

Medication Administration and Knowledge Retention in Baccalaureate Nursing Students

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ABSTRACT

A quality improvement project was undertaken in order to assist the undergraduate baccalaureate nursing students in knowledge retention for medication administration during their senior semester in nursing school. Two specific changes in curriculum were implemented in order to assist these undergraduate baccalaureate nursing students at a suburban private university in New York. Simulation and the incorporation of competency by rubrics were implemented in the spring semester of junior year, which led to an increased knowledge retention during the fall semester of the senior year. This article discusses the advantages and challenges of using technology, how change occurred in the junior year semester and the effects it had on the senior nursing student's retention of medication administration knowledge.

KEYWORDS:

Competency, Knowledge Retention,
Medication Administration, Simulation,
Nursing Students

INTRODUCTION

Baccalaureate nursing students are required to complete direct patient care hours in the clinical area as part of their educational experience [1]. However, prior to students entering into the clinical arena, they are required to practice learned skills in the nursing arts laboratory. As a significant part of nursing is medication administration, the skills which are taught are essential skills, which must be practiced, maintained, and retained. Clinical and laboratory faculty teach the students medication administration. Students then administer medication to patients in the clinical area, under the watchful eye of the instructor. Part of instruction is the use of simulation. Simulation is defined as replacing or amplifying "real experiences with guided experiences that evoke or replace substantial aspects of the real world in a fully interactive manner often "immersive" in nature [2]. Simulation has been used for many years in nursing [3]. In recent years the word "simulation" in nursing has come to be defined as high fidelity human-patient simulators (HFS) that are controlled by computer soft-ware [4, 5] These high-tech mannequins breathe and manifest various breath sounds, have heart tones and palpable pulses and mimic other anatomical functions.

Mannequins can be used to practice low and high technological skills and control room operators have the mannequins talk and respond to questions and display the outcomes of nursing interventions. Simulation can be used in order to assist the student nurse in perfecting skills such as medication administration.

There are many competencies necessary for baccalaureate nursing students to master during their undergraduate preparation. While there are didactic and hands-on skills competencies, the nursing faculty had noticed that retaining specific skills knowledge from semester to semester had become a challenge. While teaching in a four year baccalaureate nursing program, a specific gap was seen in that junior year students were taught medication administration in the spring semester. However, by the fall semester, just four months later, these new seniors typically would have difficulty in retaining their medication administration skills, especially with intramuscular (IM) and subcutaneous (SC) injections. The New York Education Lab 6908 states that “students enrolled in registered schools/programs may perform nursing services as may be incidental to their course of study [6].

Part of assisting our students to prepare for the flu clinic was to have each senior student demonstrate competency in the fall semester. It was noted that there was limited retention of the IM/SC injection skill. The purpose of this paper is to describe the quality improvement project which had two phases – changes made in the spring junior year as well as the results of such competency exams in the fall of senior year. (Appendix A – Workflow).

REVIEW OF THE LITERATURE

In determining how to plan the quality improvement project, a review of the literature was necessary. Much of the literature review regarding the use of high fidelity simulation

shows many advantages as previously discussed. Simulation has been seen to increase competency of nursing students. According to Khalia [7], simulation has been seen as decreasing student nurse anxiety, primarily since students can practice in a safe and non-threatening environment. Khalia used a descriptive quantitative study design to evaluate the effectiveness of simulation in reducing anxiety and promoting self-confidence, satisfaction with simulation, caring ability as well as investigating the predictors and mediators for caring efficacy among nursing students. Khalia found that when anxiety levels were reduced, there was improved self-confidence, caring ability, and caring efficacy among nursing students which could be seen over time as students practiced and learned with simulation.

Mills, West, Langtree, Usher, Henry, Chamberlain-Salaun, and Mason [8] completed a study of first year undergraduate nursing students and their experiences of unfolding case studies and the use of high fidelity simulation. Three instruments were used which had been developed and validated by the National League for Nursing: Student Satisfaction and Self Confidence in Learning, Education Practices Questionnaire, and Simulation Design Scale. They found evidence to support a high fidelity simulated model of teaching clinical skills development for first year undergraduate nursing students. Students had high positive satisfaction scores with all elements of the teaching model and qualitative data from interviews supports this claim. Although 47 students completed questionnaires, only five had agreed to be interviewed in addition to the questionnaire. In general, the students were nervous about being filmed and then watching themselves during the debriefing. However, it was a positive experiment for the students to participate in the simulation and scenario experience.

A significant study by Kopacek, Dopp, A., Dopp, J., Vardeny, and Sims [9] assessed pharmacy students' retention of knowledge about automatic external defibrillator (AED) use and counseling points following didactic training and simulated experience. The PharmD students completed a questionnaire to evaluate recall regarding information and needed to show demonstration of using the AED at three weeks and at four months after the initial teaching. The PharmD students were able to complete both tasks and demonstrated retention of knowledge after four months, based upon the time it took them to deliver a shock appropriately to the potential patient. Kopacek et al [9] cited a study by Monsieurs, Vogels, Bossert, Meert, and Calle [10]. These researchers used nursing students in their study, whereby they were given an AED and did not provide them with simulation or explanation. The nursing students were instructed to use the AED on the mannequin. However, only 35% of the nursing students correctly positioned the pads. Kopacek et al [9] cited Beckers, Fries, Bickenback, Skorning, Derwall, Kuhlen, and Rossaint [11]. Beckers et al [11] used medical students and instructed them to use the AED on a mannequin, without simulation or teaching. The medical students were correct 93%-97% of the time. However, with follow up of these medical students after six months, the time it took for them to correctly shock the mannequin with the AED significantly decreased, as opposed to the PharmD students who had instruction and simulation with the use of the AED.

There is very little research regarding retention of knowledge, especially simulation and the retention of knowledge, not only in nursing, but in related health science fields. More research needs to take place and published regarding this important potential correlation. Future experimental study with a control group is needed to evaluate the

effectiveness of learning with simulations compared to learning without simulations.

CREATIVE TEACHING STRATEGIES

In previous spring semesters, students were taught skills related to medication administration in our nursing laboratory setting over three weeks. Students were able to practice these skills in the nursing lab as many as six (6) days a week. They, then, cared for hospitalized patients incorporating this new knowledge in the clinical setting over the next 11 weeks and were deemed competent by their clinical instructors at the end of the semester. Despite these interventions, students demonstrated poor knowledge retention over the summer months. Senior level faculty, as well as lab faculty, reported students were weak in medication administration skills, specifically IM and SC injections. When our new seniors returned to school in September, faculty saw a noticeable decrease in their ability to perform basic skills related to these specific medication administration competencies. Each September, laboratory faculty needed to re-teach these medication administration skills, taking away time for necessary clinical skills related to senior level nursing courses.

Based on this information, there was a significant area in which to make improvement. During phase one, changes were made to the medication administration syllabus which had a three pronged approach. The students were taught (as above), and needed to pass the competencies of medication administration according to a rubric from their text and modified with a point system. If the student could not pass the competency, they were offered one additional week of remediation and practice with the lab faculty. It was then expected that they would pass the competency. Students needed to demonstrate competency in order to progress in the nursing major. The

second prong which was added to the teaching component of these clinical skills was specific simulation days in lieu of a clinical day. Each clinical group of six (6) students was scheduled to have their own simulation day in the nursing simulation lab. This key component allowed the students to practice in both the high and low fidelity simulation labs regarding medication administration via each route as taught during the first three weeks of the semester. These specific simulation days had scenarios which required patient assessment, verification of medication orders, communication skills amongst the students as well as inter-professional team members, and allowed demonstration of critical thinking skills. According to Lapkin and Levett-Jones [12], the following are additional advantages of high fidelity simulation:

- “The provision of opportunities for active involvement in challenging clinical situations that involve unpredictable simulated patient deterioration
- Exposure to time sensitive and critical clinical scenarios, that, if encountered in a “real” clinical environment, students could normally only passively observe
- Opportunities to integrate clinical skills, content knowledge, inter-professional communication, teamwork, physical assessment, nursing therapeutics, and critical thinking in a realistic but non-threatening environment
- Mistakes can be made and learnt from without risk to patients
- Opportunities for repeated practice of requisite skills and formative and summative assessment can be provided
- Debriefing and immediate opportunities for reflection can enhance the conditions for learning
- Remediation can be provided in a supportive environment.”

As we incorporated small group simulation during phase one of the project, we felt it would be valuable to have the students and faculty reflect on the simulation experience. Students stated that they thought they were comfortable with medication administration prior to the simulation experience. However, after the simulation, they found that there was so much more to learn.

In September, the students faced the third prong of the teaching modality change. They were permitted to refresh and practice their skills in the nursing arts laboratory during open hours. However, the time spent in the nursing arts laboratory was as originally planned, with the teaching of senior level skills in conjunctions with the senior clinical. The students were not re-taught the medication administration skills. They were permitted to review skills during open hours in the lab. Since the laboratory is open six days a week, there was opportunity for the students to come in for open hours in order to practice IM/SC injections. During week three of the fall semester, all senior students were required to demonstrate competency of IM and SC injections, using the same competency rubrics as in the spring semester. Based upon the success of the fall competency testing, all senior students were able to demonstrate proper IM and SC injection techniques, without being re-taught in the fall semester. This was the first time that rubrics were used to document competency in the spring semester. Although the clinical instructors could verify competency, using rubrics allowed for an objective measure for all students.

IMPLICATIONS

Due to the simulation and pending rubrics, students spent more time in the nursing arts lab practicing their injection skills. While there is much literature about the use of

simulation in teaching, especially in nursing, the costs need to be contained [12]. Using high fidelity simulation can be quite expensive. There was an increase in the cost of supplies such as alcohol prep pads, non-sterile gloves in different sizes, demi-dose powder, sterile water for injection, injection pads, and of course syringes and syringe disposal containers. Lab faculty had been scheduled to teach lab as per their position descriptions. The increased use of equipment for practice is acceptable, as students need to practice and we need to provide the items which they need for their practice. However, the cost of high fidelity simulation must be considered as well. For each simulation day, three nursing faculty were necessary: one faculty member in the control room (as the voice of the patient and changing vital signs), the clinical instructor as the facilitator of the scenario, taking different roles as needed of the inter-disciplinary team, and the third lab faculty who would be in the nursing arts laboratory as a resource regarding low/medium fidelity mannequins, in addition to teaching other classes. Our mannequins are from the Laerdal Company, who provided training for our faculty – both full time and adjunct from the nursing lab, on the use of our mannequins. The training, though through the company, was costly for their services, as well as our personal time for which we were not paid. We anticipated that the fall semester would have students practicing their injection skills in order to pass their required competency for the flu clinics. During the beginning of the fall semester for the competency testing, it was necessary for additional time to be spent in the lab in order to make sure that students had appropriate resources during practice time. However, if all the practice will make our students stronger in their skills, as well as safer for the future, the benefits will outweigh the costs.

CONCLUSIONS

Simulation has become the "wave" for nursing schools - worldwide. With the advent of more and more technology in schools, as well as healthcare, nursing programs need to compete with each other for students. There are accreditation standards which are met by having simulation in the school. We are always providing feedback loops when we have interventions and changes in teaching methodologies, to show how we have impacted, and hopefully had a positive effect, on student learning outcomes. For schools that do not have the latest or full simulation, there are companies that may be able to assist with the cost, as well as possible grants (both internal and external) to the institution, which can help to defray the costs. Also, many colleges count on the nursing major as a means to bringing in money to the school. The more that is invested into the nursing program, the more people will want to attend, especially with the competition to be accepted into a program now.

Having a simulation program helps the school, even though it is costly. Simulation can also enhance limited clinical practice placements [13]; [14]. In New York, if the Joint Commission or Department of Health has a clinical site visit, no students are permitted to stay at their site. Therefore, a full simulation day may be able to substitute for this clinical day, avoiding a make-up day at the end of the semester.

Prior to the end of the spring semester, the students were made aware of the need to demonstrate competency in the fall semester. It is up to them to take responsibility for these skills. The third prong of change for increased retention of knowledge was the competency testing done this fall. As all senior students passed their competencies in the required lab time, without the re-teaching of skills, they

demonstrated knowledge retention specifically for the skills of IM and SC injection administration. By closing this feedback loop and gathering data, we can then look at the other medication administration techniques, implement specific rubrics and help our

students achieve their best potential regarding medication administration skills. It is hoped that with the changes that were made, our nursing students will continue to grow stronger as they complete their senior year in the nursing program.

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Changes made to Increase Knowledge Retention of Medication Administration Skills for Senior BSN Students

