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Using high-fidelity simulation to increase nursing student knowledge in medication administration¹

Leona Konieczny, DNP, MPH, RN-BC, CNE*

Central Connecticut State University, New Britain, CT 06050, USA

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ABSTRACT

The increased use of prescription medications along with teaching safety presents nurse educators with the challenge of preparing students with knowledge related to medication administration. Curriculums that offer pharmacology theory apart from courses with clinical application component need an education strategy to reinforce knowledge. This research study examines the comparison of high-fidelity and low-fidelity simulation on nursing students' pharmacologic knowledge. Findings demonstrate the use of high-fidelity simulation significantly increased knowledge related to medication administration. Implications for associate degree nursing educators are discussed.

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Introduction

Teaching students safe medication administration continues as an essential area for nursing educators. Nursing students require instruction and the opportunity to apply pharmacologic knowledge to keep patients safe and to provide quality nursing care. The increased use of prescription medication emphasizes the importance for nursing students to be knowledgeable about medication administration. The Joint Commission (2016) National Patient Safety Goals includes the use of medicines safely for hospital, long term, and home care. In addition, safety is an expected competency in prelicensure nursing programs (Quality and Safety Education for Nurses, 2014). Many nursing education curricula include pharmacology course(s) that are separate from the nursing courses, which provide the opportunity to apply knowledge of medication administration. Students and faculty communicated a perceived disconnect between the theoretical pharmacology content course with the other nursing courses. The identified problem is how to increase medication administration knowledge and provide a mechanism to connect courses. This quantitative study describes the impact of high-fidelity simulation on knowledge related to medication administration among nursing students.

Background

The nursing curriculum in an associate degree program included three one-credit pharmacology courses in the last three semesters of a four-semester program. These courses are theory courses without a clinical component. However, these courses are co-requisites with other nursing courses that did have laboratories on campus and at client care sites. Students are challenged in connecting the pharmacologic knowledge with the application during medication administration during the clinical experience. This challenge was communicated by students during advising and evaluation meetings and course evaluations. Clinical faculty also communicated this identified problem when assessing students' progress. The laboratory on campus is equipped with multiple low-fidelity human mannequins and one computerized high-fidelity human patient simulator. The question examined is whether simulation experience has an effect on nursing knowledge related to medication administration. The population is nursing students in an associate degree program in nursing. The intervention is a simulation experience. The comparison is low-fidelity and high-fidelity simulation. The outcomes are scores on a knowledge assessment. The time is during the third semester of a four-semester associate degree program in nursing.

Literature Review

Medication Administration Literature

Literatures from many nursing areas describe the importance of medication knowledge for nurses. Drori, Guetta, Natan, and

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* Corresponding author. Tel.: +1 860 832 3104 (work).

E-mail addresses: lakonieczny@gmail.com, konieczny@ccsu.edu.

Table 1
Knowledge assessment

DIRECTIONS: Read each question carefully and consider all possible answers. Using pencil only, blacken the corresponding space on the answer sheet. Only answers on the test answer sheet will be accepted. There are 10 items on this assessment.

- A nurse is preparing to administer furosemide (Lasix) 80 mg by mouth. In addition to checking the blood pressure, which other nursing intervention does the nurse perform?
 - Monitor heart rate.
 - Check the serum potassium level.*
 - Insert an indwelling urinary catheter.
 - Administer with apple or cranberry juice.
- Metoprolol (Lopressor) 50 mg by mouth twice daily has been prescribed for a patient. Prior to administering the medication, the nurse should monitor which of the following? (**Select all that apply**).
 - Blood pressure
 - Heart rate
 - Pulse oximetry
 - Urine output
 - 1, 2.*
 - 1, 4.
 - 1, 2, 4.
 - 1, 2, 3, 4.
- A patient has been receiving metoprolol sustained release (Toprol XL) 100 mg once daily by mouth. After an evaluation by a speech–language pathologist, the patient's diet is changed to pureed foods and nectar-thick liquids. Which first action is appropriate by the nurse?
 - Crush the tablet and give in applesauce.
 - Contact the prescriber to change to a shorter acting oral tablet of metoprolol.*
 - Split the tablet and give with fruit nectar.
 - Insert an intravenous site for iv administration.
- The nurse administers nitroglycerine ointment 1 in. topically as prescribed at 9:00 a.m. The patient receives this medication every 6 hours. At 10:00 a.m., the patient's blood pressure is 80/58. Which is the first action by the nurse?
 - Contact the prescriber to start an iv infusion.
 - Place the patient on a cardiac monitor.
 - Offer oral fluids every 15–30 minutes.
 - Wipe off the topical nitroglycerine ointment.*
- A patient is receiving insulin glulisine (Apidra) 4 units subcutaneously with each meal. The lunch tray has just arrived. The patient is to receive insulin glulisine (Apidra) 2 units subcutaneously for blood sugars of 150–200 mg/dl and insulin glulisine (Apidra) 4 units for blood sugars >200 mg/dl. The patient's blood sugar is 214 mg/dl. How much insulin glulisine (Apidra) should the nurse administer?
 - 2 units.
 - 4 units
 - 8 units*
 - 10 units.
- A patient's blood glucose is 98 mg/dl. At 8:00 a.m., the patient has been prescribed insulin glargine (Lantus) 20 units subcutaneously once a day and insulin glulisine (Apidra) 3 units subcutaneously three times daily with meals. The breakfast tray is served. What is the correct action by the nurse?
 - Administer the Lantus and Apidra in separate syringes.*
 - Administer the Lantus but withhold the Apidra.
 - Contact the prescriber to clarify since there are two types of insulin ordered.
 - Administer the Apidra and reschedule the Lantus to 8:00 p.m.
- A patient is receiving metformin (Glucophage) 500 mg by mouth at 8:00 a.m. and 6:00 p.m. for type 2 diabetes. It is 8:00 a.m., and the breakfast tray is delivered. In report, the nurse learns that the patient is scheduled for an abdominal computed tomography scan with contrast dye for the next day. What is the appropriate action by the nurse?
 - Withhold the metformin (Glucophage).*
 - Monitor the blood glucose and give the medication if the blood glucose is 80 mg/dl or greater.
 - Administer the metformin (Glucophage) after checking the serum laboratory work for liver function.

(continued)

- Consult with the pharmacist to administer this medication with ginseng to prevent side effects.
- A patient is receiving prednisone 50 mg orally once per day for an asthma exacerbation. Which patient statement indicates effective teaching?
 - "I will take prednisone on an empty stomach."
 - "I will wean down the dosage and not stop quickly.**"
 - "I can expect that this medication will lower my blood sugar."
 - "I plan to take this medication at bedtime with milk or a snack."
 - The nurse is working in a healthcare facility where respiratory treatments are administered by the nursing staff. Budesonide (Pulmicort) 32 mcg via nebulizer is prescribed twice daily. The nurse knows that this medication is prescribed cautiously in which of the following patients?
 - 12 year old patient
 - Patient with a history of varicella zoster (chicken pox)
 - Patient with end stage chronic pulmonary disease (COPD)
 - Patient currently receiving oral systemic steroids.*
 - The nurse is caring for a patient who has tiotropium (Spiriva) 18 mcg daily via inhaler to be administered by the nurse at 8:00 a.m. The patient has been prescribed albuterol and ipratropium (DuoNeb) four times daily via nebulizer administered by the respiratory therapist which is to be given at 8:00 a.m. Which is the appropriate nursing action for a patient receiving both medications?
 - Administer the tiotropium (Spiriva) via inhaler as prescribed.
 - Consult with the pharmacist and prescriber to change the route of the tiotropium (Spiriva) to nebulizer.
 - Reschedule the time of the tiotropium (Spiriva) to a time that does not conflict with the nebulizer medications.
 - Withhold the tiotropium (Spiriva) until the order for both medications is clarified by the prescriber.*

Polakevich (2014) describe how nurse's knowledge of medications improve medication adherence in clients with mental health needs. A collaborative care study identified that oncology nurses correctly identified medications and classes but reported drug administration problems and lack of knowledge of medication side effects (Daouphars et al., 2012). Another study identified that prelicensure nursing students expressed a lack of confidence in their knowledge and ability to administer medications (Reid-Searl, Moxham, Walker, & Happell, 2010). Sears, Goldsworthy, and Goodman (2010) found that inexperience and distractions were the major reasons for medication errors in nursing students. Their case–control study performed with undergraduate nursing students showed that students' medication mistakes in clinical were less when exposed to a simulation experience involving a similar situation ($p < .05$). A study describing nursing students' perceptions on the efficacy of medication administration education included an instrument to measure safe medication administration (Krautscheid, Orton, Chorpenning, & Ryerson, 2011). Approximately 10% of this instrument was concerned with knowledge items such as therapeutic effect or patient assessment data. The majority of the instrument is concerned with safety procedures such as handwashing or verifying patient and allergies. A descriptive study by Honey and Lim (2008) demonstrates that students' perceptions of lack of pharmacology knowledge and the need for more medication management knowledge are areas for concern. Ndosi and Newell (2008) conducted a nonexperimental correlational study on pharmacology knowledge in nurses. The study found that the majority of nurses in the sample, 57.2%, demonstrated inadequate pharmacology knowledge. Using questionnaires that required short answer responses, their study reported three important points: nurses have insufficient knowledge of pharmacology, nurses and educators are dissatisfied with the amount of pharmacology education provided in prelicensure nursing education programs and, although nurses are able to identify actions and indications, they are unable to identify mechanism of action and drug interactions.

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