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Lavender Aromatherapy Compared to Midazolam For Quality Improvement Of Preoperative Anxiety In Elderly Surgical Patients: An Educational Module

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**Lavender Aromatherapy Compared to Midazolam For Quality Improvement Of
Preoperative Anxiety In Elderly Surgical Patients: An Educational Module**

A DNP Project Presented to the Faculty of the
Nicole Wertheim College of Nursing and Health Sciences

Florida International University

In partial fulfillment of the requirements
for the Degree of Doctor of Nursing Practice

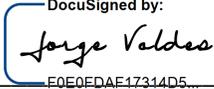
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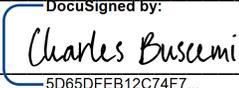
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Abstract

Impact: Investigation into the anxiolytic effects of lavender aromatherapy across several patient populations, application types, and outcome measures establishes that lavender oil relieves anxiety, reduces mental stress, provides sedation, and promotes good sleep.

Background: Studies have investigated the link between age and the occurrence of undesired responses to premedication with agents of the benzodiazepine drug class. This link is explained by age-related pathophysiologic changes that occur as a function of aging. Despite numerous knowledge-based concerns, benzodiazepines prevail amongst the top psychotropic medications prescribed in elderly patients aged between 65 and 80 years.

Objective: This quality improvement project aims to enhance anesthesia providers' knowledge, beliefs, and attitude regarding the value of aromatherapy with lavender oil as an affordable, safe, and effective alternative to midazolam administration for preoperative anxiolysis in elderly surgical patients.

Methods: An extensive literature search was conducted to synthesize studies relevant to the PICO question and create an evidence-based educational module for virtual presentation. An anonymous online platform was used to distribute the project's intervention and survey components to a sample of anesthesia providers working at a South Florida level-1 trauma center and to record and statistically analyze data.

Results: Collectively, the evidence-based literature presented by this project positively impacts the perioperative care of older adults, as it demonstrates lavender aromatherapy as a beneficial alternative to midazolam administration for improved management of preoperative anxiety and in elderly surgical patients.

Discussion: Analysis of the pre-and post-survey results reveals that this quality improvement project met the objective of expanding anesthesia providers' knowledge and understanding of the use of lavender oil aromatherapy for the optimization of preoperative anxiety and care outcomes in elderly surgical patients. As a result, they will be more competent and effective in helping elderly patient populations achieve relief from anxiety before surgery and improved perioperative care outcomes. The small sample size, short project duration, and online delivery platform were limitations of this project.

Keywords: elderly, preoperative anxiety, lavender, essential oils, aromatherapy, anxiolysis, premedication, adverse effects, delirium

Lavender Aromatherapy Compared To Midazolam For Quality Improvement Of Preoperative Anxiety In Elderly Surgical Patients: An Educational Module

Problem Identification

Preoperatively, benzodiazepines are routinely ordered for their effects on reducing anxiety or stress before surgery. From this sedative-hypnotic drug class, midazolam remains the most popular agent chosen for anxiolysis, sedation, and amnesia immediately before surgery, in patients 65 years and younger.¹ While preoperative, low-dose midazolam (1-2 mg, IV) is customarily considered safe in most surgical patients, their use in elderly patients, over the age of 65, raises numerous concerns.¹ A recent study conducted on older adults revealed that intravenous midazolam 2 mg produces significant deficits detected by functional imaging changes and cognitive testing.² Preoperative administration of benzodiazepines to older surgical patients has been linked to an increased incidence of oxygen desaturation, and the occurrence of residual drowsiness and amnesia postoperatively. Additional evidence relates benzodiazepine premedication in elderly patients to delayed recovery after surgery and prolonged durations of PACU stay.¹ Importantly, the administration of benzodiazepines in the preoperative period is associated with postoperative emergence delirium and cognitive dysfunction, most notably in the geriatric patient population.¹

Owing to these documented findings, benzodiazepines may produce significant adverse effects in elderly surgical patients, including increased postoperative morbidity and mortality rates. Routine use of these sedative-hypnotic agents in ambulatory surgical patients, especially in patients aged over 65, is thus not recommended. This recommendation coincides with published enhanced recovery after surgery (ERAS) protocols that highlight the importance of avoiding premedicating all outpatient surgical patients with benzodiazepines if not clinically prudent or beneficial to patient outcomes. Residual effects of anesthetic drugs used during the preoperative

period, if present, can delay recovery and worsen postoperative morbidity. Pharmacological anxiolysis before surgery remains the most utilized method, despite current evidence-based recommendations that support an optimally balanced anesthetic technique, void of unnecessary anesthetic premedication, to enhance recovery after elective outpatient surgery in elderly patients.^{1,4} While maintaining consideration of these effects, the presence of anxiety before surgery and its negative impact on anesthetic management and surgical recovery outcomes cannot be ignored; therefore, exploration of alternative methods for reducing preoperative anxiety in elderly surgical patients is vital.⁴

Background

Preoperative anxiety is a prevalent finding in surgical patients known to interfere with preoperative teaching and thus patient outcomes. Pharmacological strategies are routinely ordered for the management of anxiety in adult patients awaiting surgery, with benzodiazepines being the standard choice for preoperative anxiolysis. While this drug class remains a sound and effective strategy for combating anxiety in most adults before surgery, elderly patients are known to experience adverse effects and poorer outcomes following perioperative administration of sedative-hypnotic drugs like benzodiazepines. Midazolam, a benzodiazepine, is the drug most frequently administered during the presurgical period for its anxiolytic, sedative, and amnestic properties.

There is extensive data that demonstrates a strong association between age and cardiopulmonary functions, sedation, and cognition in response to agents within the benzodiazepine sedative-hypnotic drug class.⁴ This association is explained by age-related pathophysiologic changes that occur as a function of aging. With age, a continuous decline of the body's homeostatic mechanisms occurs, chiefly, in the liver, kidneys, and central nervous systems. The combination of these physiologic metabolic adaptations facilitates the

accumulation of drugs and subsequently alters the body's response to various pharmacologic agents. Increased drug sensitivity, especially to drugs affecting the central nervous system (CNS), may manifest through a variety of symptoms related to cognitive impairment.⁶ Geriatric patients when administered preoperative anesthetics that target the CNS, such as the benzodiazepine drug class, may experience benzodiazepine-induced central nervous system toxicity and thus exhibit signs and symptoms related to altered cognition, including confusion, disorientation, oversedation, motor impairment, and delirium.⁶

Owing to these documented adverse effects in adults over the age of 65, midazolam administration to elderly patients is mostly avoided, thus often leaving the presence of anxiety in these patients untreated before surgery.¹ Unfortunately, elderly patients over the age of 65 are not exempt from the negative experience of anxiety before surgical procedures. Preoperative anxiety, when left untreated, has been linked to several postoperative complications and disadvantageous outcomes, including increased post-surgical pain and analgesia requirement, immunosuppression, impaired wound healing, worsened mood and satisfaction, and prolonged length of hospital stay.¹¹ Alternative strategies that alleviate anxiety without producing undesired drug effects must therefore be considered to optimize surgical outcomes in this population.

Aromatherapy is a prevalent form of complementary and alternative medicine (CAM) that utilizes essential oils extracted from aroma plants for medicinal purposes.¹¹ Essential oils used during aromatherapy can be absorbed into the body by the skin following topical application or by the olfactory system after inhalation.¹² Lavender is amongst the most popular essential oils used to date, owing to its ranging applicability as a flavoring, perfume, craft, soap, or drug. Lavender oil is reported to maintain distinct therapeutic and curative properties that

enable its use within holistic treatment approaches for burns, muscle spasms, infections, insect bites, and many neurological and psychological disorders. Various studies conducted on animals and humans concur on the analgesic, sedative, anxiolytic, anticonvulsant, antidepressant, and neuroprotective properties of lavender oil and thus support its medicinal utilization for neuropsychological purposes.¹⁰

Although oral administration of lavender is typically recommended, lavender oil has been proven to be clinically effective when employed via aromatherapy techniques. Essential oils like lavender are volatile compounds that when inhaled can produce a variety of beneficial physiologic and psychological effects. Studies hypothesize that linalyl acetate and linalool, the main chemical components of lavender oil, when inhaled, act upon the limbic system of the brain, specifically the amygdala and hippocampus, to produce these therapeutic effects.¹⁰ Lavender's major constituents are considered responsible for producing anxiolysis with minimal side effects, thereby supporting lavender as the superior essential oil for treating anxiety.¹⁰

Scope of the Problem

In surgical patients, anxiety is described as a robust psychological and behavioral response that is often aggravated in the preoperative period by concerns related to underlying disease, the planned surgical procedure, and anesthesia. Needless anxiety may potentially alter surgical patients' perioperative experience, thus preprocedural sedative administration to most surgical patients is common.⁵ Benzodiazepines maintain anticonvulsant and skeletal muscle relaxant properties in addition to several dose-mediated effects, including anxiolysis, sedation, hypnosis, and amnesia. These properties make agents from this drug class useful for treating numerous ailments and a beneficial choice to pre-medicate patients before different procedures. Benzodiazepines, namely midazolam, remain the most popular sedative-hypnotic drug chosen

for preoperative administration in surgical patients scheduled for inpatient and outpatient procedures.¹

Studies have investigated the link between age and the occurrence of undesired responses to premedication with agents of the benzodiazepine drug class. Specifically, neuropsychological, and physiological responses following preoperative administration of midazolam in older individuals were apparent and suggest that aging magnifies pharmacodynamic sensitivity to this drug. Multiple publications correlate midazolam administration with prolonged durations of deep sedation and notable reductions in blood pressure and oxygen saturation in geriatric patients.⁴ Of the several adverse responses to benzodiazepines that are documented to occur in older patients, however, postoperative delirium is agreed upon as the most significant complication following its administration. Further, postoperative delirium, irrespective of its precipitating cause, is revealed to be the leading complication in elder surgical adult patients.⁸

Consequences of the Problem

In special populations such as geriatric and pediatric patients, delirium is an acute and unfortunately frequent complication following surgery. Numerous risk factors have been blamed as independent predictors of postoperative delirium, including preoperative cognitive and functional health status, surgical procedure, medications, age, alcohol and drug use, and medications. Older age and medications are commonly identified factors that independently contribute to the development of delirium; therefore, when coupled, markedly increase the likelihood of its occurrence. Notably, medications have a documented association with as much as 39% of delirium cases in elderly medical and surgical patients.³ In comparison to medications administered intraoperatively that are dictated by the surgical procedure and immediate patients' needs in response to surgery, the choice of the preoperative drug regimen can be potentially

modified to reduce the risk of delirium or other adverse postoperative complications following surgery.³

Supported pathophysiologic mechanisms for this condition relate to the manipulation of certain neurotransmitters and their receptors, namely, acetylcholine, dopamine, norepinephrine, serotonin, and gamma-aminobutyric acid (GABA). Specific medications or drug classes that affect the actions of these neurotransmitters can thus trigger the onset of delirium.

Benzodiazepines, which are classified as sedative-hypnotic agents, produce inhibitory CNS effects through their interaction with GABA receptors and neurotransmitters and have understandably been named as triggers for delirium.³ Delirium is a serious consequence of benzodiazepine administration in older patients, especially in those over the age of 65, that may detrimentally impact morbidity and mortality rates and increase hospital length of stay.⁶

Knowledge Gaps

Benzodiazepines are routinely administered in the preoperative surgical period to patients undergoing a variety of distinct medical and surgical procedures. Interestingly, multiple randomized clinical trials that have studied the efficacy of benzodiazepine premedication on perioperative patient experience in adult patients scheduled for elective surgery under general anesthesia did not find a clinical benefit from its administration. This conclusion is supported by evidence that suggests only a small percentage of patients experience high levels of preoperative anxiety, negating the need for routine pharmacologic anxiolysis for all surgical patients.⁵ Data collected from similar patient studies further demonstrates considerably prolonged extubation and cognitive recovery times following preprocedural administration of benzodiazepines, thus justifying recommendations that premedication with sedative-hypnotic drugs be reserved only for clinically necessary patient scenarios.⁵

Despite numerous knowledge-based concerns, benzodiazepines prevail among the top psychotropic medications prescribed in elderly patients aged between 65 and 80 years. The documented acute neurocognitive effects of benzodiazepines have led to developing hypotheses on the correlation of benzodiazepine use in geriatric patients to subsequent reductions in cognitive performance decline and an increased risk of dementia.⁷ While numerous studies support the hypothesis that benzodiazepines predispose elderly individuals to cognitive decline, data linking this class of drugs with Alzheimer's disease and dementia remains inconclusive. Results from a randomized controlled trial (RCT) did not yield reliable evidence to support the link between benzodiazepines and Alzheimer's disease or dementia; however, concluded that the impact of these drugs on cognition likely unmask the symptomology of early dementia rather than precipitating its onset. Recommendations made by distinct RCTs emphasize the need for future research into alternative methods for reducing the utilization of these medications in the elderly population.⁷

Patients over the age of 65 are identified to comprise more than one-third of all inpatient surgical operations in the United States; therefore, quality improvement strategies that focus on optimizing perioperative care outcomes in elderly patients are warranted.⁸ Owing to the wealth of evidence surrounding benzodiazepine premedication and undesirable health outcomes in older surgical patients, safer replacement therapies for easing anxiety and promoting relaxation or sedation for this patient population must be investigated.

Proposal Solution

Understanding the impact of untreated preprocedural anxiety on postoperative surgical outcomes is imperative for enhancing perioperative patient care and experiences in special surgical populations, specifically older adults. Further, knowledge of the crucial relation of preoperatively administered medications to postoperative adverse complications is vital for

preventing harmful medication-induced health outcomes and expediting surgical recovery in elderly patients. As a consequence of increased drug sensitivity with aging, methods that therapeutically address the presence of anxiety before surgery without the negative effects of traditionally used psychotropic agents must therefore be strategized for perioperative care of older patient populations.^{1,6}

Aromatherapy is a complementary and alternative medicine (CAM) technique that utilizes plant essences for various therapeutic practices. Essential oils extracted from aromatic plants have been extensively researched and determined to have significant and distinct holistic health benefits, including anxiolysis. While several herbal agents are documented to maintain anxiolytic properties, essential oils from the lavender species demonstrate the highest efficacy for anxiety reduction when used as aromatherapy.¹⁰ A randomized clinical trial on the efficacy of the essential oil lavender on preoperative anxiety reduction in comparison to standard pharmacologic care was conducted and revealed lavender aromatherapy as a cost-effective, low-risk intervention for lowering preoperative anxiety. Lavender was further advertised as a potential method to improve perioperative outcomes and patient satisfaction ratings; however, the researchers identified the need for additional studies that explore the effects of lavender in special surgical populations.⁹ Additional studies agree on the therapeutic effects of the essential oil lavender in the form of inhalational aromatherapy in reducing anxiety in surgical patients before ambulatory surgery; therefore, further investigation into these benefits within the elderly population and in comparison to the benzodiazepine drug class is required.

Rationale

Aromatherapy has been practiced for centuries by numerous countries as a form of herbal medicine that is based on the influence of essential oils on the mind-body connection through interaction with the olfactory system. Holistic healthcare approaches through the incorporation

of CAM techniques continue to gain attention in modern medicine and have sparked a scientific investigation of the efficacy of inhaled aromatherapy. Evidence-based research establishes that lavender oil relieves anxiety, reduces mental stress, and promotes sedation and good sleep. Investigation into the anxiolytic effects of lavender aromatherapy across several patient populations, application types, and outcome measures have concluded lavender inhalation is a safe and affordable strategy for relieving anxiety.⁵ There is, however, a lack of available evidence-based literature on the anxiety-relieving effects of lavender aromatherapy in certain healthcare settings and patient populations, namely, elderly surgical patients. Studies that compare the effectiveness of inhaled lavender to standard treatments for managing preoperative anxiety in older individuals are also limited. Therefore, this review includes studies that evaluate the efficacy of aromatherapy with lavender oil for reducing preoperative anxiety in the general adult surgical patient population, including patients aged over 65. Additional studies selected for review demonstrate the therapeutic health effects of lavender aromatherapy in comparison to standard pharmacological drugs used in elderly populations throughout diverse care settings.

Objective

The objective of this literature review is to gather research data in support of lavender oil aromatherapy as an alternative approach to intravenous midazolam administration for managing preoperative anxiety in elderly surgical patients who are unable to receive standard drug therapy; owing to the wealth of adverse drug effects known to follow benzodiazepine administration in adults over 65 years old, safer anxiolytic therapies are mandated to optimize their health outcomes.

II. Literature Review

Eligibility Criteria

Studies chosen for inclusion within this literature review were done so by adherence to specific inclusion and exclusion criteria to proficiently demonstrate the research topic. Articles written in the English language, published in a peer-reviewed journal within the last 15 years, and available in full-text format were the criteria established for inclusion. Exclusion criteria included studies whose entire study population consisted of adults below the age of 65, individuals younger than 18 years old, patients in the intensive care unit, and patients with a severe neuropsychiatric medical history. Studies that focused on the administration of lavender oil by any other route than aromatherapy were also excluded from this review. The literature search focused on lavender aromatherapy and its efficacy as an anxiolytic in elderly patients and adult surgical patients. Several health benefits of inhaled lavender oil were assessed across diverse healthcare settings for evidence in support of its therapeutic effects and health benefits in older adults. The adverse effect profile of benzodiazepines in elderly patients was additionally assessed to quantify the evidence in support of alternative methods for preoperative anxiolysis in older surgical patient populations.

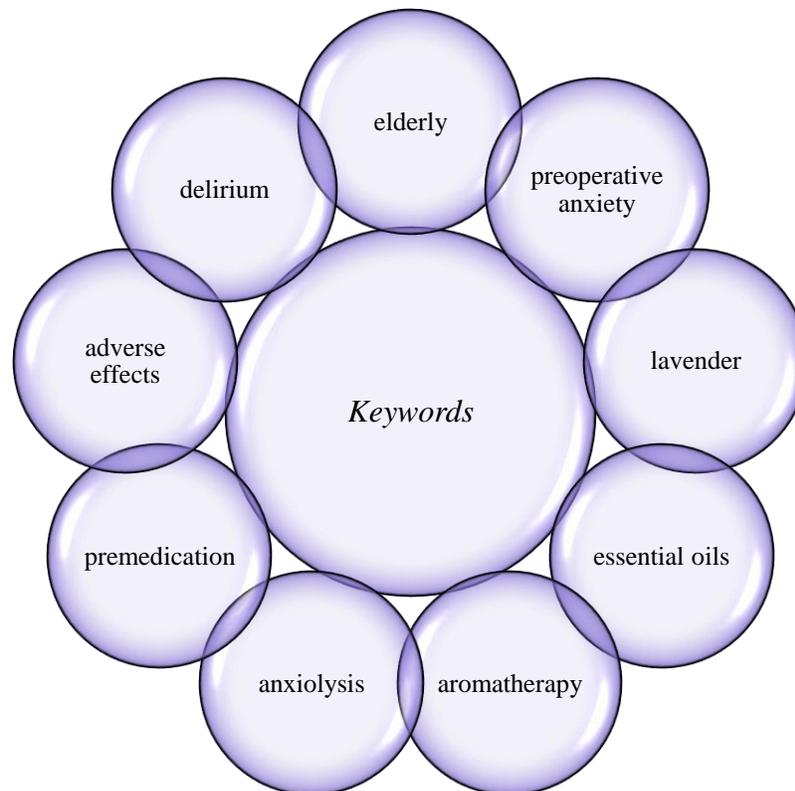
Information Sources

A comprehensive literature search was facilitated using Cochrane, Google Scholar, and the Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases to gather research studies that have assessed the value of aromatherapy with lavender oil for preoperative anxiolysis and improved perioperative outcomes in elderly patients scheduled for surgery. The literature review was extensively guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and the John's Hopkins Nursing Evidence-Based Practice evidence level and quality guide.

Keywords

Through the utilization of the necessary Boolean operators and search symbols, the following keywords were employed to facilitate retrieval of the most relevant research data to the clinical topic: elderly, preoperative anxiety, lavender, essential oils, aromatherapy, anxiolysis, premedication, adverse effects, and delirium.

Diagram 1. Keywords



Search Strategy

Upon surveying the vast collection of pertinent scholarly research and following the application of established inclusion and exclusion criteria, 17 research articles were selected for abstract review. Of these articles, studies that did not mention either the preoperative setting or the elderly population concerning lavender aromatherapy were excluded from the review. Eight articles were thus approved and read in their entirety. Three more articles were identified to not analyze the relationship between lavender oil inhalation and age and were thereby excluded

from the review. A total of eight articles were determined to be of sufficient quality and relevance to the clinical topic in question and were thus selected for literature review.

Characteristics and Results of Individual Studies

The literature search aimed to reveal evidence on lavender aromatherapy and its efficacy as an anxiolytic in elderly patients and older adult surgical patients. Although many research reports were found to explore the therapeutic efficacy of lavender essential oil and its beneficial use in diverse healthcare populations, the goal of this literature review was to highlight the most current and relevant data to the clinical scenario; therefore, a total of eight studies met the criteria established for inclusion in this systematic literature review. Included for review were studies that evaluated lavender aromatherapy as a nonpharmacological alternative for managing anxiety and improving outcomes in surgical patients. The therapeutic properties and safety profile of inhaled lavender oil were also assessed across diverse healthcare settings for evidence in support of its effects and health benefits in older adults. The adverse effect profile of benzodiazepines in elderly patients was additionally appraised to qualify the evidence in support of alternative methods for preoperative anxiolysis in older surgical patient populations. Although multiple themes were considered, collectively, the evidence supplied by the eight included articles supports lavender oil aromatherapy as an alternative method of preoperative anxiolysis in elderly surgical patients. The themes of the eight studies are summarized below:

Anxiolytic Efficacy of Lavender Aromatherapy in General Adult Population

A systematic review and meta-analysis of 22 RCTs were completed to scrutinize the strength of evidence in support of the efficacy of lavender aromatherapy as an anxiolytic treatment strategy across assorted patient populations and healthcare settings. Data synthesized from this meta-analysis revealed lavender as an efficacious method for lowering signs and symptoms related to anxiety in healthy patients with and without preexisting anxiety disorders.

Lavender aromatherapy was also found to have favorable efficacy in lowering systolic blood pressure and salivary cortisol levels; however, lavender oil was not detected to produce any beneficial effects on diastolic blood pressure.¹²

Preoperative Anxiolytic Efficacy of Lavender Aromatherapy in Surgical Adult Population

Two studies evaluated the anxiolytic efficacy of lavender oil inhalation during the preoperative period in adult surgical patients. Amongst these was one RCT directed by Braden et al. that surveyed the potential use of the essential oil lavandin to reduce preoperative anxiety in a diverse population of adult general surgery patients. This RCT concluded the association of lavender with substantially lower anxiety levels during operating room (OR) transfer and promote the inhalation of lavender via aromatherapy techniques as a safe, low-risk, cost-effective alternative intervention for alleviating the presence of pre-procedural anxiety in adult patients awaiting surgery.⁹ To contrast, one observational pilot study sought to evaluate the effects of lavender oil aromatherapy during the preoperative care of a smaller subset of adult surgical patients. Results generated by this pilot study demonstrated the application of a lavender oil aromatherapy patch to produce a significant reduction in preoperative VAS scores from baseline to anesthesia start and thus concluded the beneficial use of lavender aromatherapy for anxiety reduction in female patients before breast surgery. While the effects of lavender oil on vital signs were also investigated by this study, no significant changes in vital sign measurements were depicted by the study. The conclusions made by this study are consistent with prior research studies on the efficacy of lavender oil inhalation for reducing anxiety and add evidence supporting the anxiolytic effects of lavender oil aromatherapy in the preoperative period.¹⁴

Therapeutic Efficacy of Lavender Aromatherapy in Elderly Population

Two studies, one RCT and one systematic review with meta-analysis set out to assess the effects of inhaled aromatherapy with lavender oil on multiple outcome variables essential to the

health of elderly populations, including anxiety level, fatigue level, sleep quality, stress, pain, and depression.^{15,16} The RCT by Genc et al.¹⁶, investigated the impact of lavender oil on elderly individuals and concluded that aromatherapy via lavender oil inhalation improved sleep quality and diminished fatigue severity in the elderly. Lavender oil was additionally concluded by these authors to have short-term effects on sleep quality and fatigue level.¹⁶ The systematic review and meta-analysis conducted in 2020 by Her & Cho¹⁵ adjudicated inhalation of lavender oil to improve the quality of sleep and decrease anxiety, pain, stress, and depression in elderly patients, based on the meta-analysis of 26 of the 30 included studies that analyzed lavender aromatherapy.¹⁵ The authors of both studies agree that aromatherapy with lavender oil produces therapeutic effects on anxiety, sleep, fatigue, and stress in elderly individuals.^{15,16}

Adverse Effects of Benzodiazepines in Elderly Population

Two studies scrutinized the impactful nature of benzodiazepines on several neurocognitive risk factors in elderly people. Both studies concurred that the use of benzodiazepines in elderly adults produces negative effects on cognitive function and enhances the risk of neurocognitive decline in these individuals and were synonymous in their recommendations regarding the need for caution if prescribing benzodiazepines to elderly people and for useful approaches to lessen the use of these drugs in the geriatric population.^{15,16}

Amongst these studies is a 3-phase randomized, multicentric longitudinal study facilitated over ten years that compared non-users of benzodiazepines with current benzodiazepine users and their respective risk of cognitive impairment-not dementia (CIND), Alzheimer's disease (AD), and all-cause dementia with benzodiazepine use in people aged 65 years and older.⁷ Results portrayed by this longitudinal study linked benzodiazepine use to a greater risk of cognitive impairment (i.e., cognitive impairment-not dementia (CIND)); however, no association between benzodiazepine exposure and an increased risk of dementia or Alzheimer's disease (AD) was

found. Findings gathered by this study conclude that benzodiazepine use in elderly people increases the occurrence risk of cognitive dysfunction and highlights the need for caution when prescribing benzodiazepines to older patients to preserve cognitive function.⁷ Authored by Frolich et al.², a prospective observational study aimed to explore whether a 2-mg intravenous (IV) dose of the short-acting benzodiazepine midazolam affects cognitive function in older adults. Psychometric and functional imaging techniques were used to objectively measure changes in brain function in older adults following administration of a single small dose of midazolam. The authors of this study found midazolam decreased both immediate and delayed memory and produced a significant effect on rs-fMRI results.² This study concluded the statistically significant effects of midazolam on brain networks before and after administration and associated midazolam with memory changes in older adults.²

Anxiolytic Efficacy of Lavender Aromatherapy versus Diazepam

One RCT by Bradley et al.¹⁷ compared the effects of lavender odor inhalation with the effects of diazepam administration on gerbil behavior, following acute administration (a single 24-hour exposure) and chronic administration (24 hours per day for 14 days). Conclusions drawn by this study include that lengthened exposure to lavender essential oil odor has mildly anxiolytic effects in gerbils and that both acute and chronic exposure to lavender demonstrates an anxiolytic profile in gerbils similar to that of the anxiolytic diazepam. Results from this study also support theories that credit lavender oil's mode of anxiolytic action to its interaction with multiple neurotransmitter chemical pathways, distinct from those affected by benzodiazepines.¹⁷ This conclusion explains how lavender essential oil can produce an anxiolytic profile comparable to diazepam, yet without the commonplace adverse effects seen of agents within the benzodiazepine drug class.

Table 1. Literature Review Summary

Author(s)	Purpose	Methodology & Research Design	Interventions & Methods	Sampling & Setting	Primary Results	Relevant Conclusions
Braden et al.⁹, 2009	To explore the use of the essential oil lavandin to reduce preoperative anxiety	RCT, single-blind	Patients were randomized to one of three groups. Patients within the control group received standard care (family involvement and preoperative medications). Experimental group patients underwent both topical and olfactory application of the essential oil lavandin. Patients who were randomized to the final group received a topical and olfactory application of jojoba oil. Patients in all three randomized groups scored their anxiety on a 100 mm visual analog scale (VAS) at two distinct times: during admission and transfer to the OR. The VAS score obtained at admission served as a baseline preoperative anxiety reading, for comparison with the post-intervention VAS score gathered upon OR transfer.	150 adult general surgery patients, preoperative surgical area	The use of olfactory and topical lavandin produced substantially lower anxiety at the time of OR transfer, which was determined to be the time associated with the highest level of preoperative anxiety. Inhalation of the essential oil lavandin was determined to be very effective in decreasing preoperative anxiety in a diverse surgical population.	This RCT concluded the association of lavender with substantially lower anxiety levels during operating room (OR) transfer and promote the inhalation of lavender via aromatherapy techniques as a safe, low-risk, cost-effective alternative intervention for alleviating the presence of pre-procedural anxiety in adult patients awaiting surgery.
Jaruzel et al.¹⁴, 2018	To evaluate preoperative anxiety levels and vital signs before and after placement of a lavender oil aromatherapy patch	Observational pilot study, one-group, pre-and post-test design	Patients within the observational group underwent placement of the lavender oil aromatherapy patch during routine monitor placement in the preoperative area. The VAS was utilized to assess the participants' subjective preoperative anxiety levels at baseline (before lavender patch placement) and 15-minute intervals after patch placement until anesthesia start time. Vital signs were also assessed at identical 15-minute intervals.	30 adult female patients scheduled for breast surgery, preoperative holding area	The placement of a lavender oil aromatherapy patch from the start of the preoperative period to the anesthesia start time (the average patch time was 58.1 minutes) generated statistically significant decreases in the anxiety VAS measurements from baseline to final scores obtained at the time of anesthesia start. Vital sign measurements, however, did not demonstrate any significant changes from baseline to final.	Application of a lavender oil aromatherapy patch demonstrated a significant reduction in preoperative VAS scores from baseline to anesthesia start; therefore, results from this study are consistent with prior research studies on the efficacy of lavender oil inhalation for reducing anxiety in the preoperative period. Results generated by this pilot study conclude on the beneficial use of lavender aromatherapy for anxiety reduction in female patients before breast surgery and add evidence supporting the anxiolytic effects of lavender oil aromatherapy.

Kang et al.¹², 2019	To scrutinize the strength of evidence in support of the efficacy of lavender aromatherapy as an anxiolytic treatment strategy	Systematic review and meta-analysis of randomized controlled trials	Ten research databases were searched for relevant studies between 2000 and 2018. RCTs that investigated the anxiolytic effects of lavender oil aromatherapy for patients with or without clinical anxiety were included in the literature search. Self-rated anxiety and physiological anxiety were the outcome measures evaluated to assess the effects of aromatherapy with lavender for anxiolysis.	22 RCTs	The meta-analysis revealed lavender as an efficacious method for lowering signs and symptoms related to anxiety in healthy patients with and without preexisting anxiety disorders. Lavender aromatherapy was also found to have favorable efficacy in lowering systolic blood pressure and salivary cortisol levels; however, lavender oil was not detected to produce any beneficial effects on diastolic blood pressure.	Data synthesized from this meta-analysis demonstrated lavender inhalation to be effective in reducing both the psychic and somatic manifestations of anxiety.
Genc et al.¹⁶, 2020	To assess the effects of inhaled aromatherapy with lavender oil on the sleep quality and fatigue level of the elderly population.	RCT	The study participants were randomized to an intervention group and a control group. The intervention group received lavender oil inhalation 30 minutes before sleep every day for one month, whereas the control group did not receive any aromatherapy techniques. Three methods of data collection were used by researchers for this study: The Elderly Description Questionnaire, Pittsburgh Sleep Quality Index (PSQI), and Fatigue Severity Scale (FSS). Sleep quality and fatigue levels in the elderly were the outcome measures evaluated by this study.	59 elderly nursing home residents	Lavender oil inhalation administered 30 minutes before bedtime for one month, increased sleep quality and reduced levels of fatigue in elderly nursing home patients.	This randomized-controlled study concluded that aromatherapy via lavender oil inhalation improved sleep quality and diminished fatigue severity in the elderly. Lavender oil was concluded to have short-term effects on sleep quality and fatigue level.
Her & Cho¹⁵, 2021	To characterize studies on aromatherapy and sleep quality and to investigate the effects of aromatherapy on sleep quality and fatigue in elderly populations	Systematic literature review and meta-analysis	Eight databases were searched for relevant studies published between 2011 and 2019. Analysis of the characteristics of 1657 participants was performed before the meta-analysis of the results from the 30 research studies included in the literature review. Anxiety, pain, stress, fatigue, sleep quality, and depression were the main outcome variables measured by the 30 included articles.	1657 participants from 12 RCTs and 18 quasi-experimental studies	A meta-analysis of 30 included studies revealed aromatherapy techniques to produce reductions in anxiety, pain, stress, and depression in adult and elderly individuals; however, no significant effects on fatigue reduction were revealed by this study.	As 26 of the 30 included articles investigated aromatherapy with lavender essential oil, this study concluded inhalation of lavender oil improves quality of sleep and decreases anxiety, pain, stress, and depression in elderly patients.

Bradley et al.¹⁷, 2007	To investigate and compare the effects of lavender odor inhalation with the effects of diazepam administration on gerbil behavior.	RCT	Gerbils were randomly assigned to control groups and experimental groups to assess the effects of lavender aromatherapy following acute exposure (a single 24-hour exposure) and chronic administration (24 hours per day for 14 days). Acute and chronic diazepam administration was investigated in gerbils within similar experimental groups and compared to the results demonstrated by the lavender chronic administration group. The elevated plus maze (EPM) was the behavioral testing apparatus used by researchers, owing to its beneficial use as a non-conditioned anxiety model for rodents. Following 24-hour acute exposure to lavender oil odor, gerbils were tested on day 2 in the mazes, whereas gerbils within the chronic lavender group underwent EPM testing on day 15. Gerbils within the acute and chronic diazepam groups underwent similar EPM testing to facilitate result comparison with the lavender groups.	182 mature gerbils	Following two weeks of exposure, lavender odor produced a decrease in anxiety nearly identical to the reduction in anxiety produced by chronic diazepam; however, minor differences in the outcome results produced by these agents indicate the likelihood that lavender essential oil and diazepam produce anxiolysis via differing pathways.	Conclusions drawn by this study include that lengthened exposure to lavender essential oil odor has mildly anxiolytic effects in gerbils and that exposure to lavender demonstrates an anxiolytic profile in gerbils similar to that of the anxiolytic diazepam. Results from this study also support theories that credit lavender oil's mode of anxiolytic action to its interaction with various neurotransmitter chemical pathways.
Nafti et al.⁷, 2020	To investigate the risk of cognitive impairment-not dementia (CIND), Alzheimer's disease (AD), and all-cause dementia with benzodiazepine use in people aged 65 years and older.	3-phase, 10-year, randomized, multicentric longitudinal study	Participants aged 65 years and older, residing within communities and institutions were randomly selected for study inclusion and assessed for benzodiazepine exposure and the presence of pre-existing severe dementia. Data sets included participants for dementia, AD, and CIND as the outcomes measured.	10,263 participants aged over 65 living in the community and institutions	Compared with nonusers of benzodiazepines, current benzodiazepine use was linked to a greater risk of cognitive impairment (i.e., cognitive impairment-not dementia (CIND)); however, no association between benzodiazepine exposure and an increased risk of dementia or Alzheimer's disease (AD) was found.	This study concluded that benzodiazepine use in elderly people increases the occurrence risk of cognitive dysfunction and highlights the need for caution when prescribing benzodiazepines to older patients to preserve cognitive function.
Frolich et al.², 2020	To objectively explore whether a 2-mg intravenous (IV) dose of the	Prospective observational study	Psychometric and functional imaging techniques, namely, the Repeatable Battery for the Assessment of Neuropsychological Status test (RBANS) and the resting-state functional magnetic imaging (rs-fMRI), were used to measure changes in brain function in	Adults 55-73 years of age	Midazolam decreases both immediate and delayed memory and produces a significant effect on rs-fMRI results. Baseline resting-state connectivity between brain networks before administration of midazolam	This study concluded the statistically significant effects of midazolam on brain networks before and after administration and associated midazolam with

<p>short-acting benzodiazepine midazolam affects cognitive function in older adults.</p>		<p>older adults following administration of a single small dose of midazolam.</p>		<p>demonstrated immediate memory decline after midazolam infusion.</p>	<p>memory changes in older adults. Study researchers support the rs-fMRI as a reliable measure to predict the sensitivity in elderly adults to midazolam.</p>
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Discussion and Summary of Evidence

A total of eight articles were determined to be of sufficient quality and relevance to the clinical topic in question and were thus selected for literature review. The efficacy of aromatherapy with lavender oil in alleviating preoperative anxiety in comparison to standard preoperative care for anxiolysis was one of the crucial concepts evaluated in this literature review. Two of the eight included articles assessed this important concept by investigating lavender oil and its effectiveness when employed in the preoperative setting. Each of these two studies further describes the benefit of aromatherapy in managing preoperative anxiety, over traditional preoperative treatments for anxiety.^{9,14} While older surgical patients, over the age of 65, were among the participants included in these studies, the effects of lavender oil in the general adult surgical population were investigated; the elderly surgical population was not the sole clinical focus of these studies.

A randomized controlled trial (RCT) conducted by Braden, Reichow, and Halm⁹ was one of the research studies that explored the use of lavender for the management of preoperative anxiety in general surgery patients. The authors support lavender as one of the safest essential oils and describe its wide range of applicable uses in healthcare. Evidence gathered by this RCT concluded the association of lavender with substantially lower anxiety levels during operating room (OR) transfer and promote the inhalation of lavender via aromatherapy techniques as a safe, low-risk, cost-effective alternative intervention for alleviating the presence of pre-procedural anxiety in adult patients awaiting surgery.⁹ Researchers responsible for this study recommended further data collection to determine the effects of lavender in specific surgical patient populations, including older surgical patients and those diagnosed with high anxiety levels.⁹

A pilot study completed by Jaruzel et al.¹⁴ evaluated preoperative anxiety levels and vital signs before and after placement of a lavender oil aromatherapy patch. Due to its analysis of preoperative anxiety relief as a function of inhalation of lavender essential oil, this pilot study contributed data findings in favor of the anxiolytic efficacy of inhaled lavender oil and was thus selected for review.¹⁴ Conclusions drawn by the authors of this pilot study were similar to those drawn by the authors of the above-mentioned RCT and describe aromatherapy of lavender oil, following topical application, to be statistically significant in decreasing preoperative anxiety around the time of operating room transfer.^{9,14} Following the notation of important limitations by the authors of this study, they recommended the need for future research studies with larger sample sizes and inclusion of various populations of surgical patients and preoperative settings.¹⁴

Recently, a systematic review and meta-analysis of randomized controlled trials were facilitated to explore the strength of the evidence in support of the anxiolytic efficacy of lavender. This data review, conducted by Kang, Nam, Lee, and Kim¹², was classified as the first of its kind to scrutinize the efficacy of lavender aromatherapy as an anxiolytic treatment strategy. Self-rated anxiety and physiological anxiety measures were evaluated to assess the effects of aromatherapy with lavender for anxiolysis. The author's meta-analysis revealed lavender as an efficacious method in lowering signs and symptoms related to anxiety in healthy patients with and without preexisting anxiety disorders. Data collected by these researchers demonstrated lavender inhalation to be effective in reducing both psychic and somatic manifestations of anxiety.¹² Limitations identified within this article are the various health conditions of the study participants, methodological strategies, and intervention types across the included studies. Recommendations for future related research include studies that inspect the anxiolytic effects of lavender aromatherapy on surgical populations with diverse clinical disease features. Vital signs

are considered by these authors to be an objective, physiological indicator of anxiety; therefore, the inclusion of vital signs as an outcome for evaluation in future related studies is also recommended.¹²

Two articles, one systematic literature review, and meta-analysis, and one RCT, highlighted the variety of positive health effects produced by lavender aromatherapy within older patients across a range of care settings and were thus selected for review. The authors of each study investigated the effects of lavender aromatherapy on sleep quality and fatigue in elderly populations and concluded inhalation of lavender oil improves the quality of sleep and decreases fatigue in these patients.^{15,16} The systematic review and meta-analysis conducted by Her and Cho¹⁵ involved an inclusive review and meta-analysis of 30 articles that further revealed lavender aromatherapy techniques to produce reductions in anxiety, pain, stress, and depression in adults and elderly individuals.¹⁵ Both of these articles expressed the need for future research on the comparative effectiveness of lavender inhalation following different treatment durations and in distinct patient-care settings. A comparison of the long-term versus short-term effects of essential oil aromatherapy in elderly patients is also recommended as an area of future research.^{15,16}

One RCT, conducted by Bradley et al.¹⁷, investigated and compared the effects of lavender odor inhalation with the effects of diazepam administration on gerbil behavior. Following two weeks of exposure, lavender odor produced a decrease in anxiety nearly identical to the reduction in anxiety produced by chronic diazepam; however, minor differences in the outcome results produced by these agents indicate the likelihood that lavender essential oil and diazepam produce anxiolysis via differing pathways. Conclusions drawn by this study include that lengthened exposure to lavender essential oil odor has mildly anxiolytic effects in gerbils

and that exposure to lavender demonstrates an anxiolytic profile in gerbils similar to that of the anxiolytic diazepam. Results from this study also support theories that credit lavender oil's mode of anxiolytic action to its interaction with various neurotransmitter chemical pathways.¹⁷

The two remaining articles selected for inclusion within this literature review assessed the adverse effects and safety profile of benzodiazepines when administered to older adults. One of these articles was a three-phase, ten-year, randomized, multicentric longitudinal study conducted by Nafti et al.⁷, which investigated the risk of cognitive impairment-not dementia (CIND), Alzheimer's disease (AD), and all-cause dementia with benzodiazepine use in people aged 65 years and older.⁷ Researchers responsible for this study revealed that compared with nonusers of benzodiazepines, current benzodiazepine users were linked to having a greater risk of cognitive impairment (i.e., cognitive impairment-not dementia (CIND)); however, no association between benzodiazepine exposure and an increased risk of dementia or Alzheimer disease (AD) was found. This study further concluded that benzodiazepine use in elderly people increases the occurrence risk of cognitive dysfunction and highlights the need for caution when prescribing benzodiazepines to older patients to preserve cognitive function.⁷ Similarly, a prospective observational study implemented by Frolich et al.² aimed to objectively explore whether a 2-mg intravenous (IV) dose of the short-acting benzodiazepine midazolam affects cognitive function in older adults.² Results collected through this study found midazolam to decrease both immediate and delayed memory and produce a significant effect on rs-fMRI results. Baseline resting-state connectivity between brain networks before administration of midazolam demonstrated immediate memory decline after midazolam infusion. This study concluded on the statistically significant effects of midazolam on brain networks before and after administration and associated midazolam with memory changes in older adults.²

Conclusions

Research into the efficacy of the essential oil lavender on preoperative anxiety reduction in comparison to standard pharmacologic care has been conducted however and reveals lavender aromatherapy as a cost-effective, low-risk intervention for lowering preoperative anxiety.

Lavender oil aromatherapy is further advertised as a potential method to improve perioperative outcomes and patient satisfaction ratings; although, the need for additional studies that explore the effects of lavender in special surgical populations, such as in elderly surgical patients is vital for optimal geriatric surgical care.⁹ Although there is evidence in favor of several measurable effects of lavender aromatherapy in elderly people, studies that replicate the efficacy of lavender in older adults following preoperative administration are lacking. Evidence-based literature evaluated in this literature review demonstrated agreement on the therapeutic effects of the essential oil lavender in the form of inhalational aromatherapy in reducing anxiety in surgical patients before surgery; therefore, further investigation into these benefits within the elderly population and in comparison to the drugs within the benzodiazepine drug class is required. While data included within this review revealed a notable comparison between the anxiolytic effects of lavender oil aromatherapy and the benzodiazepine diazepam; studies that directly compare the efficacy of lavender oil and the benzodiazepine midazolam are warranted, as midazolam remains the most commonly ordered pharmacologic agent for managing preoperative anxiety.

III. Purpose and PICO Clinical Question

Purpose

To present an educational module to anesthesia providers on the therapeutic advantages of inhaled lavender oil aromatherapy compared to intravenous midazolam, for preoperative anxiolysis in elderly surgical patients.

PICO Clinical Question

In elderly patients scheduled for surgery, what are the effects of lavender oil aromatherapy compared to intravenous midazolam on improving preoperative anxiolysis?

Population (P): Elderly patients scheduled for surgery

Intervention (I): Lavender oil aromatherapy

Comparison (C): Intravenous midazolam

Outcomes (O): Improvement of preoperative anxiolysis

IV. Conceptual Underpinning of the Project

Primary DNP Project Goal

Presently, the preoperative care of elderly surgical patients does not include alternative strategies to benzodiazepine administration for the prevention or treatment of anxiety before surgery; owing to the wealth of adverse drug effects known to follow benzodiazepine administration in adults over 65 years old, safer anxiolytic therapies are mandated to optimize their health outcomes. Holistic healthcare approaches through the incorporation of CAM techniques continue to gain attention in modern medicine and have sparked a scientific investigation of the efficacy of inhaled aromatherapy. Aromatherapy is a prevalent form of complementary and alternative medicine (CAM) that utilizes essential oils extracted from aroma plants for medicinal purposes.¹¹ Aromatherapy has been practiced for centuries by numerous countries as a form of herbal medicine that is based on the influence of essential oils on the

mind-body connection through interaction with the olfactory system. Essential oils like lavender are volatile compounds that when inhaled can produce a variety of beneficial physiologic and psychological effects. Studies hypothesize that linalyl acetate and linalool, the main chemical components of lavender oil, when inhaled, act upon the limbic system of the brain, specifically the amygdala and hippocampus, to produce their therapeutic effects.¹⁰ Lavender's major constituents are considered responsible for producing anxiolysis with minimal side effects, thereby supporting lavender as the superior essential oil for treating anxiety.¹⁰

Evidence-based research gathered from the literature review establishes that lavender oil relieves anxiety, reduces mental stress, and promotes sedation and good sleep.⁵ Investigation into the anxiolytic effects of lavender aromatherapy across several patient populations, application types, and outcome measures conclude lavender inhalation to be a safe and affordable strategy for relieving anxiety.⁵ This project aims to propose lavender oil aromatherapy as an alternative approach to intravenous midazolam administration for managing preoperative anxiety in elderly surgical patients who are unable to receive standard psychotropic drug therapy, to improve perioperative care outcomes for elderly patients scheduled for surgery. The primary goal of this project is to improve anesthesia provider knowledge on the use of lavender oil aromatherapy as an alternative to midazolam for quality improvement of preoperative anxiolysis in elderly surgical patients. As a result of this project, it is expected that participants will gain increased knowledge of the effects and outcomes of managing preoperative anxiety with lavender aromatherapy compared to midazolam in elderly surgical patients. Furthermore, it is expected that this project will benefit elderly surgical patients who experience preoperative anxiety with a proposal for a safer treatment option to improve perioperative outcomes.

Goals and Outcomes

To direct the creation of the goal objectives, the SMART acronym was employed. The acronym SMART delineates that the objectives of this project should be specific, measurable, achievable, realistic, and timely.¹⁸ This project's objectives are to enhance knowledge of the effects and outcomes in managing preoperative anxiety with lavender aromatherapy compared to midazolam in elderly surgical patients and to determine the efficacy of a virtual PowerPoint educational intervention to meet this objective. The desired outcome of this project is increased anesthesia provider knowledge on the use of lavender oil aromatherapy as an alternative to midazolam for preoperative anxiolysis in elderly surgical patients. A virtual pre-test/post-test design will be used to collect data and evaluate outcomes related to the participants' knowledge, perceptions, and practices on lavender oil aromatherapy for preoperative anxiolysis in elderly adult patients.

Specific

Participating anesthesia providers will gain access via email invitation to a 20-minute virtual educational module containing a pre-test survey, an evidence-based PowerPoint presentation, and a post-test survey. As a result of this project, it is expected that participants will gain an increased knowledge of the effects and outcomes in managing preoperative anxiety with lavender aromatherapy compared to midazolam in elderly surgical patients. Furthermore, it is expected that this project will benefit elderly surgical patients who experience preoperative anxiety with a proposal for a safer treatment option to improve perioperative outcomes. Collaboration amongst anesthesia personnel enables this project's specific goals to be realistic and achievable within the timeframe allotted by the graduate program.

Measurable

Anesthesia providers' knowledge of several crucial concepts related to the preoperative

care of anxiety in elderly patients scheduled for surgery will be explored before and after the completion of the virtual educational intervention. Concepts to be evaluated include the relationship between untreated preoperative anxiety and increased morbidity, the inadequacy of conventional methods for preoperative anxiolysis in older adults, benzodiazepine-induced adverse effects in the elderly, the aromatherapeutic effects of lavender essential oil, and the holistic benefits and efficacy of lavender oil aromatherapy. A virtual pre-test/post-test survey design will be used to collect and analyze data on participants' knowledge, perceptions, and practices related to lavender oil aromatherapy and to evaluate pre- and post-educational intervention outcomes.

Achievable

Following participation in the virtual educational intervention, Participating anesthesia providers will gain increased knowledge of the benefits of managing preoperative anxiety with lavender aromatherapy compared to midazolam in elderly surgical patients. Furthermore, it is expected that this project will provide elderly surgical patients who experience preoperative anxiety with a safer treatment option to improve perioperative outcomes and satisfaction. data generated during the project's evaluation phase will be used to assess the efficacy of the virtual educational module on lavender aromatherapy.

Realistic

Anesthesia providers will be educated on the anxiolytic efficacy of preoperative lavender oil inhalation aromatherapy in elderly patients via a virtual educational module presented by the student registered nurse anesthetist (SRNA). Existing methods for managing preoperative surgical anxiety will be reexplored to consider evidence-based recommendations on lavender oil aromatherapy techniques to improve patient outcomes and satisfaction in the elderly surgical population. A pre-and post-intervention survey will be administered to analytically compare

data on anesthesia provider knowledge and generate result reports on the efficacy of the virtual educational intervention.

Timely

The virtual lavender aromatherapy educational module will be finalized and made available to participating anesthesia providers for a total of three weeks. The outcomes of this project's initiatives are as follows: within a 3-week time frame, anesthesia providers will gain improved knowledge on the efficacy of lavender oil inhalation as a therapeutic alternative to midazolam for achieving preoperative in elderly individuals. A virtual pre-test/post-test survey design will be employed to analyze data and outcomes related to the surveyed participants' knowledge and virtual educational intervention on lavender oil aromatherapy.

Project Structure

The buildout of a lavender aromatherapy educational course and protocol will necessitate a detailed organizational assessment to reveal knowledge gaps and the significance, relevance, value, and connection of the project to all interested stakeholders. The strengths, weaknesses, opportunities, and threats (SWOT) analysis tool will be engaged to assess both the internal and external features and threats to the project's developmental goals. The quality improvement project aims to highlight anesthesia providers' knowledge of preoperative strategies for managing anxiety in elderly surgical patients and its implications for perioperative care outcomes in these patients; therefore, building a team of expert stakeholders is a vital initial step. With their consent, participants will complete an anonymous virtual pre-test survey to assess their knowledge, perception, and current clinical practices related to utilizing lavender oil aromatherapy for quality improvement of preoperative anxiolysis in elderly surgical patients. Participants will then watch a virtual educational PowerPoint based on the findings of an evidence-based systematic review and fill out a virtual post-test survey questionnaire.

Strengths

Owing to the interaction of essential oils with the neuropsychological system following inhalational absorption, several essential oils when used in clinical aromatherapy practice techniques produce characteristic physiologic and psychological effects. Evidence-based research now supports inhaled lavender oil aromatherapy as an effective alternative treatment approach for a variety of health ailments, including anxiety. Clinical evidence positively details the anxiolytic efficacy of lavender oil therapy and supports lavender as the most appropriate essential oil for treating anxiety. Scientific research data backs the therapeutic application of lavender essential oil aromatherapy in surgical patients for the management of anxiety, particularly if present during the preoperative period.¹⁰ Lavender oil's applicability as an alternative anxiolytic treatment strategy proves beneficial for managing presurgical anxiety in older adults and other individuals with enhanced sensitivity to conventional pharmacological agents, such as midazolam in elderly patients. Older surgical patients would benefit from the improvisation of preoperative treatment protocols to specify alternative anxiety-reduction methods in elderly patients who are unable to receive traditional anxiolytic drugs, as a consequence of the documented adverse effects of these agents in elder populations.¹

This project, therefore, aims to provide education and the necessary evidence-based data for anesthesia providers to incorporate lavender aromatherapy guidelines into a standardized preoperative care protocol for elderly surgical patients to optimize their surgical outcomes. An anticipated strength of this preoperative aromatherapy protocol is the wealth of literature that explains the influence of anesthesia techniques on immediate and long-term postoperative surgical outcomes and therefore emphasizes the need to incorporate more therapeutic interventions to optimally balance general anesthetic techniques, especially for certain special surgical populations.¹

Weaknesses

Imperative to the project's success is a thorough analysis of any potential internal factors that may disrupt the project's ability to meet its defined goals and objectives. The lingering presence of research-practice gaps surrounding the best strategic methods for managing preoperative anxiety in older adult surgical patients is an identified weakness that may hinder the quality of this project's desired outcome.¹⁸ Habitual utilization of previously accepted pharmacotherapies often bars the consideration of modern alternative strategies to achieving anxiolysis in special surgical populations. While the negative implications of the benzodiazepine drug class in geriatric patients are generally well understood within the anesthesia profession, conflicting research evidence on the efficacy of alternative approaches for preoperative anxiolysis is an issue that further promotes the reluctance of anesthesia providers from considering the need for updated preoperative therapy guidelines that best meet the therapeutic needs of elder adults scheduled for surgery. Therefore, another probable weakness to this project's success is that experienced anesthesia providers are often disinclined to alter their anesthetic techniques and may cite prior or differing evidence to defend their methodology in caring for older adult populations. Significant methodological differences amongst anesthesia providers' patient care approaches complicate unanimous acceptance of the data presented by the evidence-based educational module and of the updates made to previous preoperative guidelines. These provider differences may delay or prevent the incorporation of alternative aromatherapeutic approaches for safely achieving anxiolysis in elderly surgical patients.

Opportunities

Evidence-based literature gathered on the anxiolytic efficacy of lavender aromatherapy recommend the inclusion of lavender oil inhalation therapy within programs designed to assuage anxiety in diverse patient populations and across multiple healthcare settings. The

implementation of aromatherapy protocol guidelines into existing preoperative care standards provides opportunities for multidisciplinary collaboration in the care and management of preoperative anxiety in elderly surgical populations. The collaborative efforts of all anesthesia care providers, including certified registered nurse anesthetists (CRNAs), certified anesthesiologist assistants (CAAs), physician anesthesiologists, and students of each respective anesthesia profession will facilitate the creation of an accepted preoperative care protocol that includes evidence-based recommendations on lavender oil aromatherapy and its use in treating pre-surgical anxiety in geriatric adults. The project's transition for use in clinical practice will further rely on collaboration with perioperative nursing staff to ensure the protocol's recommendations are well understood and appropriately implemented. Successful project implementation at the selected 797-bed level-one trauma hospital may positively influence the likelihood of future project promotion and networking opportunities, and the acceptance and incorporation of the project's established protocol within other trauma facilities and various South Florida hospitals and surgical care facilities.

Threats

External factors that may potentially threaten the project's outcomes are important to identify and address. Threats may include anesthesia providers' negative feelings towards the incorporation of holistic CAM approaches within perioperative care and reluctance to stray from existing preoperative care standards. Unanimous provider compliance is integral to the project's successful protocol implementation; therefore, evidence-based education in favor of the project's recommendations must be strategically presented to all perioperative care staff to promote a clear understanding of the protocol's intended uses and benefits to patient-care outcomes. A thorough understanding of the provided educational resources should promote a working environment of

healthcare providers who share a vested interest in optimizing surgical outcomes in elderly patients through the improvement of preoperative anxiety care.

Organizational Assessment

The implementation of a preoperative aromatherapy protocol for alleviating anxiety in elderly surgical patients is heavily reliant on an effective collaborative team approach. The essential steps for creating the educational module presentation and preoperative care protocol will be accentuated. Pre- and post-test knowledge questionnaires will be employed to assess the effectiveness of the learning intervention and to analytically compare the project's evaluation data with the goals and objectives originated during the planning phase. A summary evaluation report will be synthesized to include the project description, interventions, statement of purpose, methods and tools used for data collection and analysis, historical background of the targeted clinical issue, significant result findings, outcomes, and conclusions, project limitations, and recommendations for project improvement. Project recommendations should strive to enhance the project's overall feasibility and acceptance as a quality improvement tool for future clinical practice use.

V. Methodology

Setting and Participants

This quality improvement project will be employed at a 797-bed level-one trauma facility located in South Florida. The target population will consist of approximately 10 full-time, part-time, or per-diem anesthesia providers working at this facility. The demographics of the participating subjects will include male and female adults, of 25 years to over 60 years of age, and of various education levels and ethnic groups. Although the information presented in this educational intervention applies to all healthcare disciplines involved within the surgical services preoperative care department, this project is focused on anesthesia providers' knowledge,

including that of CRNAs and Physician Anesthesiologists.

Intervention and Procedures

Recruitment of this facility's anesthesia department professionals will take place via an email invitation containing an electronic consent form, a virtual PowerPoint educational module, and a URL link to the pre-and post-intervention questionnaires via the secure online survey platform Qualtrics. With their consent, participants will complete an anonymous virtual pre-test survey to assess their knowledge, perceptions, and current clinical practices regarding the use of lavender oil aromatherapy as an alternative to midazolam for quality improvement of preoperative anxiolysis in elderly surgical patients. Then, the participants will view a virtual educational PowerPoint based on the results of a related systematic review. Participants will be asked to complete the virtual post-test, which will be identical to the virtual pre-test. The virtual pre-test and post-test assessments are expected to take approximately 5 minutes each to complete. The virtual educational session is expected to last approximately 10 minutes. The total duration of participation for this virtual educational module will total about 20 minutes. Demographic data, including gender, age, ethnicity, and title will be obtained as part of the virtual survey. Additionally, the virtual pre-test/post-test survey will be used to collect data related to participants' knowledge, perceptions, and practices related to lavender oil aromatherapy. All data analysis will be completed virtually, and no identifiable private information will be collected.

The project's major interventions and procedures can be summarized as follows: Submission and approval of project proposal by IRB; development of educational PowerPoint module; email anesthesia providers within the selected facility important project details, participation requirements, and directions, voluntary participation consent form, PowerPoint-presented educational course, and an access link to the pre-and post-intervention questionnaires

via online survey portal; statistical analysis of pre-and post-intervention knowledge survey results; evaluation of project outcomes and results.

Protection of Human Subjects

Completed virtual surveys will not be reviewed by investigators until all pre- and post-test virtual surveys have been collected. All project data collected from the virtual pre-test and post-test surveys will be tabulated anonymously to electronic spreadsheets, without the collection of identifiable private information. Electronic data from this project will be stored securely on a password-protected laptop to which access will be limited to the primary project investigators. There are no foreseeable circumstances in which it would be necessary to break confidentiality. The level of risk or discomfort associated with participation in this research project is minimal. Physical, psychological, social, legal, and economic risks involved with this project are minimal, as would be expected in any similar type of educational intervention. The minimal risks involved with this project may include mild emotional stress or minor physical discomfort from sitting on a chair for an extended time, for instance.

Data Collection

Data will be collected anonymously using the virtual pre-test/post-test survey form attached. Demographic data, including gender, age, ethnicity, and title will be obtained as part of the virtual survey. Additionally, the virtual pre-test/post-test survey will be used to collect data related to participants' knowledge, perceptions, and practices related to lavender oil aromatherapy. All data analysis will be completed virtually, and no identifiable private information will be collected.

Data Management and Analysis Plan

Electronic data collected from this project will undergo statistical analysis and be used to determine the strength of the project's outcome results and overall project success. A process

flowchart will be used to guide data management and analysis. A summary evaluation report will be synthesized to include the project description, interventions, statement of purpose, methods and tools used for data collection and analysis, historical background of the targeted clinical issue, significant result findings, outcomes, and conclusions, project limitations, and recommendations for project improvement. Once available, the study's results will be analyzed to derive conclusions on the effectiveness of the project's intervention. The strength of the project's outcomes may be measured and evaluated to generate evidence-based recommendations for its clinical use. Conclusions derived from this project's result findings can supply evidence to the current research literature on alternative therapeutic interventions that would optimize the anesthetic management of older surgical adults and enhance perioperative outcomes in this patient population.

VI. Results

Participant Demographics

A total of 88 invitations were distributed via email to anesthesia providers to participate in the pre-and post-test educational intervention. Nine participants completed the study in its entirety. Nine participants completed the demographic survey section. The average age of the participants was 38 years old. The majority of the participants were female (n=6, 75%), as opposed to male (n=2, 25%). There was also a range of ethnicities represented: Hispanic (n=3, 33%), Caucasian (n=3, 33%), African American (n=2, 22%), Other (n=1, 11%) with no participants of Asian descent. Certified registered nurse anesthetists (CRNAs) made up the majority of the participants (n = 8, 89%), in comparison to anesthesiologists (n=1, 11%). All participants held a graduate degree, most of which were a Doctorate/Ph.D. degree (n=8, 89%). Participants were also asked about their years of practice in the anesthesia profession, finding that the practice period ranged: from 0 to 1 year (n=10, 44%), 2 to 5 years (n=2, 22%), 6 to 10

years (n= 0, 0.0%), and more than 10 years (n=3, 33%). A summary of the participant's demographics is shown in Table 1, shown below.

Table 2. Participant Demographics

Participants (n = 9)	Number	%
Gender		
Male	2	25
Female	6	75
Non-binary/third gender	0	0
Other	0	0
Ethnicity		
Hispanic	3	33
Caucasian	3	33
African American	2	22
Asian	0	0
Other	1	11
Position		
Certified Registered Nurse Anesthetist	8	89
Anesthesiologist	1	11
Anesthesiologist Assistant	0	0
Level of Education		
Bachelors	0	0
Masters	1	11
Doctorate/PhD	8	89
Years of Experience		
0 – 1	4	44
2– 5	2	22
6 – 10	0	0
More than 10	3	33

Pre-Test Knowledge of Preoperative Anxiety and Complications in the Elderly

Survey questions were used to establish a baseline of the participant's knowledge regarding the care of preoperative anxiety in older patients on the incidence of postoperative delirium in the elderly surgical patient population. The pre-test survey results, shown in Table 2,

highlight pre-intervention deficits in knowledge related to the preoperative care of anxiety and associated complications in elderly surgical patients.

In the first question, participants were asked to quantify the percentage of delirium cases that can be attributed to medications in elderly patients. Three participants (33%) responded correctly “39%”. Three participants (33%) chose “54%”, two (22%) selected “7%”, and one provider (11%) responded “100%”, all of which were incorrect choices. The following question asked what the number-one complication in elderly patients following surgery was. 67% of participants (n=6) chose the correct answer “postoperative delirium”, while two providers (22%) incorrectly chose “infection”, and one provider (11%) chose aspiration. None of the participants selected “nausea and vomiting” as an answer choice. When questioned about the adverse effects that untreated preoperative anxiety can lead to, three participants (33%) selected “impaired wound healing”, while the remaining six providers (67%) correctly answered “all of the above”, (which included: increased post-surgical pain and analgesia requirements, immunosuppression, impaired wound healing, worsened mood and satisfaction, and prolonged hospital length of stay).

Pre-Test Knowledge Related to Conventional Preoperative Anxiolysis in Elderly

When asked about adverse drug reactions of midazolam in elderly surgical patients, 67% (n=6) selected the correct answer choice “all of the above” (which included: decreased blood pressure, reduced oxygen saturation, prolonged durations of deep sedation, and residual postoperative drowsiness and amnesia). 22% of participants (n=2) responded with “reduced oxygen saturation”, while 11% (n=1) chose “prolonged durations of deep sedation”.

Pre-Test Knowledge Related to Aromatherapy and Lavender Oil

Participants were asked to identify the region of the body where inhaled lavender oil works. Eight providers (89%) correctly answered “limbic system of the brain”, while only one

(11%) incorrectly chose “adrenal glands”. Zero participants selected either “pancreas” or “GI tract” as their answers. When questioned on the types of holistic treatment approaches that lavender oil is used within, the majority of participants (n=6, 67%) answered correctly “all of the above” (that included: burns, muscle spasms, infections, insect bites, and neurological and psychological disorders). “muscle spasms”, infections, and “neurological and psychological disorders” were each chosen by one provider (11%, 11%, and 11%) respectively.

In the following question, the participants were asked to select “true” or “false” for the following statement: “Aromatherapy utilizes essential oils essential oils extracted from aroma plants, like lavender, that when inhaled can produce a variety of beneficial physiologic and psychological effects”. Seven (78%) participants correctly chose “true”, while 2 (22%) selected “false”. When questioned about the therapeutic properties of lavender oil, only 5 participants (56%) answered correctly with “all of the above” (that included: analgesic, sedative, anxiolytic, anticonvulsant, antidepressant, and neuroprotective). The answer choices “analgesic”, “sedative”, “anxiolytic”, and “antidepressant” were each chosen by one participant, while none of the participants selected “anticonvulsant” or “neuroprotective” as their answer choice.

Pre-Test Beliefs Related to Use of Lavender Oil Aromatherapy

In a “true” or “false” question, participants were provided a true evidence-based statement regarding the use of lavender oil inhalation for mental stress, sedation, sleep, and as a safe and affordable strategy for relieving anxiety. The purpose of this “true” or “false” survey question was to assess participants’ beliefs related to the use of lavender oil aromatherapy. Six (67%) participants answered “true”, while three (33%) chose “false”.

Pre-Test Attitudes Related to Use of Lavender Oil Aromatherapy

The participants were also asked about the likelihood of ordering lavender oil aromatherapy over intravenous midazolam for preoperative anxiolysis in elderly surgical

patients. Three (33%) anesthesia providers chose “most likely”, two (22%) selected “somewhat likely”, three (33%) selected “somewhat unlikely”, and one (11%) participant chose “most unlikely”.

Post-Test Knowledge of Preoperative Anxiety and Complications in the Elderly

When asked to select the percentage of delirium cases that can be attributed to medications in elderly patients, five participants (71%) correctly chose “39%” as their answer. One (14%) participant selected “7%”, while one answered “54%”. The following question asked what the number-one complication in elderly patients following surgery was. 71% of participants (n=5) correctly answered the next question about the number-one complication in elderly patients following surgery as “postoperative delirium”, while two providers (29%) selected “aspiration”. When questioned about the adverse effects that untreated preoperative anxiety can lead to, five participants (71%) correctly answered “all of the above”, (which included: increased post-surgical pain and analgesia requirements, immunosuppression, impaired wound healing, worsened mood and satisfaction, and prolonged hospital length of stay). One (14%) participant selected “immunosuppression” as their answer choice and one (14%) responded with “worsened mood and satisfaction”. Analysis of the pre-test and post-test results for these three survey questions revealed knowledge improvements in this area of 38%, 4%, and 4%, respectively. Data obtained from pre- and post-test survey questions related to anesthesia provider knowledge of preoperative care of anxiety and complications in the elderly surgical patient population are revealed in Table 3.

Table 3. Change in Pre-and Post-Test Knowledge of Preoperative Anxiety and Complications in Elderly

Question	Pre-Test	Post-Test	% Change
What percentage of delirium cases in elderly medical and surgical patients can be attributed to medications?			
7%	2 (22%)	1 (14%)	↓8%
100%	1 (11%)	0 (0%)	↓11%

39% *	3 (33%)	5 (71%)	↑38%
54%	3 (33%)	1 (14%)	↓19
What is the number-one complication in elderly patients following surgery?			
Nausea and vomiting	0 (0%)	0 (0%)	-
Aspiration	1 (11%)	2 (29%)	↑18%
Infection	2 (22%)	0 (0%)	↓22%
Postoperative delirium *	6 (67%)	5 (71%)	↑4%
Untreated preoperative anxiety can lead to:			
Increased post-surgical pain and analgesia requirements	0 (0%)	0 (0%)	-
Immunosuppression	0 (0%)	1 (14%)	↑14%
Impaired wound healing	3 (33%)	0 (0%)	↓33%
Worsened mood and satisfaction	0 (0%)	1 (14%)	↑14%
Prolonged length of hospital stay	0 (0%)	0 (0%)	-
All of the above *	6 (67%)	5 (71%)	↑4%

(*) Correct answer

Post-Test Knowledge Related to Conventional Preoperative Anxiolysis in Elderly

When asked about adverse drug reactions of midazolam in elderly surgical patients, 71% (n=5) selected the correct answer choice “all of the above” (which included: decreased blood pressure, reduced oxygen saturation, prolonged durations of deep sedation, and residual postoperative drowsiness and amnesia). This post-test result represents a 4% knowledge improvement in this category from the pre-test survey data. 14% of participants (n=1) responded with “decreased blood pressure”, while 14% (n=1) chose “residual postoperative drowsiness and amnesia”. Table 4 shows the change in pre-and post-test results.

Table 4. Change in Pre-and Post-Test Knowledge Related to Conventional Preoperative Anxiolysis in Elderly

Question	Pre-Test	Post-Test	% Change
Adverse drug reactions of midazolam in elderly surgical patients include:			
Decreased blood pressure	0 (0%)	1 (14%)	↑14%
Reduced oxygen saturation	2 (22%)	0 (0%)	↓22%
Prolonged durations of deep sleep	1 (11%)	0 (0%)	↓11%
Residual postoperative drowsiness and amnesia	0 (0%)	1 (14%)	↑14%
All of the above *	6 (67%)	5 (71%)	↑4%

(*) Correct answer

Post-Test Knowledge Related to Aromatherapy and Lavender Oil

When asked to select the region of the body that inhaled lavender oil works on, six participants (86%) correctly chose “limbic system of the brain”, while only one participant (14%) chose “adrenal glands”. In the following question, five providers (71%) answered “all of the above” (that included: burns, muscle spasms, infections, insect bites, and neurological and psychological disorders), thus correctly identifying the types of holistic treatment approaches that lavender oil is used within. One (14%) selected “infections” as their answer and one (14%) participant chose “insect bites”.

When given the following “true” or “false” statement: “Aromatherapy utilizes essential oils essential oils extracted from aroma plants, like lavender, that when inhaled can produce a variety of beneficial physiologic and psychological effects”, 100% of participants responded with the correct answer, “true”. Further, when surveyed about the therapeutic properties of lavender oil, five participants (71%) correctly chose “all of the above” (that included: analgesic, sedative, anxiolytic, anticonvulsant, antidepressant, and neuroprotective). The answer choices “analgesic” and “anticonvulsant” were selected each by one participant (14% and 14%). Analytic comparison of the pre-and post-test survey results from this knowledge category (see Table 5) demonstrates improved anesthesia provider knowledge related to aromatherapy and lavender oil, following the educational module.

Table 5. Change in Pre-and Post-Test Knowledge Related to Aromatherapy and Lavender Oil

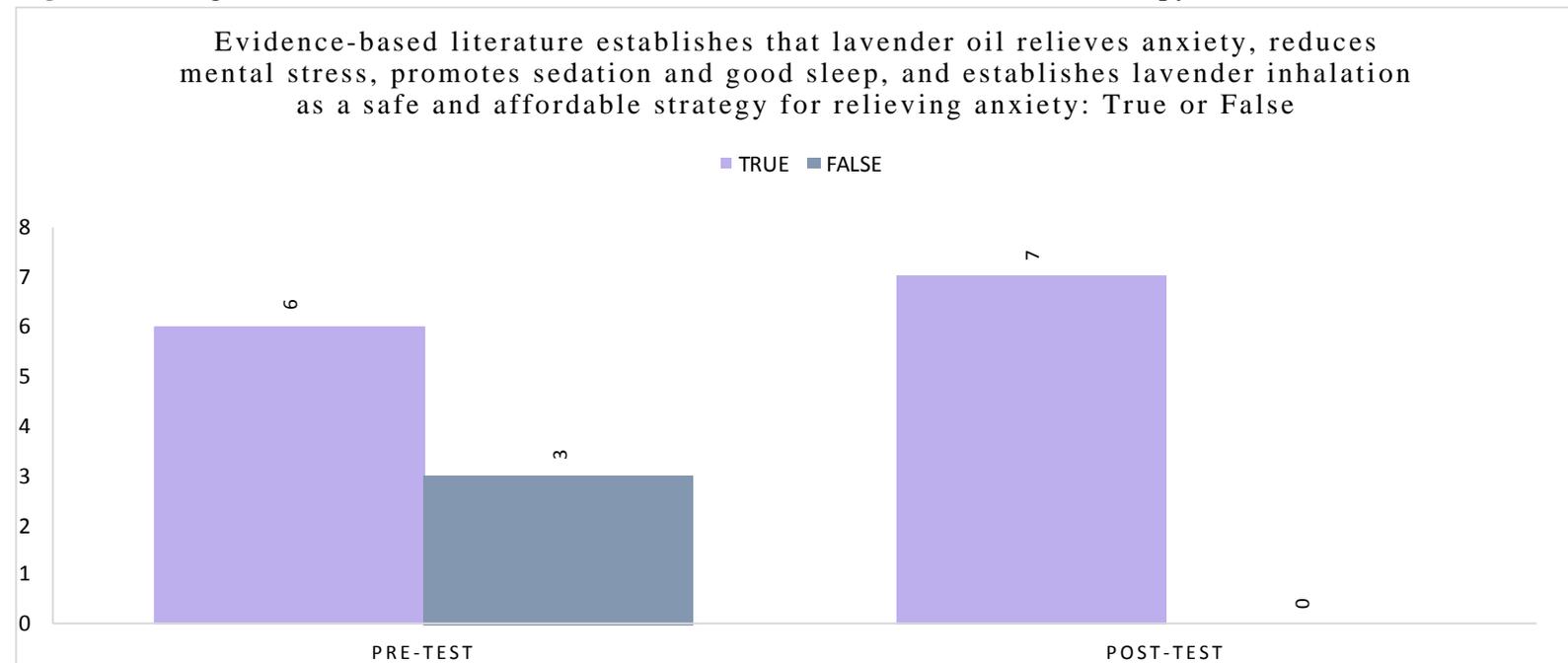
Question	Pre-Test	Post-Test	% Change
The main components of lavender oil, linalyl acetate and linalool, act on what region of the body when inhaled?			
Pancreas	0 (0%)	0 (0%)	-
Limbic system of the brain *	8 (89%)	6 (86%)	↓3%
Adrenal glands	1 (11%)	1 (14%)	↑3
GI tract	0 (0%)	0 (0%)	-
Lavender oil’s therapeutic and curative properties enable its use within			

what types of holistic treatment approaches?			
Burns	0 (0%)	0 (0%)	-
Muscle spasms	1 (11%)	0 (0%)	↓11%
Infections	1 (11%)	1 (14%)	↑3%
Insect bites	0 (0%)	1 (14%)	↑14%
Neurological and psychological disorders	1 (11%)	0 (0%)	↓11%
All of the above *	6 (67%)	5 (71%)	↑4%
Aromatherapy utilizes essential oils extracted from aroma plants, like lavender, that when inhaled can produce a variety of beneficial physiologic and psychological effects: True or False			
True *	7 (78%)	7 (100%)	↑22%
False	2 (22%)	0 (0%)	↓22%
Lavender oil possesses what therapeutic properties?			
Analgesic	1 (11%)	1 (14%)	↑3%
Sedative	1 (11%)	0 (0%)	↓11%
Anxiolytic	1 (11%)	0 (0%)	↓11%
Anticonvulsant	0 (0%)	1 (14%)	↑14%
Antidepressant	1 (11%)	0 (0%)	↓11%
Neuroprotective	0 (0%)	0 (0%)	-
All of the above *	5 (56%)	5 (71%)	↑15%

(*) Correct answer

Post-Test Beliefs Related to Use of Lavender Oil Aromatherapy

Participants were asked if they believed the statement “Evidence-based literature establishes that lavender oil relieves anxiety, reduces mental stress, promotes sedation and good sleep, and establishes lavender inhalation as a safe and affordable strategy for relieving anxiety” to be “true” or “false”. The purpose of this “true” or “false” survey question was to assess and compare participants’ knowledge and beliefs related to the use of lavender oil aromatherapy before and after the educational module. 100% (n=7) of participants responded with the correct answer, “true”, which is a 33% increase from the pre-test survey. This increase may indicate enhancements in anesthesia provider beliefs related to the use of lavender oil aromatherapy. Figure 1 illustrates the differences between the pre-and post-test response data.

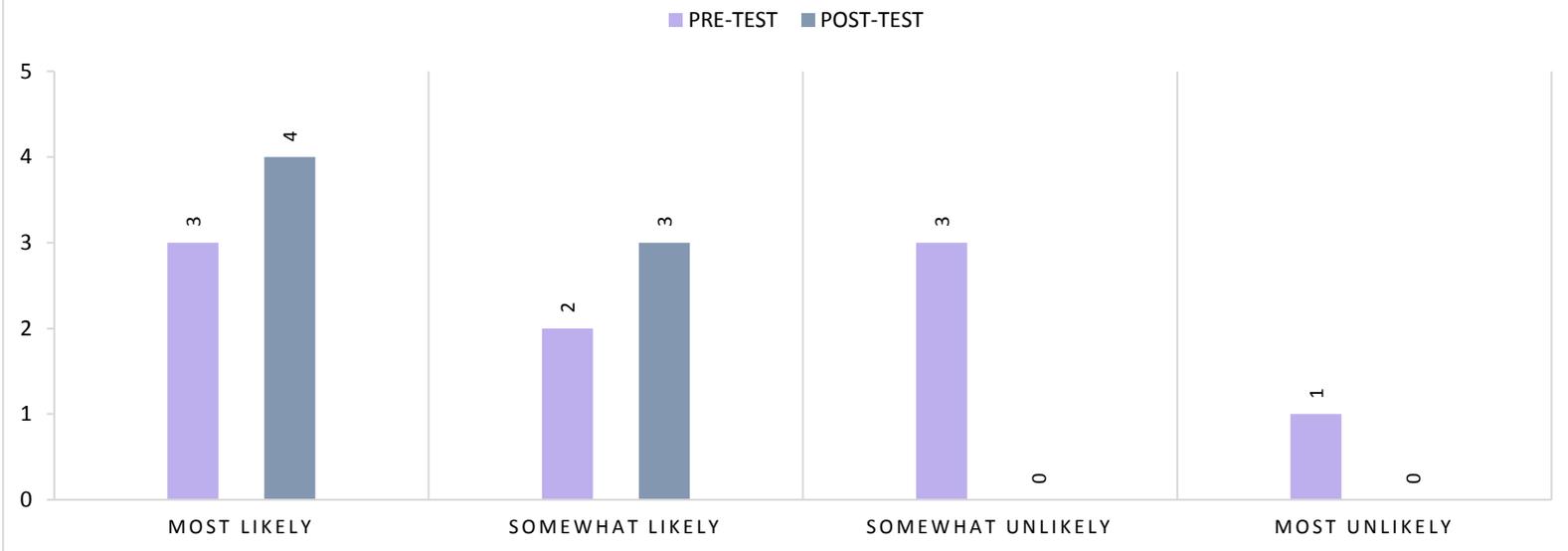
Figure 1. Change in Pre-and Post-Test Beliefs Related to Use of Lavender Oil Aromatherapy

Post-Test Attitudes Related to Use of Lavender Oil Aromatherapy

To determine anesthesia providers' attitudes related to the use of lavender oil aromatherapy in their clinical practice, participants were asked about the likelihood of ordering lavender oil aromatherapy over intravenous midazolam for preoperative anxiolysis in elderly surgical patients. Following the educational module, four providers (57%) chose "most likely" to order lavender oil aromatherapy as a preoperative anxiolytic over midazolam in elderly surgical patients, which indicates a 24% improvement change in provider attitude from pre-test results. In addition, three (43%) participants selected "somewhat likely" as their answer choice, while none of the participants chose "somewhat unlikely" or "most unlikely", further demonstrating a post-educational intervention improvement in provider attitude related to the use lavender oil aromatherapy. The changes in pre- and post-test attitudes regarding the use of lavender oil aromatherapy are displayed in Figure 2 below.

Figure 2. Change in Pre-and Post-Test Attitudes Related to Use of Lavender Oil Aromatherapy

How likely are you to order lavender oil aromatherapy over intravenous midazolam for preoperative anxiolysis in elderly surgical patients?



VII. Discussion

Limitations

Limitations of the study include the small sample size. A greater participant sample size would have been preferable in augmenting the strength of the project. Time constraint was another important limitation of the study, as the participants were asked to complete the post-test survey immediately after viewing the educational module presentation. A longer post-intervention time interval may have enhanced post-test results and benefited the project outcomes. The virtual-based delivery method posed a further limitation to the study since the entire project was done asynchronously via an online platform.

Future Implications to Advanced Nursing Practice

Evidence-based practice is of vital importance for enhancing perioperative patient care outcomes and experiences in special surgical populations, specifically older adults. The project findings highlight the importance of continued learning in anesthesia practice and of education catered towards improving anesthetic care of special populations like the elderly. As a

consequence of increased drug sensitivity with aging, midazolam administration worsens health outcomes and is not recommended in older adults as a preoperative anxiolytic. As the choice of the preoperative drug regimen is a modifiable factor, safer anxiolytic therapies, such as aromatherapy with lavender oil, are mandated to optimize health outcomes in elderly patients.

Advanced anesthesia provider knowledge in managing preoperative anxiety in elderly surgical adults and quality improvement of preoperative anxiolysis in elderly patient populations are important outcomes of this project. The evidence-based literature presented within the educational intervention positively impacts the perioperative care of older adults, as it demonstrates lavender aromatherapy as a beneficial alternative to midazolam administration for preoperative anxiolysis in elderly surgical patients.

Conclusions

Investigation into the anxiolytic effects of lavender aromatherapy across several patient populations, application types, and outcome measures establishes that lavender oil relieves anxiety, reduces mental stress, provides sedation, and promotes good sleep. Collectively, the evidence-based literature reviewed by this project concludes lavender inhalation is a safe and affordable strategy for relieving anxiety and supports lavender oil aromatherapy as an alternative method of preoperative anxiolysis in elderly surgical patients. Translation of this evidence to anesthesia professionals via a virtual educational module served the objective of enhancing providers' knowledge of midazolam and lavender oil as anxiolytic agents in elderly patients to improve the anesthetic management of preoperative anxiety in this population. Analysis of the pre-and post-survey results reveals that this quality improvement project met the objective of expanding anesthesia providers' knowledge and understanding of the use of lavender oil aromatherapy for the optimization of preoperative anxiety and care outcomes in elderly surgical patients.

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Appendix

Appendix A. Letter of Support



February 16, 2022

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

Dr. Campbell,

Thank you for inviting Memorial Regional to participate in the Doctor of Nursing Practice (DNP) project conducted by Marisa Gonzalez, "Lavender aromatherapy compared to midazolam for quality improvement of preoperative anxiety in elderly surgical patients: An educational module" in the Nicole Wertheim College of Nursing and Health Sciences, Department of Nurse Anesthetist Practice at Florida International University. I have warranted her permission to conduct the project using our providers.

Evidence-based practice's primary aim is to yield the best outcomes for patients by selecting evidence-supported interventions. This project intends to evaluate if a structured education targeting providers will increase knowledge on using lavender aromatherapy in the elderly population to decrease preoperative anxiety.

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 on line 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: Marisa Gonzalez and Dr. Campbell. We expect that Marisa Gonzalez will not interfere with normal hospital performance, behave professionally and follow standards of care.

Before implementing 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.

A handwritten signature in blue ink that reads 'Suzanne Hale'.

Suzanne Hale, MSN, CRNA, ARNP
 Advanced Practice Provider Director, Broward, and Dade
 Chief, Memorial Regional Hospital
 Envision Physician Services
 954-265-2044

Appendix B. FIU IRB Approval



Office of Research Integrity
Research Compliance, MARC 414

Dr. Yasmine Campbell

File

Handwritten initials, possibly "CJQ", in black ink.

March 25, 2022

Lavender aromatherapy compared to midazolam for quality improvement of preoperative anxiety in elderly surgical patients: An educational module.

IRB-22-0109
111556

03/25/22

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.

discontinued.

or

Special Conditions: N/A

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

Appendix C. Facility IRB Approval



3501 Johnson Street, Hollywood, FL 33021
Phone (954) 265-1857 | E-mail: irb@mhs.net
FWA# 00003898 | IRB Registration # 00003075

April 13, 2022

Yasmine Campbell
3921 BUCHANAN ST Hollywood, FL 33021

IRB Project#: MHS.2022.045

Project Title: Lavender aromatherapy compared to midazolam for quality improvement of preoperative anxiety in elderly surgical patients: An educational module

Submission Type: Non-Human Subject Research Determination (Reference# 008129)

Dear Investigator:

The Memorial Healthcare System Institutional Review Board (IRB) has reviewed the proposed activity referenced above and determined that it does not meet the definition of research with human subjects as outlined in 45 CFR 46.102 or 21 CFR 56.102. Therefore, IRB oversight is not necessary. Please note that you are still required to follow all applicable institutional policies and ethical guidelines. Additional details regarding this determination are provided starting on page 2 of this letter. Please review each page carefully.

Sincerely,

A handwritten signature in black ink that reads 'Luke Fiedorowicz'.

Luke Fiedorowicz, Ph.D.
IRB Director
Memorial Healthcare System

Appendix D. Invitation to Participants



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

Lavender aromatherapy compared to midazolam for quality improvement of preoperative anxiety in elderly surgical patients: An educational module

Dear Memorial Healthcare Envision Anesthesia Provider:

My name is Marisa Gonzalez, 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 anesthesia provider knowledge on the effects and outcomes with management of preoperative anxiety with lavender oil aromatherapy compared to midazolam in elderly surgical patients. You are eligible to take part in this project because you are a member of the Anesthesia Department for Envision at Memorial Regional Hospital.

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 presentation, 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 mgonz706@fiu.edu or 406-590-9173.

Thank you very much.

Sincerely,

Marisa Gonzalez, SRNA, BSN, CCRN

Appendix E. Informed Consent



CONSENT TO PARTICIPATE IN A QUALITY IMPROVEMENT PROJECT

"Lavender aromatherapy compared to midazolam for quality improvement of preoperative anxiety in elderly surgical patients: An educational module"

SUMMARY INFORMATION

Things you should know about this study:

- **Purpose:** Educational module to improve knowledge in utilizing lavender oil aromatherapy as an alternative to midazolam for preoperative anxiety in elderly surgical patients.
- **Procedures:** If you choose to participate, you will be asked to complete a pre-test knowledge survey, an educational module via a voiced-over PowerPoint presentation, and then a post-test knowledge questionnaire.
- **Duration:** This will take about a total of 20 minutes.
- **Risks:** The level of risk or discomfort associated with participation in this research project is minimal. The minimal risks involved with this project may include mild emotional stress or minor 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 an increase in the participants' knowledge in utilizing lavender oil aromatherapy for quality improvement of preoperative anxiety in elderly surgical patients.
- **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 participate in a quality improvement project. The goal of this project is to improve anesthesia provider knowledge on the effects and outcomes associated with management of preoperative anxiety with lavender oil aromatherapy compared to midazolam in elderly surgical patients.

NUMBER OF PARTICIPANTS

If you decide to be in this study, you will be one of approximately 10 people in this research study.

DURATION OF THE PROJECT

Your participation will require about 20 minutes of your time. If you decide to participate, you will be 1 of 10 participants.

PROCEDURES

If you agree to participate in the project, we will ask you to do the following things:

1. Complete an online 10 question pre-test survey via Qualtrics, an Online survey product for which the URL link is provided
2. Review an educational PowerPoint module presentation via Qualtrics, an Online survey product for which the URL link is provided.
3. Complete an online 10 question post-test survey via Qualtrics, an Online survey product for which the URL link is provided.

RISKS AND/OR DISCOMFORTS

The level of risk or discomfort associated with participation in this research project is minimal. Physical, psychological, social, legal, and economic risks involved with this project are minimal, as would be expected in any similar type of educational intervention. The minimal risks involved with this project may include mild emotional stress or minor 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: An enhanced understanding of the effects and outcomes in managing preoperative anxiety with lavender aromatherapy compared to midazolam in elderly surgical patients. The main benefit to you from this research is an increased knowledge on utilizing lavender oil aromatherapy for quality improvement of preoperative anxiety in elderly surgical patients.

ALTERNATIVES

There are no known alternatives available to you other than not taking part in this project. However, if you would 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.

PARTICIPATION

Taking part in this research project is voluntary.

COMPENSATION & COSTS

There is no cost or payment to you for receiving the health education and/or for 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 Maria Gonzalez at 406-590-9173/mgonz706@fiu.edu or Dr. Yasmine Campbell at 305-348-9894/ycampbel@fiu.edu.

IRB CONTACT INFORMATION

If you would like to talk with someone about your rights pertaining to 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 have read the information in this consent form and agree to participate in this study. I have had a chance to ask any questions I have about this study, and they have been answered for me. By clicking on the "consent to participate" button below I am providing my informed consent.

Appendix F. Data Collection Instrument (Pre-and Post-Test Survey)



Pretest and posttest questionnaire:

Lavender aromatherapy compared to midazolam for quality improvement of preoperative anxiety in elderly surgical patients: An educational module

INTRODUCTION

- The primary aim of this QI project is to improve the knowledge of anesthesia providers on **lavender oil aromatherapy as an alternative approach to intravenous midazolam administration for managing preoperative anxiety in elderly surgical patients to improve perioperative care outcomes for elderly patients scheduled for surgery.**
- Please answer the questions below to the best of your ability. The questions are either in multiple choice or true/false format and are meant to measure knowledge and perceptions on preoperative anxiety in elderly surgical patients using lavender aromatherapy compared to midazolam administration.

PERSONAL INFORMATION

1. **Gender:** Male Female Other _____
2. **Age:** _____
3. **Ethnicity:**
Hispanic Caucasian African American Asian Other _____
4. **Position/Title:** _____
5. **Level of Education:** Associates Bachelors Masters Other _____
6. How many years have you been an anesthesia provide?
Over 10 5-10 years 2-5 years 1-2 years

QUESTIONNAIRE

1. **What percentage of delirium cases in elderly medical and surgical patients can be attributed to medications?**
 - a. 7%
 - b. 100%
 - c. 39%
 - d. 54%
2. **What is the number-one complication in elderly patients following surgery?**
 - a. Nausea and vomiting
 - b. Aspiration
 - c. Infection
 - d. Postoperative delirium
3. **Untreated preoperative anxiety can lead to:**
 - a. Increased post-surgical pain and analgesia requirements
 - b. Immunosuppression
 - c. Impaired wound healing
 - d. Worsened mood and satisfaction
 - e. Prolonged length of hospital stay
 - f. All the above
4. **Adverse drug reactions of midazolam in elderly surgical patients include:**
 - a. Decreased blood pressure
 - b. Reduced oxygen saturation
 - c. Prolonged durations of deep sedation
 - d. Residual postoperative drowsiness and amnesia
 - e. All of the above
5. **The main components of lavender oil, linalyl acetate and linalool, act on what region of the body when inhaled?**
 - a. Pancreas
 - b. Limbic system of the brain
 - c. Adrenal glands
 - d. GI tract
6. **Lavender oil's therapeutic and curative properties enable its use within what types of holistic treatment approaches?**
 - a. Burns
 - b. Muscle spasms
 - c. Infections
 - d. Insect bites
 - e. Neurological and psychological disorders
 - f. All of the above
7. **Aromatherapy utilizes essential oils essential oils extracted from aroma plants, like lavender, that when inhaled can produce a variety of beneficial physiologic and psychological effects: True or False**
 - a. True
 - b. False
8. **Lavender oil possesses what therapeutic properties?**
 - a. Analgesic
 - b. Sedative
 - c. Anxiolytic
 - d. Anticonvulsant
 - e. Antidepressant
 - f. Neuroprotective
 - g. All of the above
9. **How likely are you to order lavender oil aromatherapy over intravenous midazolam for preoperative anxiety in elderly surgical patients?**
 - a. Most likely
 - b. Somewhat likely
 - c. Somewhat unlikely
 - d. Most unlikely
10. **Evidence-based literature establishes that lavender oil relieves anxiety, reduces mental stress, promotes sedation and good sleep, and establishes lavender inhalation as a safe and affordable strategy for relieving anxiety: True or False**
 - a. True
 - b. False

Appendix H. DNP Symposium PowerPoint Presentation

LAVENDER AROMATHERAPY COMPARED TO MIDAZOLAM FOR QUALITY IMPROVEMENT OF PREOPERATIVE ANXIETY IN ELDERLY SURGICAL PATIENTS: AN EDUCATIONAL MODULE

FIU



LEARNING GOALS

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BACKGROUND

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PROBLEM IDENTIFICATION

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CONSEQUENCES OF THE PROBLEM

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LAVENDER OIL

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DNP PROJECT PURPOSE

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Study patients

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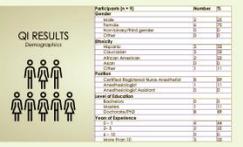
QUALITY IMPROVEMENT METHODS

FIU



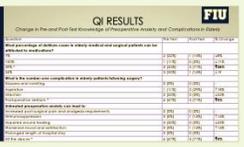
QI RESULTS

FIU



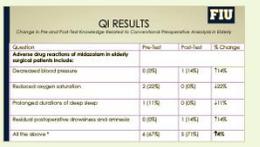
QI RESULTS

FIU



QI RESULTS

FIU



QI RESULTS

FIU



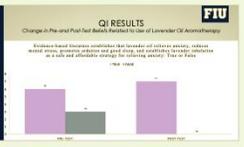
QI RESULTS

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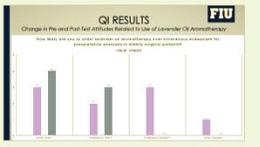
QI RESULTS

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QI RESULTS

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DISCUSSION

FIU



DISCUSSION

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CONCLUSIONS

FIU



CONCLUSIONS

FIU



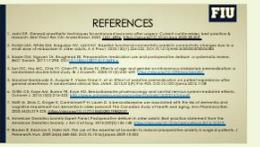
THANK YOU & ACKNOWLEDGMENTS

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REFERENCES

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