Delirium knowledge and recognition: A randomized controlled trial of a web-based educational intervention for acute care nurses

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SUMMARY

Delirium is a significant problem for older hospitalized people and is associated with poor outcomes. It is poorly recognized and evidence suggests that a major reason is lack of education. Nurses, who are educated about delirium, can play a significant role in improving delirium recognition. This study evaluated the impact of a delirium specific educational website. A cluster randomized controlled trial, with a pretest/post-test time series design, was conducted to measure delirium knowledge (DK) and delirium recognition (DR) over three time-points. Statistically significant differences were found between the intervention and non-intervention group. The intervention groups' DK scores were higher and the change over time results were statistically significant [T3 and T1 ($t = 3.78$ p $= <0.001$) and T2 and T1 baseline ($t = 5.83$ p $= <0.001$)]. Statistically significant improvements were also seen for DR when comparing T2 and T1 results ($t = 2.56$ p $= 0.011$) between both groups but not for changes in DR scores between T3 and T1 ($t = 1.80$ p $= 0.074$). Participants rated the website highly on the visual, functional and content elements. This study supports the concept that web-based delirium learning is an effective and satisfying method of information delivery for registered nurses. Future research is required to investigate clinical outcomes as a result of this web-based education.

Introduction

Delirium is a serious, potentially reversible disorder that affects up to 37% of general hospital admissions, with an incident rate as high as 67% reported in surgical populations (Eeles et al., 2010; Lundstrom et al., 2007). It is associated with poor outcomes such as a decreases in functional capacity, increased risk of future dementia or increased rates of cognitive decline in people with pre-existing dementia, relocation to residential care and even death (Adamis et al., 2006; Witlox et al., 2010). Delirium is distressing to patients and families and contributes to additional health care costs (Inouye, 2006; Leslie et al., 2008). For instance, a recent study estimated that health care costs attributable to delirium in the United States were between $38 billion and $152 billion, rivalling the costs of falls and diabetes mellitus (Leslie et al., 2008). Despite the evidence that delirium is associated with poor outcomes, less than half of the cases of delirium in older hospitalized people are recognized by clinicians (Rice et al., 2011; Spronk et al., 2009).

Nurses are seen as playing a key role in the early recognition of delirium because they spend substantial time at the bedside and have frequent opportunities to determine the subtle changes in a patient's behavior that assist in early recognition (Dahlke and Phinney, 2008; Fick et al., 2007). Early recognition enables prompt diagnosis and

management, including rapid implementation of targeted interventions (McCusker et al., 2011). A reduction in duration and severity of delirium is crucial as it helps to improve patient outcomes. However, nurses' lack of knowledge and ability to recognize delirium has been previously demonstrated in a study of nurses working in a US hospital. It was noted that nurses had difficulty recognizing delirium, with only 21% able to accurately identify hypoactive delirium superimposed on a pre-existing dementia (Fick et al., 2007). A more recent study identified that nurses at all levels of experience and education had knowledge deficits in relation to medication use in delirium and predisposing and precipitating delirium risk factors (Meako et al., 2011). Similarly an Australia study investigating nurses' knowledge of delirium demonstrated that they had inadequate knowledge (Hare et al., 2008). Moreover, nurses are aware of their knowledge deficits in this area and report that they lack the knowledge to effectively care for someone with delirium (Dahlke and Phinney, 2008).

Studies have identified that clinical staff education on the detection and treatment of delirium can improve patient outcomes (Inouye et al., 2001; Milisen et al., 2005; Naughton et al., 2005). There is evidence that delirium education interventions, including formal educational packages, development and implementation of practice guidelines, structured courses and extensive multifaceted programs including geriatric specialist input have been noted to effectively increase knowledge associated with delirium (Bergmann et al., 2005; Lundstrom et al., 2005; Tabet et al., 2005; Webster et al., 1999). However, these types of programs may be difficult to implement in a variety of health

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care settings due to such things as: access to programs; lack of geriatric specialists; lack of time for educational endeavors; and the lack of local resources to develop educational programs (Brown et al., 2009; Meyer et al., 2007).

Web-based learning provides an alternative approach that helps to overcome the challenges to more traditional educational approaches (Bollinger et al., 2011; Paavilainen and Salminen-Tuomaala, 2010). It provides opportunities for nurses to access current information and practice initiatives at a time and place to suit their needs (McCord and McCord, 2010). Moreover, students in academic programs using web-based learning performed better than those learning through traditional face-to-face instruction (Means et al., 2010). For example, hand hygiene knowledge was found to be significantly higher following web-based learning (Alemagno et al., 2010). Similarly, web-based learning was found to enhance emergency nurses' triage accuracy and reduce medication errors (Rankin et al., 2013; Straight, 2008). In addition to learning new information, nurses report high levels of satisfaction with web-based learning in terms of meeting their knowledge and practice requirements (Cottrell and Donaldson, 2013; Smith, 2010).

This study builds on previous web-based nursing education by using an innovative educational website that was specifically developed to enable access to delirium information. Unique features of this website included realistic video-vignettes, self-assessment questions, downloadable flow charts, and links to external sites to extend learning opportunities. Additionally, it was not developed in a modular form as many online courses are structured. The web-site was developed using cognitive constructivist principles to allow an individualized approach to web-site navigation. The primary aim of this study was to determine the effectiveness of this educational website, as a means of improving delirium knowledge and recognition of delirium in the clinical setting. A secondary aim was to assess the level of nurse satisfaction with this resource. Specifically we hypothesized that acute care registered nurses who used the educational website would have better delirium knowledge and delirium recognition skills than nurses who did not use the website. Additionally, we expected that nurse users of the website would be satisfied with the functional and design aspects of the site.

Methods

Design

A pretest/post-test time series cluster randomized controlled trial was used to investigate the effect of the delirium website on nurses' knowledge of, and ability to recognize, delirium. Cluster randomization, at a clinical level within each hospital, was performed by the researcher and another independent professional, using "GraphPad Software, Quick calcs" (Software Inc., 2005).

Sample

Registered Nurses (RNs) employed full or part time in four high-risk delirium areas (either critical care, orthopedic, medical or surgical wards) at three similar size hospitals (250–300 beds) in S. E. Queensland, Australia were potentially eligible. The sample frame consisted of twelve clusters of RNs across the three hospitals. Casual float employees and RNs scoring less than three on an Online Readiness: Self-Assessment Questionnaire (Watkins et al., 2004) were excluded.

Ethical approval was granted by the respective hospital and the affiliated university Human Research Ethics Committees. Written informed consent was obtained from each participant.

Procedures

Participants were recruited at each site using information sessions with the researcher. Prior to randomization, all participants completed baseline (Time One; T1) questionnaires and delirium knowledge and recognition testing. Six to eight weeks later, immediately after closure of the website educational intervention, Time Two (T2) post-intervention data were collected. At T2 the intervention group participants also provided website evaluation information. At Time Three (T3), all participants completed a final set of delirium knowledge and delirium recognition tests to assess the longer term effects of the intervention. Participants completed the questionnaire and tests either with research staff or at a time convenient to them and under indirect supervision by another person (usually Nurse Unit Manager or Clinical Nurse Teacher).

Following completion of T1 data collection, cluster randomization at a clinical area level was undertaken within each health care facility. That is, within each of the three facilities, RN participants in two clinical areas were randomized to a non-intervention group and RN participants from the other two clinical areas randomized to an intervention group. A total of 72 RNs were randomized to the non-intervention group and 75 RNs randomized to the intervention group. Intervention group participants were given five weeks access to the delirium educational website while non-intervention group participants did not receive access. Both groups continued to work as usual in their clinical areas.

Intervention

The intervention consisted of a purposely developed educational website called *learnaboutdelirum*. The website included delirium facts (e.g., definition, types, prevalence), delirium management strategies and information about how to recognize delirium using the internationally accepted Confusion Assessment Method (CAM) (Inouye et al., 1990). The website also included videotaped vignettes of people (actors) with various clinical presentations (e.g., hyperactive delirium, hypoactive delirium, delirium superimposed on dementia, and dementia), with attached narrative captions, questions and answers, and links to other educational websites. Current literature and best practice guidelines for delirium assessment and management, including the Australian delirium clinical practice guidelines (Australian Health Ministers' Advisory Council (AHMAC), 2006) underpinned all website information. The website was developed using constructivist learning principles to enhance user engagement. These principles included, providing processes for participants to build on prior knowledge and experience and support self-guided use of the website. A discussion forum was incorporated to enable social learning opportunities. After a five week period access to the educational website was closed and all participants (non-intervention and intervention groups) were asked to complete the Time Two (T2) questionnaires and six to eight weeks later the Time Three (T3) questionnaires.

To reduce attrition we used ongoing communication via electronic mail and researcher contact with the participants and the Nurse Unit Managers of each clinical area. Data collected from participants who were lost to follow-up or who withdrew from the study, was included in the final analyses.

Measures

A modified version of the *Online Learner Readiness: Self-Assessment* questionnaire was used as an inclusion criterion for this study to ensure that RN participants had at least basic computer literacy skills (Watkins et al., 2004). The original questionnaire comprised 27 items, rated by respondents on a 5-point Likert scale and had good internal validity (Cronbach's Alpha for each element = 0.74–0.95). Following approval from the original author, six items were removed from the measure as they were specific to online courses rather than an online learning website. This left a total of 21 items.

The Nurses' Knowledge of Delirium questionnaire (range 0–34) was developed by a group of Australian academics (Hare et al., 2008) and used to measure delirium knowledge in a group of nurses working