Efficacy of an Airway Management Educational Primer for Perianesthesia Nursing Staff

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Abstract

It is a requirement of perianesthesia nurses to be competent in caring for patients who are sedated or anesthetized for procedures in a hospital setting. Oftentimes, when patients are sedated, they are unable to maintain their own airways. This can lead to respiratory decompensation of the patient if interventions are not employed. Therefore, perianesthesia nursing requires expert advanced airway assessment and management skills or training to achieve competency. A review of related studies on continuing education of nurses reveals that trainings are beneficial in the realms of knowledge acquisition, practice change, and perceived self-efficacy. The primary purpose of this project was to evaluate the efficacy of such an educational training on knowledge gained utilizing a pre/post-test method of assessment. A secondary aim was to measure if there was a reduction in skill-related anxiety of the nurses following the training utilizing a short-form of the State-Trait Anxiety Inventory for Adults™. Long-term follow up of both knowledge gained and anxiety levels was performed at a six-month interval after the initial training. The findings between the initial knowledge and anxiety pre- and post-tests were both statistically significant ($p<0.001$). However, at the six-month interval, neither the knowledge gained nor reduction of anxiety remained significantly better compared to the initial pre-test. Nurse training and education is effective in increasing knowledge and self-efficacy, but long-term continuing education may be necessary to maintain familiarity and competence with material.

Keywords: nurse education, nurse training, airway management, perianesthesia nurse

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Background and Significance of Problem

Perianesthesia nurses are members of a nursing specialty that cares for patients who are undergoing anesthesia for anything from minor procedures to major surgery. This type of care usually occurs in the pre-operative and post-operative "post-anesthesia care" setting. These periods are commonly referred to as the perianesthesia phases of care. Depending on the type of procedure, the patient may be hospitalized as an inpatient, or he/she will go home the same day following nurse observation and after meeting recovery criteria. Often, these nurses are tasked with caring for patients before, during, and after the administration of sedation and pain medications for these procedures. Occasionally, these nurses are the ones responsible for administering the sedation medications and monitoring the patient throughout these procedures or diagnostic tests. When patients receive these types of medications, it is not uncommon for them to become sedated enough that they cannot safely maintain their airway. Therefore, adequate training in airway assessment and management is essential for nurses who are caring for these patients. They must know how to recognize when a patient is not oxygenating and ventilating well on their own, and how to assist these patients properly.

The Institute of Medicine (IOM) acknowledges that, although undergraduate education provides baseline knowledge needed to enter the nursing profession, it does not generally address in depth acute, complex, or specialized care (2010). There is a recognized need for continuing education that can assist nurses in acquiring specialized knowledge and skills so that they are well-equipped to "deliver safe, quality, patient-centered care across all settings," and manage the complex patients that are encountered in today's healthcare system (IOM, 2010, p. 35). The American Nurses Association (ANA) Code of Ethics (2015) states that it is the duty of individual nurses to maintain continuing acquisition of knowledge in order to maintain competence.

However, the ANA also believes it to be the duty of nurse managers and educators to assist nurses in their facilities to gain knowledge and skills when baseline knowledge is not adequate for specialized care (ANA, 2015). In their review of staff training, Forghany et al. (2018) made the connection that it is reasonable to assume the quality of staff training will have an impact on the type of care that is received by patients.

Project Aims and Problem Statement

A review of related studies on in-service nurse training reveals that continuing education is beneficial in the realms of knowledge gained, practice change, and perceived self-efficacy. The aim of this project was to evaluate the efficacy of such an educational training on knowledge gained utilizing a pre/post-test method of assessment. A secondary aim was to measure if there was a reduction in anxiety of the nurses following the training utilizing a short-form of the State-Trait Anxiety Inventory for Adults™ (Spielberger, 1977; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983). The problem "PICOT [population, intervention, comparison, outcome, and timeframe]" statement for the project was: In perianesthesia nurses, does a didactic airway management training, compared to no formal training, result in increased knowledge and decreased anxiety immediately following and six-months after training?

Literature Review

Education serves many purposes on units throughout a facility and include: get all nurses to a minimum level of proficiency (i.e., homogenize competence levels), provide the most up-to-date knowledge to staff, decrease nurses' anxiety about particular components of care by increasing their competence, improve nurse satisfaction through the acquisition of new knowledge and improve patient outcomes. Continuing education occurs in various ways, such as through unit-based staff training including educational workshops, self-directed study, computer-

based modules, simulations, and off-site professional meetings. The purpose of the literature review was to determine the efficacy of educational training on knowledge acquisition, behaviors, and psychosocial metrics, such as anxiety, stress, or satisfaction in nurses**.**

Methods

A review of the literature was conducted regarding nurse training and continuing education using the online databases PubMed, Cumulative Index to Nursing & Allied Health Literature (CINAHL), and Cochrane Collaboration. A search of relevant evidence-based articles was conducted using various combinations of the following keywords and phrases, utilizing Boolean operators: *in-service training*, *in-service education*, *nurse training*, *nurse staff development*, *educational workshop*, *nurse competency*, *in-service training AND nurse*, *in-service education AND nurse*, *educational workshop AND nurses*, *continuing education AND nursing AND staff development*. A 25-year search limit was placed in order to cover a breadth of traditional education modules, with the chosen articles ranging from 1995 to 2018. Pre-set inclusion criteria were that the articles were in the English language, used human subjects, and were not duplicates. Additional inclusion criteria were that the articles involved nurses (not nursing students), that studies were conducted in the US or countries with a similar Westernized healthcare model, and that didactic or autodidactic training methods were utilized.

Articles were excluded if they were level IV, V, or VI evidence according to Melnyk and Fineout-Overholt's (2015) "level of evidence classification," such as case reports, reviews, consensus, or opinion pieces. Articles that involved simulation or other highly technical training were also excluded as the review is focused on traditional didactic education methods. Evaluation of resultant articles was done by abstract review to determine which related best to the topic of interest in which the reviewer was trying to investigate. A final twelve studies were

selected for review: three randomized-control trials (RCTs) (level 2 evidence), and nine quasi-experimental studies (level 3 evidence).

Themes

The literature revealed three major themes for consideration: post-intervention outcomes, method of education delivery, and length of study. Regarding outcomes, all of the studies found favorable results in at least one of the following categories: participant gain of knowledge, behavior change, or perceived self-competence post-intervention. The primary goal for an educational intervention is that there will be a knowledge gain by the participants. As previously discussed, it is an assumption by most in the healthcare community that education will lead to knowledge acquisition resulting in better practice and patient outcomes (ANA, 2015; Forsetlund, 2009; IOM, 2010). Ten of the reviewed studies directly state this belief that education will result in better care by nurses, which will lead to improved patient outcomes (Attard et al., 2014; Cone et al., 1996; Corcoran, 2016; Day et al., 2001; Daly et al., 2009; Goudy-Egger et al., 2018; Hemingway et al., 2015; Melnyk et al, 2010; Murray & Dunn, 2017; Turner-Parker et al., 1995).

Post-intervention outcomes.

The purpose of both the experimental RCTs and the quasi-experimental studies was to determine the efficacy of an educational training by performing a type of pre-test, survey, or chart-audit; providing the training; and then doing a post-test, survey, or chart-audit to measure outcomes. Only one study done by Cone et al. (1996) did not perform a pre-test; training was provided, followed only by a post-training assessment of documentation. Seven of the studies directly measured knowledge gain, six of the studies measured behavior or practice changes, six of the studies assessed participant perception of self-gain in knowledge, competence, or skills; and seven of the studies reported on more than one of these dependent variables.

***Knowledge gained*.** The primary goal for an educational intervention is that there will be knowledge gained by the participants. As previously discussed, it is an assumption by most in the healthcare community that education will lead to knowledge acquisition resulting in better practice and patient outcomes (ANA, 2015; Forsetlund, 2009; IOM, 2011). Ten of the reviewed studies found that education will result in better care by nurses, which will lead to improved patient outcomes (Attard et al., 2014; Cone et al., 1996; Corcoran, 2016; Day et al., 2001; Daly et al., 2009; Goudy-Egger et al., 2018; Hemingway et al., 2015; Melnyk et al, 2010; Murray & Dunn, 2017; Turner-Parker et al., 1995).

Furthermore, in nine of the studies reviewed, there was a hypothesis, in line with previously discussed findings from the IOM (2010), that nurses' baseline knowledge is often inadequate to provide quality care to the patients they serve (Attard et al., 2014; Corcoran, 2016; Day et al., 2001; Du Mont et al., 2018; Goudy-Egger et al., 2018; Hemingway et al., 2015; Melnyk et al, 2010; Murray & Dunn, 2017; Turner-Parker et al., 1995). According to Turner-Parker et al. (1995), changes in current care recommendations, new technology, and a low percentage of nurses seeking continuing education on their own contribute to a lack of knowledge. This lack of baseline knowledge is a large motivator for nurse educators to create educational workshops or in-service training. Of the seven studies that collected data on knowledge gained, six showed significant results ($p<0.05$) for the treatment group.

Du Mont et al. (2018) had the greatest statistically significant increase in staff knowledge ($p<0.001$). Though this was a quasi-experimental study and therefore level 3 evidence (Melnyk & Fineout-Overholt, 2015), the study sample was large, n=1366, which can provide a stronger level of external validity and generalizability. Murray and Dunn (2017) had a reported significance level of ($p=0.00$), but the sample size was only 49. Thus, while the results were

positive, generalizability is limited due to the small sample size. Hemingway et al. (2015) also achieved a high level of significance, ($p=0.004$), but the sample size was also lower, $n=48$. Furthermore, the sample was a non-randomized convenience sample without a control group and included 22 nursing students. Turner-Parker et al. (1995) found a significance level of ($p=0.006$) for knowledge gain compared to the comparison group ($p=0.57$). Although the sample size for this study was only 35, this was one of the only RCTs, giving it a higher level of evidence (level 2) than nine of the other studies. Day et al. (2001) also utilized an RCT design that showed statistically significant ($p<0.01$) knowledge gain in the treatment group after the training. However, the major limitation of this study was its very small sample size of 16 nurses. Though one of the studies with the highest level of evidence (2), it is also the study with the lowest number of participants, and therefore questionable external validity. Authors did note that the study was meant to be a pilot study for larger-scale implementation if results were favorable (Day et al., 2001, p. 694).

Lower levels of statistical significance related to increased knowledge were reported by Goudy-Egger et al. (2018), with ($p<0.05$) and a sample size of 31. Even though the results just met significance and the sample size was small, the authors felt that their findings were strong enough to support a need for continued education. One limitation that was discussed by the authors was that only knowledge was tested, but changes in clinical practice were not. Therefore, one can assume that there would be some crossover, but this was not proven (Goudy-Egger et al., 2018, p. 458). One study performed by Attard et al. (2014) did not find a significant difference in scores post-training ($p=0.054$); however, overall scores post-training were higher. Though not significant, this did show some benefit to having a training.

Behavior or practice change. As discussed, there is an assumption that knowledge acquisition will lead to better patient outcomes. However, knowledge gain in itself is not an accurate measure of whether nurses will have a change in behavior or practice. For example, though Turner-Parker et al. (1995) found a significant gain in knowledge, they noted no effect on behavioral changes, and that a lack of behavioral effect supports follow-up reinforcement sessions. Similarly, Melnyk et al. (2010) also found no statistical difference for implementation of the evidence-based practices (EBP) by participants that were taught in their training session. However, the authors provided a survey to participants to identify barriers to implementation, and many confounders were identified such as time constraints, competing interests, and a unit remodel (Melnyk et al., 2010). Therefore, a limitation of this study is that there may have been adequate knowledge gain, but that outside factors made it difficult for participants to have a practice change. Other study authors, such as Du Mont et al. (2018) did not specifically study behavioral effects, but they also concluded that more research is needed to determine the impact of knowledge gain on practice change.

Conversely, some studies that measured behavior change did note positive effects on practice following the education module. For example, though Cone et al. (1996) did not perform a pre-training chart audit of study subjects vs. control subjects, they did conduct an initial needs assessment of 100 random charts to determine compliance levels with assessment documentation. Their resultant assessment describes a failure to meet documentation standards set by regulatory bodies. However, they found a significant difference ($p<0.001$) in the documentation behaviors of the treatment group vs. comparison group following an in-service education. The small sample size of 20 does limit the ability to infer external validity.

Poulsen et al. (2015) also found statistical significance (p=0.006) in the ability of participants to recover from job stress compared to the control group. Though the sample size for this study was slightly larger at 70, only 33 of the participants were nurses. A further limitation of this study was that by allowing participant data to remain anonymous, missing data was lost to follow-up (Poulsen et al., 2015, p. 496). However, allowing for anonymity was also likely a strength in getting participants to record stress levels honestly. Also, the participants chose to be in the study, which could lead to bias and decreased internal validity, as they were likely interested in the proposal of the study (to reduce job stress).

The RCT performed by Day et al. (2001) found that, at baseline, *none* of the participants demonstrated complete competency with endotracheal suctioning. However, they found a significant increase ($p<.01$) in the experimental group's utilization of research-based practices while performing endotracheal suctioning after the training. A unique aspect of this study was the actual observation of learned behaviors of the subjects by the researchers. This is the only study that reported this type of observational result, and therefore the only study that had a direct measurement of how the training impacted patient care. A limitation of this study is that subjects were likely aware that there was a study being done on their unit, as well as the small sample size (Day et al., 2001). The small sample size of 16 limits the external validity and generalizability of the studies.

In contrast to the groups with small sample size, Daly et al. (2009) used a large sample size of 308 participants across eleven hospitals, lending good external validity to the study. The authors compared an in-service training to a self-directed competency training to determine via chart audits if there was increased compliance with assessment and management standards for alcohol withdrawal. They found increased overall compliance rates across all nine measured

standards but found greater statistical significance (p=.000 in 4/9 standards and p=.001 in 1/9 standards; mean compliance scores p=.000) in the self-directed training group. Mean compliance scores revealed a percent change from pre- to post-test in the in-service group of 9%, and of 25% in the competency group. However, a few limitations to this study exist. First, the study did not have a control group. Second, relying on medical record audits to measure a change in nurse knowledge is somewhat confounded by the orders and activity of medical staff (Daly et al., 2009). For example, prescribing diazepam was a standard, but this may have been influenced by physicians prescribing practices more than the nurses' adherence to protocols.

Participants' perceived self-gain. As knowledge acquisition and behavior change are often the most desired results of an educational workshop or training, an occasionally overlooked aspect of education is the potential increase in self-efficacy of the participants. As previously mentioned, nine of the studies reported inadequate baseline knowledge resulting in nurses being unprepared to provide adequate care for their patients. Just as this knowledge gap is a motivator for nurse educators to create educational in-services, it is also a source of anxiety for many nurses. Du Mont et al. (2018) found through open-ended comments on their surveys that one nurse "felt better equipped to respond to" certain situations as a result of the training, and another "would not have known how to go about a situation had it arisen before taking the course" (pp. 127-128). This implies that inadequate baseline knowledge can lead to feelings of incompetence, fear, or anxiety

In Corcoran's (2016) study of EOL care, she relates a novice nurse's feelings of "fear" and "helplessness" when dealing with a dying patient or their family (p. 103). However, following an educational workshop, her findings showed significant (p<.001) improvements in caregivers' comfort with providing EOL care. One limitation to this study was that the pre-

test/post-test tool, though a validated tool, was not validated for this type of study design (Corcoran, 2016, p. 108). Also of note, the pre-test may have had a negative influence on the internal validity of the post-test scores.

In their study, Hemingway et al. (2015), concluded that a lack of confidence on the part of the provider could impact his/her ability to meet the needs of the clients (p. 31). This is congruent with findings from the Murray and Dunn (2017) study in which, prior to a workshop on spiritual care practices, 80% of nurses surveyed reported feeling inadequately prepared to provide this type of care for their patients (p. 120). As a result of being inadequately prepared, only 49% of those surveyed felt that they were "usually able to meet [their] patient's spiritual needs" (Murray & Dunn, 2017, p. 119). Daly et al. (2009) also surveyed participants following the study and found a perceived increase in confidence and ability to provide "non-judgmental" care to patients (p. 103). Further, the participants believed that through increased self-confidence and knowledge, there would be improved patient care and decreased risks (Daly et al., 2009, p. 104).

One study that had ambiguous results on participant self-efficacy was performed by Melnyk et al. (2010). The authors of the study report that statistical significance (p=.069) was achieved for an increase in EBP beliefs after the training. They report using a statistical value of p=.10 due to small sample size; however, the sample size was larger than eight of the other included studies. The other studies maintained a significance value of p=.05. Not only was the significance of the results questionable, the impact it had on participants' perceived ability to implement EBP remains unknown.

Delivery method of education.

Education can take many different forms. Even when exploring only traditional methods of didactic education, the design of the workshop or in-service can vary. Many modes of delivery were used in the studies reviewed, such that it is difficult to determine the most efficacious of the delivery methods as there are multiple other confounding variables. Also, of note, though simulation is a well-established form of education, it involves a greater degree of resources such as time, money, and instructor competency. Therefore, studies involving this type of training were purposefully excluded in order to focus on more feasible methods.

More than half (seven) of the studies reviewed used some variation of a lecture format (usually a PowerPoint® lecture) with or without written materials (Cone et al., 1996; Corcoran, 2016; Day et al., 2001; Goudy-Egger et al., 2018; Murray & Dunn, 2017; Poulsen et al., 2015; Turner-Parker et al., 1995). In addition to this format, three of the studies also had an interactive discussion session (Murray & Dunn, 2017; Goudy-Egger et al., 2018; Poulsen et al., 2015), and one had the addition of a bedside demonstration (Day et al., 2001). Poulsen et al. (2015) found a significant difference ($p=.006$) in providing this type of workshop over written materials alone. Interestingly, Corcoran (2016) also provided breakfast, lunch, a small gift bag, a CE credit (1), and had prize giveaways both days of her workshop in an effort to encourage participation. This is important as getting participants to give up time (paid or unpaid) to attend a workshop is often a difficult challenge. However, the downside to this is related to cost and a decreased feasibility by most institutions to provide these incentives. As all of these studies had significant gains in knowledge, behavior, or self-efficacy as previously discussed, it can be concluded that this is an effective means of education delivery.

As previously discussed, Daly et al. (2009) conducted self-directed and in-service training. They concluded that self-directed training had better results than in-service training and was favored by participants. The authors believed this to be related to the lack of time many participants have during or after their shift, and the fact that they may be too tired to concentrate on the education module (Daly et al, 2009, p. 100). However, this is in contrast to findings from Du Mont et al. (2018): they provided one group an in-person training consisting of a PowerPoint® presentation, case studies, and quizzes; and another group was provided with online training. Their results showed that participants preferred in-person training. However, the authors note that this is more time-consuming, and can be challenging due to the "operational demands" of the unit (Du Mont et al., 2018, p. 129). This is in agreement with the conclusions made by Daly et al. (2009) about why their participants preferred the self-directed training.

Two studies did not fit into the style of those previously mentioned. One study did not elaborate on how the workshop was conducted, but merely called the training a "study unit" (Attard et al., 2008). However, the authors conclude that multiple "reflective teaching methodologies," such as discussion groups, journaling, and self-reflection are important for knowledge transfer (Attard et al., 2008, p. 1464). This makes replication of this type of study, significant as its results may be ($p=.006$) for behavioral changes, difficult. The other study by Hemingway et al. (2015) used multiple teaching methods (multiple choice questionnaire, clinical equipment demonstration, video demonstration, and guided reading package), and found that participants preferred the video demonstration (highest mean ranking score of 4.28/5). Though it is likely that a variety of learning methods is preferred by learners, it is also more labor intensive for those creating the training. Alternatively, as the results of this study showed that video

demonstrations and clinical equipment demonstrations were ranked highest, the focus could be placed on those two forms of education delivery.

Study length.

Length of sessions. There were significant discrepancies among the studies regarding the length of the workshops, with sessions lasting from 20 minutes to two days; thus making it difficult to draw any conclusions about what the best length of training may be. However, all studies had generally favorable results with regard to knowledge acquisition. The articles reviewed showed that some utilized shorter sessions (two hours or less) in order to decrease the time that nurses were away from their units or had to come in off-duty, and thus result in better attendance (Day et al., 2001; Du Mont et al., 2018; Turner-Parker et al., 1995). Other studies with short sessions offered multiple times for nurses to attend in order to increase attendance (Cone et al., 1996; Murray & Dunn, 2017). It is also important to note that at least two of the studies utilizing short sessions (Cone et al., 1996; Turner-Parker et al., 1995), delivered multiple contiguous sessions over a period of time.

Five of the studies presented a longer, eight-hour/one-day workshop (Corcoran, 2016; Goudy-Egger et al., 2018; Hemingway et al., 2015; Melnyk et al., 2010; Poulsen et al., 2015). Some that delivered longer workshops cited an inability to deliver the necessary content in a shorter session (Melnyk et al., 2010; Poulsen et al., 2015). Still others, such as Hemingway et al. (2015) were looking to increase the length of the training even further based on feedback from participants who felt that there was not enough time for the training. In line with the thought that one-day training is not long enough, Poulsen et al. (2015) questioned the support of a short training on long-term gains and felt that repeated exposure to an educational training might be more important than the length of a training session (p. 496).

Timing of post-tests. Though all of the studies reviewed performed some version of a post-test, no consistency or set standard for when these tests should be administered was revealed in this review. Five of the reviewed studies collected post-test data immediately after the conclusion of the workshop (Du Mont et al., 2018; Goudy-Egger et al., 2018; Hemingway et al., 2015; Murray & Dunn, 2017; Poulsen et al., 2015). A benefit of immediate post-testing is the determination of short-term gains from the training. The main limitation of these studies that performed post-testing immediately after the workshop is that there is no measure of long-term gain; making the results of these studies suspect for whether or not they can result in a sustainable change in practice. Therefore, it is difficult to draw conclusions about the ability of the training to affect long-term patient outcomes based on these particular articles.

However, the study by Poulsen et al. (2015) differed from the others that performed immediate testing; they collected a series of post-tests once a week for six weeks. This longer-term investigation in series allowed those authors to show long-term gains or regression of behavior change and self-efficacy. They were able to support the efficacy of their workshop on behavior as the treatment group was better able to recover from stress at the six-week follow-up time. Additionally, participants in the workshop felt that the workshop met their needs and increased their confidence in self-care abilities (Poulsen et al., 2015).

The next subset of data collection was performed by Corcoran (2016) at three weeks, and then by Day et al. (2001) at four weeks post-training. Following this, three studies (Cone et al., 1996; Melnyk et al., 2010; Turner-Parker et al., 1995) used a three-month follow-up timeframe to collect their post-test data. The study with the longest follow-up period was done by Daly et al. (2009), and it is unique in that it started a post-training chart audit that lasted for two-three years (years for the audit are provided, but the months are not, making the exact timeframe

difficult to determine). The Attard et al. (2014) study did not put a timeframe for post-testing, but instead allowed anyone who had taken the training at some point be involved in the study. The limitation to this is that all participants had a different follow-up timeframe, making it impossible to make conclusions based on the timing of the training and results.

Much like the length of the training sessions, there are significant variations in the time to follow-up (if any time was given at all). Limitations of immediate follow-up have been discussed. However, waiting long periods, such as three months to perform post-testing can result in attrition of participants. Long follow-up times can also allow for confounding variables to be interjected, thus interfering with results. Though it is possible that a three, four, or six-week timeframe is reasonable to assess long-term gains and avoid attrition, further studies are required to come to a definite conclusion.

Discussion

Though education is an important mainstay of nursing, the lack of standardization of training programs is likely a cause for regional and inter-systems discrepancies in both knowledge and care. Though all the reviewed studies provided evidence that education is beneficial, it remains inconclusive that an increase in knowledge leads to long-term behavioral changes. Therefore, it is also impossible without long-term evaluation or review of patient-specific outcomes to claim that educational training will improve patient care.

Conversely, education remains the best weapon against inadequate knowledge, lack of skills, and poor practice that the healthcare community has. It is critical to continue to search for what leads to effective training and better participant engagement. Various training modalities should be employed to encourage knowledge retention and subject participation. However, those factors must also be balanced with cost, time, and best-practice.

Conclusion

Given that 10 of the 12 reviewed studies showed a favorable statistical significance ($p \leq .05$) regarding gains in either knowledge, practice changes, or perceived self-efficacy following an education module, it is reasonable to conclude from this review of literature that educational workshops, among other forms of delivery, are beneficial. Though newer technology has allowed for more in-depth and high-fidelity modes of education, the feasibility (cost/time) of delivering traditional didactic and workshop-style training helps it to remain a reasonable mode of delivery for most units.

There is also strong support provided directly via study results, or indirectly through author commentary, that repeat sessions of education will result in better outcomes for both nurses and their patients. The lack of studies demonstrating this type of long-term application is a major limitation to identifying the true ability for education to influence patient outcomes, which is the ultimate goal of education. However, the lack of strong long-term evidence suggests that follow-up training should occur.

Conceptual Model

Synergy Model

The Institute of Medicine (IOM) recognizes that nurses are central members of the healthcare team and have an essential role in coordinating complex care of patients (IOM, 2010). As such, in the current age of accountability and transparency, it is a reasonable expectation by the consumers of healthcare, i.e., patients and their families, that nurses are knowledgeable and competent to provide such care. Unfortunately, without continuing education, or specialized training in some cases, nurses may be unprepared to provide certain types of patient care. This practice may lead to poor patient outcomes, as well as a lack of confidence on the part of the

provider and consumers. Therefore, to support the implementation of this project, the American Association of Critical-Care Nurses' (AACN) Synergy Model for Patient Care was utilized (Appendix A), which links nursing competence and practice to patient characteristics and needs (Curley, 2007).

As the name of the model implies, it involves synergistic transactions of "reciprocity", "equity", and "interdependence" (Curley, 2007). In order for this type of interaction to occur in the healthcare setting, assumptions must be made about each of the three key players: patients, nurses, and systems. To begin, patients, their families, and nurses must be active participants in the relationship in order to have a reciprocal relationship that is synergistic. Patients (and their families) are tasked with defining their optimal level of wellness and acceptable outcomes; while nurses are tasked with guiding and assisting patients in achieving their goals with regards to these outcomes (Curley, 2007).

In her model, Curley (2007) describes the "synergistic" effect that occurs when nursing care meets the needs of patients and their families (p. 2). Most importantly, when synergy exists, patient outcomes are optimal (Curley, 2007). As the synergy model works to improve patient outcomes by linking nursing care to the patient's needs within a supportive system, it is logical to use it as a framework for the utilization of specialized nurse training and continuing education to increase nursing competency. Another component of the Synergy Model is that the most complex patients will have the greatest need, and therefore will require care from the nurses with the highest competency (Curley, 2007). According to the model, the pathway to increased competency is through a three-tiered approach that includes academic education, staff development, and continuing education (Curley, 2007).

There already exists an assumption by the healthcare community that continuing education will improve knowledge, enhance practice and competence, and lead to improved patient outcomes (Forsetlund et al., 2009; IOM, 2010). Therefore, the concept that a system-backed training of nurses to increase their competence and self-confidence would, in-turn better meet patient needs, thus leading to improved outcomes is logical. During the development of the project, a concept map for continuing education/in-service training was created (Appendix B). Though there are many more sub-components to this map than the Synergy Model, when simplified, it too lines up with the core components of the model: the relationship of "nurse-patient, nurse-nurse, and nurse-system" (Curley, 2007).

Curley (2007) describes the characteristics of both patients and nurses that span a continuum and can result in linkages when the characteristics of both participants are in alignment. These characteristics are highly individual and fall on different areas of the spectrum for each patient and nurse. For the patients, these characteristics include stability, complexity, vulnerability, predictability, resiliency, participation in decision-making, participation in care, and resource availability (Curley, 2007). On the part of the nurse, the characteristics include clinical judgement, clinical inquiry, caring practices, advocacy/moral agency, facilitation of learning, collaboration, systems thinking (Curley, 2007). The system is incorporated into the reciprocal nature of the nurse-patient relationship because the system must supply the resources, determine the environment (for both the nurses and patients), and support the nature of the mutual goals and outcomes between patients and nurses. On the receiving end, when optimal outcomes are achieved by the patients and nurses, the system benefits.

Going back to the literature review, Du Mont et al. (2018) found through open-ended comments on surveys evaluating nurses' training module that they "felt better equipped to

respond to" certain situations as a result of their training, and another "would not have known how to go about a situation had it arisen before taking the course" (pp. 127-128). In Corcoran's (2016) study of end-of-life (EOL) care, she relates a novice nurse's feelings of "fear" and "helplessness" when dealing with a dying patient or their family (p. 103). However, following an educational workshop, her findings showed significant improvements in caregivers' comfort with providing EOL care ($p<.001$). In their study, Hemingway et al. (2015) concluded that a lack of confidence on the part of the provider could impact his/her ability to meet the needs of the clients (p. 31).

This lack of confidence is consistent with findings from Murray and Dunn (2017) in which, prior to a workshop on spiritual care practices, 80% of nurses surveyed reported feeling inadequately prepared to provide this type of care for their patients (p. 120). As a result of being inadequately prepared, only 49% of those surveyed felt that they were "usually able to meet [their] patient's spiritual needs" (Murray & Dunn, 2017, p. 119). Daly et al. (2009) also surveyed participants following their training module and found that the participants believed that through increased self-confidence and knowledge, there would be improved patient care and decreased risks (Daly et al., 2009, p. 104). Again, this implies that inadequate baseline knowledge can lead to feelings of incompetence, fear, or anxiety. When this occurs, there is a breakdown in the level of care that a nurse can provide a patient, and in turn, a lack of synergy in the nurse-patient relationship.

DNP Project Plan

Practice Gap and Organizational Readiness

At the facility where the training occurred, the peri-operative nurses care for patients before, during, and after the administration of sedation and pain medications for diagnostic tests,

minor procedures, or major surgery. Occasionally, the pre-operative nurses are called upon to provide sedation to patients for minor procedures such as bronchoscopies. As previously stated, it is not uncommon for patients to lose their own ability to maintain a patent airway. With proper training, nurses will be exposed to the assessment skills needed to recognize airway compromise and appropriately intervene. Generally, this will require basic and non-invasive maneuvers such as bag-mask ventilation, applying a nasal cannula, or inserting an oral or nasal airway. However, if the nurse has not undergone such training, patient airway compromise can go unnoticed with potentially catastrophic results. A situation that could have required a basic airway intervention can quickly become an emergency resulting in cardiac or respiratory compromise, severe hypoxic brain injury, or even death (American Society of Anesthesiologists [ASA], 2018).

The clinical nurse educator and the perianesthesia nursing staff of the facility where the study occurred expressed the need for, not only airway management training, but also sedation medication training. This type of training is also recommended by the two nationally recognized anesthesia organizations in the US, the American Association of Nurse Anesthetists (AANA), and the American Society of Anesthesiologists (ASA), for anyone providing patient sedation (AANA, 2016; ASA, 2018). Anesthesia providers are considered experts in airway management and procedural sedation; therefore, the anesthesia department was approached by the clinical nurse educator to request that they lead the training.

The ability of non-anesthesia trained providers to administer sedation to patients remains controversial (AANA, 2016; ASA, 2018; O'Malley & Poling, 2015). The anesthesia providers at the hospital, certified registered nurse anesthetists (CRNAs) and physician anesthesiologists (MDAs) were unwilling to provide the training, as they felt that it would be an endorsement of

this practice. Time constraints of these medical professionals was also a limiting factor since they are generally all in the operating room. However, it was felt that the airway management training was important for all perianesthesia nurses to know regardless of whether or not they provided the sedation. Patients can lose their ability to maintain their airway at any point in the course of their stay, and again, it is imperative that the nurses caring for them are able to assess and intervene when necessary. A student nurse anesthetist (SRNA) was willing to provide the training and deemed competent in airway assessment and management. In an effort to avoid the controversy of nurses providing sedation, no discussion of specific sedation medications occurred, and this type of training was avoided during this particular module.

Stakeholder Assessment

Key stakeholders for this project came from all levels of the peri-operative and anesthesia departments of the organization. Those in favor of training the pre-operative and post-operative nurses in airway assessment and management included unit managers, the unit's clinical nurse educator, as well as the nurses themselves. Nursing leadership and educators supported project objectives of creating an airway assessment and management training to positively impact patient outcomes and improve the overall quality of care, as well as to decrease the anxiety that nurses were feeling regarding the care of sedated patients. Though initially many in the anesthesia department expressed concern about teaching "sedation training" to registered nurses, once the project objectives were disclosed, many, including the chief of anesthesia, were in support of such a training. Outside of the organization, nurse anesthesia faculty members were also supportive of the project.

Not only was this project undertaken to increase knowledge and decrease anxiety, another aspect of interest to the stakeholders existed: the fact that this was the inaugural DNP

project at this site. The organization and university had only recently entered into a partnership and started training nurse anesthesia students. Furthermore, many at the organization were unfamiliar with the scope of a Doctorate of Nursing Practice (DNP) student and his/her capacity for translating evidence to best practice. This project gave those involved an opportunity to see how such a partnership could work and evolve, thus making a connection for future students to implement projects at this site.

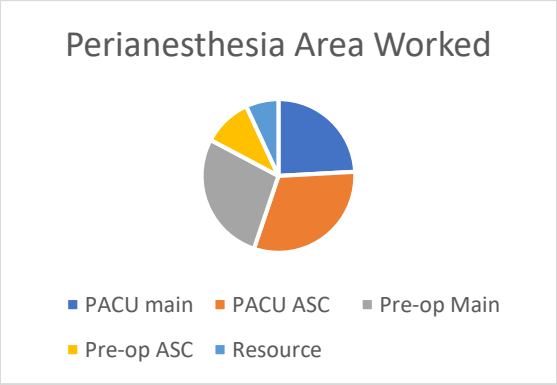
Method for Translation

Setting and participants.

Completion of the proposed project occurred at a small Midwestern, urban teaching hospital with 191 beds (Lopez-Gonzalez, Pickens, Washington, & Weiss, 2014). The selection of the institution was due to both a recognized need at the site and because it was, at the time, the current clinical site of the SRNA responsible for the training. The "students" who attended the training were perianesthesia (pre-operative and post-operative) nurses who currently worked at the facility.

At the time of the study, there were 43 perianesthesia nurses including those at the main hospital, those at the associated ambulatory surgery center (ASC), resource nurses, and "as needed" or "PRN" workers. Nurses who specifically worked only in the operating rooms were not included in the training, as there are airway experts, specifically anesthesia providers, available at all times. A limited amount of demographic data were collected including the unit in which the nurse primarily works and how many years of nursing experience the nurse had to enable the researcher to describe the sample (Appendix E). Participants were told that the collection of all data was optional. Thirty-four participants attended the training, producing a 79% response rate. However, only thirty-one participants completed all necessary knowledge-

related data, thirty completed knowledge and anxiety data, and only twenty-nine completed the demographic portion of the survey. Of the twenty-nine participants who completed that portion of the survey, demographic data is displayed in Figure 1 and Figure 2. As displayed in Figures 1 and 2, the majority of the sample (72%) had 6 or more years of nursing experience. The primary work setting of this group was PACU ASC (31%), with only 7% drawn from the "Resource" group.



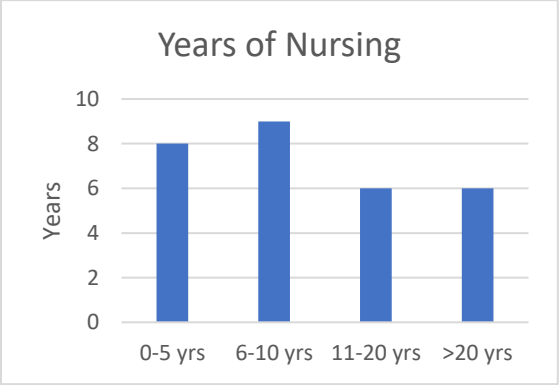


Figure 1 and 2: Breakdown of the area nurses who attended an airway assessment and management training work and how many years of nursing each had at the time of the training.

Procedure for implementation.

The proposed intervention module was composed of face-to-face didactic education delivered via PowerPoint® presentation and followed by a question and answer session. The SRNA developed the content of the PowerPoint® presentation and overall objectives (Appendix C). Three faculty content experts, three peer SRNAs, and the clinical educator reviewed the proposed content and objectives. The knowledge portion of the exam (Appendix D) consisted of a total of 15 questions taken directly from the created content and objectives. The same panel

also reviewed these. A six-question, modified version of a validated was used to evaluate the participants' anxiety regarding airway management of sedated patients.

A handout of the PowerPoint® slides was given to the nurses to follow and keep as a reference. Multiple trainings were done throughout the day to accommodate any nurse who attended with groups as small as two and as large as six at a time. These nurses are required to maintain competencies throughout the year, typically through continuing education and in-service training. Usually, these trainings are created and delivered by the unit's clinical nurse educator. The difference for this project was that an SRNA created and provided the training rather than the clinical educator at the site. As mentioned, this was requested due to the fact that those in anesthesia routinely perform airway assessment and management skills, and the clinical educator is less familiar with these topics. The nurses were encouraged, but not required to attend the training. There was no punitive action for not attending, nor was a certain score on testing required. Participation credit towards the amount of attended competencies was noted regardless of whether or not the participants completed the tests.

Prior to the training, participants were assigned a color by the clinical educator to ensure blinding of the investigator. Participants then used their color for both the knowledge portion and anxiety portion of the test as a method of de-identification. The knowledge portion of the exam was used as part of unit-based quality improvement, and therefore, the scores to this portion were released to the clinical educator. However, all participants were notified before the training that all portions of data collection were optional and that they could opt out anytime. In addition, the clinical educator was blinded to the anxiety portion of data collection to allow participants to feel more comfortable in answering. This portion was done on a separate sheet (taken at the same time) and was collected by the investigator. As previously mentioned, demographic data

including the unit in which the nurse works and how many years of nursing experience were also collected. The institution does not employ the investigator, and therefore she did not have access to the demographic data of the nurses trained (i.e., would not be able to identify participants based on their demographic data). The investigator collected the blinded results of all data using only the color coding. The knowledge and anxiety post-tests were then re-administered at a six-month interval to determine long-term increases in knowledge and confidence. Aggregate results of the knowledge portion were used to assist the clinical educator in creating future review sessions and trainings. No individual was required to undertake remediation based on any missed questions.

Ethics and human subjects' permission

This project was reviewed by the Marian University Institutional Review Board's (IRB) Social-Behavioral Subcommittee and deemed to be exempt from the need for human subjects' protections. As the nature of the project was quality improvement, the procedures proposed were appropriate for exemption under the federal regulations. The principle investigator was not an employee of the institution and did not have access to the demographic data of the nurses being trained. Further, the demographic portion was an optional component which was explicitly explained to participants. The results of the knowledge-gained portion were seen by the clinical educator, in support of quality improvement. Blinded results of this portion of the test was collected using only color coding. Additionally, all participants were told of the nature of the project, and verbal consent was received from all participants for data usage in the project. According to the IRB, "given the low-risk of your [the] study, and the blinding that you've explained" the study is exempt from IRB review. The project was therefore approved by the Leighton School of Nursing.

Method of Evaluation

Instruments used.

A quasi-experimental pre-test/post-test design was used to evaluate the effectiveness of the educational training. A knowledge-based pre-test that contained fifteen questions based on the training objectives and content was administered to the participants anywhere from a week before the training, up to immediately before the training depending on participants' availability to take the pre-test. Answers to the pre-test were not given to participants, so they did not know if they missed any questions, how many they missed, or which questions. Participants were also not permitted to work on the pre-test with any other participant. The post-test had the same fifteen questions and was administered immediately after the training. Again, participants were also not permitted to work with any other participant. No commercially available validated tool measuring airway assessment and management existed at the time of the study. Therefore, the investigator developed an evaluation tool. To establish construct validity, three former faculty content experts, three peer SRNAs, and the clinical educator reviewed the proposed content and objectives.

Additionally, a validated, shortened form of the State-Trait Anxiety Inventory (Spielberger et al., 1983) was used to measure the nurses' state anxiety level with regards to caring for a sedated patient during or after a procedure. The original inventory, developed by Spielberger and colleagues consisted of two 20-item self-report questionnaires, one created in 1970, the other in 1983 (Marteau & Bekker, 1992). Due to time constraints of study participants, shortened versions of the inventory have been developed, including the six-item form utilized for this project developed by Marteau and Bekker (1992). According to Tluczek, Henriques, and Brown (2009), the six-item scale has "favorable internal consistency, reliability, and validity

when correlated with the parent 20-item State scale" (p. 23). Marteau and Bekker (1992) used Pearson correlation coefficients between the 20-item form and their six-item form to determine that the 20-item form had a reliability coefficient value of α=.91 and for their six-item form, α=.82 (p. 303). However, Tluczek et al. (2009) found the Marteau & Bekker short-form to have even higher reliability correlations (>.9) when compared to the long-form (p. 22). Participants took the State-Trait pre- and post-tests at the same time as the knowledge tests. Copyright laws prohibit the reprinting of the tool in part or in its entirety, but an allowed question sample to give the reader a feel for the type of dyad questions includes: I feel at ease; I feel upset. (Spielberger, 1977). Answers choices to those questions include: not at all, somewhat, moderately so, or very much so. Copyright permission to utilize the tool for this project was obtained.

Post-tests of both knowledge and anxiety were re-administered to participants who completed the training, an original pre-test, and original post-test. This was done six months after the initial training in order to determine long-term increases in knowledge and self-confidence, i.e., the efficacy of the training. Conclusions made following the review of the literature determined that long-term follow-up is rare following educational training. Therefore, the ability to measure long-term gains is lost. However, this can provide a vital component in the evaluation of trainings and the future directions of providing efficacious continuing education.

Outcome data.

The analysis of the data collected consists of the comparison of means in the knowledge of participants regarding airway assessment and management before and after an in-service training, and again at a six-month interval. The two-tailed, paired (dependent) t-test was the statistical test used to compare the data at $p \leq 0.05$. The same analysis was done with the results

of the State-Trait Inventory. These results were scored using the scoring key provided with the copyright permission from the owner of the copyrights to the survey (Mind Garden, Inc.).

Analysis plan.

Both the investigator and educator have kept all test scores in password-protected, encrypted files. Original copies of all materials including completed tests are kept in locked filing-cabinets by the investigator. Original materials kept by the educator were used for grading only, and after scores were recorded in the password-protected, encrypted files, they were shredded in hospital-approved devices. Incomplete pre-and post-tests were not included in the study, but all data was treated in the same sensitive manner.

Data analysis occurred using the Microsoft Office®, Version 16.20 Excel® software (2018). All pre-test scores were entered in Excel® and paired with the same color's post-test scores. The "statistical formulas" function built into the software was utilized to generate the p-value using a paired, two-tailed t-test. This function was used for both the initial pre- and post-tests of knowledge and anxiety, as well as the six-month follow up tests. Pre-test and initial post-test data was compared, and then pre-test data was later compared to the six-month follow-up data. In addition, initial post-test data was compared to six-month post-test data. This comparison is used to show immediate differences in knowledge and self-confidence (initial pre- to post- data); any sustained long-term changes from pre-training to six-months post; and any sustained long-term changes from immediate post-training to six-months post-training.

Results

Initial

As discussed previously, thirty-one participants completed all necessary knowledge-based data, and thirty completed all anxiety-related assessment data. As part of the ethical

conduct of the study, participants were allowed to opt-out of any or all portions of the study in which they did not want to participate. Participants completed pre-tests within the week prior to the training, and initial post-tests were completed immediately following the training. However, answers to the questions on the pre-test, which were the same questions found on the post-test, were not explicitly given to participants to prevent a threat to internal validity.

Change in knowledge.

The fifteen-item knowledge assessment tool was assigned a point of one for each correct answer and zero for each incorrect answer. Then, total scores were averaged among all thirty-one participants to create a mean measure of change in knowledge. The mean number of correct answers increased from a pre-test mean of 12.35 (SD=1.60) to a post-test mean of 14.48 (SD=0.71). These results are not only meaningful from the stance that participants on average increased their scores by 2.13 points, the results were also statistically significant after the paired t-test was conducted ($p < 0.001$).

Change in anxiety.

As discussed in the "Method of Evaluation" section, a shortened form of the State-Trait Anxiety Inventory was used to measure anxiety levels of the nurse participants (Spielberger et al., 1983). The inventory utilizes a four-point frequency scale, with a score of one (1) indicating absent anxiety, to a score of four (4) indicating a presence of high levels of anxiety about a particular situation (state) (Spielberger et al., 1983). For the thirty participants who completed the anxiety portion of the assessment, the mean scores decreased from 1.61 (SD= 0.65) on the pre-test to 1.35 on the post-test (SD= 0.46). These results show a statistically significant decrease in anxiety of the participants ($p<0.001$). Anecdotally, participants reached out to the investigator following the training to verbalize their gratitude for the training. Some of the nurses stated that

they had felt anxiety about providing care to sedated patients before having any formal training, but this anxiety had been somewhat relieved by attending the training.

Long-Term (Six-Month)

Change in knowledge.

Of the thirty-one initial participants in the knowledge assessment, fifteen completed a six-month follow-up post-test, yielding a response rate of 48%. The average score on the six-month post-test was 12.8 (SD=1.42), with a mean decrease of 1.6 points, which was a statistically significant decrease from the initial post-test scores ($p<.001$). From the pre-test to the six-month post-test, there was a mean increase in scores of 0.5 points, which was not statistically significant ($p=.388$). (See Figure 3).

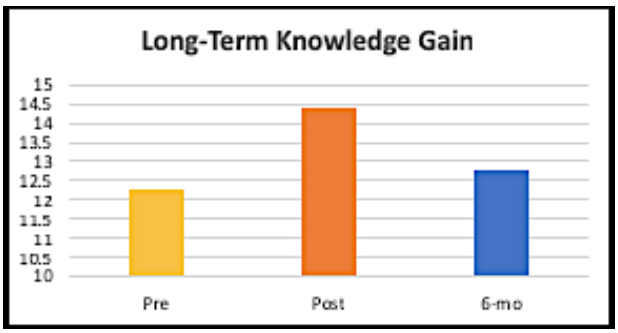


Figure 3: Comparison of mean scores between initial pre-test, initial post-test, and six-month post-test knowledge scores.

Change in anxiety.

Of the thirty original participants in the anxiety portion of the assessment, eleven completed the six-month post-test, for a return rate of 37%. The mean score on the six-month post-test was 1.49 (SD=0.49), with a mean increase of only 0.16 points from the initial post-test mean (1.33). This result was not statistically significant ($p=.289$). From the pre-test to the six-month post-test, there was a mean decrease in scores of 0.06, which was also not statistically significant ($p=.705$). (See Figure 4).

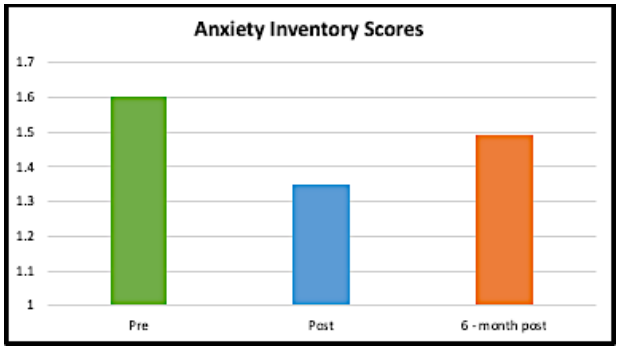


Figure 4: Comparison of mean scores between initial pre-test, initial post-test, and six-month post-test anxiety inventory (State-Trait) scores.

Discussion

The primary purpose of this study was to evaluate the efficacy of an educational training on knowledge gained utilizing a pre/post-test method of assessment. A secondary aim was to measure if there was a reduction in anxiety of the nurses following the training utilizing a short-form of the State-Trait Anxiety Inventory for Adults™. The nurse learners completed a "priming" didactic training module as a unit-based quality improvement endeavor. Long-term follow up of both changes in knowledge and anxiety levels was performed at a six-month interval after the initial training.

The didactic training module was shown to be an effective short-term tool for both knowledge acquisition and a reduction in anxiety on the part of participant perianesthesia nurses. The findings between the initial knowledge and anxiety pre- and post-tests were both statistically significant ($p<.001$). Furthermore, many nurses who attended the training, particularly those with less than five years of experience expressed gratitude at being provided with an airway management training.

At the six-month interval, neither the knowledge gained, nor reduction of anxiety results were significantly different compared to the initial pre-test. Unfortunately, this showed that there was no statistically measurable long-term gain from the training. However, this is still an important finding, as the review of the literature shows that there is little long-term follow-up of study subjects following educational training. It is important to know that long-term gains will trend downward over time based on the findings of this study because it can help guide educators to determine education intervals. It can also lead educators to recognize that there may be a need to build upon didactic education with demonstration, simulation, and perhaps more frequent didactic training. For example, following didactic training, the participants could have participated in return demonstration of how to insert oral or nasal airways, how to bag mask a patient, or how to do an effective jaw thrust with feedback could have been an important adjunct. Additionally, getting the nurses into the OR to practice these skills with an anesthesia provider could have been more beneficial than didactic training alone.

It is difficult to know if repeated exposure to the knowledge provided in training would have an additive effect on knowledge acquisition or anxiety reduction, as there was no repeat of the didactic training done at the six-month interval. A future training module may include an initial training and a six-month re-training with the same information to see if the results have a more substantial effect, i.e., the results of the six-month post-test show even greater gains in knowledge and further decreases in anxiety from the initial post-test. The additional adjunct previously mentioned could also be employed at the initial training and at the six-month interval to reinforce the didactic material. As learning is done in a multi-modal fashion, trainings should also be done in ways that address multiple learning styles.

Limitations

Limitations to Learning

A few limitations and barriers to the training did exist, the largest of which was related to time constraints of the nurses attending the training. Typically, nurses are not willing to come in on a day off or an unscheduled weekend day, such as a Saturday. These constraints were understandable, and it was not the intention of the investigator to burden nurses by doing so. Furthermore, unless already scheduled, nurses were not approved for paid time to attend the training. Thus, preventing some nurses, such as those who are only used "as needed" (PRN) or those on vacation, from being able to attend.

Another issue related to time was that neither the investigator, clinical educator, nor the nurses wanted the nurses to attend the training during a lunch break or after a scheduled shift. The training itself took approximately 25-30 minutes to deliver, with additional time needed for questions or if clarification of a topic was needed. Therefore, the training was typically completed for the PACU nurses first thing in the morning before they had started receiving patients from the OR. The pre-operative nurses attended a training throughout the day as time-permitted in between getting patients ready for surgery. Unfortunately, the result was that some nurses were pulled away from, or came late to the training, in order to attend the needs of a patient. In some instances, this meant that either a pre- or post-test was not completed, and therefore, the data could not be used.

In the operative setting, getting nurses to be able to leave the patients to attend a training is not often feasible, and there are not enough nurses scheduled to cover for one another's patients. Furthermore, paying the nurses for any extra time was not approved by management for this training. Interestingly, when Corcoran (2016) did her training, she also provided

breakfast, lunch, a small gift bag, a CE credit (1), and had prize giveaways both days of her workshop to encourage participation. This type of incentive is important, as getting participants to give up time (paid or unpaid) to attend a workshop is often a difficult challenge. However, the downside to this is related to cost and a decreased feasibility by most institutions to provide these incentives.

Limits to Implementation

When the training was in its conception stage, it was to include a demonstration component. Unfortunately, the clinical educator was unable to gain access to a big enough room and appropriately-sized mannequins. Given the time constraints already discussed, it was also determined to be too large of an undertaking, and the didactic primer was deemed the most critical initial component of training. However, a demonstration component utilizing the objectives learned from the training would have likely added a rich layer to the learning process.

The setting for the training was also a barrier, as it was difficult securing a conference room close enough to the unit and large enough for the trainees. Some conference rooms were available throughout the hospital, but the clinical educator did not feel that the nurses would be able to go far from the unit in case a patient needed them. This meant that the training ended up being done either at the nurses' station if space permitted, or in an empty PACU bay or pre-operative room. This led to many distractions in the form of noise, interruptions, and at times, the nurses not being able to give their full attention for fear that they would be needed on the unit.

Although the participation rate for the unit was reasonably high (79%), the actual sample size of nurses (n=31), is not a large enough sample size to be able to generalize the results to a large population. Additionally, there was a marked drop off in both interest and participation from the initial training to the six-month re-evaluation. Many nurses who attended the initial

training did not complete the six-month post-test due to being absent (not scheduled, illness, or vacation), unable, unwilling, or through termination of employment. Therefore, attrition of subjects was another limitation, albeit an expected limitation of allowing a six-month interval to elapse between tests.

The last major limitation was related to the long-term evaluation of the anxiety portion of the assessment. According to Spielberger et al. (1983), as the S-Anxiety scale monitors anxiety resulting from situational stress, the re-test coefficient is somewhat low. However, the internal consistency of the Form Y S-Anxiety scale was high, with a median Cronbach alpha coefficient of .93 (Spielberger et al., 1983). Therefore, it is difficult to correlate the situational stress one is feeling towards a particular event/stressor given a six-month time interval.

Conclusion

Nurse training and education is effective in the short-term at increasing knowledge and reducing anxiety, but long-term continuing education is likely necessary to maintain familiarity and competence with the material. It may also be beneficial to include different types of training such as simulation, in addition to didactic methods. As was concluded with the review of literature, this study also concludes that repeat sessions of education will likely result in better outcomes for both nurses and their patients.

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Appendix A

The Synergy Model

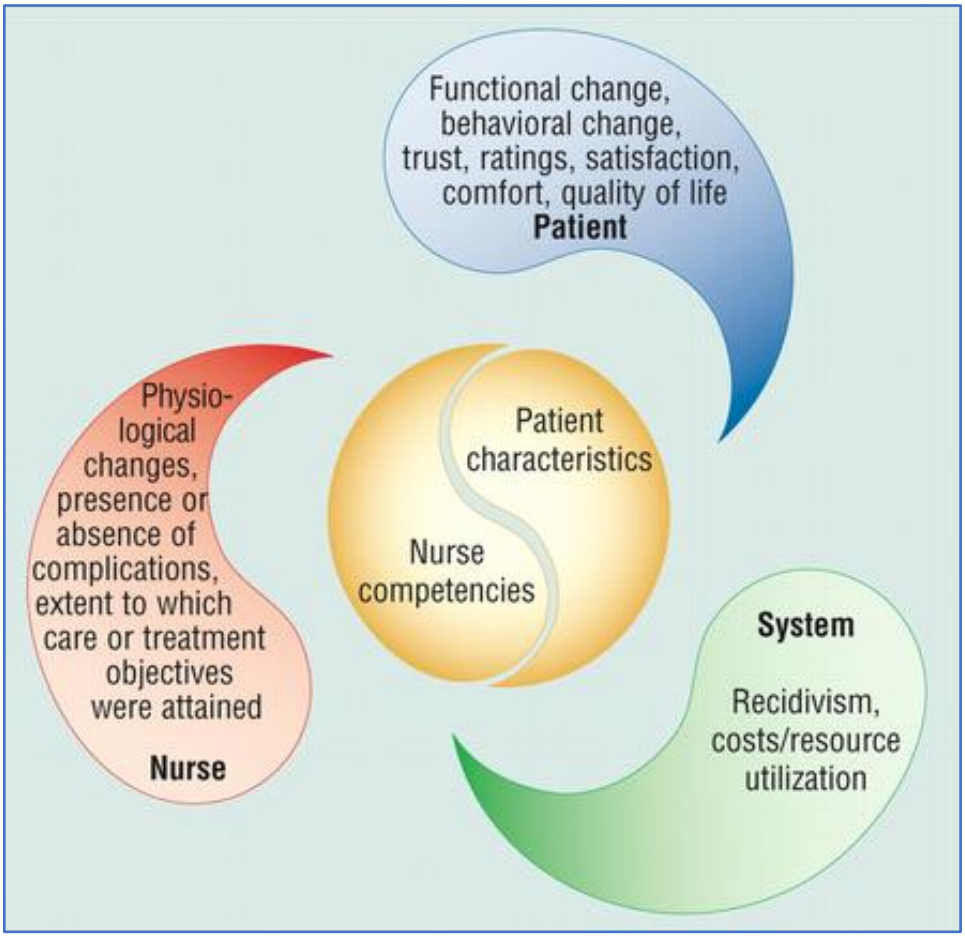

Figure 1. The Synergy Model: Optimal patient outcomes occur when the nurse's competencies, which are supported by the system, match the patient's needs. Used with permission. Curley, M. A. Q. (1998). Patient-nurse synergy: Optimizing patients' outcomes. *American Journal of Critical Care, 7*(1), 64-72. *PMID:* 9429685

Appendix B

Continuing Education/In-Servicing Concept Map

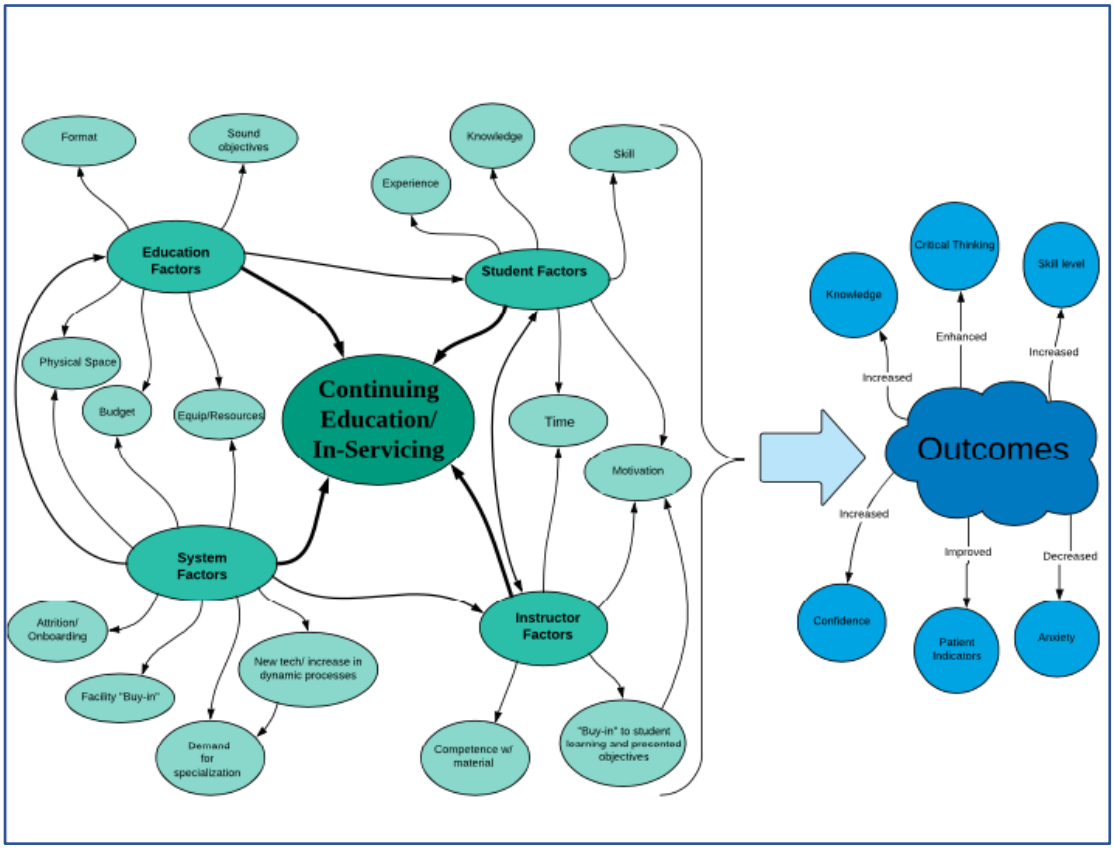

Figure 2. Depiction of relationships between education, students (learners), instructors, and the system and their impact on outcomes. Engelman, M. (2018). *DNP concept map: Continued education/in-servicing*. Unpublished raw figure.

Appendix C

Lesson Objectives:

1. Identify high risk patients based on his/her ASA classification.
2. Interpret a patient's OSA risk from his/her STOPBANG score
3. Review current NPO guidelines for patients preparing to undergo procedures.
4. Identify patient assessment findings that can lead to difficulty with mask ventilation
5. Discuss how positioning a patient can result in either increased or decreased airway patency.
6. Explain the proper use of oral and nasal airways, and when they should be employed as an airway adjunct.
7. State minimum monitoring recommendations for patients undergoing procedures outside the operating room.
8. Explain the uses of capnography as a monitoring parameter.
9. Define the depth continuum and explain how this relates to airway management.
10. List the minimum necessary equipment that should be available for a patient undergoing a procedure outside of the operating room
11. Report potential complications related to the airway that can occur during bronchoscopies

Appendix D

Patient Assessment and Airway Management Pre/Post-test

Assigned color _____

(Please circle one) Pre-test Post-test

1. Which of the following can contribute to difficulty in being able to mask-ventilate a patient?
   a. A patient's allergies
   b. The patient having a beard and no teeth
   c. The patient had recent abdominal surgery
   d. The patient is a known alcoholic

2. The most common cause of airway obstruction *when a patient is sedated* is:
   a. The tongue and soft palate
   b. The uvula and hard palate
   c. The teeth
   d. A foreign body

3. A 47-year-old female that has well-controlled diabetes mellitus, a BMI of 33, and who drinks an occasional glass of wine would be an ASA Class:
   a. 1
   b. 2
   c. 3
   d. 4

4. A 46-year-old male with a history of snoring, a BMI of 40, and a neck circumference of 48 cm would be at high risk for obstructive sleep apnea based on STOP BANG scoring:
   a. True
   b. False

5. The most effective position for bag-mask ventilating a patient is the:
   a. Chin-to-chest maneuver
   b. Pulling the face up while grabbing the soft tissue under the mandible
   c. Head-tilt-chin-lift with jaw thrust
   d. All positions are effective with proper squeezing of the Ambu bag

6. According to the most recent NPO guidelines, a patient who has eaten a light meal, without anything fried, should have a minimum fasting period of:
   a. 2 hours
   b. 4 hours
   c. 6 hours
   d. 8 hours

7. Nasopharyngeal airways are better tolerated than oral airways in patients who:
   a. are not deeply unconscious
   b. have trauma to the mid-face region or significant head trauma
   c. have a platelet count of <50,000
   d. are completely unconscious

8. Signs of effective bag–mask ventilation include all of the following EXCEPT:
   a. Adequate chest rise
   b. Gastric distension
   c. Improved color
   d. Oxygen saturation of 98-99%

9. Potential complications of bronchoscopy include:
   a. Pneumothorax or pneumomediastinum
   b. Bleeding and dental damage
   c. Laryngospasm or bronchospasm
   d. All of the above

10. If you *cannot* ventilate your patient after repositioning the mask and airway, the FIRST thing you should do is:
   a. Squeeze the bag-valve mask (BVM) harder
   b. Put your patient on their left side
   c. Call for assistance
   d. Initiate CPR

11. Continuous physiologic monitoring or assessment of the patient before, during, and after a procedure should include which of the following?
   a. Ventilation and oxygenation
   b. Cardiovascular status and neuromuscular function
   c. Patient positioning and body temperature
   d. All of the above

12. All of the following about end-tidal CO2 (ETCO2) are true EXCEPT:
   a. Normal values are 35-45 mmHg
   b. It is a measure of ventilation
   c. It is a delayed measurement, not “real-time”
   d. It can aid in the assessment of respiratory effort

13. According to the Medical Licensing Board of Indiana, during procedures, there must be a reliable source of:
   a. Oxygen, Lighting, Emergency drugs, Resuscitation equipment
   b. Oxygen, Suction, Lighting, Emergency drugs
   c. Suction, Lighting, Resuscitation equipment, Emergency drugs
   d. Oxygen, Suction, Resuscitation equipment, Emergency drugs

14. During a procedure, your patient is responsive to tactile stimulation, is maintaining her own airway and is adequately spontaneously ventilating with well-maintained cardiovascular function. She is in which stage of the "Depth of Sedation Continuum"?
    a. Minimal Sedation
    b. Moderate Sedation
    c. Deep Sedation
    d. General Anesthesia

15. When it comes to potential *airway* difficulties, which of the following patients would make you the most vigilant?
    a. A 45-year-old, obese man with a thick neck, whose wife says he snores and sometimes stops breathing at night
    b. A 6-month-old with no prior medical history who is being observed after ingesting four aspirin tablets
    c. A 61-year-old who smoked 1 pack-per-day for 10 years, but quit 35 years ago
    d. A 21-year-old who is presenting today for repair of an inguinal hernia and states he had a "cold" about 3 weeks ago

Appendix E

Demographic Data

Assigned color _____ Pre-test

1. **Which unit do you primarily work on? (please circle only one)**
    a. PACU
        i. Main OR
        ii. ASC
    b. Pre-op
        i. Main OR
        ii. ASC
    c. Other:
        Please list _____

2. **How many years have you been a nurse?**
    a. 0-5 years
    b. 6-10 years
    c. 11-20 years
    d. > 20 years