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Developing the Simulation on Management, Awareness, and Rehabilitation of Traumatic Brain Injury Care Learning Program

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Purpose:

This article describes the design and pilot of a simulation-based educational program, known as the Simulation on Management, Awareness, & Rehabilitation of TBI (SMART) Care Learning Program, developed for TBI patients and caregivers receiving rehabilitative care at the San Francisco Veterans Affairs Health Care System (SF VA HCS). The SMART Care Learning Program aims to bridge the learning gap related to TBI care, specifically emergency management during the rehabilitative process. The program primarily intends to increase knowledge acquisition among TBI patients and caregivers in the assessment, monitoring, and management of TBI-related conditions leading to emergent critical thinking. Secondary gains include (a) improving care access by increasing patient adherence to provider care visits, and (b) improving cost avoidance by decreasing secondary injury of TBI and (c) reduced perception on the burden of disease. Correspondingly, the SMART Care Learning Program aligns with the Strategic Plans of the Veterans Affairs by providing a personalized, proactive, patient-driven care for veterans with TBI through the use of innovation

Methods:

The pilot was conducted at the SFVA HCS TBI & Polytrauma Unit. A convenience sample of currently enrolled veterans derived from the facility TBI registry on the month of October 2017 was used for this project. The descriptive and statistical data analysis were used to measure participants' performance following the SMART Care Learning Program. The University's and the Healthcare Facility's Institutional Review Board reviewed and determined the project to be in compliance. The VA Simulation Learning Education & Research Network (SimLEARN) provided guidance for the design of simulation software compatible with the VA Network software and hardware architecture requirements.

Twelve participants (mix gender, ages 35 to 60 years old) participated in the program. Out of the 12, two veterans were excluded due to failure to complete the process in one setting ($n=10$, 5 veterans and 5 caregivers). All veterans have attained Bachelor's degree, while 80% of the caregivers have a Bachelor's degree and higher. Scenarios for the SMART Care Program Prototype system were developed using the Clinical Practice Guidelines for mTBI and Standards of Best Practice in Simulation; with Jeffries Theory as a conceptual framework.

Program content development was guided by subject matter experts with extensive clinical experience, research review, and solicited consumer feedback. The simulation learning program storyboard was composed of three scenarios presenting the most common TBI-related conditions – chronic headache, seizure, suicidal ideation. . The program includes three high-fidelity virtual simulations TBI-related medical scenarios overlaid with front-end challenging mode elements. A total of one hour was allotted for the simulation for each session – 30minutes presenting the prescribed scenario and 30 minutes for debriefing. The SMART Care Learning Program is formative in design, with tracking technology data, and feedback capability to guide participants' improvements. It's the performance output measure is summative in design, with ability to track data that measures the level of success or proficiency obtained presented at the end of a virtual simulation scenario.

Participants were asked to answer a 2-part questionnaire with Part 1 touching on demographics. In Part2, participants rated questions using a Likert Scale of 0-10. The questions pertained to the current (1) level of knowledge on identification and management of TBI-related emergent conditions, (2) level of

knowledge on identification and management of TBI-related emergent conditions, (3) perception on technology use, and (4) overall learning program performance, with zero (0) as none at all and ten (10) as highly knowledgeable/ confident. Part 2 was also used to reevaluate patient perception of knowledge after completion of SMART Care Learning Program. A debriefing tool composed of four semi-structured questionnaires were used (Whitehouse, 2017): (1) What did you learn?; (2) How did you feel?; (3) What did you do?; and (4) What were your strong and weak points? The debriefing questions reflect the concept themes of noticing, interpreting, responding, and reflecting (Whitehouse, 2017).

Results:

Mean performance scores improved for both veterans and caregivers on the level of knowledge, level of confidence, use of technology, and overall learning program by using the SMART Care Learning Program. Paired t-test was used for statistical analysis on pre-and-post-intervention analysis. Post-mean performance scores on the level of confidence are more than doubled from pre-intervention performance; with caregivers pre-and-post response statistically significant ($t(9) = -16.518$, $p < 0.05$) as compared with the veterans. Though the data presented a positive mean difference in all performance output and created a picture of improvement in knowledge and technology use, the difference is not significant. Personal attributes such as age, gender, and education reveal no significant differences in the level of knowledge and confidence in the pre and post-intervention. Participants described their experience on using the tool as a positive experience regarding the overall acceptability of the SMART Learning Care tool, ease of use, and perceptions of the importance of communicating and managing emergent TBI-related conditions.

The data gathered presents positive performance outcomes on all three aspects – knowledge, confidence, and technology use. The improvement among the participants are in accordance to the related literatures that shows association between simulation training and improved knowledge and skills (Chamberlain, 2017; Crimlisk et al., 2017; Kennedy, 2014; Quail, Brundage, Spitalnick, Allen, & Beilby, 2016), increased learner satisfaction, and patient outcomes (Cook, Brydges, Zendejas, Hamstra, & Hatala, 2013). The data also show significant changes in the caregivers' level of confidence post-intervention. Simulation presents an opportunity for caregivers, as learners, to actively engage in the learning environment (Cook et al., 2013; Radovich et al., 2011). Hence, family caregivers gain familiarity with the patient medical condition improving the ability and confidence in communication (Pritchard, Blackstock, Nestel, & Keating, 2016; Quail et al., 2016) and collaboratively report observations to providers (Crimlisk et al., 2017).

The influence of family and caregiver involvement to patient-centeredness on the transition of care has been the focus of varied programs both for military and civilian industry promoting patient's involvement to recovery, supports individuality, and cultivates family-provider collaboration (DVBIC, 2015; NASEM, 2016; Perlick et al., 2013). Relatively, one of the overarching goals of the program is to provide a veteran-centric care. Henceforth, during the simulation process, participants personal experience, values, belief, and attitudes are taken into account and is redirected to a formation of new knowledge. Participants identified common themes during the debriefing phase; namely, acceptability on technology as a learning tool, ease of use, and improved perception on the importance of timely communication with primary providers related to observed behavior or physical manifestations.

A key point identified that strengthen acceptability and use of the tool is the prebriefing. Participants express appreciation on the presence of prebriefing as it sets the tone and direction of the condition from everyday setting transitioning to an emergent state. Prebriefing as an integral part of the simulation pilot program that creates a supportive environment for stimulating learning engagement and sets expectations to learners (Chamberlain, 2017; Page-Cutara, 2014). Besides, the SMART Care Learning Program as an alternative learning approach establishes a non-threatening environmental opportunity enriched with realistic TBI-related condition scenarios for the participant to assimilate (Kapucu, 2017; Quail et al., 2016; Radovich et al., 2011). It also encourages participants to engaged through participation, observation, and debriefing (Baird et al., 2016; Rothgeb, 2008). Specifically, simulation as designed to respond to "error in judgment," allows participants to witness consequences of decisions

(Rothgeb, 2008). Subsequently, simulation and debriefing process encourages participants to interact with other members and environment, providing grounds to reflect on their personal beliefs and institutional values (Pritchard et al., 2016; Quail et al., 2016). The debriefing process presents the opportunity for participants attain transformative learning (Al Sabie & Lasater, 2016). Therefore, shifting participants' role from "transmitter of information to organizer and facilitator of meaningful experiences" (Manolis, Burns, Assudani, & Chinta, 2013, p. 45).

A modifying factor identified during the pilot program is time. Two participants with TBI express inability to continue the program after two scenarios and request intermittent completion of the program. Although both participants completed the program, the data were excluded from the total evaluation to minimize the occurrence of bias. Literature presents similar analysis highlighting sufficiency of time as a factor that could influence full effects (if present) of the simulation intervention (Pritchard et al., 2016).

There are some limitations to the pilot program: The number of participants is inadequate to present a correlation between the specific demographical attributes and its impact on performance output. Nonetheless, the results objectify the importance of development and implementation of the SMART Care Learning Program. Secondly, the storyboard is limited to headache, seizure, and suicide ideation. It is recommended that other conditions affected like sleep, balance, senses, and appetite be explored and incorporated in future program updates. Thirdly, the simulation learning program adapted a high-fidelity format, and the pilot did not include the use of another format of simulation training such as the use of mannequins or role-play. Lastly, as data gathered was based from self-assessment, the inherent limitation presents probable inclusion of personal prejudice and subjective assessment among participants.

Conclusion: SMART Care Learning Program provides a novel tool for teaching TBI patients and caregivers in handling TBI-related emergent conditions.

Title:

Developing the Simulation on Management, Awareness, and Rehabilitation of Traumatic Brain Injury Care Learning Program

Keywords:

US veterans and caregivers, simulation and traumatic brain injury

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Abstract Summary:

This article describes the design and pilot of the Simulation on Management Awareness & Rehabilitation of Traumatic brain injury (SMART) Care Learning Program, developed for TBI patients and caregivers. SMART Care Learning Program provides a novel tool for teaching TBI patients and caregivers in handling TBI-related and emergent conditions.

Content Outline:

Background:

- Nearly 348,000 US servicemembers sustained a Traumatic Brain Injury (TBI) between 2000-2016
- Veterans Affairs (VA) spends an estimate of \$234 for TBI care
- Gap in care practice received by TBI patients noted across VA health settings
- No simulation-based tools are designed for TBI patients and family-caregivers

Goal & Objectives:

- Goal: Design a TBI learning curriculum that can provide veterans and caregivers a personalized, proactive, patient-driven health care through innovation and care practice improvement applicable in varied VA health settings
- Objectives:
 - Appropriately recognize and manage TBI-related emergent conditions
 - Use communication skills in collaborating and timely reporting of TBI-related conditions

Methods:

- TBI story board design:
 - Institutional approval and creation of project proposal
 - Formulate scenarios and present to TBI subject matter experts (clinicians, patients, caregivers)
 - Finalize storyboard and present to simulation technical experts
 - Pilot program
- SMART Care Learning Program Pilot Process:
 - Prebriefing – clinical setting information and expectations
 - Simulation – chronic headache, seizure, suicidal ideation
 - Debriefing – (4 questions) reflect concept themes of noticing, interpreting, responding, and reflecting

Results:

- Mean performance scores on pre-and-post simulation improved for both veterans and caregivers on knowledge, confidence, technology use and overall learning program.
- Post-intervention mean performance scores on the level of confidence is more than doubled from pre-intervention performance, with caregivers change statistically significant ($t(9) = -16.518$, $p <0.05$) as compared with the veterans

- Debriefing theme: (a) simulation approach as a learning tool, (b) ease of use, (c) and improved perceptions on timely communication and collaboration with primary provider

Lessons Learned:

- SMART Care Learning Program is a novel learning tool on TBI emergent conditions
- Time as a modifying factor impacts the implementation of the simulation program
- Pre-briefing strengthens the acceptability and use of the simulation tool
- Need for further research to address demographic attributes on performance output measures
- Its integrated collaborative approach promotes adherence to clinical practice guidelines, real-time monitoring, and comprehensive reporting of TBI-related conditions observed in diverse healthcare settings.

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