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Transferability of medication administration simulation training to clinical settings

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ABSTRACT

The study examines the impact of one-on-one simulation for medication administration (MA) on prelicensure student preparedness for and performance of MA in the clinical setting.
We used a prospective quasi-experimental interventional study applying Kirkpatrick's model to the simulation experience addressing MA.
Simulation increased student preparedness. Students' critical thinking and approach during the MA process were significantly higher in the clinical setting.
One-on-one MA simulation is an effective educational method for improving student learning and performance in practice.

In recent years, there has been increased use of simulation in nursing education. Simulation is a learning methodology that partially substitutes for real experiences without harming students' knowledge acquisition and clinical performance (Alexander et al., 2015; Hayden, Smiley, Alexander, Kardong-Edgren, & Jeffries, 2014). In addition, nurse educators can create learning experiences that tie theoretical underpinnings of nursing to clinical experiences (Weller, Nestel, Marshall, Brooks, & Conn, 2012). Despite strong support for use of simulation in nursing education, there is a gap in the literature pertaining to the transfer of simulation outcomes to the clinical setting (Norman, 2012).

Medication administration simulation

One of the biggest faculty challenges in medication administration (MA) education and practice is to increase student competencies in the clinical setting. Faculty typically use oral lectures to provide content about MA, supported by deliberate practice in the clinical setting (Aggar & Dawson, 2014).

MA is a multidimensional process requiring theoretical knowledge, skills, and critical thinking (Taylor, Lillis, LeMone, & Lynn, 2011). MA simulation scenarios have been developed recently to help students prepare for MA by promoting MA principles and psychomotor skills (Hayes, Power, Davidson, Daly, & Jackson, 2015; Konieczny, 2016; Thomas, McIntosh, & Allen, 2014) and to increase safety in the clinical setting (Sarfati et al., 2018). However, MA teaching and evaluation strategies lack sufficient reality when compared with clinical practice. For example, most MA simulation scenarios are carried out in groups of students with each participant assuming a different role (e.g., nurse, patient, caregiver, student observer; Gamble, 2017; Harris, Pittiglio, Newton, & Moore, 2014; Hayes et al., 2015; Pauly-O'Neill & Prion, 2013), whereas in the clinical setting MA practice is an individual task of a single student. This gap has led investigators to examine student perceptions of effective teaching that promotes transfer of knowledge and competencies to the clinical setting (Krautscheid, Orton, Chorpenning, & Ryerson, 2011).

Simulation evaluation instruments

Recent MA simulation studies have focused on the development of evaluation instruments that include all components of the MA process (Prion, Gilbert, Adamson, Kardong-Edgren, & Quint, 2017). A recent review found that most simulation instruments focus on student reaction to the simulation and the learning outcomes. Performance evaluation instruments are difficult to validate because of subjective experience, perception, training, and knowledge of the evaluator (Adamson, Kardong-Edgren, & Willhaus, 2013). Furthermore, most instruments are designed as general measures that cover a variety of simulation clinical scenarios and do not specifically address the

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MA process and principles (Mikasa, Cicero, & Adamson, 2013; Prion et al., 2017). To date, there is no gold standard instrument to evaluate student application of the MA process (Prion et al., 2017).

Theoretical Framework

Kirkpatrick's evaluation framework is a model that comprises four levels designed to evaluate educational learning outcomes, both immediate and long term. Level 1 (*reaction*) evaluates participant reaction to education. Level 2 (*learning*) evaluates the learning that occurs as a result of education, demonstrating changes in participant knowledge, attitudes, and/or skills. Level 3 (*behavior*) evaluates the actual changes that occur in participant performance as the result of education. Level 4 (*results*) evaluates the long-term results of exposure to specific education on an organizational level (Kirkpatrick & Kirkpatrick, 2006). While the Kirkpatrick's framework originated in corporate training programs, it has been successfully implemented in academia and clinical education instructional evaluation (Abdulghani et al., 2014; Reese, Jeffries, & Engum, 2010). This model can assist in the evaluation of student performance based on standard expected competencies and identification of changes that occur in student performance as the result of education.

In a recent integrative review of simulation usage in nursing fundamentals, Stroup (2014) describes the four levels as reflected in nursing simulation. In the field of simulation, Level 1 studies produce evidence related to faculty and student satisfaction with the simulation experience. Level 2 studies focus on psychomotor skill development, knowledge examinations, and self-confidence surveys. Level 3 studies evaluate behavioral changes, namely, the capability to perform learned skills in the patient care setting. Level 4 studies evaluate simulation outcomes or impact of simulation on patient safety, such as infection reduction or medication errors (Adamson et al., 2013). There are, however, clear gaps in the research, particularly related to Levels 3 and 4 (Stroup, 2014).

The main aim of this study was to examine MA simulation focused on student perceptions of preparedness for and performance of MA in the clinical setting. Specifically, we hypothesized that

1. student preparedness for MA will be higher after the simulation;
2. student MA performance will be higher in clinical setting, as evaluated by faculty, than in simulation; and
3. student MA performance in simulation will predict MA performance in clinical setting.

In addition, to facilitate the examination of these experiences, the research team developed and evaluated specific measurement instruments.

Methods

Design

A prospective quasi-experimental interventional study was designed to examine the impact of simulation on MA in the clinical setting. This was done in the surgical nursing course clinical rotation, which is conducted for 6 weeks (192 hours). Students were exposed to common surgical patients and practiced skills of data collection and analysis, assessment of patient condition, and interventions. An objective of the course is that the student will provide holistic treatment to a specific patient, including MA.

Setting and sample

The setting for this study was a nursing school at a public university in Israel. The nursing program has a simulation laboratory, and students complete their surgical clinical rotations in a large acute care academic health center. Nursing faculty supervise both simulation and clinical experiences.

Recruits for the study were 85 third-year prelicensure nursing students enrolled in the surgical course. The sample consisted of 77 students (90% response rate), after two students who repeated the surgical course were excluded, and six declined to participate. Because of the large number of students, they were assigned to two groups. Group A ($N = 40$) included students initially enrolled in the surgical rotation prior to the internal medicine rotation. Group B ($N = 37$) included students initially enrolled in the internal medicine rotation prior to the surgical rotation. Participants in Group B were exposed to an MA simulation in their internal medicine rotation before the simulation in the surgical rotation used in the study. This simulation, however, was conducted in small groups (two to three students) rather than as a one-on-one experience and focused on medical knowledge and technical skills.

The study was approved by the university's ethics committee of the faculty of health sciences, which meets the requirements of the Code of Ethics of the World Medical Association. Although participation in the simulation was a required component of the course, participation in the study was voluntary. All participants signed an informed consent after they received information about the study purposes and process. Whether a student participated did not impact the course grade or any other aspect of their academic progression. The study was designed to be anonymous, using private numbers for identification.

Procedure and intervention

At the beginning of the course, participants received explanations about the study, gave consent, and completed the MA Preparedness Questionnaire (MAPQ). As in the clinical setting, 1 day before the simulation, participants received patient documents, including medical history, list of chronic medications, daily nursing report, and medical orders. Then, the participant was exposed to a simulation scenario, which was developed according to a scenario format (Simulation Scenario Library of the Kansas Board of Nursing, 2003). The scenario required the participant to collect patient data, assess the patient, and prepare and administer medications to a simulated mannequin. Table 1 describes the simulation instructions for faculty. The simulation scenario was conducted one-on-one in order to achieve active student involvement in each component of the MA process to better prepare the student for MA in the clinical setting. A formative simulation design was held in order to assist the student in their progression toward better performance in the clinical setting (INACSL Standards Committee, 2016). During the simulation, one faculty member evaluated participant performance with the Medication Administration Evaluation Scale (MAES). To prevent bias, a different faculty member evaluated the participant in the clinical setting, after receiving instructions for debriefing and of the evaluation scale. At the end of the simulation, participants completed the MAPQ for the second time and, then, participated in faculty debriefing. A plus/delta debriefing model was used in the study to recognize what went well and what the participant would change after the simulation training (Decker et al., 2013; Jeffries, 2010). During the participant's MA in the clinical setting, a different faculty member evaluated participant performance using the MAES.

Measures

This study used instruments that applied to Levels 2 and 3 of Kirkpatrick's evaluation framework, some of which the researchers developed, as will be detailed below.