

Information

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Considerations for the design of online gaming interventions for the frail elderly: A short communication

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Abstract

Recovery from cardiovascular surgical procedures can be problematic for the frail elderly due to developmental considerations and the way that post-operative education is delivered in hospitals. In this short communication paper, we outline the physical and developmental considerations of this cohort as well as the standard delivery of post-operative education. As an alternative, we introduce online gaming and explore considerations for the design of this intervention related to post-operative, frail elderly cardiovascular surgical patients. Specific strategies and/or techniques for addressing each of these influences are presented.

Background

Individuals over the age of 80 are typically classified as frail elderly (O'Neill et al., 2016). This cohort commonly present with three or more of the following symptoms: significant loss of muscle tissue, self-reported exhaustion, reduced gait speed, and decreased energy expenditure (Fried et al., 2001). Since the risk of developing cardiovascular disease triples with each decade of life an individual enters, the frail elderly are at an increased risk for the development of: heart failure, arrhythmias, myocardial infarction, and coronary artery disease (Finegold, Asaria & Francis, 2013). Globally, the number of frail elderly who have received cardiovascular surgical (CVS) procedures has increased significantly over the past 10 years; this shift is primarily due to an increase in the number individuals who are living longer (Nicolini et al., 2016).

The most common types of CVS procedures that the frail elderly usually receive include: coronary artery bypass graft surgery, valve replacement, and coronary artery bypass grafts in combination with valve replacements (Finegold, Asaria and Francis 2013). These procedures are typically classified as highly invasive, as they require the chest to be opened and the heart to be exposed for a number of minutes and sometimes hours. As a result, post-operative care involves sternal wound dressings, pain management, adjustments to nutrition, and activity modification (Finegold, Asaria and Francis 2013).

Within the immediate post-operative CVS environment, patient education that focuses on post-operative self-care is routinely provided for all patients. This education usually involves the delivery of information to patients by health care professionals. The education can vary depending on the dosage, medium, format, and level of standardization that is used (Fredericks, Guruge, Sidani and Wan, 2010). Typically, within an inpatient cardiac setting, educational interventions are made available in the form of brochures, videos, and/or oral delivery of information from the health care professional. The education within these environments is most often applicable to patients' experiences during their hospitalization and immediate post-discharge time. Even though the primary intent of patient education strategies is to support the

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individual as they engage in performance of health behaviors, the utility of these interventions have been called into question. Elements that negatively correlate with patients' post-operative health outcomes include decreased time for health care professional engagement in patient education activities, the lack of experience in engaging in patient education initiatives, decreased applicability of the educational content throughout the entire post-operative recovery period, which can last up to one year, and reduced rates of health literacy (Freda 2004).

Online Gaming as an Alternative

An alternative to typical patient education intervention is the use of online gaming. Online gaming in the field of healthcare is derived from video games. Gaming involves playful interactions with a computer, which are streamlined so that the interaction is designed to simulate patients' experiences with a particular health condition. Features that include a fantasy or simulated environment, and which promote mastery can serve to enhance learning (Musselwhite, Marston & Freeman, 2016). Gaming can also aid in improving an individual's health, promote social interactions, provide support, offer opportunities to practice self-care behaviors, and encourage self-paced learning processes, which can result in enhanced health literacy skills (Goh, Ang & Tan, 2008). Online gaming as an intervention can be used both within and outside of the clinical setting. As well, a variety of templates can be created to reflect the various stages of health, illness, and recovery allowing for retention and increased interaction with the gaming intervention.

Despite its overall positive effects on health (Goh, et al., 2008), the integration of online gaming may present a challenge with regards to its applicability to frail elderly cardiovascular surgical patients and feasibility in terms of its likelihood for assimilation into the clinical and home environment. Patient recovery and general health status may influence the degree of use of this intervention, as well as the quality of design of the gaming program, which may serve to significantly impede the overall effect of these interventions when applied to the frail elderly population. An individual's computer literacy skills may also serve to negatively hinder the effect of these types of interventions.

Considerations for designing online gaming interventions for the frail elderly CVS patient

Typical online gaming interventions consist of: a computer, a mouse with a low friction tracking pad to enhance the movement of the mouse console, wrist cushion to support the wrist and prevent lesion pain, microphone for communication with other players, and headset with volume control (Goh, Ang & Tan, 2008). The onset and/or aggravation of age-related arthritis, or other musculoskeletal conditions is common in the frail elderly, and may interfere with the functioning and movement of hands, making it difficult to grasp items such as a mouse (Fried et al. 2001). In designing online gaming interventions for use with the frail elderly, interactive mechanisms that allow for both arm and/or foot controlled navigation systems are needed. Foot based navigation is also appropriate for those individuals who had a radial graft (artery taken from lower arm) during coronary artery bypass surgery and thus, have decreased arm mobility, as well as those individuals who have an upper body injury resulting in decreased range of motion in the upper torso.

Since a reduction in fine motor skills is commonly noted in the frail elderly (Gerling, Schild & Masuch, 2010), it is not uncommon for these individuals to be easily confused, resulting in the pressing of incorrect buttons and/or navigating through the game erroneously. This may result in inadvertent windows popping up that may add to further confusion regarding game interaction and navigation. Thus, buttons on a gaming console should be kept to a minimum, and larger buttons should be designed and displayed in a distinct format across the screen to reduce the number of mistakes. As well, the number of pop-up windows should be blocked to enhance comfort as well as usability of the gaming intervention.

A reduction in fine motor skills may also result in the frail elderly CVS patient encountering difficulty proceeding through a detailed menu structure if complex input sequences are used. Thus, avoiding the use of these sequences and opting for more straightforward, linear instructions may be needed. Additionally, response times are slower due to neurological changes that occur as a result of aging. As such, the possibility of a time delay will be helpful to allow enough time for the frail elderly to react to the instructions and be able to master the challenges.

In addition to reduction in fine motor skills, frail elderly are at a high risk for the development of mild cognitive impairment that can result in short term memory loss and

may negatively influence their behaviours (Fredericks, 2012). This is most applicable to frail elderly who have undergone a CVS procedure. Generally, older individuals (over the age of 65 years) tend to be at an increased risk for neurologic and neurocognitive problems following cardiovascular surgical procedures (Fredericks, 2012). This is thought to be a result of a number of factors including: hypo-perfusion during cardiac surgery, re-warming of the brain following surgical procedure, air emboli, and/or intracerebral hemorrhage (Fredericks 2012). As a result, the risk for cognitive decline following heart surgery significantly increases. Thus, gaming interventions need to be easy to understand, must enable participants to pause, rewind, stop, and restart to accommodate for any short term memory loss that individuals may experience at a particular point in time (Janacek, Fiser & Nemeth, 2012).

The provision of options so that these individuals can individually adjust the level of difficulty and the speed of the game may allow for increased sensitivity and input of information. Thus, individualizing various aspects of game interventions based on the needs of the individual, may allow the frail elderly to challenge themselves by changing speeds. Additionally, gaming interventions designed for the frail elderly should incorporate mechanisms that can account for reduced vision such as large print, use of bold colours, minimal words, text speech technology, and a built-in magnifier. Lastly, as frail elderly individuals may not be familiar with gaming based interventions, strategies to encourage their use need to be implemented that include: advertising these interventions through outpatient clinics, within the post-operative care settings, at family doctors' offices, and in community centers. Initiating these gaming interventions in hospital may also help familiarize the frail elderly with this alternative.

Final Thoughts

The human-computer interface required for the frail elderly is complicated, but not futile. We need to be careful about assuming that the frail elderly will have minimal computer skills that may inversely affect the acceptance and usability of game-based interventions. More and more, the aging population is using computers, and in the near future, it will be uncommon to know of an elderly person who does not use a computer. What is most important moving forth is that the design of online gaming interventions is tailored to the population of interest: in this case, the frail elderly.

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