The Open Journal of Occupational Therapy

Volume 3
Issue 4 *Fall 2015*

Article 8

October 2015

High-Fidelity Simulation: A Tool for Occupational Therapy Education

Chi-Kwan Shea
Samuel Merritt University - USA, cshea@samuelmerritt.edu

Recommended Citation
Shea, C. (2015). High-Fidelity Simulation: A Tool for Occupational Therapy Education. *The Open Journal of Occupational Therapy, 3*(4). https://doi.org/10.15453/2168-6408.1155

High-Fidelity Simulation: A Tool for Occupational Therapy Education

Abstract

High-fidelity simulation (HFS) is an educational tool commonly used by professional education programs of medicine and nursing for student training and assessment. Although its use in occupational therapy (OT) education is emerging, implementation of simulation in OT education varies broadly across programs, and, in general, the tool remains underused. This paper describes how the OT education program at Samuel Merritt University (SMU) has systematically expanded the use of HFS in various formats throughout the curriculum. The specific processes and procedures of using HFS in facilitating student critical thinking and clinical skills are explained to emphasize the potential educational value of HFS. Although student responses to simulation have been positive, methodical studies are needed to validate the use of this teaching and learning tool in OT education. The paper also suggests additional ideas for implementing aspects of HFS based on various levels of resources available to an OT education program.

Keywords

High-Fidelity Simulation, OT education

Credentials Display

Chi-Kwan Shea, PhD, OTR/L

DOI: 10.15453/2168-6408.1155

There is a growing interest in the use of high-fidelity simulation (HFS) in occupational therapy (OT) education (Bradley, Whittington, & Mottram, 2013; Castillo, 2011; Herge et al., 2013; Lindstrom-Hazel & West-Frasier, 2004; Van Oss, Perez, & Hartmann, 2013; Velde, Lane, & Clay, 2009; Wu & Shea, 2009). Simulation is commonly known as "a replication of potential real-life experiences in an environment similar to one in which these events actually might occur" (Hunt, Nelson, & Shilkofski, 2006, p. 399). The level of fidelity refers to the degree to which the simulation mimics reality in terms of equipment, environment, and psychological responses. Therefore, a HFS would consist of realistic equipment and environmental setup with the optional use of standardized patients (SPs) so that the participants would perceive the situation to be realistic and respond as they would in the real situation (Issenberg & Scalese, 2008; Wu & Shea, 2009). The equipment may be actual medical devices, such as vital sign monitors. The environment may include a real patient room set up with SPs. SPs are professional actors who have undergone training to portray clients, family members, or other team members in simulations with students of the health care professions (Lindstrom-Hazel & West-Frasier, 2004). HFS in education has both formative and summative purposes, meaning that it is used to train and assess students on specific knowledge and skills (Merryman, 2010; Mikasa, Cicero, & Adamson, 2013; Mompoint-Williams, Brooks, Lee, Watts, & Moss, 2014).

HFS in health care education began in medical education (Maran & Glavin, 2003) and became prevalent in nursing training (Cant & Cooper, 2009; Yuan, Williams, Fang, & Ye, 2012). The theoretic foundation of HFS was based on aspects of Knowles' adult learning theory (Zigmont, Kappus, & Sudikoff, 2011a). Knowles (1985) asserted that adults learn differently from children, who often receive education from teachers in a dependent manner. Because adults are self-directing in many aspects of their lives, their learning must focus on developing competency rather than absorbing content (Knowles, 1985). HFS emphasizes experiential, collaborative, and reflective learning, incorporating the key components of an adult learning theory that stresses the development of individual competence (Conklin, 2013; Knowles, 1985; Murray & Kyle, 2008). In HFS, the adult learners are self-directed and self-regulated, and their previous knowledge and experiences play an important role in guiding their behaviors and reasoning in response to the simulated clinical scenarios (Zigmont, Kappus, & Sudikoff, 2011b). The effectiveness of HFS as a learning tool has been documented in the medical and nursing education literature (Cant & Cooper, 2009; McGaghie, Issenberg, Cohen, Barsuk, & Wayne, 2011; Yuan et al., 2012). In OT education, the use of HFS is still emerging, and there have been few studies of its effectiveness. The existing

OT literature has reported students' interest in and preference for HFS to develop clinical skills, but has yet to provide evidence of learning outcomes (Herge et al., 2013; Lindstrom-Hazel & West-Frasier, 2004; Velde et al., 2009; Wu & Shea, 2009).

HFS has been used differently in various educational programs. OT students are commonly asked to role-play client-therapist scenarios, an exercise that is considered to below-fidelity simulation (Vegni, Mauri, D'Apice, & Moja, 2010). Since its documentation by Lindstrom-Hazel and West-Frasier (2004), the use of SPs to portray clients and/or family members in clinical scenarios has become increasingly popular in OT education programs (Bradley et al., 2013; Castillo, 2011; Herge et al., 2013; Van Oss et al., 2013; Velde et al., 2009). Recent OT literature has documented some extended uses of HFS, which include but are not limited to a combination of a simulated physical environment (such as a hospital room equipped with functional medical equipment), the use of programmable human-like mannequins or SPs, observation, and an in-depth debriefing (Bradley et al., 2013; Castillo, 2011; Van Oss et al., 2013).

Although HFS is emerging as an important tool in OT education, it is still only used to a limited extent. Its potential value has not been sufficiently explored in the OT literature (Bradley et al., 2013; Castillo, 2011; Van Oss et al., 2013; Wu & Shea, 2009). Adult learning theory predicts that OT students would benefit from learning opportunities that are self-directed, collaborative, context based, and experiential (Chen, 2014). The current OT clinical internship (CI) provides such learning opportunities based on the adult learning theory. In contrast to the CI, which involves actual clients with disabilities in a real clinical setting, HFS provides similar experiences without the risk of causing potential harm to clients. In addition, HFS is often used to develop students' specific clinical skills based on preestablished learning objectives. Therefore, HFS could potentially be a powerful learning tool in preparing OT students for clinical interships and practices.

To maximize the benefits of HFS in OT education while also systematizing the simulation curriculum so that outcome studies can be conducted, the OT department at Samuel Merritt University (SMU) has been developing and expanding simulation-based learning, using it as an important component of an OT curriculum that seeks to foster critical thinking and clinical reasoning skills. The key components of the simulation-based learning implemented by the OT department at SMU are: (a) high-fidelity learning environment, (b) learning objectives, (c) case scenario, (d) participant engagement, and (e) debriefing (Zigmont et al., 2011b). This article addresses each component of HFS. The purpose is to describe in detail how one OT academic program uses HFS as an education tool in order to stimulate further interest in and discussion about HFS in the OT community.

DOI: 10.15453/2168-6408.1155

Key Components of HFS

High-Fidelity Learning Environment

Fidelity in simulation is a measure of the learners' experience of reality as they participate in the simulation. Three major factors influence that experience of reality: equipment, environment, and psychology (Issenberg & Scalese, 2008). HFS uses functional medical equipment and simulators that resemble actual clinical settings. The physical environment where the simulated learning occurs is also realistically arranged. The Health Science Simulation Center (HSSC) at SMU allows for the creation of a highly realistic experience, as it can be set up to resemble an inpatient room or intensive care unit that is nearly indistinguishable from the same site at an actual hospital. In addition to the use of SPs, who portray specific patients or clients in a scenario, the entire simulated setting of HFS accurately "replicates motion cues, visual cues, and other sensory information" (Issenberg & Scalese, 2008, p. 33) of a task environment in which a clinician cares for patients. In such an environment, where the student learner perceives the setting to be realistic, that learner experiences a genuine psychological impact.

Learning Objectives

Because simulation is a tool to facilitate learning, it is of the utmost importance to determine the specific learning that is to occur. Developing learning objectives is the first step in designing a simulation project. The objectives should align with the learners' academic and professional preparedness (Alinier, 2011). Examples of the learning objectives adopted in the SMU curriculum include recognizing a critical situation; handling a difficult client, patient, and/or family member; anticipating and planning for a specific clinical issue; displaying professionalism and an awareness of safety; and demonstrating foundational OT techniques.

Case Scenario

Once learning objectives have been identified, the next step is to draft a case scenario. The scenario should be based on the learning objectives, and many factors should be considered in crafting it, such as the clinical environment; the client's physical condition, mental status, and pertinent medical history; critical stages of the scenario that can lead the participants to specific learning objectives; and the extent of and limitations on time, space, and equipment (Alinier, 2011). HFS demands a high level of realism to elicit authentic responses from the participants. Once the clinical environment has been determined (for example, an acute care hospital room), the personnel and equipment associated with the scenario can be considered. The personnel may include computerized mannequins and/or SPs. The room can be set up with functional furniture and medical devices. The clinical environment may be remotely controlled, for example, varying a client's vital signs on a monitor, which may require a specific computer setup and operator instruction. There may be supporting documents, such as medical records, for learners to review. Finally, the SPs may be given scripts that include presenting behavior and/or specific verbal communication.

Participant Engagement

HFS is largely a student-led learning experience in that the participants are actively involved in determining the direction and course of action in response to the clinical scenario (Alinier, 2011). Prior to the actual simulation, the OT instructor and the HSSC personnel orient the student participants to the simulation process and the simulated environment. The instructors brief the students on the clinical scenarios, but the extent of briefing may vary according to the learning objectives. The students are categorized as active learners or as observers. The active learners interact with the client in the simulated environment, while the observers watch live footage of the simulation on a screen in an adjacent conference room. The active learners have the advantage of experiencing psychological fidelity, which may include anxiety. Such psychological fidelity is necessary to elicit the learner's authentic responses to the clinical situation (Alinier, 2011). The student observers may play a supportive role in the simulated scenario, prompting the active learner through a two-way radio. More important, because they have seen the scenario unfold, the observers are able to provide critical feedback during debriefing. The HSSC is equipped with audiovisual recording devices throughout the premises to record partial or entire simulation processes of student learner, SP, and instructor interactions; student observer interactions; and postsimulation discussions. The video records are available to be viewed by the students and instructors immediately postsimulation or at a later time for debriefing and/or student self assessment and reflection.

Debriefing

The literature suggests that postsimulation debriefing is the most important element of the learning process (Zigmont et al., 2011a). Although debriefing usually occurs immediately following a simulation, certain simulated learning situations may call for real-time feedback from either the instructor or the student observers. The SMU OT simulation debriefing process consists of a number of activities performed by active learners, observers, instructors, and SPs, which include real-time feedback, postsimulation feedback, and group reflection.

Real-time feedback. As an example of a simulation that uses real-time feedback, consider an individual simulation project with the dual purpose of assessing and reinforcing student competency in working with older adults in an acute hospital setting. As the student learner performs a transfer activity with an SP in a simulated patient room, the observing instructor may interrupt if the learner makes errors. The instructor may ask the student to provide his or her rationale for taking a certain action, or instruct the student as to the proper method of performance. In this situation, the learner receives immediate feedback as he or she performs the clinical task, developing and reinforcing the student's critical thinking and clinical reasoning skills. In addition, the student observers may use a two-way radio to suggest ways to handle challenging clinical situations that arise. This real-time feedback process allows for peer support and collaboration.

Post-simulation feedback. Immediately following every simulation involving an SP, the SP provides feedback to the student learners and observers. The SP describes his or her experience with the student learner(s) during the clinical scenario. From the SP, the students become aware of how their actions and communication may affect their clients and influence the outcome of a clinical intervention.

The student observers are often required to complete a formal peer review of the student learners, and the student learners are often required to complete a self-assessment. These written assignments are designed according to the learning objectives of the simulation and must be submitted to the instructor for feedback and evaluation. These written assignments are not intended to be shared with other students; rather, their purpose is to develop the students' critical appraisal skills. Each student must also submit a written reflection that describes his or her personal experience with the simulation and offers suggestions for improving the learning process.

Group reflection. A thorough postsimulation group reflection is the most important step in the simulation learning process. The instructor usually facilitates the debriefing and the students lead it. Group reflection follows a three-step debriefing process, which Zigmont, Kappus, and Sudikoff call "3D" for defusing, discovering, and deepening (2011a). In order to ensure that every student has the opportunity to benefit from the simulation experience, significant time should be allocated after every simulation for debriefing.

Defusing. The debriefing process begins with a venting session where the students can freely express their emotional reactions to the simulation experience. The facilitating instructor provides and emphasizes a safe environment for openness so that the students can candidly verbalize their thoughts. HFS is meant to have an authentic psychological impact on learners, so the venting process, which encourages the students to release the stress and anxiety felt before, during, and after the simulation, helps to prepare them for more in-depth learning (Zigmont et al., 2011b). The instructor also guides the students to review the events of the simulation, asking them to describe what took place. This activity allows the instructor to discover knowledge gaps among the students and take note of critical issues for further discussion during the next phase, discovering (Zigmont et al., 2011a).

Discovering. The instructor encourages the students to identify specific behaviors in the simulated scenario that facilitated and/or impeded the clinical intervention. The active learners describe what they were thinking when they exhibited those behaviors. As the students explain their rationales, further discussion and debate occurs in response. Review of video records of the simulation can guide the discussion and reflection. Ultimately,, this discussion process facilitates the students' awareness of their thought processes associated with the simulated clinical scenario and identification of optimal behavioral responses (Zigmont et al., 2011a, 2011b).

Deepening. As the students gain insight into their mental models and optimal behavioral responses, the instructor prompts them to connect new learning to larger clinical environments by revisiting previous clinical cases and projecting to future clinical experiences, such as clinical internships. The students may also have the opportunity to test their newly acquired knowledge in a subsequent simulation, where a different clinical scenario demands similar clinical behaviors and mental models at the same time that it poses additional challenges. This scaffolding approach, in which the instructor facilitates the reflective and analytic process at each stage of learning in order to advance the students to the next level of inquiry, intends to solidify and perpetuate the students' learned knowledge and skills (Zigmont et al., 2011a).

Occupational Therapy HFS-Based Curriculum

At SMU, three core courses currently use simulation as a significant tool to facilitate student learning: Integrative Seminar One, Applied Kinesiology, and Integrative Seminar Two. The HSSC, which first opened in 2007, is a state-of-the-art facility featuring programmable human-like mannequins, simulation suites, a remote control room, and viewing conference rooms. The OT department uses all of these simulation tools, as well as SPs, in its simulation learning projects. Table 1 summarizes the three major OT courses that feature HFS at SMU.

Integrative Seminar One

This second semester course aims to develop foundational communication and clinical reasoning skills, integrating knowledge and skills that the students acquire in their first semester and concurrent second semester OT courses. In the simulation activity, a pair of students conduct an initial acute care inpatient interview to obtain a complete occupational profile of the client. The students are assigned to a small group cohort, and pairs from each cohort interview an SP for approximately 20 min. The SP has been trained to respond according to one of three clinical scenarios. The rest of the small group observes the interview and provides real-time feedback to the pair conducting the interview. Following the simulation, all of the students complete a self-assessment form and write a one-page reflection paper on the simulation experience. The students also participate in nine hr of group debriefing that the instructor facilitates. Further coursework related to the simulation includes: (a) composition of the client's occupational profile, (b) development of a

Table 1
HFS-Based OT Curriculum at SMU

OT Course	Semester	Learning Objectives	Simulation Activities	Setting	Debriefing
Integrative Seminar One	Second	1. Apply critical and clinical reasoning, relevant theories, and best available evidence to a life clinical scenario. 2. Identify an occupational profile of a client through a clinical interview process. 3. Establish therapeutic rapport with a client.	Interview of a patient (SP) in the presence of student observers	Simulated acute care inpatient room	Real-time student observer feedback, postsimulation SP feedback, in-depth group reflection, student self-assessment
Applied Kinesiology	Second	Demonstrate competence in administering OT physical assessments on a client.	Administration of assessments (manual muscle testing, range of motion measure) on a client (SP)	OT clinical laboratory	Real-time instructor feedback, postsimulation SP feedback
Integrative Seminar Two	Fourth	1. Recognize explicit and subtle environmental issues impacting the OT process.	**Pediatric Case** Interview of a caregiver (SP)	Classroom	Postsimulation SP feedback, group reflection
		2. Demonstrate competence in developing an appropriate OT plan.	**Adolescent Case** Psychosocial intervention with a youth client (SP)	OT clinical laboratory	Postsimulation SP feedback, group reflection
			Older Adult Case Bed to wheelchair transfer with an older patient (SP)	Simulated acute care inpatient room	Real time instructor feedback, postsimulation SP feedback, instructor assessment, student self-assessment
			Intensive Care Case Initial assessment of a clinical case (SP) in the presence of student observers	Simulated intensive care unit	Real-time student observer feedback, postsimulation group reflection, student peer review

preliminary OT therapeutic plan for the client, and (c) identification and investigation of interdisciplinary team members' roles in serving the client in the simulated clinical scenario.

Integrative Seminar Two

This fourth semester course is similar in purpose to that of the first integrative seminar but aims to further hone the students' clinical reasoning and skills. The simulations conducted in this course use all of the features of the HSSC as well as SPs. This course has four modules. The first module is a pediatric case, in which pairs of students interview SPs playing the roles of a parent and a teacher to obtain salient information about the pediatric client. The second module is a case about adolescents, in which pairs of students provide actual interventions to SPs in the role of adolescents. In the third module, an older adult client receives multiple medical interventions at an acute care hospital. Each of the students assesses the client's functional mobility while an instructor provides real-time feedback. The fourth module, an intensive care case set in an intensive care unit with multiple medical devices, requires a student learner to perform an initial evaluation of a client and interface with the nursing staff and family members. This module involves both SPs and programmable mannequins.

In modules one, two, and four, the student observers watch the simulation and then submit peer reviews; the students participating in the simulation complete self-assessments. Module three requires individual self-assessments from each student. In module four, the student observers provide real-time feedback. Further postsimulation activities for all four modules include SP feedback, in-depth group debriefing, group development of a therapeutic plan for the client in each scenario, and a final individual student reflection paper.

Applied Kinesiology

This course, which the students take in their second semester (concurrent with Integrative Seminar One), uses simulation with an SP to assess the students' competence in administering range of motion and manual muscle tests. The students receive real-time feedback from the instructor and postsimulation feedback from the instructor and the SP.

Student Feedback

Since SMU began its first simulation project in 2008, feedback from the students has been uniformly positive. The students surveyed before and after their participation in simulations in 2012 and 2013 reported that the simulation project significantly improved their knowledge, skills, and confidence in working with patients in an adult acute care setting as they prepared for their level two fieldwork placements. Among the three simulation projects involving SPs, the students found the individual simulated transfer activities of Integrative Seminar Two (the fourth semester course) to be the most realistic, informative, and educational, and it had a greater emotional impact and promoted better retention of the knowledge acquired.

Future Plan

Instructors are continuously developing strategies to prepare students to become competent OT practitioners. Simulation is receiving growing attention as a teaching and learning tool. The OT department at SMU, which plans to further integrate simulation into its programs, views simulation as a way to meet several objectives. One is responding to the students' positive feedback about the learning outcomes of simulations. Another is fostering the university's commitment to promoting the use of technology in teaching and learning, especially in the area of interprofessional education (IPE). IPE is a growing expectation in health care education and SMU is just beginning to develop curriculum addressing this aspect of learning. Simulation is a significant component of the IPE curriculum integrating various clinical disciplines (Mohaupt et al., 2012; Shoemaker, Platko, Cleghorn, & Booth, 2014). Furthermore, the HSSC at SMU is a valuable resource that continues to grow and develop, and the OT department is committed to further expanding this learning tool to meet the students' needs. Finally, because the effectiveness of these simulation tools must be further investigated, theory-based research studies are being planned to measure learning outcomes when simulations are used in OT education.

Other Recommendations

The SMU OT department is in a unique position to expand the use of HFS through the availability of the HSSC, which provides ample resources for the program to create various HFS learning experiences. The general spectrum of HFS is relatively broad and can be customized in accordance with the extent of available resources. Several recommendations may be considered when developing a HFS OT curriculum, especially where sophisticated HFS facilities are not available.

- The use of SPs significantly elevates the fidelity of a simulated scenario, which is increasingly common in OT education (Bradley et al., 2013; Castillo, 2011; Herge et al., 2013; Van Oss et al., 2013; Velde et al., 2009). SPs can be recruited through local professional actors guilds and medical/nursing education programs.
- Device and environmental fidelity in HFS may be enhanced by OT education programs collaborating with local clinical facilities. HFS may take place in actual clinical facilities with the use of SPs.
- Audiovisual recording of student participation in simulated activities is an important aspect of HFS. Video cameras are useful tools to document simulated activities, and the recorded footage can be easily retrieved to be viewed for debriefing and self-assessment.
- Individual and group debriefings postsimulation are an essential component of HFS that does not require complex technology and often yields the most learning.
- Above all, establishing clear student learning objectives before surveying the existing environment to determine how HFS can be implemented successfully is often the most important first step of developing HFS for OT education.

References

Alinier, G. (2011). Developing high-fidelity health care simulation scenarios: A guide for educators and professionals. *Simulation & Gaming*, *42*(1), 9-26. http://dx.doi.org/10.1177/1046878109355683

Bradley, G., Whittington, S., & Mottram, P. (2013). Enhancing occupational therapy education through simulation. *British Journal of Occupational Therapy*, *76*(1), 43-46. http://dx.doi.org/10.4276/030802213X13576469254775

Cant, R. P., & Cooper, S. J. (2009). Simulation-based learning in nurse education: Systematic review. *Journal of Advanced Nursing*, *66*(1), 3-15. http://dx.doi.org/10.1111/j.1365-2648.2009.05240.x

Castillo, D. C. (2011). Experiences in a simulated hospital: Virtual training in occupational therapy. *OT Practice*, *16*(22), 21-23.

Chen, J. C. (2014). Teaching nontraditional adult students: Adult learning theories in practice. *Teaching in Higher Education*, *19*(4), 406-418. http://dx.doi.org/10.1080/13562517.2013.860101

Conklin, T. A. (2013). Making it personal: The importance of student experience in creating autonomy-supportive classrooms for Millennial learners. *Journal of Management Education*, *37*(4), 499-538. http://dx.doi.org/10.1177/1052562912456296

Herge, E. A., Lorch, A., DeAngelis, T., Vause-Earland, T., Mollo, K., & Zapletal, A. (2013). The standardized patient encounter: A dynamic educational approach to enhance students' clinical healthcare skills. *Journal of Allied Health*, *42*(4), 229-235.

Hunt, E. A., Nelson, K. L., & Shilkofski, N. A. (2006). Simulation in medicine: Addressing patient safety and improving the interface between healthcare providers and medical technology. *Biomedical Instrumentation & Technology*, *40*(5), 399-404. http://dx.doi.org/10.2345/i0899-8205-40-5-399.1

Issenberg, S. B., & Scalese, R. J. (2008). Simulation in health care education. *Perspectives in Biology and Medicine*, *51*(1), 31-46. http://dx.doi.org/10.1353/pbm.2008.0004

Knowles, M. S. (1985). Applications in continuing education for the health professions: Chapter five of "Andragogy in Action." *Möbius: A Journal for Continuing Education*

Professionals in Health Sciences, *5*(2), 80-100. http://dx.doi.org/10.1002/chp.4760050212

Lindstrom-Hazel, D., & West-Frasier, J. (2004). Preparing students to hit the ground running with problem-based learning standardized simulations. *The American Journal of Occupational Therapy*, *58*(2), 236-239. http://dx.doi.org/10.5014/ajot.58.2.236

Maran, N. J., & Glavin, R. J. (2003). Low- to high-fidelity simulation–A continuum of medical education? [Supplemental material]. *Medical Education*, *37*, 22-28. http://dx.doi.org/10.1046/j.1365-2923.37.s1.9.x

McGaghie, W. C., Issenberg, S. B., Cohen, E. R., Barsuk, J. H., & Wayne, D. B. (2011). Does simulation-based medical education with deliberate practice yield better results than traditional clinical education? A meta-analytic comparative review of the evidence. *Academic Medicine*, *86*(6), 706-711. http://dx.doi.org/10.1097/ACM.0b013e318217e119

Merryman, M. B. (2010). Effects of simulated learning and facilitated debriefing on student understanding of mental illness. *Occupational Therapy in Mental Health*, *26*(1), 18-31. http://dx.doi.org/10.1080/01642120903513933

Mikasa, A. W., Cicero, T. F., & Adamson, K. A. (2013). Outcome-based evaluation tool to evaluate student performance in high-fidelity simulation. *Clinical Simulation in Nursing*, *9*(9), e361-e367. http://dx.doi.org/10.1016/j.ecns.2012.06.001

Mohaupt, J., van Soeren, M., Andrusyszyn, M. A., MacMillan, K., Devlin-Cop, S., & Reeves, S. (2012). Understanding interprofessional relationships by the use of contact theory. *Journal of Interprofessional Care*, *26*(5), 370-375. http://dx.doi.org/10.3109/13561820.2012.673512

Mompoint-Williams, D., Brooks, A., Lee, L., Watts, P., & Moss, J. (2014). Using high-fidelity simulation to prepare advanced practice nursing students. *Clinical Simulation in Nursing*, *10*(1), e5-e10. http://dx.doi.org/10.1016/j.ecns.2013.07.005

Murray, W. B., & Kyle, R. R. (Eds.) (2008). *Clinical simulation: Operations, engineering and management*. Burlington, MA: Academic Press.

Shoemaker, M. J., Platko, C. M., Cleghorn, S. M., & Booth, A. (2014). Virtual patient care: An interprofessional education approach for physician assistant, physical therapy and occupational therapy students. *Journal of Interprofessional Care*, *28*(4), 365-367. http://dx.doi.org/10.3109/13561820.2014.891978

Van Oss, T., Perez, J., & Hartmann, K. (2013). Simulation helps students practice occupational therapy. *OT Practice*, *18*(14), 15-17.

Vegni, E., Mauri, E., D'Apice, M., & Moja, E. A. (2010). A quantitative approach to measure occupational therapist-client interactions: A pilot study. *Scandinavian Journal of Occupational Therapy*, *17*(3), 217-224. http://dx.doi.org/10.3109/11038120903147956

Velde, B. P., Lane, H., & Clay, M. (2009). Hands on learning: The use of simulated clients in intervention cases. *Journal of Allied Health*, *38*(1), e17-e21.

Wu, R., & Shea, C. (2009). Using simulations to prepare OT students for ICU practice. *Education Special Interest Section Quarterly*, *19*(4), 1-4.

Yuan, H. B., Williams, B. A., Fang, J. B., & Ye, Q. H. (2012). A systematic review of selected evidence on improving knowledge and skills through high-fidelity simulation. *Nurse Education Today*, *32*(3), 294-298. http://dx.doi.org/10.1016/j.nedt.2011.07.010

Zigmont, J. J., Kappus, L. J., & Sudikoff, S. N. (2011a). Theoretical foundations of learning through simulation. *Seminars in Perinatology*, *35*(2), 47-51. http://dx.doi.org/10.1053/j.semperi.2011.01.002

Zigmont, J. J., Kappus, L. J., & Sudikoff, S. N. (2011b). The 3D model of debriefing: Defusing, discovering, and deepening. *Seminars in Perinatology*, *35*(2), 52-58. http://dx.doi.org/10.1053/j.semperi.2011.01.003

DOI: 10.15453/2168-6408.1155