respectively; 40 and 79.5 on 'operational knowledge of cardiac defibrillators' ( $z = -3.849, p < .001$ ), respectively; 90 and 98 on 'operational knowledge of Abbott pumps' ( $z = -1.841, p = 0.066$ ), respectively; and 8.7 and 13.7 on 'perceived competence' (showing a significant statistical difference;  $t = -2.77, p < .05$ ). In the participating hospital, medical equipment operation errors were observed in both 2016 and 2017. However, since the implementation of the intervention, medical equipment operation errors have not yet been observed up to October 2017, which can be regarded as the secondary outcome of this study. Conclusion: In this study, innovative teaching strategies were adopted to effectively enhance the professional literacy and skills of nursing personnel in operating medical equipment. The training and practice course also elevated the nursing personnel's related literacy and perceived competence of operating medical equipment. The nursing personnel was thus able to accurately operate the medical equipment and avoid operational errors that might jeopardize patient safety.

**Keywords :** medical equipment, digital teaching plan, simulation-based teaching plan, operational knowledge, patient safety

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