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The effects of neurologic assessment E-learning in nurses

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ABSTRACT

Background: A firm understanding of the preliminary assessment of a patient with neurological disorders is needed for ensuring optimal patient outcomes.
Objectives: The purpose of this study is to evaluate the effects of using e-learning on neurologic assessment knowledge, ability, and self-confidence among nurses.
Design: This study used a non-equivalent control group pretest-posttest design.
Settings: Nurses working in the neurology and neurosurgery wards, Republic of Korea
Participants: A convenience sample of 50 nurses was assigned to either the experimental group (n = 24) or the control group (n = 26).
Methods: The experimental group participated in the self-directed e-learning program related to neurologic assessment, and control group underwent self-directed learning with handout. Knowledge, ability, and self-confidence were measured at pretest and posttest.
Results: There were no significant differences in knowledge (U = 270, p = 0.399) and self-confidence (U = 241.5, p = 0.171) between the two groups. Nurses in the experimental group showed higher neurologic assessment ability compared with those in the control group (U = 199, p = 0.028).
Conclusions: Self-directed neurologic assessment e-learning induced improvement in the neurologic assessment ability among nurses. Self-directed e-learning can be applied for improving competencies in neurologic assessment.

1. Introduction

The neurological assessment provides a comprehensive database of critical information about the patient's neurological function (Hickey, 2014). Many clinical practice guidelines emphasize the importance of ongoing neurologic assessment to detect neurological deterioration and initiate prompt action (Le Roux et al., 2014; Livesay, 2016). Currently, multiple neurological assessment tools are available for nurses including the Glasgow Coma Scale, the National Institutes of Health Stroke Scale, the Canadian Neurological Scale, and the Full Outline of Unresponsiveness Score (Iacono et al., 2014). Nurses play a pivotal role in the monitoring of the patient's neurologic status. Nursing assessment of severity and changes in neurological function is essential for ensuring optimal outcomes. Therefore, nurses should be competent in neurological assessment skills (Gocan and Fisher, 2008; Livesay, 2016). However, one study found that critical care and neurosurgical nurses' abilities were suboptimal in pupil assessment. This lack of competence is problematic because it prevents early detection of changes and delay clinical intervention. Nurses' early identification of neurological changes can lead to a more timely and effective intervention (Kerr et al., 2016).

The neurological assessment of persons with neurological impairment can be complex and challenging regarding form and interpretation. These challenges are more significant when the clinician is less specifically trained in neurological assessment (Zasler, 2015). One systematic review found that knowledge and experience are the most significant factors on nurses' performance of consciousness level assessment (Chan et al., 2013). Korean nurses tend to be not confident with the neurologic assessment because little education or training is provided in nursing schools or hospitals. Nurse educators should implement training with adopting the mastery learning model to prepare nurses with a firm understanding of neurologic assessment skills for ensuring optimal patient outcomes.

Lifelong learning among nurses is essential for developing a comprehensive core of clinical performance competencies (Hinkle et al., 2012). Educational methodologies including face-to-face learning, e-learning, and simulation have been used in lifelong learning. Of these methods, e-learning is education that is available through numerous

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technologies, with enhanced opportunity for connectivity and flexibility in design, while overcoming constraints of time and space (McGowan, 2015). Potential advantages of e-learning over other instructional methods include interactivity, practice exercises, repetition, and feedback (Cook et al., 2010). The flexibility, accessibility, and convenience of e-learning provide nurses with increased opportunities to enhance their knowledge (Chong et al., 2016). E-learning can provide nurses with increased opportunities to enhance their knowledge. However, there have been no studies conducted in the Republic of Korea. The purpose of this study is to evaluate the effects of self-directed neurologic assessment e-learning on neurologic assessment knowledge, ability, and self-confidence among nurses.

2. Background

Although previous studies assessed the effects between groups in e-learning and traditional learning, the results were not consistent. A systematic review and meta-analysis reported that there was no statistical difference between groups in e-learning and traditional learning relating to nurses' or student nurses' knowledge, skills and satisfaction (Lahti et al., 2014). The results of another review indicated that online learning for teaching clinical skills is as effective as face-to-face learning in undergraduate nursing education (McCutcheon et al., 2015). A review of 14 studies revealed that the most effective intervention was a blended learning program including e-learning to improve medication administration skills and safety of registered nurses (Härkänen et al., 2016).

In terms of knowledge, nursing students' knowledge scores of hand washing increased significantly from baseline, and no significant differences were detected between the scores of the computer-assisted learning group and the conventional face-to-face method group (Bloomfield et al., 2010). Computer-aided teaching of exposure therapy for phobia/panic among nursing students led to similar improvements in knowledge in comparison with tutor-delivered teaching (Gega et al., 2007). The mean change in the score of knowledge in the web-based learning group did not significantly differ from that in the face-to-face lecture group (Horiuchi et al., 2009). Results of a study in 60 nurses also showed there was an equal acquisition of knowledge between the e-learning and traditional classroom training groups, confirming the efficacy of both methods (Padalino and Peres, 2007). Conversely, an e-learning program appears to have a greater effect on the accuracy of pressure ulcer classification than classroom teaching in the short term (Bredesen et al., 2016). Computer-assisted multimedia instruction in intravenous injection had a significant effect on the intravenous injection's knowledge compared with the control group that received a lecture on hospital orientation (Tsai et al., 2004). A case management e-learning continuing education program for psychiatric nurses induced a positive effect on knowledge scores in comparison with no intervention after the program and at the 3-month follow-up (Liu et al., 2014). In a before-and-after study design, an e-learning course on delirium significantly improved nursing staff's knowledge of delirium (Van De Steeg et al., 2015).

Regarding self-confidence, a study indicated that nurses' confidence in mathematics and their beginning level skills showed no statistically significant change following the introduction of the computer based medication calculation education and testing program (Sherriff et al., 2012). Conversely, nursing students' self-efficacy had improved after receiving blended e-learning education related to cardiopulmonary resuscitation and defibrillation (Park et al., 2016).

Regarding the effect of e-learning on skills, a previous study reported a significant difference in only one of the pre-surgical care skills between screen-based computer simulation and skill laboratories (Durmaz et al., 2012). Skill performance scores were similar in computer-assisted learning and conventional teaching at the 2-week follow-up with significant differences emerging at the 8-week follow-up in favor of the computer-assisted learning group (Bloomfield et al., 2010). Conversely, among the qualified nurses, there was no difference in pressure ulcer classification skills between the e-learning program and the lecture group (Beeckman et al., 2008). For proficiency in Braden scoring, no significant effect of educational methods on learning results was detected (Bredesen et al., 2016). Assessment correctness scores of the interactive computer assisted instruction group were higher than those of the videotaped instruction group, although the differences did not reach statistical significance (Chiu et al., 2009).

Literature reviews yield little information about the teaching effectiveness in neurologic assessment among nurses. A systematic educational program that included online and video lectures regarding National Institutes of Health Stroke Scale (NIHSS) improved the quality of nursing records for neurological assessment and the detection rate of neurological deterioration (Han et al., 2013). One study reported that the nurses in both the interactive computer assisted instruction group and the instructor-led videotape learning program showed significantly improved scores on the assessment of correctness after intervention. However, there was an insignificant difference between the changes in the two groups (Chiu et al., 2009). In another study, Stroke and TIA Assessment Training (STAT) used video and audio clips from real patients in conjunction with a patient simulator to create interactive scenarios for emergency department staff. Results showed that learner self-confidence for stroke assessment increased significantly (Garside et al., 2012). Moreover, the specialty of neurology presents an interesting challenge to the field of simulation-based medical education because of the inability of even the most advanced mannequins to mimic a focal neurologic deficit (Ermak et al., 2013).

Despite the increasing use of e-learning within nurse education, evidence to support its use for health assessment teaching is limited and inconclusive. It remains to be determined which type of teaching program could be used to achieve standardization, uniformity and stability in the field of teaching design. Nurses' barriers to learning were time constraints, financial constraints, workplace culture, and access and relevance (Santos, 2012). E-learning can help overcome these barriers to nurses' learning with the flexibility, accessibility, and convenience (Chong et al., 2016). Use of e-learning in neurological assessment can meet the learning needs of nurses and help develop a comprehensive core of clinical performance competencies.

3. Methods

3.1. Design

This study used a non-equivalent control group pretest-posttest quasi-experimental design because it is impractical to do random allocation of small number of nurses in a hospital (Fig. 1).

3.2. Participants

A total of 26 participants would be required in each group for an effect size of 0.5 with 80% power at a significance level of 0.05 on a *t*-test using G*Power 3.20 (Faul et al., 2007). A total of 58 nurses were invited to participate in this study and they were assigned to the experimental group or the control group. For the experimental group, 28 nurses working in the neurology and neurosurgery wards were recruited from a hospital in Seoul, Korea. For the control group, 30 nurses working in the neurology and rehabilitation wards of two hospitals were recruited. Twenty-four nurses (attrition rate: 85.7%) in the experimental group and 26 nurses (attrition rate: 86.7%) in the control group completed the pretest and posttest measures.

3.3. Measures

Baseline data including age, gender, academic degree, and work duration was obtained in a questionnaire.

Nurses' knowledge level was measured using an 8-item multiple