# The Utilization of Dexmedetomidine in the Elderly Population to Decrease Postoperative Delirium: A Quality Improvement Project

A DNP Project Presented to the Faculty of the
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**Abstract**

**Importance:** Postoperative delirium is highly prevalent among elderly hospitalized patients over 65 years old. It is associated with increased mortality, functional and cognitive impairment, admission into long-term care facilities, lengthier hospitalization, and higher costs. Dexmedetomidine decreases the incidence, duration, and severity of postoperative delirium.

**Objective:** This quality improvement (QI) project aims to improve healthcare provider knowledge regarding dexmedetomidine to decrease postoperative delirium in the elderly population and determine the efficacy of an educational intervention.

**Setting:** A 716-bed acute care hospital in Broward County, Florida, has a large elderly population requiring anesthetic services. Anesthesia providers at this facility will be educated on preventative measures to reduce the incidence of postoperative delirium.

**Methods:** A pretest survey will be administered to assess anesthesia providers' knowledge, attitudes, and behaviors regarding dexmedetomidine and postoperative delirium. An educational module will then be provided. Finally, a posttest survey containing the same questions as the pretest will be administered to participants.

**Results:** Following the educational intervention, there was an increase in knowledge scores and stronger attitudes and beliefs regarding the role of anesthesia providers in reducing postoperative delirium. Furthermore, most participants reported that they were highly likely to implement this into their clinical practice.

**Conclusion:** An educational module can enhance anesthesia provider knowledge and increase the likelihood of using dexmedetomidine to reduce postoperative delirium.

*Keywords:* dexmedetomidine, elderly, geriatric, older, elder, aged, midazolam, postoperative delirium, delirium.

## INTRODUCTION

### Background

Delirium is an acute state of confusion in which symptoms come and go throughout the ailment.[1] Common clinical findings include decreased focus and attention, memory loss, disorientation, and language and perceptual disturbances.[2] Typically, the clinical course of delirium develops 24 hours postoperatively and lasts for about 48 hours.[1]

Predisposing factors for developing postoperative delirium include older age, pre-existing functional debilitation, neuropsychiatric conditions, and multiple comorbidities.[1] Heart failure, renal disease, diabetes mellitus, and vascular disease are among the most common comorbidities associated with postoperative delirium.[1] Perioperative risk factors include long, complex, and invasive procedures. Intensive care unit admission, prolonged intubation and mechanical ventilation, inadequate pain control, and disturbed sleep can also contribute to postoperative delirium.[1]

Postoperative delirium can clinically be measured using diagnostic scales, including the confusion assessment method (CAM) and confusion assessment method for the intensive care unit (CAM-ICU).[1] The CAM and CAM-ICU were derived explicitly from the Diagnostic and Statistical Manual of Mental Disorders (DSM) and have high sensitivity and specificity.[1] The CAM consists of four features: (1) an acute onset or fluctuating course, (2) inattention, (3) disorganized thinking, and (4) altered level of consciousness.[1] A diagnosis of delirium by the CAM includes the first two features, with the addition of either the third or fourth feature.

The pathogenesis of postoperative delirium is complex and not fully understood. However, neuroinflammation and oxidative stress from surgery are commonly implicated with its progression.[1] These mechanisms cause changes in neurotransmitter regulation and result in reduced connections among brain networks.[1]

Surgery causes a neuroendocrine response that results in neuroinflammation. Tissue injury triggers an inflammatory response, leading to activation of the hypothalamic-pituitary axis

(HPA) and subsequent production of glucocorticoids that augment neuroinflammation and ischemia.[1] Additionally, peripheral cytokines released from the inflammatory response can enter the brain and cause further cytokine synthesis and perpetuate neuroinflammation.[5] Neuroinflammation triggers "sickness behaviors," characterized by a reduction in cognition, depression, and other behavioral changes.[1] Delirium is hypothesized to be an extreme version of sickness behavior.[1]

Oxidative stress is thought to contribute to the development of postoperative delirium. Reduced perfusion to the brain leads to ischemia and increased production of reactive oxygen species.[1] This results in neuronal death, inflammation, and excitotoxicity.[1]

Currently, there are limited strategies to prevent the development of postoperative delirium in this population.[3] Intraoperatively, avoiding deep anesthesia is recommended using the bispectral index (BIS) monitor.[1] Postoperative strategies include orienting patients to the unit in which they are admitted, encouraging early mobility, facilitating undisturbed sleep, and adequately controlling pain while avoiding polypharmacy.[1]

**Proposal Solution**

Emerging research has revealed an association between dexmedetomidine and a reduced prevalence and clinical course of postoperative delirium. Dexmedetomidine is a highly selective alpha-2 adrenergic receptor agonist that inhibits noradrenergic neuronal firing in the locus coeruleus.[2] It is a unique sedative medication with analgesic, anxiolytic and sympatholytic properties. Dexmedetomidine is particularly useful for its ability to preserve respiratory function while promoting deep sedation.[6]

Dexmedetomidine facilitates cooperative sedation, which is helpful for many procedures and scenarios. By inhibiting noradrenergic neuronal firing in the locus coeruleus, dexmedetomidine promotes activation of endogenous sleep pathways and sedation.[6] Dexmedetomidine can be administered for deep sedation to manage intensive care unit patients or adjunct to general anesthesia.[6]

The analgesic effect that dexmedetomidine provides is mediated via spinal, supraspinal, and peripheral tracts.[6] Dexmedetomidine can be administered through intravenous, intramuscular, spinal, epidural, intranasal, and buccal routes. Many high-quality clinical trials have demonstrated reduced opioid requirements with the use of dexmedetomidine.[6]

Dexmedetomidine has unique cardiovascular effects when administered as a loading dose and infusion intravenously. When initially administered as a loading dose, an increase in blood pressure may occur due to stimulation of peripheral alpha-2 receptors present in vascular smooth muscle.[6] Afterwards, hypotension may ensue from stimulation of central alpha-2 receptors, resulting in vasodilation.[6] There is dose-dependent bradycardia associated with dexmedetomidine due to reduced sympathetic tone, baroceptor reflexes, and increased vagal response.[6]

Dexmedetomidine is neuroprotective and is associated with a decreased incidence, duration, and severity of postoperative delirium and enhanced postoperative cognitive function.[2] The association between dexmedetomidine and reduced postoperative delirium is not fully understood. However, it is believed to prevent the neuroendocrine and inflammatory response that occurs in response to tissue injury during surgery, which is hypothesized to trigger postoperative delirium.[7] Dexmedetomidine is thought to inhibit the inflammatory response through activation of alpha-2 adrenergic receptors and vagal nerve stimulation.[8] As a result, dexmedetomidine may protect against transient ischemia and neuroinflammation that can propagate postoperative delirium.

**Significance**

Currently, over one-third of anesthetics are administered to elderly patients.[1] There is a high incidence of postoperative delirium in the geriatric population undergoing surgery. Roughly 20% of hospitalized patients over 65 years old experience postoperative delirium, accounting for approximately 12.5 million cases annually.[2] Postoperative delirium is associated with many problems, including increased mortality, functional and cognitive impairment, and admission into long-term care facilities.[2] Furthermore, this condition may increase the length of hospitalization

and associated costs.[2] An estimated 38 to 152 billion dollars are attributed to managing postoperative delirium.[4]

**Purpose**

As the elderly population grows, it will be essential for anesthesia providers to be informed on postoperative delirium to reduce the incidence of adverse outcomes associated with its development. Due to its neuroprotective effects, dexmedetomidine has decreased the geriatric population's prevalence, severity, and duration of postoperative delirium. In elderly patients aged 60 years or older (P), will utilizing dexmedetomidine perioperatively (I), compared midazolam perioperatively (C), decrease the incidence of postoperative delirium measured by the confusion assessment method (CAM) or the confusion assessment method for the intensive care unit (CAM-ICU).

**METHODOLOGY**

**Search Strategy**

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist was utilized to guide the systematic review and electronic database search.[9] A search of the literature was accomplished using Cumulative Index to Nursing and Allied Health Literature (CINAHL), PubMed, and the EMBASE electronic databases. Table 1 depicts the specific search terms and criteria that were used in the databases. The searches yielded 336 results, with 123 from CINAHL, 187 from Pubmed, and 26 from EMBASE. Duplicate results were removed, which left 287 articles to be critically appraised.

**Table 1.** Database Search Table

| **Topics/ Concepts** | **Elderly Population** | **Medications** | **Postoperative Delirium** | **Filters/ Results** |
|---|---|---|---|---|
| **CINAHL** | Elderly OR older OR elder OR geriatric | Dexmedetomidine OR midazolam | Postoperative delirium OR delirium | Date range: 2005- 2020. **123 results** found |

| | | | | |
|---|---|---|---|---|
| **Pubmed** | MESH.EXACT (“Aged “) | MESH.exact(“Dexmedetomidine ”) OR MESH.exact (“Midazolam) | MESH.EXACT (“Delirium”) | Date range: 2005-2020 **187 results** found |
| **EMBASE** | ‘Aged’/exp | ‘Dexmedetomidine’/exp OR ‘midazolam’/exp | ‘Delirium’/exp | Date range: 2005-2020 **26 results** found |

**Study Selection and Screening Method with Inclusion/Exclusion Criteria**

The PRISMA diagram in Figure 1 portrays the screening process for the development of this systematic review. Two research investigators conducted an initial screening of the title and abstracts to enhance reliability. Studies considered relevant to the PICO search were then included in a full-text screening to determine eligibility based on inclusion and exclusion criteria, listed below in Table 2. Inclusion criteria included articles published from 2005 to present, adults 60 years or older undergoing surgery, perioperative dexmedetomidine, perioperative midazolam, and primary outcomes measuring the incidence of postoperative delirium using the CAM or CAM-ICU scale. Exclusion criteria included articles published before 2005, adults younger than 60 years old, delirium scales other than the CAM or CAM-ICU, and studies that focused solely on emergence agitation and postoperative cognitive delirium.

Nine studies met the inclusion criteria and were selected for this systematic review to answer the PICO question: In elderly patients aged 60 years or older (P), will utilizing dexmedetomidine perioperatively (I), compared midazolam perioperatively (C), decrease the incidence of postoperative delirium measured by the confusion assessment method (CAM) or the confusion assessment method for the intensive care unit (CAM-ICU)? The evaluation tables listed in Appendix A provide a summary of the studies included in this systematic review.

**Figure 1.** PRISMA Flow Diagram

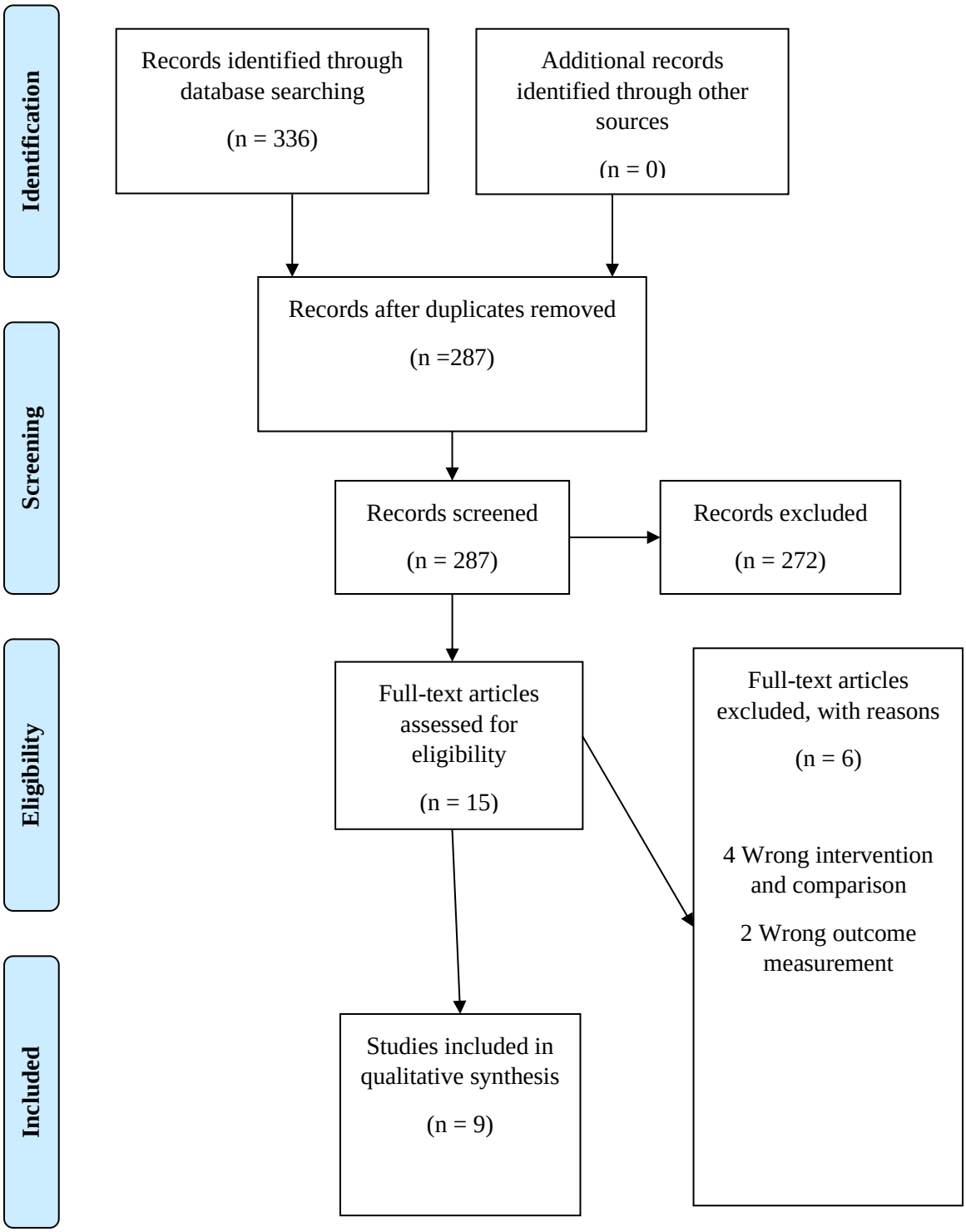

**Table 2.** Inclusion and Exclusion Criteria

| Inclusion | Exclusion |
|---|---|
| Population:<br>• Adults (≥ 60 years old) undergoing surgery<br>Intervention:<br>• Dexmedetomidine versus saline perioperatively<br>• Midazolam perioperatively<br>• Dexmedetomidine versus midazolam perioperatively<br>Primary Outcomes:<br>• Postoperative delirium as measured by the CAM or CAM-ICU<br>Type of Study:<br>• Randomized Controlled Trials (RCTs)<br>• Case Studies<br>• Publication 2005- Present | Population:<br>• Adults (< 60 years old) undergoing surgery<br>Intervention:<br>• Dexmedetomidine versus propofol perioperatively<br>Primary Outcomes:<br>• Postoperative delirium measured by scales other than the CAM or CAM-ICU<br>Type of Study:<br>• Publication before 2005 |

## RESULTS

### Study Characteristics

Eight out of nine chosen studies are randomized control trials (RCTs), and one is a prospective cohort study. In total, 2,602 patients were included in this systematic review who received dexmedetomidine, midazolam, or normal saline as a placebo perioperatively. Patients had various surgical procedures completed, including laparoscopic surgery, vertebral fracture surgery, thoracic surgery, cardiac surgery, and orthopedic surgery.

### Definition of Terms

The CAM, CAM-ICU, or both scales were used in all the studies to evaluate for delirium. A positive CAM includes the following findings: an acute onset or fluctuating course and inattention, with either disorganized thinking or an altered level of consciousness.[1] A patient with a positive CAM or CAM-ICU is considered to have a diagnosis of postoperative delirium.

### Risk of Bias

The Cochrane Handbook Collaboration's Risk of Bias tool was used to assess for bias in all the studies selected in this systematic review.[17] Eight of the nine studies selected demonstrated low selection bias since the groups were randomly selected. These studies utilized random sequence generation into respective groups. Since Santana et al.[15] used a prospective cohort study design, there was no randomization process.

Five of the studies included in this systematic review were double-blinded randomized control trials.[7,10,13,14,16] Potential performance bias exists in the remaining studies. Liu et al.[2] stated that both patients and anesthesiologists were blinded to the treatment of dexmedetomidine or placebo intraoperatively and preoperative cognitive function of participants. However, it does not explicitly list that it is a double-blinded trial. It was not mentioned whether the anesthetists in the study conducted by Yu et al.[11] and He et al.[12] were blinded to the interventions in the study. Blinding did not occur in the prospective cohort study by Santana et al.[15].

**Intraoperative Dexmedetomidine Compared to Normal Saline as Placebo**

Three RCTs utilized dexmedetomidine intraoperatively in comparison to normal saline as a placebo to evaluate for postoperative delirium.[2,7,10] The dosing strategy of dexmedetomidine varied among the three studies. A dexmedetomidine infusion at a rate of 0.2-0.4 mcg/kg/hr was utilized in one RCT with an equivalent amount of normal saline used as a placebo.[2] To maintain general anesthesia, propofol, remifentanil, and dexmedetomidine rates were titrated to bispectral index (BIS) values between 40-50 and a mean arterial pressure (MAP) and heart rate within 20% of baseline values.[2] Both cognitively intact elderly adults and those with amnestic mild cognitive impairment (aMCI) were included. The CAM was used on postoperative days 1, 3, and 7 to evaluate for the presence of postoperative delirium. Dexmedetomidine decreased the incidence of postoperative delirium in adults with normal cognitive function and those with aMCI compared to normal saline. Within the aMCI subgroups, the group that received normal saline had a higher incidence of abnormal cognitive function on postoperative day seven compared to the group that received dexmedetomidine.[2]

Two other RCTs incorporated the use of a loading dose in combination with an infusion of dexmedetomidine intraoperatively.[7,10] Li et al.[10] included a 0.6 mcg/kg loading dose of dexmedetomidine before induction, followed by an infusion at 0.5 mcg/kg/hr compared to an equal volume of normal saline. Intraoperatively, propofol, sufentanil, and a 1:1 nitrous: oxygen mixture were adjusted to maintain anesthesia between BIS values of 40-60.[10] The CAM or CAM-ICU was used at 24, 48, and 72 hours postoperatively to evaluate for postoperative delirium.[10] Postoperative delirium was decreased in the dexmedetomidine group (5.5%) compared to the normal saline group (10.3%) by the fifth postoperative day.[10]

Lee et al.[7] measured postoperative delirium utilizing three different strategies: a dexmedetomidine loading dose at the beginning of the procedure (1 mcg/kg) followed by an infusion intraoperatively (0.2-0.7 mcg/kg/hr), a dexmedetomidine bolus (1 mcg/kg) over 10 minutes 15 minutes before the procedural end, or an equivalent volume of normal saline 15 minutes before the procedural end. Desflurane was adjusted to maintain BIS values between 40-60 and a MAP and heart rate within 20% of baseline measurements.[7] The CAM was used twice a day for a total of 5 days.[7] A psychiatrist confirmed the diagnosis of delirium in patients that were found to be CAM positive.[7] There was a decreased incidence and duration of postoperative delirium in the group that received a dexmedetomidine loading dose at the beginning of the procedure and intraoperative infusion (9.5%) compared to the group that received the dexmedetomidine bolus towards the end of the procedure (18.4%) and normal saline (24.8%).[7] Additionally, there was a decreased period of postoperative delirium in the group that received the dexmedetomidine bolus before the end of surgery compared to the group that received normal saline.[7]

**Intraoperative Dexmedetomidine Compared to Midazolam**

Two RCTs compared the effects of dexmedetomidine intraoperatively to midazolam and the incidence of postoperative delirium. The dosing regimens of dexmedetomidine and midazolam varied between the studies. Yu et al[11] utilized an intravenous injection

(0.05mcg/kg/hr) followed by an infusion (0.02-0.08 mcg/kg/hr) of midazolam, compared to an infusion of dexmedetomidine between 0.2-0.7 mcg/kg/hr. A fentanyl infusion was used for analgesia in both groups. The CAM was used on the first three postoperative days to assess for postoperative delirium. Postoperative delirium was significantly lower in the group who received dexmedetomidine intraoperatively (6.52%) compared to midazolam (21.75%).[11] On postoperative days 1 and 2, postoperative delirium was higher in the group who received midazolam compared to control.[11]

He et al.[12] randomized patients into receiving a dexmedetomidine loading dose (0.5 mcg/kg) before induction followed by an infusion of 0.4 mcg/kg/hr until the end of the surgery, an intravenous injection of midazolam (0.03 mg/kg), or an equivalent volume of saline. Sevoflurane was adjusted intraoperatively to attain BIS values between 55-60.[12] Postoperative delirium was assessed on the first five days postoperatively using the CAM.[12] Postoperative delirium in the dexmedetomidine group was significantly reduced compared to the group that received midazolam or normal saline.[12]

**Postoperative Dexmedetomidine Compared to Normal Saline as Placebo**

Two RCTs used low-dose dexmedetomidine postoperatively (0.1 mcg/kg/hr) compared to an equivalent volume of normal saline. Su et al.[13] administered dexmedetomidine from admission to the ICU until 08:00 on postoperative day 1. Postoperative delirium was assessed twice daily from 24 hours postoperatively until the seventh day using the CAM-ICU.[13] The incidence of postoperative delirium was reduced in the dexmedetomidine group (9.1%) compared to the normal saline group (22.6%).[13]

Xuan et al.[14] began the dexmedetomidine infusion within one hour of admission to the ICU and continued it for three days. Postoperatively delirium was evaluated for using the CAM-ICU scale twice daily from 24 hours until the seventh day.[14] Postoperative delirium was significantly reduced in the dexmedetomidine group (13.2%) compared to the normal saline group (28.3%).[14]

**Preoperative Midazolam**

Santana et al.[15] assessed for postoperative delirium twice daily starting on the second postoperative day and up to the fifth postoperative day or until postoperative delirium had abated in a prospective cohort study of geriatric patients who had surgery for a hip fracture. Over half of the patients eventually developed postoperative delirium, which was evaluated for using the CAM.[15] The use of preoperative midazolam was associated with postoperative delirium.[15]

**Postoperative Dexmedetomidine Compared to Midazolam and Morphine**

Azeem et al.[16] conducted an RCT that measured postoperative delirium in patients at least 60 years old who had cardiac surgery. Upon admission to the ICU postoperatively, thirty patients were randomly assigned to group A, who received a loading dose of dexmedetomidine (1 mcg/kg) followed by an infusion (0.4-0.7 mcg/kg/hr), and thirty patients were randomized into group B, who received morphine (10-50 mcg/kg/hr) and midazolam (0.05 mg/kg up to 0.2 mg/kg).[16] The CAM-ICU was used once daily for seven days to monitor for postoperative delirium.[16] Group A ultimately had a decreased risk of delirium compared to group B; however, it was deemed statistically insignificant.[16] Based on these findings, Azeem et al.[16] concluded that dexmedetomidine compared to morphine and midazolam did not significantly decrease postoperative delirium.

**DISCUSSION**

Based on the literature review, there was sufficient evidence to suggest that using dexmedetomidine intraoperatively could reduce postoperative delirium in elderly adults undergoing surgery compared to general anesthesia not using dexmedetomidine with normal saline as a placebo.[2,7,10] An optimal dexmedetomidine dose to decrease postoperative delirium has not been identified. Furthermore, these studies have not explored the use of a loading dose with an infusion compared to just an infusion of dexmedetomidine and the associated effects on postoperative delirium. Despite lacking an optimal dexmedetomidine dose and dosing regimen,

all studies have shown that using dexmedetomidine intraoperatively within a typical dose range effectively decreases the development of postoperative delirium.

Dexmedetomidine was superior to midazolam intraoperatively to decrease postoperative delirium in elderly adults.[11, 12] The dosing regimens and dosages of dexmedetomidine and midazolam differed between the studies. Nevertheless, a statistically significant reduction in postoperative delirium was found in those who received dexmedetomidine compared to midazolam.

Santana et al.[15] found an association between preoperative midazolam administration and postoperative delirium. Yu et al.[11] found that postoperative delirium increased in the group who received midazolam intraoperatively compared to normal saline on postoperative days 1 and 2. These findings suggest that perioperative midazolam could increase the incidence of postoperative delirium.

Postoperatively, low dose dexmedetomidine significantly reduced the incidence of postoperative delirium in elderly patients admitted to the ICU following non-cardiac surgery in two RCTs.[13, 14] However, there was no statistically significant difference in reducing postoperative delirium using dexmedetomidine compared to midazolam and morphine in one RCT.[16] More studies must be conducted on elderly patients 60 years or older evaluating the effects of midazolam and dexmedetomidine postoperatively in various procedures before a definitive conclusion can be drawn.

**CONCLUSION**

Overall, dexmedetomidine in the intraoperative and postoperative period was effective in reducing postoperative delirium. Perioperative midazolam was associated with postoperative delirium compared to both control and dexmedetomidine. Therefore, in elderly patients undergoing surgery, perioperative dexmedetomidine was found to be superior to perioperative midazolam for reducing postoperative delirium diagnosed by the CAM or CAM-ICU in this systematic review.

## IMPLEMENTATION

### Implementation Objectives

The objective of this quality improvement (QI) project is to improve healthcare provider knowledge regarding the use of dexmedetomidine to decrease postoperative delirium in the elderly population and determine the efficacy of an educational intervention to meet this objective. The target population will be approximately ten healthcare providers working within the Broward Health system.

### Theoretical Framework

Lewin's Theory of Change Model guided this quality improvement (QI) project. According to Lewin's theory, there are three processes involved in change: unfreezing, moving, and refreezing.[18] Individuals must realize that their current behavior or practice requires improvement in the unfreezing stage.[19] The unfreezing stage within the quality improvement project will include the educational module, which will provide anesthesia providers with information regarding postoperative delirium and the elderly. The incidence and consequences of postoperative delirium in the elderly will be emphasized in the educational module, so anesthesia providers are informed of the magnitude of this clinical issue. The effect of dexmedetomidine on postoperative delirium will also be presented, along with a literature review.

For change to occur, driving forces must exceed restraining forces. Driving forces are those which facilitate change while restraining forces hinder change. Perceived norms and individual and group beliefs can be a part of these forces.[19] Motivation to improve patient care, receptiveness, and management support are driving forces that will facilitate change. Desire to maintain the status quo, cost restrictions, and a lack of management support are restraining forces that may hinder change. After unfreezing has transpired, the moving process begins in which change can occur. In this stage, anesthesia providers use the information learned from this educational module and incorporate it into their clinical practice to enhance patient outcomes.

Finally, refreezing must occur in which the change is sustained within the institution and becomes part of a new "quasi-stationary equilibrium".[19]

**Setting**

The setting for this project is a 716-bed acute care hospital in Broward County, Florida. This facility is a teaching hospital and level I trauma center with multiple specialties. Certified registered nurse anesthetists (CRNAs) and anesthesiologists provide anesthesia services in 19 operating rooms and multiple satellite areas within the hospital.

Broward County has a large elderly population: approximately 23 percent is 60 years or older.[20] At this facility, many geriatric patients require anesthetic services. Therefore, anesthesia providers need to be informed of unique anesthetic considerations for this population, including postoperative delirium and preventative measures that can be taken to reduce its incidence.

**Recruitment**

Before recruitment, approval will be obtained by Florida International University and Broward Health Medical Center. The target population for this quality improvement project was CRNAs and anesthesiologists employed by the setting. A letter will be sent to all CRNA's and anesthesiologists in this facility to participate in this project.

**Project Participants**

Full-time and part-time CRNAs and anesthesiologists employed by the setting are eligible to participate in the educational intervention. This sample's demographics will include male and female anesthesia providers, full-time and part-time employees, and various ages, levels of education, and ethnic groups. Student registered nurse anesthetists will be excluded from participation, as the educational intervention was focused on current anesthesia providers' knowledge and clinical practice. Anesthesia providers that met inclusion criteria can partake in the pretest and posttest.

**Intervention**

This evidence-based scholarly project requires multiple phases, including enrollment of subjects, completion of the pretest and posttest, and delivery of an educational module. After subjects are enlisted, a pretest will be administered to assess current knowledge of postoperative delirium and dexmedetomidine pharmacology. Following the pretest, subjects will be given an educational module that defines postoperative delirium and its consequences, reviews the mechanism of action and effects of dexmedetomidine, discusses the impact that dexmedetomidine has on postoperative delirium, and relays findings from a comprehensive literature review that assesses the effects of dexmedetomidine on postoperative delirium. The validity of the content delivered in the educational module is supported by the literature review that was conducted. Finally, anesthesia providers will complete a posttest to evaluate newfound knowledge and ascertain whether the evidence provided was sufficient to integrate into clinical practice.

**Procedure**

An invitation to participate in the project will be distributed to CRNAs and anesthesiologists in the setting via e-mail. A link to the pretest utilizing the Qualtrics survey platform will be completed before the educational module. The Qualtrics survey will not capture any personal identifiable information, and complete anonymity will be maintained in the pretest and posttest. Therefore, the privacy of subjects who participate in the project will be protected. The education module will be distributed virtually amongst anesthesia providers in the setting. Finally, the posttest Qualtrics survey link will be delivered to subjects via e-mail to be completed following the education module.

**Protection of Human Subjects**

No personal identifiable information will be captured through the pretest and posttest Qualtrics surveys. Complete anonymity will be maintained throughout the quality improvement project. This will ensure the safety and security of the data collected.

**Analysis**

Data will be collected from the pretest and posttest Qualtrics surveys. Excel software will be used to analyze the data and evaluate responses from the pretest and posttest. The responses to each question will be measured to determine if changes in knowledge and behavior occur before and after the intervention. Statistical analysis will be completed to evaluate subjects' responses from the pretest and posttest to determine the efficacy of an educational module and its effect on clinical practice. Collected data will be stored in a password-protected laptop.

**Measure**

The pretest Qualtrics survey encompasses questions specific to the anesthesia providers' knowledge, beliefs, attitudes, and implementation. Six questions test anesthesia providers' knowledge regarding postoperative delirium in the elderly population, dexmedetomidine pharmacology, and effects of dexmedetomidine on postoperative delirium. Three questions assess anesthesia providers' attitudes and beliefs on the relevance of the clinical issue and the potential for eliciting practice change based on the educational module's information. In addition, consideration of implementing the knowledge within the educational module to elicit a practice change is inquired, along with current clinical practice. The posttest incorporates the same questions as the prettest.

## IMPLEMENTATION RESULTS

**Demographics**

The pretest demographics are shown below in Table 3. More females (n=8, 73%) than males (n=3, 27%) participated in this quality improvement project. There were a variety of ethnicities represented: Caucasian (n=4, 36%), Hispanic (n=4, 36%), Asian (n=1, 9%), and Other (n=2, 18%). All participants in this quality improvement project were CRNAs (n=11, 100%). Participants ranged in their years of experience: 0-2 years (n=2, 18%), 2-5 years (n=2, 18%), 5-10 years (n=3, 27%), and over 10 years (n=4, 36%). All of the participants in this study either received a master's (n=7, 64%) or doctorate (n=4, 36%) as their highest level of education.

**Table 3.** Demographics

| **Total Participants** | **11** |
|---|---|
| **Demographics** | **n (%)** |
| **Gender** | |
| Male | 3 (27%) |
| Female | 8 (73%) |
| **Age** | |
| 25-35 | 2 (18%) |
| 36-45 | 5 (45%) |
| 46-55 | 2 (18%) |
| 56-66 | 1 (9%) |
| Unknown | 1 (9%) |
| **Ethnicity** | |
| Caucasian | 4 (36%) |
| African American | 0 (0%) |
| Asian | 1 (9%) |
| Hispanic | 4 (36%) |
| Other | 2 (18%) |
| **Position/Title** | |
| CRNA | 11 (100%) |
| Anesthesiologist | 0 (0%) |
| Anesthesiologist Assistant | 0 (0%) |
| Resident | 0 (0%) |
| **Years of Experience** | |
| 0-2 years | 2 (18%) |
| 2-5 years | 2 (18%) |
| 5-10 years | 3 (27%) |
| Over 10 years | 4 (36%) |
| **Level of Education** | |
| Bachelor's | 0 (0%) |
| Master's | 7 (64%) |
| Doctorate | 4 (36%) |
| PhD | 0 (0%) |
| Other | 0 (0%) |

**Attitudes and Beliefs**

Table 4 displays participants' pretest and posttest responses to attitudes and beliefs about dexmedetomidine and postoperative delirium in the elderly population. In the pretest, most participants (n=10, 91%) agreed that elderly patients were at high risk of developing postoperative delirium. The remaining participants indicated that they strongly agreed with this (n=1, 9%). In the posttest, most subjects (n=6, 60%) strongly agreed that elderly patients were at high risk of developing postoperative delirium. The remaining participants (n=4, 40%) agreed

with this statement. These findings demonstrate that although all participants agreed with this statement overall, they felt a more robust response following the educational module.

Participants strongly agreed (n=2, 18%) or agreed (n=7, 72%) that it was essential to use anesthetic techniques to reduce postoperative delirium in the elderly in the pretest. In the posttest, there was a higher incidence of participants strongly agreeing (n=6, 60%) than merely agreeing (n=4, 40%) with this statement. Again, a more robust response was expressed by participants after engaging in the educational module.

Most participants agreed (n=9, 82%) that anesthesia providers played a role in decreasing the incidence of postoperative delirium in the elderly in the pretest. The remainder of the participants strongly agreed (n=1, 9%) or were neutral (n=1, 9%) towards this statement. After the posttest, most participants strongly agreed (n=7, 70%) with this assertion. The rest of the participants just agreed (n=3, 30%). Therefore, participants following the educational module expressed a more substantial response regarding anesthesia providers' role in decreasing postoperative delirium in the elderly.

**Table 4.** Differences in Pretest and Posttest Attitudes and Beliefs

| Questions | Pretest | Posttest | Difference |
|---|---|---|---|
| Please indicate your level of agreement with the following statement: Elderly patients undergoing surgery are at high risk of developing postoperative delirium. | Strongly agree 9%<br>Agree 91%<br>Neutral 0%<br>Disagree 0%<br>Strongly disagree 0% | Strongly agree 60%<br>Agree 40%<br>Neutral 0%<br>Disagree 0%<br>Strongly disagree 0% | 51%<br>-51%<br>0%<br>0%<br>0% |
| Please indicate your level of agreement with the following statement: It is important to use anesthetic techniques to reduce the incidence of postoperative delirium in the elderly. | Strongly agree 18%<br>Agree 72%<br>Neutral 9%<br>Disagree 0%<br>Strongly disagree 0% | Strongly agree 60%<br>Agree 40%<br>Neutral 0%<br>Disagree 0%<br>Strongly disagree 0% | 42%<br>-32%<br>0%<br>0%<br>0% |

| | | | |
|---|---|---|---|
| Please indicate your level of agreement with the following statement: As an anesthesia provider, your clinical practices can help decrease the incidence and consequences of postoperative delirium in the elderly. | Strongly agree 9%<br>Agree 82%<br>Neutral 9%<br>Disagree 0%<br>Strongly disagree 0% | Strongly agree 70%<br>Agree 30%<br>Neutral 0%<br>Disagree 0%<br>Strongly disagree 0% | 61%<br>-52%<br>-9%<br>0%<br>0% |

**Knowledge**

Six of the survey questions tested the knowledge of participants regarding dexmedetomidine and postoperative delirium. Table 5 shows the scores of participants and the difference in correct responses from the pretest and posttest. There was a large increase in knowledge regarding the relationship between dexmedetomidine and postoperative delirium (65%). Most participants improved in knowledge regarding the incidence of postoperative delirium in the elderly population (25%). There was a slight increase in knowledge regarding clinical findings in postoperative delirium (9%), consequences of postoperative delirium (9%), dexmedetomidine pharmacology (9%), and effects of dexmedetomidine (9%). However, all pretest scores of these questions were high initially (91%).

**Table 5.** Differences in Pretest and Posttest Knowledge

| **Questions** | **Pretest** | **Posttest** | **Difference** |
|---|---|---|---|
| What is the incidence of postoperative delirium in adults 65 years or older? | 45% | 70% | 25% |
| Which of the following are common clinical findings of postoperative delirium? | 91% | 100% | 9% |
| Which of the following is NOT a consequence of postoperative delirium | 91% | 100% | 9% |
| Which receptor does dexmedetomidine exert its effects? | 91% | 100% | 9% |
| Which of the following is NOT an effect of dexmedetomidine? | 91% | 100% | 9% |
| How is dexmedetomidine believed to decrease postoperative delirium? | 45% | 90% | 45% |

**Implementation**

In the pretest, most participants indicated that they sometimes use dexmedetomidine as part of their anesthetic plan in the elderly to reduce postoperative delirium (n=9, 82%). The

remainder of the participants indicated that they always incorporated it into their anesthesia care (n=2, 18%). These findings show room for improvement in the implementation of dexmedetomidine to reduce postoperative delirium in the elderly.

Table 6 shows participants' responses on the pretest and posttest concerning the use of dexmedetomidine to reduce postoperative delirium in elderly patients. Before the educational module, most participants reported that they were somewhat likely (n=10, 91%). The remainder of participants (n=1, 9%) indicated they were extremely likely to implement this into clinical practice. Following the education module, most participants (n=9, 90%) indicated that they were extremely likely to implement this into their clinical practice. The remainder of participants (n=1, 10%) were somewhat likely to implement this into clinical practice. These results suggest that participants are more inclined to use dexmedetomidine to decrease postoperative delirium in elderly patients following participation in the educational module.

**Table 6.** Implementation

| Questions | Pretest | Posttest | Difference |
|---|---|---|---|
| How likely are you to implement this in clinical practice? | Extremely likely 9%<br>Somewhat likely 91%<br>Neither likely nor unlikely 0%<br>Somewhat unlikely 0%<br>Extremely unlikely 0% | Extremely likely 90%<br>Somewhat likely 9%<br>Neither likely nor unlikely 0%<br>Somewhat unlikely 0%<br>Extremely Unlikely 0% | 91%<br>-82%<br>0%<br>0%<br>0% |

## DISCUSSION

### Limitations

One limitation of this project is the small sample size. Many subjects that were eligible to participate in the study chose not to. Forty-six members of the Broward Health anesthesia department were distributed the survey via e-mail, and only eleven people participated in the project. A small sample size can impact the reliability and validity of a study. In the future, the survey could be distributed to more subjects across different hospital systems to increase the sample size.

Finally, sample attrition occurred, which could have potentially impacted the final results of the study. One person who completed the pretest did not fill out the posttest. Additionally, one person who filled out the pretest and posttest did not answer the posttest question regarding the consequences of postoperative delirium.

### Implications for Anesthesia Practice

Currently, postoperative delirium is a prevalent issue in the elderly population undergoing surgery. It is associated with increased mortality, functional and cognitive impairment, extended hospitalization, and higher costs. There are limited strategies that anesthetists can utilize intraoperatively to prevent postoperative delirium in elderly patients. A literature review revealed that dexmedetomidine effectively reduces the incidence of postoperative delirium in elderly patients due to alpha-2 adrenergic receptor-mediated inhibition of the neuroendocrine and inflammatory response to surgery.

This quality improvement project demonstrated increased knowledge on dexmedetomidine and its effect on reducing postoperative delirium following the educational intervention. Participants also demonstrated stronger attitudes and beliefs regarding their role and the significance in preventing postoperative delirium in elderly patients. Furthermore, following the educational intervention, most participants indicated that they were extremely likely to implement the use of dexmedetomidine for elderly patients to prevent postoperative delirium. These findings suggest that participants may change their practice to improve patient outcomes related to postoperative delirium.

## CONCLUSION

Postoperative delirium occurs in 20% of elderly patients undergoing surgery. It leads to poorer outcomes, higher mortality, and increases the burden on healthcare systems. As the aging population grows, it will become essential for anesthesia providers to be informed of the unique anesthetic considerations for this population, including postoperative delirium. Furthermore, anesthesia providers must be knowledgeable of the preventable measures that can reduce the

incidence of postoperative delirium. Implementing an educational module on dexmedetomidine for reducing postoperative delirium can enhance anesthesia provider knowledge, strengthen the beliefs and attitudes of anesthesia providers, and increase the likelihood of using this modality in the elderly population to improve quality of care and patient outcomes.

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# Appendix A: Evaluation Tables

**Evaluation table 1**

| Citation and Theme of the article | Design/ Method | Sample/Setting | Major Variables Studied and Their Definitions | Measurement And Data Analysis | Findings | Results | Conclusions | Appraisal: Worth to Practice/Level |
|---|---|---|---|---|---|---|---|---|
| Liu Y, Ma L, Gao M, Guo W, Ma Y. Dexmedetomidine reduces postoperative delirium after joint replacement in elderly patients with mild cognitive impairment. *Aging Clin Exp Res*. 2016;28(4): 729-736. doi:10.1007/s40520-015-0492-3 | Prospective, randomized parallel-study group of elderly patients aged 65 years or older who received general anesthesia for elective hip, knee, or shoulder joint replacement therapy. All participants in this study had a neuropsychological assessment conducted before surgery. Patients were designated to: amnestic mild cognitive impairment (aMCI) dexmedetomidine group, aMCI normal saline group, normal adult dexmedetomidine group, or normal adult normal saline group. Patients received standardized | Elderly adults (aged 65 years or older) with American Society of Anesthesiologists (ASA) physical status II to III undergoing general anesthesia for elective hip, knee, or shoulder joint replacement therapy. Normal elderly patients (n=120) and aMCI patients (n=80) randomly assigned to dexmedetomidine or normal saline. aMCI dexmedetomidine group (n=40), aMCI normal saline group (n=40), normal adult dexmedetomidine group (n=60), normal adult normal saline group (n=60). One patient in the aMCI group who received dexmedetomidine and two patients in the normal adult normal saline group | IV: dexmedetomidine versus normal saline.<br>DV: Incidence of postoperative delirium in first 7 days following surgery. | Delirium: the CAM, a nominal scale, was used on postoperative day 1, 3, and 7. Delirium as defined by the CAM includes both an acute onset and fluctuating course, inattention, and either disorganized thinking or an altered level of consciousness.2 The incidence of delirium was measured in all four groups. No follow up was indicated if patients were normal at 3 days. | Dexmedetomidine significantly decreased postoperative delirium in adults with normal cognitive function and aMCI groups compared to control groups (all $P<0.05$). Age was positively correlated to the incidence of postoperative delirium in the aMCI normal saline group ($P<0.05$). In the aMCI normal saline group, there was a higher incidence of abnormal cognitive function by postoperative day 7 compared to the aMCI dexmedetomidine group and normal adult normal saline | Postoperative delirium was increased in 65-75 year old patients and those greater than 75 years old in the aMCI normal saline group compared to the normal adult normal saline group.[2] Postoperative delirium was substantially decreased in the normal adult dexmedetomidine group at 65-75 years old and 75 years old and older.[2] Both age categories in the normal adult dexmedetomidine group had a significantly reduced incidence of postoperative delirium. In the aMCI normal saline group, there was a higher | Dexmedetomidine used intraoperatively significantly decreased the incidence of postoperative delirium in elderly patients with normal cognitive function and those with aMCI. This suggests that it can be used to prevent postoperative delirium. | Level I, Quality A<br>Strength: assessed the effect of dexmedetomidine versus control for both aMCI and normal adults, sufficient sample size, RCT, blinding of patients and anesthesiologists. Limitations: the incidence of postoperative cognitive dysfunction (POCD) was not observed, the relationship between postoperative delirium and POCD was not studied, and the relationship between postoperative delirium and conversion ratio to dementia was not studied. Feasibility of use: adequate, since dexmedetomidine is widely available |

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| | anesthesia across all groups. In the groups receiving dexmedetomidine, 0.2-0.4 mcg/kg/hr was infused throughout surgery.[2] Normal saline was substituted for dexmedetomidine in the control groups. Rates of propofol, remifentanil and dexmedetomidine were adjusted to achieve bispectral index (BIS) values of 40-50 and less than a 20% change in mean arterial pressure (MAP) and heart rate of baseline.[2] Dexmedetomidine or saline was stopped 20 minutes before surgery ended.[2] | were not included in the study, due to delays in recovery from anesthesia. The study was conducted at Beijing Military General Hospital. | | | group (P<0.05).[2] | incidence of abnormal cognitive function by postoperative day 7 compared to the aMCI dexmedetomidine group and normal adult normal saline group.[2] | | and used in many institutions. |

**Evaluation table 2**

| Citation and Theme of the article | Design/Method | Sample/Setting | Major Variables Studied and Their Definitions | Measurement And Data Analysis | Findings | Results | Conclusions | Appraisal: Worth to Practice/ Level |
|---|---|---|---|---|---|---|---|---|

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|---|---|---|---|---|---|---|---|---|
| Li CJ, Wang BJ, Mu DL, et al. Randomized clinical trial of intraoperative dexmedetomidine to prevent delirium in the elderly undergoing major non-cardiac surgery. *Br J Surg.* 2020;107(2):e123-e132. doi:10.1002/bjs.11354 | Double-blind, placebo-controlled RCT. Patients in experimental group received a 0.6 mcg/kg loading dose of dexmedetomidine before induction and then a continuous infusion of dexmedetomidine at 0.5 mcg/kg/hr, which was stopped one hour prior to the end of surgery.[10] Patients in the control group received an equivalent volume of normal saline. Induction was accomplished in both groups with propofol and sufentanil. Intravenous propofol and sufentanil, and a 1:1 nitrous oxide: oxygen mixture was used to maintain anesthetic depth, titrated to maintain BIS values of 40-60.[10] | Adults aged 60 years or older with ASA physical status I-III undergoing major non-cardiac surgery at Peking University First Hospital. 619 patients: n=309 experimental group patients; n=310 control group patients; adults aged 60 years or older undergoing major non-cardiac surgery. | IV: Dexmedetomidine versus normal saline.<br>DV: incidence of delirium in the first 5 days postoperatively. | Delirium: the CAM or CAM-ICU, which are nominal scales, was used at 24, 48, and 72 hours postoperatively in the experimental and control groups. Investigators were trained by psychiatrists on how to perform the CAM or CAM-ICU prior to the start of the study. The CAM was used for patients who were not intubated while the CAM-ICU was used for intubated patients. | In the experimental group, postoperative delirium occurred in 5.5% of subjects, compared to 10.3% in the control group (p=0.026).[10] There was a reduced incidence of non-delirium complications in the dexmedetomidine group compared to the normal saline group (p=0.047). | Postoperative delirium by day 5 following surgery was lower in the experimental group than the control group. There was a decreased incidence of complications at 30 days in the experimental group in comparison to the control group. | The use of dexmedetomidine intraoperatively reduced the risk of postoperative delirium by half in the elderly undergoing major non-cardiac surgery. | Level I, Quality B<br>Strength: large sample size (619), anesthesia guided by BIS monitoring, and the use of a loading dose and infusion of dexmedetomidine. Limitations: single-center study that may lack generalizability, possible weakening of blinding due to the hemodynamic effects associated with dexmedetomidine use. Risk of harm: higher rate of bradycardia and treatment of bradycardia in dexmedetomidine group. Feasibility of use: adequate, since dexmedetomidine is widely available and used in many institutions. |

**Evaluation table 3**

| Citation and Theme of the article | Design/ Method | Sample/ Setting | Major Variables Studied and Their Definitions | Measurement And Data Analysis | Findings | Results | Conclusions | Appraisal: Worth to Practice/ Level |
|---|---|---|---|---|---|---|---|---|
| Lee C, Lee CH, Lee G, Lee M, Hwang J. The effect of the timing and dose of dexmedetomidine on postoperative delirium in elderly patients after laparoscopic major non-cardiac surgery: A double blind randomized controlled study. *J Clin Anesth*. 2018;47: 27-32. doi:10.1016/j.jclinane.2018.03.007 | A double-blinded RCT in which patients were randomized into the D1 group, who received a 1 mcg/kg dexmedetomidine loading dose and then a 0.2-0.7 mcg/kg/hr infusion from induction till the end of surgery); D2 group, who received dexmedetomidine 1 mcg/kg bolus over 10 minutes 15 minutes before the end of procedure; or S group, who received an equivalent volume of normal saline 15 minutes prior to the end of the procedure.[7] All patients received premedication prior to the procedure. Propofol and rocuronium were used to accomplish induction of anesthesia. Anesthesia was maintained with | Adults aged 65 years or older, ASA physical status I-III, having laparoscopic major non-cardiac surgery at University Hospitals were included in this study. 354 total patients were included: (n=118) in the D1 group, (n=118) in the D2 group, and (n=118) in the S group. 36 patients were not included due to a loss of follow-up, conversion to open surgery, or postoperative complications. | IV: Dexmedetomidine loading dose and infusion versus dexmedetomidine bolus at the end of surgery versus normal saline administration.<br><br>DV: incidence of delirium in the first 5 days postoperatively. | Delirium: the CAM, a nominal scale, was used every 12 hours for 5 days in the study groups. Patients that were considered CAM positive were subsequently referred to a psychiatrist for diagnosis of delirium. | The incidence of delirium in group D1 was 9.5%, in group D2 was 18.4%, and in group S was 24.8% (P=0.017).[7] There was a reduced period of delirium in group D2 compared to group S (P=0.04).[7] | There was a reduced incidence and duration of delirium in group D1 compared to the other groups. | Using an intraoperative bolus and infusion is superior to merely a dexmedetomidine bolus injection at the end of surgery to decrease postoperative delirium. | Level I, Quality A<br><br>Strength: sufficient sample size, multiple methods of administering dexmedetomidine, anesthesia guided by BIS monitoring, randomization of patients and researchers, confirmed diagnosis of delirium by psychiatrist. Limitations: no optimal dosing and timing schedule for the use of dexmedetomidine, dose of dexmedetomidine for infusion not fixed, lacked measurement of additional secondary outcomes, no comparison of BIS values among groups, no discussion of adverse events. |

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| | desflurane, which was titrated to maintain MAP and heart rate within 20% of baseline values, and BIS values between 40-60.[7] | | | | | | | Feasibility of use: adequate, since dexmedetomidine is widely available and used in many institutions. |

**Evaluation table 4**

| Citation and Theme of the article | Design/Method | Sample/ Setting | Major Variables Studied and Their Definitions | Measurement And Data Analysis | Findings | Results | Conclusions | Appraisal: Worth to Practice/ Level |
|---|---|---|---|---|---|---|---|---|
| Yu DN, Zhu Y, Ma J, Sun Q. Comparison of post-anesthesia delirium in elderly patients treated with dexmedetomidine and midazolam maleate after thoracic surgery. *Biomed Res*. 2017;28:6852-6855. | This study was an RCT in which patients were randomized to receive midazolam or dexmedetomidine intraoperatively. The patients who received midazolam were given an intravenous injection (.05 mcg/kg/hr) followed by an infusion (0.02-0.08 mcg/kg/hr).[11] The dexmedeto | 92 patients 60 years or older of either sex, categorized as ASA I-II, and undergoing elective thoracic surgery at Guangdong General Hospital. Patients with senile dementia, coronary heart disease, hypertension, and severe | IV: midazolam vs. dexmedetomidine<br>DV: delirium on the first 3 postoperative days. | Delirium: the CAM, a nominal scale, was used to diagnose delirium on days 1-3 postoperatively in both the dexmedetomidine and midazolam groups. | Postoperative delirium occurred in 6.52% of patients in the dexmedetomidine group compared to 21.75% of the midazolam group (P<0.05).[11] | Postoperative delirium was significantly lower in the dexmedetomidine group compared to the midazolam group.[11] | In elderly patients undergoing thoracic surgery, dexmedetomidine can be used to enhance postoperative cognitive function and reduce the incidence of postoperative delirium. | Level I, Quality B<br>Strength: randomized trial. Limitations: size. Risk of harm: midazolam can cause adverse reactions, including respiratory depression after surgery. Feasibility of use: adequate, since dexmedetomidine and midazolam are both commerci |

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| | midine group received an intravenous injection followed by an infusion of 0.2-0.7 mcg/kg/hr.[11] Both received an infusion of fentanyl for analgesia. | hepatic and renal dysfunction were excluded from the study.[11] Patients were randomized into the dexmedetomidine (n=46) or midazolam (n=46) groups. | | | | | | ally available and used in various institutions. |

**Evaluation table 5**

| Citation and Theme of the article | Design/Method | Sample/ Setting | Major Variables Studied and Their Definitions | Measurement And Data Analysis | Findings | Results | Conclusions | Appraisal: Worth to Practice/ Level |
|---|---|---|---|---|---|---|---|---|
| He F, Shen L, Zhong J. A study of dexmedetomidine in the prevention of postoperative delirium in elderly patients after vertebral osteotomy. *Int J Clin Exp Med*. 2018;11:4984-4990 | An RCT was conducted in which patients were randomized to the dexmedetomidine group, midazolam group, or control. The dexmedetomidine group received dexmedetomidine 0.5 mcg/kg intravenously 10 minutes prior to induction, followed by an infusion at 0.4 | 90 adults 75 years or older of either sex with an ASA physical status of I-III undergoing vertebral fracture surgery at Nanxiang Hospital of Shanghai Jiading District were randomized to the dexmedetomidine group (n=30), midazolam group | IV: dexmedetomidine vs. midazolam DV: postoperative delirium days 1-5 postoperatively. | Delirium: the CAM, a nominal scale, was used to assess for delirium for 1-5 days postoperatively in all study groups. A patient was considered to have delirium as defined by the CAM if they experienced an acute onset of mental status changes or a fluctuation course; inattention; and either disorganized thinking or an altered level of consciousness. | The incidence of postoperative delirium in the dexmedetomidine group was significantly lower than in the control group or midazolam group ($P<0.001$, $F=38.731$).[12] On postoperative day 1 and 2, postoperative delirium was higher in the midazolam group | The incidence of postoperative delirium in the dexmedetomidine group was substantially lower than in the control group or midazolam group. On postoperative day 1 and 2, postoperative delirium was higher in the midazolam group than the control. | In elderly patients undergoing vertebral fracture operation, dexmedetomidine used in combination with sevoflurane can be used to reduce the incidence of postoperative delirium. | Level I, Quality B<br>Strength: randomized trial. Limitations: further experiments to confirm the preventative effect of dexmedetomidine in reducing postoperative delirium at day 5. Risk of harm: cases in which life-threatening situations arise were |

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| | mcg/kg/hr until the end of surgery.[12] The midazolam group received an intravenous injection of 0.03 mg/kg of midazolam.[12] The control group was given an equivalent volume of saline. Anesthetic depth was adjusted intraoperatively to maintain a BIS value of 55-60 using sevoflurane.[12] | (n=30), or control (n=30). | | | than the control (P=0.003, F= 26.759; P=0.031, F=17.685).[12] No significant difference in the incidence of postoperative delirium was present in the control and midazolam groups on postoperative days 3-5 (P=0.528, F=4.716; P=0.815, F=3.681; P=0.482, F=6.257).[12] | There was no significant difference in the incidence of postoperative delirium in the control and midazolam groups on postoperative days 3-5. | | not included in this study. Feasibility of use: adequate, since dexmedetomidine and midazolam are both widely available and used in many institutions. |

**Evaluation table 6**

| Citation and Theme of the article | Design/Method | Sample/ Setting | Major Variables Studied and Their Definitions | Measurement And Data Analysis | Findings | Results | Conclusions | Appraisal: Worth to Practice/ Level |
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| Su X, Meng ZT, Wu XH, et al. Dexmedetomidine for prevention of delirium in elderly patients after non-cardiac surgery: a randomised, double-blind, placebo-controlled trial. *Lancet*. 2016;388(10054):1893-1902. doi:10.1016/S0140-6736(16)30580-3 | A double-blind, parallel-arm, placebo-controlled RCT of patients who received 0.1 mcg/kg/hr of dexmedetomidine from ICU admission the day of surgery until 0800 on postoperative day 1 or an equivalent volume of normal saline.[13] | 700 patients of Peking University First Hospital and Peking University Third Hospital: n=350 experimental group patients who received dexmedetomidine; n=350 control group patients who received normal saline; adult population aged 65 years or older undergoing non-cardiac surgery with admission to ICU postoperatively. | IV: Dexmedetomidine versus normal saline.<br>DV: incidence of delirium in the first 7 days postoperatively. | Delirium: the CAM-ICU, a nominal scale, was used twice daily from 24 hours postoperatively until the seventh day following surgery to evaluate for delirium in study groups. A patient was considered to have delirium as defined by the CAM-ICU if they experienced an acute onset of mental status changes or a fluctuation course; inattention; and either disorganized thinking or an altered level of consciousness. | The incidence of postoperative delirium was decreased from 22.6% in the control group to 9.1% in the experimental group ($p<0.0001$).[13] | The incidence of postoperative deliriu m was decreased in the experimental group. | Low dose dexmedetomidine is a relatively safe therapy that can be administered to elderly patients undergoing noncardiac surgery to reduce the incidence of delirium in the first seven days following surgery | Level I, Quality A<br>Strength: large sample size (700). Limitations: focused on solely surgical ICU patients; no baseline delirium or cognitive function assessment completed prior to ICU admission. Risk of harm: dose-dependent hypotension and bradycardia with dexmedetomidine. However, since a low dose was used, these side effects were eliminated. Feasibility of use: adequate, since dexmedetomidine is widely available and used in many institutions. |

**Evaluation table 7**

| Citation and Theme of the article | Design/Method | Sample/ Setting | Major Variables Studied and Their Definitions | Measurement And Data Analysis | Findings | Results | Conclusions | Appraisal: Worth to Practice/Level |
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| Xuan Y, Fan R, Chen J, et al. Effects of dexmedetomidine for postoperative delirium after joint replacement in elderly patients: a randomized, double-blind, and placebo-controlled trial. *Int J Clin Exp Med*. 2018; 11: 13147-57. | A double-blind, parallel arm RCT of patients admitted to the ICU following joint replacement surgery. Patients received 0.1 mcg/kg/hr of dexmedetomidine within 1 hour of ICU admission for three days or an equal normal saline.[14] | 453 adults aged 60 years or older undergoing total joint replacement surgery with admission to ICU postoperatively in three hospitals in China: n=227 experimental group patients who received dexmedetomidine; n=226 control group patients who received normal saline. Nine patients withdrew consent and the drug infusion was altered in 19 patients.[14] However, all patients were included upon final analysis.[14] | IV: Dexmedetomidine versus normal saline.<br>DV: incidence of delirium in the first 7 days postoperatively. | Delirium: the CAM-ICU, a nominal scale, was used twice daily from 24 hours postoperatively until the seventh day following surgery to evaluate for delirium in the study groups. | Delirium was experienced in 13.2% of the patients in the experimental group compared to 28.3% in the control group ($P<0.0001$).[14] | Postoperative delirium was significantly reduced in the dexmedetomidine group compared to the placebo group who received normal saline. | Dexmedetomidine is a safe therapy that can be administered to elderly patients undergoing total joint replacement surgery to reduce the incidence of delirium in the first seven days following surgery. | Level I, Quality A<br>Strength: large sample size (453); dexmedetomidine was well-tolerated, double-blind, multicenter, randomized, placebo-controlled study. Limitations: population only included total joint surgery patients, no baseline delirium or cognitive function assessment completed prior to ICU admission, infusion of dexmedetomidine was limited to 3 days maximum, only a single dose of dexmedetomidine was used. Risk of harm: no patients required early termination of dexmedetomidine treatment. Feasibility of use: adequate, since dexmedetomidine is widely available and used in many institutions. |

**Evaluation table 8**

| Citation and Theme of the article | Design/Method | Sample/ Setting | Major Variables Studied and Their Definitions | Measurement And Data Analysis | Findings | Results | Conclusions | Appraisal: Worth to Practice/ Level |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Santana Santos F, Wahlund LO, Varli F, Tadeu Velasco I, Eriksdotter Jonhagen M. Incidence, clinical features and subtypes of delirium in elderly patients treated for hip fractures. *Dement Geriatr Cogn Disord*. 2005;20(4):231-237. doi:10.1159/000087311 | Prospective cohort study of 34 patients aged 60 years or older who underwent hip fracture surgery. Preoperative factors that were assessed include age, gender, impairment of hearing, residency prior to admission, preexisting cognitive function via MMSE, comorbidities, hemoglobin, type of fracture, and time between admission and surgery.[15] Factors that were collected from medical records perioperatively included ASA, premedication, and surgery-related aspects.[15] | 34 patients of either sex aged 60 years or older, with an ASA physical status of II to IV, who underwent hip fracture surgery at Karolinska University Hospital. | DV: delirium twice daily postoperatively starting on the second postoperative day, up to the fifth postoperative day or until delirium had subsided. | Delirium: the CAM, a nominal scale, was used to diagnose delirium preoperatively and twice daily postoperatively starting on the second postoperative day, up to the fifth postoperative day or until delirium had subsided. | 55.9% of patients in this study developed delirium.[15] A significant association was found between the use of preoperative midazolam and development of delirium ($P<0.05$).[15] | The use of 7.5-15 mg of midazolam orally 1 hour before surgery is associated with the development of postoperative delirium.[15] | Midazolam used perioperatively increases the risk of postoperative delirium. Hyperactive delirium is the most common subtype of delirium that was diagnosed. | Level III, Quality C<br><br>Strengths: prospective data collection, preoperative enrollment, baseline cognitive function was evaluated. Limitations: small sample size. Feasibility of use: adequate since midazolam is widely available and used in many institutions. |

**Evaluation table 9**

| Citation and Theme of the article | Design/Method | Sample/ Setting | Major Variables Studied and Their Definitions | Measurement And Data Analysis | Findings | Results | Conclusions | Appraisal: Worth to Practice/ Level |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Azeem TMA, Yosif NE, Alansary AM, Esmat IM, Mohamed AK. Dexmedetomidine vs morphine and midazolam in the prevention and treatment of delirium after adult cardiac surgery; a randomized, double-blinded clinical trial. *Saudi J Anaesth*. 2018;12(2):190-197. doi:10.4103/sja.SJA_303_17 | A double-blinded RCT of patients randomized in receiving dexmedetomidine or midazolam and morphine.[16] Medications titrated to maintain light sedation (-2 to +1) using RASS scale.[16] | 60 patients at least 60 years old undergoing cardiac surgery at Ain Shams university hospitals, with an ASA Class I and I, 70-100 kg, and 160-180 cm were selected for this study.[16] Group A (n=30) received a loading dose of (1 mcg/kg) of dexmedetomidine over 10 minutes immediately postoperatively, followed by a dexmedetomidine infusion (0.4-0.7 mcg/kg/min).[16] Group B (n=30) morphine (10-50 mcg/kg/hr) with midazolam (0.05 mg/kg up to 0.2 mg/kg, repeated as needed).[16] | IV: Dexmedetomidine versus morphine and midazolam<br>DV: Postoperative delirium incidence up to 7 days. | Delirium: the CAM-ICU, a nominal scale, was used once daily by nurses up to 7 days. Delirious behavior was reviewed by the research team. | Group A (dexmedetomidine) had lower risk of delirium after cardiac surgery compared to group B (morphine and midazolam), although it was statistically insignificant(P=1). Three percent of group A was diagnosed with delirium, compared to six percent of group B.[16] | There was no statistically significant difference in the incidence of delirium between group A (dexmedetomidine) and group B (morphine and midazolam). | Dexmedetomidine compared to morphine and midazolam in elderly patients who had cardiac surgery did not cause a significant reduction in postoperative delirium. | Level I, Quality B<br>Strengths: randomized, double-blind study. Limitations: study size, single-center design, study lacked power to show a significant decrease in mortality, and the time to discharge was not measured. Risk of harm: there was no significant bradycardia in group A, although there were statistically significant decreases in heart rate 4 hours following ICU admission. Feasibility of use: adequate, since midazolam, dexmedetomidine, and morphine are widely available and used in many institutions. |

# Appendix B: FIU IRB Approval

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**Office of Research Integrity**
**Research Compliance, MARC 414**

**MEMORANDUM**

**To:** Dr. Yasmine Campbell
**CC:** Katie Brennan

**From:** Maria Melendez-Vargas, MIBA, IRB Coordinator

**Date:** April 7, 2021

**Protocol Title:** "The Utilization of Dexmedetomidine in the Elderly Population to Decrease Postoperative Delirium: A Quality Improvement Project"

---

The Florida International University Office of Research Integrity has reviewed your research study for the use of human subjects and deemed it Exempt via the **Exempt Review** process.

**IRB Protocol Exemption #:** IRB-21-0136 **IRB Exemption Date:** 04/07/21
**TOPAZ Reference #:** 110226

As a requirement of IRB Exemption you are required to:

1) Submit an IRB Exempt Amendment Form for all proposed additions or changes in the procedures involving human subjects. All additions and changes must be reviewed and approved prior to implementation.
2) Promptly submit an IRB Exempt Event Report Form for every serious or unusual or unanticipated adverse event, problems with the rights or welfare of the human subjects, and/or deviations from the approved protocol.
3) Submit an IRB Exempt Project Completion Report Form when the study is finished or discontinued.

***Special Conditions:*** N/A

For further information, you may visit the IRB website at http://research.fiu.edu/irb.

MMV/em

# Appendix C: Broward Health IRB Approval

BROWARD HEALTH

Institutional Review Board - Human Research Protections

Broward Health Medical Center
Broward Health Coral Springs
Broward Health Imperial Point
Broward Health North
Salah Foundation Children's Hospital
Broward Health Weston
Community Health Services
Broward Health Physician Group

**DATE:** 05/07/2021

**TO:** Katie Brennan

**FROM:** Broward Health Institutional Review Board

**RECORD NUMBER:** 2021-063

**STUDY TITLE**: The Utilization of Dexmedetomidine in the Elderly Population to Decrease Postoperative Delirium: A Quality
Improvement Project

**RE:** NOT HUMAN SUBJECT RESEARCH DETERMINATION

Dear Katie Brennan:

This is to advise you that your project, "The Utilization of Dexmedetomidine in the Elderly Population to Decrease Postoperative Delirium: A Quality
Improvement Project " was reviewed on behalf of the Broward Health Institutional Review Board and was declared "not research involving human subjects" based on the definitions provided in the U.S. Department of Health and Human Services Code of Federal Regulations found at 45 CFR 46.102.

Please note, this determination does not absolve the Principal Investigator from complying with other federal, state, or local laws or institutional policies and procedures that may be applicable in the conduct of this project.
This determination applies to your project in the form and content as submitted to the IRB for review. Any variations or modifications to this project involving the participation of human subjects must be approved by the IRB prior to implementing such changes. Please maintain a copy of this determination for your records.

Thank you for submitting your project to the IRB for consideration.

The Broward Health Institutional Review Board – FWA00001248 operates in accordance with the Office of Human Research Protections and U.S. Food and Drug Administration (FDA) regulations. The Broward Health Institutional Review Board complies with the ICH guidelines on Good Clinical Practice (GCP) where they are compatible with the FDA and HHS regulations.

*This letter has been electronically signed in accordance with all applicable regulations, and a copy is retained within Broward Health IRB's records.*

# Appendix D: Letter of Support


March 1, 2021

Yasmine Campbell, DNP, CRNA, APRN
Clinical Assistant Professor,
Department of Nurse Anesthetist Practice
Florida International University

Dr. Campbell,

Thank you for inviting Broward Health to participate in Doctor of Nursing Practice (DNP) project conducted by Katie Brennan entitled "The Utilization Educational Module To Educate CRNAs On The Use Of Dexmedetomidine In The Elderly Population To Decrease Post-Operative Delirium During The Perioperative." in the Nicole Wertheim College of Nursing and Health Sciences, Department of Nurse Anesthetist Practice at Florida International University. I have warranted him permission to conduct the project using our providers.

Evidence-based practice's primary aim is to yield the best outcomes for patients by selecting interventions supported by the evidence. This project intends to evaluate if a structured education targeting providers will increase knowledge on the use of Dexmedetomidine in the elderly population to decrease post-operative delirium.

We understand that participation in the study is voluntary and carries no overt risk. All Anesthesiology providers are free to participate or withdraw from the study at any time. The educational intervention will be conveyed by a 15-minute virtual PowerPoint presentation, with a pretest and posttest questionnaire delivered by a URL link electronically via Qualtrics, an online survey product. Responses to pretest and posttest surveys are not linked to any participant. The collected information is reported as an aggregate, and there is no monetary compensation for participation. All collected material will be kept confidential, stored in a password encrypted digital cloud, and only be accessible to the investigators of this study: Katie Brennan and Dr. Campbell. We expect that Katie Brennan will not interfere with normal hospital performance, behaving in a professional manner and following standards of care.

Prior to the implementation of this Educational project the Florida International University Institutional Review Board will evaluate and approve the procedures to conduct this project. Once the Institutional Review Board's approval is achieved, this scholarly project's execution will occur over two weeks. We support the participation of our Anesthesiology providers in this project and look forward to working with you.

March 1, 2021

Edward Punzalan, DNP, CRNA, APRN — Date
Administrative Director of Nurse Anesthesia
Healthcare Performance Anesco

## Appendix E: Informed Consent

FIU | FLORIDA INTERNATIONAL UNIVERSITY

**ADULT ONLINE CONSENT TO PARTICIPATE IN A RESEARCH STUDY**
"The Utilization of Dexmedetomidine in the Elderly Population to Decrease Postoperative Delirium: A Quality Improvement Project"

**SUMMARY INFORMATION**

Things you should know about this study:

- **Purpose:** The purpose of the study is to improve health care provider knowledge on the use of dexmedetomidine to decrease postoperative delirium in the elderly population in the perioperative period.
- **Procedures**: If you choose to participate, you will be asked to complete an emailed pretest/posttest and watch a virtual educational voiceover power point.
- **Duration:** This will take about 20 minutes of your time
- **Risks**: There will be minimal risks involved with this project, as would be expected in any type of educational intervention, which may have included mild emotional stress or mild physical discomfort from sitting on a chair for an extended period of time, for instance.
- **Benefits:** The main benefit to you from this research is: improved knowledge of dexmedetomidine in reducing postoperative delirium. It will benefit society by guiding health care providers in preventing postoperative delirium with dexmedetomidine.
- **Alternatives:** There are no known alternatives available to you other than not taking part in this study.
- **Participation:** Taking part in this research project is voluntary.

Please carefully read the entire document before agreeing to participate.

**PURPOSE OF THE PROJECT**
You are being asked to be in a quality improvement project. The goal of this project is to improve health care provider knowledge on the use of dexmedetomidine to decrease postoperative delirium in the elderly population in the perioperative period.

**NUMBER OF STUDY PARTICIPANTS**
If you decide to be in this study, you will be one of 20 people in this research study.

**DURATION OF THE PROJECT**
Your participation will require about 20 minutes of your time.

**PROCEDURES**
If you agree to be in the project, we will ask you to do the following things:

- Complete an online 10 question pre test survey via Qualtrics, an online survey product for which the URL link is provided
- Review the educational PowerPoint module lasting 10 minutes via Qualtrics, and onlye survey for which the URL link is provided
- Complete the online 10 question post test survey via Qualtrics, an online survey product for which the URL link is provided

**RISKS AND/OR DISCOMFORTS**
There will be minimal risks involved with this project, as would be expected in any type of educational intervention, which may have included mild emotional stress or mild physical discomfort from sitting on a chair for an extended period of time, for instance.

**BENEFITS**
The following benefits may be associated with your participation in this project: improved knowledge of dexmedetomidine in reducing postoperative delirium. It will benefit society by guiding health care providers in preventing postoperative delirium with dexmedetomidine.

**ALTERNATIVES**
There are no known alternatives available to you other than not taking part in this project. However, if you like to receive the educational material given to the participants in this project, it will be provided to you at no cost.

**CONFIDENTIALITY**
The records of this project will be kept private and will be protected to the fullest extent provided by law. If, in any sort of report, we might publish, we will not include any information that will make it possible to identify you as a participant. Records will be stored securely, and only the project team will have access to the records.

**COMPENSATION & COSTS**
There is no cost or payment to you for receiving the health education and/or participating in this project.

**RIGHT TO DECLINE OR WITHDRAW**
Your participation in this project is voluntary. You are free to participate in the project or withdraw your consent at any time during the project. Your withdrawal or lack of participation will not affect any benefits to which you are otherwise entitled. The investigator reserves the right to remove you without your consent at such time that they feel it is in the best interest.

**RESEARCHER CONTACT INFORMATION**
If you have any questions about the purpose, procedures, or any other issues relating to this research project, you may contact Katie Brennan at 954-648-8710, kbren023@fiu.edu or Dr. Yasmine Campbell at ycampbel@fiu.edu.

**IRB CONTACT INFORMATION**

If you would like to talk with someone about your rights of being a subject in this project or about ethical issues with this project, you may contact the FIU Office of Research Integrity by phone at 305-348-2494 or by email at ori@fiu.edu

**PARTICIPANT AGREEMENT**

I consent by participating in the survey. I have read the information in this consent form and agree to participate in this project.

# Appendix F: Recruitment Letter


Nicole Wertheim College of Nursing and Health Sciences
Department of Nurse Anesthetist Practice

**The Utilization of Dexmedetomidine in the Elderly Population to Decrease Postoperative Delirium: A Quality Improvement Project**

Dear Broward Health Anesco Anesthesia Provider:

My name is Katie Brennan and I am a student from the Anesthesiology Nursing Program Department of Nurse Anesthetist Practice at Florida International University. I am writing to invite you to participate in my quality improvement project. The goal of this project is to improve health care provider knowledge on the use of dexmedetomidine to decrease postoperative delirium in the elderly population in the perioperative period. You are eligible to take part in this project because you are a member of the Anesthesia Department for Anesco at Broward General.

If you decide to participate in this project, you will be asked to complete and sign a consent form for participation. Next, you will complete a pre-test questionnaire, which is expected to take approximately 5 minutes. You will then be asked to view an approximately 15 minute long educational presentation online. After watching the video, you will be asked to complete the post-test questionnaire, which is expected to take approximately 5 minutes. No compensation will be provided.

Remember, this is completely voluntary. You can choose to be in the study or not. If you'd like to participate or have any questions about the study, please email or contact me at kbren023@fiu.edu or 954-648-8710

Thank you very much.

Sincerely,

Katie Brennan, SRNA, BSN, CCRN

# Appendix G: Educational Module

FIU

The Utilization of Dexmedetomidine in the Elderly Population to Decrease Postoperative Delirium: A Quality Improvement Project

Katie Brennan RN, BSN, CCRN
Florida International University

FLORIDA INTERNATIONAL UNIVERSITY

1

## Learning Goals

- The objectives of this module are to:
  - Define postoperative delirium and its consequences
  - Review the mechanism of action and effects of dexmedetomidine
  - Discuss the impact that dexmedetomidine has on postoperative delirium
  - Relay findings from a literature review that assesses the effects of dexmedetomidine on postoperative delirium

FIU

2

## Background: Postoperative Delirium

- An acute state of confusion in which symptoms come and go[1]
- Common clinical findings:
  - Decreased focus and attention
  - Memory Loss
  - Disorientation
  - Language and perceptual disturbances[2]
- Typical clinical course:
  - Develops 24 hours postoperatively
  - Lasts for 48 hours[1]
- Incidence:
  - 20% of hospitalized patients over 65 years old (12.5 million cases annually)[2]

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3

## Consequences of Postoperative Delirium

- Associated with
  - Increased mortality
  - Functional and cognitive impairment
  - Admission into long-term care facilities
  - Increased length of hospitalization[2]
  - Increased costs: $38-152 billion to manage postoperative delirium[3]


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4

## Dexmedetomidine

- Mechanism of Action
  - Selective alpha-2 receptor agonist
  - Inhibits noradrenergic neuronal firing in the locus coeruleus[2]

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5

## Dexmedetomidine, continued

- Effects
  - Analgesia
  - Anxiolysis
  - Sedation
  - Sympatholysis
  - Preservation of respiratory function

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6

## Dexmedetomidine, continued

- Hemodynamic effects
  - Loading dose:
    - Hypertension from stimulation of peripheral alpha-2 receptors in the vascular smooth muscle
    - Followed by hypotension from central alpha-2 receptor stimulation (vasodilation)
  - Dose dependent bradycardia from reduction of sympathetic tone, stimulation of baroceptor reflexes, and increased vagal response[4]

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7

## Effects of Dexmedetomidine on Postoperative Delirium

- Dexmedetomidine is "neuroprotective"
- Associated with
  - Decreased incidence, duration, and severity of postoperative delirium[2]
  - Enhanced postoperative cognitive function[2]
- Exact mechanism of decreasing postoperative delirium is not fully understood

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8

## Main Findings from Literature Review: Dexmedetomidine and Postoperative Delirium

- Dexmedetomidine intraoperatively could reduce postoperative delirium in elderly adults undergoing surgery compared to general anesthesia not using dexmedetomidine [2, 6, 7]
- Postoperatively, low dose dexmedetomidine significantly reduced the incidence of postoperative delirium in elderly patients admitted to the ICU following non-cardiac surgery in two RCT's[8,9]
- An optimal dexmedetomidine dose has not be discovered.
- All studies have show that the use of dexmedetomidine intraoperatively within a typical dose range is effective in decreasing postoperative delirium.

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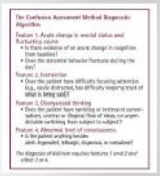
9

## Proposed Intervention

- Targeted to geriatric patients 60 years or older undergoing surgery
- Using a dexmedetomidine infusion intraoperatively within a typical dose range (0.2-0.7 mcg/kg/hr) as part of a combined general anesthetic
- Measuring the occurrence of postoperative delirium for three days using the confusion assessment method (CAM)



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## Summary

- Postoperative delirium is an acute state of confusion associated with common clinical findings, including reduced focus and attention, disorientation, and memory loss.[1,2]
- It is a widespread clinical issue that adversely affects elderly surgical patients.
- Postoperative delirium is associated with many consequences, increasing morbidity, mortality, and hospital costs, alike.

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11

## Summary, continued

- Dexmedetomidine is an alpha-2 agonist that has neuroprotective properties.
- It has been used in many studies to demonstrate efficacy in reducing postoperative delirium in elderly surgical patients, although its exact mechanism is unknown.
- Using dexmedetomidine within a typical dose range is sufficient to decrease postoperatively delirium in elderly surgical patients.

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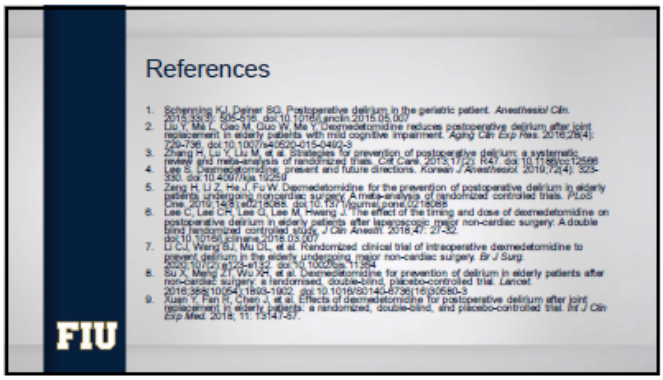
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## Appendix H: Demographics, Pretest and Post-test Questionnaire


**Pretest and Posttest Questionnaire:**

**Demographics**

1. **Gender:** Male Female
2. **Age:** _____
3. **Ethnicity:**

   Hispanic Caucasian African American Asian

   Other_____
4. **Position/Title:** Anesthesiologist CRNA Anesthesiologist Assistant Resident
5. **Level of Education:** Bachelors Masters Doctorate pHD Other _____
6. How many years have you been an anesthesia provider?

   Over 10 5-10 years 2-5 years 0-2 years

**QUESTIONNAIRE**

1. **What is the incidence of postoperative delirium in adults 65 years or older?**
    a. 20%
    b. 40%
    c. 60%
    d. 80%
2. **Which of the following are common clinical findings of postoperative delirium?**
    a. Decreased focus and attention
    b. Memory loss
    c. Disorientation
    d. Language and perceptual disturbances
    e. All of the above
3. **Which of the following is NOT a consequence of postoperative delirium?**
    a. Increased mortality
    b. Decreased costs
    c. Admission into long-care facilities
    d. Functional and cognitive impairment
4. **Which receptor does dexmedetomidine exert its effects?**
    a. Alpha-1
    b. Alpha-2
    c. Beta-1
    d. Beta-2
5. **Which of the following is NOT an effect of dexmedetomidine?**
    a. Tachycardia
    b. Bradycardia

c. Analgesia

d. Sedation

6. **How is dexmedetomidine believed to decrease postoperative delirium?**

    a. By keeping a patient sedated

    b. By effectively treating a patient's pain

    c. By reducing a patient's anxiety

    d. By inhibiting the neuroendocrine and inflammatory response associated with surgery

7. **Please indicate your level of agreement with the following statement: I currently use dexmedetomidine as part of my anesthetic in elderly population to decrease postoperative delirium.**

    a. Yes, always

    b. Sometimes

    c. No, never

8. **Please indicate your level of agreement with the following statement: Elderly patients undergoing surgery are at a high risk of developing postoperative delirium.**

    a. Strongly agree

    b. Agree

    c. Neutral

    d. Disagree

    e. Strongly Disagree

9. **Please indicate your level of agreement with the following statement: It is important to use anesthetic techniques to reduce the incidence of postoperative delirium in the elderly.**

    a. Strongly agree

    b. Agree

c. Neutral

d. Disagree

e. Strongly Disagree

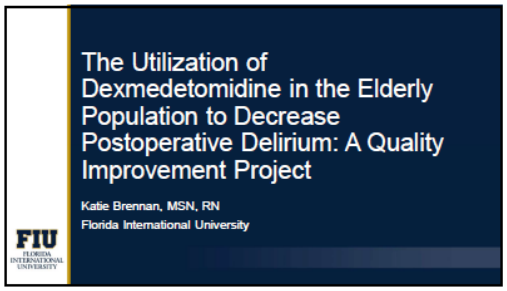
10. **Please indicate your level of agreement with the following statement: As an anesthesia provider, your clinical practices can help decrease the incidence and consequences of postoperative delirium in the elderly.**

    1. Strongly agree
    2. Agree
    3. Neutral
    4. Disagree
    5. Strongly Disagree

11. **How likely are you to implement this in clinical practice?**

    1. Extremely likely
    2. Somewhat likely
    3. Neither likely nor unlikely
    4. Somewhat unlikely
    5. Extremely unlikely

# Appendix I: DNP Symposium Presentation

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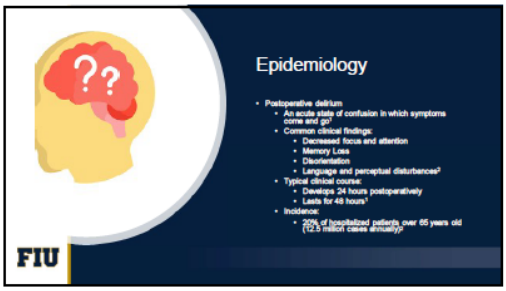


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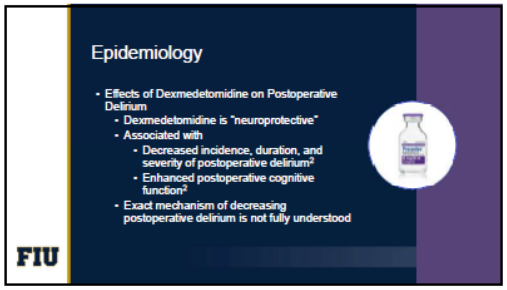


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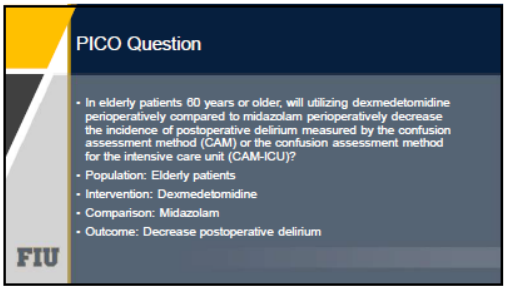


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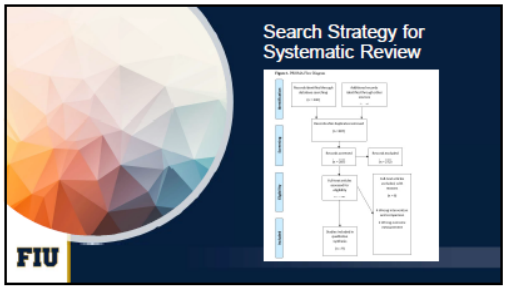


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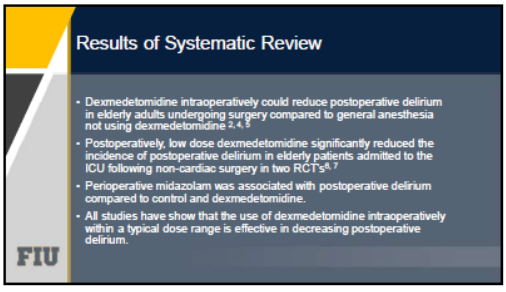


6

## Implications

Dexmedetomidine has been used in many studies to demonstrate efficacy in reducing postoperative delirium in elderly surgical patients

Using dexmedetomidine within a typical dose range is sufficient to decrease postoperatively delirium in elderly surgical patients.

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## Conclusion

- Intraoperative and postoperative dexmedetomidine reduced postoperative delirium.
- In elderly patients undergoing surgery, perioperative dexmedetomidine is superior to perioperative midazolam to reduce postoperative delirium.

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## Quality Improvement Project

- Purpose
  - To improve healthcare provider knowledge of dexmedetomidine and its effectiveness of decreasing postoperative delirium in the elderly.
  - Determine the efficacy of an education intervention on this topic.

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## Quality Improvement Project

- Setting
  - A 716-bed acute care hospital in Broward County, Florida
- Subjects
  - 11 CRNA's and anesthesiologists employed at the setting.

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## Quality Improvement Project

- Methods
  - Pretest survey
  - Educational module
  - Posttest survey
- Analysis
  - Excel software- to analyze data and evaluate responses from the pretest and posttest.
  - Statistical analysis- to evaluate subjects' responses from the pretest and posttest.

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## Results: Differences in Pretest and Posttest Attitudes and Beliefs

| Questions | Pretest | Posttest | Difference |
|---|---|---|---|
| Please indicate your level of agreement with the following statement. Elderly patients undergoing surgery are at high risk of developing postoperative delirium. | Strongly agree 9%<br>Agree 91%<br>Neutral 0%<br>Disagree 0%<br>Strongly disagree 0% | Strongly agree 90%<br>Agree 10%<br>Neutral 0%<br>Disagree 0%<br>Strongly disagree 0% | 81%<br>-81%<br>0%<br>0%<br>0% |
| Please indicate your level of agreement with the following statement. It is important to use anesthetic techniques to reduce the incidence of postoperative delirium in the elderly. | Strongly agree 18%<br>Agree 73%<br>Neutral 9%<br>Disagree 0%<br>Strongly disagree 0% | Strongly agree 80%<br>Agree 40%<br>Neutral 0%<br>Disagree 0%<br>Strongly disagree 0% | 62%<br>-33%<br>0%<br>0%<br>0% |
| Please indicate your level of agreement with the following statement. As an anesthesia provider, your clinical practices can help decrease the incidence and consequences of postoperative delirium in the elderly. | Strongly agree 9%<br>Agree 82%<br>Neutral 9%<br>Disagree 0%<br>Strongly disagree 0% | Strongly agree 70%<br>Agree 30%<br>Neutral 0%<br>Disagree 0%<br>Strongly disagree 0% | 61%<br>-52%<br>-9%<br>0%<br>0% |

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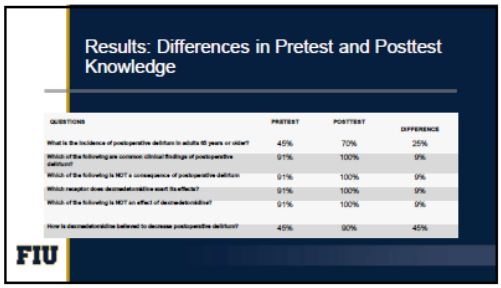
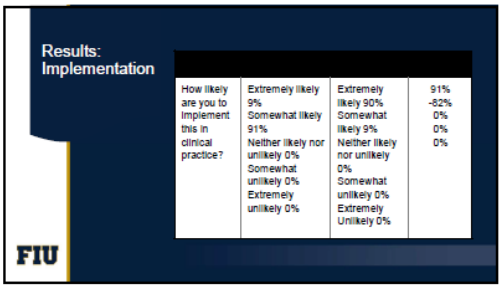
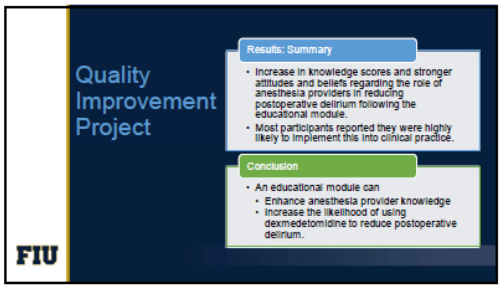

Results: Differences in Pretest and Posttest Knowledge
QUESTIONS
PRETEST
POSTTEST
DIFFERENCE
What is the incidence of postoperative delirium in adults 65 years or older?
45%
70%
25%
Which of the following are common clinical findings of postoperative delirium?
91%
100%
9%
Which of the following is NOT a consequence of postoperative delirium
91%
100%
9%
Which receptor does dexmedetomidine exert its effects?
91%
100%
9%
Which of the following is NOT an effect of dexmedetomidine?
91%
100%
9%
How is dexmedetomidine believed to decrease postoperative delirium?
45%
90%
45%
FIU

13


Results: Implementation
How likely are you to implement this in clinical practice?
Extremely likely 9%
Somewhat likely 91%
Neither likely nor unlikely 0%
Somewhat unlikely 0%
Extremely unlikely 0%
Extremely likely 90%
Somewhat likely 9%
Neither likely nor unlikely 0%
Somewhat unlikely 0%
Extremely Unlikely 0%
91%
-82%
0%
0%
0%
FIU

14


Quality Improvement Project
Results: Summary
Increase in knowledge scores and stronger attitudes and beliefs regarding the role of anesthesia providers in reducing postoperative delirium following the educational module.
Most participants reported they were highly likely to implement this into clinical practice.
Conclusion
An educational module can
Enhance anesthesia provider knowledge
Increase the likelihood of using dexmedetomidine to reduce postoperative delirium.
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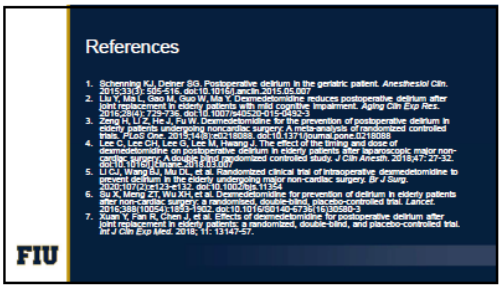
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