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Efficacy and Usefulness of an Educational Video on Safe Medication Handling

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Abstract

Background: Medication errors are a significant and detrimental issue in anesthesia practice and have the potential to have drastic effects for patients, providers, and hospitals; therefore, it is important to determine if an educational video on safe medication handling technique can improve knowledge on safe medication handling.

Objectives: The purpose of this study was to evaluate the efficacy and perceived usefulness of an investigator-developed educational video on nurse anesthesia trainees' (NATs) knowledge of safe medication handling.

Methods: A single group pretest-posttest design was used to evaluate actual knowledge and perceived usefulness of safe medication handling video. A convenience sample included 19 voluntary second year NATs at NorthShore University HealthSystem School of Anesthesia.

Results: Using a paired sample *t*- test, a statistically significant difference was found between the pre-knowledge assessment tool mean score of $M = 3.6842$ with $SD = 1.97$ and the post-knowledge assessment tool mean score of $M = 7.6842$ with $SD = 2.26$ ($t = 6.643$; $df = 18$; $p = 0.00$*). The overall mean score of the Perceived Usefulness Scale was $M = 4.28$; $SD = .36$, indicating moderately high perceived usefulness of the safe handling video. Eighty nine and a half percent (n=17) of the participants rated each question in the Perceived Usefulness Questionnaire greater than the neutral score of 3.

Conclusion: The educational video increased the knowledge on NAT-2's on safe medication handling and was perceived as a useful tool. The video can be used for future NAT-2s to increase their knowledge on safe medication handling prior to their clinical experience.

Keywords: medication safety, medication errors, anesthesia, student, video, education

Introduction

Background and Significance

Medication safety is a critical component of patient safety. Certified Registered Nurse Anesthetists (CRNAs) are responsible for prescribing, mixing, re-labeling, and administering numerous medications during a procedure, making correct medication handling imperative (Brown, 2014). According to the Institute of Medicine (2006), 380,000 to 450,000 adverse drug events occur in hospitals each year with an annual cost of $3.5 billion. Even more concerning is that this number is assumed to be an underestimate of the actual adverse drug events due to under-reporting. According to Kothari, Gupta, Sharma, and Kothari (2010), up to 98,000 patients die every year due to a medical error, and a vast number of the errors are related to medication administration. Anesthesia is particularly at risk for medication errors as there is not a secondary verification process to prevent errors and it involves administration of many potent intravenous medications.

Medication errors can have a detrimental effect on patients and providers. These effects include patient mortality, additional costs for the patient, increased health care institution costs, and emotional trauma for the patient and provider (Jennings & Foster, 2007). Medication errors are found to be the seventh most common cause of death (Kothari et al., 2010). Medication errors in anesthesia are relatively common. According to Nanji, Vernest, Sims, Driscoll, and Levine (2015), drug administration errors are the most commonly cited critical issues in anesthesia, with 85% of anesthesiologists self-reported making at least one drug error or one near miss drug error during their professional careers. Depending on the definition of an error, they occur as frequently as one out of every 113 medications administered (Cooper, DiGiovanni, Schultz, Taylor, & Nossaman, 2012). A prospective observational study found that some of the

reasons medication errors are made in anesthesia is related to exposure to new or unexpected medication vials or labels, distraction, haste, and lack of knowledge or experience (Cooper et al., 2012). According to Cooper et al. (2012), anesthesia providers in training reported an error incidence in one out of every 135 anesthetics administered compared to the reported error incidence by experienced providers of one out of every 272 anesthetics administered. Orser, Hyland, U, Sheppard, and Wilson (2013) performed a separate article review and determined that medication errors in anesthesia practice occur as frequently as one in every 130 patients depending on the definition of an error. This study found that inadvertent "syringe swaps" and misidentification of ampules and vials are the most common cause of errors (Orser et al., 2013).

The Institute of Medicine recommends improved labeling and medication packaging to increase medication safety (Institute of Medicine, 2006). The Joint Commission has medication labeling standards that must be met to ensure the correct medication is given helping to prevent medication errors (The Joint Commission, 2015). There is a need for additional education on safe medication handling practices in anesthesia to improve providers' knowledge with the potential to decrease medication errors. The purpose of this Doctorate of Nursing Practice (DNP) project is to improve knowledge on the process of safe medication handling, including creating an organized workspace, drawing up medications, and proper syringe labeling to decrease medication errors.

Problem Statement

Despite the clearly documented issue of medication safety in anesthesia and the high-risk potential for a medication error by a novice provider, there is a lack of education for nurse anesthesia trainees prior to starting the clinical portion of the program. There was a need to

examine if an educational video regarding safe medication handling would improve nurse anesthesia trainee knowledge and be perceived as useful by the trainees.

Purpose of the Study

The purpose of this study was to evaluate the efficacy and perceived usefulness of an educational video on nurse anesthesia trainees' knowledge of safe medication handling.

Clinical Questions

- Does an educational video improve Nurse Anesthesia Trainees' (NATs) actual knowledge of safe medication handling?
- Do NATs perceive the educational video to be useful?

Theoretical Framework

The dual coding theory describes how the use of an educational video has positive outcomes for learners. This theory states that both verbal and nonverbal modes are associated with mental representation and are important in processing information (Clark & Paivio, 1991). The theory stresses the importance of both imagery and language in learning (Clark & Paivio, 1991).

Harland, Biddle, and Fallacaro (2008) utilized the dual coding theory during their research investigating the impact of learning on anesthesia providers who watched an educational film compared to those who read an educational report. Although the research is still in its infancy, the preliminary results showed a profound increase in the ability to recall and use the information that was portrayed through an audiovisual film compared to a written report (Harland, Biddle & Fallacaro, 2008). Anesthesia education involves many complicated and stressful interventions. According to Hartland et al. (2008), simulation based video teaching interventions can "bridge the gap between the textbook and the real patient and provide a

uniquely equivalent experience…" (p.197). The use of video for education has the potential to improve nursing education and benefit students.

Literature Review

To determine the need for this DNP project, an extensive literature review was completed utilizing computerized databases including PubMed, CINAHL, and Springer. The literature review focused on the prevalence of medication safety in the operating room, medication safety education, and the efficacy of video education. The terms used included "syringe labeling," "medication errors," "medication safety," "anesthesia medication safety," and "video education." The first search yielded 2,842 results, which was narrowed down based on published year range of 2004 and 2017, and relevance to topic. Articles relevant to the study included sixteen articles and are summarized in Table 1.

Medication Safety in the Operating Room

Labeling and Pre-filling of Medications.

Ang, Hing, Tun, and Park (2014), performed an observational study of anesthetists to evaluate the compliance of labeling medication syringes before and after implementation of a new barcode labeling technology. The baseline audit showed the syringe labeling compliance to be 58.4%. Results from the randomized study found that syringe labeling compliance from the conventional group improved to 63.8% and in the new technology group to 98.6%. There were no near-misses or medication errors reported in either part of the study by either the observer or the anesthesiologists. The user acceptability survey found that most participants were dissatisfied with the increased workload and increased time of drug labeling with the new technology and, although it was easy to use, it was not the preferred method of labeling (Ang et al., 2014).

Yang, Rivera, Fortier, and Abernathy (2016) performed both qualitative research and quantitative research to compare system vulnerabilities between self-filled and pre-filled syringes to determine the impact on medication safety using human factors engineering. Results found that the pre-filled syringes were superior to self-filled syringes, as they simplified the work process and decreased the number and associated risk of system vulnerabilities. Twenty-one system vulnerabilities were found in the self-filled syringe system compared to eight system vulnerabilities in the pre-filled syringe system (Yang et al., 2016). This study suggests that the use of pre-filled syringes is a potential method to reduce medication errors. Although pre-filled syringes are superior to self-filled syringes and are identified as the safest practice, the pre-filled syringes are cost prohibitive for many institutions and not a realistic solution to this problem.

A randomized experiment involving nurses, nurse anesthetists, and physicians researched the impact of compliant medication labeling and the correlation to amount of medication errors made (Garnerin et al., 2007). Results showed that labels that included complete drug information (e.g. concentration, quantity, and volume) were associated with fewer medication errors compared to labels that did not include all the information (Garnerin et al., 2007). This research demonstrates the importance of accurate and complete labeling.

Jensen, Merry, Webster, Weller and Larsson (2004) performed a systematic review to develop a list of recommendations to decrease intravenous drug administration errors in anesthesia. Based on this systematic review, the authors strongly recommended several practices. These practices include carefully reading the label of any drug ampule or syringe before the drug is drawn up or administered, labels should be legible and optimized according to agreed upon standards, syringes should always or almost always be labeled, and drug drawers and workspaces should be organized with attention to tidiness (Jensen et al., 2004). These recommendations were

found to have the highest impact on medication safety and were incorporated into the educational video.

Other recommended safe practices identified by a systematic review included checking labels specifically with a second person or a device before the drug is drawn up or administered, focusing inventory management on minimizing the risk of drug error, and avoiding similar packaging and presentation of drugs which can contribute to errors (Jensen et al., 2004). The authors also recommended using pre-filled syringes when possible rather than ampules, and drawing up and labeling drugs by the anesthetists who will administer them (Jensen et al., 2004). This systematic review determined straightforward practices that are cost effective and easy to implement to decrease errors in anesthesia.

Merry, Shipp, and Lowinger (2011) discussed the best practice guidelines for medication labeling, factors related to medication errors, and potential areas to improve medication safety. Information from the International Organization for Standardization and the Australian Commission on Safety and Quality was compiled to create labeling recommendations. These labeling recommendations include having labels present on all syringes containing medications used during anesthesia. Labels should include the generic name of the medication and the concentration of syringe contents. Poor labeling practices can lead to adverse patient outcomes. The following standard procedure may be used to ensure syringes are properly labeled (p. 153):

- One medication should be drawn up and labeled at a time
- The label on the medication vial must be read and the name and amount of medication must be reviewed
- The name on the vial must be matched with the name on the label

Some factors that may predispose anesthesia providers to make medication errors include time pressure, long working hours, and distractions. Other potential sources to decrease errors include pre-filled syringes, peel-off labels on medication vials, color coding labels, and bar-code scanners (Merry, Shipp, & Lowinger, 2011).

Alkhani et al. (2012) investigated the adherence to proper medication labeling technique in Saudi Arabia hospitals. The standard assessment tool used was derived from the guidelines set by the Institute for Safe Medication Practices (Alkhani et al., 2012). Results showed that hospitals had strong adherence rates to the guidelines, although injectable medication had the lowest labeling adherence rates (Alkhani et al., 2012). As anesthesia providers most commonly use injectable medications, it is crucial they adhere to proper labeling guidelines.

Medication Safety Environment.

Grigg et al. (2017) created an Anesthesia Medication Template to formally organize the anesthesia workspace to determine if it would decrease perioperative medication errors by anesthesia providers. Results found the likelihood of dosing errors were reduced by 79% when using the template. All observed errors in the study were dosing errors. A cluttered workspace can increase the cognitive load, resulting in dosing errors, which is why dosing errors may have decreased with the use of the template (Grigg et al., 2017). Creating a clean and organized anesthesia workspace is a simple strategy to decrease the odds of a medication error by anesthesia providers.

A cross-sectional qualitative study involving nurses and managers researched the latent failures perceived to be related to medication errors. Through transcribing interviews, ten themes including unit climate, local working environment, workload, routine procedures, and training were found to be involved in medication errors (Lawton, Carruthers, Gardner, Wright, &

McEachan, 2012). Unit climate, including values, attitudes, and patterns of behavior of the staff, was the most common theme identified by nurses and managers (Lawton et al., 2012). There is a need to adapt the values, habits, and attitudes of staff regarding safe medication handling to ensure that safe medication handling guidelines are being used.

Medication Safety Education

Sears, Goldsworthy and Goodman (2010), performed a randomized study that compared nursing students who completed a medication administration simulation during their training, with those who did not have the simulation. Results showed that students who completed the simulation had fewer drug errors (Sears, Goldsworthy, & Goodman, 2010). The two types of errors included actual medication administration errors and potential errors. The control group had twenty-four recorded errors and the treatment group had seven reported errors (Sears, Goldsworth, & Goodman, 2010). This study provides preliminary evidence that nursing students who completed a simulation-based learning experience that gives them exposure to medication administration had fewer actual and potential medication errors during their clinical experience (Sears, Goldsworth, & Goodman, 2010).

Drach-Zahavy and Pud (2010) tested the effectiveness of integrated and non-integrated learning mechanisms for medication administration education for nursing staff. Integrated learning uses educators that are in the same role as the learners, while in non-integrated learning, the learners are taught by a superior or an external educator (Drach-Zahavy & Pud, 2010). Results showed that integrated learning decreased medication administration errors. According to Eichhorn (2010), one of the roots of the problem with noncompliant medication labeling is the need for a stronger curriculum, including simulation of medication administration with safety skills for certified registered nurse anesthetist students.

Video Education Efficacy

Hartland, Biddle and Fallacaro (2008) performed a study to determine if audiovisual information increases cognition compared to written or lecture information alone. Results found a significant difference between the group that received information in an audiovisual format versus only a written format. 100% of the audiovisual group recalled the theme of the information six to 12 months after compared to only 9.5% of the written group. In addition, 93% of the audiovisual group reported the learned information was useful in practice compared to only 17% of the written group (Hartland, Biddle & Fallacaro, 2008). Presenting information in an audiovisual format is more effective for the learners to recall the information long-term and integrate into practice. In addition, students prefer videos over textbooks. Chan (2010), surveyed students to determine beliefs and preferences for learning beyond the classroom. Students reported that educational videos held their attention, facilitated learning, and was the preferred method of learning (Chan, 2010).

Lastly, Forbes et al. (2016) discussed the effectiveness, efficiency, and quality of the use of videos for teaching of clinical skills in nursing. Education video use has been reported to be as effective or more effective than traditional education for skill learning and student satisfaction (Forbes, et al., 2016). The use of educational videos has been found to be efficient for students to manage their cognitive load and allows for concentration on solely the crucial information. Though more research on the use of educational videos is needed, it has a promising future in nursing education.

Method

Design

A pretest-posttest design with a single group was used for this study to evaluate the effectiveness and perceived usefulness of an educational video on safe medication handling. A pretest-posttest design includes collecting baseline data before an intervention and collecting data after, allowing a change to be examined (Polit & Beck, 2017). The study involved four phases: (1) development of educational video, (2) development of a Knowledge Assessment Tool (KAT) that was used as a pre-test and post-test, (3) evaluation of the effectiveness of the educational video using the KAT, and (4) evaluation of the perceived usefulness of the educational video using an adapted survey from Otani et al. (2013). This research was not randomized with a control group because all participants viewed the intervention video.

Sample

The convenience sample used for this research study was second year NATs at NorthShore University HealthSystem (NSUHS) School of Nurse Anesthesia (SNA). The second year NATs were full-time doctoral students without any prior clinical anesthesia residency experience. NATs at NSUHS SNA are required to have a minimum of two years of prior intensive care unit nursing experience. As previously described, the process of medication handling in the operating room requires increased diligence as there is not a second verification process, unlike in the intensive care unit. In addition, the population of NAT-2s will not have any anesthesia experience, allowing the education to be conducted prior to the participants forming their personal mediational handling practices and will provide the NATs with the necessary information to handle medication safely in their clinical residency.

Recruitment Procedure

To recruit the target population participants, an email with an explanation of research objectives and an invitation to participate in the study was sent by DNP committee chair, Julia Feczko, DNP, CRNA seven days before the study. In addition to the recruitment email (Appendix G), an information sheet (Appendix H) explaining the rights of the participants was included in the email. Participation in the study was voluntary without any monetary reimbursement or incentives, and no formal consent was required.

Video Content Development

The video content was developed based on the recommendations found through the literature review. The script included the teaching objectives, necessary equipment, and specific steps that were shown in the educational video as seen in Appendix A. The educational script was validated by an expert panel of five CRNAs consisting of the NSUHS SNA Program Director, Pamela Schwartz DNP, CRNA and faculty instructors, Julia Feczko DNP, CRNA, Karen Kapanke DNP, CRNA, Susan Krawczyk DNP, CRNA, and Anne Sauri, DNP, CRNA. Each component of the script was assessed for clarity, relevance, simplicity, and consistency and scored on a scale of 1-10, with 1 being the lowest score and 10 being the highest. For the content to be validated, each component of the script required a score of 10 in each category by every member of the expert panel. After the script was validated, the video was filmed in the operating room at NSUHS.

Knowledge Assessment Tool Development

For this study, knowledge on safe medication handling practices was assessed using a Knowledge Assessment Tool (KAT) as a pretest and posttest. The KAT included 10 steps of safe medication handling as seen in Appendix C. The NATs were instructed to place the steps in the

correct order with a time limit of three minutes before and after the educational video to assess the knowledge of the students. The KAT was sent to an expert panel of five CRNAs consisting of the NSUHS SNA Program Director, Pamela Schwartz DNP, CRNA and faculty instructors, Julia Feczko DNP, CRNA, Karen Kapanke DNP, CRNA, Susan Krawczyk DNP, CRNA, and Anne Sauri, DNP, CRNA to validate the content. Each step of the KAT was assessed for clarity, relevance, simplicity, and consistency and scored on a scale of 1-10, with 1 being the lowest score and 10 being the highest. After multiple revisions, KAT was approved for content validity in each of the four categories.

Perceived Usefulness Survey Development

To evaluate perceived usefulness of the educational video, a survey created by Otani et al. (2013) was adapted to fit the context of this current study. The survey utilized thirteen statements and participants were asked to rate their level of agreement with the statements. The survey included a 5-point Likert-type scale that included scores ranging from 1 = *not at all useful* to 5 = *very useful* (Otani et al., 2013). This survey was formatted to fit the goals and evaluation of perceived usefulness of the educational video as seen in Appendix D.

Validity and Reliability

In order to ensure the study was rigorous and the results were reliable, it was essential to evaluate threats to the validity and determine methods to minimize bias and control variables. Although, according to Polit and Beck (2017), randomization is the most effective method to manage confounding variables, it was not possible in this particular research as there was no control group. To control participant characteristics, the research had an aspect of homogeneity in that all the participants were registered nurses with previous intensive care unit experience (Polit & Beck, 2017).

The pretest-posttest design methodology was subject to the internal validity threats of testing and instrumentation. The act of taking a pretest can affect people's performance on a posttest, which is more likely to occur when the pretest obtains self-reporting questions (Polit & Beck 2017). To avoid this threat to validity, the pretest and posttest did not contain any open-ended questions or self-reporting questions. A time limit of three minutes to complete the KAT was done to remove the potential bias of educated guessing rather than actual knowledge. Instrumentation bias occurs when there is a change in the measuring instrument between two points of data collection (Polit & Beck, 2017). To eliminate this potential bias, the pretest and posttest contained the exact same questions and were the same format. This was done to ensure that any change between the pretest and posttest was from the educational video and not bias from inconsistent measurement tools.

Instrumentation bias can also occur when the same measuring tool is used to collect baseline and post intervention data (Polit & Beck, 2017). The post intervention data may be more accurate if the study participants are more experienced with the test on the second administration. In order to reduce this potential bias, the pretest and posttest were designed to be easy to comprehend to prevent false improvement on the posttest. Another alternative is that the data is less accurate post intervention because the study participants become bored and answer the questions carelessly. To minimize this potential bias, the study was short and concise to decrease the likelihood of boredom and random posttest data.

An additional threat to internal validity includes history. It is difficult to control historical events occurring that may affect results, such as a recent medication administration error being made. In an attempt to decrease the effects of history on internal validity, the intervention was completed prior to the start of clinical rotations. Having participants view the video prior to

starting clinical rotations eliminates the possibility of participants having experience with a medication error being made in the operating room. Attempts to decrease the threats to construct validity included the set script that was used in the educational video. This was done to decrease the threat of researcher expectancies or communication about desired outcomes (Polit & Beck, 2017).

Human Subjects Protection

To ensure human subjects protection, both investigators involved in this study completed the Collaborative Institutional Training Initiative (CITI) training (Appendix E). This training provided education in research conduction that protects human rights. The involvement in this study was voluntary and all obtained data was anonymous and kept confidential. A recruitment email was sent by the DNP Committee Chair and included the purpose of the study, protection of privacy, right to stop the study without penalty and the contact information of the investigators for any questions before participating in the study.

To ensure the privacy of the study participants was protected, the demographic survey (Appendix B) was administered as a separate survey and collected in a manila envelope before distributing the other surveys included in the study. The pretest, posttest, and perceived usefulness survey were all distributed in separate manila folders, coded with a number to allow the investigators to correlate a change in pre and post-test knowledge scores but ensure anonymity of the participants.

Before the study began, the researchers stated the voluntary nature of the study in addition to a written explanation of the voluntary nature on each survey with the instructions as seen in Appendices B, C, and D. There was not any monetary or other incentive for the NATs to

participate in the study. Study participants were informed that there was not a signed consent and by voluntarily completing the surveys consent was implied.

Data Collection Procedure

After approval by the DePaul University and NSUHS IRBs, the research project was implemented and data collection was completed on October 9, 2017 in a classroom at NSUHS, Evanston Hospital. The setting of NSUHS SNA was chosen due to the accessibility to the relevant target population. Participation in the study was offered on a day that students were already scheduled for class, therefore no added travel was required for participation. A convenience sample of volunteer NAT-2s participated in the study. Students were informed that the participation in the study was voluntary, anonymous, and can be terminated at any time. All data collected from volunteers was kept confidential because no identifiable information was collected.

First, a short demographic survey including gender, age, ethnicity, and years of intensive care nursing experience was distributed and collected after completion. Next, the pre-test KAT was distributed. The participants had three minutes to complete the survey. Once completed, the participants were shown the educational video on safe medication handling. After viewing the video, the participants took the post-test KAT, with three minutes to complete, and then the perceived usefulness survey.

Data Analysis

The data sets for pre-KAT, post-KAT, and perceived usefulness survey were examined for normal distribution and the ability to use parametric statistics. After thorough examination of the data sets, it was determined that the data was normally distributed and analysis was continued with the paired t-test. A p-value of < 0.05 was considered statistically significant. Using the

Kuder-Richardson-20, the reliability of the pre-and post-knowledge assessment tool was analyzed. The goal coefficient was 0.50 or higher to have the knowledge assessment tool considered reliable. A Cronbach's alpha coefficient was conducted to determine the reliability of the perceived usefulness survey. The goal of 0.7 or higher was used to have the survey be considered a reliable tool for the study. All the data was analyzed using International Business Machines (IBM) SPSS version 24.

Results

There were a total of 19 participants for the study as summarized in Table 2. Three participants identified themselves as male and 16 participants identified themselves as female. Over half of the participants were of under the age of 30 years old (57.9%, n=11). Eight participants were older than 30 years of age (42.1%). Most the participants identified as white (73.7%, n = 14), one as African American (5.3%), and two as Asian and Mixed (10.5%). Eight participants had five or more years of Intensive Care Unit (ICU) experience (42.1%). Five participants had between three and four years of ICU experience (26.3%), and six participants had only between one and two years of ICU experience (31.6%).

Knowledge of Safe Medication Handling

The KAT was created by the investigators and validated by a panel of experts. This tool was used to measure the knowledge level of each participant on safe medication handling. The KAT consisted of ten steps with each step worth one point. The study participants were asked to correctly sequence the ten steps prior to and after the educational video. There was a maximum score of 10 and a minimum score of zero possible. The mean score for the pre-KAT was M = 3.6842 with SD = 1.97 (n=19), and the mean score for the post-KAT was M = 7.6842 with a SD= 2.26 (n=19) as shown in Table 3.

The data met the all the assumptions of parametric testing, therefore a paired samples t-test was conducted to examine the statistically significant difference in the mean scores from the pre-KAT and the post-KAT. The paired samples t-test showed the differences in the means to be statistically significant with a p-value of 0.00* and *t* value of -6.643 with *df*=18 (Table 4).

Perceived Usefulness of Educational Video

The Perceived Usefulness Survey contained 10 questions, with each question scored on a 5-point Likert scale ranging from not at all useful (1) to very useful (5) (see Appendix D). Descriptive statistics was used to analyze the data collected from this survey with the results shown in Table 5. The mean score for the questions ranged from 3.737 (n=19), question 8, to 4.632 (n=19), question 3. The mode for the questions ranged from 3 to 5. The sum of the questions ranged from 71.0 (n=19) to 88.0 (n=19). For each question, a score of three, which was considered neutral, by all 19 participants would yield a sum of 57. Therefore, a sum greater than 57 would be considered to be perceived as useful by the participants. Standard deviations ranged from 0.4956 (n=19) to 1.1496 (n=19). The reliability of the Perceived Usefulness Survey was established using the Cronbach's alpha coefficient of 0.942. The overall mean score of the Perceived Usefulness Scale was M = 4.28; SD=.36, indicating moderately high perceived usefulness of the safe medication handling video.

Discussion

The literature clearly identifies an issue with medication errors in the operating room, causing detrimental effects to patients and providers. As demonstrated by Cooper et al. (2012), it has been shown that novice providers with lack of familiarity to the environment pose a greater risk for medication errors to occur. Research done by Hartland, Biddle and Fallacaro (2008), Forbes et al. (2016) and Chan (2010) shows educational videos lead to improved learning and

memory retention. There was a lack of research on the use of an educational video on medications safety for anesthesia providers. This study investigated the usefulness and knowledge gained from an educational video on safe medication handling for nurse anesthesia trainees prior to their clinical experience.

This research explored NAT-2's knowledge on safe medication handling before and after viewing an educational video, and their perceived usefulness of the educational video. This study was conducted with the following questions to guide the research:

- Does an educational video improve Nurse Anesthesia Trainees' (NATs) actual knowledge of safe medication handling?
- Do NATs perceive the educational video to be useful?

After analyzing the results, it was clear that both research questions were answered. There was a statistically significant increase in the mean scores from 3.6842 in the pre-knowledge assessment tool to 7.6842 in the post-knowledge assessment tool. This shows that the NAT-2's knowledge on safe medication handling increased significantly after viewing the educational video.

Additionally, the results showed that overall the NAT-2's perceived the educational video to be useful. To determine the perceived usefulness results, the sum of each question was determined. As previously stated, a sum greater than 57 was considered to be perceived as useful of the participants. The sum of the questions ranged from 71 to 88; therefore every question on the survey determined that the participants perceived the educational video to be useful. Additionally, the overall mean score of Perceived Usefulness scale was $M = 4.28$ (SD=.63), which is very near the highest score of 5, indicating moderately high perceived usefulness of the safe handling video.

In the perceived usefulness survey, question three yielded the highest mean score of 88. This question pertained to identifying the steps of safe medication handling. It is appropriate that this question had the highest mean because the main focus of the video was the steps the of safe medication handling. The lowest scoring question was question eight (71). This question pertained to relieving anxieties about safe medication handling. It is natural for students to have anxiety about beginning their first clinical rotation and unknown environments, and in addition, it was not the main focus of the study to relieve anxiety.

The participants consisted of 19 NAT-2s, all of which had prior ICU experience. It can be assumed that from this ICU experience, they had baseline knowledge in safe medication handling. However, since the study was conducted prior to the NAT-2's obtaining any anesthesia clinical experience, it can be inferred that if the study had taken place after the NAT-2's had anesthesia clinical experience, the pre-knowledge assessment tool results would have yielded higher mean scores, likely decreasing the difference between the pre-and post-test means.

The results of this study on a safe medication handling educational video have shown to significantly improve the participants' knowledge and perceived usefulness of safe handling video. Both tools were proven to be reliable with Cronbach's alpha coefficient greater than .70. With these results, there is potential for this educational video to be used as a resource for future NATs and other anesthesia providers to increase their knowledge on safe medication handling prior to beginning their anesthesia clinical experience.

Ethical Consideration

This research study was approved by the Institutional Review Board at DePaul University and Northshore University HealthSystem prior to implementation. This process and approval ensured the protection of the participants and their confidentiality. Participants were recruited for

the intervention through an email from the research committee chair. This email included a description of the study, information of confidentiality and privacy, contact information for the investigators, and contact information for a representative of Northshore University Health System IRB.

To ensure confidentiality of the participants, the demographics survey was collected into a separate un-coded manila envelope labeled “demographics survey.” The pre-knowledge assessment tool and post-knowledge assessment tool were collected into coded manila envelopes. With this process, the demographics survey results were unable to be connected to the knowledge assessment tool results, which protected the anonymity of the small sample. Once the surveys were collected, they were stored in a safe, secure location.

Limitations

One of the main limitations of this study was the small sample size of nineteen participants. The study focused on second year nurse anesthesia trainees at Northshore University Health System which allowed a maximum participation of nineteen participants due to class size. Due to the specific population used and the nonrandom convenience sample, the study was at risk for selection bias. With the convenience sample of NAT-2’s prior to their clinical experience, it is unknown if the educational video would be beneficial to all anesthesia providers.

Having the demographics surveys separated from the knowledge assessment tools and perceived usefulness surveys also limited the amount of analysis that could be performed. In order to maintain confidentiality, investigators were unable to research any links between demographic variables and mean scores in the KAT for safe handling and the mean scores in the Perceived Usefulness scale.

Future Recommendations

There are several future recommendations to continue and strengthen this research. First, the same research should be conducted with a larger sample size to strengthen the results, as obtaining the same results with a larger study would increase the validity of this study. Additionally, having a wider sample target population including all anesthesia providers would provide insight in the use of the educational video among a variety of different experience levels.

Another recommendation involves continuing the research with the same target population. A future study could evaluate the NAT-2's perceived usefulness of the educational video after starting the clinical experience, this has the potential to provide further insight into the usefulness of this education. Another possibility includes conducting an observational study before and after the educational video to determine if medication errors decreased due to the education provided. Due to the statistically significant results of perceived usefulness and efficacy for this educational video, future NAT-2's can use this as a resource prior to their clinical experience.

Conclusion

Safe medication handling is a critical component of patient safety in anesthesia. An educational video was found to be effective in educating NAT-2's on safe medication handling practices, and was perceived as useful by the participants. This research supports the concept that educational videos are an effective learning strategy. This educational video on safe medication handling can be used for future NAT-2's to improve knowledge and potentially decrease medication errors in the operating room.

References

Alkhai, S., Ahmed, Y., Bin-Sabbar, N., Almorgirah, H., Alturki, A., Albanyan, H., . . . Vaida, A. (2013). Current practices for labeling medications in hospitals in Riyadh, Saudi Arabia. *Saudi Pharmaceutical Journal, 21*(4)*,* 345-346.

Ang, S., Hing, W., Tung, S., & Park, T. (2014). Experience with the use of the Codonics Safe Label System™ to improve labelling compliance of anaesthesia drugs. *Anaesthesia & Intensive Care*, *42*(4), 500-506.

Brown, L. B. (2014). Medication administration in the operating room: New standards and recommendations. *American Association of Nurse Anesthetists Journal, 82*(6), 465-469.

Chan, Y. M. (2010). Video instructions as support for beyond classroom learning. *Procedia Social and Behavioral Sciences, 9*(1), 1313-1318.

Clark, J. M., & Paivio, A. (1991). Dual coding theory and education. *Educational Psychology Review, 3*(3), 149-210.

Cooper, L., DiGiovanni, N., Schultz, L., Taylor, A., & Nossaman, B. (2012). Influences observed on incidence and reporting of medication errors in anesthesia. *Canadian Journal of Anesthesia, 59*(6), 562-570.

Devellis, R. F. (2017). *Scale development: Theory and applications* (4th ed.). Thousand Oaks, CA: Sage.

Drach-Zahavy, A. & Pud, D. (2010). Learning mechanisms to limit medication administration errors. *Journal of Advanced Nursing, 66*(4)*,* 794-805. doi: 10.1111/j.1365-2648.2010.05294.x

Eichhorn, J. (2010). APSF hosts medication safety conference: consensus group defines challenges and opportunities for improved practice. *The Official Journal of the Anesthesia Patient Safety Foundation, 25*(1)*,* 1-20.

Forbes, H., Oprescu, F., Downer, T., Phillips, N., McTier, L, Lord, B., . . . Visser, I. (2016). Use of videos to support teaching and learning of clinical skills in nursing education: A review. *Nurse Education Today, 42*(1)*,* 53-56.

Garnerin, P., Perneger, T., Chopard, P., Ares, M., Baalbaki, R., Bonnabry, P., & Clergue, F. (2007). Drug selection errors in relations to medication labels: a simulation study. *Anaesthesia, 62*(11)*,* 1090-1094.

Grigg, E. B., Martin, L. D., Ross, F. J., Roesler, A., Rampersad, S. E., Haberkern, C., … Martin, L. D. (2017). Assessing the impact of the anesthesia medication template on medication errors during anesthesia: A prospective study. *Anesthesia and Analgesia, 124*(5), 1617-1625.

Hartland, W., Biddle, C., & Fallacaro, M. (2008). Audiovisual facilitation of clinical knowledge: A paradigm for dispersed student education based on Paivio's Dual Coding Theory. *American Association of Nurse Anesthetists Journal*, *76*(3), 194-198.

Institute of Medicine. (2006, July). *Report brief: Preventing medication errors*. Retrieved from http://www.nationalacademies.org/hmd/~/media/Files/Report%20Files/2006/Preventing-Medication-Errors-Quality-Chasm-Series/medicationerrorsnew.pdf

International Business Machines. (2017). *IBM SPSS statistics.* Retrieved from http://www.ibm.com/analytics/us/en/technology/spss/

Jennings, J. & Foster, J. (2007). Medication safety: Just a label away. *Association of Perioperative Nurses, 86*(4)*,* 618-625.

Jensen, L. S., Merry, A. F., Webster, C. S., Weller, J., & Larsson, L. (2004). Evidence-based strategies for preventing drug administration errors during anesthesia. *Anaesthesia, 59*(5), 493-504.

Kothari, D., Gupta, S., Sharma, C., & Kothari, S. (2010). Medication error in anaesthesia and critical care: A cause for concern. *Indian Journal of Anaesthesia, 54*(3)*,* 187-192.

Lawton, R., Carruthers, S., Garder, P., Wright, J., & McEachan, R. (2012). Identifying the latent failures underpinning medication administration errors: An exploratory study. *Health Research, 47*(4), 1437-1459.

Merry, A., Shipp, D., & Lowinger, J. (2011). The contribution of labelling to safe medication administration in anaesthetic practice. *Best Practice & Research Clinical Anaesthesiology, 25*(2), 145-159.

Nanji, K., Vernest, K., Sims, N., Driscoll, W., & Levine, W. (2015). Bar code-assisted medication labeling: A novel system to improve efficiency and patient safety. *International Journal of Anesthesiology & Pain Management, 1*(1)*,* 1-6.

Orser, B. A., Hyland, S., U, D., Sheppard, I., & Wilson, C. R. (2013). Review article: Improving drug safety for patients undergoing anesthesia and surgery. *Canadian Journal of Anesthesia, 60*(2), 127-135.

Otani, H., Morita, T., Uno, S., Yamamoto, R., Hirose, H., Matsubara, T., … Sasaki, K. (2013). Usefulness of a leaflet-based intervention for family members of terminally ill cancer patients with delirium. *Journal of Palliative Medicine, 16*(4), 419-422.

Polit, D. F., & Beck, C. T. (2017). *Nursing research: Generating and assessing evidence for nursing practice.* Philadelphia, PA: Wolters Kluwer.

Schoening, A. *Interpreting exam performance: what do those stats mean anyway?* {PDF document]. Retrieved from https://www.creighton.edu/sites/www12.creighton.edu/files/PtT-Exam%20Analysis.pdf

The Joint Commission. (2015). *National patient safety goals effective January 1, 2015.* Retrieved from: http://www.jointcommission.org/assets/1/6/2015_NPSG_HAP.pdf

Yang, Y., Rivera, A. J., Fortier, C. R., & Abernathy, J. H. (2016). A human factors engineering study of the medication delivery process during an anesthetic: Self-filled syringes versus prefilled syringes. *Anesthesiology, 124*(4), 795-803.

Appendix A

	VIDEO CONTENT AND SCRIPT
Screen 1:	Steps for Safe Medication Handling
Screen 2:	Medication Handling Definition: For the purpose of this study, medication handling is defined as the process of determining a medication plan based off of the anesthetic plan, syringe labeling, drawing up a medication from a vial, and administering the medication to the patient.
Screen 3:	Teaching Objectives: 1. Improve nurse anesthesia trainees knowledge of safe medication handling practices 2. Provide a useful educational video for nurse anesthesia trainees 3. At the completion of the video the nurse anesthesia trainee will be able to list the sequential steps involved in safe medication handling
Screen 4:	Essential equipment includes: Anesthesia cart, Anesthesia medications, Medication vials, Syringes, Syringe Labels, Needles, Alcohol swab (visual of each item)
Screen 5:	Step 1: Create an organized, clean, and consistent workspace *Script: A disorganized, cluttered workspace creates an environment susceptible to errors* (visual of clean workspace compared to cluttered and unorganized workspace)
Screen 6:	Step 2: Consider the patient-specific anesthetic plan and necessary medications. *Script: Different medications may be used depending on the anesthesia plan, patient height, weight, allergies and history. Medications may be drawn up and administered throughout the procedure*. (visual of nurse anesthesia trainee reviewing plans)
Screen 7:	Step 3: Obtain medication vial and appropriately sized syringe with needle *Script: For example, obtain a 5ml vial of Rocuronium, 5ml syringe, and needle.* (visual of Rocuronium vial with 5ml syringe and needle)
Screen 8:	Step 4: Apply standard color-coded medication label including medication name, concentration, date, time, and initials (visual of Rocuronium label being placed on 5ml syringe and properly labeled) *Script: For medications requiring a specific expiration time and date on label such as Propofol, add the specific time and date of expiration to the label* (visual of Propofol label with expiration time and date and initials being written on label)
Screen 9:	Step 5: Verify syringe label and vial label are the same: Med Check #1 (visual of verification)
Screen 10:	Step 6: Clean top of vial with alcohol wipe and draw up medication into syringe while verifying correct medication with vial: Med Check #2 (visual of 5ml of Rocuronium being drawn up into 5ml syringe)

Screen 11:	Step 7: Verify correct medication was drawn up: Med Check #3 (visual of verification)
Screen 12:	Step 8: Place syringe in consistent, safe location on workspace *Script: For example, if you are planning on using the medication immediately, place syringe on top of anesthesia cart in the same place each time* (visual of placing Rocuronium syringe on top of anesthesia cart) *Script: If not immediately using medication, place syringe in secure space off anesthesia workspace* *Script: For example, place syringe in anesthesia cart drawer and lock drawer when leaving room* (visual of placing syringe in drawer and locking cart) *Script: If you are planning for immediate use, proceed to step 9*
Screen 13:	Step 9: Verify 5 rights of medication administration, medication indication and patient allergies: Med Check #4
Screen 14:	Step 10: Verify medication label, clean the intravenous line with an alcohol wipe, administer medication, and ensure medication is flushed through the line (visual of verifying Rocuronium syringe and administering medication through intravenous line)

Appendix B

Demographic Survey

Your participation is voluntary and anonymous. Please circle the answer that best pertains to your demographics

1) What is your gender?
   1. Male
   2. Female

2) What is your age group?
   1. 20-29 years old
   2. 30-39 years old
   3. 40-49 years old
   4. 50-59 years old
   5. 60 years old and above

3) What is your ethnicity or race?
   1. White
   2. Hispanic/Latino
   3. Black/African American
   4. Native American/American Indian
   5. Asian/Pacific Islander
   6. Mixed Race

4) How many years of ICU nursing experience did you have prior to the start of anesthesia school?
   1. <1 year
   2. 1-2 years
   3. 3-4 years
   4. 5-6 years
   5. >6 years

Appendix C
Knowledge Assessment Tool

Pre-Test Knowledge Assessment Tool: Safe Medication Handling

*Instructions: The following exercise is aimed at evaluating your knowledge of the sequential steps of **safe medication handling**. Please place the steps of safe medication handling in the correct sequential order by writing the corresponding letter (from column 2) next to the correct number (column 1). The survey must be completed in 3 minutes. Participation is voluntary and anonymous. Completion of the assessment tool implies consent to participate in the study.*

Sequential Steps of Safe Medication Handling	Steps of Safe Medication Handling
1. ___	A. Verify syringe label and vial label are the same
2. ___	B. Place syringe in consistent, safe location on workspace
3. ___	C. Consider the anesthetic plan and necessary medications
4. ___	D. Verify medication label and administer medication
5. ___	E. Label syringe with medication name and concentration
6. ___	F. Verify correct medication was drawn up
7. ___	G. Create an organized, clean, and consistent workspace
8. ___	H. If not immediately using medication, place syringe in secure space off anesthesia workspace
9. ___	I. Obtain medication vial and correct syringe size with needle
10. ___	J. Draw up medication into syringe while verifying correct medication with vial

Post-Test Knowledge Assessment Tool: Safe Medication Handling

*Instructions: The following exercise is aimed at evaluating your knowledge of the sequential steps of a **safe medication handling**. Please place the steps of safe medication handling in the correct sequential order by writing the corresponding letter (from column 2) next to the correct number (column 1). The survey must be completed in 3 minutes. Participation is voluntary and anonymous. Completion of the assessment tool implies consent to participate in the study.*

Sequential Steps of Safe Medication Handling	Steps of Safe Medication Handling
1. ___	A. Verify syringe label and vial label are the same
2. ___	B. Place syringe in consistent, safe location on workspace
3. ___	C. Consider the anesthetic plan and necessary medications
4. ___	D. Verify medication label and administer medication
5. ___	E. Label syringe with medication name and concentration
6. ___	F. Verify correct medication was drawn up
7. ___	G. Create an organized, clean, and consistent workspace
8. ___	H. If not immediately using medication, place syringe in secure space off anesthesia workspace
9. ___	I. Obtain medication vial and correct syringe size with needle
10. ___	J. Draw up medication into syringe while verifying correct medication with vial

Appendix D

Perceived Usefulness Survey

Your participation is voluntary and anonymous. Please rate the following questions on a scale of 1 to 5 (1= not at all useful, 5= very useful)

The education video:

1. Helped me understand the process of safe medication handling
   1 2 3 4 5
   not at all useful very useful
2. Helped me understand the importance of a clean workspace
   1 2 3 4 5
   not at all useful very useful
3. Helped me identify the steps of safe medication handling
   1 2 3 4 5
   not at all useful very useful
4. Helped me feel more comfortable with how to handle medications safely
   1 2 3 4 5
   not at all useful very useful
5. Was useful in preparing for clinical rotations
   1 2 3 4 5
   not at all useful very useful
6. Was useful in explaining the process of safe medication handling
   1 2 3 4 5
   not at all useful very useful
7. Was useful in identifying the importance of safe medication handling
   1 2 3 4 5
   not at all useful very useful
8. Was useful in relieving my anxieties about safe medication handling as an anesthesia provider
   1 2 3 4 5
   not at all useful very useful
9. Was useful in making me feel more confident with medication handling in the operating room
   1 2 3 4 5
   not at all useful very useful
10. Explained what I wanted to know about the process of safe medication handling
    1 2 3 4 5
    not at all useful very useful

Appendix E
CITI Training

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Molly Wenzel (ID: 6086265)
- **Institution Affiliation:** DePaul University (ID: 1435)
- **Institution Email:** molly.wenzel6@gmail.com
- **Phone:** 989-751-1081

- **Curriculum Group:** Students
- **Course Learner Group:** Students - Class projects
- **Stage:** Stage 1 - Basic Course

- **Record ID:** 22047361
- **Completion Date:** 23-Jan-2017
- **Expiration Date:** 23-Jan-2020
- **Minimum Passing:** 80
- **Reported Score*:** 95

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
History and Ethical Principles - SBE (ID: 490)	22-Jan-2017	5/5 (100%)
Defining Research with Human Subjects - SBE (ID: 491)	22-Jan-2017	5/5 (100%)
The Federal Regulations - SBE (ID: 502)	22-Jan-2017	5/5 (100%)
Assessing Risk - SBE (ID: 503)	22-Jan-2017	5/5 (100%)
Informed Consent - SBE (ID: 504)	22-Jan-2017	5/5 (100%)
Privacy and Confidentiality - SBE (ID: 505)	22-Jan-2017	5/5 (100%)
Students in Research (ID: 1321)	22-Jan-2017	5/5 (100%)
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	22-Jan-2017	3/5 (60%)
DePaul University (ID: 12952)	23-Jan-2017	No Quiz

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?k763ee3a6-d30e-4706-b1cb-de0dd2966af5-22047361

Collaborative Institutional Training Initiative (CITI Program)
Email: support@citiprogram.org
Phone: 888-529-5929
Web: https://www.citiprogram.org

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 2 OF 2
COURSEWORK TRANSCRIPT**

** NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional (supplemental) elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

- **Name:** Molly Wenzel (ID: 6086265)
- **Institution Affiliation:** DePaul University (ID: 1435)
- **Institution Email:** molly.wenzel6@gmail.com
- **Phone:** 989-751-1081

- **Curriculum Group:** Students
- **Course Learner Group:** Students - Class projects
- **Stage:** Stage 1 - Basic Course

- **Record ID:** 22047361
- **Report Date:** 23-Jan-2017
- **Current Score**:** 95

REQUIRED, ELECTIVE, AND SUPPLEMENTAL MODULES	MOST RECENT	SCORE
Students in Research (ID: 1321)	22-Jan-2017	5/5 (100%)
History and Ethical Principles - SBE (ID: 490)	22-Jan-2017	5/5 (100%)
Defining Research with Human Subjects - SBE (ID: 491)	22-Jan-2017	5/5 (100%)
The Federal Regulations - SBE (ID: 502)	22-Jan-2017	5/5 (100%)
Assessing Risk - SBE (ID: 503)	22-Jan-2017	5/5 (100%)
Informed Consent - SBE (ID: 504)	22-Jan-2017	5/5 (100%)
Privacy and Confidentiality - SBE (ID: 505)	22-Jan-2017	5/5 (100%)
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	22-Jan-2017	3/5 (60%)
DePaul University (ID: 12952)	23-Jan-2017	No Quiz

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

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COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Suzanne Anderson (ID: 3814427)
- **Email:** suzanne.e.butz@gmail.com
- **Institution Affiliation:** DePaul University (ID: 1435)
- **Phone:** 920-819-7542

- **Curriculum Group:** Students
- **Course Learner Group:** Students - Class projects
- **Stage:** Stage 1 - Basic Course

- **Report ID:** 21954779
- **Completion Date:** 16-Jan-2017
- **Expiration Date:** 16-Jan-2020
- **Minimum Passing:** 80
- **Reported Score*:** 88

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
History and Ethical Principles - SBE (ID: 490)	16-Jan-2017	4/5 (80%)
Defining Research with Human Subjects - SBE (ID: 491)	16-Jan-2017	5/5 (100%)
The Federal Regulations - SBE (ID: 502)	16-Jan-2017	4/5 (80%)
Assessing Risk - SBE (ID: 503)	16-Jan-2017	4/5 (80%)
Informed Consent - SBE (ID: 504)	16-Jan-2017	4/5 (80%)
Privacy and Confidentiality - SBE (ID: 505)	16-Jan-2017	4/5 (80%)
Students in Research (ID: 1321)	16-Jan-2017	5/5 (100%)
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	16-Jan-2017	5/5 (100%)
DePaul University (ID: 12952)	16-Jan-2017	No Quiz

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

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COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)

COMPLETION REPORT - PART 1 OF 2
COURSEWORK REQUIREMENTS*

* NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional (supplemental) course elements.

- **Name:** Suzanne Anderson (ID: 3814427)
- **Email:** suzanne.e.butz@gmail.com
- **Institution Affiliation:** DePaul University (ID: 1435)
- **Phone:** 920-819-7542

- **Curriculum Group:** Students
- **Course Learner Group:** Students - Class projects
- **Stage:** Stage 1 - Basic Course

- **Report ID:** 21954779
- **Completion Date:** 16-Jan-2017
- **Expiration Date:** 16-Jan-2020
- **Minimum Passing:** 80
- **Reported Score*:** 88

REQUIRED AND ELECTIVE MODULES ONLY	DATE COMPLETED	SCORE
History and Ethical Principles - SBE (ID: 490)	16-Jan-2017	4/5 (80%)
Defining Research with Human Subjects - SBE (ID: 491)	16-Jan-2017	5/5 (100%)
The Federal Regulations - SBE (ID: 502)	16-Jan-2017	4/5 (80%)
Assessing Risk - SBE (ID: 503)	16-Jan-2017	4/5 (80%)
Informed Consent - SBE (ID: 504)	16-Jan-2017	4/5 (80%)
Privacy and Confidentiality - SBE (ID: 505)	16-Jan-2017	4/5 (80%)
Students in Research (ID: 1321)	16-Jan-2017	5/5 (100%)
Conflicts of Interest in Research Involving Human Subjects (ID: 488)	16-Jan-2017	5/5 (100%)
DePaul University (ID: 12952)	16-Jan-2017	No Quiz

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent Learner.

Verify at: www.citiprogram.org/verify/?kcaa2646a-9692-4103-8da8-e1d0bea43bdb-21954779

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Appendix F
DNP Committee Forms

DePaul University
School of Nursing
Doctor of Nursing Practice Program (DNP)
DNP Project
Request Form for Appointment of Doctoral Committee

Date 3/31/17

Student Name (s): Suzanne Anderson & Molly Wenzel

DNP Project Topic: Safe Medication Handling

Please appoint the following faculty members to the Doctoral committee for the above name student. Each of these faculty members has been contacted by the student (s) and signatures indicate agreement and willingness to serve on this committee. By singing this form, the committee member verifies that no conflict of interest exists.

Julia Feczko Name of the DNP Committee Chair	Julia Feczko Signature	5/10/17 Date
Anne Sauri Name of the DNP Committee Member	ASauri Signature	04/01/2017 Date
_____ Name of the DNP Committee Member	_____ Signature	_____ Date

May. 17. 2017 4:00PM No. 9540 P. 1

NSG 600

DePaul University

School of Nursing

Doctor of Nursing Practice Program

DNP Project Proposal Approval Form

DNP Student Name: Suzanne Burz and Molly Wenzel

DNP Project Title: Use of an Educational Video to Teach Safe Medication Handling

The student(s) successfully developed a high quality DNP project proposal, which represents the students' intellectual ability, knowledge in the subject area, and contributions to nursing. Thus, the DNP project committee members have approved the project to move on to the next process.

DNP Project Proposal Approval

Justin Jaeger ANP, CRNA — 5/17/17

DNP Committee Chair Signature — Date

Anne Sauri CRNA, DNP — 5/17/17

DNP Committee Member Signature — Date

DNP Committee Member Signature — Date

Appendix G
Recruitment Email

Dear Nurse Anesthesia Trainee,

Our names are Suzanne Anderson and Molly Wenzel. We are third year nurse anesthesia trainees conducting our research as part of our doctoral work with the NorthShore University HealthSystem School of Nurse Anesthesia and DePaul University. We are conducting a research study to learn about the efficacy and perceived usefulness of an educational video on safe medication handling. On Monday, October 9th you may choose to attend a 20 minute study which includes a pre-test, 8 minute video, a post test, and perceived usefulness survey. The goal of our research is to evaluate the efficacy and perceived 'usefulness' of an educational video on nurse anesthesia trainees' knowledge of safe medication handling. Your participation is both voluntary and confidential. You are not obligated to attend and whether you choose to participate or not will not have any bearing on your standing within the School of Nurse Anesthesia. By nature of a survey, completion of the survey implies your consent to participate. You may choose to terminate participation at any time, however, once surveys are submitted we are unable to remove your responses from the data, as they are anonymous and will not be identifiable. Attached to this email you will find an information sheet for participation in research. Please review it prior to Monday. If you have questions at any time, please contact us at Suzanne.E.Butz@gmail.com or Molly.Wenzel6@gmail.com.

Thank you,
Suzanne Anderson & Molly Wenzel

Appendix H
Information Sheet

INFORMATION SHEET FOR PARTICIPATION IN RESEARCH STUDY

Efficacy and Usefulness of an Educational Video on Safe Medication Handling

Principal Investigator: Suzanne Anderson, BSN, RN; Molly Wenzel, BSN, RN
Institution: DePaul University, USA
Collaborators: NorthShore University HealthSystem School of Nurse Anesthesia: Julia Feczko, DNP, CRNA

We are conducting a research study because we are trying to learn more about the efficacy and perceived usefulness of an educational video on safe medication handling. We are asking you to be in the research because you are enrolled in the NorthShore University HealthSystem School of Nurse Anesthesia and are in your second year of training. If you agree to be in this study, you will be asked to watch a 8 minute educational video on safe medication handling, and complete three surveys: one prior to watching the video and two after watching the video. The surveys will include questions about your knowledge of safe medication handling and your perceived usefulness of the educational video. We will also collect some personal information about you such as gender, age, ethnicity, and number of years of intensive care unit experience. If there is a question you do not want to answer, you may skip it. This study will take about 20 minutes of your time. Research data collected from you will be confidential.

Your participation is voluntary, which means you can choose not to participate. There will be no negative consequences if you decide not to participate or change your mind later after you begin the study.

You can withdraw your participation at any time prior to submitting your survey. If you change your mind later while answering the survey, you may simply exit the survey. Once you submit your responses, we will be unable to remove your data later from the study because all data is confidential and we will not know which data belongs to you. Your decision whether or not to be in the research will not affect any grade, evaluation, or status within DePaul University or the NorthShore University HealthSystem School of Nurse Anesthesia.

If you have questions, concerns, or complaints about this study or you want to get additional information or provide input about this research, please contact Suzanne Anderson at suzanne.e.butz@gmail.com or Molly Wenzel at molly.wenzel6@gmail.com

If you have questions about your rights as a research subject, you may contact Karen McAviney, Northshore University HealthSystem Research Administrator, in the Northshore University HealthSystem Research Institute at 224-364-7274 or by email at KMcAviney@northshore.org. You may also contact Northshore University HealthSystem Research Institute if:

- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.

You may keep (or print) this information for your records.

Appendix I
Tables

Table 1. Evidence-based Table on the Efficacy of Video Simulation

Author (Year)	Study Objectives	Methods	Study Variables	Instrument/s Used to Measure the Construct/s	Statistics Used for Data Analysis	Study Findings	Conclusions
Yang, Rivera, Fortier, and Abernathy (2016)	To compare the system vulnerabilities (SV) in both self-filled (SFS) and pre-filled syringes (PFS) and understand the impact on medication safety and efficiency in the anesthesia medication delivery process	-Qualitative with a quantitative portion. 8 surgical cases using SFS and 9 surgical cases using PFS. -A focus group (n=6) was conducted to validate observational data and to rate the risk of the SVs. -Academic medical center in Southeastern United States. -Both phases were approved by the university's and institution's IRB -Direct observation of	Study variables include PFS and SFS. Not all medications are available in commercially PFS, therefore during the PFS portion of the study some medications were still SFS.	-Two human factors engineers conducted work system analysis observations. The two researchers combined observation notes and coded the data independently, creating descriptive codes related to the research objective. -Themes of SVs were then created. -The focus group rated the risk of the SVs by assigning a likelihood score between 1 to 4 of its occurrence, severity, and disruptiveness. -An overall score of >16 was	Descriptive statistical analysis was used to determine each system vulnerability's mean and standard deviation.	-PFS are superior to SFS as they simplify the work process and decrease the number and associated risk of SVs. -The SFS system had 21 SVs identified with 4 themes, while the PFS system had 8 SVs identified with 3 themes. -The SPS system had 11 SVs with a score >16, the PFS system only had 1 SV with a score of >16	PFS simplify work processes and have decreased number and associated risks of SVs. Therefore, from a human factors engineering perspective, PFS are superior to SFS and can aid in a safer medication delivery system.

Author (Year)	Study Objectives	Methods	Study Variables	Instrument/s Used to Measure the Construct/s	Statistics Used for Data Analysis	Study Findings	Conclusions
		human subjects for the study		determined to be a high-risk SV to workflow or patients.			
Grigg et al. (2017)	-An Anesthesia Medication Template (AMT) was created to define a formal way to organize the anesthesia workspace. -The study's purpose was to determine if the AMT can decrease perioperative medication errors by anesthesia providers.	-Phase 1) 2 prospective, randomized observational (n= 41 anesthesia providers) -Phase 2) prospective self-reported medication errors 12 months before and 12 months after implementation of the AMT (n=200 providers, n=53 reported errors). -Seattle Children's Hospital. -IRB approval from Seattle Children's Hospital Human Subjects -Human subject issue	-Usability of product. -The odds of medication errors with and without the AMT. -Self-reported errors, categorized into 6 types including: prescribing and communication, preparation, syringe swap, miscalculation, timing, and infusion pump programming	-System Usability Scale (SUS) -Direct observation of medication search time, administration time, medication given, and dose. -Online, anonymous, self-reporting tool	-Errors per 100 simulations and Wilson 95% confidence interval -Control charts of self-reported medication errors based on if the error reached the patient -Generalized linear models estimated mean monthly error rates and 95% Poisson confidence intervals -Stata 12 was used for analysis	-All observed errors were dosing calculation errors. The odds of dosing errors using the AMT was 0.21 times the odds of errors when not using the AMT. -A cluttered workspace can increase the cognitive load, resulting in dosing errors, therefore that is why dosing errors may have decreased with the use of the AMT. -With or without the AMT there was no significant statistical or clinical difference in the time to locate and administer medications. -There was a decrease from 1.50 to 0.83 in self-reported medication errors after implementation of the AMT, AMT specific errors decreasing from 0.97 to 0.35. -The SUS score for the AMT was 90.4 on a 100-point scale, putting the AMT in the 99th percentile for usability.	The AMT is a very usable tool that can decrease the odds of a medication error. For the AMT to really impact medication safety it needs to be implemented at other institutions. The AMT has the potential to be a low cost, flexible medication safety tool in anesthesia.

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		of direct observation of participants					
Brown (2014)	-To discuss medication errors in anesthesia -To present the Anesthesia Patient Safety Foundation's (APSF) standards to reduce the number of adverse drug events -To review the available technology, and the cost, to assist anesthesia providers to deliver medications safely	N/A	N/A	N/A	N/A	-Anesthesia providers prescribe, mix, relabel, and administer numerous medications without safety checks or a second verification, creating many opportunities for medication errors to occur each case. -The Joint Commission has specific guidelines for medication handling including on storage, preparation, labeling, dispensing, and accounting for medications administered. -The APSF has additional recommendations regarding medication administration safety and technology in the operating room. -Although costly to implement, a Barcode Medication Administration system's return on investment in the form of a reduced number of costly and potentially deadly medication errors is equal or greater to the cost of implementation.	-The APSF developed a new paradigm recommending standardization of high-alert medications, standardization of workspace, and standardization of technology. -Anesthesia providers are at risk for making medication errors. Implementing the APSF's recommendations of using a Barcode Medication Administration system, pre-filled syringes, and standardizing workstations can reduce mediation errors and improve safety.

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Hartland, Biddle, and Fallacaro (2008)	-To determine if audiovisual information increases cognition when compared to written/lecture information alone. -To improve didactic and practical experiences and provide students the opportunity to learn from individual and classmates experiences in a risk-free environment by utilizing simulated-based video teaching interventions (SBVTIs). -Paivio's Dual Coding Theory	-Group 1 viewed audiovisual information and Group 2 read case reports, with both groups receiving the same information. -A follow-up survey was sent 6-12 months post-exposure to determine the recall of the information. -The research was in its infancy and lacks the elements of a randomized controlled trial. -Results are considered preliminary. Group 1 n=1,844 Group 2 n=185 -Virginia Commonwealth University	The information was portrayed differently -Group 1: one 1-minute-long video and one 9-minute-long video depicting the events that led to the negative event, demonstration of the actual event and demonstration of how the event could have been prevented -Group 2: read 2 case reports describing the 2 events -Information included was the same	The follow-up survey included the following 4 dimensions: 1) the ability to specifically recall the theme of the information 2) the preventive actions displayed in the information 3) if the portrayed information has subsequently affected their practice or work life in a useful way and 4) if the portrayed information represented a useful or highly useful tool in the patient care and safety domain.	Descriptive statistics. -Inferential statistics, although would likely demonstrate group differences of great significance are not relevant at this stage of the research	Group 1 Results: -100% recalled the themes of the films -68% recalled specific preventive actions displayed in the films -47% indicated that the film affected their practice in a useful way -93% indicated that the film was a useful or highly useful tool in the patient care and safety domain Group 2 Results: -9.5% recalled the themes of the written case study -4.5% recalled specific preventive actions displayed in the written case studies -12% indicated that the written case study may have impacted their practice -17% indicated that the written case report was a useful or highly useful tool in the patient care and safety domain	-Although preliminary, there is a significant difference between the recall and impact of the information between Group 1 and Group 2. -Utilizing the Dual Coding Theory and providing information in an audiovisual manner is more effective than written information alone. -This research needs to be continued to fully determine the relevance

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	(DCT) provides the infrastructure for the SBVTIs	-IRB approval from Virginia Commonwealth University for protection of human subjects					
The Joint Commission (2015)	2015 Hospital National Patient Safety Goals Goal 3: Improve the safety of using medications	N/A	N/A	N/A	N/A	N/A	-Label all medications and medication containers with the following information: medication name, strength, amount of medication in container is not apparent, diluent name and volume if not apparent, expiration date if not used in 24 hours, expiration time when expiring less than 24 hours. The date and time are not necessary for short procedures -Verify all medications both verbally and visually. A two-person verification should be done when the person preparing the medication is not the person who will be administering it -Label each medication as soon as it is prepared unless immediately administered -Discard any medication or solution found unlabeled
Chan (2010)	To determine students' learning beliefs and preferences	-A survey was sent to university students taking a computer based learning	-Students' learning beliefs and preferences for beyond classroom	Three 5 point Linkert Scale surveys determining the students' preferences on	Quantitative descriptive statistics was used to analyze the Linkert Scale surveys	-Students believe that videos hold their attention and help them learn -Students have little issue viewing videos	-A larger sample size of students is needed to determine the significant of the results -Video instructions are beneficial to students and have the potential to support formal

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	for beyond classroom learning	course at Multimedia University (n=31) -IRB approval was not mentioned in the article, human subjects were surveyed and IRB approval would be necessary	learning (video vs textbook) -Students' beliefs on aspects of a good streaming video	video instruction for learning and aspects of a good streaming video		-Video instruction is the preferred method of learning -Students believe high quality content and fast loading videos are the most important elements to good streaming videos	learning outside the classroom setting
Jensen, Merry, Webster, Weller, and Larsson (2004)	To develop a list of recommendations to reduce intravenous drug administration errors in anesthesia based on the best evidence available	Systematic Review	N/A	N/A	N/A	The following are the recommendations to avoid drug administration errors during anesthesia in order of strength: 1) The label on any drug vial or syringe should be read carefully before a drug is drawn up or administered 2) Legibility and contents of labels on vials and syringes should be optimized according to agreed standards in respect to some or all of font, size, color and information included 3) Syringes should always or almost always be labeled	This systematic review provides recommendations to decrease the incidence of drug administration errors in anesthesia. The recommendations are reasonable and several are straightforward, which can be implemented by anesthetists immediately.

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						4) Formal organization of drugs and workspace should pay attention to tidiness, position of medications, separation of similar or dangerous drugs, and removal of dangerous drugs from the OR 5) Labels should be checked with a second person or device before a drug is drawn up or administered 6) Errors in intravenous drug administration during anesthesia should be reported and reviewed 7) Inventory management should focus on minimizing the risk of drug error 8) Similar packaging and presentation of drugs should be avoided when possible since they contribute to error 9) Drugs should be presented in pre-filled syringes rather than vials when possible 10) Drugs should be drawn up and labeled by the anesthetists who will administer them 11) Color coding labels according to an agreed	

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						national or international standard should be used 12) Coding by syringe position, size or by the needle should be used	
Garneri n et al. (2007)	-To assess the impact of differences in drug label information on drug errors associated with selection	-Qualitative experimental -n = 75; 5 different professional groups (nurses, ICU nurses, nurse anesthetists, physicians, and anesthesiologis t) -Setting: hospital -Participants informed of aim and design of study, consent granted, received monetary compensation. Protocol approved by institutional ethical committee for human research	- Independent variables: presentation sequence of the three formats (format A: incomplete label, format B: complete label but varying sequence, format C: complete label and same sequence), type of target drug instruction, drug strength information format, concentratio n units, and professional group	-Data collection included the answer, the response time, the presentation sequence of the 3 sets, the strength information format, the type of target drug instruction, the professional group, and the participants' identification number	-Univariate and multivariate analyses using generalized linear models -Comparisons of selection error frequencies used Pearson's Chi-squared test -p value of < 0.05 was consider statistically significant -STATA 8.2	-13.4% of answers were selection errors -Frequency of errors higher in Format A (29.7%), than B (6.4%), and C (4.1%). -Anesthetists had fewer errors than other physicians and other nursing groups	-The most complete standardized label format led to the least number of errors -Standardizing labels with concentration(mg.ml), amount, and volume proved to have the fewest selection errors and the fastest selection of the correct medication

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			-Dependent variable: selection error				
Lawton, Carruthers, Gardner, Wright, and McEachan (2012)	-Identify latent failures perceived to be behind medication errors	-Cross-sectional qualitative design -n = 12 nurses and 8 managers -Setting: 3 medical wards in a hospital in UK -Letters of invitation were sent to participants -Ethical approval from Local Research Ethics Committee	-Higher order themes associated with medication errors	-Interviews were transcribed and analyzed for thematic content	-Interviews transcribed and stored in NVivo7 and subjected to five stages of Thematic Content Analysis -Inter-rater comparison used to test reliability of themes	-Data analysis showed 10 themes with ward climate the most significant -Themes included ward climate, local working environment, workload, routine procedures, bed management, team communication, written policies and procedures, supervision and leadership, and training	-Ward climate, including values, attitudes and patterns of behavior of staff, was the most common theme identified in interviews about perceived latent failures involving medication errors
Drach-Zahavy and Pud (2010)	-To identify and research the efficacy of different learning mechanisms from nursing staff to decrease medication administrati	-Cross sectional mixed methods design -n = 173 nurses in 32 surgical and internal units -Setting: 3 of the largest	-Independent variables: learning mechanism patterns; non-integrated, integrated, supervisory, patchy	-Observations of medication administration with observers being nursing students -Interviews for qualitative data collection (taped and transcribed)	-Qualitative: responses coded into themes -Quantitative: coded each sub-mechanism into 4 types of learning mechanisms	-Mean ratio of errors was 0.27 (SD =14). -Non-integrated learning made up 25% of learning mechanisms observed -Integrated learning was second most common pattern observed -Integrated learning negatively and statistically significantly associated	-Roughly every third patient experience a deviation from proper protocol in medication administration -The most effective learning mechanisms to decrease MAE involve the whole cycle of team integrated learning, and is led by nurses who administer medications

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	on errors (MAE)	hospitals in Israel -Approved by institutional review board of university	-Dependent variable: frequency of medication administration errors			with MAE, while non-integrated learning was positively associated with MAE	
Eichhorn (2010)	-Anesthesia Patient Safety Foundation met with 100 stakeholders to create new strategies to improve medication safety in operating rooms	N/A	N/A	N/A	N/A	N/A	-Recommendations include standardization, utilizing technology, pre-filled or mixed medications, and establishing a culture of education and "just culture" for medication error reporting -Support for need of stronger medication safety education and training modules for CRNA students
Merry, Shipp, and Lowinger (2011)	-Discussion of best practice guidelines for medication labeling in anesthesia and interventions to reduce medication errors	N/A	N/A	N/A	N/A	N/A	-Labels should be used in anesthetic practice on syringes containing medications and infusions -Information on label should include generic drug name and concentration of syringe contents -Factors that predispose anesthesia providers to make medication errors include no safeguards or double checks that are used in other fields, time pressure, distractions, and long hours.

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							-Labeling medications is an important step in medication safety and poor labeling may result in patient harm -Providers should discard syringes that are unlabeled and cannot be identified -Standard procedure for labeling syringes: 1) Process of drawing up and labeling medication should be done one at a time 2) The label on the vial should be read, and the name and amount of medication should be reviewed 3) The name on the vial should be matched to the name on the label
Cooper, DiGiovanni, Schultz, Tayler, and Nossamn (2012)	To investigate if the type of surgery, healthiness of patient, the level of experience of provider, or additional factors affect the number of medication errors being made	-Prospective observational study -n = 8,777 -Setting: Major tertiary teaching hospital in southern United States -Institutional Review Board approval	-Medication error reporting forms were attached to chart and were anonymous and voluntary -Medication errors were classified as pre-error, omission, repetition, substitution,	-Survey instrument attached to each anesthesia record during 6-month period	-JMP 6.0.0 software -Category variables were used as percentages -Group differences assessed with Chi square or Fisher's exact test -$p < 0.05$	-83% of surveys were returned, 8777 surveys total -35 reported errors, 17 reported pre-errors -One out of every 203 anesthetics delivered had an error occurrence -No errors reported for neurology cases -0.81% incidence of error with ASA III, 0.43% with ASA II, 0.8% with ASA I -0.74% incidence of errors in providers in training and 0.37% in experienced providers	-Statistically significant frequency of medication errors in ASA class III patients compared to class II and class I -Two-fold increase in reporting of medication errors of providers in training compared to experienced providers -American Society of Anesthesiologists' classification, level of provider experience contributed to frequency of medication errors

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			insertion, incorrect dose, incorrect route/incorrect drug - Independent variables included type of surgery, healthiness of patient, provider experience -Dependent variable was medication error being made			-Factors identified to contribute to errors included distraction, stress, misread label, unexpected medication, lack of knowledge, inappropriate medication storage, and inadequate communication	
Forbes et al. (2016)	-To investigate and discuss the current areas of research for the use of videos to support teaching and clinical skills in nursing	N/A	N/A	N/A	N/A	N/A	-Video education provides a visual demonstration of clinical skills in a simulated setting -Video education has been found to be effective in skill learning and student satisfaction -Videos can improve education outcomes when they focus on crucial information -Many videos on YouTube are poor quality for clinical skills -Need for rigorous evaluation of quality of educational videos -More research is needed on the use of educational videos, but

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							has positive outlook for enhancing educational opportunity
Alkhani et al. (2013)	-To evaluate and research adherence to medication labeling protocol set by the Institute for Safe Medication Practices (ISMP)	-Descriptive, cross-sectional analysis -n = 208 medication labels -Setting: 14 public hospitals in Riyadh, Saudi Arabia	-5 different types of labels including community and mail order, intravenous piggy back, oral liquids, oral solids, and injectable syringes	-ISMP guidelines used for data collection tool	-Descriptive statistics -Analysis with Microsoft Access	-Adherence rates for community and mail order medications was 90.5%, for oral solids was 88%, for intravenous piggyback was 85.8%, for oral liquid was 83.74%, and for injectable medications was 81%	- Riyadh hospitals have strong adherence rates for medication labeling, with injectable medications being the lowest levels of adherences -Private, teaching hospitals have the lowest level of adherence to labeling guidelines

Table 2. Demographic Characteristics of Study Participants (N = 19)

Variable		Frequency	Percent	Cumulative Percent
Gender	Male	3	15.8	15.8
	Female	16	84.2	100.0
Age	20-29	11	57.9	57.9
	30-39	7	36.8	94.7
	40-49	1	5.3	100.0
Ethnicity	White	14	73.7	78.7
	African American	1	5.3	78.9
	Asian	2	10.5	89.5
	Mixed	2	10.5	100.0
ICU Experience Prior to Start of Anesthesia School	1-2 years	6	31.6	31.6
	3-4 years	5	26.3	57.9
	5-6 years	6	31.6	89.5
	Greater than 6 years	2	10.5	100.0

Table 3. Knowledge Assessment Tool Pre-Test and Post-Test (N=19)

	Mean Score	Standard Deviation	Standard Error Mean
Pre-KAT	3.6842	1.97351	0.45275
Post-KAT	7.6842	2.26207	0.51895

Table 4. Knowledge Assessment Tool Paired Samples Test

	t	df	Significance (2-tailed)
	-6.643	18	p = 0.00*

* $p < 0.01$

Table 5. Perceived Usefulness of Safe Handling of Medications Video (N=19)				
	Mean	**Mode**	**Sum**	**Standard Deviation**
Helped me understand the process of safe medication handling	4.421	5.0	84.0	0.7685
Helped me understand the importance of a clean workspace	4.158	5.0	79.0	0.8983
Helped me identify the steps of safe medication handling	4.632	5.0	88.0	0.4956
Helped me feel more comfortable with how to handle medications safely	4.158	4.0	79.0	0.7647
Was useful in preparing for clinical rotations	4.368	5.0	83.0	0.8307
Was useful in explaining the process of safe medication handling	4.389	5.0	79.0	0.7775
Was useful in identifying the importance of safe medication handling	3.895	5.0	74.0	1.1496
Was useful in relieving my anxieties about safe medication handling as an anesthesia provider	3.737	3.0	71.0*	0.9335
Was useful in making me feel more confident with medication handling in the operating room	4.000	4.0	76.0	0.7454
Explained what I wanted to know about the process of safe medication handling	4.158	4.0	79.0	0.6882

*Lowest Sum