COMPARING THE IMPACT OF HIGH FIDELITY SIMULATION, LOW FIDELITY

SIMULATION, AND VIDEO TRAINING OF ORAL MEDICATION ADMINISTRATION

FOR STATE ANXIETY WITH FIRST YEAR UNDERGRADUATE NURSING STUDENTS

A DISSERTATION SUBMITTED TO THE GRADUATE DIVISION OF THE UNIVERSITY

OF HAWAI'I AT MĀNOA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR

THE DEGREE OF DOCTOR OF PHILOSOPHY

IN

NURSING

DECEMBER

2014

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Dedication

This work is dedicated to my family who supported me throughout my educational journey. My father was an educator and believed in the power of education. His guidance early in my life encouraged me to strive for excellence and to understand that there are no limitations to what I could achieve. My mother is an inspiration to me for all of her hard work in raising two teenagers on her own while maintaining a patient guiding force that still influences me today. She often quoted Philippians 4:13: "I can do all things through Him who strengthens me." There are many times that verse pushes me towards my goals no matter what the circumstance. My brother always supports me in my educational goals encouraging me to believe in myself and my abilities. I appreciate the support of my grandparents, aunts, uncles, cousins, and close friends as they have all helped me along the way towards my educational goals.

I most want to dedicate this work to my husband Rob who has encouraged me in my education since we met. He always pushes me to work to my potential even when I get discouraged by the stresses of going to school, working, and every day responsibilities. He allows me the time I need to focus on my schoolwork by taking over household chores including cooking dinners, helping with cleaning up, and taking care of our daughter. He celebrates my achievements and listens to me when I have setbacks. He helps me to understand that everything will be all right no matter what the outcome, but he makes sure to remind me to "get to work". I want to thank him for understanding the time I had to spend to achieve my educational goals. Thank you for understanding me and allowing me to achieve my dreams.

ABSTRACT

Competent and safe nursing care is essential in professional nursing practice. This is especially true in the area of medication administration. Nursing students are particularly vulnerable to making medication errors due to inexperience and anxiety when taking care of patients. To lessen anxiety and increase competence, nursing students are required to practice medication administration prior to performing this skill in the clinical setting. Nursing students benefit from many educational techniques, but different training methods in medication administration may affect students differently in regards to competence and levels of anxiety.

This study measures differences in state anxiety level from pre-training to post-training, prior to administering oral medications in the clinical setting. The purpose of this study is to compare the use of high-fidelity simulation (HFS) training, low-fidelity simulation (LFS) training, and video training (VT) to learn the skill of safe and competent medication administration.   The null hypothesis is there will be no significant difference in state anxiety pre-training or post-training between HFS, LFS, and VT for medication administration.

Forty-four first year undergraduate nursing students completed this investigatory research study. Participants were randomly assigned to HFS, LFS, or VT groups and had an hour of reading to complete prior to training. On the first day of training, participants filled out a demographic form and the State Trait Anxiety Inventory for State Anxiety (STAI-SA). All participants watched a 20 minute video about oral medication administration and then the participants experienced a three hour training session in HFS, LFS, or VT. Two to six weeks post-training, participants filled out the STAI-SA a second time. This was immediately prior to administering oral medication in the clinical facility.

Results were analyzed using two way repeated analysis of variance (ANOVA). The results of this study supported the null hypothesis. There were no significant differences in state anxiety levels between the three methods of simulation training. Although the results did not reach significance, there was a trend in scores that suggested that HFS and LFS methods decreased state anxiety from pre-training to post-training. The VT method increased state anxiety from pre-training to post-training. Further research is required to substantiate those findings.

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Abbreviations and Symbols

ACLS	Advanced Cardiac Life Support	38
AED	Automated External Defibrillator	27
ANOVA	Analysis of Variance	vii
BLS	Basic Life Support	45
BSN	Bachelor of Science in Nursing	36
CD-ROM	Compact Disc- Read Only Memory	54
CHF	Congestive Heart Failure	160
CINAHL	Cumulative Index to Nursing and Allied Health Literature	31
CPR	Cardiopulmonary Resuscitation	12
DVD	Digital Video (or Versatile) Disc	11
EBSCO	Elton B. Stevens Co.	31
EMAR	Electronic Medication Administration Record	80
ERIC	Educational Resource Information Center	31
GPA	Grade Point Average	66
HPS	Human Patient Simulator	8
HFS	High Fidelity Simulation	vi
IV	Intravenous	8
LFS	Low Fidelity Simulation	vi
MAE	Medication Administration Error	60
MAR	Medication Administration Record	80
MD	Medical Doctor	60
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Chapter 1

Introduction

  Purpose. Registered Nurses (RNs) are expected to be safe and competent in medication administration for patients while working in the clinical setting (Sulosaari, Suhonen, & Leino-Kilpi, 2010). However, RNs have been trained by a variety of educational methods for this task (Bearnson & Wiker, 2005; Holland et al., 2012; Sears, Goldsworthy, & Goodman, 2010; Wheeler, et al., 2008). Patient safety requires that nurses and nursing students are sufficiently prepared to ensure medication administration competency (Bearnson & Wiker, 2005; Sears et al., 2010; Thompson & Bonnel, 2008). Nursing students may not be prepared for this task due to limited educational training or high anxiety levels when performing a skill for the first time (Kang, Choi, & Ryu, 2008; Kanji, White, & Ernst, 2004).

  There is limited research in the education of first year undergraduate nursing students in oral medication administration (Honey & Anecita, 2008; Krautscheid, Orton, Chorpenning, & Ryerson, 2011; Murphy, 2012; Reid-Searl, Moxham, Walker, & Happell, 2010a). Although there is research regarding simulation and video training, there are few studies identifying levels of state anxiety during oral medication administration in the clinical setting after these educational methods are implemented (Megel et al., 2011; McKay, Buen, Bohan, & Maye, 2010). A study comparing the use of HFS, LFS, and VT as educational methods in oral medication administration is needed to determine the effect of those training methods on the levels of state anxiety of first year undergraduate nursing students. The purpose of this research study is to compare the impact of different levels of fidelity in simulation with VT in oral medication administration on state anxiety pre and post-training in first year undergraduate nursing students.

  Significance. Accrediting bodies like The Joint Commission: Accreditation, Healthcare, Certification ensure that measures are in place to protect patient safety (The Joint Commission,

2014). One of the National Patient Safety Goals is to improve the safety of using medications (The Joint Commission, 2014). Increases in numbers and types of medications and higher acuity levels of patients increase the risk for medication errors (Sulosaari et al., 2010). Nursing students have anxiety in the clinical setting because they feel incompetent and they lack the professional nursing skills and knowledge to take care of multiple patients with a variety of health care conditions (Sharif & Masoumi, 2005). High levels of anxiety in nursing students may increase the risk for medication errors because anxiety negatively affects performance in some students (McKay et al., 2010). Medication administration education and training for nursing students is important and may be effective to reduce anxiety levels (Floyd, 2012; Megel et al., 2011). Medication administration education and training may ultimately protect patients and promote medication administration safety because controlling stress and reducing anxiety may improve nursing student performance in clinical practice (Ratanasirapong, Ratanasirapong, & Kathalae, 2012; Sulosaari et al., 2010; Thompson & Bonnel, 2008). It is important to evaluate medication administration training and how different training methods affect anxiety levels of nursing students during training and when those skills are applied in the practice setting.

Registered Nurses must maintain a level of education and competency to safely administer medications in the clinical setting (Sulosaari et al., 2010). Major challenges to medication administration safety are the increased number of drugs available, drug therapy for more severely ill patients, and increased numbers of older patients with co-morbidities and polypharmacy (Sulosaari et al., 2010). Currently, there are a wide variety of educational training methods in medication administration with little knowledge of the best practice for educating nursing students in this area (Greenfield, 2007; Kyrkjebo, Brattebo, & Smith-Strom, 2006; Murphy, 2012; Sears et al., 2010; Sredl, 2006; Stillman, Alison, Croker, Tonkin, & White, 1998; Wheeler et al., 2008). Students learn medication administration through the methods of lecture,

skills training, simulation, online training, VT, and hands-on training in the clinical setting (Holland et al., 2012; Sears et al., 2010; Wheeler, et al., 2008). There is a lack of research to determine the best practice for medication administration education and how these educational methods impact students' levels of state anxiety (Greenfield, 2007; Kyrkjebo et al., 2006; Muphy, 2012; Sears et al., 2010; Sredl, 2006; Stillman et al., 1998; Wheeler et al., 2008).

The proposed study compares state anxiety levels of first year undergraduate nursing students immediately prior to training in oral medication administration using HFS, LFS, or VT. State anxiety levels are measured again post-training immediately prior to oral medication administration in the clinical setting. While there is research about the benefits of education to decrease anxiety levels in nursing students related to medication administration, few studies compare HFS, LFS, and VT in relation to state anxiety in first year undergraduate nursing students. There are also limited studies investigating state anxiety of first year undergraduate nursing students while administering oral medications in the clinical setting.

Background. *Medication administration.* Once nursing students graduate, they are expected to be able to administer medications competently and safely (Sulosaari et al., 2010). Safe and competent medication administration includes preparing, checking, and administering medications, updating one's knowledge of medications, monitoring the effectiveness of pharmacologic therapy, reporting adverse reactions, and patient education about their drugs (O'Shea, 1999). Foundational knowledge competence in this skill requires a background in anatomy and physiology, pharmacology, communication, interdisciplinary collaboration, information seeking, mathematical calculation, administration techniques, educational principles, assessment and evaluation, accuracy in documentation, and principles of safe practice (Sulosaari et al., 2010). Application of foundational principles and knowledge in real-life situations involves decision making, theory, and practical competence (Sulosaari et al., 2010).

In order to understand the best methods of educating nursing students in medication administration, feedback from nursing students is essential. Students value faculty demonstrations, peer-learning opportunities, and repetitive practice with timely feedback (Krautscheid et al., 2011). Students report a need to learn more about communication and conflict resolution to manage interruptions, distractions, and computer generated alerts which happen in the clinical facility, but may not happen during academic lab learning activities (Krautscheid et al., 2011).

There are a wide variety of educational methods to develop competence in medication administration (Greenfield, 2007; Kyrkjebo et al., 2006; Murphy, 2012; Sears et al., 2010; Sredl, 2006; Stillman et al., 1998; Wheeler et al., 2008). Research studies have been conducted to test medication administration with Video Clips and simulation scenario practice (Holland et al., 2012; Sears et al., 2010; Wheeler, et al., 2008). Students were satisfied with these methods, less likely to have medication errors, and maintained their skills over time (Holland et al., 2012; Sears et al., 2010; Wheeler, et al., 2008). This means there is value to both video and simulation training in medication administration and this type of training may have lasting improvements in competence of nursing students over time.

Anxiety. The state of anxiety is necessary to increase motivation for learning and to maintain physical and mental health, but too much stress can have a negative influence on health and academic performance when there are not adequate coping mechanisms (Kang et al., 2008; Paul, Elam, & Verhulst, 2007). Anxiety and high levels of stress may hinder concentration, memory, and problem-solving which are needed for learning (Beddoe & Murphy, 2004). In nursing students unable to cope with stress, it can negatively influence holistic patient care and professionalism (Kang et al., 2008). Stress may also weaken communication, interpersonal effectiveness, and empathy (Beddoe & Murphy, 2004).

The experience of anxiety may affect students' progression in their academic program as well as the ability to pass standardized examinations (e.g. course examinations, state board or certification exams) (Beddoe & Murphy, 2004). Anxiety is commonly conceptualized as: state anxiety (response to a specific situation – such as interacting with a patient the first time) or trait anxiety (underlying personal characteristic) (Paul et al., 2007). There may be other situations in which both state and trait anxiety interact - for example, test anxiety occurs when students have the cognitive ability to perform well on an exam, but perform poorly as stress affects their ability to concentrate and process information (Paul et al., 2007).

Many college students experience anxiety at some point in their academic career (Kanji et al., 2004). Anxiety is a form of psychological distress; some factors that contribute to increased stress levels in college students may include interpersonal and social problems, pressures to succeed academically, financial strains, and uncertain futures (Nidich et al., 2009). Undergraduate nursing students may experience more anxiety related to performance in the clinical setting where they take the responsibility of patients with limited knowledge and experience in an unfamiliar hospital environment (Kang et al., 2008). In addition, undergraduate nursing students may be particularly susceptible to anxiety due to pressures of the nursing profession on top of academic stressors faced by college students (Kanji et al., 2004). Increased stress levels are also reflected in the healthcare industry and contribute to poor health outcomes, which has a negative effect on quality of life affecting quality of care (Bormann, et al., 2006). Stress compromises the well-being of nursing students and healthcare workers and may contribute to the development of anxiety (Praissman, 2008).

Students experience various levels of anxiety related to performance in clinical environments with simulations and authentic clinical settings. In a study determining the relationship of acute stress, anxiety, and salivary α-amylase level with performance of student

nurse anesthetists during human-based anesthesia simulator training, McKay et al. (2010) found that low performers have increased stress and perform poorly, but high performers have increased stress and perform exceptionally well, while moderate performers have modest stress and perform moderately. This suggests that some levels of anxiety in some students can be beneficial, but some students perform poorly in high anxiety training methods like simulation training.

When assessing the effect of HFS on pediatric nursing students' anxiety, Megel et al. (2011) found that anxiety scores were significantly lower in students that experienced the four hour simulation experience prior to the start of their in-patient hospital rotation versus those students that began their in-patient hospital rotation without the simulated experience. Video training has been used to evaluate performance of nursing students related to skills and in simulation (Brimble, 2008 & Minardi & Ritter, 1999). Skills assessment using video analysis may give students anxiety due to self-consciousness during the filming of their performance (Brimble, 2008). Recording skills practice caused anxiety in nursing students, but was still considered helpful in increasing students' ability to learn effective interpersonal skills in a study of a 12 day clinical supervision course (Minardi & Ritter, 1999). Nursing student anxiety levels should be taken into account when determining the best training method for medication administration. It is also important to evaluate anxiety levels in relation to training and performance to determine the impact of educational training methods in practice.

Simulation. Simulation is one type of experiential learning used to provide students with the opportunity to observe or participate in medication administration (Bearnson & Wiker, 2005; Sears et al., 2010). Experiential learning with simulation in nursing students is a process in a simulated, controlled environment in which a close representation of an actual life event is personally encountered or directly perceived and ultimately results in knowledge, skills, and or

modification of behavior through critical reflection and applying personal meaning (Burnard, 1991; Fowler, 2007; Freire, 1972; McGill & Weis, 1989; Merriam-Webster online dictionary; Mesirow, 1998). Simulation is used to improve knowledge and develop performance skills for situations that may increase anxiety in nursing students in the clinical setting (Bearnson & Wiker, 2005; Sears et al., 2010)

Simulation is used in nursing schools to provide nursing students with clinical experiences in realistic situations without the risks to authentic patients (Billings & Halstead, 2005). Simulation allows the nursing student to apply knowledge and critical thinking skills in a safe environment where they have the opportunity to repeat specific learning experiences (Billings & Halstead, 2005). Simulation also allows nursing students the opportunity to experience specific clinical situations with a variety of medical conditions without requiring access to those types of patients in the clinical setting (Billings & Halstead, 2005). Simulation promotes interactions between students as well as the student and instructor to receive immediate feedback from instructors, encouragement regarding their actions, and corrective actions to guide future performance in simulation and the healthcare setting (Billings & Halstead, 2005). This leads to improved decision making skills and retention of classroom content which improves feelings of self-confidence and competence in clinical skills (Billings & Halstead, 2005).

Simulation may involve the use of: live actors, written scenarios, simulation games, computer simulations, simple manikins, or a human patient simulator (Bearnson, 2005). There are different levels of fidelity and technology utilized with simulation. Fidelity refers to the level of realism and different levels of technology may be used to modify levels of fidelity (Waldner & Olson, 2007). Low fidelity simulation allows students to focus on tasks or a specific skill and may use a static manikin or model for this task. Medium fidelity simulation may involve the use of a human patient simulator (HPS) which may provide realistic breath or heart sounds (Waldner

& Olson, 2007). High fidelity simulation may involve the use of a HPS that provides realistic breath or heart sounds, but also can be programmed to respond to interventions of the student (Waldner & Olson, 2007). High fidelity simulation is a close representation of an actual life event and may involve a high level of technology when using a HPS (Parker & Myrick, 2008).

SimMan™ is one example of a HPS; Simman™ is a life-sized human manikin with palpable pulses, heart, breath, bowel sounds, and an arm for intravenous (IV) fluids (Childs & Sepples, 2006). This simulator improves decision making and critical thinking through experiential learning and increases the students' self-confidence and self-efficacy (Parker & Myrick, 2008). It is theorized that the knowledge gained during simulation experiences with a human manikin is easily transferable to the hospital setting (Parker & Myrick, 2008). Although simulation is different from clinical experiences in the hospital, it is a valuable experiential learning tool for students as errors can be made in a safe environment without harming patients (Parker & Myrick, 2008).

Simulation is used in many industries as an educational tool to improve competence in specific skills or scenarios (McNeal, 2010). Simulation scenarios are most useful when they are incorporated into the educational curriculum and when each scenario assists in skill acquisition, retention of knowledge, transference of theory to clinical practice, development of self-confidence in practice, and the development of clinical reasoning (Wotton, Davis, Button, & Kelton, 2010). Simulation-based training increases knowledge and ability and repetitive training allows students to maintain competence over time (Summerhill et al., 2008). Simulation may be used to evaluate student performance and recognize abilities to manage critical cases, assess, detect, and act on clinical cues of a deteriorating client (Dillard et al., 2009; Endacott et al., 2010; Gantt, 2010; Tsai, Harasym, Nijssen-Jordan, Jennett, & Powel, 2003).

Simulation was found to be a valuable teaching tool that allows for hands-on learning to enhance learner satisfaction and self-confidence for novice critical care nurses, clinical practice, and interprofessional team training (Kyrkjebo et al., 2006; Stefanski & Rossler, 2009; Traynor, Gallagher, Martin & Smyth, 2010). Simulation helps students to gain perspective on the role of the nurse, to understand the relationship between theory and practice, and realize gaps in their knowledge (Traynor, et al., 2010). Collaboration between educational institutions and service providers are important to develop programs to expand the use of simulation laboratories by implementing community-wide continuing education courses for the nursing community (Stefanski & Rossler, 2009).

Simulation may be used in teaching medication administration and patient safety (Bearnson & Wiker, 2005; Sears et al., 2010; Thompson & Bonnel, 2008). When nursing students participated in a two hour HFS session with three different patients needing pain medications, students found that the HFS session increased knowledge of medication side effects, increased knowledge of differences in patients' responses, increased ability to administer medications safely, and increased confidence in medication administration skills (Bearnson & Wiker, 2005). Thompson & Bonnel (2008) describe the integration of HFS in an undergraduate pharmacology course and found that HFS promotes opportunities for students to practice newly gained knowledge which can ultimately promote patient safety. Results are mixed in the literature regarding outcomes of simulation training. Further research is needed to evaluate the outcomes of simulation, to compare the various levels of fidelity in simulation training, and to evaluate the transfer of competence into the clinical setting.

Video training. Video training is used in nursing schools to provide students with visual and auditory examples of various nursing skills like medication administration to help them train for performance in the clinical setting (Chan, 2010). Video training is an inexpensive training

method that allows the student to be exposed to a specific type of patient situation which may not be available in the clinical setting (Chan, 2010). Video training may include expert demonstrations and explanations, screen captured presentations, lectures, interviews, or simulated scenarios (Barratt, 2010 & Chan, 2010).

There are multiple ways of using VT in nursing schools. Video training is often used in distance education or hybrid courses, in which students utilize both classroom and distance education methods including webcasts or podcasts (Chan, 2010). Video training has the advantages of being available for purchase, easily recorded by instructors on site in simulation laboratories, or posted on you tube for home or classroom use (Agazio & Buckley, 2009 & Chan, 2010). Some examples of VT in nursing education are online instruction videos of physical examination skills in a health assessment course (Lashley, 2005), videos of clinical examinations of nurse practitioner students (Barratt, 2010), skills videos using the iPOD (Hansen et al., 2011), and showing interprofessional simulation scenarios on DVD (Williams, French, & Brown, 2009).

An example of video-recording of simulated structured clinical examinations was found beneficial in nurse practitioner education because it allowed for flexibility in staff resources and time, allowed for mistakes to be viewed and corrected, it was possible to use the videos for various students, and the recordings could easily be made available for students via the internet (Barratt, 2010). In a study of providing instructional videos of female and male urinary catheter insertion by iPOD to medical trainee interns, students' confidence levels were evaluated three consecutive months (Hansen et al., 2011). Students in the experimental group that had training using the iPOD maintained a stable competency level in female and male urinary catheter insertion compared to a control group who had a decline in competency over time (Hansen et al., 2011).

Interprofessional DVD simulations were also perceived by nursing students as a useful learning tool to supplement students' clinical placements and provided a cost effective way to provide learning opportunities outside of clinical placements (Williams et al., 2009). When video analysis was used to evaluate nursing students in a simulated environment, students had concerns about being judged by others, making mistakes, feeling embarrassed, and worrying about personal appearance; those concerns were eliminated after participating in this type of training (Brimble, 2008). Students found the use of video cameras in the clinical skills laboratory as a useful tool for assessing competency (Brimble, 2008).

When using video-based introductory, instructional, and evaluation applications, Sorenson & Dieter (2005) found that students scored higher on exams and there were fewer deficiencies at midterm. Faculty also found the videos allowed for quick identification of students that needed help, provided means for immediate feedback, and allowed for faster progression into advanced content (Sorenson & Dieter, 2005). Video assessment of student skill performance has been evaluated as an effective method for assessing student learning and may improve student learning and reduce stress (Shorten & Robertson, 1996).

When video-based self-assessment was used by nursing students, there was a statistically significant difference in exam scores and satisfaction for the video-review group than the control group and allowed for students to develop awareness of their strengths and weaknesses which improved clinical skills (Yoo, Son, Kim, & Park, 2009). Paul (2010) found that using video-recording for students to assess their performance of cardiopulmonary resuscitation (CPR) during a mock objective structured clinical examination (OSCE) was beneficial to the six participants in identifying skills deficits, but suggested having students repeat the OSCE and compare performance. In a study to determine effectiveness and student attitudes toward online instructional videos for teaching clinical nursing skills, Kelly, Lyng, McGrath, & Cannon (2009)

found that student outcomes were unchanged and videos are best used to support lecturer demonstration rather than replace this teaching method. Using videos to self-assess psychomotor skills using videotape in first year nursing students was beneficial in establishing self-regulated learning, but students tended to overrate their performance when compared to faculty assessment (Watts, Rush, & Wright, 2009).

Benefits of VT may include keeping students' attention (Chan, 2010), potential for enhancing critical thinking ability (Chau, et al., 2001), cost effectiveness, a supplement for clinical experiences, and increased self-efficacy (McConville & Lane, 2006). Students valued video instructions for learning because these videos were able to hold the learners attention; students also valued high quality visual content and fast loading speeds as well as captions (Chan, 2010). In a study evaluating the effects of using videotaped vignettes on enhancing students' critical thinking ability in a baccalaureate nursing program using a pre-test, post-test design, post-test scores were significantly higher, but the critical thinking skill test scores were not significantly higher (Chau, et al., 2001). The self-efficacy of nursing students dealing with difficult situations was increased when using on-line video clips, but there was not a significant increase when compared with lectures (McConville & Lane, 2006).

The limitations of VT include a lack of hands-on experience, shows only one way to perform a skill, shows the skill in a specific scenario when there may be multiple ways to perform in that scenario, and permits minimal student interaction. If using online methods, computer skills of students need to be assessed and appropriate training provided (Guhde, 2010). Faculty should also take into consideration the amount of time and resources it takes to create the videos and providing specific examples for students when posting these types of assignments (Guhde, 2010). The results are mixed related to VT enhancing skills performance and there is a

need for research specific towards VT and medication administration and how that training may

be transferred into the clinical setting.

Chapter 2

Review of Literature

Theoretical Framework. Experiential learning in the context of HFS in nursing education is a process in a simulated, controlled environment in which a close representation of an actual life event is personally encountered or directly perceived which ultimately results in knowledge, skills, and or modification of behavior through critical reflection and applying personal meaning (Burnard, 1991; Fowler, 2007; Freire, 1972; McGill & Weis, 1989; Merriam-Webster online dictionary; Mesirow, 1998). Reflection on the experience allows for deeper understanding and the HFS method allows for repeated experiences (Kolb, 1981). The repeated exposure to concepts and skills through experiential learning and reflecting on them creates the opportunity for the nursing student to develop understanding (Kolb, 1981). Once understanding has begun, generalizations are made which may be applied to new simulation experiences and the student learns to apply the concept or skill in new and different ways (Kolb, 1981). Once the student has developed understanding to this level, the student can transfer what is learned to the clinical environment (Kolb, 1981). The student is then able to learn by experience with real patients in the authentic clinical setting.

Epistemological basis for learning. The use of experiential learning in the context of HFS in nursing education is supported by an epistemological basis for learning based on constructivism, experiential learning theory, and Benner's novice to expert model (Benner, 1984; Billings & Halstead, 2005; Kolb, 1981). In describing experiential learning methods, Burnard (1986) explains that the epistemological basis for experiential learning in nursing education can be divided into propositional knowledge, practical knowledge, and experiential knowledge (Burnard, 1986). Propositional knowledge is described as "book knowledge" or the "facts, theories or ideas, about a subject" (Burnard, 1986, p.190). Practical knowledge is skill

knowledge or understanding "how" to do something (Burnard, 1986, p.190). An example is taking a blood pressure. A student can develop propositional knowledge through reading in their book the process of taking a blood pressure; the student can develop the practical knowledge by applying the process by taking a blood pressure of a partner in lab. The student can develop propositional knowledge alone or preferably, the student will learn both practical knowledge, along with propositional knowledge so the student understands how, but also understands why (Burnard, 1987).

Experiential knowledge is gained through a direct personal relationship with a subject or person (Burnard, 1987). In the case of blood pressure, this is the experience of taking an actual patient blood pressure in the clinical setting. The student that experiences this interaction with taking a blood pressure of an actual patient will then have their own experience to learn from. Through reflection, the student can develop the experiential knowledge to go along with the propositional and practical knowledge so that this knowledge is used in the next interaction. An example of learning from experiential knowledge could be having a patient that has a shunt for hemodialysis. The student learns from this interaction that they need to take the blood pressure on the arm without the hemodialysis shunt. The student could then add that interaction to their knowledge base and now understands that blood pressures cannot always be taken the same way for every patient (Burnard, 1987).

Constructivism. The constructivist believes knowledge is constructed in order to understand experiences and the meaning of those experiences (Billings & Halstead, 2005). Each nursing student interacts with their learning environment uniquely and comes with their own individual understanding based on that interaction. This experiential learning process involves context, relationships, interaction, emotions, and feelings that lead to intellectual learning (Boud,

Cohen, & Walker, 1993). Experiential learning involves active interaction with the environment and developing meaning through reflection is a vital part of experience (Boud et al., 1993).

Kolb's theory of experiential learning. Kolb describes the importance of experience in the learning process through his theory of experiential learning. Kolb's (1981) theory of experiential learning is a cyclical model that describes the experiential learning process. This process includes a concrete experience, observations and reflections, formation of abstract concepts and generalizations, and testing implications of concepts in new situations. Concrete experiences are those new experiences the learner is able to be fully involved in (Kolb, 1981). Observations and reflections on those experiences are essential to experiential learning (Kolb, 1981). The formation of abstract concepts and generalizations occur through the observations and reflections on the concrete experience (Kolb, 1981). Testing implications of concepts in new situations is when the learner can apply what is learned in this process by using the theoretical concepts developed from abstract concepts and generalizations (Kolb, 1981). Nursing attracts different types of learners and Kolb's theory of experiential learning supports varied learning styles as students learn through reflection on their unique experiences (Kolb, 1981). This process of learning through reflection of experiences is also described in Benner's (1984) model Novice to Expert.

Benner's Model Novice to Expert. Benner's (1984) model of Novice to Expert shows the importance of experience in developing expert nurses. According to Benner (1984), knowledge development in nursing expands practical knowledge through theory and clinical experience. The Dreyfus model applied to nursing practice is described in five stages: Novice, Advanced Beginner, Competent, Proficient, and Expert (Benner, 1984). Nursing students are novices and they have limited understanding of the application of textbook terms in the clinical setting (Benner, 1984). Advanced beginners are nurses that demonstrate acceptable performance

through experience of actual situations in which knowledge is applied to nursing practice (Benner, 1984). Competent nurses have experienced related situations in nursing practice and have utilized strategies to achieve efficiency and organization (Benner, 1984). The proficient nurse views experiences holistically and develops meaning through long-term goals (Benner, 1984). The proficient nurse has learned what to expect in certain situations and understands how to adjust actions in response to events (Benner, 1984). The expert nurse does not rely on rules to connect understanding to an appropriate action (Benner, 1984). The expert nurse intuitively understands each situation and focuses on the specific problem without having to eliminate other options first (Benner, 1984).

Although Benner's model Novice to Expert is focused on the nurse in clinical practice, this theory has relevance in nursing education. Benner (1984) describes experience as a change agent for nurses to develop from the novice nurse to the expert nurse. Nursing students also learn from experience during nursing school and this ultimately leads the student to a level of competence as a beginning nurse. The nursing student is a novice learner and benefits from clinical experiences to develop knowledge in order to connect theory to practice.

One way students learn from experience is in the high fidelity simulated environment. High fidelity simulation is a clinical experience that expands propositional and practical knowledge through the use of a human patient simulator. The students then take this knowledge and use it in a safe environment for further learning through experience without the risk of harming a live patient. High fidelity simulation allows nursing students opportunities to gain clinical experiences that are not available in the traditional hospital clinical setting and also allows for repeated exposure to specific patient scenarios.

High fidelity simulation supports constructivism by the construction of knowledge through the students' unique experience with active participation in HFS. Students come to their

own understanding through simulated patient care and reflection during debriefing. High fidelity simulation incorporates experiential learning which is supported by Kolb's theory of experiential learning. The HFS experience with a HPS is the concrete experience and debriefing allows for observation and reflection on the HFS experience. The formation of abstract concepts and generalizations happens through repeated exposure of students to simulated scenarios about the same topic and students apply what they have learned from their HFS to test implications of concepts in new situations during their clinical practice. Benner's Novice to Expert supports HFS by using this experience to prepare nursing students to become competent novice nurses. Nursing students have limited exposure to the application of theory into practice, but HFS helps them to gain experience prior to exposure to the clinical environment. Once they are in clinical experiences, the knowledge gained through HFS will help them apply theory to practice.

Concept Analysis: Experiential Learning. The concept of experiential learning is used in various disciplines to describe education that occurs through an encounter with the environment. Experiential learning is important to nursing education because it allows the student to apply their knowledge in an active learning environment. Experiential learning is a broad concept and there are multiple definitions. The purpose of this concept analysis is to define experiential learning in the context of HFS as applied to nursing education using the Walker & Avant (2005) strategy for concept analysis. Application of this concept in nursing education and implications for research are also explored.

Concept analysis method. Concept analysis is used to define and clarify a concept (Walker & Avant, 2005). Walker & Avant (2005) list eight steps for concept analysis: select concept, determine aim of analysis, identify all uses of concept, determine defining attributes, construct a model case, construct an additional case, identify antecedents and consequences, and define empirical referents. The Walker & Avant (2005) method is used to define experiential

learning in the context of HFS of nursing students; a model case, related case, and contrary case are presented. Antecedents, consequences, and empirical referents are identified.

  Experiential learning defined. Experiential learning has many definitions found in the literature. Experience according to Merriam-Webster Online Dictionary and Thesaurus has five definitions given. Experience is defined as "direct observation of or participation in events as a basis of knowledge", "the fact or state of having been affected by or gained knowledge through direct observation or participation". Merriam-Webster Online Dictionary and Thesaurus also defines experience as "practical knowledge, skill, or practice derived from direct observation of or participation in events or in a particular activity", "the length of such participation <has 10 years' experience in the job>". Experience is defined as "the conscious events that make up an individual life", "the events that make up the conscious past of a community or nation of humankind generally" (Merriam-Webster online dictionary). Finally, experience is defined as "something personally encountered, undergone, or lived through", "the act or process of directly perceiving events of reality" (Merriam-Webster online dictionary). Learning is defined as "the act or experience of one that learns" or "knowledge or skill acquired by instruction or study", or "modification of a behavioral tendency by experience as exposure to conditioning" (Merriam-Webster online dictionary).

  There are multiple definitions of experiential learning found in the literature. According to Kolb (1984), experiential learning is defined as learning that happens through an encounter with an experience that is prepared by instructors in a course or curriculum. This is a limited definition as experiential learning involves much more than an encounter prepared by instructors. Experiential learning is active rather than passive and includes critical reflection of the experience (Burnard, 1991; Fowler, 2007; Freire, 1972; McGill & Warner Weis, 1989; Mesirow, 1998). McGill & Weis (1989) expand on reflection by including the creation of personal

meaning of the experience through reflection. Boud, Cohen, & Walker (2000) emphasize the importance of experiential learning as they describe experience as the foundation for learning. Cohen, Boud, & Walker (2005) believe that learners are involved in active learning that is holistic and influenced by a socio-emotional context which is socially and culturally constructed.

HFS defined. High fidelity simulation is a close representation of an actual life event and may use a high level of technology (Parker & Myrick, 2008). Human patient simulators are used to provide realistic "humanlike" simulation experiences (Parker & Myrick, 2008, p.2). Other models of simulation include low fidelity and medium fidelity (Waldner & Olson, 2007). Low fidelity simulation focuses on tasks and allows students to concentrate on a specific skill like CPR training using head and chest manikins (Waldner & Olson, 2007). Mid fidelity simulation (MFS) is more realistic and may provide breath or heart sounds without chest movement or palpable pulse (Waldner & Olson, 2007). High fidelity simulation is different than low or medium fidelity in that signs and symptoms of the simulated patient can be programmed and the simulated patient can respond to interventions of the student (Waldner & Olson, 2007). This concept analysis focuses on experiential learning in the context of HFS in nursing education. SimMan™ is one example of HPS that can be used in HFS.

SimMan™ is life-sized and has palpable pulses, heart, breath, bowel sounds, and an arm for IV fluids (Childs & Sepples, 2006). SimMan™ improves decision making and critical thinking through experiential learning and increases the students' self-confidence and self-efficacy (Parker & Myrick, 2008). Students perceive the knowledge gained during simulation experiences as easily transferable to the hospital setting (Parker & Myrick, 2008). Although simulation is different from clinical experiences in the hospital, it is a valuable experiential learning tool for students.

Defining attributes. Defining attributes of experiential learning in the context of HFS in nursing education include the HFS experience, reflection on that experience, and development of competency to apply to practice. The HFS experience is in a controlled environment and must include a life-like simulated experience that could happen in clinical practice (Baker et al., 2008; Billings & Halstead, 2005; Hamilton, 2005; Parker & Myrick, 2008). This life-like simulated experience helps to make the experience easily transferable to the hospital setting where the student eventually applies what is learned into practice (Baker et al., 2008; Ham & Rourke, 2004; Hamilton, 2005; Parker & Myrick, 2008).

Experiential learning in the context of HFS in nursing education includes reflection (Boud, Cohen, & Walker, 1993; Horton-Deutsch & Sherwood, 2008; Hough, 2008; Kolb, 1984; Steinaker & Bell, 1979). Reflection is connected to emotion and leads to deep learning in which the student develops knowledge and skills for decision making (Horton-Deutsch, 2008; Hough, 2008; Kolb, 1984; Steinaker & Bell, 1979). Through HFS, nursing students have the opportunity to deal with high-risk, low-frequency events like cardiac arrest (Devita, 2005). Reflecting on those experiences helps in improving competence in dealing with those situations in simulation and transferring that experiential knowledge into clinical practice.

Experiential learning leads to development of competence in nursing concepts and skills (Brannan, White, & Bezanson, 2008; Bruce, et al., 2009; Devita, 2005; Donoghue et al., 2009; Ham & Rourke, 2004; Hough, 2008; Villamaria, et. al, 2008; Waldner & Olson, 2007). Competency is the development of propositional and practice knowledge, problem-solving ability, clinical judgment, technical, and interpersonal skills (Baker et al., 2008; Hough, 2008). Students develop competency through experiential knowledge by interacting with the HFS encounter and active engagement with a simulated patient (Burnard, 1987). The student then

understands better how to deal with those situations in the simulated environment. Competency gained through this simulated experience may be transferable into the clinical setting.

Other defining attributes include an emotional component, social interaction, behavioral change, and working as a team. Emotions play an important role in intellectual learning (Boud, Cohen, & Walker, 1993; Dirkx, 2008; Freshwater & Stickley, 2004; Rosenzweig, Breedlove, & Watson, 2005). According to Rosenzweig et al. (2005), emotions can actually change memory formation. When a student is concerned about a patient in simulation or their performance in simulation, the student develops an emotional connection to the experience and it helps the student to remember the simulated scenario. The emotions felt in simulation also give the students a better understanding of how that experience may make them feel if they were to have a similar experience in the clinical setting. Marsch et al. (2005) list the importance of simulation in altering behavior since there is an opportunity to learn from mistakes and rehearse the scenario to improve.

High fidelity simulation is one way to improve team dynamics (Marsch et al., 2005; Messmer, 2008). A team approach is often times used with HFS during the experience, and after the simulated experience through the process of debriefing. Students work together to assess the simulated patient, identify a problem, provide interventions, and reassess the simulated patient. After the scenario, students work together to reflect on their experience sharing aspects that went well and areas of potential change. Social interaction and team dynamics are essential for experiential learning using HFS to occur (Boud et al., 1993).

Antecedents. Experiential learning using HFS in nursing education is further characterized by the nursing instructor, the nursing student, and the high fidelity HPS. Antecedents may also include the time, resources, and ability to create, practice, facilitate, and reflect on the simulation experience. The nursing instructor is the facilitator of experiential

learning using HFS with intentions to provide the experience, ask reflective questions and guide students to interact in the experience (Fowler, 2007). The facilitator also needs training in order to operate the high fidelity equipment as well as training in debriefing, and creating opportunities for students to reflect on their experience.

The student is the active participant and must be motivated to interact with the simulated experience and reflect on that experience (Fowler, 2007). The student needs to have the ability to draw on emotions and the ability to interact on a social level with the simulated patient, other students, and the facilitator (Boud et al., 1993; Dirkx, 2008; Freshwater & Stickley, 2003; Marsch et al., 2005; Messmer, 2008). Students need some level of cognitive ability, the ability to alter behavior based on the situation, and the ability to reflect on experience (Boud et al., 1993; Brannan, White, & Bezanson, 2008; Horton-Deutsch & Sherwood, 2008; Hough, 2008; Kolb, 1984; Lawrence, 2008; Marsch et al., 2005; Steinaker & Bell, 1979). The ability to work with others cohesively is also an important antecedent to experiential learning in the context of HFS (Marsch et al., 2005; Messmer, 2008).

The HPS delivers a level of experiential learning outside of the clinical setting which is controlled and safe (Parker & Myrick, 2008). HFS requires resources of space to house the high fidelity simulation lab, staff required to run the simulator, and training for the staff and facilitator. These resources are time consuming and expensive.

Consequences. Consequences of experiential learning in the context of HFS include the opportunity to learn from mistakes, acquirement of new skills, and competency development (Bruce, et al., 2009; Devita, 2005; Donoghue et al., 2009; Fowler, 2007; Hough, 2008; Waldner & Olson, 2007; Villamaria, et al., 2008). Competency includes developing knowledge and skills for decision making, problem-solving ability, clinical judgment, technical, and interpersonal skills as well as understanding (Hough, 2008; Melby, 2000; Waldner & Olson, 2007). Other

consequences include self-growth, personal development, and professional development of the participant (Fowler, 2007; Steinaker & Bell, 1979). Self-growth includes growth of the individual, professional life, and academics (Fowler, 2007; Steinaker & Bell, 1979). Personal and professional development includes self-respect, hope, control, vulnerability, acceptance, loss and persistence (Daley, 2001).

Other consequences include improved self-confidence and self-efficacy of the participant (Bruce et al, 2009). Experiential learning in the context of HFS in nursing education also increases comfort with communication and planning care of patients as well as improvement of team dynamics and teamwork (Fowler, 2007; Marsch et al., 2005; Messmer, 2008). All of these consequences ease the transition to apply concepts and skills from the classroom to clinical environments (Ham & Rourke, 2004).

Demonstration cases. *Model case.* John is a nursing student attending a SimMan™ simulation session for an adult health class. The simulated patient is a 32 year old mother named Jane being sent to surgery for a congenital heart problem. John is one of four nursing students in the simulation room for this scenario. As John was assessing the simulated patient Jane, she became unresponsive without respirations or heart-beat. John called a code and started CPR along with another student. Jane (SimMan™ simulated patient) was stabilized and sent to surgery.

John then received a call from the operating room that Jane died during surgery. The spouse of Jane came in the room with his three year old daughter and John had to explain to the spouse that his wife died in surgery. John tried to comfort the spouse and the simulation ended. John and his group members involved in the simulation came to the debriefing room where the group's other classmates had watched the simulation. The instructor facilitated the debriefing session by asking students what was done well and what could be changed to improve. The

instructor facilitated the simulation experience and asked the students how they felt during the simulation and what was learned. In this way, the students had the opportunity to reflect on their experience in the simulation laboratory.

John and the group members were sad for the spouse of the patient and felt like they did not do enough to help the patient or the spouse. John had trouble understanding why Jane died even though CPR worked and he really did not know how to comfort the spouse after he told him that his wife had died. John and the group members had the opportunity to repeat the simulated scenario in order to reflect on the emotional coping during the process as well as improve competence in dealing with this type of situation. The students repeated the scenario working together as a team and improved upon social interaction with each other as well as the spouse. John and the group members were able to alter their behavior as a team and when speaking with the spouse to develop understanding and improve performance during the HFS experience.

The next week on the medical-surgical unit in the hospital, John had a patient with a terminal diagnosis. John felt prepared to give CPR if needed and he was able to talk to the family and listen as they spoke about their feelings about the patient. This is an example of experiential learning using HFS because John is involved in this simulated clinical experience with Jane (SimMan™: HPS) in a controlled environment. This simulated experience was life-like and concepts and skills learned could be transferred to clinical practice. This scenario is also considered high-risk, low-frequency meaning it is an emergent situation, but does not happen often. John was able to reflect on his experience and developed an understanding of what to do when encountering a patient that needed CPR and how to talk to a family member in the grieving process. Emotional coping strategies were used and John and the group members were able to use them effectively through social interactions, working as a team, and ultimately able to alter behavior during the simulated scenario. John was able to apply what he learned in clinical

practice by feeling prepared to give CPR to a patient and speaking to a family member of an authentic patient with a terminal diagnosis that was in the grieving process.

Contrary case. Molly is a computer science student in an online CPR training course. Molly participates in the course by reading the class material. Although there is the opportunity to email and chat with classmates about the topic, Molly chooses not to do so. She does not participate in discussion online about CPR and the assigned reading. She does not actively practice with a head and chest manikin and there is little to no interaction with the other students in the class. Molly is not emotionally involved as she is only reading class materials about CPR. She learns how to open the airway, give ventilations, and perform chest compressions from the online course materials. She then takes an online exam for the CPR course, but she is not able to pass this exam. She chooses not to take the class again and she does not give anyone CPR. She does not reflect on her experience in this course. This is not an example of experiential learning using HFS in nursing students because Molly reads the course materials online, but she does not interact with other students and she does not practice CPR on a manikin. Molly is not involved in teamwork and does not have a HFS experience. Molly does not develop understanding, alter her behavior, or apply what is learned to practice.

Related case. Mary is a nursing student attending a CPR training course. Mary participates in the course by watching a training video and practicing on a head and chest manikin opening the airway, giving ventilations using a mouth to mask method, and performing chest compressions. Mary partners with another student in the class to practice team CPR. Each student performs in the appropriate role either giving ventilations using the mouth to mask method or providing chest compressions. The students switch positions in order to learn each role. Mary then participates in team CPR using the automated external defibrillator (AED).

Each student practices putting the pads on the head and chest manikin, and follows directions of the AED ultimately shocking the simulated patient.

At the end of the class Mary takes a test to evaluate what was learned in the CPR training course. Mary passes the course and obtains a CPR card and is now qualified to give CPR to a patient when needed. Mary attends a clinical experience for nursing school the next day and does not use CPR when in the clinical setting. This is related to the model case because it is experiential learning using simulation. However, Mary participates in LFS using the head and chest manikin instead of HFS using the HPS. There is little emotional involvement and limited reflection, but understanding is developed.

This experience could happen in clinical practice, but LFS is less life-like. This is a controlled environment, but different than HFS because the manikin is not as life-like because it does not breathe or have palpable pulses or heart sounds. Cardiac arrest is considered a high risk, low frequency event and Mary uses repetition to improve ability in performing CPR on the manikin during the class. Mary is able to work in a team and is involved in social interaction with her teammate. This experience alters Mary's behavior in dealing with cardiac arrest patients, but she is not able to apply what is learned in the clinical setting after practicing with this case.

Empirical referents. Empirical referents of experiential learning in the context of HFS in nursing education includes the HFS experience which incorporates use of a high fidelity manikin, the students' active engagement in the scenario with emotional impact, use of social interaction, and working as a team (Boud et al., 1993; Dirkx, 2008; Freshwater & Stickley, 2004; Rosenzweig et al., 2005). Another empirical referent is guided reflection on the HFS experience (Boud et al., 1993; Horton-Deutsch & Sherwood, 2008; Hough, 2008; Kolb, 1984; Steinaker & Bell, 1979). Finally empirical referents include developing understanding from experience and

applying what is learned in clinical practice (Brannan, White, & Bezanson, 2008; Bruce, et al., 2009; Devita, 2005; Donoghue et al., 2009; Ham & Rourke, 2004; Hough, 2008; Kolb, 1981; Marsch et al., 2005; Messmer, 2008; Villamaria, et. al, 2008; Waldner & Olson, 2007).

Implications for research. This concept analysis of experiential learning in the context of HFS of nursing students has many implications for nursing education and research. High fidelity simulation is an experiential, active learning technique to help adult learners improve practice through active engagement and reflection. This may influence nursing instruction and hospital orientation programs for new graduate nurses. Research questions may include how experiential learning using HFS influences specific competencies of nursing students and how this influences nursing students in the clinical setting. The comparison of experiential learning using HFS to LFS to MFS, VT, or lecture in achieving learning outcomes could be other implications for research. Other research questions may include how experiential learning using HFS influences state anxiety during performance of specific competencies like oral medication administration and how HFS training influences state anxiety levels in the clinical setting. Other questions may include the use of HFS on nursing students' competency and state anxiety in high risk, low frequency clinical scenarios, like cardiac arrest. Other implications for research include measuring the importance of emotion and behavior in experiential learning using HFS, or measuring the influence of social interaction and team dynamics on behavioral conditioning in experiential learning. Emotional coping, social interaction, and team dynamics may also influence the development of competence or understanding should be described. Finally, it is important to compare performance in clinical to performance in a simulated scenarios to determine if concepts and skills are transferred.

Conclusion. Experiential learning in the context of HFS in nursing students is a process in a simulated, controlled environment in which a close representation of an actual life event is

personally encountered or directly perceived and ultimately results in knowledge, skills, and or modification of behavior through critical reflection and applying personal meaning (Burnard, 1991; Fowler, 2007; Freire, 1972; McGill & Warner Weis, 1989; Merriam-Webster online dictionary; Mesirow, 1998). An epistemological basis for learning, constructivism, Kolb's (1981) experiential learning theory, and Benner's (1984) novice to expert model help to clarify this concept.

Experiential learning in the context of HFS is defined by a HFS experience, in a controlled environment, that is life-like and could happen in clinical practice. It is further defined by exposure to high-risk, low frequency events and repeated experiences. Emotional coping and reflection on the simulated experience, as well as social interaction and working as a team separates this experiential learning from other types of learning. The last defining features are development of understanding through reflection, altering behavior, and applying what is learned in clinical nursing practice.

Pertinent Topics in Clinical Nursing Education. *Background.* Simulation has been used in many industries including aviation, transportation, space exploration, and nuclear power industries (McNeal, 2010). In many cases simulation is a required learning technique to ensure safety in a variety of ways depending on the industry involved (McNeal, 2010). It is of vital importance that nurses practice safety in today's healthcare industry. The nursing shortage, decreased patient length of stay in hospitals, increased hospital closures (McNeal, 2010), increased patient acuity, and competition for clinical sites (Broussard, Myers, & Lemoine, 2008; Hauber, Cormier, & Whyte, 2010) limit the opportunities for traditional clinical experiences for nursing students where they can practice their skills.

Increases in technology and attempts to increase safety and patient satisfaction in nursing has led to the development of new training strategies in nursing education (Alinier, Hunt,

Gordon, & Harwood, 2006; Feingold, Calaluce, & Kallen, 2003). High fidelity simulation is one way for nursing students and nurses to develop, synthesize, and apply their knowledge in a realistic simulated environment (Cant & Cooper, 2010; Cordeau, 2010). Even though simulation is not an authentic patient experience in the clinical setting, simulation provides elements of real clinical situations, including planning and implementation of interventions, assessment of measurable patient responses to medications, and evaluation of patient outcomes (Bearnson, 2005). This integrative literature review investigates the current findings in the literature regarding HFS, VT, medication administration, competency, anxiety, and nursing education.

Purpose. This purpose of this integrative literature review is to identify evidence regarding the use of HFS, VT, medication administration, competency, and anxiety in nursing education. This integrative literature review will determine how HFS is used and its relation to the other topics mentioned above in nursing education. The implications of these findings for evidence-based practice will be considered by discussing advantages, challenges, considerations, limitations, gaps in the literature, and implications of the published empirical literature.

Methods. The intent of this integrative literature review is to evaluate and summarize research on HFS and nursing education. The related topics of VT, medication administration, competency, and anxiety in relation to nursing education will also be evaluated as they impact HFS. The synthesis process involves the combination of the results of the published research to form themes across the body of empirical literature. These themes will then be used to draw overall conclusions.

Setting and sample. Initial inclusion criteria for this integrative literature review were peer reviewed journal articles including case examples, concept analyses, integrative reviews, literature reviews, quantitative and qualitative studies with descriptive, quasi-experimental, and experimental research between the years of 2003-2010. A search of the literature was conducted

from electronic databases using Elton B. Stevens Co. (EBSCO) Host [Academic Search Premier, Alt Health Watch, Business Source Premier, Cumulative Index to Nursing and Allied Health (CINAHL), Computer Source, Consumer Health Complete, Education Resources Information Center (ERIC), Healthsource, MasterFile Premier, Military & Government Collection, Newspaper Source Plus, Professional Development Collection, Psychology and Behavioral Sciences Collection, Teacher Reference Search, TOPICsearch, & MEDLINE] regarding HFS and nursing education.

The search of EBSCO Host using the key words simulation and education yielded 45,428 results so the search was reduced using the key words simulation and education and nursing yielding 6419 resulting articles. The focus was then narrowed further using terms HFS and nursing education and patient safety yielding 172 results. The search was narrowed further to HFS and nursing education yielding 41 results. A total of 37 journal articles were utilized in this integrative review. Five were excluded from this analysis due to limited applicability to HFS; one was added to give broader results regarding simulation evaluation instruments.

A second search of the literature was conducted to find further evidence regarding HFS, VT, medication administration, competency, anxiety in relation to nursing education. There were 25 HFS articles (2003-2012), 23 VT articles (1996-2012), 21 medication administration articles (1999-2012), 12 competency articles (2000-2012), and 22 anxiety articles (2004-2012) included in the second review of the literature.

Data analysis. Data elements entered into the matrix included the citation, purpose, data (sample and design) and key findings. The components of the matrix were then analyzed for themes. The themes were inductively identified, categorized, and coded. The themes were verified across studies prior to compiling the data for the final analysis. Data from the second

review of the literature were reviewed for further exploration into HFS and related topics of video training, medication administration, competency, anxiety, and nursing education.

Results. *Types of designs.* Thirty-seven journal articles were utilized for the initial integrative literature review. Study designs included 12 case examples, one concept analysis, two integrative reviews, four literature reviews, 12 quantitative studies, three qualitative studies, and three mixed method studies. The case examples reported on experiences using HFS related to simulation instruments, implementing HFS programs in a variety of settings, and factors associated with HFS. The concept analysis focused on debriefing in HFS. The integrative and literature reviews focused on HFS in nursing education and evaluation instruments related to HFS. The quantitative studies consisted of three experimental, three quasi-experimental, and six descriptive designs. The qualitative studies focused on the lived experience of clinical simulation and nursing student perception of intraprofessional team education using HFS. The mixed method designs were both descriptive and qualitative using likert scale surveys with comments.

A second review of the literature was completed on topics of simulation, VT, medication administration, competency, anxiety, and nursing education. Simulation articles included a literature review, two mixed method studies, eight quantitative studies, two qualitative, five descriptive, and seven case examples. Video training articles included a literature review, five mixed method studies, one qualitative study, four experimental quantitative studies, three quasi-experimental studies, three descriptive, and six case examples. Competency articles included two mixed method, two qualitative, three descriptive, and five case examples. Medication administration articles included two literature reviews, one integrative review, one mixed method study, four quantitative (one experimental & one quasi-experimental), seven qualitative, two descriptive, and four case examples. Anxiety articles included three mixed method studies, eight

quantitative (one experimental, two quasi-experimental), three qualitative, four descriptive, and four case examples.

Sample characteristics. The case examples included in this integrative study were from a variety of college, university and hospital settings: Kennesaw State University in Georgia (GA), University of North Carolina (UNC) at Charlotte and East Carolina University in North Carolina (NC), Midwestern State University in Texas (TX), University of Maryland in Maryland (MD), Charles Drew University of Medicine & Science and California State University in California (CA), Oregon Health & Science University in Oregon (OR), Macomb Community College in Michigan (MI), University of Hertfordshire, United Kingdom (UK), North Western Memorial Hospital in Illinois (IL), and Craig Hospital in Colorado (CO). The concept analysis was conducted at Indiana University in Indiana (IN). The integrative reviews were conducted at the Monash University in Australia (AU) and at Youngstown State University in Ohio (OH). The literature reviews were conducted at Robert Morris University in Pennsylvania (PA), the University of Louisiana in Louisiana (LA), Washington State University in Spokane, Washington (WA), and La Trobe University in AU.

The quantitative studies were conducted in a variety of colleges, universities, and training centers: Florida Atlantic University in Florida, Kennesaw State University and Valdosta State University in GA, University of Texas in TX, Robert Morris University in PA, Washington State University in WA, University of North Carolina at Wilmington, University of North Carolina at Pembroke, and New Hanover Regional Medical Center in NC, Louisiana State University in LA, Wright State University in OH and University of Northern Colorado in CO, University of Technology in Australia, University of Hertfordshire in the United Kingdom, and Proctor Hospital Training Center in IL. The qualitative studies were conducted at Quinnipiac University in Connecticut, McMaster University, and University of British Columbia in Canada. The mixed

method studies were conducted at Oregon Health & Science University in OR, Ball State University in IN, and University of Arizona in Arizona. The participants in these studies were nursing students in undergraduate and graduate programs, new graduates, and experienced nurses.

The second review of the literature included a wide variety of colleges and universities. Simulation articles were from: Brigham Young University in Salt Lake City, Utah, a regional simulation center and University of Mary Hardin-Baylor in Belton, TX, Texas Christian University with participants from Fargo, ND and Houston, TX, academic health science center in Midwest US, Wake Forest University school of medicine in NC, The Catholic University of America, university in Pennsylvania, PA, Lehman College in NY, Old Dominion University in Norfolk, VA, University of Louisiana Lafayette Critical Care Simulation Laboratory, Memorial Hospital of Rhode Island and Apert Medical School of Brown University Internal Medicine residency program, Creighton University School of Nursing in NE, University of Missouri Kansas City, American Heart Association and Laerdal Medical Corporation, Seneca College in Toronto and Georgian College Barrie, Ontario and Children's Hospital in Calgary (Canada), Perth, Western Australia, Alberta, Flinders University in Adelaide, Australia, Open University of Hong Kong, and Queens University Belfast, Ireland.

Video training articles were from: The Catholic University of America in Washington D.C., Towson University in MD, University of Akron in OH, Department of the Army Academy of Health Sciences Fort Sam Houston in TX, Northwestern State University, Shreveport in LA, South Dakota State University in SD, London South Bank University, Cardiff University, Edinburgh Napier University, University of Wolverhampton School of Health, University of Dundee in UK, Western Canadian, McMaster University southwestern Ontario in CA, Multimedia University in Malaysia, Chinese University of Hong Kong in China, Yonssei

University Seoul in KR, Ajou University, Suwon, Gyeonggi-Do in South Korea, University of Auckland in NZ, Dublin City University in IE, and University of Wollongong, New South Wales, Monash University Victoria in AU.

Competency articles were from schools of nursing in TX, Lamar University Beaumont, in TX, Miami University Hamilton in OH, Duke University, Durham in NC, University of New Hampshire, Durham in NH, Sauk Valley Community College Dixon, IL, McGill University in Montreal Quebec, University of Ontario Institute of Technology, Durham College Scarborough, Ontario in CA, major metropolitan hospital in Adelaide, AU, University of Johannesburg, South Africa. Medication administration articles were from Adelphi University Garden City, Erie County Medical Center and School of Nursing, University of Buffalo in NY, University of Portland in OR, FL, Selkirk College, Castlegar, British Columbia, Durham College, University of Ontario in CA, University of Huddersfield West Yorkshire, Cambridge, University of Leeds, emergency admissions unit in a city north of England in UK, University of Bergen, Bergen University College in Norway, Turku, Finland, Beaumont Hospital Dublin in IE, University of Auckland, Auckland in NZ, Queensland, Northern Territory University in AU, Arak University of Medical Sciences in IR.

Anxiety articles were from Southeastern regional university, The University of Tennessee at Martin, Martin, Tennessee, Northern Michigan University in MI, Yale University School of Nursing, New Haven CT, Uniformed Services University, Bethesda, MD, Bachelor of Science in Nursing (BSN) program in a public health sciences university in the Midwest, in suburban nursing program in NE in US, University of Manitoba in CA, AU universities, UK university, Mansoura University Mansoura in EG, Isfahan School of Nursing & Midwifery, Tehran University of Medical Sciences, Shiraz University of Medical Sciences in IR, Universidad de Valparaiso in CL, nursing students in TH and TR, nursing schools in JP.

High Fidelity Simulation. *Background.* High fidelity simulation is used to supplement clinical experiences in nursing education and in professional development (Alinier, 2007). High fidelity simulation is considered the most realistic simulation which may incorporate a computerized full body manikin that can be programmed to provide a realistic physiologic responses to clinical interventions; participants provide care to simulated patients in a realistic environment with actual medical equipment and supplies (Cant & Cooper, 2010). A computer simulates breathing, blood pressure, palpable pulses, heart tones, and breath sounds (Leigh, 2008).

High fidelity simulation is a tool of experiential learning used to replicate clinical practices in a safe environment and provides a way for students to participate in clinical decision making, practice skills, and observe outcomes from clinical decisions in a variety of clinical situations (Brannan & Bezanson, 2008; Cant & Cooper, 2010; Gordon & Buckley, 2009). High fidelity simulation prepares students to use skills in real life, to develop clinical judgment, refine cognitive, technical, behavioral skills, and team problem-solving skills (Touriniemi & Schott-Baer, 2008). High fidelity simulation allows for repetitive teaching of skills, remediation, and evaluation of student learning (Weaver, 2010).

HFS Research. There is a large body of research related to HFS in nursing education. This integrative literature review synthesizes current findings in the literature related to HFS and nursing education in the areas of satisfaction, competence and knowledge transfer, critical thinking, confidence, communication, best practices, debriefing, and simulation instruments. Strengths of using an integrative review to synthesize the data include varied viewpoints,

methodologies, and topics related to HFS in nursing education. The strengths in the literature included in this integrative review relate to analysis of the findings.

   Discussion. Student satisfaction was measured in many of the peer reviewed journal articles and although there were mixed results, overall student satisfaction was prevalent when using HFS in nursing education (Cant & Cooper, 2010; Corbridge, Robinson, Tiffen, & Corbridge, 2010; Garrett, MacPhee, & Jackson, 2010; Hoadley, 2009; Mould, White, & Gallagher, 2011; Smith, 2009; Smith & Roehrs, 2009; Stefanski & Rossler, 2009; Wotton et al., 2010). There was higher satisfaction for participants using HFS than participants that utilized online instruction (Corbridge et al., 2010). Participants were satisfied with HFS and LFS in another study comparing these techniques to teach Advanced Cardiac Life Support (ACLS) (Hoadley, 2009).

   There is a strong potential for HFS in nursing education to lead to competence and knowledge transfer (Alinier et al., 2006; Bearnson, 2005; Brannon, White, & Bezanson, 2008; Heitz, Brown, Johnson, & Fitch, 2009; Hoadley, 2009; Kidd & Kendall, 2006; Schlairet & Pollock, 2010; Weaver, 2010). High fidelity simulation was found to develop psychomotor skills actively rather than in a static environment, helped with leadership skills, and helped students recognize actual clinical skills while recognizing limits of the competence and the implications on patient safety (Sportsman, Schumacker, & Halmilton, 2011).

   High fidelity simulation has the potential to develop critical thinking in nursing students through repetitive practice and identifying cues and trends in deteriorating patients (Endacott et al., 2010; Fero et al., 2010; Kardong-Edgren, Starkweather, & Ward, 2008; Lee, Lee, Wong, Tsang, & Li, 2010). High fidelity simulation allows students to practice learned knowledge and decide between multiple clinical alternatives during patient care which may promote future patient safety (Thompson & Bonnel, 2008).

High fidelity simulation is a valuable teaching tool to offer hands-on learning opportunities to enhance self-confidence (Stefanski & Rossler, 2009; Traynor et al., 2010). High fidelity simulation was found to increase confidence in critical care practice, in performing technical and non-technical aspects of responding to a clinical emergency, and in medication administration (Bearnson, 2005; Gordon & Buckley, 2009; Mould et al., 2011). Student self-efficacy improved when using HFS in caring for patients at the end of life (Moreland, Lemieux, & Myers, 2012).

New graduate nurses described HFS as beneficial because it offered real-life critical care scenarios, allowed performance assessment in a risk-free environment, gave immediate feedback on performance, evaluated critical thinking in action, allowed videotaping with feedback on performance, and offered the opportunity to stop a scenario for teachable moments (Morris et al., 2007). Some of the positive outcomes that result from simulation include: facilitating learning through feedback on practice, enabling repetitive practice, integrating life-like practice throughout a curricula, providing a range of difficulty level, facilitating multiple learning strategies, controlling environmental conditions, individualizing learning, and defining outcomes of learning (Sportsman et al., 2011). Other advantages of simulation found in the literature included the ability to think spontaneously and actively rather than passively, conducting realistic situations in real time using actual supplies that would be used in the clinical setting, and decreased anxiety with higher self confidence in psychomotor skills (Broussard et al., 2008).

Other advantages noted were increased critical thinking abilities, increased comfort level with technology, and providing learners an environment to make mistakes and learn from them (Broussard et al., 2008). Larew, Lessans, Spunt, Foster, & Covington (2006) found that

simulation provides a positive learning experience where students can refine patient management skills and collaborate with multidisciplinary team members to resolve common postoperative problems. This teamwork is supported by repetitive training with interdisciplinary teams (Paige et al., 2009).

Kameg, Mitchell, Clochesy, Howard, & Suresky (2009) lists the main benefits of HPS as recreating real life situations without increasing risk to a live patient. Creating an interactive environment for teaching and learning, enhanced assessment and decision making, permitted replay to critique performance, and standardized learning for students. Simulation allows for a creative, interactive environment for teaching and learning (Kameg et al., 2009; Kardong-Edgren et al., 2008). High fidelity simulation may also be used to assess competency and determine readiness for practice (Booth & McMullen-Fix, 2012; Cannon-Diehl, Rugari, & Jones, 2012; Fero et al., 2010).

Challenges. Developing an HFS program requires knowledge, technical skill, commitment, time, and money (Lee et al., 2010; Tuoriniemi & Schott-Baer, 2008). In developing a clinical nursing education center for undergraduate nursing education in Hong Kong, Lee et al. (2010) discussed the phases used to establish this center: conceptualization (develop framework), exploration (solicit views from experts and work out possibilities to establish), and actualization (realize the concept and translate into action). Challenges to establishing a clinical nursing education center for the use of HFS include: budget, space, urgent need to revise the existing teaching materials from a traditional information-giving format into a scenario-based format to deliver through simulation, and faculty support (Lee et al., 2010).

Challenges to using simulation include expense, time, resources, needs for technical support and dedicated space for storing and using simulation equipment (Broussard et al., 2008; Feingold et al., 2003; Tuoriniemi & Schott-Baer, 2008). Other challenges include faculty

development, time to learn how to use equipment, time to develop scenarios related to learning objectives, and conduct research to validate simulation as an effective teaching and learning strategy (Broussard et al., 2008; Tuoriniemi & Schott-Baer, 2008). It requires additional time and coordination with assistive personnel to implement HFS; the instructor cannot perform everything required without assistance (Kardong-Edgren et al., 2008).

Integration of HFS in an undergraduate pharmacology course presented the following challenges: simulation development, consistency in implementation, creation of clinical situations, the time commitment to develop new cases, simulations need supervision, there is a potential for students to share scenarios to future groups of students which may affect results, building simulations into a course takes creativity and faculty and students must see the value of the applied HFS learning experience for it to work (Thompson & Bonnel, 2008). High fidelity simulation requires educators to change the way they define teaching and some educators are reluctant to change; faculty members involved in HFS need to be supported (Kardong-Edgren et al., 2008; Tuoriniemi & Schott-Baer, 2008).

According to the current literature, HFS may improve confidence of nursing students, but there were mixed results related to gains in confidence as a result of only HFS (Cant & Cooper, 2010; Weaver, 2010). When comparing HFS to traditional experiences of clinical and lecture, there was not a significant difference in confidence of the students (Blum, Borglund, & Parcells, 2010; Brannon et al., 2008). The literature is unclear to the gains in confidence from HFS when comparing learning methods.

There are numerous instruments to evaluate HFS; there are limited instruments that have proven validity and reliability (Kardong-Edgren, Adamson, & Fitzgerald, 2010). There needs to be valid and reliable instruments to measure the outcomes of HFS. To establish validity and

reliability, these instruments need to be used in repeated generalizable studies. There are few repeated generalizable studies in HFS.

Considerations of best practices. When simulations are based on educational best practices, they use an active, dynamic, and reflective process through which the students learn theoretical and clinical skills (Thompson & Bonnel, 2008). It is important to provide meaningful simulation experiences and provide resources for simulation coordinators to develop scenarios, effectively use clinical equipment, provide education support for faculty, and have equipment to mimic reality as closely as possible (Beattie, Koroll, & Price, 2010). Simulations should be learner-centered and raise awareness; simulations should include an orientation for students and facilitators, the role of facilitator, learner variables, assigning roles, specific learning outcomes, evidence based best practice, and debriefing which incorporates reflection and critical analysis (Beattie et al., 2010; Jeffries, Bambini, Hensel, Moorman, & Washburn, 2009).

Developing clear learning goals and preparing students for the simulation scenario are important along with the considerations of student group size, setting the stage (reports, patient charts, time, key concepts), and real-life scenarios (Garrett et al., 2010; Jeffries et al., 2009). Other considerations include the use of symmetrical scenarios (requiring similar psychomotor skills and complementary complexity levels), facilitator prompts, videotaping, and debriefing (Garrett et al., 2010). Considerations for simulation design should include a complexity of scenarios that match the learning needs of the student, well placed cues based on the individual student and the case, repetition, and the use of debriefing to improve confidence in participants preparing for nursing practice (Cordeau, 2010; Smith & Roehrs, 2009; Tuoriniemi & Schott-Baer, 2008). Coordinating simulation with didactic content and clinical experiences is important to best direct student learning and reinforce clinical reasoning outcomes (Kuiper, Heinrich,

Matthias, Graham, Bell-Kotwall, 2008). This is supported by Lasater & Nielsen's (2009) study of the influence of concept-based learning activities on students' clinical judgment development.

Simulation provides the opportunity to practice low-incidence, high-risk critical or emergency events (Jeffries, Bambini, Hensel, Moorman, & Washburn, 2009). Realism is very important when creating and implementing HFS scenarios to prepare participants to respond quickly and efficiently in the clinical setting (Jeffries et al., 2009). Important topics to consider are communication, patient safety, triage, emergency preparedness, and other critical events (Jeffries, et al., 2009).

It is important to prepare participants in HFS through a briefing which includes getting report about the simulated patient, getting in the mindset of the nurse, discussion of facts going beyond physiological parameters, and cues for nursing interventions (Locsin, Slemp, & Lynn, 2008). When participants go into the simulated clinical environment, participants encounter the simulated patient in the role of the nurse with a focus to respond to what matters most to the patient (Locsin et al., 2008). Debriefing allows the participant to reflect on the caring process that took place and focus on the uniqueness of the patient (Locsin et al., 2008). Debriefing is an essential aspect of HFS and allows for students to reflect on their HFS experience, develop clinical reasoning, increase confidence, and to clarify students' knowledge and rationale for practice (Bricker & Pardee, 2011; Broussard et al., 2008; Dreifuerst, 2009; Gordon & Buckley, 2009; Kuiper et al., 2008; Wotton et al., 2010). Debriefing should be non-judgmental to maintain motivation and provide psychological safety, and should provide critique, correction, evaluation of student performance, and discussion of the simulation experience (Dreifuerst, 2009; Kuiper et al., 2008).

Considerations from student perceptions. Students valued real life, real-time patient scenarios with appropriate challenging problems that help highlight gaps in their knowledge with

limited faculty intervention (Garrett et al., 2010; Smith, 2009; Smith & Roehrs, 2009; Traynor, et al., 2010). Students also valued clear learning objectives, having preparation for HFS, orientation to HFS, and patient status changes as a result of student interventions for the patient (Garrett et al., 2010; Smith 2009). Specific learning styles were found to correspond with student satisfaction and the use of HFS (Fountain & Alfred, 2009). Students describe the importance of the reality of the simulation, the benefits of active learning, the opportunity to experience working as an autonomous practitioner, the importance of transferring theory to practice, and the benefits of working in a safe environment when evaluating HFS (Traynor et al., 2010).

The emotional impact of HFS on students should be considered when using this learning technique. Oftentimes students feel overwhelmed and anxious during HFS (Weaver, 2010). In a qualitative study about the lived experience of clinical simulation of novice nursing students, thematic clusters consisted of perceived anxiety, seeking and imagining (adequate preparation, rehearsing), performing in the moment (perceived fidelity, cueing, nursing interventions, realism), and critiquing the performance (debriefing, videotaping) (Cordeau, 2010). These findings report on student perception of factors that increase satisfaction and optimal learning experiences related to HFS; these findings can be implemented by facilitators of HFS to improve student satisfaction in education practice (Cant & Cooper, 2010; Corbridge et al., 2010; Garrett et al., 2010; Hoadley, 2009; Mould et al., 2011; Smith, 2009; Smith & Roehrs, 2009; Stefanski & Rossler, 2009; Wotton et al., 2010).

Considerations from research. The outcomes of HFS are mixed in the literature in the areas of satisfaction, competence and knowledge transfer, critical thinking, confidence,

communication, best practices, debriefing, and simulation instruments. High fidelity simulation scenarios use applied, active learning and assist in developing safe practitioners in a safe setting; pharmacology simulations provide opportunities to help students gain clinical skills in medication administration and prevent future medication errors (Booth & McMullen-Fix, 2012; Thompson & Bonnel, 2008). Disaster-preparedness, basic life support (BLS), and critical care curriculum that included simulation-based training had positive effects on participant knowledge base, CPR psychomotor skills, and ability to respond to disaster (Mould et al., 2011; Oermann et al., 2010; Summer hill et al., 2008). Reinforcement is needed at regular intervals to retain knowledge and skills (Oermann et al., 2010; Summerhill et al., 2008).

High fidelity simulation, LFS, and intermediate fidelity simulation were found to be a useful training techniques in areas of critical patient care scenarios, BLS, ACLS, end of life, culture, and disaster-preparedness (Alinier et al., 2006; Kidd & Kendall, 2006; Moreland et al., 2012; Oermann et al., 2010; Rutledge, Barham, Wiles, & Benjamin, 2008; Summerhill et al., 2008). When HFS was compared to lecture, students showed a greater ability to answer questions on a test of cognitive skills (Brannon et al., 2008). Critical care simulation improves the link between theory and practice (Mould et al., 2011; Traynor et al., 2010). Identifying trends and problem solving are important skills for nursing students to improve patient care with simulated or authentic patients; the ability to link pathophysiology and patient assessment helped in identifying trends (Endacott et al., 2010; Wotton et al., 2010).

In quantitative studies comparing LFS and HFS, there was not a significant difference in knowledge transfer (Hoadley, 2009). When comparing HFS with a narrated PowerPoint presentation online, both groups had improvements in knowledge scores, but there was not a significance between the two learning methods (Corbridge et al., 2010). There was not a significant difference found between HFS and traditional clinical in knowledge acquisition

(Blum et al., 2010; Schlairet & Pollock, 2010). In a survey of perceived competence, a higher percentage of faculty than students felt that skills learned in simulation would transfer into the clinical setting (Feingold et al., 2003).   These findings indicate there is a strong potential for HFS to increase competence and knowledge transfer, but there is not sufficient evidence in the literature that HFS is better than other educational methods to increase competence and knowledge transfer (Leigh, 2008).

Communication improves health outcomes, patient compliance, and patient satisfaction, yet nursing students have anxiety and lack confidence in communicating with patients (Kameg et al., 2009; Kameg, Howard, Clochesy, Mitchell, & Suresky, 2010). When comparing lecture to HFS in improving communication in nursing students, HFS was supported over lecture in a psychiatric course (Kameg et al., 2009; Kameg et al., 2010). High fidelity simulation allows the student to interact with a wide variety of patients including patients experiencing mental illness (Kameg et al., 2010). This helps the student to practice communication in a safe environment and allows faculty to observe how the student interacts with the simulated patient to provide timely feedback (Kameg et al., 2010). There is a need for further research using HFS while measuring the outcome of communication.

A valid, reliable tool to evaluate simulation experiences improves student assessment skills and ultimately clinical performance (Todd, Manzo, Hawkins, Parsons, & Hercinger, 2008). The instruments included in this integrative review include the Clark Simulation Evaluation rubric and the Lasater Clinical Judgment rubric. Both of these instruments were found to be effective in evaluating students participating in HFS (Dillard et al., 2009; Gantt, 2010). From self-reported instruments related to the transition into clinical practice, students recognized HFS as beneficial to the transfer of confidence and knowledge into the clinical setting (Bricker & Pardee, 2011).

Cost of simulation is a consideration as well due to the resources needed equipment, space, training of faculty, and lack of studies examining the cost-benefit ratio in higher education (Kameg et al., 2009). In an economic analysis of patient simulators for clinical training in nursing education, Harlow & Sportsman (2007) compared the difference between three stand-alone versus one regional center for HFS in terms of facility, equipment, and faculty costs. They found that although faculty costs were reduced, the investment costs in a regional center was more than the savings from faculty costs (Harlow & Sportsman, 2007). Despite the large investment in time and resources for HFS, Mould, et al. (2011) lists the benefits for students out-weigh the investment. This claim would need to be evaluated by consumers and should be researched further to develop cost savings plans.

Limitations. Results in each thematic cluster were mixed regarding the use of HFS and could be due to multiple methodological designs of studies included in this integrative review. There were varied results in the peer reviewed literature that examined competence and knowledge transfer (Cant & Cooper, 2010; Weaver, 2010). There were limited results utilizing experimental research as most studies were quasi-experimental or descriptive which limits the conclusions that can be drawn from results. The lack of control group in the descriptive studies means there may be other variables that affected the results besides HFS. Many of the studies had small sample sizes and were limited to one geographic area. Most of the studies were based on self-reported perceptions related to HFS which may influence choice of answers as participants may want to be perceived differently. The studies were also affected based on the types of participants: nursing students and nurses of varying experience levels as experience could be a factor in the results.

Gaps in the literature. This integrative review synthesizes current findings in the literature related to HFS and nursing education in the areas of satisfaction, competence and

knowledge transfer, critical thinking, confidence, communication, best practices, debriefing and simulation instruments. The body of research is lacking consistent findings in these areas; more research in each of these areas would strengthen the current literature. There needs to be more research to determine if HFS results in increased competence and knowledge transfer for participants and there need to be more comparison studies with other learning techniques to determine if there is a difference in competence or knowledge transfer when compared with HFS. Further research is needed to determine the best methods to improve critical thinking, to verify that HFS improves critical thinking, and to determine if HFS predicts clinical performance.

Further research is needed to determine if HFS affects confidence levels and if that confidence is transferred into the clinical setting when caring for authentic patients. Further research about communication and HFS is needed to understand how HFS could improve communication skills and how these skills can be transferred into the clinical setting. Further research is needed to evaluate the outcomes of reflective debriefing (Kuiper et al., 2008).

There is limited experimental research regarding HFS in nursing education; three out of twelve quantitative studies included in the initial integrative review were experimental research. This leaves an opening for other variables to affect the results outside of HFS. Out of the other quasi-experimental and descriptive quantitative studies on HFS, there are limited repeated studies using one instrument to measure HFS.

There were many studies supporting the use of HFS to prepare nursing students for clinical practice, but there were few valid, reliable instruments to evaluate HFS. There needs to be further research utilizing valid, reliable instruments to measure HFS in order to evaluate outcomes of participants after experiencing this learning technique. Instead there are a wide variety of instruments used in studies with small sample sizes that are limited to one geographic

area. This means the literature is inadequate to make comprehensive generalizations regarding HFS and nursing education.

To remedy this, researchers and facilitators in nursing education need to agree on the best instruments for measuring the outcomes of HFS in nursing education. Using the same instruments with repeated studies, larger sample sizes, in multiple geographic areas will strengthen the research. Once the body of literature is strengthened, researchers have the opportunity to evaluate simulation empirically and determine if the benefits of simulation are transferred into the clinical setting. If the connection between what is learned in the simulation setting and clinical practice can be made, the support of HFS in clinical practice can be established. Then it will be important to evaluate student performance in the clinical setting related to the outcomes of patients. Patient safety is a prominent topic in nursing practice and there is a current gap in the literature of the transfer of skills learned in HFS regarding patient safety and if those are transferred into the clinical setting.

Implications for research. There are numerous implications for research as there were mixed results related to competence/knowledge transfer, critical thinking, and confidence as well as limitations in studies of simulation instruments and transition into practice. Further research regarding the use of HFS and teamwork (Garret et al., 2010), team size (Cant & Cooper, 2010), instruments for evaluation and outcome measurements (Alinier, 2007; Gant, 2010), transition into practice (Bricker & Pardee, 2011; Morris et al., 2007), debriefing (Dreifuerst, 2009), videotaping (Garret et al., 2010), anxiety, cuing, end of life (Smith-Stoner, 2009), patient safety, and student satisfaction related to learning style (Weaver, 2010) are needed. Further research is needed to confirm the transfer of knowledge and confidence from HFS to the clinical setting (Kameg et al., 2009; Weaver, 2010; Gordon & Buckley, 2009).

Implications for nursing education. The use of HFS in nursing education is becoming more prominent as an accepted learning process for nursing students. Student perceptions of HFS in clinical education are positive, but there needs be further investigation into standardized methods for implementing simulation, instruments for evaluation in simulation, verified scenarios, and debriefing. Other implications for nursing education are the use of HFS in specialized areas of nursing such as pediatrics, mental health, and end of life scenarios with a focus on communication. Ultimately, nursing education needs to evaluate the transfer of knowledge and experiences in HFS into the clinical setting and how that effects nurses and patient outcomes.

Video training. There is a large body of literature about VT in nursing education. This integrative literature review synthesizes current findings in the literature related to VT and nursing education in areas of teaching and learning methods, comparing teaching and learning methods, and evaluation methods. Strengths of using an integrative review to synthesize the data include varied viewpoints, methodologies, and topics related to VT in nursing education. Video training articles included a literature review, five mixed method studies, one qualitative study, four experimental quantitative studies, three quasi-experimental studies, three descriptive, and six case examples (1996-2012). The literature evaluated many different types of VT including

There were many advantages to using VT in nursing education. There are multiple VT techniques that can be used in different ways and students perceived VT positively (Brimble, 2008; Chan, 2010; Chau et al., 2001; Holland et al., 2012; Kelly et al., 2009; Lashley, 2005; Minardi & Ritter, 1999; Paul, 2010; Williams et al., 2009). Students improved in abilities through the use of VT (Baxter, Akhtar-Danesh, Landeen, & Norman, 2012; Chan, 2010; Chau et al., 2001; Guhde, 2010; Hansen et al., 2011; Holland et al., 2012; Yoo et al., 2009; Yoo, Yoo, & Lee, 2010). Self-efficacy was improved through the use of VT (McConville & Lane, 2006).

Video training increased knowledge, self-directed thinking and learning, self-awareness, communication skills, and confidence when used as an evaluative method (Shorten & Robertson, 1996; Winters, Hauck, Riggs, Clawson, & Collins, 2003; Yoo et al., 2010).

    Discussion. There are many advantages to VT as it encompasses a wide variety of uses as a learning technique including: video-taped lessons, whole videos or clips for discussion, videos to view role models for practice, and as a tool for detailed feedback (Minardi & Ritter, 1999). Other advantages as a learning technique include instructional videos for skills (Kelly et al., 2009), physical examination (Lashley, 2005), and managing clinical situations (Chau et al., 2001). Video training can be used as a learning technique for understanding concepts and theories (Chan, 2010), increased awareness of the importance of assessment (Guhde, 2010), and enhancing self-efficacy to effectively communicate (McConville & Lane, 2006). Video training is a very accessible method of teaching and learning for faculty and students. There are many different instruments available for faculty and students with varying levels of information technology competence.

    With the internet and online instruction, students are able to access videos continuously, to allow for repeated viewing, which helps to maintain competency over time (Kelly et al., 2009; Lashley, 2005). Students value the flexibility (working in their own environment at their own pace), ability to view the videos repeatedly, and independent self-management of this learning method (Chan, 2010; Kelly et al., 2009; Lashley, 2005; Shorten & Robertson, 1996). When compared to other teaching and learning methods, VT is cost effective although this needs to be investigated further (Williams et al., 2009). Overall, students were satisfied with VT as a learning method (Chan, 2010; Chau et al., 2001; Kelly et al., 2009; Lashley, 2005; Minardi & Ritter, 1999; Williams et al., 2009;).

Students viewed DVD simulations as educationally, professionally, and clinically relevant (Williams et al., 2009). Knowledge, ability to analyze, synthesize, and evaluate simulated clinical situations were increased using VT (Chau et al., 2001). In studies comparing VT (iPod, online video clip) to standard teaching and lecture, two out of five studies showed gains in confidence, competency, and satisfaction; the other three studies showed no difference in training methods (Hansen et al., 2011; Holland et al., 2012). When VT was used for evaluation, it was found to be a safe way for students to practice skills, assessments, and develop confidence and competence before actually performing skills in the clinical setting. Video training also provides students with a means for detailed instructor feedback to improve performance (Winters et al., 2003; Yoo et al., 2010; Yoo et al., 2009).

Advantages of VT as an evaluation method include: opportunity for repeated application of skills, working in teams for cooperative learning, and observation of mistakes when reviewing videos. Other advantages of VT include: increased knowledge and communication skills, self-directed thinking, efficient use of faculty time, and flexibility for all (Winters et al., 2003; Yoo et al., 2010). When students were given the opportunity to make corrections to videos produced with peers in the lab setting for evaluation prior to submitting the assignment, students could work to meet criteria without the pressures of doing it correctly the first time in front of faculty (Shorten & Robertson, 1996). When faculty assessed a video as unsatisfactory, they had the advantage of watching the video with the student to identify errors (Shorten & Robertson, 1996). Students valued the opportunity to learn from their mistakes, improve skills, gain visual and verbal feedback, find out what they did well, the opportunity for practice, self-awareness, good preparation for placement, controlled environment, and confidence building when using video training for evaluation (Brimble, 2008; Yoo et al., 2009; Yoo et al., 2010).

When students were required to pass a video assessment prior to performing skills in the clinical setting, students and faculty were more confident in these skills which allowed faculty to focus more on principles of relationships, attitudes, time management, and organization (Shorten & Robertson, 1996). Video assessment has the potential to provide consistent, reliable, objective, efficient evaluation of skills and can also be used to verify prerequisite knowledge allowing faculty to identify the need for remediation (Brimble, 2008; Shorten & Robertson, 1996). The use of video recorded OSCEs was an effective method to evaluate nurse practitioner students (Barratt, 2009).

Challenges. The varying level of technology required to utilize VT as a learning technique may be difficult for faculty or students with limited abilities in information technology. There are a lot of considerations and steps to develop an effective online module or video for instruction (Kelly et al., 2009). Students disliked the long development time needed for streaming videos so it is important to have high quality content and fast loading clips with captions (Chan, 2010).

Three out of five studies showed no significant increases in competence using VT when compared with other instructional methods; comparisons were made between internet only, compressed video remote-site, and compressed video host-site, HPS versus CD-ROM, and videotape versus hands-on training (Baxter et al., 2012; Johnson, Corrigan, Gulickson, Holshouser, & Johnson, 2012; Wells & Dellinger, 2011). Critical thinking was not significantly changed from VT (Chau et al., 2001). Video training lacks realism when compared with HFS or HPS (Baxter et al., 2012; D. Johnson et al., 2012). In many cases, VT was combined with other learning methods to achieve outcomes, so VT alone may not be the best educational technique (Kelly et al., 2009).

Disadvantages of using VT for evaluation include: coordinating time with others for videotaping, time required to learn how to use equipment, difficult to use for procedures with small details, and need resources for videotaping. Other disadvantages of VT include: potential for technical problems, may be a tedious process, and access to faculty may be limited (Winters et al., 2003). Students may evaluate their performance higher than faculty; faculty may improve this through using videotapes demonstrating common errors (Watts et al., 2009). Students had concerns about making mistakes, being nervous, negative impact on performance, and being judged by others. Students were also concerned about feeling foolish or embarrassed, reduced confidence, feeling pressured, or worrying about personal appearance (Brimble, 2008).

Considerations. The anxiety of nursing students being video-taped should be taken into consideration when using this type of learning technique (Minardi & Ritter, 1999). The time and effort for faculty to implement online modules and create videos may be extensive (Kelly et al., 2009). Video training is a valuable learning technique, but better applied as a blended model of teaching with other learning techniques (Kelly et al., 2009; Guhde, 2010). Learner-instructor interaction was a significant finding when examining student perception of VT indicating this relationship is more important than the type of VT used (Wells & Dellinger, 2011).

Videos need to be contextual using relevant material reflecting real experiences in the clinical setting and should be accessible online (McConville & Lane, 2006). Video training should be made available for repeated views to increase retention of knowledge gained over time (Hansen et al., 2011). When using video for evaluation, it was helpful to have faculty demonstrate skills on videotape during laboratory sessions and for faculty to incorporate abstract content in order to make those concepts concrete for students (Sorenson & Dieter, 2005). When using OSCEs, it may be beneficial to have students evaluate their performance and then repeat the exercise by comparing previous and current performance (Paul, 2010).

Limitations. There were only four experimental studies and three quasi-experimental studies out of 23 peer reviewed articles. The lack of control group in non-experimental or quasi-experimental studies may limit the conclusions that can be drawn as variables may not be taken into consideration. Video training was viewed as a positive teaching, learning, and evaluation technique for nursing students, but there were only two studies with significant findings for video training when compared with other methods of training (Baxter et al., 2012; D. Johnson et al., 2012; Wells & Dellinger, 2011).

There are many methods of VT and many learning outcomes evaluated in the literature which means there are few studies measuring the same type of training for the same outcomes. Many of the studies were based on perceptions of students to a particular use of VT without a comparison to another type of learning technique which means it may be a useful technique, but there is no conclusive evidence that it is any better than another technique. Many of the studies utilized many different learning techniques along with VT so there is a lack of evidence that video training alone improves outcomes. Most studies were limited to one geographic area with limited sample sizes.

Gaps in the literature. This integrative literature review synthesizes current findings in the literature related to VT and nursing education in the areas of teaching and learning methods, comparing teaching and learning methods, and evaluation methods. The body of research is lacking in experimental research and consistent significant findings for competency. More research using a control group would strengthen the current literature. There are not repeated studies and various instruments are used to measure findings, which limits comparisons that can be made between studies. The literature is not adequate to make generalizations regarding VT and nursing education. Repeated studies with larger sample sizes in various geographical areas

will strengthen this research. There is not enough research indicating that VT alone increases competency or that competency is transferred into the clinical setting.

Medication administration competency. There is a significant body of literature regarding competency and medication administration in nursing education. This integrative literature review synthesizes current findings in the literature related to competency and medication administration in nursing education in areas of medication errors, clinical competency and transition into practice, competency teaching and learning methods, and evaluation methods. Strengths of using an integrative review to synthesize the data include varied viewpoints, methodologies, and topics related to competency and medication administration in nursing education. Competency articles included two mixed method, two qualitative, three descriptive, and five case examples (2000-2012). Medication administration articles included two literature reviews, one integrative review, one mixed method study, four quantitative (one experimental & one quasi-experimental), seven qualitative, two descriptive, and four case examples (1999-2012).

There are many advantages in competency learning and teaching methods to reduce medication errors, improve clinical competency in medication administration, ease the transition into practice, and to evaluate students. Peer learning (Chojecki et al., 2010), progressive journal prompts (Harrison & Fopma-Loy, 2010), and situated learning (Stillman et al., 1998) are three methods found to increase competency. There are multiple ways to increase math and pharmacology competency in nursing education to improve medication administration (Cummings, 2011; Greenfield, 2007; Sredl, 2006). The use of HFS may be used to improve competency and decrease anxiety in nursing students when giving medications in the clinical setting (Atack, Parker, Rocchi, Maher, & Dryden, 2009; Sears et al., 2010; Wheeler et al., 2008). A collaborative model between practice and education is a positive way to improve the transition

into clinical practice for new RNs (Burns, 2008). The use of simulation and competency examinations provides a means to assess student learning to prepare students for clinical practice (Klein, 2006; McWilliam, 2010; McWilliam & Botwinski, 2012). Electronic portfolios provide a means of storing, organizing and showcasing achievements and can be used to provide evidence of lifelong learning and competency attainment (Hawks, 2012).

   Discussion. Peer learning may be a viable option to increase competency for students (Chojecki et al., 2010). Progressive journal prompts are useful instruments for introducing and encouraging reflection on emotional intelligence competencies in nursing students (Harrison & Fopma-Loy, 2010). Situated learning is an ideal framework for the design and implementation of learning environments to facilitate bringing the student into the practices and thinking about the processes (Stillman et al., 1998).

   The Triangle Technique (Sredl, 2006), the use of personal digital assistant (PDA) technology (Greenfield, 2007), online quiz questions to check calculations, one on one tutoring sessions for basic math and dosage calculation, and a math tutor website are learning methods that may help decrease medication administration errors in the clinical facility, increase drug knowledge, and increase critical thinking in preparation for medication administration (Cummings, 2011). Intensive drug administration teaching using an online module and HFS improves drug administration skills (Wheeler et al., 2008). There is compelling evidence that collectively, students in clinical placements generate fewer medication errors if they have had prior exposure to a related, simulation-base experience (Sears et al., 2010). An online course with simulation improved students' readiness for practice during a disaster, emphasized interprofessional practice, gave insight into the patient perspective, and led to development of new intentions and activities (Atack et al., 2009). An assessment of new RNs identified strengths as being able to identify the problem, demonstrate good interpersonal skills, and consistently

reassure patients and families. New RNs were also able to recognize pain and seek an order, offer non-analgesic alternatives, and listen to instructions carefully (Burns, 2008). A collaborative model between practice and education is a positive way to improve the transition into clinical practice for new RNs (Burns, 2008).

The use of simulation and competency examinations provides a means to assess student learning to prepare students for clinical practice (Klein, 2006). OSCEs provide students with opportunities to demonstrate interpersonal and interview skills, problem-solving abilities, teaching, assessment skills, and application of basic clinical knowledge (McWilliam & Botwinski, 2012). OSCEs may increase the validity, reliability, feasibility, and objectivity of student evaluation (McWilliam, 2010). Electronic portfolios provide a means of storing, organizing and showcasing achievements and can be used to provide evidence of lifelong learning and competency attainment (Hawks, 2012). Electronic portfolios are portable, accessible at any time, show new competencies while maintaining old, and help with self-reflection (Hawks, 2012).

Challenges. Deficits of pre-registration nurses include lack of knowledge in relation to drug actions and nursing interventions, insufficient information for effective communication with patients about medications, and failure to recognize a drug prescription (RX) error and what to do when that happens. Other deficits include failure to recognize a drug interaction, limited capacity to prioritize possible actions when drug interaction identified, and failure to identify that 10 ml of insulin is greater than 10 units of insulin (Murphy, 2012). Challenges contributing to students' poor clinical competencies include challenges within the primary health care (PHC) clinical field which were identified as shortage of staff, students regarded as part of staff, lack of clinical equipment and other relevant resources. Another challenge was staff burnout in the PHC clinical practice field which led to low morale and negative attitude of preceptors and staff; staff

burnout was also related to lack of recognition, support, and incentive for preceptors (Magobe, Beukes, & Muller, 2010). Within the learning program, a lack of quality control in the PHC clinical practice field was identified including a lack of continuing education for preceptors, lack of feedback from preceptors and from referral resources like the hospital, lack of appropriate qualifications of preceptors, and lack of adequate staffing. This contributes to poor clinical competencies (Magobe et al., 2010).

After graduation, weaknesses of new RNs include failing to give relevant nursing actions relating to specific disease states, indeterminate prioritization, and giving incomplete or irrelevant information to physicians. Weaknesses of new RNs also include difficulty giving rationale for nursing actions and not knowing laboratory values (Burns, 2008). There is a lack of active partnership between nursing education and hospital quality assurance systems (Harding & Petrick, 2008). Improvement in this collaboration may increase nursing student competence reducing the weaknesses of new RNs. Challenges to using electronic portfolios to display achievements and competencies include evolving guidelines, no common creation software, and dissemination difficulty. Other challenges to using electronic portfolios include developing programs, dedicated time for student and faculty training, and the need for continuous support of faculty and information technology. Challenges also include privacy concerns and the question of employers accepting an electronic portfolio (Hawks, 2012).

The most frequent medication errors are wrong technique, wrong time, and omission (Maricle, Whitehead, L., & Rhodes, 2007). Contributing factors to medication administration errors are mathematical skills of nurses, nurses' knowledge of medications, length of nursing experience, and inadequate supervision (Harding & Petrick, 2008; O'Shea, 1999; Reid-Searl et al., 2010a). Contributing factors to medication administration errors include length of nursing shifts or disruption of sleep patterns related to rotating shifts, workload and staffing levels, and

nursing care and med delivery systems. Other contributing factors are single-nurse drug

administration, policy and procedures (failure to follow policy or being ritualistic increased

error), distractions and interruptions, and quality of prescriptions (illegible, MD (medical doctor)

failure to follow policy) (Harding & Petrick, 2008; Hemingway, Baxter, Smith, Burgess-Dawson,

& Dewhirst, 2011; O'Shea, 1999). Barriers to reporting medication errors of nursing students

include limited positive feedback when giving medications correctly, too much emphasis on

medication administration errors (MAE) as a quality indicator of nursing care, and fear of

decreasing their evaluation score. Reporting medication errors was perceived by nursing

students to introduce educational problems, the instructor's reprimand, and being recognized as

incompetent (Koohestani & Baghcheghl, 2009).

Nurses have a limited understanding of pharmacology or are dissatisfied with the

teaching of pharmacology (King, 2004). There are also limited opportunities and preceptor

direction in the clinical context of pharmacology knowledge (Honey & Anecita, 2008). More

focus on improving basic math competency and pharmacology knowledge may go a long way to

improving medication administration skills and reducing medication administration errors.

Considerations. Medication errors could be avoided through fewer interruptions during

medication preparation and barcode systems (Murphy, 2012). Nursing instructors must

demonstrate positive responses to nursing students for reporting medication errors to improve

patient safety (Koohestani & Baghcheghl, 2009). There is a need for examination of medication

policies, assessment of medication administration competency, and targeted in-service education

(Maricle et al., 2007). Medication competence requires a solid knowledge base, ability to apply

that knowledge in real-life situations, and decision making competence (Sulosarri et al., 2010).

Improved pharmacology teaching may increase nurses' confidence and reduce anxiety when

performing drug administration (King, 2004). The use of a workbook that draws from both

clinical and theoretical activities of medication administration and increased preceptor involvement may improve performance (Honey & Anecita, 2008).

When teaching medication administration, there needs to be a practical component reflecting the practice environment, which incorporates context beyond basic theory testing (Harding & Petrick, 2008; Krautscheid et al., 2011; Murphy, 2012; O'Shea, 1999). The importance and need for adequate supervision is central to the undergraduate nursing student experience of administering medication in the clinical setting; there are factors in the clinical environment may limit adequate supervision from RNs (Reid-Searl, Moxham, Walker, & Happell, 2010b). Feedback from instructors and RNs has the ability to enhance the student's performance and make them feel confident and competent in their role especially when feedback is immediate; feedback also allows for reflection in practice (Glover, 2000). When utilizing video and simulation exercises as learning techniques, realism, decision-support technology, and interprofessional team training are important (Kyrkjebo et al., 2006; Krautscheid et al., 2011).

Ongoing conversation between educators and practicing nurses needs to continue to improve the competence of new graduates (Burns, 2008). The use of retired nurses and older clinical faculty in a simulated environment may be one way to increase faculty resources (Curl Smith, S., Chisholm, L., Hamilton, J., & McGee, 2007). Recommendations to increase compliance with use of filter needles includes assessing and validating nursing knowledge and skills in (IV) therapy on yearly basis, educating and enforcing written policies and procedures regarding use of filter needles to improve compliance with patient safety standards, and require preparation of parenteral medications in designated areas. Other recommendations include empowering nurses to promote safe medication prep with peer education and recognize and reward nurses who value further education and promote best practice standards (Stein, 2006). If

this level of detail is put into areas that lead to medication errors, recommendations and policies can be made to increase medication administration competency and decrease medication errors.

Considerations for competency based assessment administration include student preparation for the testing format, investment of time and scheduling arrangements, and cost and purchase of supplies used during practice testing. Other considerations for competency based assessment include random assignment of testing situations and evaluations, consistency among evaluators and testing of students, and management of retesting of students. Discussion of examination results with students, and review and revision should also be considered (Klein, 2006). The use of competency frameworks and OSCE should be used to assess medication administration competency (Hemingway et al., 2011). Recommendations for OSCE case scenarios are scenarios must be specific and should be a single patient encounter with a detailed patient profile (McWilliam, 2010). Considerations for OSCE are frequency of updates, methods by which standardized patients should be trained, and how to depict details of what a patient would say or do during an encounter with a health care professional. Other considerations for use of the OSCE include providing objective feedback and descriptive evaluation of student behavior, remediation, and program requirements (McWilliam, 2010).

To ensure valid and reliable OSCE in nursing an individual should be assigned to collect student data at the completion of each OSCE station so that all items are completed on the instruments used and all data collected are filed for data entry. OSCE assessment instruments should be tested for validity and reliability to ensure that they include critical competencies that meet nursing program objectives. Also, a trained technician or an audiovisual recording company should be hired to provide optimal videotaping of the OSCE (McWilliam & Botwinski, 2012). A formal and consistent method of selecting and training standardized patients for the OSCE and a review session for returning standardized patients to update their skills prior to each

OSCE should be developed (McWilliam & Botwinski, 2012). Considerations for implementing electronic portfolios to display accomplishments and competencies include: select software, create template as a guide, ensure stakeholder buy in, create clear guidelines, and educate students and faculty evaluate regularly (Hawks, 2012).

Limitations. There were few experimental quantitative studies examining competency and medication administration in nursing education and most studies were limited to small sample sizes in one geographic area limiting generalizable conclusions that can be drawn. There are multiple teaching and learning methods used to increase competency of nursing students, but there are not repeated studies to indicate that one method is better than another. High fidelity simulation seems to be supported in the literature to increase competencies in specific areas, but there needs to be further research to support conclusions about HFS as a teaching method. Also, competency is measured using different instruments in each study which limits comparisons that can be made. Many of the studies examined student satisfaction and perceived benefits which is important, but does not provide conclusive evidence that the teaching method gives those benefits or improves outcomes.

Gaps in the literature. This integrative literature review synthesizes current findings in the literature related to competency and medication administration in nursing education in the areas of medication errors, clinical competency and transition into practice, competency teaching and learning methods, and evaluation methods. The body of research is lacking in experimental research and consistent significant findings for competency including medication administration. More research using a control group would strengthen the current literature. There are not repeated studies and various instruments are used to measure findings, which limits comparisons that can be made between studies. The literature is not adequate to make generalizations regarding competency and medication administration in nursing education.

Repeated studies with larger sample sizes in various geographical areas will strengthen this research. There is not enough research giving conclusive evidence of the best teaching and learning methods to improve competency in nursing students. There are many suggestions of how to improve medication administration competence, but there are not studies putting those suggestions into practice. High fidelity simulation was supported in the literature, but further studies are needed to give conclusive evidence for specific competencies. The gap between education and the practice setting is evident throughout the research indicating there need to be more studies exploring competency transferring into practice and the collaboration between university and hospital settings.

Anxiety. There is a significant body of literature regarding anxiety and nursing education with research from around the world. This integrative literature review synthesizes current findings in the literature related to anxiety and nursing education in areas of stress, anxiety influences, and reducing anxiety. Strengths of using an integrative review to synthesize the data include varied viewpoints, methodologies, and topics related to anxiety and nursing education. Anxiety articles include three mixed method studies, eight quantitative (one experimental, two quasi-experimental), three qualitative, four descriptive, and four case examples (2004-2012). Advantages listed in the literature relate to reducing stress and anxiety in nursing students.

A positive outlook (Gibbons, 2009), increases assertiveness (Larijani, Aghajani, Baheiraei, & Neiestanak, 2010), and experience (Chen, Del Ben, Fortson, & Lewis, 2006; Yildiz & Neriman, 2011) may decrease anxiety in nursing students and improve psychological health. Improved psychological health leads to improved educational and professional outcomes (Ratanasiripong, 2012). Educational programs that increase the opportunity to practice reduce anxiety of nursing students (Walsh, 2008; Dehkordi & Tavakol, 2011).

Using adult learning principles and learning methods like HFS may reduce anxiety in nursing students when compared to other learning methods (Megel et al., 2011; McMillan et al., 2007). Stress management programs and educational counseling can improve the mental health of nursing students and may reduce students' anxiety, increase self-esteem, and improve grade point average (GPA) over time (Sharif & Armitage, 2004; Yazdani, Rezaei, & Pahlavanzadeh, 2010). Peer led support groups, mentoring, and biofeedback help nursing students with stress, reducing anxiety, and coping among other benefits (Hamrin, Weycer, Pachler, & Fournier, 2006; Giordana & Wedin, 2010; Ratanasiripong et al., 2012).

Discussion. Students with a positive outlook tend to avoid stress-related illnesses (Gibbons, 2009). When nursing students are more psychologically healthy, they are more likely to graduate in a timely manner, to have a more enjoyable work experience, and to persist longer in the nursing profession (Ratanasiripong, 2012). Students with higher assertiveness have less anxiety (Larijani et al., 2010). Nursing students understand the importance of the knowledge and skills they learn in nursing school including the importance of correct dosage calculations for nursing practice (Walsh, 2008). Nursing students experience anxiety in many areas of nursing education including: mathematics (Walsh, 2008), working with isolated patients (Dehkordi & Tavakol, 2011), working with cancer patients (Yildiz & Neriman, 2011), and end of life patients (Chen et al., 2006). Experience may decrease anxiety of nursing students when working with various patients and learning new skills (Chen et al., 2006; Yildiz & Neriman, 2011).

Educational programs that provide opportunities for practice in various competencies help to reduce anxiety of nursing students (Dehkordi & Tavakol, 2011; Walsh, 2008). Educational programs for nursing students working with isolated patients can reduce anxiety in students which can lead to more control and prevent the spread of infectious diseases (Dehkordi & Tavakol, 2011). Practice with HFS before clinical experiences has the potential to reduce

anxiety of students more than practicing new psychomotor skills without a manikin (Megel et al., 2011). When working with adult students, it is important to incorporate concepts of adult learning theory to decrease anxiety and create an enjoyable learning experience (McMillan et al., 2007).

The implementation of educational counseling may reduce students' anxiety, increase self-esteem, and improve GPA over time (Sharif & Armitage, 2004). Holding stress management training program workshops in different courses can improve mental health of students (Yazdani et al., 2010). Peer led support groups teach students group leadership skills, emphasize importance of the curative factors of universality and cohesiveness in creating a positive group experience, and help students apply group theory principles to practical group situations (Hamrin et al., 2006). Peer led support groups assist with graduate school transition, decrease anxiety and improve ability to cope with demands of program, help with processing interactions with patients, improve ability to develop new coping skills and better process interactions with other nurses, and improve ability to process interactions with preceptors and peers (Hamrin et al., 2006).

Mentoring helps reduce anxiety, provides a positive learning environment, boosts self-confidence, lessens confusion, increases student interaction at various levels of curriculum, and improves retention rates and satisfaction among first semester students; mentors may help through reassurance and active role modeling of care (Giordana & Wedin, 2010). Biofeedback also helps nursing students to maintain stress levels and reduces anxiety during clinical training (Ratanasiripong et al., 2012). The better nursing students manage their stress and anxiety, the more successful they are in their clinical training (Ratanasiripong et al., 2012).

Challenges. Nursing students have high stress which leads to high anxiety levels; academic pressures are the most frequent stressors (Amostafa, El-Gilany, El-Moafee, Salama, L.,

& Cristobal, 2011). There are many stressors students face which puts them at risk for developing a stress-related illness (Gibbons, 2009). Stressful life events predict both depression and anxiety and emotion-oriented coping predicts anxiety in nursing students (Shikai, Shono, M., & Kitamura, 2009). Twenty percent of the general population is at risk of developing a stress-related illness compared to 30% of students and 40% of nursing students (Gibbons, 2009). Nursing students have a significant amount of anxiety during the first year of nursing school and higher levels of anxiety may be associated with poor academic achievement (Floyd, 2012; Ratanasiripong, 2012).

Human-based anesthesia simulators provoke an acute stress and anxiety response from student nurse anesthetists which may influence educational outcomes (McKay et al., 2010). Worry and anxiety is associated with performance and evaluation in nursing school and students have fear of the consequences of failing (McKay et al., 2010; Walsh, 2008). Nursing students also experience anxiety in the clinical setting especially when caring for patients when they have had negative encounters associated with patient care and treatment (Chen et al., 2006; Dehkordi & Tavakol, 2011; Yildiz & Neriman, 2011). Nursing students often have feelings of alienation when on clinical placements; attitudes and behaviors of clinical staff made a significant impact on student learning (Levett-Jones, Lathlean, Higgins, & McMillan, 2008). Many nursing students are not satisfied with clinical component of their education and they experience anxiety as a result of feeling incompetent, and lacking professional nursing skills and knowledge to take care of various patients in the clinical setting (Sharif & Masoumi, 2005). Students with anxiety may limit contact with their mentor, insist they are there simply to observe, stand back from demonstrations, be absent from a placement or shift when a specific teaching session or assessment is planned (Price, 2005). They may ask few questions and only when they seem

uncomfortable, assure you they understand when their facial expressions suggest otherwise, or report difficulty sleeping and seem unpunctual or distracted (Price, 2005).

Considerations. Sources of stress for nursing students are balancing of time given to lectures and tutorials, course organization, and management of cancelled classes. Other sources of stress for nursing students are placement demands, developing clinical skills, and relationships with patients and colleagues (Gibbons, 2009). Stress management techniques encourage peer support and peer networking among student colleagues, more group learning and support, a change in student group composition during first semester to widen pool of support, and learning listening and helpful skills early in the course (Gibbons, 2009). There is a need for stress management programs and psychiatric care in nursing health services of the university to control the stress and anxiety associated with nursing students (Amostafa et al., 2011).

Many factors such as years of education and working while studying influences the level of assertiveness in students. Anxiety in students has a significant relation with the father's level of education, family income, and positive impression of the family about the students' major (Larijani et al., 2010). Stress was positively associated with anxiety and self-esteem was negatively associated with anxiety (Ratanasiripong, 2012). Self-esteem and social support were negatively associated with depression and stress had a positive correlation with depression (Ratanasiripong, 2012). Practices to reduce stress and increase assertiveness, self-esteem, and social support will help to reduce anxiety in nursing students.

When using HFS, low performers had increased stress and performed poorly, high performers had increased stress and performed superbly, and moderate performers had modest stress and performed moderately (McKay et al., 2010). Faculty need to encourage use of resources to improve coping and study skills (Floyd, 2012). Incorporating aspects of adult learning theory may help to reduce anxiety and increase enthusiasm for nursing courses

(McMillan et al., 2007). It is important to understand what makes the student especially anxious, emphasize respect for the process of learning in practice, target those elements of learning where students need additional help, and repeat the same teaching frequently (Price, 2005).

Stress producing factors in the clinical setting include having errors when working, harming the patient, and receiving contradictory orders from instructors (Musso et al., 2008). It is important for nursing instructors to give greater emphasis to support the student, diminish stress, and encourage learning in the clinical setting (Musso et al., 2008). Also, the level of the nursing students should be taken into consideration when assigning clinical sites to decrease stress in students with limited clinical experience and knowledge (Yildiz & Neriman, 2011). Staff-student relationships are also a key influence on students' experience of belongingness; belongingness was promoted by staff receptiveness, inclusivity, legitimization of the student role, recognition and appreciation, and challenge with support (Levett-Jones et al., 2008). Positive staff-student relationships are crucial for students to feel accepted, included, and valued; it is important that nursing staff to recognize the pivotal role they play in students' socialization to the workforce and their learning (Levett-Jones et al., 2008). Mental health care of nursing students before and during clinical training is very important to reduce anxiety and increase coping abilities (Shikai et al., 2009).

Limitations. There were few experimental quantitative studies examining anxiety and nursing education and most studies were limited to small sample sizes in one geographic area limiting generalizable conclusions that can be drawn. There are many studies examining perceptions of nursing students related to stress, anxiety influences, anxiety in nursing education, and methods to relieve anxiety. These studies are valuable, but there are not multiple studies examining one type of anxiety influence or one method to relieve anxiety using the same measures. Students may answer questions differently based on their level in nursing school, their

amount of clinical experience, or the type of instruction they receive. Variables that influence student answers need to be taken into consideration. There are studies examining specific areas of anxiety or specific situations that cause anxiety in nursing students, but there are few repeated studies in these areas. There are few comparison studies between anxiety relieving techniques which may help to understand they best technique to implement in nursing schools to improve student mental health.

Gaps in the literature. This integrative literature review synthesizes current findings in the literature related to anxiety and nursing education, specifically stress, anxiety influences, anxiety and education, and reducing anxiety. The body of research is lacking in experimental research and consistent significant findings related to stress and anxiety of nursing students, specific influences on anxiety or anxiety relieving measures. More research using a control group would strengthen the current literature. There are not repeated studies and various instruments are used to measure findings, which limits comparisons that can be made between studies. The literature is not adequate to make generalizations regarding anxiety and nursing education.

Repeated studies with larger sample sizes in various geographical areas will strengthen this research. There is not enough research giving conclusive evidence of the best interventions to decrease stress and anxiety and to cope with the pressures of nursing school. Many studies in the literature measure student perceptions, but there needs to be more research using that research to implement ways to reduce anxiety or programs to improve mental health of nursing students. There is a link between education and the practice setting and that partnership should be explored to improve mental health of nursing students and nurses in the practice setting.

Conclusion. This integrative review explores the use of HFS along with video training, medication administration, competency, and anxiety in nursing education. The use of HFS may

be a viable way to increase satisfaction, competency, knowledge transfer, confidence, and communication skills in nursing students. Video training was explored as alternative method to HFS; students perceived video training positively and improved in abilities and self-efficacy (Baxter et al., 2012; Brimble, 2008; Chan, 2010; Chau et al., 2001; Guhde, 2010; Hansen et al., 2011; Holland et al., 2012; Kelly et al., 2009; Lashley, 2005; McConville & Lane, 2006; Minardi & Ritter, 1999; Paul, 2010; Williams et al., 2009; Yoo et al., 2009; Yoo et al., 2010). Video training may increase knowledge, self-directed thinking and learning, self-awareness, communication skills, and confidence when used as an evaluation method (Shorten & Robertson, 1996; Winters et al., 2003; Yoo et al., 2010).

Competency and medication administration findings include medication errors, clinical competency and transition into practice, competency teaching and learning methods, and evaluative methods. Peer learning, progressive journal prompts, and situated learning, and HFS were found to increase competency; many studies included ways to increase math and pharmacology competency. Collaboration between practice and education is important and competency examinations using simulation help to prepare students for clinical practice.

Anxiety of nursing students in areas of stress, anxiety influences, and reducing anxiety were evaluated in the literature. A positive outlook, increased assertiveness, opportunity to practice, experience, and use of adult learning principles and HFS were found to decrease anxiety in nursing students (Chen et al., 2006; Dehkordi & Tavakol, 2011; Gibbons, 2009; Larijani et al., 2010; Megel et al., 2011; Walsh, 2008; Yildiz & Neriman, 2011). Stress management programs, educational counseling, peer led support groups, mentoring, and biofeedback may all help nursing students deal with stress, reduce anxiety, and increase coping (Giordana & Wedin, 2010; Hamrin et al., 2006; Ratanasiripong et al., 2012; Sharif & Armitage, 2004; Yazdani et al., 2010).

Further research is required to substantiate these findings in the literature. There are advantages, challenges, and considerations to using HFS or video training, and in areas of competency, medication administration, and anxiety in nursing education. This integrative review is a synthesis of the current literature in the area of HFS, video training, medication administration, competency, and anxiety in the teaching and learning of nursing students. The strengths of the body of literature are adding to the knowledge base of HFS video training, medication administration, competency, and anxiety in nursing education in a variety of areas and revealing new areas for research related to outcomes measures. The limitations of this body of literature are the use of non-experimental studies with small sample sizes focusing on one geographic area. There are also few studies measuring the same variables and outcomes with the same instruments limiting conclusions that can be drawn from results. Results from qualitative studies of perceptions of nursing students need to be utilized to investigate techniques to improve competency and reduce anxiety. More comparative studies of teaching and learning techniques and anxiety reduction techniques to investigate outcomes of competency and anxiety and more studies on how to improve medication administration competency through proven researched methods would strengthen the literature. There are limited studies operationalizing how to encourage collaboration between education and the practice setting to improve competency and reduce anxiety of nursing students.

Gaps in the literature include the use of established instruments to measure outcome measures of HFS to establish validity and reliability, the impact of debriefing on outcome measures of HFS, and the transfer of benefits of HFS into clinical practice. There need to be more studies comparing teaching and learning techniques of HFS and video training and more controlled studies to understand if outcomes are from the teaching and learning technique or other variables. There also need to be more studies examining costs of HFS in comparison with

other learning methods. There need to be more studies testing competency of nursing students and investigation of instruments that can be utilized for specific competencies. If competencies can be more standardized, it will lead to better prepared nursing students and nurses. There is a gap between nursing education and the practice setting and the transfer of competency into the clinical setting.

High fidelity simulation is prominent in nursing education and the impact of this learning technique needs to be explored further by nursing educators and researchers to verify the potentially beneficial outcomes of this learning technique. Areas of video training, competency, medication administration, and anxiety should also be investigated further to determine the impact of these variables in the education of nursing students. Comparing teaching and learning methods and measuring anxiety and competency including the transfer of competency into the clinical setting would fill a gap in the literature.

Chapter 3

Methodology

Overview of the Study. Upon graduation, student nurses are expected to be able to administer medications competently and safely (Sulosaari et al., 2010). There are many contributing factors to medication errors and nursing students may be particularly vulnerable to making medication errors (O'Shea, 1999). Anxiety and high levels of stress may hinder concentration, memory, and problem-solving which are needed for learning (Beddoe & Murphy, 2004). In nursing students with high levels of stress and poor stress management, this can have a negative impact on nursing students, holistic patient care, and professionalism in nursing (Kang et al., 2008). Other possible negative outcomes include poor communication, loss of interpersonal effectiveness, and decreased empathy (Beddoe & Murphy, 2004). Additionally, unmanaged anxiety may limit the nursing students' developing competence and overall will have a negative impact on performance of skills in the clinical setting.

Nursing students need adequate training in medication administration in order to increase medication administration competence and to reduce anxiety when giving medications. Various training methods have been shown to increase performance in the skill of medication administration, but there is limited evidence as to the best training method to increase student performance in the clinical setting and the effects of that training on state anxiety. The purpose of this study was to compare the training methods of HFS, LFS, and VT and determine if there is a difference in state anxiety of first year undergraduate nursing students prior to training and immediately prior to administering medications in the clinical setting.

Research Questions/Hypothesis. What is the impact of HFS, LFS, or VT of oral medication administration on state anxiety levels of first year undergraduate nursing students in the clinical setting? The null hypothesis is there will be no difference between state anxiety of

three groups of first year undergraduate nursing students in the clinical setting when one group is trained with HFS, a second group is trained with LFS, and third group is trained with VT.

Design. A randomized quasi-experimental research design was chosen for this research study in order to establish the relationship between different methods of medication administration training and the dependent variable of state anxiety.

Table 1
Operational Definitions

Anxiety (State Anxiety)	Anxiety levels as evaluated by the State Anxiety Inventory for Adults State Anxiety STAI-SA Form Y
Barcoding	Use of barcoding used in medication verification process in simulation and/or the clinical facility
Clinical facility medication dispensing areas	Area in a clinical facility used to obtain, prepare, and begin verification process prior to administering medications
Comparison group HFS	First year undergraduate nursing students participating in HFS
Comparison group LFS	First year undergraduate nursing students participating in LFS
Comparison group VT	First year undergraduate nursing students participating in VT
Debriefing	A time of reflection about the high fidelity medication administration simulated scenario where students discuss what was done well and what could be improved upon
Demographics Questionnaire	Questions pertaining to demographics including: gender, age, ethnic background, level of education completed, health related degree, hours of work, healthcare related work, and medication administration training outside of the university (Appendix A)
EMAR	Computer electronic medication administration record used in simulation and the clinical facility

HFS	High fidelity simulation: use of Simman™ to train students in medication administration; a close representation of an actual life event using a high level of technology (Parker & Myrick, 2008); signs and symptoms of the simulated patient can be programmed and the simulated patient can respond to interventions of the student
HFS control room	High fidelity simulation room with a viewing window of the HFS room to facilitate and monitor the simulation experience; facilitators speak as the patients via microphone/speaker
HFS room	High fidelity simulation room that contains Simman™ 3G and other medical equipment to simulate a hospital room; used to simulate the clinical experience of medication administration
HPS	Human Patient Simulator
LFS	Low fidelity simulation: use of lab to train students in medication administration; focuses on tasks and allows students to concentrate on a specific skill
LFS Hospital Bay	Low fidelity simulation space with four hospital bay areas each with two hospital beds, two LFS manikins, computers, and medication dispensing areas
MAR	Paper medication administration record
Medication administration	Giving PO medications to simulated or authentic patients
Medication administration supplies	PO medication, medicine cup, barcode scanner, medication dispensing system, and EMAR
Medication dispensing systems	Computer systems used to store and dispense medications
Multimedia debrief room	Room with viewing capabilities of HFS rooms used for debriefing medication administration simulated scenarios and for video training
Participants	First year undergraduate nursing students that gave consent to participate in this study

Patient	Person who is taken care of in simulation or in the clinical setting
Patient rooms	Rooms of patients in the clinical facility where medication administration takes place
PO	By mouth
Simman™	A life-sized human patient simulator that has palpable pulses, heart, breath, bowel sounds, and an arm for IV fluids; used to simulate a live patient
STAI-SA	State Trait Anxiety Inventory- State Anxiety (Spielberger, 1977)
THSSC	Translational Health Science Simulation Center: integrates state-of-the art equipment, electronic patient records and practices currently used by the state's leading medical centers; hub for campus interdisciplinary biomedical and behavioral research and education on Oahu and via distance programming (UH Translational Health Science Simulation Center, 2012).
VT	Video training

Setting. This intervention was conducted at the School of Nursing & Dental Hygiene (SONDH) at the University of Hawaii at Manoa (UHM) in Honolulu, HI and clinical facilities where nursing students were assigned for clinical rotations on the island of Oahu. Oahu is the third largest Hawaiian island; the majority of the Hawaiian island population consists of a mixture of East and West cultures (The Island of Oahu, 2012). There are 20,429 students at the University of Hawaii at Manoa with 14,402 undergraduate students and 6,027 graduate students (University of Hawaii Manoa, 2012). The mean age of students is 25.2 and the gender split is men (45.4%) and female (54.6%). All interventions including HFS, LFS, and VT were conducted in the Translational Health Science Simulation Center (THSSC) located on the third floor of Webster Hall at the University of Hawaii at Manoa. Students also completed surveys in clinical sites across Oahu.

UHM is a diverse university with 71% of the population as Hawaiian residents, 21.1% from US mainland or US affiliated, 6.8% foreign, and 1% unknown (University of Hawaii Manoa, 2012). The university has ethnicities of Caucasian (24%), Hawaiian/part-Hawaiian (15%), mixed (13%), Japanese (12%), Filipino (9%), Chinese (7%), Pacific Islander (2%), and all other (18%) (University of Hawaii Manoa, 2012). The ethnicity of undergraduate students in Fall 2010 at UHM ($n = 13,912$) are Asian (43.8%), with Caucasian (21.5%), Hawaiian/Pacific Islander (17.3%), mixed race (13.2%), Hispanic (2.1%), African American (1.5%), American Indian/Alaskan Native (0.4%) (Enrollment, 2012).

The study took place in the Translational Health Science Simulation Center (THSSC) in the multimedia debrief room, HFS room, HFS control room, LFS hospital bay, as well as clinical facility medication dispensing areas, and patient rooms. The multimedia debrief room contained interactive white boards, video screens for video training, table in the center of the room with chairs, and capability to watch the HFS session. The HFS room contained SimMan 3G™, a hospital bed or stretcher, a bedside table, computerized charting with a computer on wheels, medical equipment cart, small counter with drug books, and a medication dispense system. The HFS control room contained computer desks, with viewing windows of the HFS room, and computer screens to watch the HFS scenario and the debrief rooms. The LFS hospital bay contained four hospital bay areas each with two hospital beds, two LFS manikins, computers, and medication dispensing areas.

Students completed surveys in the clinical setting on medical-surgical floors at various healthcare facilities across Oahu. Medication dispensing areas contained medication dispensing systems, supplies for medication administration, medications, and computers or paper charts for electronic medication administration records (EMAR) or medication administration records

(MAR). Patient rooms contained a hospital bed, bedside table, sinks, counter space, and bathrooms.

Sample. Sample participants were first year undergraduate nursing students enrolled in the Bachelor of Science in nursing program at the University of Hawaii Manoa School of Nursing and Dental Hygiene. At UHM SONDH as of 2011, there were 369 undergraduate nursing students and 93% were Hawaiian residents (Nursing, 2011). The population had a ratio of 77% women and 23% men in the SON (School of Nursing) (Nursing, 2011). Ethnicities at UHM SONDH included Asian: Chinese (7%), Filipino (27%), Japanese (15%), Korean (2%), Mixed Asian (9%), Other Asian (2%), native Hawaiian/Pacific islander: Hawaiian/Part Hawaiian (10%), Pacific Islander (1%), other ethnic Groups: African American (1%), Caucasian (16%), Hispanic (2%), Mixed (7%), and Unknown (1%) (Nursing, 2011).

The sample size for this study consisted of 44 first year undergraduate nursing students. Thirty participants were required based on a power analysis using G*Power v3.1.2 for ANOVA Repeated Measures with an anticipated effect size 0.4, $\alpha = 0.05$, and power of 0.97 (Faul, Erdfelder, Lang, & Buchner, 2007). The anticipated effect size was set at a conservative medium level of 0.4 based on the effect size of previous research in simulation and nursing education that had medium to high effect sizes (Andrighetti, Knestrick, Marowitz, Martin, & Engstrom, 2012; Baxter, et al., 2012; Brydges, Carnahan, Rose, Dubrowski, 2010; E. Johnson et al., 2012). A review of 25 studies reported effect sizes ranging from 0.11-2.45 with 15 out of 25 of studies in the medium to large effect size range Cohen's *d*: 0.5-0.8 and above (Appendix B).

Participants were randomly assigned to HFS, LFS, or VT groups by using a blind drawing of participants; the first participant drawn was in the HFS group, the second in the LFS group, and the third in the VT group. This process was repeated until all participants had been assigned. Students attended the HFS, LFS, or VT session in their assigned group. Students were

required to be 18 years or older to participate in this study and could not participate if they were students of the principal investigator (PI). There were not exclusions beyond these requirements.

Recruitment and Retention. Participants were recruited from first year undergraduate nursing students enrolled in the Bachelor of Science in nursing program at UHM SONDH. Students in their first and second semester were approached and the study was presented in person in a nursing class to recruit participants. There were three recruitment sessions. Students in the second semester of nursing school were approached to participate in this study, but no participants were recruited.

All participants recruited were recruited from first semester classes in fall of 2013 and spring of 2014 using a script read by a trained research assistant that was not an instructor of these students (See Appendix C). Interested students signed up in class on the day of recruitment. Participants received $5 gift cards to Starbucks or Jamba Juice for participating in this study. Participants were notified that they would not benefit directly by taking part in this study, but the information learned from this study had the potential to benefit other nursing students in the nursing program in the future.

Procedure. The usual practice for student administration of by mouth (PO) medication is to pass a written medication math exam with a 90% and complete a skills check-off regarding PO medication administration. First semester student participants received traditional training from first semester including passing a medication math exam with at least a 90%, passing a skills check-off, and participating in a HFS scenario regarding PO medication administration as a student prior to participating in this study. All participants in this study met these requirements, but also participated in one of the PO medication administration training groups. Participants signed an informed consent (Appendix D) and received medication administration instructional materials (Appendix E).

Participants in this study were instructed to prepare for the training by reading the oral medication administration instructional materials. This was an hour's worth of reading assigned a few days after recruitment a week prior to training. On the day of training, participants were required to fill out a demographics tool and the state anxiety survey (STAI-SA) related to their feelings about medication administration. After filling out the pre-intervention survey, all participants were required to watch a 20 minute video on oral medication administration together in the multi-media debrief room. Topics included oral medications: review of key points, preparing unit-dose-packaged medications, administering oral medications, removing a medication tablet from a bottle, splitting tablet medications, preparing liquid medication, and unexpected situations (see website for VT: http://micro189.lib3.hawaii.edu/ezproxy/details.php?dbId=57369). Participants were then separated into training groups: HFS, LFS, or VT. Participants in the HFS group went to a debrief room, the LFS group went to the hospital bay, and the VT group stayed in the same room where they watched the video. Each comparison group had three hours of training which was completed that day. STAI-SA surveys were filled out a second time two to six weeks later, immediately prior to PO medication administration in the clinical setting. The timing was based on when the clinical instructor was able to schedule the students that participated in this research study to give oral medications in the clinical facility.

Participants in the HFS comparison group were trained in a groups of six to eight. These participants were split into smaller groups of two or three for scenarios and then the large group discussed the chart of the simulated patient and received a brief report prior to each scenario. Each small group experienced a 15-minute HFS simulation scenario on oral medication administration where they were expected to give one PO medication to the simulated patient. The medication dispensing unit, electronic medical record (EMR), and barcoding were used to

verify and administer medications. There were three different HFS scenarios for PO medication administration and there were specific guidelines for student participants and trained faculty facilitating the scenarios (Appendix F).

Although the HFS participant group administered medications in only one scenario, they observed their peers' medication administration experience two additional times using different scenarios to reinforce training and reflect clinical practice more accurately. After each group simulated scenario, all participants in the HFS group training that day had a debriefing about the simulation experience by a trained research assistant facilitator that was also a nursing instructor. All HFS student participants had the opportunity to experience a medication administration simulated scenario with SimMan™, simulated administering a PO medication in their small group, observed two simulated scenarios, and participated in three debriefing sessions for the different medication administration scenarios. Student participants had three hours for the HFS experience.

Participants in the LFS comparison group received LFS training in a groups of nine to ten. All participants in the LFS comparison group were given a demonstration of how to give PO medications to patients using the medication dispensing unit, EMR, and barcoding to verify and administer medications. Participants were split into smaller groups of three to four to practice PO medication administration using the low fidelity manikin with guidance from a trained research assistant facilitator that was also a nursing instructor. Each participant had the opportunity to give at least one PO medication individually using the medication dispensing unit, EMR, and barcoding to verify and administer medications. Participants had three hours to practice PO medication administration using various PO medications from the written scenarios (Appendix G).

Participants in the VT comparison group watched the 20 minute medication administration video for oral medications along with the other participants in the study. Student participants then had three hours to practice using the skills check-list for PO medication administration in groups of two (Appendix H). A trained research assistant facilitator who was also a nurse or nurse instructor was available to answer questions and help the participants during training. These participants did not watch the medication administration video again and did not have equipment or a simulated patient to practice with.

Participants in this study had one hour of preparation and on the day of training filled out a demographics tool and the STAI-SA tool for a total of 20 minutes. Training included the 20 minute oral medication administration video and three hours of HFS, LFS, or VT. Post intervention, two to six weeks later, participants filled out the STAI-SA tool again for 10 minutes. The total time allotted for each student to participate in this study was approximately five hours.

Figure 1: Intervention Procedures

Methods of Measurement. Measurement instruments included a demographics questionnaire and the STAI-SA. The demographics instrument was developed by the investigator to gain information about participants in order to understand personal characteristics that may affect the state anxiety of nursing students outside of HFS, LFS, or VT related to medication administration. Questions were used to gain information about age, gender, ethnicity, level of education, job status, healthcare employment, hours of work outside of nursing school, and medication administration training. The demographics instrument contained eight items and was given prior to the intervention.

The STAI-SA was developed to measure anxiety in adults (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1977). This is a 20-item tool with established reliability and a Cronbach's alpha ranging from 0.86-0.95; it also has established concurrent and construct validity (Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983; Spielberger, 1989). The STAI-SA evaluates how respondents feel at a particular time and how they anticipate they will feel either in a specific situation they may encounter in the future. This instrument assesses the levels of state anxiety induced by stressful events such as novice nursing students giving medications. This instrument was found to be a sensitive indicator of changes in transitory anxiety experienced by patients (Spielberger, et al., 1983). The STAI-SA has been used to assess anxiety levels induced by stressful experimental procedures and by unavoidable real-life stressors such as surgery, dental treatment, job interviews, or important school tests (Spielberger, et al., 1983). Measurements of anxiety for all student participants were taken twice: once immediately prior to HFS, LFS or VT and once after training and immediately prior to administering medication in the clinical setting.

High fidelity simulation and LFS scenarios were evaluated prior to the full implementation of the study to ensure feasibility, clarity, usability, and understandability. The participants, the trained facilitators, and the simulation reviewers were asked to report any items that were unclear, problematic, or difficult to understand. Those items were revised to ensure clarity, usability, and understandability

Data Collection. Data was collected by the PI and research assistants who had experience working with undergraduate nursing students. The research assistants were trained by the PI about the purpose of the study, the procedures for consent, administering the measurement instruments, and the interventions.

Table 2
Data Collection

Timing	Prior to the Intervention (HFS, LFS, or VT)	After Intervention/Immediately Prior to Medication Administration in the Clinical Setting
HFS (Experimental Group)	STAI-SA, demographics	STAI-SA
LFS (Comparison Group)	STAI-SA, demographics	STAI-SA
VT (Comparison Group)	STAI-SA, demographics	STAI-SA

Data Analysis. The independent variables of this study were HFS, LFS, or VT; the dependent variable was state anxiety pre and post-training. Since the PI was blinded to the identities of the students, the PI gave instructions to one research assistant about how to code the participants into the HFS, LFS, or VT groups. The code-sheet with participant identities was kept in a password protected excel spreadsheet by the research assistant. The PI only had access to the codes and did not have access to the identities of the participants. Methods of quantitative analysis were conducted using SPSS (v. 22) software. Data were entered using appropriate coding for each group of participants after checking all items on each instrument for response errors. The PI coded the items and checked the data as it was entered into the SPSS database.

Univariate statistical analysis was conducted to describe the sample. Nominal data of gender, ethnicity, level of education, degree in a health related field, work in a healthcare related field, and medication administration training outside of the school of nursing were analyzed with frequencies and percentages. Age, level of education, and hours of work outside of nursing school were considered ordinal data. Bivariate statistics were used to determine the statistically

significant relationships between pairs. Chi-square tests were used with nominal data pairs and Spearman's rho tests were conducted with ordinal pairs. Mann-Whitney U and Kruskal-Wallis test were run when one variable was nominal and one was ordinal. Two-way ANOVA for Repeated Measures was used to analyze the differences in perceived anxiety between groups of HFS, LFS, and VT.

Protection of Human Subjects. Nursing students are inherently vulnerable since they have involuntary constraints as students (Leavitt, 2007). They may feel required to participate in research when the researcher is an instructor and they are approached in a classroom setting. The research assistant informed students that their participation in this research was strictly voluntary and that participation or lack of participation in the research study would not affect the course grade of the student. The student was informed they would not be penalized in any way for participation or the lack of participation in this research study.

The researcher was an instructor at University of Hawaii at Manoa in the nursing program so it is important to protect the nursing students from feeling pressured to participate in the research study in order to impress the instructor. To do this, the researcher provided a script for the research assistant who is not a nursing instructor, to solicit nursing students to consent to participate in the research study. The consent form informed participants that they may refuse to participate or withdraw from the study at any time. If there are risks of harm to the participants related to this study, participants may stop at any time or choose not to answer any part at any time. Those risks would be addressed and appropriate referrals would be made as listed in the informed consent.

Students signed a written informed consent in person after the research was explained and students verified understanding. To further protect students, the PI who is a nursing instructor was blinded to the identities of the participants. Also, students of the PI were not

allowed to participate in this study. Research information was held confidential to the extent allowed by state and federal law and the participant's personal information was protected. Codes, known only to study personnel were used instead of the participant's name. Research records were kept in a secure locked file when not being used and were only accessible to the PI.

Other potential risks to participants included psychological pain, deception, and loss of privacy. To monitor participants for safety related to potential risks of participating in this study, students had the opportunity to contact the investigator throughout this study and were aware, based on informed consent, that they could stop or withdraw from this study at any time. Research assistants were also aware to watch for any signs of psychological pain beyond the levels anticipated during educational interventions and when filling out surveys. If increased risk was detected, students would be counseled about the ability to withdraw from the study due to unanticipated harm.

It is well documented that anxiety affects performance and stress from the professional demands of nursing may contribute to anxiety in nursing students (Beddoe & Murphy, 2004; Kang et al., 2008). The purpose of this study was to compare the impact of three educational modalities of medication administration using the dependent variable state anxiety. Deception was used so the knowledge that the study measures state anxiety would not influence the participant survey responses which could alter the results of the study. Since deception was used, students were fully informed as to the nature of the research in writing after the data was collected from the second survey for all participants.

The loss of privacy was a possiblity due to the signed consent forms and the code book identifying the student and their group assignment. Research information was held confidential to the extent allowed by state and federal law and the participant's personal information was protected. Codes, known only to study personnel were used instead of the participant's name.

Research records were kept in a secure locked file when not being used and was only accessible to the principle investigator.

        Limitations of the Design. Limitations of this study included threats to internal validity: testing, selection, ambiguity about the direction of causal influence, inconsistencies in communication, treatment diffusion, compensatory equalization of treatments, compensatory rivalry by respondents receiving less desirable treatments, or resentful demoralization of respondents receiving less desirable treatments, and the time difference between the pre-test and the post-test (Burns & Grove, 2009). Participants may have changed answers based on viewing the same questions twice which may alter the outcomes of the study (Burns & Grove, 2009). Students were selected to be in the HFS, LFS, or VT groups randomly, but the make-up of the study groups could be different from each other in some way (Burns & Grove, 2009). Ambiguity about the direction of causal influence was a concern because there are other variables like study skills, amount of preparation completed, and previous observation experiences or specific clinical opportunities that could influence outcomes of this study (Burns & Grove, 2009). There could also be differences between clinical sites, clinical instructors, or acuity of patients that may influence state anxiety levels of students. Treatment diffusion was a concern because participants may discuss their experiences with participants in another study group (Burns & Grove, 2009).

        Compensatory equalization of treatments was a concern to nursing students with regards to having the HFS, LFS, or VT. Compensatory rivalry by respondents receiving less desirable treatments was a possible threat to internal validity because some students participating in the study could perceive either participating in HFS, LFS, or VT as the more desirable treatment (Burns & Grove, 2009). If compensatory rivalry is a possible threat to internal validity, then resentful demoralization could also be a possible threat to internal validity (Burns & Grove,

2009). This was addressed by providing the opportunity for all students to experience HFS, LFS, and VT following the study. Another important limitation is the differences in time between training and completing the post-test which could affect results. Participants that took the post-test two weeks out from training may have remembered their training better than participants that took the post-test six weeks out. Participants that took the post-test closer to six weeks out may have had more time to be comfortable with the clinical instructor and clinical site in comparison to participants that took the post-test two weeks out. Either of these situations could affect the levels of state anxiety in these participants. The different time periods were based on the participants' clinical group, their instructor, and the opportunities available in the clinical setting.

Summary. The purpose of this quasi-experimental randomized study was to determine the impact of three types of training on state anxiety of first year undergraduate nursing students related to medication administration. This study was conducted in the THSSC at the SONDH at UHM and in clinical facilities on the island of Oahu in the state of Hawaii. Student participants were recruited in person from an undergraduate nursing course using a script read by a research assistant who was not a nursing instructor. Data obtained from this study were utilized to evaluate the use of HFS, LFS, or VT as educational methods in teaching medication administration. The state anxiety of nursing students in administering medications could influence their educational outcomes and ultimately may influence their competency in medication administration. Understanding student state anxiety when utilizing educational methods like HFS, LFS, or VT helps researchers and those involved in nursing education to learn more about the best ways to educate students, reduce anxiety, improve competency, and practice nursing skills like medication administration safely in the clinical setting.

Chapter 4

Results

  Sample. A total of 47 participants were recruited for this research study. Forty-four completed the study. Demographics questionnaires and pre and post-intervention surveys. Frequencies and percentages were reported for types of training, age, gender, ethnicity, work in a health related field, healthcare employment, and medication administration training (See Table 3). Thirteen (29.5%) participants completed HFS training, 18 (40.9%) participants completed LFS training, and 13 (29.5%) participants completed VT. Participants reported age ranges as 34 (77.3%) participants in the age range of 18-23, five (11.4%) in the age range of 24-29, three (6.8%) in the age range of 30-35, one (2.3%) in the age range of 36-41, and one (2.3%) in the age range of 42 and above (See Table 3). Overall, there were nine (20.5%) male participants and 35 (79.5%) female participants.

  When reporting ethnic background, 31 (70.5%) participants identified themselves as Asian, five (11.4%) as Asian and White, three (6.8%) as White, and one (2.3%) each for Native Hawaiian/ Other Pacific Islander, American Indian, Asian, and White, Hispanic or Latino & White, Hispanic or Latino, Native Hawaiian/Other Pacific Islander, and White, and Native Hawaiian/Other Pacific Islander and White. If participants had a college degree, one (2.3%) participant had a degree in a health related field, six (13.6%) did not have a degree in a health related field, and 37 (84.1%) did not have a college degree. When asked if participants have worked or currently work in a healthcare related field outside of clinical with the school of nursing, five (11.4%) reported working in a healthcare related field and 39 (88.6%) reported not working in a healthcare related field. None of the participants had been trained in medication administration outside of the UHM SONDH.

Frequencies and percentages were also reported for level of education and how many hours of work a week the participant works outside of nursing school (See Table 3). The highest level of education completed for participants was reported as 36 (81.8%) participants completing high school, three (6.8%) completing an associate's degree, four (9.1%) completing a bachelor's degree, and one (2.3%) completing a master's degree. When asked how many hours a week participants worked outside of nursing school, 21 (47.7%) participants reported not working, 15 (34.1%) participants reported working 1-10 hours a week, seven (15.9%) participants reported working 11-20 hours a week, and one (2.3%) participant reported working 31-40 hours a week.

Table 3
Frequencies of Demographic Variables for Total Sample

Training Method	Frequency	Percent
HFS	13	29.5
LFS	18	40.9
VT	13	29.5
Total	44	100
Age Range		
18-23	34	77.3
24-29	5	11.4
30-35	3	6.8
36-41	1	2.3
42 and above	1	2.3
Total	44	100
Gender		
Male	9	20.5
Female	35	79.5
Total	44	100
Ethnic Background		
Asian	31	70.5
Asian & White	5	11.4
White	3	6.8
Native Hawaiian/ Other Pacific Islander	1	2.3
American Indian, Asian, & White	1	2.3
Hispanic or Latino & White	1	2.3
Hispanic or Latino, Native Hawaiian/Other Pacific	1	2.3

Islander, & White		
Native Hawaiian/Other Pacific Islander, & White	1	2.3
Total	44	100
Degree in Health Related Field		
Yes	1	2.3
No	6	13.6
Not Applicable	37	84.1
Total	44	100
Work in Healthcare Related Field		
Yes	5	11.4
No	39	88.6
Total	44	100
Level of Education Completed		
High School	36	81.8
Associate's Degree	3	6.8
Bachelor's Degree	4	9.1
Master's Degree	1	2.3
Total	44	100
Work Hours per Week		
0	21	47.7
1-10	15	34.1
11-20	7	15.9
31-40	1	2.3
Total	44	100

Summary of Results. *Demographic variables.* Evaluation of the demographic variables revealed the majority of participants were in the age range of 18-23, female, identified themselves as Asian, completed high school, did not work outside of nursing school, did not have a degree in a health related field, did not have healthcare employment, and no participants had previous medication administration training. This sample accurately reflected the population at UHM SONDH for age, gender, and ethnicity (Nursing, 2011). There were no significant differences in demographic variables between training groups (see Tables 3 & 4, Figures 2-5). This means that differences between groups were not due to differences in demographic variables listed.
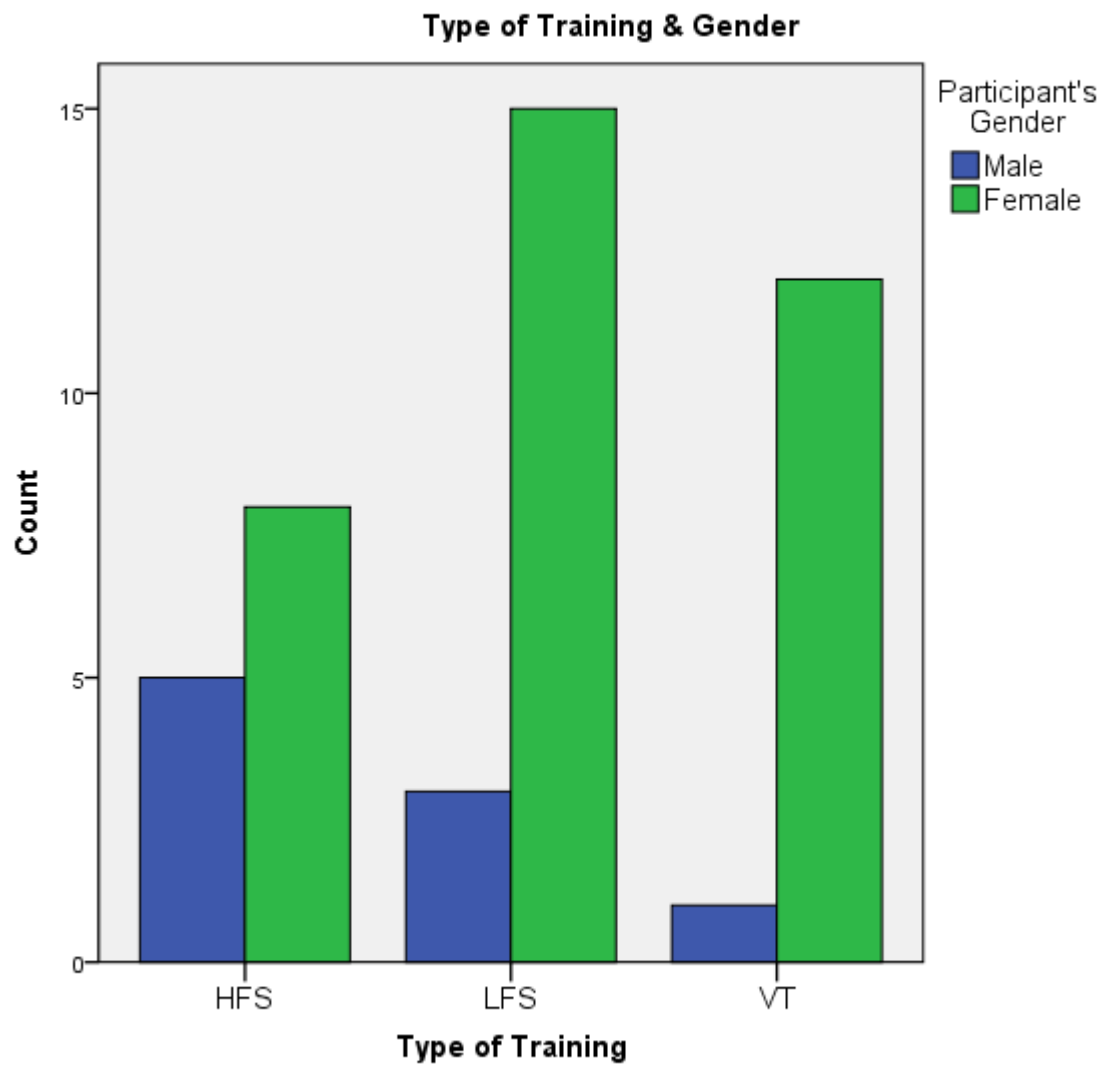
Figure 2. χ2(N = 44) = 3.619, p = 0.157)
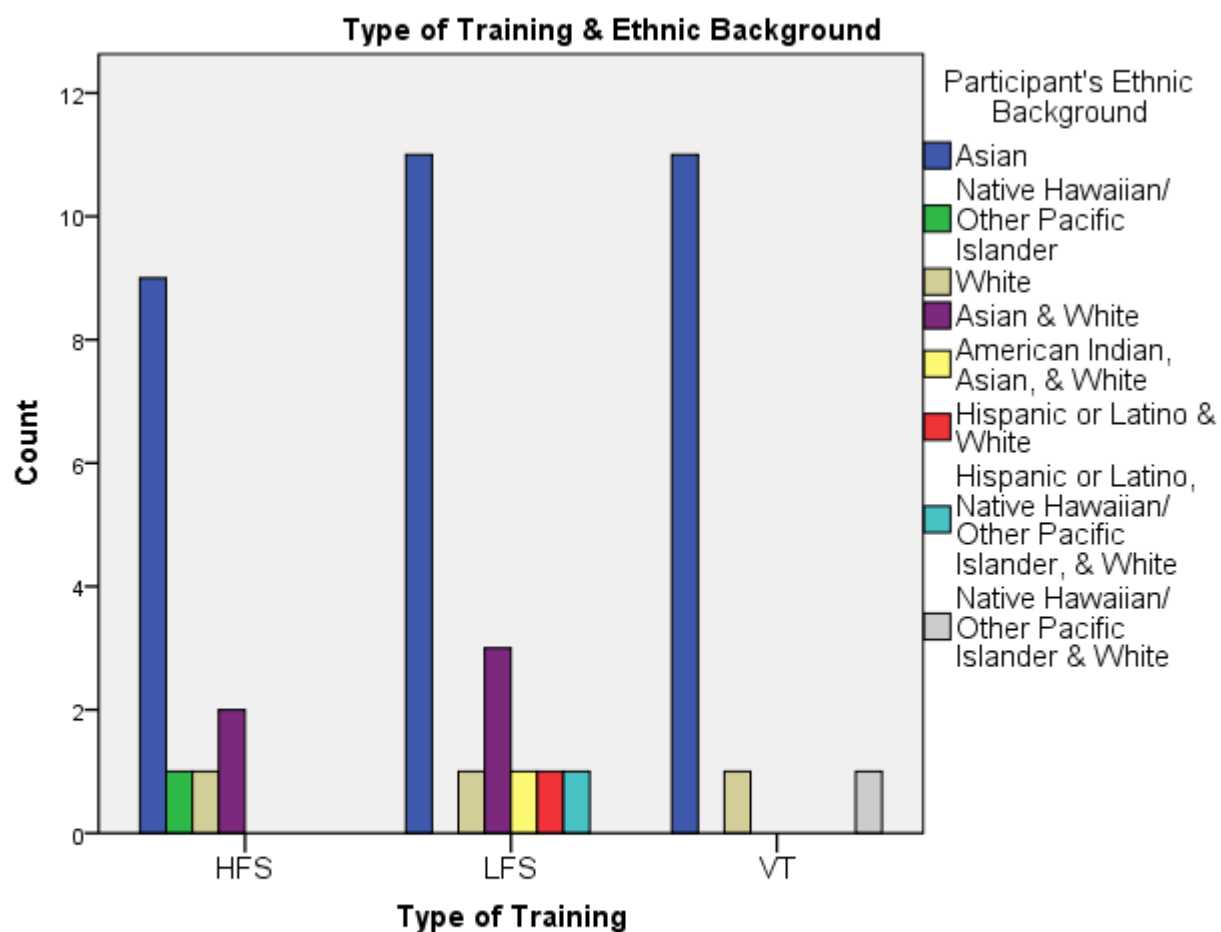
Figure 3. ($\chi 2(N = 44) = 11.755$, p = 0.746)

Type of Training & Degree in Health Related Field

Figure 4. (χ2(N = 44) = 2.223, p = 0.944)

Type of Training & Work in a Healthcare Related Field
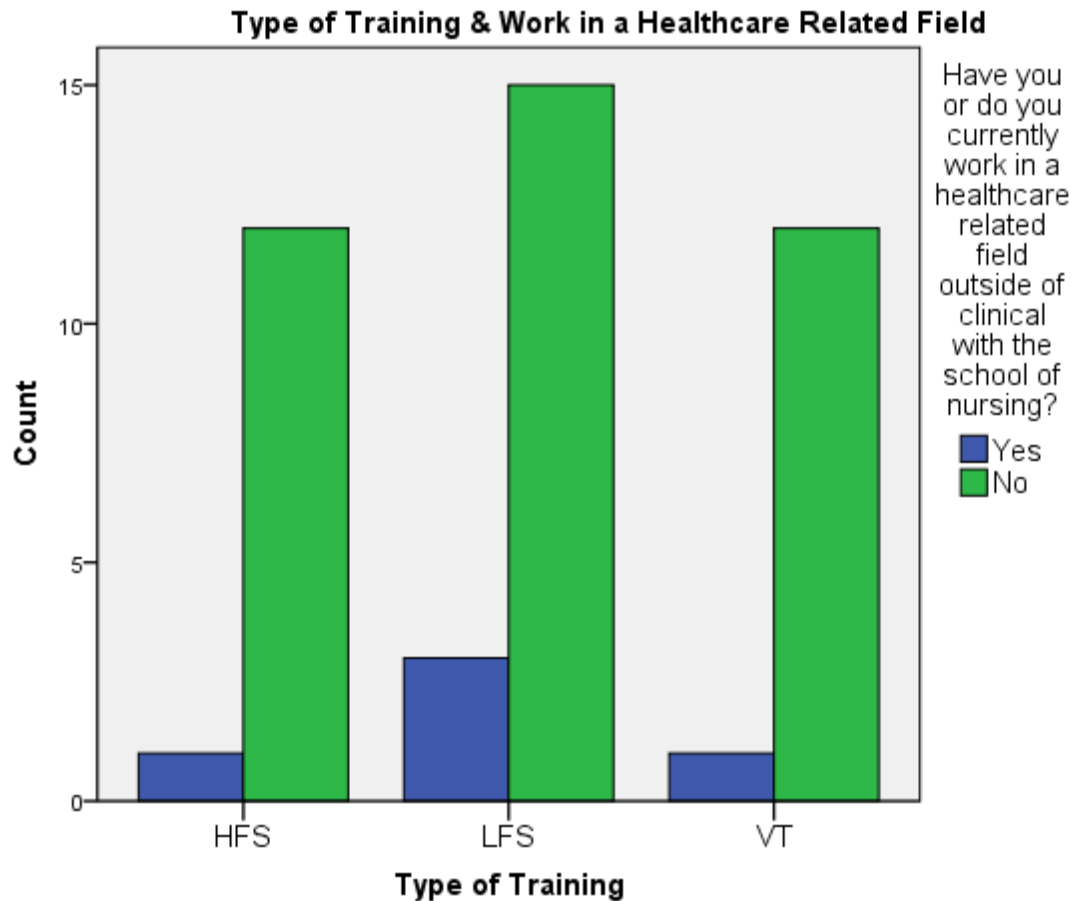
Figure 5. (χ2(N = 44) = 0.806, p = 0.714)

It is typical for the majority of students in bachelor degree programs to be traditional students between the ages of 18-23. The participants in this study were reflective of this age group. Only 16% of students were over the age of 30 in bachelor degree programs in 2012 (NLN, 2013). Most bachelor degree nursing programs have a majority of female students in comparison to male students which was reflected in this study. However, this sample reflected 20% males versus a national average of 14% males in nursing programs in 2012 (NLN, 2013). The percentage of males in nursing school has increased from 2009-2012 (NLN, 2013). The majority of students identified themselves as Asian in this study. This is contrary to national

averages of only 8% of students identifying themselves as Asian in bachelor degree programs. Because this study was based in Honolulu, HI, the ethnicities were reflective of ethnicities in the population with the majority of students identifying themselves as Asian (Honolulu, HI Demographics, 2012).

Due to the ages of the participants in this study, it is not surprising that most of these students completed high school as their highest level of education. The students have not had the time needed to complete degrees beyond high school. That explains why the majority of participants did not have a degree in a health related field. Nursing students are typically told not to work during nursing school because of the high demands of the program. This could be the reason many of the nursing students did not work or worked less than 10 hours a week. The majority of participants had never worked in a healthcare related field; this could be due to age and lack of previous training as well as the limited time to work while in nursing school due to the demands of the program. None of the participants had previous training in medication administration and this most likely had to do with age and lack of previous experience in school.

Relationships. Bivariate analysis using Chi Square and the H statistic of the Kruskall-Wallis did not show any statistical significant relationships when comparing age range, level of education completed, and how many hours a week a participant works outside of nursing school with type of training (See Table 4). There was not a statistically significant difference between age range and type of training ($\chi^2(2) = 0.346$, $p = 0.841$) with a mean rank of 22.46 for HFS, 23.36 for LFS, and 21.35 for VT. There was not a statistically significant difference between level of education completed and type of training ($\chi^2(2) = 2.305$, $p = 0.316$) with a mean rank of 20.00 for HFS, 24.69 for LFS, and 21.96 for VT. There was not a statistically significant difference between how many hours a week a participant works outside of nursing school and

type of training ($\chi^2(2) = 0.930$, $p = 0.628$) with a mean rank of 21.31 for HFS, 21.44 for LFS, and 25.15 for VT.

Table 4
Ordinal Variables & Types of Training

	Mean Rank HFS	Mean Rank LFS	Mean Rank VT	χ^2	Significance
Age Range	22.46	23.36	21.35	0.346	0.841
Level of Education	20.00	24.69	21.96	0.316	0.316
Work Hours a Week	21.31	21.44	25.15	0.628	0.628
Pre-test "I am tense"	25.73	25.14	15.62	6.560	0.038
Post-test "I feel confused"	19.00	26.33	20.69	7.037	0.030
Post-test "I feel steady"	15.35	24.94	26.27	6.503	0.039

The Kruskall-Wallis test was also used to compare each survey question with type of training. There was one survey question that was significantly different for the pre-test and two survey questions that were significantly different for the post-test for types of training. Higher scores on the pre-test survey question "I am tense" indicates more tension. The pre-test survey question "I am tense" was significantly different ($\chi^2(2) = 6.560$, $p = 0.038$) with a mean rank of 25.73 for HFS, 25.14 for LFS, and 15.62 for VT. Higher scores on post-test items "I feel confused" and "I feel steady" indicates more confusion or more steadiness. The post-test survey question "I feel confused" was significantly different ($\chi^2(2) = 7.037$, $p = 0.030$) with a mean rank of 19.00 for HFS, 26.33 for LFS, and 20.69 for VT. The post-survey question "I feel steady" was significantly different ($\chi^2(2) = 6.503$, $p = 0.039$) with a mean rank of 15.35 for HFS, 24.94 for LFS, and 26.27 for VT.

Fisher's exact test was used because of the small sample size to determine statistically significant relationships between pairs of variables. The exact Chi-square value did not show

any significant associations between type of training and participant's gender $\chi^2(N=44)=3.619$, $p=0.157$ (See Figure 2), between type of training and participant's ethnic background $\chi^2(14, N=44)=11.755$, $p=0.746$ (See Figure 3), between type of training and participants having a college degree in a health related field $\chi^2(N=44)=2.223$, $p=0.944$ (See Figure 4), or between type of training and participants working in a healthcare related field $\chi^2(N=44)=0.806$, $p=0.714$ (See Figure 5).

Two-way ANOVA for repeated measures was used to analyze the differences in the means within and between groups for state anxiety levels (See Table 5). There were no statistically significant differences within or between groups related to state anxiety. There was not a statistically significant difference in state anxiety levels before training and immediately prior to administering medications in the clinical facility $F(1, 41)=0.749$, $p=0.392$, $\eta^2=0.018$, between groups training with HFS, LFS, or VT $F(2, 41)=0.201$, $p=0.819$, $\eta^2=0.010$, or before training and immediately prior to administering medications in the clinical facility and training with HFS, LFS, or VT $F(2, 41)=2.340$, $p=0.109$, $\eta^2=0.102$.

Table 5 and Figure 6 display the mean state anxiety levels of participants in HFS, LFS, and VT groups on pre and post intervention surveys. The mean state anxiety levels of participants in the HFS group ($n=13$) were higher prior to training (pre-test) ($M=36.08$, $SD=9.578$) and the mean state anxiety levels went down immediately prior to administering medication in the clinical facility (post-test) ($M=30.62$, $SD=10.046$). The mean state anxiety levels of participants in the LFS group ($n=18$) was slightly higher prior to training (pre-test) ($M=34.89$, $SD=12.522$) and state anxiety levels were slightly lowered immediately prior to administering medication in the clinical facility ($M=34.56$, $SD=7.965$). The mean state anxiety levels of participants in the VT group ($n=13$) was lower prior to training (pre-test) ($M=31.85$, $SD=7.967$) and mean state anxiety levels were higher immediately prior to administering

medication in the clinical facility ($M = 34$, $SD = 7.176$). The trend shows mean state anxiety

levels decrease after training in HFS and LFS, but mean state anxiety levels increase after

training with VT.

Table 5				
ANOVA results				
Type of Training	HFS ($n = 13$)	LFS ($n = 18$)	VT ($n = 13$)	Significance
Pre-test *M*	$M = 36.08$	$M = 34.89$	$M = 31.85$	$p = 0.392$
Pre-test *SD*	$SD = 9.578$	$SD = 12.522$	$SD = 7.967$	
Post-test *M*	$M = 30.62$	$M = 34.56$	$M = 34$	$p = 0.109$
Post-test *SD*	$SD = 10.046$	$SD = 7.965$	$SD = 7.176$	
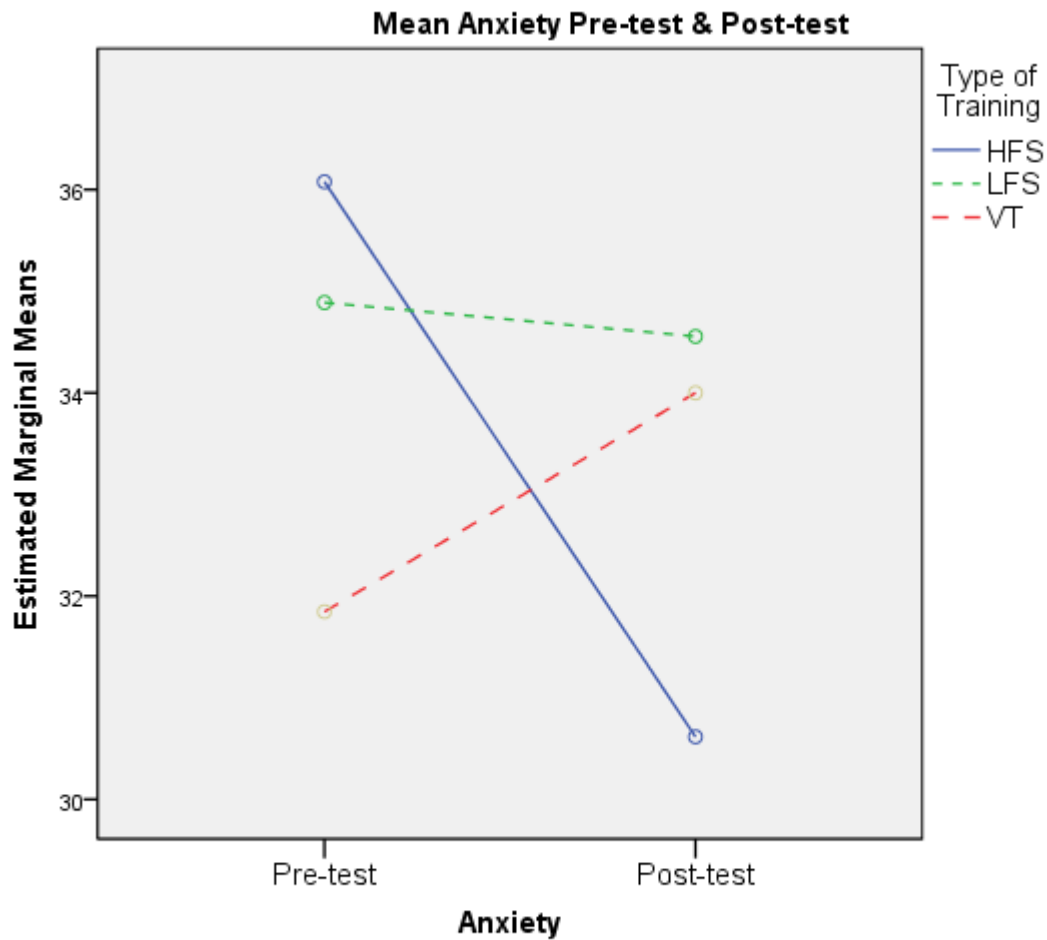
Figure 6: Mean Anxiety Pre-test & Post-test

Summary. The sample participants (*n* = 44) in this study were split into three groups: participants who completed the HFS training, LFS training, and VT. The majority of participants were female, ages 18-23, identified themselves as Asian, and reported completing high school as the highest level of education completed. The majority of participants did not have a college degree; only one participant had a degree in a health related field out of the seven with college degrees. Five out of the 44 participants had worked or were currently working in a healthcare related field and the majority of students worked less than 10 hours a week. None of the participants had previous training in medication administration outside of the UHM SONDH.

There were no statistically significant relationships between types of training and variables of gender, age range, ethnic background, level of education completed, having a degree in a health related field, working in a healthcare related field, or how many hours a week a participant worked outside of nursing school. This could be because the participants in the sample reflect the population and randomization of training groups was successful in keeping the groups fairly homogenous.

STAI-SA. Survey items were also compared with training groups to determine if there were any significant differences in how those survey items were answered between groups. There was one pre-test item ("I am tense.") that was significantly different. The mean was high in the HFS and LFS groups and low in the VT group. There were two post-test items ("I feel confused" & "I feel steady") that showed statistically significant differences between training groups. For the item "I feel confused," HFS had the lowest mean score, VT was also low, and LFS group was high. The post-test item, "I feel steady," was also significantly different between training groups. This item had a low mean score for HFS, higher for LFS and highest for the VT group. The null hypothesis was there will be no difference in state anxiety of first year

undergraduate nursing students' pre or post-training when using HFS, LFS, or VT for medication administration. This study failed to reject the null hypothesis.

Chapter 5

Discussion

   Purpose. The purpose of this study was to compare the use of HFS training, LFS training, and VT for medication administration to determine if there was a difference in state anxiety in first year undergraduate nursing students prior to training and post-training when administering medications in the clinical setting. The null hypothesis stated there would be no difference in state anxiety prior to oral medication administration training with HFS, LFS, or VT or post-training immediately prior to administering medications in the clinical facility.

   Rationale for the Study. Ensuring patient safety is one of the most important aspects of nursing practice (The Joint Commission, 2014). Medication administration is a nursing skill that is vital to patient safety due to the risk of making errors in the clinical setting (Sulosaari et al., 2010). Nursing students have limited experience in nursing skills like medication administration, which increases anxiety when performing those skills in the clinical setting (Kang et al., 2008; Kanji et al., 2004). Since anxiety can affect competence in practice and student performance of skills in clinical practice has a direct effect on the patient, training nursing students in skills like medication administration is vital to avoiding errors (Thompson & Bonnel, 2008).

   There are many different methods for teaching medication administration to nursing students, but there is limited research available to provide guidance for best practices in teaching and learning (Greenfield, 2007; Kyrkjebo et al., 2006; Murphy, 2012; Sears et al., 2010; Sredl, 2006; Stillman et al., 1998; Wheeler et al., 2008). There have been many studies examining different types of teaching techniques (Bearnson & Wiker, 2005; Holland et al., 2012; Sears et al., 2010; Wheeler, et al., 2008) for various nursing skills and the effects of those training methods on student anxiety and student performance (Brimble, 2008; Megel et al., 2011; Minardi

& Ritter, 1999). However, there are limited studies evaluating state anxiety levels associated with medication administration training for clinical practice.

Discussion of Results. *Demographics.* Participants were randomly placed into three different training groups. There were no significant relationships between demographic variables when comparing training groups. Therefore, differences between groups were not due to demographic variables.

STAI-SA. Survey items were compared with training groups to determine if there were any significant differences in how those survey items were answered between groups. There was one pre-test item ("I am tense.") that was significantly different. The mean was high in the HFS and LFS groups and low in the VT group (See Table 4). High fidelity simulation and LFS have been associated with higher anxiety levels in nursing students (McKay et al., 2010). High fidelity simulation and LFS require active learning where the participant must participate in scenarios hands on with peers watching their performance. Video training is more passive.

There were two post-test items ("I feel confused" & "I feel steady") that showed statistically significant differences between training groups. For the item "I feel confused," HFS had the lowest mean score, VT was also low, and LFS group was high (See Table 4). High fidelity simulation has been associated with increased confidence (Bearnson, 2005; Gordon & Buckley, 2009; Mould et al., 2011) and competence (Alinier et al., 2006; Bearnson, 2005; Brannon et al., 2008; Heitz et al., 2009; Hoadley, 2009; Kidd & Kendall, 2006; Schlairet & Pollock, 2010; Weaver, 2010) which would mean these students would most likely be less confused post-training with HFS. Video training was associated with increased self-efficacy which could explain why the mean score for confusion would be low (McConville & Lane, 2006). Some studies comparing the use of HFS with other training methods have shown HFS to have higher scores for satisfaction (Cant & Cooper, 2010; Corbridge et al., 2010; Garrett et al.,

2010; Hoadley, 2009; Mould et al., 2011; Smith, 2009; Smith & Roehrs, 2009; Stefanski & Rossler, 2009; Wotton et al., 2010), competency and knowledge transfer (Alinier et al., 2006; Bearnson, 2005; Brannon et al., 2008; Heitz et al., 2009; Kidd & Kendall, 2006; Schlairet & Pollock, 2010; Weaver, 2010), confidence (Bearnson, 2005; Gordon & Buckley, 2009; Mould et al., 2011), and communication skills (Kameg et al., 2009; Kameg et al., 2010) in nursing students. This could explain the differences in HFS and LFS for increased confusion. The HFS group also had a debriefing session which was lacking in the LFS group which could have had an impact on understanding and could explain the differences in confusion of participants.

The post-test item, "I feel steady," was also significantly different between training groups. This item had a low mean score for HFS, higher for LFS and highest for the VT group (See Table 4). The item "I feel steady" seems to be in contrast to having state anxiety. It is surprising that HFS would have the lowest score compared with LFS which had a slightly higher score, and VT with the highest score for "I feel steady." The literature is in support of HFS for lowering anxiety when in clinical practice post-training (Atack et al., 2009; Sears et al., 2010; Wheeler et al., 2008). Participants in the VT group may have had higher scores for the item "I feel steady" because this group was not exposed to debriefing and they did not discuss the potential situations that could happen when giving medications like a patient having an allergic reaction. Participants in the HFS group were exposed to debriefing and because they were exposed to potential situations that could happen when giving medications, this could have made them more cautious which would make them feel less steady. Participants in the LFS or VT groups that did not have debriefing as part of their training may have felt more steady due to lack of awareness regarding aspects of medication administration that may not have been covered in the scenarios.

Anxiety and learning. The state of anxiety increases motivation for learning and maintains physical and mental health, but too much stress can have a negative influence on health and academic performance when there are not adequate coping mechanisms (Kang et al., 2008; Paul et al., 2007). The trends in this study show that participants with higher state anxiety prior to training had lower state anxiety post training and participants with lower state anxiety prior to training had higher state anxiety post training. Anxiety and high levels of stress may hinder concentration, memory, and problem-solving which are needed for learning (Beddoe & Murphy, 2004). In nursing students unable to cope with stress, it can negatively influence holistic patient care and professionalism (Kang et al., 2008). Stress may also weaken communication, interpersonal effectiveness, and empathy (Beddoe & Murphy, 2004). This indicates that anxiety may have a negative effect on learning in nursing students, however trends in this study do not confirm this finding.

There is research in nursing simulation that evaluates the relationship of acute stress, anxiety, and salivary α-amylase levels with performance (McKay et al., 2010). In one study, low performers had increased stress and performed poorly, but high performers had increased stress and performed exceptionally well, while moderate performers had modest stress and performed moderately (McKay et al., 2010). This suggests that some levels of anxiety in some students can be beneficial, but some students perform poorly with high anxiety. This indicates a need for further research beyond this study to evaluate different aspects of anxiety and stress and how those factors affect learning and performance.

State versus trait anxiety. State anxiety is a response to a specific situation, such as training in medication administration or administering medication to a patient in the clinical setting for the first time (Paul et al., 2007). This study focuses on state anxiety alone in relation to medication administration training and performance in the clinical setting. This does not take

into consideration the trait anxiety (underlying personal characteristic of participants) (Paul et al., 2007). There may be situations in which both state and trait anxiety interact and further research evaluating state and trait anxiety in relation to learning could inform the body of literature more, particularly in the area of medication administration training and clinical performance (Paul et al., 2007).

Training and state anxiety. The results of this study supported the null hypothesis; there were no significant differences between HFS, LFS, or VT groups when evaluating state anxiety prior to training or post-training immediately prior to administering medications in the clinical facility. For the purposes of this study, there were two specific situations when state anxiety was measured: pre-training - immediately prior to medication administration training with HFS, LFS, or VT and post-training - immediately prior to medication administration to an actual patient in the clinical setting. Although there were not statistically significant differences between training groups for state anxiety in this study, there were trends for state anxiety levels between and within training groups (See Table 5 & Figure 6).

State anxiety levels in the HFS group were higher prior to HFS training and lower post-training immediately prior to administering medications in the clinical facility. State anxiety levels in the LFS group were slightly higher prior to LFS training and slightly lower post-training immediately prior to administering medications in the clinical facility. The differences in state anxiety levels before and after training were also greater in the HFS group than the LFS group. State anxiety levels in the VT group were lower prior to VT training and higher post-training immediately prior to administering medications in the clinical facility. The differences in anxiety levels before and after training were greater in the VT group than the LFS group, but less than the HFS group (See Table 5 & Figure 6). These results are supported in the literature.

With HFS and LFS, students are required to participate in active learning where they are required to apply knowledge rather than listening passively to absorb information. For example, HFS was associated with an acute stress and anxiety response in student nurse anesthetists (McKay et al., 2010). When students are first exposed to this type of learning, it creates anxiety. Although HFS & LFS create higher levels of anxiety initially, the literature supports the use of HFS to decrease anxiety in nursing students when transitioning into the clinical setting to treat authentic patients (Atack et al., 2009; Sears et al., 2010; Wheeler et al., 2008).

The opportunity to practice reduces anxiety of nursing students (Walsh, 2008; Dehkordi & Tavakol, 2011). Low fidelity simulation and HFS are two ways to increase opportunities to practice prior to providing care for patients in the clinical setting. When students utilized HFS prior to clinical experiences, students had less anxiety than students that practiced new psychomotor skills without a manikin (Megel et al., 2011). The trend for state anxiety levels found in this study were encouraging for the use of HFS training to decrease state anxiety levels of first year undergraduate nursing students when administering oral medications in the clinical setting. However, the results of this study do not support the use of one learning technique over another.

Limitations of the Study. Limitations of this study included a small sample size in one geographic area and there was limited power in this study to draw strong conclusions and make generalizations despite a conservative approach to determining the effect size from the available literature. The power of this study was weak $\eta^2 = 0.018$ and increased the risk for a Type II error.

The timing between training and medication administration in the clinical facility was not measured and may have also affected the results. Some participants were able to practice medication administration in the clinical facility as soon as two weeks post-training and up to six weeks post-training for others. The timing of the practice medication administration session may

have created more or less state anxiety for participants. Participants who were able to practice medication administration at two weeks post training may have had less state anxiety levels because they may have been able to retain more medication administration skills and knowledge from their training. Participants who practiced medication administration in the clinical facility six weeks post-training may have been more comfortable with their nursing instructor or clinical facility which could affect state anxiety levels. Unfortunately, controlling for the timing of this practice session was logistically impossible, given the number of clinical sites, clinical instructors, and students as well as varying demands of the clinical units and patient situations. Additionally, instructors can only give medications with a certain number of students each week, so it was not possible for all students to give medications within the same time period post-training.

There are other variables that could affect the participants' state anxiety levels. Differences in state anxiety levels before training could have been caused by levels of comfort with the learning environment, with new learning activities, lack of knowledge about who their training facilitator would be, and the amount of preparation participants actually completed. After training, just prior to giving medications in the clinical facility, state anxiety levels could have been affected by the clinical instructor, level of orientation to the clinical facility, comfort level with the patient being treated, and the amount of preparation to learn about the medications and the patient's past medical history. State anxiety may be further affected by interpersonal and social problems, pressures to succeed academically, financial strains, and uncertain futures (Nidich et al., 2009).

Instructors or clinical facilities may affect state anxiety levels of nursing students due to differences in teaching styles, personalities, expectations, organization, and location. Some nursing students' state anxiety levels may be affected more than others based on their own

characteristics or the characteristics of their clinical instructor. This may be difficult to control for because each student and instructor is unique. Also, there is a need for multiple instructors and clinical facilities in order to teach a cohort of nursing students effectively, and each instructor or facility may be different in some way.

It may have also been helpful to compare levels of trait anxiety (an underlying personal characteristic) with state anxiety (response to a specific situation) to evaluate the differences between individual students (Paul et al., 2007). Some students perform well in high stress situations while other students do not and it may be important to evaluate the differences in students to determine which students would benefit from reducing stress and anxiety in training and in the clinical facility (McKay et al., 2010).

Implications for Nursing Education. The potential implications for nursing education include considering the use of a variety of learning techniques for first year nursing students in medication administration. Since there were not significant differences in state anxiety of participants, it indicates that HFS, LFS, or VT could be used and will not affect state anxiety. However, the trends did show higher anxiety levels in students that participated in HFS and LFS in comparison to VT prior to training. This indicates it may be important to construct and conduct simulated scenarios to alleviate anxiety when nursing students participate in simulated experiences.

There was also a trend for students who participated in HFS to have lower anxiety levels post-training just prior to giving medications in the clinical setting and for the VT comparison group to have higher anxiety levels post-training. This indicates VT may be best in conjunction with other learning techniques.

Faculty should take state and trait anxiety into consideration when teaching nursing students. Various skill training techniques may affect students' state anxiety levels, and,

conversely, different levels of state anxiety may affect student skill performance. Faculty should evaluate students individually to determine the learning techniques that work best for them and then implement a variety of learning techniques to give all students the opportunity to learn in a way that is best for them.

   Implications for Nursing Practice. Medication administration training with LFS and HFS may be used to maintain medication administration competency post-graduation for RNs. Less state anxiety may help to increase competency in medication administration and lead to improved patient safety and that is a main goal when providing pharmacologic therapy (Ratanasirapong et al., 2012; Sulosaari et al., 2010; Thompson & Bonnel, 2008). These previous findings inform nurse educators, nurse managers, and administrative leaders in clinical facilities about strategies that may potentially decrease medication errors. The findings of this study are encouraging for the use of HFS, LFS, and video training and may also apply to reducing anxiety amongst seasoned RNs.

   Implications for Nursing Administration. There is a wide cost gap between VT, LFS, and HFS and the evidence from this study seems to support using any of these training methods. A human patient simulator that was used for the HFS scenarios in this study may cost hundreds of thousands of dollars when you include the service plans, equipment, and facility needed to run this type of simulator. This is in comparison to lower technology manikins that may cost thousands to tens of thousands of dollars depending on the capabilities of the manikin or videos that may be hundreds of dollars. Further research is needed to evaluate the use of HPS with high levels of technology to determine if the resources are justified or if other, less costly, training methods could affect outcomes in the same way.

   Implications for Future Research. This study should be repeated with a larger sample size in a different geographic location to confirm the findings. Controlling for variables such as

different clinical instructors, different clinical facilities, and the timing between training and practice would improve this study. Future research should focus on the use of debriefing to determine if that is a factor in state anxiety and competency measures. Debriefing is an essential aspect of HFS and allows for students to reflect on their HFS experience, develop clinical reasoning, increase confidence, and to clarify students' knowledge and rationale for practice (Bricker & Pardee, 2011; Broussard et al., 2008; Dreifuerst, 2009; Gordon & Buckley, 2009; Kuiper et al., 2008; Wotton et al., 2010). Perhaps, debriefing is the feature of HFS that may lead to decreased state anxiety levels and perhaps debriefing should also be used with other training methods. Measuring competency levels along with anxiety to compare how levels of anxiety affect competency specific to medication administration in nursing students would also add to the literature. Another recommendation would be to compare the use of HPS manikins with a live standardized patient to compare fidelity and outcomes. It is also important to evaluate training techniques in online education and in programs that require online skills training. The importance of measuring state anxiety along with trait anxiety may impact results when comparing various learning techniques. And last, but not least, is the importance of evaluating the cost versus benefit of various levels of technology in training nursing students.

Conclusion. This study failed to reject the null hypothesis, which would indicate that HFS, LFS, or VT may be equally effective in reducing state anxiety levels. However, this study did not have adequate power to determine any differences between the three training methods. The findings of this study are important because they give certain insight into how to improve the conduct of future research in skills training and their relationship to anxiety.

Appendices

Appendix A

Please fill out these questions to the best of your ability. Circle the category you fit best.

Demographics

1. Gender: Male   Female

2. Age: 18-23   24-29   30-35   36-41   42 and above

3. Ethnic Background: Circle all that apply.

__American Indian / Alaskan Native
__Asian
__Black / African American
__Hispanic or Latino
__Native Hawaiian / Other Pacific Islander
__White

4. Level of Education Completed:

High School   Associate's Degree   Bachelor's Degree   Master's Degree

5. If you have a college degree, is your degree in a health related field?

Yes   No

6. How many hours a week do you work outside of nursing school?

        0   1-10   11-20   21-30   31-40   41 or more

7. Have you or do you currently work in a healthcare related field outside of clinical with the

school of nursing?   Yes   No

8. Have you been trained in medication administration outside of the University of Hawaii

School of Nursing?   Yes   No

Appendix B

HFS Effect Size Table				
Reference	Independent Variable	Dependent Variable	Effect Size	Results
Andrighetti, T.P., Knestrick J.M., Marowitz A., Martin C., Engstrom J.L. (2012). Shoulder dystocia and postpartum hemorrhage simulations: student confidence in managing these complications. *J Midwifery Womens Health.*, 57(1):55-60. doi: 10.1111/j.1542-2011.2011.00085.x.	Discussion, video, low-fidelity simulation High-fidelity simulation	Confidence in managing shoulder dystocia and postpartum hemorrhage	Moderate effect size (0.54) for the intervention group for the shoulder dystocia simulations and a large effect size (1.68) for the postpartum hemorrhage simulations.	Significant increase in confidence with HFS
Baxter, P., Akhtar-Danesh, N., Landeen, J., & Norman, G. (2012). Teaching critical management skills to senior nursing students: videotaped or interactive hands-on instruction? *Nursing Education Perspectives*, 33(2): 106-110.	Video-taped instruction Hands-on experience Control: no instruction	Three station objective structured clinical examination using HFS to evaluate trauma management	Between control and video ES: 1.29; control and interactive group: 1.64; no difference b/n two interventions 0.35	Differences between instructional groups and control were significant; differences between instructional groups were not significant
Blum, C., Borglund, S., & Parcells, D. (2010). High-fidelity nursing simulation: Impact on student self-confidence and clinical competence. *International journal of nursing education scholarship* Vol 7, Iss 1, Art 18.	Simulation	Student self-confidence and competence	Calculated effect size: Cohen's *d*: 0.58 (self-confidence scores mid-term) Cohen's *d*: 0.41 (self-confidence scores final) Cohen's *d*: 0.18 (clinical competence scores mid-term) Cohen's *d*: 0.27 (clinical competence	Results indicated an overall improvement in self-confidence across the semester, however simulation did not significantly enhance these confidence & competence

			scores final)	
Botezatu, M., Hult, H., Tessma, M., & Fors, U. (2010). Virtual patient simulation: knowledge gain or knowledge loss? *Medical Teacher*, 32: 562-568.	Virtual patients (simulation) Regular learning activities	Variations in retention	Effect size from 0.5-0.8	Better retention with VP than traditional learning methods
Brannon, J., White, A., & Bezanson, J. (2008). Simulator Effects on Cognitive Skills and Confidence Levels. *Journal of Nursing Education*, 47 (11).	Lecture Human Patient Simulator	Junior level nursing students cognitive skills & confidence	Calculated effect size: Cohen's *d*: 0.49 (AMIQ pre-test) Cohen's *d*: 0.71 (AMIQ post-test) Cohen's *d*: 0.11 (CL tool pre-test) Cohen's *d*: 0.38 (CL tool post-test)	The use of a teaching strategy involving the HPS method made a positive difference of the nursing students' ability to answer questions on a test of cognitive skills; confidence levels were not found to be significantly enhanced the HPS method
Bruppacher, H. et al. (2010). Simulation-based training improves physicians' performance in patient care in high-stakes clinical setting of cardiac surgery. *Anesthesiology*, 112: 985-92.	Simulation-based training Interactive seminar	Better patient care during weaning from cardiopulmonary bypass (CPB)	Effect size: (In the field of psychology, an effect size of more than 1 SD is considered a large and acceptable difference for assessing teaching interventions (large effect size)	Pretest global rating scale and checklist performances were similar; the simulation group scored significantly higher than the seminar group at both posttest
Brydges R, Carnahan H, Rose D, Dubrowski A. (2010). Comparing self-guided learning and educator-guided learning formats for simulation-based clinical training. *J Adv Nurs.*, 66(8):1832-44.	***Proficiency-based students*** advanced from low- to mid- to high-fidelity after achieving a proficiency	Performance on high-fidelity post-test	Proficiency-based students scored highest on the high-fidelity post-test (effect size = 1.22).	Proficiency-based students scored highest on the high-fidelity post-test (effect size = 1.22). An interaction effect showed that the

doi: 10.1111/j.1365-2648.2010.05338.x. Epub 2010 Jun 16.	criterion at each level. ***Progressive students*** self-guided their progression from low- to mid- to high-fidelity. Yoked control students followed an experimenter-defined progressive practice schedule. ***Open-ended students*** moved freely between the simulators. One week after practice, blinded experts evaluated students' skill transfer on a standardized patient simulation.			Progressive and Open-ended groups maintained their performance from post-test to transfer test, whereas the Proficiency-based and Yoked control groups experienced a significant decrease ($P < 0.05$). Surprisingly, most Open-ended students (73%) chose the progressive practice schedule.
Cant, R. & Cooper, S. (2009). Simulation-based learning in nurse education: systematic review. *Journal of Advanced Nursing*, 66(1), 3-15. Doi: 10.1111/j.1365-2648.2009.05240.x	Systematic review	12 studies using experimental or quasi-experimental designs	Table: 4/12: no power analysis given 1/12: not adequate sample for statistical significance 4/12 analysis of means, one way ANOVA 3/12: power analysis adequate	All report simulation as a valid teaching/learning strategy 6/12 studies show additional gains in knowledge, critical thinking ability, satisfaction or confidence compared with control group

			Alinier: observed effect size slightly in excess of 1.0	
Corbridge, S., Robinson, F., Tiffen, J., & Corbridge, T. (2010). Online learning versus simulation for teaching principles of mechanical ventilation to nurse practitioner students. *International Journal of Nursing Education Scholarship*, 7(1), 1-9.	HFS Online narrated power point presentation	Differences in knowledge acquisition and student satisfaction	Calculated effect size: Cohen's *d*: 2.45	Both groups had significant improvement in knowledge scores from pretest to posttest, but knowledge scores were not significantly different at posttest b/n groups Student satisfaction with their learning method was significantly higher in the simulation group Students choosing to participate in the alternative teaching method after study completion preferred the simulation to the online method
Fountain, R. & Alfred, D. (2009). *Nursing Education Perspectives*, 30 (2) Student Satisfaction with High-Fidelity Simulation: Does it Correlate with Learning Styles?	Student's learning style	Satisfaction with the use of HFS technology enhanced activities	Calculated effect size: Cohen's *d*: 0.5 (all students auditory/visual) Cohen's *d*: 1.02 (all students auditory/social) Cohen's *d*: 0.16 (all students auditory/solitary) Cohen's *d*: 0.41 (all students auditory/oral	Analysis of data reveals positive relationships between social and solitary learning styles and student satisfaction with simulation

			dep.) Cohen's d: 0.19 (all students auditory/writing dep.)	
Hoadley, T. (2009). Learning advanced cardiac life support: a comparison study of the effects of low and high fidelity simulation. *Nursing Education Perspectives*, 30 (2).	HFS LFS	Satisfaction with simulation design and learning and cognitive and behavioral testing	Calculated effect size: Cohen's d: 0.13 (knowledge prior) Cohen's d: 0.31 (knowledge post) Cohen's d: 0.45 (mean skills test score)	Findings showed a positive correlation between enhanced practice and learning but no significant correlation between posttest and skills test scores for the LFS and HFS groups; HFS scored higher on both cognitive and behavioral tests, but not statistically significant. Participants from both groups indicated satisfaction with their forms of simulation experience and course design.
Johnson, E., Lasater, K., Hodson-Carlton, K., Siktberg, L., Sideras, S., & Dillard, N. (2012). Geriatrics in simulation: role modeling and clinical judgment effect. *Nursing education perspectives*, 33(3): 176-180.	Expert role modeling	Nursing students' clinical judgment in care of a simulated geriatric hip fracture patient	Large effect size of Cohen's d >= 1.13 for each aspect of clinical judgment	Significant group differences using Lasater clinical judgment rubric
McGaghie, W., Issenberg, S., Petrusa, E., & Scalese, R. (2006). Effect of practice on standardized	Synthesis of 31 journal articles on high-fidelity simulation-		A Weighted Effect Size: number of cases represented by each variable	There is a strong association between hours of practice on high-fidelity medical

learning outcomes in simulation-based medical education. *Medical Education*, 40: 792-797.	based medical education		and approximation to study power 8.76-54.48 changed based on hours of simulation	simulators and standardized learning outcomes; hours of high-fidelity simulator practice have a positive, functional relationship with standardized learning outcomes in medical education
Ohtake, P., Lazarus, M., Schillo, R., & Rosen, M. (2013). Simulation experience enhances physical therapist student confidence in managing a patient in the critical care environment. *Physical Therapy*, 93(2): 216-228.	Effect of participation in simulation-based management of a patient with critical illness in an ICU setting	Confidence & satisfaction of physical therapist students	Average effect size of 0.52	Confidence & satisfaction increased
Persoon, M., Schout, B., Muijtjens, A., Hendrikx, A., Witjes, J., & Scherpbier, A. (2010). The effect of a low-fidelity model on cystoscopic skill training, S*imulation in healthcare*, 5(4): 213-218. DOI: 10.1097/SIH.0b013e31 81e1b73d	Training with low-fidelity to computerized simulator or no low-fidelity training to computerized simulator	Performanc e	Performance: Effect size 0.6 (task 1) Appreciation: effect size 1.8	Intervention group had generally higher scores; appreciated more than enhanced performance
Ravert, P. (2002). An integrative review of computer-based simulation in the education process. *CIN*, 20(5): 203-208.	Integrative review		5/9 studies had large effect sizes Gordon: 2.20 Ewy: 1.43 skill 1 post-test Champagne: 2.07 Garfield: 3.94, 5.06 Harrell: 1.09	75% of the studies showed positive effects of simulation on skill and/or knowledge acquisition

			2nd article: 1.60 Other studies < 0.5	
Summerhill, E., Mathew, M., Stipho, S., Artenstein, A., Jagminas, L., Russo-Magno, P., Potter, S., & Shapiro, M. (2008). A simulation-based biodefense and disaster preparedness curriculum for internal medicine residents. *Medical Teacher*, 30, e145-e151.	HFS Control	Knowledge	Calculated effect size: Cohen's *d*: 1.35	Training increased participants level of knowledge significantly better than control group; subjective preparedness was also significantly better; objective improvements were not maintained after one year
Yuan, H., Williams, B., Fang, J., & Ye, Q. (2012). A systematic review of selected evidence on improving knowledge and skills through high-fidelity simulation. *Nurse Education Today*, 32: 294-298.	Systematic review		Effects of HFS: MCQs/exam, paper (13 studies): (0.53: 0.16-0.90) Skill exam (11 studies): (1.15: 0.78-1.52) OSCE (2 studies): (0.18: -0.82—1.17)	HFS enhanced scores on knowledge and skill exams, but OSCE was mixed; RCTs of low methodological quality: necessary to conduct more high quality RCTs with larger sample sizes to determine the effect of HFS on students' performance

Appendix C

Informed Consent Script

Elise Thompson is a PhD Candidate at the University of Hawai'i at Manoa, in the Department of Nursing. As part of her dissertation, she is conducting research. The purpose of her research project is to compare the impact of High fidelity simulation (HFS) training, Low fidelity simulation (LFS), and video training (VT) for medication administration with first year undergraduate nursing students. You are being asked to participate in this project because you are a first year undergraduate nursing student.

If you participate, you will receive learning materials regarding oral medication administration, and experience video training for oral medication administration along with HFS training (training with Simman™ using simulation in groups of 2-4), LFS training (training with manikins in the lab in groups of 2-4), or practicing with a skills checklist for oral medication administration (training with the skills checklist in groups of 2). Students that do not participate in this research study received similar training as part of the normal curriculum. Participants will also fill out demographic information and two surveys. Training and filling out the surveys will take approximately five hours. Preparation including reading and preparing a clinical packet for the simulated patient will take an hour or less. Training will take place on Friday November 8, 2013 between the hours of 1000-1340 (3 hours and 40 minutes). The second survey will be filled out immediately prior to giving a medication in the clinical facility. All participants will be placed randomly into one of the three forms of training. The data collected during this study will not be utilized as part of your grade in the course and will only be used for this research study. This study is not in any way related to your evaluation in your current nursing course.

You will receive a $5 gift card to either Jamba Juice or Starbucks for participating in this research project. The results of this project will help determine the best form of education to meet the needs of nursing students related to giving oral medications.

All identifying information will be kept private in a secure location and only the research assistant will have access to this information. Elise Thompson, the investigator will not be given any identifying information and will not know who is participating in this study or which education modality they will participate in.

Participation in this research project is voluntary. You can choose freely to participate or not to participate. In addition, at any point during this project, you can withdraw your permission without any penalty of loss of benefits. If you are interested in participating in this study, please sign the consent form and you will be given further information. If you are not interested in participating in this study, you may turn in the consent form unsigned. Thank you for your consideration. Do you have any questions?

Appendix D

<div align="center">

University of Hawai'i

Consent to Participate in Research Project:

Comparing the Impact of High Fidelity Simulation, Low Fidelity Simulation, and Video Training for Medication Administration with First Year Undergraduate Nursing Students

</div>

My name is Elise Thompson, RN, MSN. I am a PhD Candidate at the University of Hawai'i at Manoa (UH), in the Department of Nursing. As part of my dissertation, I conduct research. The purpose of my current research project is to evaluate the impact of High fidelity simulation (HFS), Low fidelity simulation (LFS), and video training (VT) for oral medication administration on first year undergraduate nursing students. I am asking you to participate in this project because you are a first year undergraduate nursing student. There will be approximately 30-40 subjects involved in this study.

Project Description - Activities and Time Commitment: If you participate, you will receive learning materials regarding oral medication administration, and experience video training for oral medication administration along with HFS training, LFS training, or practicing with a skills checklist for oral medication administration. You will need to fill out demographic information and two surveys during this study. If you choose not to participate in this research study, you will receive similar training as part of the normal curriculum.

Training and filling out the demographic information and two surveys will take approximately five hours and will take place during this semester. The surveys filled out for this study are part of this research study and are not part of your grade in the course. All participants will be placed randomly into one of the three training modalities and all students are required to prepare for their training modality and read the learning materials regarding oral medication administration which should take approximately one hour. All participants will watch a video on oral medication administration which should take approximately 20 minutes. Students are required to stay for the duration of the 20-minute video. Students will all watch the video together in the multi-media debrief room.

Student participants in the HFS group will be trained in a group of nine to twelve students. The HFS student participants will be given a brief report prior to the scenario and will then experience a 15-minute HFS experience on medication administration in small groups of three to four. Each small group will be expected to give one oral medication to the simulated patient. The medication dispensing unit, Cerner Electronic Medical Record (EMR), and barcoding will be used to verify and administer medications. Student participants will have debriefing sessions after each scenario. This training should take three hours.

Student participants in the LFS group will receive training in groups of nine to twelve students. Students will be given a demonstration of how to give oral medications to patients. The medication dispensing unit, Cerner EMR, and barcoding will be used to verify and administer medications. Students will work in groups of two to four to practice oral medication administration using the low fidelity manikin with guidance from instructors. Students will have three hours to practice this skill using four different oral medications.

Student participants in the VT group will be in groups of nine to twelve students. Students will have three hours to practice utilizing the skills checklist in pairs.

Surveys for all student participants will be taken twice: once immediately prior to HFS, LFS or VT along with demographics and once immediately prior to administering medication in the clinical setting.

Filling out demographic information and the surveys will take approximately 30 minutes.

Summary:

Preparation: 1 hour

Training: 3.5 hours

Surveys: 0.5 hours

Total: 5 hours

Compensation: You will receive a $5 gift card to either Jamba Juice or Starbucks for participating in my research project.

Benefits and Risks: There are no direct benefits to you for participating in this project. However, the results of this project are important to determine the best form of clinical education to meet the needs of nursing students as well as clinical faculty and healthcare facilities. I believe there is little or no risk to you in participating in this project. If, however, you are uncomfortable or stressed by participating in this study, you may request not to participate or to withdraw from the project altogether. Please contact the principal investigator for questions or to report any concerns or research-related injury from participating in this research project.

Confidentiality and Privacy: All personal information will be kept confidential to the extent allowed by the law. During this research project, research records will be kept in a locked file in a secure location for the duration of the study. All personal information will be destroyed upon completion of this research project. Several public agencies with responsibility for research oversight, including the University of Hawai'i Human Studies Program, have authority to review research records.

When I report the results of my research project, and in my typed transcripts, I will not use your name or any other personally identifying information. If you would like a summary of the findings from my final report, please contact me at the number listed near the end of this consent form.

As the investigator, I will be blinded to the identity of students participating in this study. Only my research assistant will have access to your personal information.

Voluntary Participation: Participation in this research project is voluntary. You can choose freely to participate or not to participate. In addition, at any point during this project, you can withdraw your permission without any penalty of loss of benefits. If there are new findings that develop during the course of this research that may relate to your willingness to continue participation, you will be provided those findings. If the investigator is concerned for your well-being as a result of participating in this study, the subject's participation may be terminated without regard to the subject's consent. There will be no consequences for non-participation or withdrawal from this study. Your participation or lack of participation will in no way impact your grade for your coursework. Please contact the principal investigator if you choose to withdraw from this research study.

Questions: If you have any questions about this project, please contact me at via phone (808) 341-8457 or e-mail (cethomps@hawaii.edu). If you have any questions about your rights as a research participant, in this project, you can contact the University of Hawai'i, Human Studies Program, by phone at (808) 956-5007 or by e-mail at uhirb@hawaii.edu.

Faculty Advisor: Dr. Debra Mark phone (808) 956-0532; email: (debramar@hawaii.edu)

Please keep the prior portion of this consent form for your records.

If you agree to participate in this project, please sign the following signature portion of this consent form and return it to the research assistant.

Signature(s) for Consent:

I agree to participate in the research project entitled, *Comparing the Impact of High Fidelity Simulation, Low Fidelity Simulation, and Video Training for Medication Administration with First Year Undergraduate Nursing Students.* I understand that I can change my mind about participating in this project, at any time, by notifying the researcher.

Your Name (Print): _____

Your Signature: _____

Date: _____

Appendix E

Comparing HFS, LFS, & VT for Oral Medication Administration in First Year Undergraduate Nursing Students: Oral Medication Administration **(Participant brings RX medication information sheets for Keoki Kahue's medications)**			
1. Check orders			
2. Compare EMAR or MAR with orders for accuracy			
3. Use RX medication information sheets. Verbalizes major points of drug information. Verify right reason and appropriate dose.			
4. Verbalizes safety checks: special assessment criteria (BP, AP), laboratory data, allergies, refer to chart or EMR (Use EMAR or MAR to check when the last dose was given, and checking the correct time for medication administration based on previous doses)			
5. Assess patient ability to swallow from nurse report or chart			
6. The participant must perform a focused assessment of the patient's problem (ex: pain assessment using OLDCART and pain scale)			
7. Calculate dose correctly & prepares medication.			
8. Correctly accesses and uses MedDispense Cart			

9. Three Checks: Compare drug label with record form and MedDispense Cart, checks expiration dates
     a. reaching for medication with MedDispense
     b. compare with drug record, EMAR or MAR
     c. placing medication in cup with EMAR, MAR, or MedDispense Cart			

10. 5 Rights Check during medication preparation
     - patient: at least 2 identifiers (ex: first/last name, birthdate, medical record number). The participant may not illicit information by asking if the patient is John Doe or if their birthday is a specific date)
     - drug
     - dose
     - route
     - time
 + 3: Right Reason, Right Documentation, Right to Refuse			

11. Hand Hygiene in patient room (wash hands with soap and water or use hand sanitizer in front of the patient prior to medication administration)			
12. Introduce self (including name & role) to patient and state that participant is here to administer medication			
13. Explain purpose of the medication and educate the patient about medication and potential side effects			

14. The participant must verify if the patient has allergies using the EMR or chart and verify with the patient regarding allergies			
15. States faculty would be called to monitor any medication administration.			

16. At bedside 5 Right Check
    - patient: at least 2 identifiers: (ex: first/last name, birthdate, medical record number). The participant may not illicit information by asking if the patient is John Doe or if their birthday is a specific date)
    - drug
    - dose
    - route
    - time
+ 3: Right Reason, Right Documentation, Right to Refuse
 	
Check vital signs as required for safety: BP, AP, etc.			

17. Demonstrates use of Barcoding to verify patient and correct medication, ***Optional if available***			
18. Remain with patient while taking medication.			

19. Documents administration of medication in EMAR or MAR using black/blue pen
    a. Date, time, Print Name/Signature, signature
    b. safety check data, example BP, AP			

20. Dispose of supplies, washes hands			
21. States will return in 30 minutes to 1 hour to evaluate patient response			
22. States will reassess the patient post medication administration for resolution of patient's problem using an appropriate method (ex: pain assessment using OLDCART and pain scale).			

University of Hawaii Nursing Consortium Simulation Template

Course: N220 Patient   Name: Keoki Kahue   DOB: 6-11-1967

Scenario Title and Concept: Scenario 1: Medication Administration: Concept: Safety

Created and validated by (Names and date):

Created by/Date:	Elise Thompson/ 10-14-12	
Validated by/date: (2 faculty/staff)	**Edited by/date:**	**Yearly Review by/date:**
		Elise Thompson/ 10-21-13

Duration:

Preparation Time:

Teardown Time:

Program and Classification: *Primary and Secondary*

Simulation Objectives (Keyword = Concept):

1. Display an understanding of PO medication administration (see key points)
2. Understand the importance of patient safety related to medication administration

Pre-Sim Study (Participant Preparation Prior to Simulation Event):

Participant Preparation Prior to Simulation Event:

- **Complete readings for PO medication administration**
- **Read Keoki Kahue's Chart & look up Keoki Kahue's medications**
- **Bring supplies (stethoscope, pencil, paper)**
- **Bring Resources (Davis' Drug Guide for Nurses, Med-Surg text, laptop)**

- **Bring Instruments for Assessment, Simulation Roles, & SBARC**

Faculty Preparation Prior to Simulation Event:

- **Complete readings for PO medication administration**
- **Bring a copy of simulation scenarios**
- **Bring Instruments for Assessment, Simulation Roles, & SBARC**
- **See High Fidelity Simulation N220 Guidelines for further instruction**

Critical Elements:

1. Demonstrate medication verification using EMAR
2. Display an understanding of rationale for medication use including potential side effects
3. Demonstrate medication teaching to the patient including potential side effects
4. Demonstrate medication administration using rights of medication administration
5. Demonstrate the need to reassess patients to verify effectiveness of medication

<u>**Scene Setting:**</u>

Participant roles:

1. Primary Nurse (PN): demonstrate medication verification, display understanding of medication rationale, hand-washing, introduction of self to patient, patient identification, focused assessment for patient with a skin infection and open wound, verification of allergies, medication teaching, medication administration, reassess
2. Registered Nurse (RN): demonstrate medication verification if giving medications, display understanding of medication rationale, hand-washing, introduction of self to patient, patient identification, focused assessment for patient with a skin infection and open wound, verification of allergies, medication teaching, medication administration, reassess

Staff roles: act as patient (see script on scenario)

Faculty roles: may act as medical personnel as needed (ex: physician, pharmacist, etc.) only if participant calls; physician may verify medication after directing participant to EMAR and drug book, pharmacist to direct participants back to look up their own medication in their drug book

Scene Setting: Medical-Surgical Admission (any adult simulation room with SimMan 3G™)

Equipment needed/ setup/props:

1. Medications (see drugs)

2. ID band (**Keoki Kahue; DOB 6-11-1967; Medical Record #)**
3. male genitals
4. hospital gown
5. small red wound to right heel with dressing with yellow drainage

Capital Equipment:

1. **SimMan 3G™**: Keoki Kahue

Supplies:

1. Medicine cup; cup with water to take medication

Drugs:

1. Augmentin 500 mg PO q 12 h, start now (need two of these pills available) using med dispense, Cerner, and barcoding; orders visible at beginning of sim

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BACKGROUND/Brief DESCRIPTION of SCENARIO (Staff ONLY – DO NOT READ TO PARTICIPANTS!):

See Keoki Kahue Chart: chief complaint: foot pain; wound on right heel developed after stepping on a hot coal; Keoki to receive Augmentin (anti-infective) for treatment of right heel infection.

Brief narrative report from the "nurse" (shift report) to the participants:

Mr. Keoki Kahue age 46, was admitted today to be evaluated for right foot wound

Appearance: Tired

VS: HR 92, BP 135/78, RR 20, SpO2 95%, T 101.2

Neuro: Alert and oriented x 3

Cardiac: HRR; palpable pulses

Resp: clear and decreased

GI: soft with +BS. LBM yesterday; PO intake good

GU: voiding clear yellow urine

Integ: skin warm, dry, color normal for ethnicity; had wound culture for right foot wound today and results are pending

ACTIVITY: Up ad lib

Pain: complains of pain to right foot

0700 glucose check = 110; patient does not need DM medications at this time

Objectives: You need to perform medication administration of an antibiotic medication Augmentin (new order) utilizing your PO medication administration skills check-list. This includes medication verification, display understanding of medication rationale, hand-washing, introduction of self to patient, patient identification, focused assessment for patient with a skin infection and open wound, verification of allergies, medication teaching, medication administration, reassess.

Manikin Set-up/ Scenario Software

Original setup : SimMan 3G™ with Keoki Kahue armband	Desired Participant Responses: Include important interventions (nursing and medical)
VS: HR 97, BP 135/78, RR 20, SpO2 95%, T 101.2	1. Check orders
	2. Compare EMAR with orders for accuracy
Patient Responses: (only answer when asked)	3. Use RX medication information sheets. Verbalizes major points of drug information. Verify right reason and appropriate dose.
Onset, Location: "I got a sore on my right heel a month ago."	4. Verbalizes safety checks: special assessment criteria (BP, AP), laboratory data, allergies, refer to chart (EMR) (Use the EMAR to check when the last dose was given, and checking the correct time for medication administration based on previous doses)
Duration: "It just started getting worse the past few days."	
Characteristics: "The pain is a dull ache and it has this bad odor and it is draining." 4/10 if asked for pain scale level	5. Assess patient ability to swallow from nurse report or chart
Aggravating Factors: "It bothers me more when I touch it or walk on it."	6. The participant must perform a focused assessment of the patient's problem (ex: pain assessment using OLDCART and pain scale)
Relieving Factors: "It helps not to walk on it and try not to keep my heel covered."	7. Calculate dose correctly & prepares medication.
Treatment: "I tried to wrap my foot, but it is just getting worse."	8. Correctly accesses and uses MedDispense Cart
	9. Three Checks: Compare drug label with EMAR, MedDispense Cart, and checks expiration dates
	a. obtain medication with MedDispense
	b. compare with drug record EMAR
	c. placing medication in cup with EMAR or MedDispense Cart
	10. 5 Rights Check during medication preparation

	a. patient: at least 2 identifiers: (ex: first/last name, birthdate, medical record number). The participant may not illicit information by asking if the patient is John Doe or if their birthday is a specific date)
	b. Drug
	c. Dose
	d. Route
	e. Time
	f. + 3: Right Reason, Right Documentation, Right to Refuse
	11. Hand Hygiene in patient room (wash hands with soap and water or use hand sanitizer in front of the patient prior to medication administration)
	12. Introduce self (including name and role) to patient and state that participant is here to administer medication
	13. Explain purpose of the medication and educate the patient about medication and potential side effects.
	14. The participant must verify if the patient has allergies using the EMR or chart and verify with the patient regarding allergies
	15. States faculty would be called to monitor any medication administration.
	16. At bedside 5 Right Check
	   a. patient: at least 2 identifiers
	   b. drug
	   c. dose
	   d. route
	   e. time
	   f. + 3: Right Reason, Right Documentation, Right to Refuse
	   g. **Check vital signs as required for safety: BP, AP, etc.**
	17. Demonstrates use of Barcoding to verify patient and correct medication, ***Optional if available***
	18. Remain with patient while taking medication.
	19. Documents administration of medication in EMAR
	   a. Date, time
	   b. Include safety check data, example: BP, AP

	20. Dispose of supplies, washes hands 21. States will return in 30 minutes to 1 hour to evaluate patient response 22. State will reassess the patient post medication administration for resolution of patient's problem using an appropriate method (ex: pain assessment using OLDCART and pain scale).
If called: **MD will direct participants to EMAR:** **May state: "monitor vital signs, give Augmentin 500 mg PO q 12 h as ordered"** **Pharmacist will direct participant to EMAR and to drug book** **May state: "The pharmacist stepped out. Please use your drug book to look up the medication as that is what we would do anyway."**	SBAR if calling physician regarding medication administration (if participant forgets to check the EMAR): Situation: The patient needs to be treated for his infected wound to the right heel Background: patient admitted today for wound to right heel Assessment: OLDCART, vitals including temperature Recommendation: give patient Augmentin 500 mg PO q 12 hours as prescribed, start now & teach about the medication
Patient Responses: **"Thank you for the medicine to help with the infection. I understand more about the medicine and how it will help me."** **Participant Responses:** **Reassure and encourage patient to follow teaching**	

Debriefing Issues - List points every instructor should present for discussion:

Focus: PO Medication Administration

Antibiotic Medication:

1. What is going on with this patient?

Patient admitted to the hospital with wound to right heel today; may include description of wound, discuss OLDCART (onset, location, duration, characteristics, aggravating factors, relieving factors, treatment)

2. What medication is listed on EMAR to take for the skin infection?
Augmentin 500 mg PO q 12 h, start now

3. Describe the medication: see Davis Drug Guide

Clinical Judgment:

4. What should you do as the nurse when the patient mentions the wound to his heel?
Verbalize understanding and discuss with patient. Perform assessment of wound and document: OLDCART, assess pain including pain scale (quantify pain)

5. How can you make a difference for this patient's treatment?

Communication

6. How was your communication with the patient?
7. How was your communication with each other?
Safety

8. Medication Administration:
   a. Demonstrate medication verification using EMAR: What are you verifying and why? (compare med taken from drawer to EMAR order: patient, medication, dose, route, time, reason)
   b. Display an understanding of rationale for medication use including potential side effects: Why is this important? (Augmentin: anti-infective used to treat skin infections (also Otitis media, Sinusitis, Respiratory tract infections, Genitourinary tract infections); may have side effects of diarrhea, rashes (also seizures in high doses, pseudomembranous colitis, anaphylaxis, serum sickness): important to know rationale and side effects for medications in order to teach the patient and treat any signs and symptoms)
   c. Demonstrate hand-washing: Why is this important? (this should be in front of the patient; important to prevent the spread of infection)
   d. Demonstrate introduction of self to patient: Why is this an important step? (important for the patient to understand which professional is treating them; you need to be identified as the RN)
   e. Demonstrate patient identification using two patient identifiers: what verifiers are acceptable and which are not? (acceptable: first and last name & DOB or MR #; not acceptable: patient stating yes when asked if their name is Keoki Kahue or only one identifier)

f. Demonstrate a focused assessment of patient with a skin infection and open wound

g. Demonstrate medication teaching to the patient including potential side effects: what is the purpose of patient teaching? (The patient should be informed about the medication they are taking and this is part of the nurse's role; the patient should understand what side effects may happen as a result of taking this medication)

h. Demonstrate medication administration using rights of medication administration: What are the 8 rights? Why is this important? (patient, medication, dose, route, time, documentation, reason, refusal: this prevents medication errors and ultimately maintains patient safety)

i. Demonstrate the need to reassess the patient with a skin infection and open wound (in order to know if the medication is treating the infection)

9. Who can you call when you have a question about giving a medication?
   Pharmacy, Charge Nurse, Physician, etc.

Team interaction

10. Did the group work well together?
11. Did the group meet all of the medication administration criteria? If yes, how so? If not, why?

Ethical/legal

12. What do you do if a patient refuses medication?

Culture

13. Sensitivity: language/gender/respect
14. What if the culture does not accept Western Medicine?

Reference

Deglin & Vallerand. (2011). Davis's Drug Guide for Nurses with CD. (12th ed.) F.A.Davis. ISBN: 0-8036-1454-3

Lewis, S., Dirksen, S., Heitkemper, M., Bucher, L., Camera, I. (2010). Medical-Surgical Nursing: Assessment and Management of Clinical Problems. Mosby Elsevier. St Louis. ISBN 13: 978-0-323-06580-1

University of Hawaii Nursing Consortium Simulation Template

Course: N220   Patient   **Name: Keoki Kahue**   **DOB: 6-11-1967**

Scenario Title and Concept: Scenario 2: Medication Administration: Concept: Safety

Created and validated by (Names and date):

Created by/Date:	Elise Thompson/ 10-14-12	
Validated by/date: (2 faculty/staff)	**Edited by/date:**	**Yearly Review by/date:**
		Elise Thompson/ 10-21-13

Duration:

Preparation Time:

Teardown Time:

Program and Classification: *Primary and Secondary*

Simulation Objectives (Keyword = Concept):

1. Display an understanding of PO medication administration (see key points)
2. Understand the importance of patient safety related to medication administration

Pre-Sim Study (Participant Preparation Prior to Simulation Event):

Participant Preparation Prior to Simulation Event:

- **Complete readings for PO medication administration**
- **Read Keoki Kahue's Chart & look up Keoki Kahue's medications**
- **Bring supplies (stethoscope, pencil, paper)**
- **Bring Resources (Davis' Drug Guide for Nurses, Med-Surg text, laptop)**
- **Bring Instruments for Assessment, Simulation Roles, & SBARC**

Faculty Preparation Prior to Simulation Event:

- **Complete readings for PO medication administration**
- **Bring a copy of simulation scenarios**
- **Bring Instruments for Assessment, Simulation Roles, & SBARC**
- **See High Fidelity Simulation N220 Guidelines for further instruction**

Critical Elements:

1. Demonstrate medication verification using EMAR
2. Display an understanding of rationale for medication use including potential side effects
3. Demonstrate medication teaching to the patient including potential side effects
4. Demonstrate medication administration using rights of medication administration
5. Demonstrate the need to reassess patients to verify effectiveness of medication

Scene Setting:

Participant roles:

1. Primary Nurse (PN): demonstrate medication verification, display understanding of medication rationale, hand-washing, introduction of self to patient, patient identification, focused assessment for patient with a skin infection and open wound, verification of allergies, medication teaching, medication administration, reassess
2. Registered Nurse (RN): demonstrate medication verification if giving medications, display understanding of medication rationale, hand-washing, introduction of self to patient, patient identification, focused assessment for patient with a skin infection and open wound, verification of allergies, medication teaching, medication administration, reassess

Staff roles: act as patient (see script on scenario)

Faculty roles: may act as medical personnel as needed (ex: physician, pharmacist, etc.) only if participant calls; physician may verify medication after directing participant to EMAR and drug book, pharmacist to direct participants back to look up their own medication in their drug book

Scene Setting: Medical-Surgical Admission (any adult simulation room with SimMan 3G™)

Equipment needed/ setup/props:

1. Medications (see drugs)
2. ID band (**Keoki Kahue; DOB 6-11-1967; Medical Record #)**
3. male genitals
4. hospital gown
5. small red wound to right heel with dressing with yellow drainage

Capital Equipment:

1. **SimMan 3G™**: Keoki Kahue

Supplies:

1. Medicine cup; cup with water to take medication

Drugs:

1. Percocet 5/325 mg 1 pill q 4 hour prn pain using med dispense, Cerner, and barcoding; orders visible at beginning of sim

---

BACKGROUND/Brief DESCRIPTION of SCENARIO (Staff ONLY – DO NOT READ TO PARTICIPANTS!):

See Keoki Kahue Chart: chief complaint: foot pain; wound on right heel developed after stepping on a hot coal; Keoki to receive Percocet (opioid analgesic) for treatment of pain to right heel.

Brief narrative report from the "nurse" (shift report) to the participants:

Mr. Keoki Kahue age 46, was admitted yesterday for wound to the right heel

Appearance: Tired

VS: HR 92, BP 135/76, RR 20, SpO2 95%, T 101.2

Neuro: Alert and oriented x 3

Cardiac: HRR; palpable pulses

Resp: clear and decreased

GI: soft with +BS. LBM yesterday; per shift report PO good

GU: voiding clear yellow urine

Integ: skin warm, dry, color normal for ethnicity; right heel red with yellow drainage

ACTIVITY: Up ad lib

Pain: complains about right heel

0700 glucose check = 110; patient does not need DM medications at this time

Objectives: You need to perform medication administration of pain medication Percocet utilizing your PO medication administration skills check-list. This includes medication verification, display understanding of medication rationale, hand-washing, introduction of self to patient, patient identification, focused assessment for patient with a skin infection and open wound, medication teaching, medication administration, reassess.

Manikin Set-up/ Scenario Software

| Original setup : SimMan 3G™ with Keoki Kahue armband

VS: HR 100, BP 135/78, RR 20, SpO2 95%, T 101.2

Patient Responses: (only answer when asked)

Keoki Kahue complains of pain to his right heel 8/10

Onset, Location: "I got a sore on my right heel a month ago."

Duration: "I just started having more pain with my heel since I have been here in the hospital."

Characteristics: "The pain is a dull ache."

Aggravating Factors: "It hurts when I touch it or walk on it."

Relieving Factors: "It helps not to walk on it and try not to have my heel down in the bed."

Treatment: "I haven't really done anything for the pain, but it is hurting really bad." | Desired Participant Responses: Include important interventions (nursing and medical)

Oral Medication Administration
1. Check orders
2. Compare EMAR with orders for accuracy
3. Use RX medication information sheets. Verbalizes major points of drug information. Verify right reason and appropriate dose.
4. Verbalizes safety checks: special assessment criteria (BP, AP), laboratory data, allergies, refer to chart (EMR) (Use the EMAR to check when the last dose was given, and checking the correct time for medication administration based on previous doses)
5. Assess patient ability to swallow from nurse report or chart
6. The participant must perform a focused assessment of the patient's problem (ex: pain assessment using OLDCART and pain scale)
7. Calculate dose correctly & prepares medication.
8. Correctly accesses and uses MedDispense Cart
9. Three Checks: Compare drug label with EMAR, MedDispense Cart, and checks expiration dates
   d. obtain medication with MedDispense
   e. compare with drug record EMAR
   f. placing medication in cup with |

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	EMAR or MedDispense Cart
	10. 5 Rights Check during medication preparation
	    g. patient: at least 2 identifiers: (ex: first/last name, birthdate, medical record number). The participant may not illicit information by asking if the patient is John Doe or if their birthday is a specific date)
	    h. Drug
	    i. Dose
	    j. Route
	    k. Time
	    l. + 3: Right Reason, Right Documentation, Right to Refuse
	11. Hand Hygiene in patient room (wash hands with soap and water or use hand sanitizer in front of the patient prior to medication administration)
	12. Introduce self (including name and role) to patient and state that participant is here to administer medication
	13. Explain purpose of the medication and educate the patient about medication and potential side effects.
	14. The participant must verify if the patient has allergies using the EMR or chart and verify with the patient regarding allergies.
	15. States faculty would be called to monitor any medication administration.
	16. At bedside 5 Right Check
	    h. patient: at least 2 identifiers
	    i. drug
	    j. dose
	    k. route
	    l. time
	    m. + 3: Right Reason, Right Documentation, Right to Refuse
	    n. **Check vital signs as required for safety: BP, AP, etc.**
	17. Demonstrates use of Barcoding to verify patient and correct medication, ***Optional if available***
	18. Remain with patient while taking medication.

	19. Documents administration of medication in EMAR
	    c. Date, time
	    d. Include safety check data, example: BP, AP
	20. Dispose of supplies, washes hands
	21. States will return in 30 minutes to 1 hour to evaluate patient response
	22. State will reassess the patient post medication administration for resolution of patient's problem using an appropriate method (ex: pain assessment using OLDCART and pain scale).

If called: **MD will direct participants to EMAR:** **May state: "monitor vital signs, give prn medication Percocet 5/325 mg PO 1 pill q 4 hours prn pain as ordered"** **Pharmacist will direct participant to EMAR and to drug book** **May state: "The pharmacist stepped out. Please use your drug book to look up the medication as that is what we would do anyway."**	SBAR if calling physician: Situation: Patient has pain to the right heel Background: patient admitted yesterday for wound to right heel Assessment: OLDCART, vitals including temperature Recommendation: give patient prn medication for pain: Percocet 5/325 mg PO 1 pill q 4 hours prn pain; teach about medication
VS changes/events (1): Pain goes to 4/10 after Percocet 5/325 mg PO given (30 min later) Temp down to 99 in 1 hour after Percocet given Patient Responses: **"Thank you for helping my pain and teaching me. I understand more about the pain medicine."**	Desired Participant responses: 1. Reassess patient during/after performing interventions per MD orders 2. Report findings to MD 3. Patient teaching about Percocet 4. Reassure and encourage patient to follow teaching

Debriefing Issues - List points every instructor should present for discussion:

Focus: PO Medication Administration

Pain Medication:

1. What is going on with this patient?
Patient admitted to the hospital with wound to right heel yesterday; today started

   complaining of pain to the right heel (may include description of wound, discuss

   OLDCART)

2. What medication is listed on the EMAR to take for pain?
Percocet 5/325 mg PO, 1 pill q 4 hours prn pain

3. Describe the medications: see Davis Drug Guide

Clinical Judgment:

4. What should you do as the nurse when the patient mentions his heel pain?
Verbalize understanding and discuss with patient. Perform assessment: OLDCART, assess pain including pain scale (quantify pain)

5. How can you make a difference for this patient's treatment?

Communication

6. How was your communication with the patient?
7. How was your communication with each other?

Safety

8. Medication Administration:
   a. Demonstrate medication verification using EMAR: What are you verifying and why? (compare med taken from drawer to EMAR order: patient, medication, dose, route, time, reason)
   b. Display an understanding of rationale for medication use including potential side effects: Why is this important? (Percocet: opioid analgesics used to treat moderate to severe pain; may have side effects of confusion, sedation, respiratory depression, and constipation): important to know rationale and side effects for medications in order to teach the patient and treat any signs and symptoms)
   c. Demonstrate hand-washing: Why is this important? (this should be in front of the patient; important to prevent the spread of infection)

d. Demonstrate introduction of self to patient: Why is this an important step? (important for the patient to understand which professional is treating them; you need to be identified as the RN)
e. Demonstrate patient identification using two patient identifiers: what verifiers are acceptable and which are not? (acceptable: first and last name & DOB or MR #; not acceptable: patient stating yes when asked if their name is Keoki Kahue or only one identifier)
f. Demonstrate a focused assessment of patient with a skin infection and open wound
g. Demonstrate medication teaching to the patient including potential side effects: what is the purpose of patient teaching? (The patient should be informed about the medication they are taking and this is part of the nurse's role; the patient should understand what side effects may happen as a result of taking this medication)
h. Demonstrate medication administration using rights of medication administration: What are the 8 rights? Why is this important? (patient, medication, dose, route, time, documentation, reason, response: this prevents medication errors and ultimately maintains patient safety)
i. Demonstrate the need to reassess the patient with a skin infection and open wound (in order to know if the medication is treating the infection)
9. Who can you call when you have a question about giving a medication?
   Pharmacy, Charge Nurse, Physician, etc.

Team interaction

10. Did the group work well together?
11. Did the group meet all of the medication administration criteria? If yes, how so? If not, why?

Ethical/legal

12. What do you do if a patient refuses medication?

Culture

13. Sensitivity: language/gender/respect
14. What if the culture does not accept Western Medicine?

Reference

Deglin & Vallerand. (2011). Davis's Drug Guide for Nurses with CD. (12th ed.) F.A.Davis. ISBN: 0-8036-1454-3

Lewis, S., Dirksen, S., Heitkemper, M., Bucher, L., Camera, I. (2010). Medical-Surgical Nursing: Assessment and Management of Clinical Problems. Mosby Elsevier. St Louis. ISBN 13: 978-0-323-06580-1

University of Hawaii Nursing Consortium Simulation Template

Course: N220   Patient   Name: Keoki Kahue   DOB: 6-11-1967

Scenario Title and Concept: Scenario 3: Medication Administration: Concept: Safety

Created and validated by (Names and date):

Created by/Date:	Elise Thompson/ 10-14-12	
Validated by/date: (2 faculty/staff)	**Edited by/date:**	**Yearly Review by/date:**
		Elise Thompson/ 10-21-13

Duration:

Preparation Time:

Teardown Time:

Program and Classification: *Primary and Secondary*

Simulation Objectives (Keyword = Concept):

1. Display an understanding of PO medication administration (see key points)
2. Understand the importance of patient safety related to medication administration

Pre-Sim Study (Participant Preparation Prior to Simulation Event):

Participant Preparation Prior to Simulation Event:

- **Complete readings for PO medication administration**
- **Read Keoki Kahue's Chart & look up Keoki Kahue's medications**
- **Bring supplies (stethoscope, pencil, paper)**
- **Bring Resources (Davis' Drug Guide for Nurses, Med-Surg text, laptop)**
- **Bring Instruments for Assessment, Simulation Roles, & SBARC**

Faculty Preparation Prior to Simulation Event:

- **Complete readings for PO medication administration (see Laulima)**
- **Bring a copy of simulation scenarios**
- **Bring Instruments for Assessment, Simulation Roles, & SBARC**
- **See High Fidelity Simulation N220 Guidelines for further instruction**

Critical Elements:

1. Demonstrate medication verification using EMAR
2. Display an understanding of rationale for medication use including potential side effects
3. Demonstrate medication teaching to the patient including potential side effects
4. Demonstrate medication administration using rights of medication administration
5. Demonstrate the need to reassess patients to verify effectiveness of medication

Scene Setting:

Participant roles:

1. Primary Nurse (PN): demonstrate medication verification, display understanding of medication rationale, hand-washing, introduction of self to patient, patient identification, focused assessment for patient with a skin infection and open wound, verification of allergies, medication teaching, medication administration, reassess
2. Registered Nurse (RN): demonstrate medication verification if giving medications, display understanding of medication rationale, hand-washing, introduction of self to patient, patient identification, focused assessment for patient with a skin infection and open wound, verification of allergies, medication teaching, medication administration, reassess

Staff roles: act as patient (see script on scenario)

Faculty roles: may act as medical personnel as needed (ex: physician, pharmacist, etc.) only if participant calls; physician may verify medication after directing participant to EMAR and drug book, pharmacist to direct participants back to look up their own medication in their drug book

Scene Setting: Medical-Surgical Admission (any adult simulation room with SimMan 3G™)

Equipment needed/ setup/props:

1. Medications (see drugs)
2. ID band (**Keoki Kahue; DOB 6-11-1967; Medical Record #)**
3. male genitals
4. hospital gown
5. small red wound to right heel with dressing with yellow drainage

Capital Equipment:

1. **SimMan 3G™**: Keoki Kahue

Supplies:

1. Medicine cup; cup with water to take medication

Drugs:

1. Diltiazem 60 mg PO twice a day
2. Captopril 25mg PO twice a day

BACKGROUND/Brief DESCRIPTION of SCENARIO (Staff ONLY – DO NOT READ TO PARTICIPANTS!):

See Keoki Kahue Chart: chief complaint: foot pain; wound on right heel developed after stepping on a hot coal; Keoki to receive regularly scheduled medications Diltiazem and Captopril (anti-hypertensives) for treatment of HTN.

Brief narrative report from the "nurse" (shift report) to the participants:

Mr. Keoki Kahue age 46, was admitted yesterday for wound to the right heel

Appearance: Tired

VS: HR 92, BP 165/90, RR 20, SpO2 95%, T 98.6

Neuro: Alert and oriented x 3

Cardiac: HRR; palpable pulses

Resp: clear and decreased

GI: soft with +BS. LBM yesterday; per shift report PO good

GU: voiding clear yellow urine

Integ: skin warm, dry, color normal for ethnicity; right heel red with yellow drainage

ACTIVITY: Up ad lib

Pain: complains about right heel

0700 glucose check = 110; patient does not need DM medications at this time

Objectives: You need to perform medication administration of anti-hypertensive medications Diltiazem and Captopril utilizing your PO medication administration skills check-list. This includes medication verification, display understanding of medication rationale, hand-washing, introduction of self to patient, patient identification, focused assessment for patient with a skin infection and open wound, medication teaching, medication administration, reassess.

Manikin Set-up/ Scenario Software

| Original setup : SimMan 3G™ with Keoki Kahue armband

HR 92, BP 175/96, RR 20, SpO2 95, T 98.6, pain 0/10

Patient Responses:

Keoki Kahue denies complaint at this time; converses with nurses calmly

"I feel fine. The last nurse said my blood pressure was high though."

If asked about taking his medication, he did not have his HTN medication this morning yet.

If asked about his medication regimen at home, he has not been taking his blood pressure medication because he feels fine. "I feel fine. I don't know why I need to take this medication. It is a waste of money" | Desired Participant Responses: Include important interventions (nursing and medical)

Oral Medication Administration

1. Check orders
2. Compare EMAR with orders for accuracy
3. Use RX medication information sheets. Verbalizes major points of drug information. Verify right reason and appropriate dose.
4. Verbalizes safety checks: special assessment criteria (BP, AP), laboratory data, allergies, refer to chart (EMR) (Use the EMAR to check when the last dose was given, and checking the correct time for medication administration based on previous doses)
5. Assess patient ability to swallow from nurse report or chart
6. The participant must perform a focused assessment of the patient's problem (ex: pain assessment using OLDCART and pain scale)
7. Calculate dose correctly & prepares medication.
8. Correctly accesses and uses MedDispense Cart
9. Three Checks: Compare drug label with EMAR, MedDispense Cart, and checks expiration dates
   g. obtain medication with MedDispense
   h. compare with drug record EMAR
   i. placing medication in cup with EMAR or MedDispense Cart |

| | 10. 5 Rights Check during medication preparation
    m. patient: at least 2 identifiers: (ex: first/last name, birthdate, medical record number). The participant may not illicit information by asking if the patient is John Doe or if their birthday is a specific date)
    n. Drug
    o. Dose
    p. Route
    q. Time
    r. + 3: Right Reason, Right Documentation, Right to Refuse
11. Hand Hygiene in patient room (wash hands with soap and water or use hand sanitizer in front of the patient prior to medication administration)
12. Introduce self (including name and role) to patient and state that participant is here to administer medication
13. Explain purpose of the medication and educate the patient about medication and potential side effects.
14. The participant must verify if the patient has allergies using the EMR or chart and verify with the patient regarding allergies.
15. States faculty would be called to monitor any medication administration.
16. At bedside 5 Right Check
    o. patient: at least 2 identifiers
    p. drug
    q. dose
    r. route
    s. time
    t. + 3: Right Reason, Right Documentation, Right to Refuse
    u. **Check vital signs as required for safety: BP, AP, etc.**
17. Demonstrates use of Barcoding to verify patient and correct medication, *Optional if available*
18. Remain with patient while taking medication.
19. Documents administration of |

	medication in EMAR
	e. Date, time
	f. Include safety check data, example: BP, AP
	20. Dispose of supplies, washes hands
	21. States will return in 30 minutes to 1 hour to evaluate patient response
	22. State will reassess the patient post medication administration for resolution of patient's problem using an appropriate method (ex: pain assessment using OLDCART and pain scale).
If called: **MD will direct participants to EMAR:** **May state: "monitor vital signs, give Diltiazem 60 mg PO, Captopril 25 mg BID as ordered"** **Pharmacist will direct participant to EMAR and to drug book** **May state: "The pharmacist stepped out. Please use your drug book to look up the medication as that is what we would do anyway."**	SBAR if calling physician: Situation: patient has high blood pressure: 175/96 Background: patient admitted today for HTN Assessment: vitals, does not understand why he has to take medication when he feels fine Recommendation: give patient his medication as prescribed, teach about medication and the importance of taking medication despite "feeling fine"
VS changes/events (1): If given HTN meds and it has had time to work: BP change to 155/90 Patient Responses: **"Thank you for teaching me. I understand now why I should take my**	Desired Participant responses: 1. Reassess patient during/after performing interventions per MD orders 2. Report findings to MD 3. Patient teaching about HTN medications 4. Reassure and encourage patient to follow

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medication.” "I'll try and take my medication like I should."	teaching

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Debriefing Issues - List points every instructor should present for discussion:

Focus: PO Medication Administration

HTN Medication:

1. What is going on with this patient?
   Patient admitted to the hospital with hypertension that is not treated despite being

   prescribed medication.

2. What medication is listed on the EMAR to take for HTN?
   Diltiazem 60 mg PO BID, Captopril 25 mg PO BID

3. Describe the medications for HTN (see Davis Drug Guide)

Clinical Judgment:

4. What should you do as the nurse when the patient states "I feel fine so I don't really need this medication"?
   Patient teaching: "silent killer"; if severe: may feel sx secondary to effects of blood vessels in various organs and tissues or increased workload of the heart: fatigue, reduced activity tolerance, dizziness, palpitations, angina, and dyspnea

5. How can you make a difference for this patient's treatment? Open answers.

Communication

6. How was your communication with the patient?
7. How was your communication with each other?
8. Describe what it was like to verify medications with another participant.

Safety

9. Medication Administration:

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a. Demonstrate medication verification using EMAR: What are you verifying and why? (compare med taken from drawer to EMAR order: patient, medication, dose, route, time, reason)
b. Display an understanding of rationale for medication use including potential side effects: Why is this important? (Captopril: Angiotensin-Converting Enzyme (ACE) inhibitors used to treat HTN; side effects of cough, hypotension, taste disturbances (also agranulocytosis, angioedema) Diltiazem: Calcium Channel Blockers used to treat HTN; side effects of peripheral edema (also hypotension, arrhythmias, congestive heart failure (CHF), gingival hyperplasia)
c. Demonstrate hand-washing: Why is this important? (this should be in front of the patient; important to prevent the spread of infection)
d. Demonstrate introduction of self to patient: Why is this an important step? (important for the patient to understand which professional is treating them; you need to be identified as the RN)
e. Demonstrate patient identification using two patient identifiers (acceptable: first and last name & DOB or MR #; not acceptable: patient stating yes when asked if their name is Keoki Kahue or only one identifier)
f. Demonstrate a focused assessment of hypertensive patient specifically blood pressure
g. Demonstrate medication teaching to the patient including potential side effects: what is the purpose of patient teaching? (The patient should be informed about the medication they are taking and this is part of the nurse's role; the patient should understand what side effects may happen as a result of taking this medication)
h. Demonstrate medication administration using rights of medication administration: What are the 8 rights? Why is this important? (patient, medication, dose, route, time, documentation, reason, response: this prevents medication errors and ultimately maintains patient safety)
i. Demonstrate the need to reassess the hypertensive patient specifically blood pressure (in order to know if the medications are successfully treating the HTN)

10. Who can you call when you have a question about giving a medication?
Pharmacy, Charge Nurse, Physician, etc.

Team interaction

11. Did the group work well together?
12. Did anyone assume leadership role? If yes, how so? If not, why?

Ethical/legal

13. Is there anything you can do to make a patient take medications?
14. What happens with patients do not take their HTN meds? Is it fair that the government (taxpayers) pay for the patient to get treatment for organ damage when they did not change their lifestyle or take their meds?

Culture

15. Sensitivity: language/gender/respect
16. What about diet?
17. What if the culture does not accept Western Medicine?

Reference

Deglin & Vallerand. (2011). Davis's Drug Guide for Nurses with CD. (12th ed.) F.A.Davis. ISBN: 0-8036-1454-3

Lewis, S., Dirksen, S., Heitkemper, M., Bucher, L., Camera, I. (2010). Medical-Surgical Nursing: Assessment and Management of Clinical Problems. Mosby Elsevier. St Louis. ISBN 13: 978-0-323-06580-1

Student Preparation Prior to Simulation Event:

- **Complete readings for PO medication administration: Potter & Perry Fundamentals of Nursing 8th Edition: Chapter 31: pp. 565-572 through Buccal Administration; p.577 Prescriber's Role- p. 594 up to Topical Medication Applications; p.611 Guidelines for Nursing Skills Safety- p. 615; p.639-640. Total: 29 pages**
- **Complete a clinical packet for Keoki Kahue and bring to simulation**
- **Bring supplies (stethoscope, pencil, paper)**
- **Bring Davis's Drug Guide for Nurses**

Faculty Preparation Prior to Simulation Event:

- **Complete readings for PO medication administration: Potter & Perry Fundamentals of Nursing 8th Edition: Chapter 31: pp. 565-572 through Buccal Administration; p.577 Prescriber's Role- p. 594 up to Topical Medication Applications; p.611 Guidelines for Nursing Skills Safety- p. 615; p.639-640. Total: 29 pages**
- **Read and bring copy of chart for Keoki Kahue to simulation**
- **Have students pull out and use clinical packets for Keoki Kahue**
- **On white board, have a student recorder list what is known about Keoki Kahue using concept map template with the participation of all students using their clinical packets**
- **On white board, have students participate in listing critical elements of medication administration (make sure all are covered before starting scenarios)**
- **Discuss how to look up medications and what to look for using medications specific to the scenario**
- **Assign and discuss student roles as listed (Primary Nurse (PN), Nurse Assistant (NA), Charge Nurse (CN), and Registered Nurse (RN) (RN role only if 4 students)**
- **Assign order of groups (3-4 in groups) to participate in the room with Simman 3G™ (if 9 students: 3 groups of 3; if 12 students: 3 groups of 4)**
- **For each group, read out loud the brief narrative report and objectives (highlighted in yellow)**
- **Simulation assistant will set up scenario in the room with Simman 3G™ and will program computer with vital signs**

During Simulation Event:

- **Students that are not in the room with Simman™ should be watching for what the students performed well and what could be improved upon; recorder to list this on the whiteboard along with any other important information**

- **Act as patient and other participants as needed during the scenario using script as listed in scenario (suggested words highlighted in yellow)**
- **Scenarios should end within 15 minutes**

After Simulation Event:

- **After scenario completed, congratulate students on completing the scenario**
- **Facilitate debriefing with all students participating:**
  - **What did the students perform well?**
  - **What could be improved upon?**
  - **Use debriefing template in scenario to guide debriefing of students**
  - **Make sure to allow the students to speak more than the facilitator**
- **After debriefing, ask if there are further questions**
- **Repeat process for next two scenarios**

Appendix G

LFS Scenarios

University of Hawaii Nursing Consortium Simulation Template

Course: N220   Patient Name: Keoki Kahue   DOB: 4-1-1964

Scenario Title and Concept: Scenario 1: Medication Administration: Concept: Safety

Simulation Objectives (Keyword = Concept):

1. Display an understanding of PO medication administration (see key points)
2. Understand the importance of patient safety related to medication administration

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Pre-Sim Study (Student Preparation Prior to Simulation Event):

Student Preparation Prior to Simulation Event:

- **Complete readings for PO medication administration**
- **Read Keoki Kahue's Chart & complete a clinical packet for Keoki Kahue**
- **Bring supplies (stethoscope, pencil, paper)**
- **Bring Resources (Davis' Drug Guide for Nurses, Med-Surg text, laptop)**
- **Bring Instruments for Assessment, Simulation Roles, & SBARC**

Faculty Preparation Prior to Simulation Event:

- **Complete readings for PO medication administration**
- **Bring a copy of simulation scenarios**
- **Bring Instruments for Assessment, Simulation Roles, & SBARC**
- **See High Fidelity Simulation N220 Guidelines for further instruction**

LFS Activity: students will work in groups of 2-4 to provide PO medications to the static manikins. Each student must go through the skills checklist at least twice in front of their peer group. There are three scenarios with four different medications. The instructor will be available for any questions the students may have.

Critical Elements:

1. Demonstrate medication verification using EMAR
2. Display an understanding of rationale for medication use including potential side effects
3. Demonstrate medication teaching to the patient including potential side effects

4. Demonstrate medication administration using rights of medication administration
5. Demonstrate the need to reassess patients to verify effectiveness of medication

Scene Setting:

Student roles:

Primary Nurse (PN): demonstrate medication verification, display understanding of medication rationale, hand-washing, introduction of self to patient, patient identification, focused assessment for patient with a skin infection and open wound, verification of allergies, medication teaching, medication administration, reassess

Faculty roles: demonstrate PO medication administration for the student as an exemplar; monitor students and answer any questions they may have regarding PO medication administration; make sure students utilize drug book, Cerner, MedDispense, & barcoding

Equipment needed/ setup/props:

1. Medications (see drugs)
2. ID band (**Keoki Kahue; DOB 4-1-1964; Medical Record #)**
3. male genitals
4. hospital gown
5. small red wound to right heel with dressing with yellow drainage

Capital Equipment:

1. Static Manikin: Keoki Kahue

Supplies:

1. Medicine cup; cup with water to take medication

Drugs:

1. Augmentin 500 mg PO q 12 h, start now (need two of these pills available) using med dispense, Cerner, and barcoding; orders visible at beginning of sim

Brief narrative report from the "nurse" (shift report) to the students:

Mr. Keoki Kahue age 46, was admitted today to be evaluated for right foot wound

Appearance: Tired

VS: HR 92, BP 135/78, RR 20, SpO2 95%, T 101.2

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Neuro: Alert and oriented x 3

Cardiac: HRR; palpable pulses

Resp: clear and decreased

GI: soft with +BS. LBM yesterday; PO intake good

GU: voiding clear yellow urine

Integ: skin warm, dry, color normal for ethnicity; had wound culture for right foot wound today and results are pending

ACTIVITY: Up ad lib

Pain: complains of pain to right foot

0700 glucose check = 110; patient does not need DM medications at this time

Objectives: You need to perform medication administration of an antibiotic medication utilizing your PO medication administration skills check-list. This includes medication verification, display understanding of medication rationale, hand-washing, introduction of self to patient, patient identification, focused assessment for patient with a skin infection and open wound, verification of allergies, medication teaching, medication administration, reassess.

Desired Student Responses: Include important interventions (nursing and medical)

1. Check orders
2. Compare EMAR with orders for accuracy
3. Use RX medication information sheets. Verbalizes major points of drug information. Verify right reason and appropriate dose.
4. Verbalizes safety checks: special assessment criteria (BP, AP), laboratory data, allergies, refer to chart (EMR) (Use the EMAR to check when the last dose was given, and checking the correct time for medication administration based on previous doses)
5. Assess patient ability to swallow from nurse report or chart
6. The student must perform a focused assessment of the patient's problem (ex: pain assessment using OLDCART and pain scale)
7. Calculate dose correctly & prepares medication.
8. Correctly accesses and uses MedDispense Cart
9. Three Checks: Compare drug label with EMAR, MedDispense Cart, and checks expiration dates
   a. obtain medication with MedDispense
   b. compare with drug record EMAR
   c. placing medication in cup with EMAR or MedDispense Cart
10. 5 Rights Check during medication preparation

    a. patient: at least 2 identifiers: (ex: first/last name, birthdate, medical record number). The student may not illicit information by asking if the patient is John Doe or if their birthday is a specific date)

    b. Drug

    c. Dose

    d. Route

    e. Time

    f. + 3: Right Reason, Right Documentation, Right to Refuse

11. Hand Hygiene in patient room (wash hands with soap and water or use hand sanitizer in front of the patient prior to medication administration)

12. Introduce self (including name and role) to patient and state that student is here to administer medication

13. Explain purpose of the medication and educate the patient about medication and potential side effects.

14. The student must verify if the patient has allergies using the EMR or chart and verify with the patient regarding allergies.

15. States faculty would be called to monitor any medication administration.

16. At bedside 5 Right Check

    a. patient: at least 2 identifiers

    b. drug

    c. dose

    d. route

    e. time

    f. + 3: Right Reason, Right Documentation, Right to Refuse

    g. **Check vital signs as required for safety: BP, AP, etc.**

17. Demonstrates use of Barcoding to verify patient and correct medication, ***Optional if available***

18. Remain with patient while taking medication.

19. Documents administration of medication in EMAR

    a. Date, time

    b. Include safety check data, example: BP, AP

20. Dispose of supplies, washes hands

21. States will return to evaluate the patient response in appropriate time period (onset of medication)

22. State will reassess the patient post medication administration for resolution of patient's problem using an appropriate method (ex: pain assessment using OLDCART and pain scale).

University of Hawaii Nursing Consortium Simulation Template

Course: N220   Patient   Name: Keoki Kahue   DOB: 4-1-1964

Scenario Title and Concept: Scenario 2: Medication Administration: Concept: Safety

Created and validated by (Names and date):

Created by/Date:	Elise Thompson/ 6-4-13	
Validated by/date: (2 faculty/staff)	**Edited by/date:**	**Yearly Review by/date:**

Simulation Objectives (Keyword = Concept):

1. Display an understanding of PO medication administration (see key points)
2. Understand the importance of patient safety related to medication administration

Pre-Sim Study (Student Preparation Prior to Simulation Event):

Student Preparation Prior to Simulation Event:

- **Complete readings for PO medication administration**
- **Read Keoki Kahue's Chart & complete a clinical packet for Keoki Kahue**
- **Bring supplies (stethoscope, pencil, paper)**
- **Bring Resources (Davis' Drug Guide for Nurses, Med-Surg text, laptop)**
- **Bring Instruments for Assessment, Simulation Roles, & SBARC**

Faculty Preparation Prior to Simulation Event:

- **Complete readings for PO medication administration**
- **Bring a copy of simulation scenarios**
- **Bring Instruments for Assessment, Simulation Roles, & SBARC**
- **See High Fidelity Simulation N220 Guidelines for further instruction**

LFS Activity: students will work in groups of 2-4 to provide PO medications to the static manikin. Each student must go through the skills checklist at least twice in front of their peer group. There are three scenarios with four different medications. The instructor will be available for any questions the students may have.

Critical Elements:

1. Demonstrate medication verification using EMAR
2. Display an understanding of rationale for medication use including potential side effects
3. Demonstrate medication teaching to the patient including potential side effects
4. Demonstrate medication administration using rights of medication administration
5. Demonstrate the need to reassess patients to verify effectiveness of medication

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<u>**Scene Setting:**</u>

Student roles:

Primary Nurse (PN): demonstrate medication verification, display understanding of medication rationale, hand-washing, introduction of self to patient, patient identification, focused assessment for patient with a skin infection and open wound, verification of allergies, medication teaching, medication administration, reassess

Faculty roles: demonstrate PO medication administration for the student as an exemplar; monitor students and answer any questions they may have regarding PO medication administration; make sure students utilize drug book, Cerner, MedDispense, & barcoding

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Equipment needed/ setup/props:

1. Medications (see drugs)
2. ID band (**Keoki Kahue; DOB 4-1-1964; Medical Record #)**
3. male genitals
4. hospital gown
5. small red wound to right heel with dressing with yellow drainage

Capital Equipment:

1. Static Manikin: Keoki Kahue

Supplies:

1. Medicine cup; cup with water to take medication

Drugs:

1. Percocet 5/325 mg 1-2 pills q 4-6 hour prn pain using med dispense, Cerner, and barcoding; orders visible at beginning of sim

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Brief narrative report from the "nurse" (shift report) to the students:

Mr. Keoki Kahue age 46, was admitted yesterday for wound to the right heel

Appearance: Tired

VS: HR 92, BP 135/76, RR 20, SpO2 95%, T 101.2

Neuro: Alert and oriented x 3

Cardiac: HRR; palpable pulses

Resp: clear and decreased

GI: soft with +BS. LBM yesterday; per shift report PO good

GU: voiding clear yellow urine

Integ: skin warm, dry, color normal for ethnicity; right heel red with yellow drainage

ACTIVITY: Up ad lib

Pain: complains about right heel

0700 glucose check = 110; patient does not need DM medications at this time

Objectives: You need to perform medication administration of a pain medication utilizing your PO medication administration skills check-list. This includes medication verification, display understanding of medication rationale, hand-washing, introduction of self to patient, patient identification, focused assessment for patient with a skin infection and open wound, verification of allergies, medication teaching, medication administration, reassess.

Desired Student Responses: Include important interventions (nursing and medical)

1. Check orders
2. Compare EMAR with orders for accuracy
3. Use RX medication information sheets. Verbalizes major points of drug information. Verify right reason and appropriate dose.
4. Verbalizes safety checks: special assessment criteria (BP, AP), laboratory data, allergies, refer to chart (EMR) (Use the EMAR to check when the last dose was given, and checking the correct time for medication administration based on previous doses)
5. Assess patient ability to swallow from nurse report or chart

6. The student must perform a focused assessment of the patient's problem (ex: pain assessment using OLDCART and pain scale)
7. Calculate dose correctly & prepares medication.
8. Correctly accesses and uses MedDispense Cart
9. Three Checks: Compare drug label with EMAR, MedDispense Cart, and checks expiration dates
    a. obtain medication with MedDispense
    b. compare with drug record EMAR
    c. placing medication in cup with EMAR or MedDispense Cart
10. 5 Rights Check during medication preparation
    a. patient: at least 2 identifiers: (ex: first/last name, birthdate, medical record number). The student may not illicit information by asking if the patient is John Doe or if their birthday is a specific date)
    b. Drug
    c. Dose
    d. Route
    e. Time
    f. + 3: Right Reason, Right Documentation, Right to Refuse
11. Hand Hygiene in patient room (wash hands with soap and water or use hand sanitizer in front of the patient prior to medication administration)
12. Introduce self (including name and role) to patient and state that student is here to administer medication
13. Explain purpose of the medication and educate the patient about medication and potential side effects.
14. The student must verify if the patient has allergies using the EMR or chart and verify with the patient regarding allergies.
15. States faculty would be called to monitor any medication administration.
16. At bedside 5 Right Check
    a. patient: at least 2 identifiers
    b. drug
    c. dose
    d. route
    e. time
    f. + 3: Right Reason, Right Documentation, Right to Refuse
    g. **Check vital signs as required for safety: BP, AP, etc.**
17. Demonstrates use of Barcoding to verify patient and correct medication, ***Optional if available***
18. Remain with patient while taking medication.
19. Documents administration of medication in EMAR
    a. Date, time
    b. Include safety check data, example: BP, AP
20. Dispose of supplies, washes hands
21. States will return to evaluate the patient response in appropriate time period (onset of medication)
22. State will reassess the patient post medication administration for resolution of patient's problem using an appropriate method (ex: pain assessment using OLDCART and pain scale).

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University of Hawaii Nursing Consortium Simulation Template

Course: N220   Patient   Name: Keoki Kahue   DOB: 4-1-1964

Scenario Title and Concept: Scenario 3: Medication Administration: Concept: Safety

Created and validated by (Names and date):

Created by/Date:	Elise Thompson/ 6-4-13	
Validated by/date: (2 faculty/staff)	Edited by/date:	Yearly Review by/date:

Simulation Objectives (Keyword = Concept):

1. Display an understanding of PO medication administration (see key points)
2. Understand the importance of patient safety related to medication administration

Pre-Sim Study (Student Preparation Prior to Simulation Event):

Student Preparation Prior to Simulation Event:

- **Complete readings for PO medication administration**
- **Read Keoki Kahue's Chart & complete a clinical packet for Keoki Kahue**
- **Bring supplies (stethoscope, pencil, paper)**
- **Bring Resources (Davis' Drug Guide for Nurses, Med-Surg text, laptop)**
- **Bring Instruments for Assessment, Simulation Roles, & SBARC**

Faculty Preparation Prior to Simulation Event:

- **Complete readings for PO medication administration**
- **Bring a copy of simulation scenarios**
- **Bring Instruments for Assessment, Simulation Roles, & SBARC**
- **See High Fidelity Simulation N220 Guidelines for further instruction**

LFS Activity: students will work in groups of 2-4 to provide PO medications to the static manikin. Each student must go through the skills checklist at least twice in front of their peer group. There are three scenarios with four different medications. The instructor will be available for any questions the students may have.

Critical Elements:

1. Demonstrate medication verification using EMAR
2. Display an understanding of rationale for medication use including potential side effects
3. Demonstrate medication teaching to the patient including potential side effects
4. Demonstrate medication administration using rights of medication administration
5. Demonstrate the need to reassess patients to verify effectiveness of medication

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Scene Setting:

Student roles:

Primary Nurse (PN): demonstrate medication verification, display understanding of medication rationale, hand-washing, introduction of self to patient, patient identification, focused assessment for patient with a skin infection and open wound, verification of allergies, medication teaching, medication administration, reassess

Faculty roles: demonstrate PO medication administration for the student as an exemplar; monitor students and answer any questions they may have regarding PO medication administration; make sure students utilize drug book, Cerner, MedDispense, & barcoding

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Equipment needed/ setup/props:

1. Medications (see drugs)
2. ID band (**Keoki Kahue; DOB 4-1-1964; Medical Record #)**
3. male genitals
4. hospital gown
5. small red wound to right heel with dressing with yellow drainage

Capital Equipment:

1. Static Manikin: Keoki Kahue

Supplies:

1. Medicine cup; cup with water to take medication

Drugs:

1. Diltiazem 60 mg PO twice a day
2. Captopril 25mg PO twice a day

Brief narrative report from the "nurse" (shift report) to the students:

Mr. Keoki Kahue age 46, was admitted yesterday for wound to the right heel

Appearance: Tired

VS: HR 92, BP 165/90, RR 20, SpO2 95%, T 98.6

Neuro: Alert and oriented x 3

Cardiac: HRR; palpable pulses

Resp: clear and decreased

GI: soft with +BS. LBM yesterday; per shift report PO good

GU: voiding clear yellow urine

Integ: skin warm, dry, color normal for ethnicity; right heel red with yellow drainage

ACTIVITY: Up ad lib

Pain: complains about right heel

0700 glucose check = 110; patient does not need DM medications at this time

Objectives: You need to perform medication administration of anti-hypertensive medications utilizing your PO medication administration skills check-list. This includes medication verification, display understanding of medication rationale, hand-washing, introduction of self to patient, patient identification, focused assessment for patient with a skin infection and open wound, verification of allergies, medication teaching, medication administration, reassess.

Desired Student Responses: Include important interventions (nursing and medical)

1. Check orders
2. Compare EMAR with orders for accuracy
3. Use RX medication information sheets. Verbalizes major points of drug information. Verify right reason and appropriate dose.
4. Verbalizes safety checks: special assessment criteria (BP, AP), laboratory data, allergies, refer to chart (EMR) (Use the EMAR to check when the last dose was given, and checking the correct time for medication administration based on previous doses)
5. Assess patient ability to swallow from nurse report or chart
6. The student must perform a focused assessment of the patient's problem (ex: pain assessment using OLDCART and pain scale)
7. Calculate dose correctly & prepares medication.
8. Correctly accesses and uses MedDispense Cart

9. Three Checks: Compare drug label with EMAR, MedDispense Cart, and checks expiration dates
    a. obtain medication with MedDispense
    b. compare with drug record EMAR
    c. placing medication in cup with EMAR or MedDispense Cart
10. 5 Rights Check during medication preparation
    a. patient: at least 2 identifiers: (ex: first/last name, birthdate, medical record number). The student may not illicit information by asking if the patient is John Doe or if their birthday is a specific date)
    b. Drug
    c. Dose
    d. Route
    e. Time
    f. + 3: Right Reason, Right Documentation, Right to Refuse
11. Hand Hygiene in patient room (wash hands with soap and water or use hand sanitizer in front of the patient prior to medication administration)
12. Introduce self (including name and role) to patient and state that student is here to administer medication
13. Explain purpose of the medication and educate the patient about medication and potential side effects.
14. The student must verify if the patient has allergies using the EMR or chart and verify with the patient regarding allergies.
15. States faculty would be called to monitor any medication administration.
16. At bedside 5 Right Check
    a. patient: at least 2 identifiers
    b. drug
    c. dose
    d. route
    e. time
    f. + 3: Right Reason, Right Documentation, Right to Refuse
    g. **Check vital signs as required for safety: BP, AP, etc.**
17. Demonstrates use of Barcoding to verify patient and correct medication, ***Optional if available***
18. Remain with patient while taking medication.
19. Documents administration of medication in EMAR
    a. Date, time
    b. Include safety check data, example: BP, AP
20. Dispose of supplies, washes hands
21. States will return to evaluate the patient response in appropriate time period (onset of medication)
22. State will reassess the patient post medication administration for resolution of patient's problem using an appropriate method (ex: pain assessment using OLDCART and pain scale).

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Student Preparation Prior to Low Fidelity Simulation (LFS):

- **Complete readings for PO medication administration: Potter & Perry Fundamentals of Nursing 8th Edition: Chapter 31: pp. 565-572 through Buccal Administration; p.577 Prescriber's Role- p. 594 up to Topical Medication Applications; p.611 Guidelines for Nursing Skills Safety- p. 615; p.639-640. Total: 29 pages**
- **Complete a clinical packet for Keoki Kahue and bring to simulation**
- **Bring supplies (stethoscope, pencil, paper)**
- **Bring Davis's Drug Guide for Nurses**

Faculty Preparation Prior to LFS:

- **Complete readings for PO medication administration: Potter & Perry Fundamentals of Nursing 8th Edition: Chapter 31: pp. 565-572 through Buccal Administration; p.577 Prescriber's Role- p. 594 up to Topical Medication Applications; p.611 Guidelines for Nursing Skills Safety- p. 615; p.639-640. Total: 29 pages**
- **Read and bring copy of chart for Keoki Kahue to simulation**
- **Have students pull out and use clinical packets for Keoki Kahue**

During LFS:

- **Faculty should demonstrate PO medication administration for the students as an exemplar; monitor students and answer any questions they may have regarding PO medication administration; make sure students utilize drug book, Cerner, MedDispense, & barcoding**

- **Students that are not actively practicing PO medication administration with the manikin should be watching for what the students performed well and what could be improved upon**

Appendix H

VT Preparation

Student Preparation Prior to Video Training (VT):

- **Complete readings for PO medication administration: Potter & Perry Fundamentals of Nursing 8th Edition: Chapter 31: pp. 565-572 through Buccal Administration; p.577 Prescriber's Role- p. 594 up to Topical Medication Applications; p.611 Guidelines for Nursing Skills Safety- p. 615; p.639-640. Total: 29 pages**
- **Bring Davis's Drug Guide for Nurses**

Faculty Preparation Prior to VT:

- **Complete readings for PO medication administration: Potter & Perry Fundamentals of Nursing 8th Edition: Chapter 31: pp. 565-572 through Buccal Administration; p.577 Prescriber's Role- p. 594 up to Topical Medication Applications; p.611 Guidelines for Nursing Skills Safety- p. 615; p.639-640. Total: 29 pages**
- **Watch PO medication administration training video**

During VT:

- **Faculty should begin video once all students are present for video training; ensure students watch the entire video; have students practice utilizing their skills checklist in groups of two; monitor students and answer any questions they may have regarding PO medication administration; make sure students understand the purpose of EMR, MedDispense, & barcoding in relation to PO medication administration from readings & video**

- **Students should practice utilizing their skills checklist in groups of two; students may choose to utilize medications from their drug book to practice with their partner**

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