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A Paradigm Shift: The Implementation of Utilizing Dexmedetomidine and Propofol for Laryngeal Mask Airway Insertion

Linnet Flores

Florida International University, lflor049@fiu.edu

Ann miller

Florida International University, anmille@fiu.edu

Emie Dieudonne

Emie.Dieudonne@shcr.com

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A Paradigm Shift: The Implementation of Utilizing Dexmedetomidine and Propofol for Laryngeal Mask
Airway Insertion

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

By

Linnet Flores, MSN, RN

Supervised By

Dr. Ann B. Miller, DNP, CRNA, APRN
Dr. Emie Dieudonne, DNP, CRNA, APRN

Approval Acknowledged: _____, DNA Program Director

Date: _____

Approval Acknowledged: _____, DNP Program Director

Date: _____

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ABSTRACT

Background: Laryngeal mask airway (LMA) is a common airway device used intraoperatively for anesthetic airway management. The insertion of LMA requires anesthesia and adequate suppression of airway reflexes. The factors that affect the insertion and positioning of LMA are jaw relaxation, mouth opening, episodes of coughing or movement during insertion, and the depth of anesthesia. If all these parameters are satisfactory, then there will be a minimal hemodynamic stress response, which is required for LMA insertion. In search of an optimum drug, recent studies have suggested that dexmedetomidine is superior to fentanyl as an anesthetic adjuvant in decreasing the requirement of propofol and maintaining stable hemodynamics intraoperatively.

Objectives: This literature review aimed to evaluate the current randomized controlled trials (RCTs) on the impact of dexmedetomidine as an adjunct to propofol during LMA insertion.

Data sources: Data sources included MedLine, CINAHL, EMBASE, Pubmed, and Google Scholar.

Sources were chosen to answer the Population, Intervention, Comparison, and Outcome (PICO) question:

(P) In adult surgical patients who present for laryngeal mask insertion (I), does Dexmedetomidine-Propofol IV (C) compared to Fentanyl- Propofol IV (O) decrease hemodynamic instability, ensure spontaneous respirations, and reduce the propofol dosage requirement for induction?

Study selection: The inclusion criteria for the articles included: Studies published after 2019, RCTs published in English, dexmedetomidine as the treatment, and opioid consumption as the primary outcome. Exclusion criteria included: meta-analyses and systematic analyses, failure to focus on LMA insertion, and dexmedetomidine not used as treatment.

Results: The evidence search, and screening resulted in 15 RCTs. Eleven studies demonstrated dexmedetomidine is a superior adjuvant in preserving respirations and a stable hemodynamic profile. Four studies demonstrated dexmedetomidine could reduce propofol dose requirements by as much as 38%.

Conclusion: Evidence shows that dexmedetomidine as a co- induction agent with propofol not only gives excellent overall insertion conditions and hemodynamic stability but also reduces the requirement of induction as well as incremental doses of propofol.

Keywords: Dexmedetomidine, LMA, fentanyl, surgical units, surgery, postoperative, perioperative.

BACKGROUND

Introduction

Maintaining a patent airway remains a significant concern to anesthesia providers. Dr. Archibald Brain invented the "Laryngeal Mask Airway" (LMA) in 1981 as an alternative to an endotracheal tube.⁴ The LMA is a supraglottic airway device that secures the airway, allowing spontaneous ventilation.⁸ The lighter plane of anesthesia required for LMA insertion has the potential to provide excellent hemodynamic stability, which makes its use very attractive to anesthesia providers. However, proper anesthetic depth is necessary to allow attenuation of upper airway reflexes to avoid coughing, gagging, and laryngospasm.¹⁰

Numerous studies focus on finding the ideal balance of anesthesia to provide optimum sedation for LMA insertion. Due to its rapid induction and recovery time, intravenous propofol has been the drug of choice to produce sedation and hypnosis.¹ The cardio-respiratory effect when using propofol alone has been a well-known concern for anesthesia.¹⁰ There is also a lack of analgesic effect from propofol. To avoid these complications, fentanyl was added to reduce propofol dose requirements and provide analgesic properties. Unfortunately, the lack of spontaneous breathing and the frequency of lasting apneic episodes makes the use of fentanyl not favorable. Dexmedetomidine properties show to be beneficial for sedation and analgesia without resulting in cardio-respiratory depression.¹⁰ Therefore, dexmedetomidine continues to be the focus of this Quality Improvement Project for propofol adjuncts during LMA insertion.

Clinical Significance

The laryngeal mask airway is proven to be a safe and effective method to secure an airway that improves hemodynamic stability through the three phases of anesthesia.¹ LMA allows pressure support ventilation with airway pressures not exceeding 15 cm H₂O.¹⁰ Cardiovascular variables are a major concern during the induction and maintenance of anesthesia. Reports suggest the use of propofol alone has been reported to be inadequate for LMA insertion, given it could require higher doses for proper insertion but increasing the risk of hemodynamic and respiratory instability, also described as unethical.¹⁰

The use of propofol alone has been reported to require a higher dosage, such as 2.5 mg/kg, for appropriate LMA insertion.¹⁰ There are reports suggesting a smaller dosage of propofol when used in combination with dexmedetomidine (1.5 mg/kg) compared to Fentanyl (1.8 mg/kg).⁸

Opioids such as fentanyl have been the adjunct of choice to inhibit the sympathetic response associated with LMA placement. Fentanyl provides homeostasis of the cardiovascular system through action on the nucleus solitarius, nucleus ambiguus, dorsal nucleus of the vagus, and the parabrachial nucleus.¹⁰ The effect of fentanyl through μ_2 receptors acts as a potent respiratory depressant.¹⁰ When combined with propofol, fentanyl causes respiratory compromise by inhibiting carbon dioxide's stimulatory effects, leading to apnea¹⁰. Glottic rigidity has been described after repeated doses of fentanyl.⁹ Hemodynamic instability was reported by Gupta et al. after fentanyl administration, resulting in an increased heart rate up to 10% and a rise in systolic blood pressure at the 1st and 3rd minute after LMA insertion. Gupta et al. found in study participants that received dexmedetomidine, 58 patients had spontaneous respirations while 12 exhibited breath-holding. While in a group that received fentanyl, 36 patients maintained spontaneous respirations and 34 patients showed breath-holding. The difference was found to be statistically significant.

Dexmedetomidine properties provide sedation and analgesia via the α_2 -adrenoceptor in blood vessels, sympathetic terminals, locus coeruleus, and spinal cord.⁹ Dexmedetomidine action on the locus coeruleus preserves hypercapnic ventilatory drive, and this effect gives the appearance of natural sleep.¹⁰ An increase in respiratory rate during dexmedetomidine infusions is secondary to its mechanism of action not only on the locus coeruleus but also in the pulmonary vasculature and carotid body by stimulating the respiratory center.⁹ The cardiovascular stabilizing properties and preservation of spontaneous respiration of dexmedetomidine are ideal for reducing propofol requirements and attenuation of sympathetic response during LMA insertion.⁸ Studies have shown that dexmedetomidine has anesthetic and analgesic properties and at dosages of 0.5mcg-2mcg/kg/IV causes sedation. Dexmedetomidine can decrease the heart rate by 27% during induction but return to normal at 15 min.⁴

Jayaram et al. reported 69% of apnea in the propofol-fentanyl group compared to 40% in the propofol- dexmedetomidine group. Significant lower systolic, diastolic blood pressure, and mean arterial pressure in the propofol-fentanyl group compared to the propofol-dexmedetomidine was also reported. When compared to dexmedetomidine, fentanyl has not only been found to suppress respiratory drive but also is associated with nausea and vomiting.¹⁰ The use of fentanyl could imply the need for additional medication to control the side effects of nausea and vomiting. Even apneic episodes related to the use of dexmedetomidine may be due to a higher dose of propofol (2.5mg/kg) when used in combination.⁹

The use of dexmedetomidine infusion has been reported to delay emergence time; nonetheless, spontaneous breathing and oxygen saturation were well preserved in all patients.⁹ The use of fentanyl has been felt to potentiate the depressant effect from propofol, therefore causing longer apneic episodes. Postoperative pain evaluation is of great clinical relevance after emergence time. Pain score tools have been validated to assess a patient's pain level during the recovery period; one validated score is the visual analog score (VAS).⁹ Choudhary et al. demonstrated significantly lower VAS values in the postoperative pain management for the patient that received dexmedetomidine compared to fentanyl. Overall, dexmedetomidine is found to be unique among other sedatives given its clinical safety regarding respirations even with high doses enough to cause significant central nervous system depression with LMA placement stimulation in the hypopharynx.

There is not sufficient data to address the clinical outcome as well as the cost related to the use of dexmedetomidine over fentanyl. One can imply the postoperative recovery would be faster with dexmedetomidine compared to fentanyl with less requirement for adjunctive symptomatic management such as pain control, nausea, vomiting, but this is not well studied. Fentanyl will carry a higher liability within institutional administrative logistics such as storage, documentation, and distribution of opioids compared to dexmedetomidine; there are also higher concerns of possible drug abuse with the use of fentanyl compared with dexmedetomidine.¹⁰

PICO Question

The following PICO was formulated: (P) In adult surgical patients who present for laryngeal mask insertion (I), does an educational module on Dexmedetomidine- Propofol IV increase knowledge (C) compared to Fentanyl- Propofol IV (O) decrease hemodynamic instability, ensure spontaneous respirations, and reduce the propofol dosage requirement for induction?

METHODOLOGY

Information Sources and Search Strategy

A literature search was conducted to identify studies on patients receiving propofol and fentanyl or propofol and dexmedetomidine while undergoing laryngeal mask airway (LMA) insertion. Evidence selection requires the selection of credible databases and sources. Many databases are available with a wide range of articles in different fields of healthcare provisions. The initial search utilized the following databases: Cochrane Database of Systematic Reviews, Medline (ProQuest), Cumulative Index of Nursing and Allied Health Literature (CINAHL), Scopus, Google Scholar, and PubMed. For this Quality Improvement Project, CINAHL was the primary database for the identification of relevant sources. CINAHL had many articles with pertinent information, including clinical interventions, for addressing various clinical problems. ¹

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was utilized to enhance the objectivity of the search and formatting of the systematic review.¹In this context; the methodological approach employed the PRISMA checklist to ensure the creation of credible evidence for clinicians. The reliability of the systematic review is dependent on the previous studies, the clarity of documentation, and research processes.

The formulated PICO question was used in developing keywords and concepts to aid in the identification of relevant sources within the selected databases.⁴ The search terminology included the efficacy of dexmedetomidine combined with propofol in LMA insertion, the effectiveness of fentanyl in combination with propofol for LMA, dexmedetomidine as an alternative to fentanyl when co-administered with propofol, hemodynamic stability of fentanyl versus dexmedetomidine, dexmedetomidine versus fentanyl in preserving respiration. ¹ The PRISMA flow diagram outlines the search and screening process

as illustrated in fig. 1. The search was conducted in October 2020; thus, the search was current and up to date. The selected databases resulted in a different number of articles related to the search terminologies. PubMed yielded 98 articles, Medline resulted in 112 articles, and CINAHL revealed 143, and Scopus resulted in 56 results. A total of 409 articles were retrieved from the selected databases. Duplicated articles were removed, leaving 204 articles for further evaluation.

The credibility of the selected sources and databases generated substantial evidence associated with the adoption of clinical interventions identified in the formulated PICO question.⁴ Reliable sources are current and up to data reflecting interventions in the management of the selected clinical problem. Most significantly, credible sources tend to focus on a particular area or audience.³ Authority of the authors are some of the aspects of criteria when evaluating articles in the databases. Credible sources evaluate a relatively large quantity of preliminary studies to draw significant findings and conclusions of the study. In this literature review, the identified journal articles met such criteria.⁴

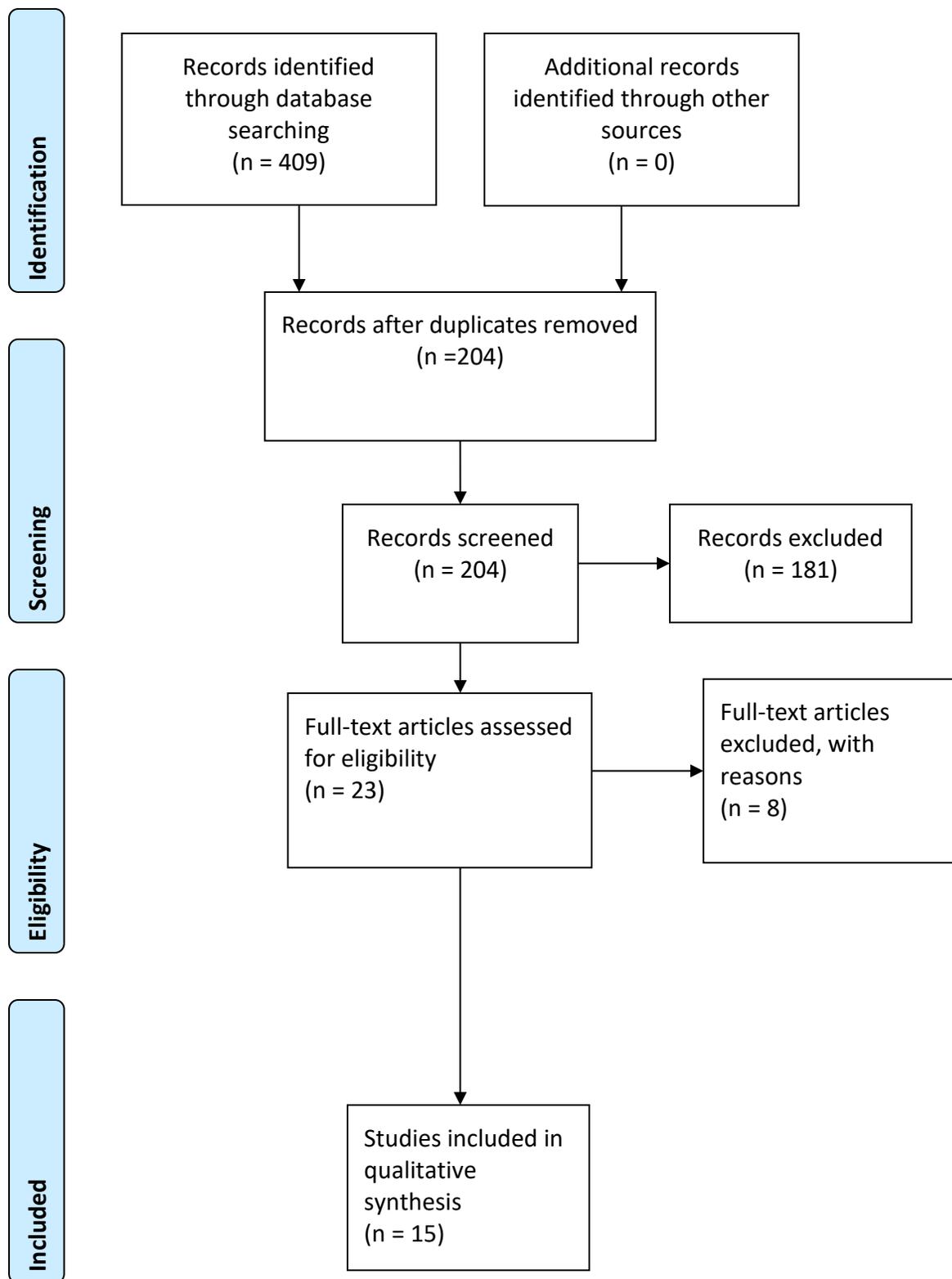


Figure 1. PRISMA Flow Diagram

Study Selection and Screening Method: Inclusion/Exclusion Criteria

The formulated PICO question was useful in evaluating the appropriate articles, including the dissemination of the selected articles. The search strategy also determined the levels of evidence in the hierarchy of evidence of scientific sources. Citations were imported to Endnote to check for duplicated articles. The screening of the 15 articles was based on sets of inclusion and exclusion criteria.

Inclusion Criteria

The inclusion criteria for the selection of the article include the following.

- Publications in the English language were selected in the proposed research investigation.
- References published within the last ten years (2010-2020).
- Sources considered from the databases must be relevant to the selected topic.

Other inclusion criteria include selecting observational studies, case-control: cohort studies, and randomized control trials (RCTs). The studies included surgical patients taking Dexmedetomidine-propofol combination IV or Fentanyl-propofol IV for laryngeal mask insertion. Other critical information forming part of the evaluation criteria include dosage requirements for LMA insertion, cardio-respiratory stability, and decreased narcotic utilization.

Exclusion Criteria

The exclusion criteria consisted of patients mainly using dexmedetomidine and fentanyl as single therapies for pain management following the intraoperative and postoperative period. Inclusion and exclusion criteria are illustrated in table 1 below.

Table 1. Inclusion and Exclusion Criteria

Inclusion	Exclusion
<p>Population:</p> <ul style="list-style-type: none"> • Intervention group use combination suggested Medications. • Adult surgical patients who present for laryngeal mask insertion who received Dexmedetomidine- Propofol IV compared to Fentanyl- Propofol IV <p>Intervention</p> <ul style="list-style-type: none"> • Studies that investigate the effect of dexmedetomidine-propofol combination IV or Fentanyl-propofol IV for facilitating successful laryngeal mask airway (LMA) insertion. <p>Outcomes:</p> <ul style="list-style-type: none"> • Decrease hemodynamic instability in a patient treated with dexmedetomidine and propofol versus fentanyl and propofol • Preservation of spontaneous respirations in a patient treated with dexmedetomidine • Reduction of propofol dosage requirement for induction <p>Type of study:</p> <ul style="list-style-type: none"> • Inclusion of observational studies, case-control, cohort, and RCTs. 	<p>Population:</p> <ul style="list-style-type: none"> • Non-surgical patients on either treatment regimen. • Surgical patients ventilated with an endotracheal tube. • Patients receiving either medication in the postoperative period for pain control <p>Intervention:</p> <ul style="list-style-type: none"> • Sedations effects of either medication in patients that remained mechanically ventilated. <p>Outcomes:</p> <ul style="list-style-type: none"> • Interventions other than patients that received LMA and were induced with fentanyl or dexmedetomidine. <p>Type of study:</p> <ul style="list-style-type: none"> • Publication date pre-2010 • Dissertations/theses • Questionnaire • Animal studies

Collection, Analysis, and Data Items

John Hopkins' rating structure is critical in evaluating research studies and has five levels of evidence in assessing the reliability of the research study. RCTs and systematic reviews provide the highest level of evidence (level 1). In this literature search, RCTs and observational studies were selected. Level 2 evidence includes articles, whereas quasi-experimental studies and non-experimental studies, including expert opinions, are level 4. Most significantly, level 5 provides clinician experience, clinical case reports, and literature reviews. According to the John Hopkins tool, evidence can be described as bad, good, or low quality based on the position of the evidence on the hierarchy of evidence.⁵ High-quality evidence describes data that is reliable, large sample size, definitive conclusions, and evaluation of the outcomes.⁵ Low- or poor-quality evidence is associated with relatively small sample size and unclear findings and conclusions of the study.⁵

An evaluation table was developed to summarize and categorize aspects of the studies included for this systematic review, see table 2. The individual studies were assigned rankings based on the John Hopkins evaluation tool.¹ The evaluation table contains highlights of the author, publication date, results, and the levels of evidence-based on the Johns Hopkins Research Evidence evaluation tool.

Table 2. Studies Included in the Appraisal

Author (Year) & Level of Evidence	Indication in the use of dexmedetomidine vs. fentanyl in anesthesia	Study type/ Sample size	Influence of dexmedetomidine vs. fentanyl on hemodynamics during insertion	Insertion conditions (Muzzi score)	Successful induction in relation to apneic episodes	Guidelines provided
Subhadra et al. (2014) Level 2 Quality B	lower abdominal and lower limb surgery patients	Randomized single-center study/60 patients	The reductions in SBP, DBP, MAP was greater in Group with Fentanyl	Better hemodynamics during insertion with dexmedetomidine	More apnea in the Fentanyl group	Suggested dexmedetomidine similar to fentanyl, although left hemodynamic concerns
Ramaswamy et al. (2015) Level 2 Quality B	Elective minor surgical procedures	Prospective, double-blind, randomized study/80 patients	Hemodynamics were stable in both groups	Increase in the RR in the dexmedetomidine Group from 5 min after insertion	duration of apnea was longer in the Fentanyl Group (290 s) than in the dexmedetomidine Group (227 s).	Suggest that Dexmedetomidine can be a comparable alternative to fentanyl

<p>Choudhary et al. (2019)</p> <p>Level 1 Quality A</p>	<p>Elective uro-surgical procedures lasting <120 min</p>	<p>Prospective, randomized, double-blinded, parallel-group clinical trial/74 patients</p> <p>Sample Size: 1</p>	<p>Hemodynamics were stable in both groups</p>	<p>insertion score in six patients was >2, and in the PD group, three patients had score >2 (Not significant)</p>	<p>Incidence of apnea was greater in the Fentanyl group</p>	<p>Dexmedetomidine preserved the patient's spontaneous breathing and provided better postoperative analgesia.</p>
<p>Gupta et al. 2018</p> <p>Level 1 Quality A</p>	<p>elective minor surgical procedures</p>	<p>Prospective, double-blind, randomized clinical study/140 patients</p>	<p>SBP had highly significant differences at 1, 3, 5, 10, and 15 mins. DBP, MAP and RR had highly substantial differences at 1, 3, 5, 10, 15, and 30 mins</p>	<p>Better preservation of spontaneous respiration and acceptable LMA insertion conditions for Dexmedetomidine</p>	<p>Apnea was 237 sec in the Fentanyl group vs. 208 sec in the Dexmedetomidine</p>	<p>Dexmedetomidine better insertion and hemodynamics, and acceptable LMA insertion.</p>
<p>Shalaka et al. 2016</p> <p>Level 1 Quality A</p>	<p>short surgical procedures</p>	<p>Prospective randomized, double-blind study/60 patients</p>	<p>No difference in hemodynamics</p>	<p>The induction dose and increments of propofol required in group D was significantly lower</p>	<p>Apnea occurred with both medications</p>	<p>Dexmedetomidine significantly reduces induction dose propofol for PLMA insertion</p>

Uzümçügil et al. (2010) Level 2 Quality B	Minor urological procedures	Prospective randomized study/52 patients	Baseline systolic BP (SBP) and mean BP (MBP) were similar	Dexmedetomidine, before propofol induction, provides successful laryngeal mask insertion comparable to fentanyl	Apnea was greater in the Fentanyl Group	Dexmedetomidine preserves respiratory functions better during induction
Surabhi et al. (2014) Level 1 Quality A	short elective surgeries	A prospective, randomized, double-blind comparative study. /60 patients	Increased of the SBP with the use of Fentanyl compared to Pre LMA baseline. Fall in SBP at 1 min, 2 mins, 3mins with dexmedetomidine compared to Pre LMA baseline	Better jaw relaxation in dexmedetomidine. More attempts needed with Fentanyl	No significant changes in RR	Dexmedetomidine gives better insertion conditions and less pressor response to LMA insertion
Sintavanuruket al. (2020) Level 1 Quality	elective surgeries	Randomized, prospective, single-blinded, clinical study/78 patients	no significant hemodynamic response difference	The first insertion attempt was equal for both medications	Non-reported	TCI significantly lowered the propofol consumption
Tan et al. (2017) Level 1 Quality A	Non-paralyzed patients.	Randomized, controlled trial/75 patients Sample Size: 1	Non reported	high rate of successful first attempt at insertion with 1 µg.kg and 1.5 µg.kg, 93% and 87% respectively, compared to 87% in the 2.0 µg.kg-1 group.	Higher doses of fentanyl are associated with an increased incidence of apnea.	Yes, recommends 1.0 µg.kg as the optimal dose of fentanyl when used in addition to propofol 2.5 mg/kg for LMA
Rustagi et al.	short surgical procedures	Randomized	MAP after propofol	Moderately relaxed jaw during LMA	Incidence and the mean	Dexmedetomidine and

<p>(2019)</p> <p>Level 1 Quality B</p>		<p>controlled double-blinded study/80 patients</p> <p>Sample size: 1</p>	<p>induction was significantly lower with Fentanyl</p>	<p>insertion was higher in Fentanyl. None of the patients had a poorly relaxed jaw. More coughing and movement with Fentanyl use The total dose of propofol was higher with fentanyl</p>	<p>duration of apnea was significantly more with fentanyl</p>	<p>fentanyl provide comparable conditions for LMA insertion with propofol.</p>
<p>Yoo et al. (2017)</p> <p>Level 1 Quality A</p>	<p>elective minor surgery</p>	<p>Blind RCT/40 patients</p>	<p>MAP was higher, and HR was lower in the dexmedetomidine</p>	<p>Pretreatment with dexmedetomidine 1 µg/kg could reduce the propofol requirement by 38 % for facilitating LMA insertion without prolonged respiratory depression and hemodynamic instability.</p>	<p>Respiratory depression and hemodynamic instability.</p>	<p>A bolus dose of propofol needed for successful LMA insertion was 1.9 mg/kg in 50 % of adults. dexmedetomidine reduces the propofol requirement</p>
<p>Yao et al. (2019)</p> <p>Level 1 Quality A</p>	<p>Elective unilateral strabismus surgery, children</p>	<p>Randomized, double-blind, placebo-controlled study/90 patients</p>	<p>Intranasal dexmedetomidine (1 or 2 mcg/kg) produces a dose-dependent reduction in HR and SBP. Modest reduction (within 20% of baseline values) of hemodynamic variables was observed</p>	<p>No subject cried, required restraint, or complained of discomfort with intranasal dexmedetomidine</p>	<p>No apnea reported</p>	<p>Yes, Dexmedetomidine premedication was associated with a reduction in sevoflurane</p>
<p>Joshi et al. (2013)</p> <p>Level 1 Quality B</p>	<p>Ambulatory surgery with an expected duration of less than 2 hours</p>	<p>Randomized, double-blinded, controlled trial/100 patients</p>	<p>The intraoperative hemodynamic variables (i.e., HR and MAP) and RR, as well as SpO₂ and ETCO₂ values in the two</p>	<p>Fentanyl pretreatment group had a lower frequency of movements. intraoperative laryngospasm was similar</p>	<p>Fentanyl pretreatment group had a higher frequency of apnea and a longer duration of manual ventilation.</p>	<p>Pre induction fentanyl increased the frequency of apnea at induction and duration of manual ventilation but reduced the</p>

			groups, were similar.			frequency of movements.
Dwivedi <i>al.</i> (2016) Level 1 Quality B	Various surgical procedures	Prospective, randomized study	After insertion of LMA, statistically significant drop-in means heart rate, systolic blood pressure (BP), diastolic BP, and mean BP was noted in Group Fentanyl as compared to Group butorphanol (P < 0.05).	Propofol, when used as a sole drug for LMA placement requires a large dose to achieve optimal insertion conditions.	Non-released	Improved cardiovascular stability with butorphanol compared with a combination of propofol and fentanyl.
Akanksha <i>et al.</i> (2012) Level 1 Quality B	elective surgery (modified radical mastectomy, mastectomy, or superficial surgery of the upper limb)	Randomized double-blind study/96 patients	Significant fall in SBPs and MAP, and higher incidence of bradycardia with fentanyl use	Pre-administered dose of fentanyl of 2 mcg/ kg, carry fewer doses of propofol for LMA Classic insertion	Non reported	Both doses of fentanyl (1 and 2 mcg/kg) provide comparable insertion conditions for LMA. Fentanyl in the lower dose provides a more stable hemodynamic profile

RESULTS

Hemodynamic stability

Subhadra et al.⁴ conducted a prospective, randomized single-center study in 2014, which included sixty patients admitted for lower abdominal and lower limb surgery. Patients were divided into the Fentanyl group, which received 1 µg/kg, and the dexmedetomidine group, received dexmedetomidine 1 µg/kg diluted in 10 ml normal saline (NS); both groups were induced with propofol 2mg/kg.⁴ Researchers examined patients for 90 seconds after propofol injection for jaw relaxation and proceed to

laryngeal mask airway (LMA) insertion. Heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DPB), arterial oxygen saturation, and respiratory rate (RR) parameters were recorded before and at the end of the 1st, 2nd, 3rd, 5th, and 10th minutes after insertion of LMA.⁴ The study found that more patients in the Fentanyl group developed apnea compared to the dexmedetomidine group, values reported were 40% vs. 67% respectively; $P < 0.01$.⁴ Researchers found reductions in SBP, DBP, MAP were greater in the fentanyl group; $P < 0.001$ than in the dexmedetomidine group; $P < 0.05$.⁴ The study reveals that hemodynamic parameters were more stable in patients that received dexmedetomidine than in patients that receive Fentanyl co-administered with propofol for LMA insertion.⁴

From the Surabhi et al.¹¹ study published in 2014, dexmedetomidine - propofol was compared to fentanyl - propofol during laryngeal mask airway insertion in elective surgery. Patients received $1\mu\text{g}/\text{kg}$ of dexmedetomidine and fentanyl, respectively, followed by propofol $2.5\text{ mg}/\text{kg}$. This prospective, randomized, double-blind comparative study included 60 patients aged 20 and 50 years with an American Society of Anesthesiologists (ASA) I-II category, MPC grade I and II, scheduled for short elective surgeries.¹¹ Surabhi et al. recorded extensive data regarding hemodynamic responses including HR, BP, RR at baseline, just after administering the study drug, immediately before LMA insertion, 30 s, 1min, 2mins, 3mins, 5mins, 7mins, 10min after LMA insertion.¹¹ Bradycardia was defined as heart rate $< 15\%$ of the baseline or $< 50/\text{mins}$.¹¹ A P value was established as < 0.05 for statistical significance.¹¹ The analysis of the results revealed a statistically significant fall; $P < 0.05$ in the mean SBP seen during the post-LMA, at 1 min, 2 mins, and 3mins compared to the Pre LMA mean SBP in the dexmedetomidine group.¹¹ The fentanyl group showed statistically significant values in the mean SBP during the post-LMA phase compared to the pre-LMA mean SBP; P value= 0.003.¹¹ The study revealed that Dexmedetomidine gives better insertion conditions and better attenuation of pressor response to LMA insertion than fentanyl.¹¹

Rustagi et al.¹⁴ conducted a randomized controlled double-blinded study on insertion conditions with propofol induction after pretreatment with dexmedetomidine or fentanyl. The randomized controlled double-blinded study was conducted with eighty ASA I/II patients undergoing general anesthesia.¹⁴

Groups were randomized into group D= 40 and group F=40; group D received 1µg/kg dexmedetomidine over 10 minutes followed by 5ml of 0.9% NS over 2 minutes; group F received 10 ml of 0.9%NS over 10 minutes followed by fentanyl 1 µg/kg over 2 minutes.¹⁴ Propofol 2 mg/kg was given thirty seconds after study groups. Gupta et al.¹⁴ used the Modified Scheme of Lund and Stovener to assess the overall insertion condition of LMA. Excellent- no gagging or coughing, no laryngospasm, no patient movement; Good- Mild to moderate gagging or coughing, no laryngospasm, mild to moderate patient movement, Poor- Moderate to severe gagging or coughing, no laryngospasm, moderate to severe patient movement, Unacceptable- Severe gagging or coughing, laryngospasm, severe patient movement. The overall insertion condition, according to Lund and Stovener, were comparable in both groups, but dexmedetomidine provided better jaw relaxation as assessed by Young's criteria, with 97.5% of patients having absolute jaw relaxation compared to 87.5% with fentanyl.¹⁴ In the fentanyl group, 12.5% of patients had moderately relaxed jaw and required additional boluses of propofol to facilitate LMA insertion.¹⁴ The study did not find this observation statistically significant.¹⁴ Still, vastly clinically significant finding as added increments of propofol in group F led to hypotension episodes in <15% baseline MAP.¹⁴ The research also concluded that apnea was significantly higher in group F 18/40 than group D 3/40; $P < 0.0001$. A total of 10.3% drop in MAP from baseline was seen in group F compared to 5.6% in group D; $P = 0.002$.¹⁴

A randomized controlled trial from Dwivedi et al. in 2016 evaluated the hemodynamic responses for LMA insertion using propofol and butorphanol compared to propofol and fentanyl for induction.¹⁸ The study had two groups: Group F, propofol, fentanyl, Group B, propofol, and butorphanol.¹⁸ A total of hundred patients of ASA I and ASA II with Mallampati-II and III between 18–60 years were randomly selected and divided into two groups with 50 on each.¹⁸ All hemodynamic parameters were recorded, including SBP, DBP, MAP, RR, and HR.¹⁸ A significant decrease in the mean arterial pressure was noticed in the propofol group over the first 5 min of induction.¹⁸ The values of mean SBP, DBP, and MBP in this study were lowest at 5 min of insertion of LMA with a statistically significant decrease in Group F than in Group B.¹⁸ After premedication, a transient increase in the mean HR, 92.38 ± 16.00 , $Z =$

1.32; $P = 0.188$, and a significant rise in the mean SBP, 125.86 ± 13.96 , $Z = 2.77$; $P = 0.007$, was observed in Group B.¹⁸ Also, the MBP, 92.75 ± 1.07 was significantly higher, Z -value = 2.15; $P = 0.033$, after premedication in Group B.¹⁸ After insertion of LMA at 1 min, 3 mins, and 5 mins, a statistically significant drop in mean heart rate, SBP, DBP, and MBP were noted in Group F as compared to Group B, $P < 0.05$.¹⁸ After extubation, all the vital parameters started returning to premedication values; however, the increase in the mean SBP and MBP after extubation was statistically significant in Group B; $Z = 2.99$; $P = 0.003$ and $Z = 2.91$; $P = 0.004$, respectively as compared to Group F.¹⁸ This study demonstrated a co-induction agent with propofol 2.5 mg/kg, such as butorphanol 30 μ g/kg as found to be a better alternative to fentanyl 1.5 mg/kg as far as hemodynamic stability.¹⁸ The effect of butorphanol leading to stable hemodynamics by stabilizing bradycardia was felt to be related to the release of the catecholamines from this co-induction agent.¹⁸

Preservation of spontaneous respirations

In 2015 Ramaswamy et al. conducted a ten-month prospective, double-blind, randomized study on eighty patients of ASA physical status 1 and 2 randomly divided into two groups of 40 patients each.¹ Both groups were comparable in terms of the distribution of age, sex, and weight.¹ Researcher used Statistical Package Software Statistical Analysis to calculate the sample size with an alpha error of 0.05, confidence of 95%, infinite population.¹ Group D received dexmedetomidine 1mcg/kg, and group F received fentanyl 1 mcg/kg IV over 2 minutes; both groups were induced with propofol 2mg/kg, and 90 seconds later, LMA was inserted.¹ During the study, the parameters recorded were apnea time- the time from last spontaneous breath after propofol administration to first spontaneous breath, HR, RR, SBP, DBP, and oxygen saturation.¹ The Muzi scoring system was used to evaluate patients' responses to LMA insertion.¹ The scoring system includes jaw mobility graded as 1-fully relaxed, 2-mild resistance, 3-tight but, opens, 4-close; coughing/movement graded as 1-none, 2-one or two coughs, 3-three or more coughs, 4- bucking/movement.¹ Score ≤ 2 was considered optimum for LMA insertion.¹ The study found that 37 patients, 92.5% patients of group D and 35, and 87.5 % of group F had scores of <2 , thus demonstrating the acceptable condition for insertion of LMA. The incidence of adverse events was found to be

statistically insignificant. The incidence of apnea was recorded to be longer in group F than in group D, 290s, and 227s, respectively.¹ The study concluded that incidences of adverse events were comparable and statistically insignificant in both groups, but dexmedetomidine showed to be superior in preserving patients' respiration.¹

Choudhary et al. performed a prospective, randomized, double-blinded, parallel-group clinical trial.⁶ The study included seventy-four ASA I and II patients who were randomly chosen to receive either dexmedetomidine 1 µg/kg or fentanyl 1 µg/kg.⁶ Propofol 2.5 mg/kg was administered for induction after thirty seconds of administering the study drugs.⁶ Researchers used the Muzi score system to calculate the sample size.⁶ A difference in 23.4% in jaw relaxation grade 1 was found between dexmedetomidine and fentanyl groups; using power analysis, 37 patients in each group were calculated considering α error of 5% and power of 80%.⁶ In group dexmedetomidine, three patients had Muzi score >2; two patients moved, and one had mild resistance to jaw mobility; none of the patients had coughing or bucking during LMA insertion.⁶ On the fentanyl group, six patients scored > 2; three patients had coughing, four patients moved during LMA insertion.⁶ Choudhary et al.⁶ concluded that baseline HR, SBP, and MAP were comparable in both groups, but the incidence of apnea was significantly higher in the fentanyl group; P 0.011; dexmedetomidine also provided better postoperative analgesia.

Gupta et al.⁷ compared the hemodynamic and respiratory parameters, apnea time, and patient's response to LMA insertion using dexmedetomidine-propofol and fentanyl-propofol combination. Propofol is notable for providing superior airway reflexes suppression, but propofol causes cardiorespiratory depression and does not offer analgesic effects when used without premedication.⁷ The double-blind, randomized clinical study was carried out in 140 healthy patients with ASA grades I and II.⁷ The fentanyl group received 1 µg/kg, and Propofol 2mg/kg IV, and the dexmedetomidine group received 1 µg/kg and propofol 2mg/kg. Parameters such as HR, RR, SBP, DBP, MAP, and oxygen saturation were recorded before induction, 30 seconds after induction, 1, 3, 5, 10, 15, 30, 45, and 60 minutes after insertion of LMA.⁷ Apnea time was noted. Jaw mobility, coughing, and gagging were also noted and scored according to the scoring system modified by Muzi.⁷ Patients that received fentanyl had a higher

rise in HR compared to patients that receive dexmedetomidine.⁷ A single dose of dexmedetomidine reduces norepinephrine release by stimulation of presynaptic alpha 2 adrenoreceptors as much as 92% in young, healthy volunteers, which decreases HR.⁷ Gupta et al. found that 58 patients that received dexmedetomidine had spontaneous respirations and 12 showed breath-holding while in the group that received fentanyl 36 patients had spontaneous respirations and 34 showed breath-holding.⁷ The study found this difference to be statistically significant; $P < 0.05$.⁷ The study concluded that dexmedetomidine is superior to fentanyl in maintaining stable hemodynamics, preserving respirations, and providing better LMA insertion conditions.⁷

The prospective randomized study by Uzümcügil F et al. from 2008 included a total of 52 patients, aged 26–65 years old with an ASA physical status I–II, scheduled to have minor urological procedures.¹⁰ The patients meeting inclusion criteria were randomized into two groups.¹⁰ A group F included those induced with propofol and fentanyl, whereas group D was treated with propofol and dexmedetomidine.¹⁰ The Data analysis was performed using SPSS for the categorical variables to include Student's t-test and ANOVA. A $P < 0.05$ was considered statistically significant.¹⁰ Two groups were similar in terms of gender distribution, age, weight, and duration of surgical procedures, and baseline SBP and mean BP (MBP) were similar.¹⁰ The emergence time was greater in Group D.¹⁰ The emergence time was 81–385s, mean: 253.5 s in Group F and 85–992s, mean: 397.5s, in Group D; $P = 0.001$.¹⁰ The variable apnea was greater in Group F, 24 patients, than in Group D, 11 patients; $P = 0.01$.¹⁰ Group D, the respiratory rates increased compared to the baseline.¹⁰ Subsequently, it was concluded that dexmedetomidine, when used before propofol induction, provides successful laryngeal mask insertion comparable to fentanyl while preserving respiratory functions more than fentanyl.¹⁰

Tan et al. in 2010 reported the optimum Fentanyl dose in combination with propofol for classic LMA insertion.¹³ The study was a randomized, controlled trial with a sample size of Seventy-five ASA I or II patients randomly assigned to five groups of fentanyl dosage: 0 $\mu\text{g.kg}^{-1}$ placebo, 0.5 $\mu\text{g.kg}^{-1}$, 1.0 $\mu\text{g.kg}^{-1}$, 1.5 $\mu\text{g.kg}^{-1}$ and 2.0 $\mu\text{g.kg}^{-1}$.¹³ Data was recorded to include hemodynamic parameters and apneic events.¹³ Prolonged apnea was defined as more than 5 mins.¹³ A grading system was utilized to

determine the optimal score for insertion and calculated by adding the grades for all the insertion condition categories of 1, 2, or 3.¹³ A total score of 6 was considered optimal.¹³ The data analysis was carried through the chi-square test for trends' linear association,' and it was used to compare insertion conditions with respect to increasing dosage.¹³ A 5% level of probability, $P < 0.05$, was utilized as a criterion for significance.¹³ This study found a high rate of the successful first attempt at insertion with 1 µg.kg and 1.5 µg/kg, 93% and 87% respectively, compared to 87% in the 2.0 µg.kg-1 group.¹³ The 1.0 µg.kg-1 group also achieved an 80% optimal insertion conditions score of 4, compared to 73% in the 1.5 µg.kg-1 group and 80% in the 2 µg.kg- group.¹³ The study found a significantly high incidence of prolonged apnea occurred mainly in the 2 µg/kg-1 group by 60%.¹³ The study concluded that even at low doses of fentanyl of 1.0 µg.kg , patients experience prolonged episodes of apnea.

Joshi et al. study in 2014 evaluated the effects of fentanyl administration before induction and LMA placement.¹⁷ This randomized double-blinded controlled trial included 100 patients with an ASA physical status 1, 2, and 3 patients undergoing ambulatory surgery.¹⁷ Patients were administered fentanyl 1 µg/kg, n=51 or saline, n=49, 3 to 5 minutes before induction with propofol 2-2.5 mg/kg IV, followed by LMA placement.¹⁷ The data were analyzed with Chi-square or Fisher's Exact tests to assess differences in breath-holding and postoperative categorical outcomes between the two study groups.¹⁷ Cochran-Mantel-Haenszel test was performed to investigate the anesthetic technique's effect on apnea after adjusting for smoking status.¹⁷ The fentanyl pretreatment group revealed a higher frequency of apnea, 94% vs. 64%; $P=0.0003$, requiring a longer duration of manual ventilation (3 [interquartile range (IQR), 1.5-5] min vs. 1 [0-1.5] min; $P=0.0001$, at induction.¹⁷ The rates of intraoperative breath-holding, 6.1% vs. 8.5%, in the two groups were similar.¹⁷ This study concluded that pre-induction with fentanyl increased the frequency of apnea at induction and manual ventilation duration.¹⁷

Propofol dosage reduction during induction.

Shalaka et al in 2016, conducted a prospective randomized, double-blind study.⁸ The study included a total of 60 ASA I and II patients of either sex scheduled for short surgical procedures under general anesthesia.⁸ Patients with neck and facial burns, reduced mouth opening, BMI>30, on B-blocker

therapy, basal heart rate <60, and known egg allergy was excluded.⁸ The researchers had two different groups, including a group D with dexmedetomidine and propofol and a second group F with fentanyl and propofol.⁸ The data was analyzed, demonstrating that the induction dose and increments of propofol required in group D were significantly lower, $P < 0.001$.⁸ Other measured parameters, such as jaw relaxation as assessed by Young's criteria, were comparable; $P = 0.41$, between the two groups.⁸ The hemodynamics, including heart rate variation and mean arterial pressure results, were not statistically significant between the two groups.⁸ Apnea of more than 30 seconds after induction occurred in both groups and was comparable.⁸ The study concluded that Dexmedetomidine significantly reduces the requirements of induction dose propofol for PLMA insertion.⁸

A blind randomized controlled trial was conducted by Yoo J et al. 1 in 2017.¹⁵ A total of 40 patients, aged 19–60 years with ASA physical status I–II, and scheduled to undergo elective minor surgery in which the use of LMA was indicated were included.¹⁵ There were two groups, the dexmedetomidine group evaluating the effect of dexmedetomidine, 1 µg/kg, pretreatment on the median effective dose (ED50) of propofol vs. the control group with propofol alone to evaluate successful LMA insertion.¹⁵ The ED50 of propofol for successful LMA insertion was determined by the modified Dixon's up-and-down method.¹⁵ The ED50 of propofol was determined to be 1.9 mg/kg for LMA insertion with a loading dose of 1 µg/kg dexmedetomidine over 10 min.¹⁵ ANOVA analyzed and recorded the hemodynamic and BIS changes recorded. Statistical significance was accepted when the P -value was <0.05.¹⁵ The ED50 of propofol for smooth insertion of the LMA, as determined by the Dixon's up-and-down method, was significantly higher in the control group than in the dexmedetomidine group, 3.1 ± 0.4 vs. 1.9 ± 0.3 mg/kg, $P < 0.001$.¹⁵ Using isotonic regression and a bootstrap approach, the ED50 of propofol was 2.9 mg/kg, 83 % CI 2.5–3.3 mg/kg, and 1.8 mg/kg, 83 % CI 1.8–2.1 mg/kg, in the control and dexmedetomidine groups, respectively.¹⁵ The MAP was higher, and HR was lower in the dexmedetomidine group than in the control group during drug infusion and LMA insertion.¹⁵ The BIS value was lower in the dexmedetomidine group during drug infusion.¹⁵ The apnea time was 43 ± 50 s in control and 54 ± 48 s in the dexmedetomidine group, but there was no statistically significant

difference.¹⁵ The study advised pretreatment with dexmedetomidine 1 µg/kg could reduce the propofol requirement by 38 % for facilitating LMA insertion without prolonged respiratory depression and hemodynamic instability.¹⁵ One limitation of this study found the estimated propofol dose for facilitating LMA insertion was limited to the fixed-dose of dexmedetomidine.¹⁵

Reduction in Minimum Alveolar Concentration

Yao et al ¹⁶ conducted a prospective, randomized, double-blind, placebo-controlled study on intranasal dexmedetomidine premedication and its effect in reducing the minimum alveolar concentration of sevoflurane for laryngeal mask airway insertion in children.¹⁶ The study included ninety ASA physical status I patients aged 3–7 years. Patients were randomized to three equal groups to receive saline (Group S), dexmedetomidine 1mcg/ kg (Group D1), or dexmedetomidine 2 mcg/kg (Group D2) approximately 45 min before anesthesia.¹⁶ Researchers used Dixon's up-and-down method to assess alveolar concentration for laryngeal mask airway insertion. Yao et al. concluded that intranasal dexmedetomidine premedication of 1 and 2 mcg/kg was associated with a reduction in sevoflurane from 1.92% to 1.53% and 1.23%, corresponding to a decrease of 20% and 36%, respectively.¹⁶ Emergence delirium, defined as peak PAED score ≥ 10 , was significantly lower in Groups D1 and D2 than in Group S; $P < 0.001$.¹⁶ Parents satisfaction scores were significantly higher in Groups D1 and D2 than in Group S; $P < 0.001$.¹⁶ The induction quality, delirium scores, and the parent's satisfaction yield a P value < 0.05 and were considered statistically significant.

DISCUSSION

Summary of Evidence

Eleven prospective, double-blind, randomized studies with a total of 836 patients and two randomized single-center studies with a total of 100 patients were included in this Quality Improvement Project. Several studies were excluded, including studies which had an inappropriate publication date i.e., older than 2010), wrong population (e.g., non-surgical patients on either treatment of propofol-fentanyl combination or propofol- dexmedetomidine combination), and wrong intervention (e.g., patients receiving

medications in the postoperative period for pain control). Of the thirteen articles found, eight were rated as high quality, and seven were rated as medium quality based on Johns Hopkins' appraisal scale. Due to larger sample sizes, well-defined methodology and inclusion criteria, as well as rigorous statistical methods, eight of the articles met the criteria for high-quality level 1 evidence. Seven articles appraised by the Johns Hopkins' tool, as medium-quality level 2 evidence had small sample sizes or mediocre defined inclusion criteria and methodology.

Of the thirteen articles analyzed, all studies recommended using propofol- dexmedetomidine combination on induction to achieve better laryngeal mask insertion condition while preserving respiratory functions.¹¹ According to Uzümcügil F et al., dexmedetomidine is beneficial for sedation and analgesia without resulting in cardio-respiratory depression.¹⁰ All RTCs concluded that apnea time was significantly shorter in patients who received dexmedetomidine compared to fentanyl. Most of the subjects by Joshi et al. study who received fentanyl upon induction had apnea, requiring manual ventilation for a more extended period.¹⁷ Subhadra et al. also reported a statistically significant drop-in respiratory rate from baseline value in patients induced with propofol and fentanyl.⁴

Five RCTs of high-quality level 1 evidence showed a statistically significant drop-in mean heart rate, SBP, DBP, and MBP in patients that received fentanyl compared to dexmedetomidine.^{4,11,14,17,18.} Surabhi et al. recorded a statistically significant rise in SBP in the post-LMA phase than in the fentanyl group, which was not seen in the dexmedetomidine group; P value=0.003. ¹¹ According to Subhadra et al.⁴ patients induced with fentanyl had a statistically significant decrease in MAP, SBP, and DBP from baseline after induction with propofol. Although it has been reported that dexmedetomidine can cause a dose-dependent reduction in arterial BP; Rustagi et al. found pre-administration of dexmedetomidine in the dose of 1mcg/kg is reported to attenuate the decrease in blood pressure during propofol induction.¹⁴

Both fentanyl and dexmedetomidine are used in conjunction with propofol in order to reduce propofol requirements for LMA insertion.¹⁴ According to Rustagi et al propofol at doses of 2.0-2.5mg/kg decreases MAP due to its vasodilatory and myocardial depressing effects, which are shown to be

potentiated by co-induction with fentanyl.¹⁴ Three double-blind RCTs showed that patients induced with fentanyl required additional boluses of propofol due to inadequate jaw relaxation, coughing, and movement.^{8,15,15} Induction doses of propofol range from 2 mg/kg to 2.5mg/kg, while fentanyl and dexmedetomidine doses of 1mcg/kg were the only doses used in all thirteen studies. Choudhary et al.⁶ was the only study that used a higher dose of propofol, 2.5 mg /kg. Choudhary et al. also observed that patients induced with propofol and dexmedetomidine had better postoperative pain scores when compared to the fentanyl group due to dexmedetomidine action on α 2adrenoceptors in locus cerulean and dorsal horn of the spinal cord.⁶

Limitations of the Quality Systematic Review:

An extensive data search was performed with criteria to include the comparison of dexmedetomidine vs. fentanyl during induction for LMA insertion, and which resulted in limited published available data. All studies, when comparing dexmedetomidine vs. fentanyl as an adjuvant anesthetic during LMA insertion, represent a small population of patients evaluated for a combination of two anesthetic drugs within the two different groups with Propofol being a primary anesthetic for both groups.^{1,4,5-17} For this quality improvement project, the use of IV propofol alone during induction is considered insufficient for adequate LMA insertion and, therefore, unethical to be used by itself.^{1,7,10,14} Increased dose of propofol when used as a sole anesthetic tends to cause respiratory depression and hemodynamic instability.^{1,7,10,14}

There was no evaluation of propofol as an individual sedative agent as a control group. The use of propofol alone for sedation during LMA insertion is considered a high risk for respiratory complications.⁶ Most of the research is randomized double-blinded, but no multicenter clinical trial was available to address this subject better.^{1,4,5-17} As part of the evaluation, all reviewed studies are single-center without inclusion for other institutions with homogeneous inclusion criterias.^{1,4,5-17}

The bispectral index (BIS) is a very useful tool to assess levels of hypnosis and subsequently levels of comfort, especially during LMA insertion or maintenance. From all the studies within this Quality Improvement Project, only one considered the use of BIS during LMA insertion.¹⁵ Another study in this review utilized the BIS as a monitoring tool to properly titrate desflurane during anesthesia maintenance.¹⁷ Otherwise, there is a significant lack of utilization of the BIS monitor during induction for LMA insertion, nor during anesthesia maintenance within currently available data when comparing dexmedetomidine to fentanyl.

The hemodynamics at baseline might not necessarily be similar among these groups prior to LMA insertion, and the result description or the statistical analysis were not adjusted given the small population and demographic included in each randomized clinical trial between the dexmedetomidine and fentanyl. Also, there is great variability in hemodynamics measurement and results among the revised clinical trials during LMA insertion and post-induction during anesthesia maintenance.^{1,4,5-17} Although the focus on most of these examined clinical trials remains on hemodynamics and respiratory status, including episodes of apnea, there is no homogeneity to determine whether the significant changes occurred during induction vs. post-induction. There is no significant data available during the postoperative state when comparing these two anesthetics.

During the postoperative state, the use of pain, recovery, and sedation scales are very useful in determining and guiding the management of patients as part of the post-surgical intervention. There is very limited data regarding the use of pain scales such as the visual analog scale (VAS) on these studies reviewed. Only one study demonstrated significantly lower VAS values within the group of patients that received dexmedetomidine during the postoperative state.⁶ One study reported the utilization of lidocaine during induction of anesthesia for LMA insertion. The addition of lidocaine as an adjuvant continues to grow in practice as a standard of care, but none of the studies on this review reports postoperative pain scales or their relationship to the use of dexmedetomidine vs. fentanyl.⁶

Another limitation within the currently available data is the lack of generalizability of the clinical data to include a wider demographic population. According to the CDC for 2017-2018, the percent of adults aged 20 and over who are overweight, including obesity, is 73.6%. Weight criteria were commonly used as exclusion criteria in this quality improvement project. Shalaka et al., Yoo et al. and Rustagi et al. studies did not include patients with a BMI > 30 Kg/m².^{8,14,15} Ramaswamy et al. and Gupta et al. excluded patients with a weight more than 80kg whereas Sintavanuruk utilized a 40 - 85Kg range and did not utilize the BMI as criteria.^{1,7,12} Choudhary et al. utilized the BMI > 35 Kg/m², whereas Joshi et al. used BMI > 40 Kg/m² as exclusion criteria.^{6,17} The study from Uzümcügil did not include a weight exclusion criteria reporting 75.7 Kg +/- 11.85 in the Fentanyl group and 76.3 Kg +/-9.93 in the dexmedetomidine demonstrating how the average weight can easily be more than 80 Kg although a BMI level could not be determined.¹⁰ Surabhi et al. did not address weight during their study.¹¹ The above results in a substantial limitation as there is a lack of data understanding the reaction and side effects of dexmedetomidine vs. fentanyl on this population as it affects hemodynamics and respiratory parameters, as an example.

Recommendations for Future Research

When evaluating the available data on comparisons for dexmedetomidine vs. fentanyl during induction for LMA insertion, the current publications are limited with small populations. There is no multicenter clinical trial from all available reports within this quality improvement project. Multicenter clinical trials represent the best available data as it includes a larger population with demographic variability and a better general population analysis as many institutions would participate. The practice changes of using dexmedetomidine versus fentanyl upon induction have changed clinical practice away from the use of opioid-based medications. Although currently available data suggest and favor the use of dexmedetomidine over fentanyl during induction for LMA insertion, a multicenter clinical trial would bring generalizability in the surgical population in supporting this practice change. A multicenter clinical trial would impact the current AANA guidelines for induction during LMA insertion with high-quality and reliable clinical data.

Future research can expand inclusion criteria of the following: type of surgery, ASA classification, mallampati classifications, 1,2 3 & 4, BMI, and desired depth of anesthesia. Multiple measurable variables come into play within the complex induction process of anesthesia during LMA insertion. For purposes of comparison between dexmedetomidine and fentanyl, the following variables should be researched, graded insertion conditions, baseline hemodynamic levels during induction and maintenance, episodes of apnea, and emergence time. Hemodynamics should include SBP, MAP, DBP, and heart rate. The definition of an episode of apnea should be supported by a capnograph. One study reported a longer apneic time when using fentanyl (290 sec) when compared to dexmedetomidine (227 sec).¹ Another study also reported apneic events in the fentanyl group 237.78 ± 21.36 sec, statistically different to dexmedetomidine, with 208.74 ± 15.69 sec.⁷ Another study defined apnea as more than 30 seconds and found it to be comparable in both groups of anesthetics used, whereas similar criteria on Rustagi al.al and on Joshi al.al revealed significantly higher incidence and mean duration of apneic events within the fentanyl group.^{8,14,17} Joshi et al. utilized minutes as the unit of measurements instead of seconds.¹⁷ It might be appropriate to define an episode of apnea as more than 30 seconds, but it appears that most apneic episodes could easily reach a mean of 200 seconds long or more based on this systematic review. Although longer episodes of apnea are more concerning for clinical outcomes, different levels of severity should be better defined. Mild apnea is defined between 30 to 200 sec, moderate between 200 to 300 sec, and severe as more than 300 sec, but this might be difficult to define given multiple factors such as the surgical scenario, patient's age, medical history, ASA classification, or the patient's hemodynamics.

Another aspect to consider for future research is the utilization of pain monitoring tools for the intraoperative and postoperatively assessment when comparing dexmedetomidine to fentanyl. There is limited data on the use of the BIS during induction as only one study published a significantly lower score on the BIS values when using dexmedetomidine, demonstrating its superiority to fentanyl.¹⁵ There is also limited intraoperative data when monitoring for pain levels as there is only one study utilizing BIS monitor to titrate desflurane during anesthesia maintenance properly, but it does not reflect any benefit of

dexmedetomidine over fentanyl.¹⁷ The postoperative state tools to monitor pain include the use of a visual analog scale (VAS), but data was found to be limited when comparing dexmedetomidine to fentanyl. Choudhary et al. suggest there are superior results when using dexmedetomidine during LMA insertion, as the VAS showed lower values in the postoperative state.⁶ Future research in this area would benefit from the inclusion of pain measuring tools such as BIS or VAS during anesthesia induction, maintenance, or even in the postoperative state when studying dexmedetomidine vs. fentanyl as adjuvant anesthetics. Also, it is unknown how the use of lidocaine within this group of anesthetics would influence pain levels on the patient during the intraoperative state and the postoperative state.⁶

Recommendations for Practice Presented in an Algorithm

Dexmedetomidine dose of 1mcg/kg, 30 seconds prior to induction of propofol at 1.5mg/kg, provides successful LMA insertion. Successful insertion is defined by having a fully relaxed jaw, absence of cough, minimum effect on the adrenergic state of the patient, and preservation of respiratory drive. Among the studies, the combination was found to preserve respirations.¹⁰ The double-blind RCT conducted by Yoo J et al.¹⁵ determined that using dexmedetomidine 1mcg/kg can potentially reduce the propofol requirements by 38%. The RCT conducted by Rustagi et al. concluded that using dexmedetomidine even at a lower dose of 0.5mcg/kg can be more effective than using fentanyl at 1mcg/kg in maintaining hemodynamic stability during extubation.¹⁴

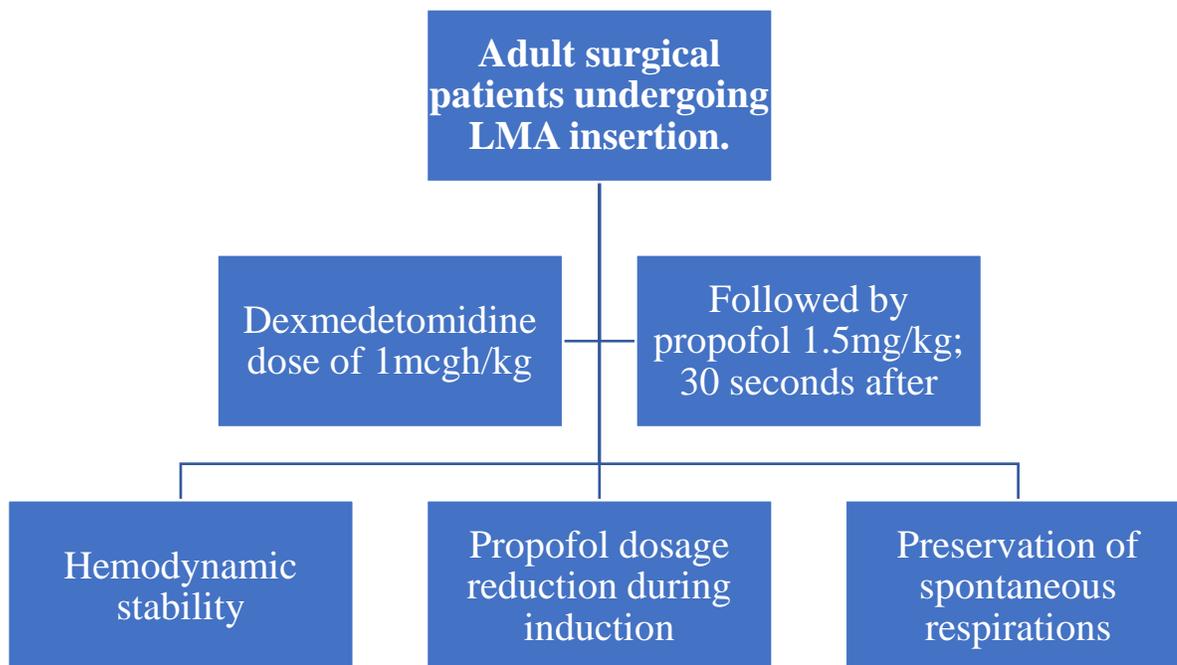


Figure 2. Algorithm for Perioperative Patients Undergoing LMA Insertion

CONCLUSION

Providing the best level of anesthesia during induction with LMA insertion remains an important query in anesthesia. Propofol as the sole anesthetic does not appear to be appropriate and might even be unethical for the patient's best depth of anesthesia during LMA insertion.^{1,7,10,14} The need for anesthetic adjuvants such as dexmedetomidine or fentanyl is frequently needed. The use of dexmedetomidine compared to fentanyl appears to provide better insertion conditions and better attenuation of the hemodynamic and respiratory stress response caused by the insertion of LMA. All thirteen RCTs suggest the use of dexmedetomidine to be superior to fentanyl in preserving respirations and not needing incremental doses of propofol. A multicenter randomized clinical trial with a larger demographic is needed to provide generalizability and higher quality clinical evidence when comparing the use of dexmedetomidine to fentanyl. Utilization of current available tools such as the use of BIS monitoring, VAS, and other pain assessment tools would provide valuable clinical data on pain management outcomes intraoperatively and postoperatively with a general anesthetic utilizing an LMA.

IMPLEMENTATION

Setting and Participants

The setting will take place through an online survey and a Zoom PowerPoint educational module consisting of a pre and post-test with the members of the Anesthesia Department from Envision Physician Services at Memorial Regional Hospital. The preliminary study will include anesthesia providers such as Certified Registered Nurse Anesthetists (CRNAs) and Anesthesiologists. The participation will be based on individuals who were forwarded within the email list provided by Memorial Regional Hospital and will be asked to provide feedback regarding the educational module's anesthesia providers' experience and knowledge. The anticipated sample size will be between 15-20 participants.

Recruitment

The target population consisted of CRNAs and Anesthesiologists who have taken care of patients during LMA insertion. Participants were identified through an email list provided by Memorial Regional Hospital. The anesthesia providers within the email list were emailed an invitation and link to participate in the educational module.

Description of Approach and Project Procedures

The primary methodology of the proposed project is to have the survey taker participate in an online PowerPoint educational module that focuses on the difference between dexmedetomidine versus fentanyl as adjuncts to propofol during LMA insertion. The project will be implemented by conducting an online preassessment test that will assess the anesthesia provider's knowledge about the efficacy of Dexmedetomidine- Propofol, and Fentanyl - Propofol for LMA insertion. The existing knowledge and understanding of the anesthesia provider will be defined using a pre-evaluation tool that will influence the intervention's information and determine the content or subject matter of the intervention.

The second phase will include an online PowerPoint presentation. The primary means of learning will be through a voiceover PowerPoint presentation with information regarding the advantage of using dexmedetomidine- propofol combination during LMA insertion. Anesthesia providers' education is essential in bridging existing gaps in knowledge and supporting the need for additional tools to ensure

optimal patient conditions during LMA insertion. Anesthesia providers will have the opportunity to expand their knowledge about the benefits of using dexmedetomidine during LMA insertion. The delivery of the presentation will offer insight for providers regarding the differences of using dexmedetomidine-propofol versus fentanyl-propofol combination. The empirical evidence supports an evidence-based project with comprehensive information regarding the benefits of using a dexmedetomidine-propofol combination to provide better insertion conditions and lesser hemodynamic response.

The third phase of the project will involve an online post-assessment test to identify the anesthesia providers learned knowledge and perception of the intervention and the contents that were delivered. This information will provide greater feedback regarding the impact of the educational intervention and will determine how to best move forward in expanding the use of dexmedetomidine during LMA insertion. The pre/post-testing will provide relevant information regarding the benefits of using dexmedetomidine as an adjuvant to decrease the requirement of propofol and maintain stable hemodynamics intraoperatively. At the end of the educational tool, feedback will also demonstrate if the information provided will improve anesthesia providers' knowledge.

Protection of Human Subjects

Anesthesia providers participating in the survey remained anonymous, and the data was secured by using unique code identifiers. The digital data collected from the pre-test and post-test were protected by a laptop password and spyware. Using laptop passwords and spyware ensured the safety of the data. There are no perceived risks to the study as it only requires the time spent by each anesthesia provider in the educational module, which took less than 20 minutes to complete.

Data collection and analysis

For the Quality Improvement Project, the primary instruments included preassessment and post-assessment testing applications to determine the effects of the educational module. Both tests will be conducted using surveys utilizing Qualtrics that will determine if participants understand the difference between the adjuvants, dexmedetomidine, and fentanyl, during LMA insertion. The survey consisted of 15 questions that focus on knowledge and practice. The pre-test survey will gauge baseline knowledge. In

contrast, the post-test survey will determine the participant's knowledge from the educational module and the application of knowledge gained to professional practice. The data collected will be confidential, and no subject identifiers will be recorded during any component of the study.

Data Management and Measure

The investigator for the project will be the DNP student responsible for obtaining the members of the Anesthesia Department at Memorial. Regional Hospital via email list for the administration of the pre-and post-survey and a PowerPoint educational module. Each question will be measured, and the responses recorded to identify the knowledge base before and after the educational module. No personal identifiers will be recorded for each of the study participants so that confidentiality will be protected. The impact of the educational module will be based upon the results of the pre-and post-test survey instruments. Through the statistical analysis, the study results will likely identify patterns that will be used to determine the effectiveness of the educational module and if the module will improve anesthesia providers' knowledge. The co-investigator will store the data collected in a password-protected laptop computer.

IMPLEMENTATION RESULTS

Pre/Post-Test Demographics

The pre-test demographics are shown in Table 3., shown below.

Pre-Test Participants Demographics

Demographic	n (%)
Total Participants	10 (100%)
Gender	
Male	3 (30%)
Female	7 (70%)
Age	
25-35	7 (70%)
36-45	2 (20%)
46-55	1 (10%)
56-66	0 (40%)
Ethnicity	
Hispanic	2 (20%)
Caucasian	5 (50%)
African American	1 (10%)

Asian	0 (0%)
Other	2 (20%)
Position/Title	
CRNA	10 (100%)
MD/DO	(0%)
Years of Experience	
1 to 2 years	6 (60%)
2 to 5 years	3(30%)
5 to 10 years	1(10%)
More than 10 years	0 (0%)

There were 10 participants in the pre-test demographics. Most of the participants were female (n=7, 70%) instead of male (n=3, 30%). There was also a range of ethnicities represented: Caucasian (n=5, 50%), Hispanic (n=2, 20%), African American. (n=1, 10%), and other (n=2, 20%). Information was obtained regarding the participant's role at the hospital. It was found that all participants were CRNAs. The participants were questioned about the length of time practicing, finding that the practice period ranged: 1-2 years (n=6, 60%), and 2 to 5 years (n=3, 30%). The participants consisted of DNP-prepared CRNAs (n=7, 70%) and Master level prepared CRNAS (n=3, 30%).

Pre-Test Likelihood of Utilization of Dexmedetomidine in Patients Undergoing Laryngeal Mask Insertion

The pre-test contained information regarding the benefits of using dexmedetomidine versus fentanyl as an anesthetic adjunct during LMA insertion. Most participants (n=8, 80%) stated that they were somewhat likely to utilize dexmedetomidine on induction to achieve better laryngeal mask insertion conditions while preserving respiratory function. The survey concluded that most respondents (n=8, 80%) were unaware of how much dexmedetomidine pretreatment could reduce propofol requirements during LMA insertion. This group of participants admitted to not knowing that the use of dexmedetomidine could reduce propofol requirements by 38%.

Pre-Test Identification of Current Knowledge about Perioperative Management of Surgical Patients Receiving Dexmedetomidine as an Anesthetic Adjunct to Propofol to Facilitate Laryngeal Mask Insertion.

The survey focuses on identifying the benefits of utilization of dexmedetomidine as an anesthetic adjunct during LMA insertion. Most of the participants understood the mechanism of action of dexmedetomidine; the question was correctly answered by 9 participants (n=9, 90%). When asked about the benefits of dexmedetomidine use, all 10 participants answered the questions correctly (n=10, 100%). All participants (n=10, 100%) answered correctly when questioned about dexmedetomidine's side effect profile. The participants knew the side effects of fentanyl, when asked about the most common side effect of fentanyl (n=8, 80%), answered correctly. The participant's scores improved in the post-test when asked questions pertaining to the dose of dexmedetomidine recommended to blunt the sympatho-adrenal responses to laryngeal mask insertion (n=10, 100%). The participants were asked questions about the recommended dose of propofol and dexmedetomidine combination that provided the best insertion conditions without compromising the patient's hemodynamic state. Participant's scores showed a universal improvement upon the comparison of the pre-and post-survey. Table 4 shows the difference in responses from the pre- to post-test.

Table 4. Difference in Pre- and Post-Test Knowledge

Questions	Pre-test	Post-test	Difference
Select which statement is TRUE about dexmedetomidine	90%	100%	10%
In which receptor does dexmedetomidine exert its action	100%	100%	0%
What are the MOST common side effects of fentanyl?	100%	100%	0%
What is the MOST common side effect of dexmedetomidine?	100%	100%	0%
Which dose of dexmedetomidine has been reported to blunt the sympatho-adrenal responses to laryngeal mask insertion?	40%	100%	60%
How much could dexmedetomidine pretreatment reduce propofol requirements during LMA insertion?	60%	100%	40%

According to research which of the following combination of induction agents provides the best insertion conditions without compromising the patient's hemodynamic state?	80%	100%	20%
Which statement is CORRECT about fentanyl?	80%	100%	20%
Which of the following statement is CORRECT about dexmedetomidine?	80%	100%	20%
How much rise in systolic blood pressure can be seen in a patient treated with fentanyl during the Post LMA phase?	0%	100%	100%
How likely are you to use dexmedetomidine as an alternative to fentanyl during LMA insertion?	80%	100%	20%
How likely are you to recommend the use of dexmedetomidine over fentanyl during LMA insertion?	80%	100%	20%

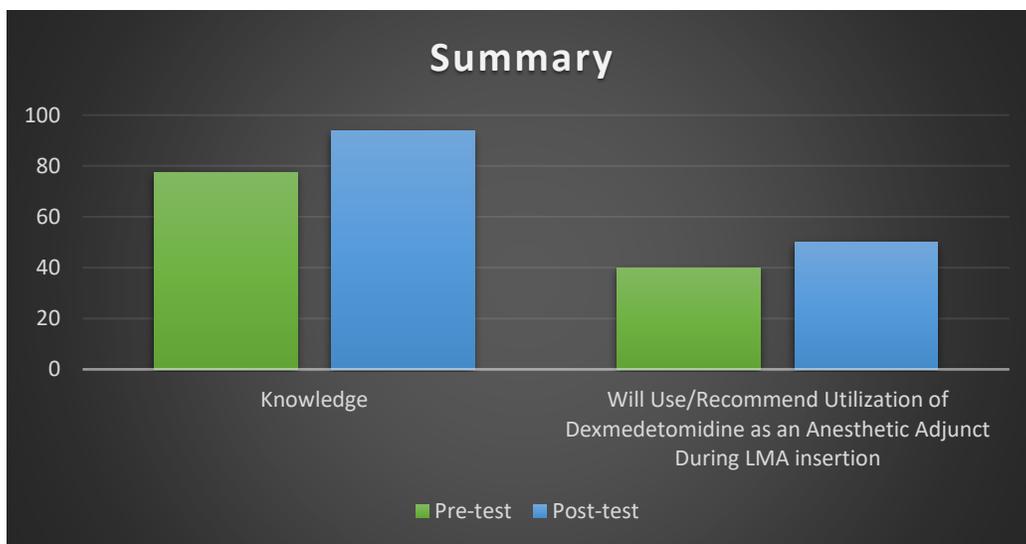
On average, the scores on the post-test increased compared to that of the pre-test after the participants viewed the online PowerPoint presentation. All the participants improved knowledge about the benefits of utilizing dexmedetomidine versus fentanyl as an adjunct to propofol during LMA insertion. Most of the participants report improved knowledge about how much dexmedetomidine pretreatment could reduce propofol requirements during LMA insertion (n=8, 80%). Questions regarding dexmedetomidine on the mechanism of action, benefits of use, and side effects, there was no decipherable proof of learning as all the participants answered the questions correctly on the pre-and post-test (n=10, 100%). Most of the participants report improved knowledge about the correct dosage of dexmedetomidine reported to blunt the sympatho-adrenal responses to laryngeal mask insertion (n=6, 60%). Lastly, all the participants in the post-test stated they would be likely to use and/or recommend dexmedetomidine over fentanyl as an anesthetic adjunct during LMA insertion (n=10, 100%).

Post-Test Likelihood of Utilization of Dexmedetomidine in Patients During LMA Insertion

Most of the participants stated they were somewhat likely to utilize dexmedetomidine in patients undergoing LMA insertion in the pretest (n=8, 80%). The post-test showed that all eight participants changed their answer from “somewhat likely” to “extremely likely” (n=8, 80%). The post-test not only showed an increase in knowledge but showed that all the participants were “extremely likely” to recommend the use of dexmedetomidine versus fentanyl during LMA insertion.

Summary

Overall, the results reflected an improvement in knowledge based on the pre-test and post-test scores. Knowledge showed an average gain of (25%). In addition, the post-test demonstrated that participants are extremely likely (n=4, 80%) or somewhat likely (n=2, 20%) to use a dexmedetomidine-propofol combination for LMA insertion.



IMPLEMENTATION DISCUSSION

Limitations

Limitations of the study include a small sample size; the survey was emailed to the members of the Anesthesia Department at Memorial Regional Hospital. There were 56 emails on the list; however, only ten people completed the survey. A larger sample size is preferred to enhance the study's findings and offer a sample size that mirrors Memorial Regional Hospital's anesthesia practitioners. The survey link, which included a pre-test, a narrated PowerPoint presentation, and a post-test, was available online for two weeks; it is possible that lengthening the time of survey availability may have produced more responses. Lastly, the study was executed completely online, preventing it from being distributed through other modalities.

Future Implications for Anesthesia Practice

The literature demonstrated that hemodynamic parameters were more stable in patients that received dexmedetomidine-propofol combination than in patients that receive fentanyl co-administered with propofol for LMA insertion.⁴ Dexmedetomidine gives better insertion conditions and better attenuation of pressor response to LMA insertion than fentanyl.¹¹ Even though the primary aim was to demonstrate that dexmedetomidine possesses sedative, anesthetic-sparing, analgesic, sympatholytic, and hemodynamic-stabilizing properties and lacks respiratory depression, it was discovered that dexmedetomidine is also capable to significantly reduce the requirements of induction dose propofol for LMA insertion.^{8,14,15} Incorporation of Dexmedetomidine has also reduced the need for NSAIDs, improved quality of sleep, and exhibited a shorter recovery time in PACU.

When compared to dexmedetomidine, fentanyl has not only been found to suppress respiratory drive but also is associated with nausea and vomiting.¹⁰ The use of fentanyl could imply the need for additional medication to control the side effects of nausea and vomiting. Overall, dexmedetomidine is found to be unique among other sedatives given its clinical safety regarding respirations even at high doses. The Quality Improvement Project showed that the intervention of bringing awareness to these factors was effective in increasing healthcare provider's knowledge and increased the likelihood of utilizing/recommending dexmedetomidine as an anesthetic adjunct in patients undergoing LMA insertion.

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Appendix A

Evaluation Table 1

Citation	Subhadra P, Jayaram A, Rao M. Comparison of dexmedetomidine combined with propofol Vs fentanyl combined with propofol for laryngeal mask insertion. Journal of Clinical and Scientific Research. 2014;3(4):228. doi:10.15380/2277-5706.jcsr.13.032.
Design/Method	Prospective, randomized single-center study which included sixty patients admitted for lower abdominal and lower limb surgeries.
Sample/Setting	Sixty patients with lower abdominal and lower limb surgery were randomized into Group F (n=30) and Group D (n=30). Thirty seconds after the study drug (fentanyl 1 µg/kg in Group F and dexmedetomidine 1 µg/kg in Group D diluted in 10 mL normal saline over 2 min) was administered, induction was done with IV propofol 2 mg/ kg in both groups. Ninety seconds after propofol injection, jaw relaxation was assessed and LMA of appropriate size was inserted. If the first attempt failed, another attempt with additional dose of IV propofol (0.5 mg/kg).
Major Variables Studied and Their Definitions	Independent variable: IV1 is fentanyl and propofol vs IV2 dexmedetomidine and propofol Dependent variable: DV1 is systolic blood pressure (SBP); DV2 is diastolic blood pressure (DBP); DV3 is mean arterial pressure (MAP); DV4 is respiratory rate (RR); DV5 is SpO2; and DV6 is insertion condition. Continuous variables: age, weight, heart rate, systolic blood pressure, diastolic blood pressure, mean blood pressure and apnea time.
Measurement and Data Analysis	Apnea event: measured by SpO2 and respiratory rate Insertion condition: jaw mobility (fully relaxed, mild resistance, tight but opens, closed); coughing (none, 1 or 2 bouts of cough, 3 or more bouts of cough, bucking); movements (mild, moderate, severe, none); and number of insertion attempts. Continuous variables were compared with student's t-test. Parameters measured over multiple points of time were analyzed using repeated measures ANOVA with Bonferroni post-hoc test. Categorical variables were compared by Chi-square test. Statistical analysis was done by using SPSS. A p-value of < 0.05 was considered as statistically significant.
Findings	Both the groups were comparable in age weight, sex, age wise distribution and insertion conditions. The apnea times were significantly shorter in group D than in group F. Baseline hemodynamics were comparable in both groups. Hemodynamics parameters were more stable in Group D. There were less apneic events in Group D as well.
Results	The reductions in SBP, DBP, MAP was greater in Group F (p < 0.001). More patients developed apnea in Group F than in Group D (p < 0.05). The incidence of apnea was lower in group D compared to group F (40% vs 67%, p<0.01).
Conclusions	Dexmedetomidine combined with propofol provides the same conditions for LMA insertion as fentanyl- propofol combinations with advantage of better maintainance of haemodynamic parameters.

Appraisal: Worth to Practice/Level	Strength: dexmedetomidine appears to be a potential alternative to fentanyl. Limitations: Small study. No control group with propofol was used alone. Patients required different levels of analgesia and variable duration of anaesthesia, only insertion conditions using propofol and dexmedetomidine were studied. BIS was not used. Risk of harm: risk of severe bradycardia in predisposed patients. Feasibility of use: Adequate, less use of Fentanyl decreasing risk for side effects such as apneic episodes. Dexmedetomidine is commercially available
THEME	Laryngeal mask airway insertion with dexmedetomidine decrease hemodynamic instability, ensure spontaneous respirations, and reduce propofol dosage on induction.

Evaluation Table 2

Citation	Ramaswamy AH, Shaikh SI. Comparison of dexmedetomidine-propofol versus fentanyl-propofol for insertion of laryngeal mask airway. Journal of Anesthesiology Clinical Pharmacology. 2015;31(2):217-220. doi:10.4103/0970-9185.155152
Design/Method	Prospective double blind randomized study
Sample/Setting	Eighty patients of ASA class 1&2 were randomly divided into two groups of 40 each. Group D received dexmedetomidine 1 mcg/kg and group F received fentanyl 1 mcg/kg intravenously (IV) over 2 minutes. For induction, propofol 2mg/kg was given IV and 90 seconds later LMA was inserted.
Major Variables Studied and Their Definitions	Independent variable: IV1 is dexmedetomidine and propofol vs IV2 is fentanyl and propofol Dependent variable: DV1 is apnea time; DV2 is respiratory rate (RR), DV3 is laryngeal mask airway insertion.
Measurement and Data Analysis	Apnea time: time from last spontaneous breath after propofol administration to first spontaneous breath LMA insertion score: Jaw mobility was graded as: 1-fully relaxed, 2-mild resistance, 3-tight but, opens, 4-close. Coughing/movement were graded as: 1-none, 2-one or two coughs, 3-three or more coughs, 4- bucking/movement. In each category, scores ≤ 2 were considered optimum for LMA insertion. The sample size was calculated using Statistical Package Software Statistical Analysis with an alpha error of 0.05, confidence of 95% (infinite population). The calculated power of the study was 88%. Statistical analysis with Student t-test (z-test) for parametric data. Chi-square test for nonparametric data. $P < 0.05$ was considered statistically significant.
Findings	Two groups were similar in terms of distribution of age, sex, and weight. Insertion conditions with respect to jaw mobility, were appropriate in all patients of Group D. Adverse events to insertion of LMA and hemodynamic variables were comparable in both the groups. Increase in RR in dexmedetomidine group compared to fentanyl group.
Results	37 (92.5%) patients of group D and 35 (87.5%) patients of group F had LMA insertion score of < 2 and 5 (12.5%) patients of group F had score > 2 . Statistically significant ($P < 0.001$) increase in the RR in Group D from 5 min after insertion of LMA which got stabilized at 22/min by 15 min. The duration of apnea was longer in Group F (290 s) than in Group D (227 s).

Conclusions	Dexmedetomidine can be a comparable alternative to fentanyl as an adjuvant to propofol for providing optimum insertion conditions for LMA and preservation of respiration. Both drugs provide stable hemodynamic profile but, dexmedetomidine is superior to fentanyl in preserving respiration.
Appraisal: Worth to Practice/Level	Strength: Better RR effect with dexmedetomidine than with fentanyl. This study did not require inhalation gasses. Limitations: Small study. not included control group that is, propofol alone for insertion of LMA although unethical due to propofol provides inadequate insertion. Pain, recovery, and sedation scale were not included anywhere in the study. Risk of harm: Lack of use of inhalation gasses might not provide continuous sedation and greater risk of awareness given dexmedetomidine was only given for insertion. Feasibility of use: Adequate, dexmedetomidine is commercially available and provides better respiratory status during LMA insertion.
THEME	Laryngeal mask airway insertion with dexmedetomidine decrease hemodynamic instability, ensure spontaneous respirations, and reduce propofol dosage on induction.

Evaluation Table 3

Citation	Jaya Choudhary, Aaditya Prabhudesai, & Chumki Datta. (2019). Dexmedetomidine with propofol versus fentanyl with propofol for insertion of Proseal laryngeal mask airway: A randomized, double-blinded clinical trial. <i>Journal of Anesthesiology Clinical Pharmacology</i> , 35(3), 368–372. https://doi-org.ezproxy.fiu.edu/10.4103/joacp.JOACP_104_18
Design/Method	Prospective, randomized, double-blinded, parallel group clinical trial. Inclusion criteria: American Society of Anesthesiologists (ASA) physical status I–II patients, aged 18–60 years, weighing between 35 to 80 kg scheduled for elective urosurgical procedures lasting <120 mins. Exclusion criteria: anticipated difficult airway, morbid obesity (BMI >35), or those at risk of gastric aspiration.
Sample/Setting	Seventy-four American Society of Anesthesiologists (ASA) physical status I–II patients were randomly allocated to receive either dexmedetomidine 1 µg/kg [Group PD] or fentanyl 1 µg/kg [Group PF]
Major Variables Studied and Their Definitions	Independent variable: IV1 is dexmedetomidine and propofol vs IV2 is fentanyl and propofol. Dependent variable: DV1 is apnea time; DV2 is laryngeal mask airway insertion under the Muzi score; DV3 is bradycardia; DV4 is hypotension; DV5 is Emergence time; and DV6 is Visual Analogue score (VAS).
Measurement and Data Analysis	Insertion evaluated by a blinded investigator: jaw mobility (1: fully relaxed, 2: mild resistance, 3: tight but opens, and 4: closed), coughing or movement (1: none, 2: 1 or 2 coughs, 3: 3 or more coughs, and 4: bucking/ movements). Score ≤2 was considered optimal for PLMA insertion. Effective ventilation was confirmed by adequate chest rise and a capnograph trace. Bradycardia: Heart Rate <60 Hypotension: Systolic Blood Pressure <90 mm Hg.

	<p>Emergence time: time between switching off sevoflurane to first response to verbal commands.</p> <p>Postoperative pain was assessed in the postoperative anesthesia care unit (PACU) with the VAS</p> <p>The categorical variables were compared between the two groups using the Pearson's Chi-square test. Continuous variables are expressed as mean \pm SD and compared using unpaired t-test and Mann-Whitney U test. The statistical software SPSS version 20 was used for the analysis of data. P value <0.05; was considered as significant.</p>
Findings	<p>The two groups were comparable in terms of patient characteristics such as age, sex, ASA grading, Mallampati grade. In the PF group, PLMA insertion score in six patients was >2, and in the PD group, three patients had score >2 (Not significant). Baseline HR, SBP, and MAP were comparable in both the groups. Incidence of apnea was greater in PF group as compared to PD group. Emergence time was significantly longer in PD group as compared to PF group.</p> <p>Postoperative pain in the PACU showed that VAS values were significantly lower in PD group as compared to PF group</p>
Results	<p>83.8% patients in the group PF and 91.9% in the group PD achieved optimal insertion condition (not significant). Hemodynamic stability was maintained in both the groups, but the incidence of apnea was significantly higher in the PF group ($P = 0.011$). Apnea time was 68.8 ± 104.1 in the PD group vs 123.8 ± 67.7 in the PF group ($P = 0.011$). Emergence time was prolonged in PD group 412.2 ± 77.6 vs PF group 227.3 ± 66.6 but postoperative pain scores were significantly lower, 36 in PD group vs 15 in PF group ($P < 0.001$)</p>
Conclusions	<p>Single IV dose of both dexmedetomidine and fentanyl administered prior to induction with propofol provide comparable and satisfactory PLMA insertion conditions and stable hemodynamic parameters.</p> <p>Dexmedetomidine preserved patient's spontaneous breathing and provided better postoperative analgesia.</p>
Appraisal: Worth to Practice/Level	<p>Strength: Stable hemodynamics, less apnea time and better postoperative control in PACU with dexmedetomidine. Anesthesia maintenance with inhalation gasses.</p> <p>Limitations: Small study. Patients excluded after three unsuccessful attempts. Depth of anesthesia achieved for PLMA insertion in two groups not assessed due to non-availability of BIS monitor. No control group as propofol alone fails to provide adequate condition for PLMA insertion and may increase the incidence of respiratory morbidities.</p> <p>Risk of harm: Pain monitoring is of great importance to determine patient comfort during insertion. Lack of use of inhalation gasses might not provide continuous sedation and greater risk of awareness given dexmedetomidine was only given for insertion</p> <p>Feasibility of use: Adequate, dexmedetomidine is commercially available and probes to be feasible for insertion, stable hemodynamics</p>
THEME	<p>Laryngeal mask airway insertion with dexmedetomidine decrease hemodynamic instability, ensure spontaneous respirations, and reduce propofol dosage on induction.</p>

Evaluation Table 4

Citation	Gupta S, Gadani HN, Shah PR. A comparative evaluation of use of dexmedetomidine versus fentanyl for anesthesia induction with propofol for insertion of laryngeal mask airway. <i>Anesthesia, Pain & Intensive Care</i> . 2018;22(2):165-173. Accessed September 26, 2020.
Design/Method	Prospective, double blind, randomized clinical study Inclusion criteria: healthy patients of both sexes, having ASA grade I and II, aged 18-70 years, weighing 30-80 kg were selected undergoing elective minor surgical procedures under general anesthesia Exclusion criteria: ASA grade III-IV, pregnant patients, smokers, patients undergoing oral and nasal surgeries, having inadequate mouth opening, patients with risk of aspiration, poorly controlled hypertension, respiratory compromises, neuromuscular diseases, hematological disorders and severe hepatic or renal insufficiency, patients allergic to any of the study drug
Sample/Setting	140 healthy patients of both sexes, having ASA grade I and II, random numbers by a person blinded to the procedure into two groups, Group-D (dexmedetomidine-propofol group) (n = 70) and Group-F (fentanyl-propofol group) (n = 70).
Major Variables Studied and Their Definitions	Independent variable: IV1 is dexmedetomidine and propofol vs IV2 is fentanyl and propofol. Dependent variable: DV1 is Baseline parameters; DV2 is Correct LMA placement; DV3 is bradycardia; DV4 is apnea time; DV5 is LMA insertion
Measurement and Data Analysis	Baseline parameters: HR, RR, SBP, DBP, MAP, SpO at 0, LMA insertion, 1, 3, 5, 10, 15, 30, 45 and 60 mins. Correct LMA placement was confirmed with the expansion of the chest wall with bag compression Bradycardia: Heart rate < 45 Apnea time: time from last spontaneous breath after propofol administration to first spontaneous breath of the patient was noted. LMA insertion score by Muzi: Jaw mobility was graded as: 1-fully relaxed, 2-mild resistance, 3-tight but, opens, 4-close. Coughing/movement were graded as: 1-none, 2-one or two coughs, 3-three or more coughs, 4- bucking/movement. In each category, scores ≤ 2 were considered optimum for LMA insertion. Data obtained from observations were entered and analyzed in EPI info 7. Continuous variables were expressed in mean and standard deviation. Categorical variables were expressed in percentages. t-test and chi square test were applied accordingly. P value < 0.05 was considered statistically significant and < 0.001 was considered highly significant.
Findings	No significant differences in patients' age, weight, or sexes in the two groups. No significant differences in baseline heart rates in the two groups (p = 0.20) and on LMA insertion. SBP had highly significant differences at 1, 3, 5, 10 and 15 mins. DBP, MAP and RR had highly significant differences at 1, 3, 5, 10, 15 and 30 mins Breath holding was significantly more in Group-F as compared to Group-D. No significant change in SpO ₂ at any time in both the groups. Apnea greater in Group F
Results	5 patients in Group-D developed bradycardia.

	<p>Differences in systolic blood pressure (mm of Hg) readings were not statistically significant at baseline (T0), on LMA insertion (TL), and at 30, 45 and 60 min. Highly significant differences at 1, 3, 5, 10 and 15 mins. ($p < 0.001$)</p> <p>Differences in diastolic blood pressure (mmHg), mean blood pressure (mmHg) and respiratory rates readings were not statistically significant at baseline (T0), and on 60 min (T60). Significant difference was recorded at T45 ($p = 0.006$), and highly significant differences were noted at LMA insertion, 1, 3, 5, 10, 15 and 30 mins. ($p < 0.001$)</p> <p>Hypotension was noted in 3 patients of Group-D intra operatively, corrected with IV fluids.</p> <p>Apnea was 237.78 ± 21.36 sec vs. 208.74 ± 15.69 sec in Group-F and Group-D ($p = 0.0001$; highly significant)</p>
Conclusions	Dexmedetomidine 1 $\mu\text{g}/\text{kg}$ with propofol 2mg/kg IV provides beneficial effect in attenuation of hemodynamic response to LMA insertion, better preservation of spontaneous respiration and acceptable LMA insertion conditions as compared to fentanyl 1 $\mu\text{g}/\text{kg}$ with propofol 2mg/kg IV without major side effects.
Appraisal: Worth to Practice/Level	<p>Strength: beneficial to the consultants with limited availability of opioids, and to avoid side effects of opioids on patients</p> <p>Limitations: Small study. control group of propofol alone for insertion of LMA, unethical given inadequate LMA insertion. Only experienced users inserted LMA. BIS was not used. Included population limited by exclusion criteria.</p> <p>Risk of harm: Pain monitoring is of great importance to determine patient comfort during insertion. Lack of use of inhalation gasses might not provide continuous sedation and greater risk of awareness given dexmedetomidine was only given for insertion.</p> <p>Feasibility of use: Adequate, dexmedetomidine is commercially available and probes to be feasible for insertion, better hemodynamics results and less apneic events</p>
THEME	Laryngeal mask airway insertion with dexmedetomidine decreases hemodynamic instability, ensure spontaneous respirations, and reduces propofol dosage on induction.

Evaluation table 5

Citation	Shalaka Sandeep Nellore, Abhijeet Dattatray Waychal, Preeti Sachin Rustagi. Comparison of Dexmedetomidine-Propofol versus Fentanyl-Propofol on Insertion Conditions of Proseal Laryngeal Mask Airway. Journal of Clinical and Diagnostic Research. 2016;10(11). doi:10.7860/JCDR/2016/23244.8934
Design/Method	<p>Prospective randomized double-blind study</p> <p>Inclusion criteria: ASA I and II patients of either sex scheduled for short surgical procedures under general anesthesia.</p> <p>Exclusion criteria: neck and facial burns, reduced mouth opening, BMI>30, on B-blocker therapy, basal heart rate <60 and known egg allergy</p>
Sample/Setting	60 ASA I and II patients of either sex scheduled for short surgical procedures under general anesthesia. Recruited in 6 different blocks as follows: FFDD, FDFD, FDDF, DFF, DFDF, DDDF

Major Variables Studied and Their Definitions	<p>Independent variable: IV1 is dexmedetomidine and propofol vs IV2 is fentanyl and propofol</p> <p>Dependent variable: DV1 is PLMA insertion, DV2 is hemodynamic parameters; DV3 is apnea time.</p> <p>Premedication with glycopyrrolate.</p>
Measurement and Data Analysis	<p>PLMA insertion conditions assessed jaw relaxation by “Young’s criteria” and swallowing, gagging, coughing, head or limb movements, lacrimation, laryngospasm etc., according to “Modified Scheme of Lund and Stovener</p> <p>Hemodynamics parameters during PLMA insertion were also noted at intervals of baseline, 1, 3, 5, 10, 15 and 20 minutes</p> <p>Apnea time < 30 seconds.</p> <p>Mean and standard deviation for all the values were calculated and compared between two groups D and F. The demographic data was analyzed using Mann Whitney-test and Fisher-exact test. Ordinal categorical data such as PLMA insertion conditions and number of attempts were analyzed by Fisher-exact, or Chi-square test and hemodynamic parameters were analyzed using the unpaired t-test or Mann-Whitney test. A p-value <0.05 was accepted as statistically significant.</p>
Findings	<p>Induction dose and increments of propofol required in group D was significantly lower (p<0.001),</p>
Results	<p>Age (p=0.23), gender (p= 0.99), height (p=0.66), weight (p=0.68), and BMI (p=0.39), both the groups were comparable. Modified Mallampati Test which was comparable (p=0.36), the groups D and F. Apnea, more than 30 seconds, after induction occurred in both groups and was comparable.</p> <p>Jaw relaxation by Young’s criteria was comparable (p=0.41), between the two groups.</p> <p>The “Modified scheme of Lund and Stovener” were also comparable and statistically not significant (p=0.12), between groups D and F.</p> <p>Hemodynamically, heart rate variation and mean arterial pressure were not statistically significant between two groups.</p>
Conclusions	<p>Dexmedetomidine and fentanyl when both used individually for co-induction with propofol for PLMA insertion give excellent overall insertion conditions with hemodynamic stability. Dexmedetomidine also significantly reduces the requirements of induction dose propofol for PLMA insertion</p>
Appraisal: Worth to Practice/Level	<p>Strength: Pre induction assessment with Mallampati test.</p> <p>Limitations: Small study. Premedication with glycopyrrolate. PLMA insertion conditions may be assessed more accurately by the effect-site concentration of propofol using target-controlled infusion. No BIS uses. BMI > 30 not included.</p> <p>Risk of harm: Lack of use of inhalation gasses might not provide continuous sedation and greater risk of awareness given dexmedetomidine was only given for insertion</p> <p>Feasibility of use:</p>
THEME	<p>Laryngeal mask airway insertion with dexmedetomidine decrease hemodynamic instability, ensure spontaneous respirations, and reduce propofol dosage on induction.</p>

Evaluation Table 6

Citation	Uzümcügil F, Canbay O, Celebi N, Karagoz AH, Ozgen S. Comparison of dexmedetomidine-propofol vs. fentanyl-propofol for laryngeal mask insertion. <i>Eur J Anaesthesiol.</i> 2008;25(8):675-680. doi:10.1017/S0265021508004213
Design/Method	Prospective randomized study Inclusion criteria: ASA physical status I–II, scheduled to have minor urological procedures, were randomized into two groups. Exclusion criteria: gastroesophageal reflux, allergy, or sensitivity to volatile anesthetics or propofol, asthma, dysrhythmia, congestive heart failure and any pathology of CNS and respiratory tract
Sample/Setting	52 patients, aged 26–65 years, ASA physical status I–II, scheduled to have minor urological procedures, were randomized into two groups.
Major Variables Studied and Their Definitions	Independent variable: IV1 is dexmedetomidine and propofol vs IV2 is fentanyl and propofol Dependent variable: DV1 is LMA insertion, DV2 is hemodynamic parameters; DV3 is apnea time; and DV4 is emergence time
Measurement and Data Analysis	LM insertion: Scoring system, modified from Muzi. jaw mobility (1: fully relaxed, 2: mild resistance, 3: tight but opens, 4: closed), coughing or movement (1: none, 2: one or two coughs, 3: three or more coughs, 4: bucking/ movement) Category scores <2 was defined as acceptable for LM insertion Apnea time: last spontaneous breath after propofol administration to the first spontaneous breath Hemodynamic parameter: BP and HR before insertion of LM, 1 min, 3 min and 5 min Bradycardia: Heart Rate <45 Emergence time: time needed for the patients to respond to verbal stimulus Data analysis was performed using SPSS. Data were shown as mean 6 SD or median(range) for continuous variables, where appropriate. Categorical variables were presented as percentages. Means were compared using Student's t-test or the U-test. hemodynamic parameters were evaluated using Repeated Measures ANOVA or Friedman test. When the P value from the Variance Analysis and Friedman test statistics were statistically significant, multiple comparison tests were used to determine which measurement differed from the others. The Bonferroni correction was applied for comparisons of repeated measures between groups. For categorical comparisons x 2 -test or Fisher's exact test were used, where appropriate. P, 0.05 was considered statistically significant.
Findings	Apnea was greater in Group F (24 patients) than in Group D (11 patients) (P, 0.01). Group D, the respiratory rates increased compared to the baseline. In Group D, the HRs at different time intervals were similar but significantly different from the baseline immediately before LM insertion. The emergence time was greater in Group D.

Results	Two groups were similar in terms of gender distribution, age, weight and durations of surgical procedures. Baseline systolic BP (SBP) and mean BP (MBP) were similar. The emergence time was 81–385 s (mean: 253.5 s) in Group F and 85–992 s (mean: 397.5 s) in Group D (P , 0.001).
Conclusions	Dexmedetomidine, when used before propofol induction, provides successful laryngeal mask insertion comparable to fentanyl, while preserving respiratory functions more than fentanyl.
Appraisal: Worth to Practice/Level	Strength: Study is complete evaluated multiple independent parameters Limitations: Small study. Not include a control group in which propofol was used alone, felt to be unethical. BIS monitor not use. The baseline respiratory rates were not similar statistically Risk of harm: Lack of use of inhalation gasses might not provide continuous sedation and greater risk of awareness given dexmedetomidine was only given for insertion Feasibility of use:
THEME	Laryngeal mask airway insertion with dexmedetomidine decrease hemodynamic instability, ensure spontaneous respirations, and reduce propofol dosage on induction.

Evaluation Table 7

Citation	Surabhi A. Lande, C. P. Gadkari, A. R. Bhure, Sobhan Aich. “Comparison of Dexmedetomidine Propofol Virus Fentanyl – Propofol for Conditions of Laryngeal Mask Airway Insertion in Elective Surgeries”. Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 15, April 14; Page: 4042-4051, DOI: 10.14260/jemds/2014/2397
Design/Method	Prospective, randomized, double blind comparative study. Inclusion criteria: ASA I-II category, MPC grade I and II who were scheduled for short elective surgeries. Exclusion criteria: asthma, respiratory or oropharyngeal tract pathology or those on anti-hypertensive drugs like β -blockers and calcium channel blockers, patients with risk of aspiration like full stomach, hiatus hernia, pregnancy, patients with known drug allergy
Sample/Setting	60 patients aged between 20 and 50 years with an ASA I-II category, MPC grade I and II who were scheduled for short elective surgeries. Random sequence was generated by random allocation software. Utilizing the value of change in MBP from the study of Uzümcügil. F et al and keeping confidence interval of 95% and power of the test 80%, the sample size was calculated using Epi info software to be 60 i.e., 30 patients in each group. Observer and patients were unaware of the study drug
Major Variables Studied and Their Definitions	Independent variable: IV1 is dexmedetomidine vs IV2 is fentanyl Dependent variable: DV1 is hemodynamic responses, DV2 is bradycardia, DV3 is LMA insertion.
Measurement and Data Analysis	Hemodynamic responses: heart rate (HR), blood pressure (BP), respiratory rate (RR) at baseline, just after administering the study drug (Pre-med), immediately before LMA insertion, 30 s, 1min, 2mins, 3mins, 5mins, 7mins, 10min after LMA insertion

	Bradycardia: heart rate < 15% of the baseline or < 50/mins LMA insertion: scored by the, modified from Muzi. No Data Analysis specified, except for statistically significant $p < 0.05$.
Findings	Better jaw relaxation in dexmedetomidine group compared to fentanyl group A statistically significant fall (p value < 0.05) in mean SBP was seen in the Post LMA, 1 min, 2 mins, 3mins compared to the Pre LMA mean SBP in dexmedetomidine group. In fentanyl group statistically significant rise (p value = 0.003) in mean SBP was seen in Post LMA phase compared to the Pre LMA mean SBP
Results	1 patient (3.33%) required two attempts at LMA insertion in dexmedetomidine group and 5 patients (16.67%) in fentanyl group required two attempts at LMA insertion. This difference was not statistically significant. (p value = 0.08) No statistically significant difference (p value > 0.05) between the mean DBP or RR of the dexmedetomidine and fentanyl group throughout the study duration
Conclusions	Dexmedetomidine gives better insertion conditions and better attenuation of pressor response to LMA insertion compared to fentanyl in the given doses
Appraisal: Worth to Practice/Level	Strength: Study focus on hemodynamics and insertion Limitations: Small study. Premedicated with Ranitidine, Ondansetron, Midazolam and Glycopyrrolate. Lignocaine use in addition to Propofol. Risk of harm: Lack of use of inhalation gasses might not provide continuous sedation and greater risk of awareness given dexmedetomidine was only given for insertion Feasibility of use:
THEME	Laryngeal mask airway insertion with dexmedetomidine decrease hemodynamic instability, ensure spontaneous respirations, and reduce propofol dosage on induction.

Evaluation Table 8

Citation	Sintavanuruk K, Pongruekdee S, Thaharavanich R, Laosuwan S, Charuluxananan S. Comparative study of effective-site target controlled infusion with standard bolus induction of propofol for laryngeal mask airway insertion. ASIAN BIOMEDICINE. 4(1):177-182. Accessed October 24, 2020. http://search.ebscohost.com.ezproxy.fiu.edu/login.aspx?direct=true&db=eds&AN=000276053900022&site=eds-live
Design/Method	Randomized, prospective, single-blinded, clinical study was used for this study. This study compares the efficacy of induction of anesthesia with propofol for LMA insertion between the effective-site target-controlled infusion (TCI) of propofol, using 6 $\mu\text{g}/\text{mL}$, and the standard bolus propofol dose of 2.5 mg/kg in elective surgical patients.
Sample/Setting	Seventy-eight unpremedicated patients, American Society of Anesthesiologists (ASA) physical status I and II undergoing elective surgical procedure were randomly allocated between two groups. Group 1 received the standard bolus propofol dose of 2.5 mg/kg. Group 2 received effective site TCI (Schnider model) dose of 6 $\mu\text{g}/\text{mL}$ for LMA

	insertion. The hemodynamics and anesthetic depth (Bispectral index score) were monitored and recorded during and immediately after LMA insertion. The number of insertions attempted, insertion quality score, induction time, and propofol doses used were recorded and compared between groups
Major Variables Studied and Their Definitions	<p>Independent variable: IV1 is propofol 2.5 mg/kg vs site target concentration of 6 µg/mL by propofol TCI</p> <p>Dependent variable: DV1 BIS monitor; DV2 hypotension; DV3 Hypoxemia; DV4 insertion quality score</p> <p>hypotension (decrease blood pressure to more than 30% from baseline) or hypoxemia (SpO₂ <90%) in the present study.</p> <p>insertion quality score</p> <p>Score 1 = full mouth opening and no movement, Score 2 = partially mouth opening, slight gagging, and fingers movement, Score 3 = difficult mouth opening, coughing and gross limbs movement.</p>
Measurement and Data Analysis	The Pearson's Chi-Square test was used for comparison of gender, LMA insertion attempt, and insertion quality between groups. A p-value less than 0.05 was considered as significant.
Findings	<p>BIS scores were significantly lower in the bolus group than the TCI group during post LMA insertion period.</p> <p>The bolus group showed significantly higher propofol doses for induction than the TCI group.</p> <p>The TCI group took significantly longer induction time than the bolus group.</p> <p>In 28 patients of the bolus group and 30 patients of the TCI group, LMA were inserted with the insertion quality score of 1.</p>
Results	The success rate of the first insertion attempt was equal in both groups (92.3%). There was no significant hemodynamic response difference between the groups during pre-induction, induction, insertion, and post insertion period. The BIS score was significantly lower during post insertion period in group 1 (51.4+11.0) than group 2 (58.4+3.2) (p=0.013). The propofol doses in group 2 were significantly lower than in group 1 (110.6+14.8 vs. 153.5+21.5) (p <0.001). Patients in group 2 required significantly more induction time than group 1 (146.9+42.3 vs. 103.4+33.6 (p <0.001).
Conclusions	Propofol induction with TCI provided equal success rate as compared with standard bolus propofol induction for LMA insertion and insertion quality score. TCI significantly lowered the propofol consumption when compared with the standard 2.5 mg/kg propofol dose.
Appraisal: Worth to Practice/Level	<p>Strength:</p> <p>Limitations: Small study.</p> <p>Risk of harm:</p> <p>Feasibility of use: adequate, since BIS monitoring is affordable and available at many clinical sites</p>
THEME	Bolus of propofol (2.5 mg/kg) is associated with higher induction doses

Evaluation Table 9

Citation	Tan AS, Wang CY, Tan ASB, Wang CY. Fentanyl dose for the insertion of Classic Laryngeal Mask Airways in non-paralyzed patients induced with propofol 2.5 mg/kg. <i>Anesthesia & Intensive Care</i> . 2010;38(1):65-69. doi:10.1177/0310057x1003800112
Design/Method	Randomized, controlled trial was to determine the optimum dose of fentanyl in combination with propofol 2.5 mg.kg-1 when inserting the Classic™ Laryngeal Mask Airway.
Sample/Setting	Seventy-five ASA I or II patients were randomly assigned to five groups of fentanyl dosage: 0 µg.kg-1 (placebo), 0.5 µg.kg-1, 1.0 µg.kg-1, 1.5 µg.kg-1 and 2.0 µg.kg-1. Anesthesia was induced by first injecting the study drug over 10 seconds. Three minutes after the study drug was injected, propofol (2.5 mg.kg-1) was injected over 10 seconds.
Major Variables Studied and Their Definitions	Independent variable: IV1 is dexmedetomidine and propofol 2.5mg/kg vs IV2 is fentanyl and propofol. Dependent variable: DV1 SBP; DV2 is Correct LMA placement; DV3 is bradycardia; DV4 is apnea time; DV5 is LMA insertion conditions apnea (>5 minutes) hypotension (systolic blood pressure <80 mmHg) and bradycardia (heart rate <50 bpm)
Measurement and Data Analysis	An optimal score for insertion was calculated by adding the grades for all the insertion condition categories of 1, 2 or 3. A total score of 6 would be considered optimal The chi-square test for trends 'linear association' was used to compare insertion conditions with respect to increasing dosage.
Findings	Higher doses of fentanyl are associated with high incidence of apnea. The study found a significantly high incidence of apnea occurred mainly in the 2 µg.kg-1 group.
Results	This study found that there was a high rate of successful first attempt at insertion with 1 µg.kg and 1.5 µg.kg, 93% and 87% respectively, compared to 87% in the 2.0 µg.kg-1 group. The 1.0 µg.kg-1 group also achieved an 80% optimal insertion conditions score of 4, compared to 73% in the 1.5 µg.kg-1 group and 80% in the 2 µg.kg- group.
Conclusions	The study recommends 1.0 µg.kg as the optimal dose of fentanyl when used in addition to propofol 2.5 mg/kg for the insertion of the Classic™ Laryngeal Mask Airway.
Appraisal: Worth to Practice/Level	Strength: There were no instances of severe hypotension or bradycardia with any of the doses of fentanyl. Limitations: Small study. Risk of harm: none Feasibility of use:
THEME	Higher doses of fentanyl (1.5 mcg/kg) are associated with prolonged apnea episodes.

Evaluation Table 10

Citation	Rustagi P, Nellore S, Kudalkar A, Sawant R. Comparative evaluation of i-gel[R] insertion conditions using dexmedetomidine-propofol versus fentanyl-propofol – A 57 randomized double-blind study. Indian Journal of Anesthesia. 2019;(11). Accessed October 22, 2020. http://search.ebscohost.com.ezproxy.fiu.edu/login.aspx?direct=true&db=edsghw&AN=edsgcl.606693001&site=eds-live
Design/Method	Randomized controlled double-blinded study. The study aimed to compare i-gel[R] insertion conditions with propofol induction after pre-treatment with dexmedetomidine or fentanyl.
Sample/Setting	Eighty ASAI/II patients undergoing general anesthesia were 57 randomized into Groups D (n = 40) and F (n = 40). Group D received 1. µg/kg dexmedetomidine over 10 minutes followed by 5ml of 0.9% normal saline (NS) over 2 minutes. Group F received 10 ml of 0.9% NS over 10 minutes followed by fentanyl 1. µg/kg over 2 minutes. Thirty seconds after study drugs, propofol 2 mg/kg was given. Ninety seconds after propofol, i-gel[R] was inserted
Major Variables Studied and Their Definitions	<p>Independent variable: IV1 is 1. µg/kg dexmedetomidine propofol 2 mg/kg and vs IV2 fentanyl 1. µg/kg and propofol 2 mg/kg.</p> <p>Dependent variable: DV1HR; DV2 MAP; DV3 apnea; DV4 is RR, DV5 jaw relaxation</p> <p>Insertion conditions were comparable between both groups. Moderately relaxed jaw, coughing and movement was observed in more patients of Group F.</p> <p>Bradypnea (respiratory rate <12/min)</p> <p>Apnea (cessation of respiration >30 seconds)</p> <p>‘Young’s Criteria was used to measure jaw relaxation: ‘Absolutely relaxed jaw-I, moderately relaxed jaw-II, poorly relaxed jaw-III</p>
Measurement and Data Analysis	<p>The overall i-gel® insertion conditions were assessed using the Modified Scheme of Lund and Stovener: [Excellent- No gagging or coughing, no laryngospasm, no patient movement, Good- Mild to moderate gagging or coughing, no laryngospasm, mild to moderate patient movement, Poor- Moderate to severe gagging or coughing, no laryngospasm, moderate to severe patient movement, Unacceptable- Severe gagging or coughing, laryngospasm, severe patient movement. If any of the above were present during the first attempt of the i-gel® insertion, then a further bolus of 0.5 mg/kg of propofol was administered.</p> <p>‘Young’s Criteria was used to measure jaw relaxation: ‘Absolutely relaxed jaw-I, moderately relaxed jaw-II, poorly relaxed jaw-III</p> <p>Data was analyzed using SPSS ver. 16.0 software</p>
Findings	This study findings are in accordance with a study by Lande SA et al who compared dexmedetomidine and fentanyl for LMA insertion and reported 96.6% patients having relaxed jaw with dexmedetomidine.

	<p>MAP after propofol induction was significantly lower in group F than group D. Propofol when used for induction in a dose of 2.0-2.5 mg/kg decreases mean blood pressure due to its vasodilatory and myocardial depressing effects which can be further potentiated by co-induction with fentanyl.</p> <p>Pre-administration of dexmedetomidine in the dose of 1. µg/kg also reduces the frequency of hypotensive episodes before and after i-gel® insertion. A greater percentage decrease from baseline in heart rate with dexmedetomidine was recorded.</p> <p>Dexmedetomidine in a dose of 1. µg/kg is previously reported to blunt the sympatho-adrenal responses to i-gel® insertion while fentanyl 1. µg/kg did not suppress sympatho-adrenal response to LMA insertion adequately.</p> <p>In the present study, the incidence and mean duration of apnea was significantly more with fentanyl ($P < 0.01$) than with dexmedetomidine. Higher incidence of apnea could also be due to more additional boluses of propofol required in the fentanyl group.</p>
Results	<p>Five out of forty patients in Group F and 1/40 in Group D ($P = 0.08$) had a moderately relaxed jaw during i-gel® insertion. None of the patients had a poorly relaxed jaw. However, group F had more episodes of coughing and movement during i-gel® insertion necessitating additional propofol boluses. No laryngospasm or bronchospasm was observed. Total dose of propofol was significantly ($P = 0.02$) higher with fentanyl ($2.21 + 0.39$ mg/kg) than with dexmedetomidine ($2.07 + 0.21$ mg/kg).</p>
Conclusions	<p>Dexmedetomidine and fentanyl provide comparable conditions for i-gel® insertion with propofol.</p>
Appraisal: Worth to Practice/Level	<p>Strength: Reduce the dose of propofol and associated adverse effects</p> <p>Limitations: depth of anesthesia at the time of i-gel® insertion was only assessed clinically and no specific monitor was used due to non-availability.</p> <p>Risk of harm: The reduction in MAP after fentanyl-propofol was well tolerated by pre-hydrated, ASA I-II patients in this study however precaution is needed in elderly/debilitated patients.</p> <p>Feasibility of use:</p> <p>Feasibility of use: Adequate, dexmedetomidine is commercially available and probes to be feasible for insertion, better hemodynamics results and less apneic events</p>
THEME	<p>Reduce propofol dose requirement for induction.</p>

Evaluation Table 11

Citation	<p>Yoo J, Kwak H, Kim Y, Park C, Lee S, Kim J. The effect of dexmedetomidine pretreatment on the median effective bolus dose of propofol for facilitating laryngeal mask airway insertion. <i>Journal of Anesthesia</i>. 2017;31(1):11-17. doi:10.1007/s00540-016-2245-7</p>
Design/Method	<p>Blind RCT of 40 patients, aged 19–60 years with ASA physical status I–II, and scheduled to undergo elective minor surgery in which the use of LMA was indicated were included. The study Investigates the effect of dexmedetomidine (1 µg/kg) pretreatment on the median effective dose (ED50) of propofol for facilitating successful laryngeal mask airway (LMA) insertion compared</p>

	to propofol alone.
Sample/Setting	Forty patients were randomized to either the control group (n = 21) or the dexmedetomidine group (n = 19). After infusion of normal saline or dexmedetomidine 1 µg/kg over 10 min, 1 % lidocaine 0.5 mg/kg, followed by propofol 2.5 mg/kg was administered and the laryngeal mask airway was inserted without muscle relaxants. The ED50 of propofol for successful LMA insertion was determined by the modified Dixon's up-and-down method.
Major Variables Studied and Their Definitions	Independent variable: IV1 is dexmedetomidine 1 µg/kg pretreatment on the median effective dose (ED50) of propofol vs propofol alone. Dependent variable: DV1 mean arterial pressure (MAP) DV2 is heart rate (HR), DV3 is BIS values
Measurement and Data Analysis	Hemodynamic and BIS changes were compared by repeated measures ANOVA.
Findings	The present study showed that the ED50 of propofol was. 1.9 mg/kg for LMA insertion with a loading dose of 1 µg/ kg dexmedetomidine over 10 min.
Results	The ED50 of propofol for smooth insertion of the LMA, as determined by the Dixon's up-and-down method, was significantly higher in the control group than in the dexmedetomidine group (3.1 ± 0.4 vs 1.9 ± 0.3 mg/ kg, $P < 0.001$). The MAP was higher, and HR was lower in the dexmedetomidine group than in the control group during drug infusion and LMA insertion. The BIS value was lower in the dexmedetomidine group during drug infusion. Hypotension developed in 2 patients in the control group and 1 patient in the dexmedetomidine group.
Conclusions	The bolus dose of propofol needed for successful LMA insertion was 1.9 mg/kg in 50 % of adults without muscle relaxant after pretreatment with dexmedetomidine 1 µg/kg. Pretreatment with dexmedetomidine 1 µg/kg could reduce the propofol requirement by 38 % for facilitating LMA insertion without prolonged respiratory depression and hemodynamic instability.
Appraisal: Worth to Practice/Level	Strength: adequate monitoring with electrocardiogram, pulse oximeter, noninvasive blood pressure, and bispectral index (BIS) Limitations: Small study. Risk of harm: No significant decrease in patient BP or HR were reported Feasibility of use: adequate
THEME	Dexmedetomidine decreases propofol requirements

Evaluation table 12

Citation	Yao Y, Qian B, Lin Y, Wu W, Ye H, Chen Y. Intranasal dexmedetomidine premedication reduces minimum alveolar concentration of sevoflurane for laryngeal mask airway insertion and emergence delirium in children: a prospective, randomized, double-blind, placebo-controlled trial. <i>Pediatric Anesthesia</i> . 2015;25(5):492-498. doi:10.1111/pan.12574
Design/Method	Randomized, double-blind, placebo- controlled study to verify the hypothesis that intranasal dexmedetomidine premedication can reduce the minimum alveolar concentration of sevoflurane for laryngeal mask airway insertion in children.
Sample/Setting	Ninety (ASA) physical status I subjects, aged 3–7 years, were randomized to three equal groups to receive saline (Group S), dexmedetomidine 1 mcg / kg

	<p>(Group D1), or dexmedetomidine 2 mcg/kg (Group D2) approximately 45 min before anesthesia.</p> <p>The minimum alveolar concentration for laryngeal mask airway insertion of sevoflurane was determined according to the Dixon's up-and-down method.</p>
Major Variables Studied and Their Definitions	<p>Independent variable: IV1 is premedication of 0.9% saline vs dexmedetomidine 1 mcg/kg or dexmedetomidine 2 mcg/kg</p> <p>Dependent variable: DV1 is systolic blood pressure (SBP); DV2 is heart rate (DBP)</p>
Measurement and Data Analysis	<p>Emergence delirium was evaluated using the Pediatric Anesthesia Emergence Delirium (PAED) scale in the post anesthesia care unit (PACU). Induction quality was assessed by a single attending anesthesiologist using a 4-point scale: 1 = crying, needs restraint; 2 = moderate fear and reassured with difficulty; 3 = slight fear but can be reassured easily; and 4 = asleep or awake but co-operative, accepting the mask.</p> <p>The minimum alveolar concentration for laryngeal mask airway insertion of sevoflurane was determined according to the modified Dixon's 'up-and-down' approach.</p> <p>Patient's responses to laryngeal mask airway insertion were classified by 'movement' or 'no movement'. Movement was defined as the presence of purposeful movement of extremities, coughing, or bucking within 1 min of laryngeal mask airway insertion. All responses to laryngeal mask airway insertion were assessed by two nurses who were blinded to the anesthetic concentration.</p>
Findings	<p>Dexmedetomidine premedication improves the quality of recovery profile. Data indicated that dexmedetomidine premedication may improve parent satisfaction.</p> <p>intranasal dexmedetomidine premedication of 1 and 2 mcg/kg resulted in a reduction of postoperative delirium (defined as peak PAED score ≥ 10) from 48.3% in the control group to 16.7% and 3.3%, respectively.</p> <p>The study revealed that intranasal dexmedetomidine (1 or 2 mcg/kg) produces a dose-dependent reduction in HR and SBP, which may be attributed to a decrease in central sympathetic tone and an increase in vagal activity. However, only a modest reduction (within 20% of baseline values) of hemodynamic variables was observed, and these effects were clinically insignificant; and no intervention was required.</p>
Results	<p>Dexmedetomidine premedication of 1 and 2 ug was associated with reduction in sevoflurane from 1.92% to 1.53% and 1.23%, corresponding to decrease of 20% and 36%, respectively. The peak PAED scores (Median [IQR]) were 9 [8–11.5], 5 [3–5.3], and 3 [2–4] in Group S, Group D1, and Group D2, respectively. No subject cried, required restraint, or complained of discomfort with intranasal dexmedetomidine administration in our study.</p>
Conclusions	<p>Intranasal dexmedetomidine premedication produces a dose-dependent decrease in the minimum alveolar concentration for laryngeal mask airway insertion of sevoflurane and emergence delirium in the PACU.</p>

Appraisal: Worth to Practice/Level	<p>Strength: fix dose of dexmedetomidine 100mcg/ ml (total final volume of administered was 0.02 ml/ kg) along with standard monitoring, including electrocardiogram, noninvasive blood pressure, pulse oximetry, and rectal temperature, was used in all children. Body temperature was maintained at 36.8 _ 0.4°C using a Bair Huger. Inhaled and exhaled concentrations of sevoflurane and end-tidal carbon dioxide partial pressure (PETCO₂) were continuously monitored. Limitations: Subjects with potentially difficult airway, reactive airway malformation, any sign of upper respiratory infection, or asthma were excluded. There are no pharmacokinetic data available following administration of intranasal dexmedetomidine in children. Preliminary results indicated no subjects need rescue analgesics and all subjects were expected to experience a similar slight pain in this study, and no evaluation was made on the degree of postoperative pain, which is likely to affect the incidence of agitation. Lastly, glucose levels were not monitored, Ghimire et al. (24) reported that dexmedetomidine decreased plasma insulin concentration and may cause hyperglycemia in healthy fasting individuals. Therefore, further studies are required to address these limitations and verify further findings.</p>
THEME	Intranasal Dexmedetomidine produces a dose depend on decrease in the minimum alveolar concentration

Evaluation Table 13

Citation	Joshi GP, Kamali A, Meng J, Rosero E, Gasanova I. Effects of fentanyl administration before induction of anesthesia and placement of the Laryngeal Mask Airway: a randomized, placebo-controlled trial. <i>Journal of Clinical Anesthesia</i> . 2014;26(2):136-142. doi:10.1016/j.jclinane.2013.09.008
Design/Method	Randomized, double-blinded, controlled trial. Assess the effects of fentanyl administered before induction of anesthesia on movement and airway responses during desflurane anesthesia via the Laryngeal Mask Airway (LMA).
Sample/Setting	<p>100 adults, ASA physical status 1, 2, and 3 patients undergoing ambulatory surgery. Patients were administered fentanyl 1 µg/kg (n=51) or saline (n=49) 3 to 5 minutes before induction with propofol 2-2.5 mg/kg intravenously (IV), followed by LMA placement.</p> <p>Anesthesia was maintained with desflurane titrated to a bispectral index (BIS) of 50-60 and 50% nitrous oxide in oxygen, and fentanyl 25 µg boluses were titrated to respiratory rate.</p>
Major Variables Studied and Their Definitions	<p>Independent variable: IV1 is fentanyl 1 µg/kg (constituted to 10 mL with saline) vs 10 mL saline before induction of anesthesia.</p> <p>Dependent variable: DV1 intraoperative coughing (SBP); DV2 apnea at induction (DBP); DV3 laryngospasm (MAP); DV4 breath holding.</p>
Measurement and Data Analysis	<p>Chi-square or Fisher's Exact tests, as appropriate, were performed to assess differences in frequency of movement, coughing, breath holding, laryngospasm, and postoperative categorical outcomes between the two study groups.</p> <p>Cochran-Mantel-Haenszel test was also performed to investigate the effect of the anesthetic technique on the frequency of movement, apnea, coughing, and laryngospasm after adjusting for smoking status.</p>
Findings	The risk of apnea at induction was almost 50% higher in the fentanyl pretreatment group than the placebo group.

	Although the difference was not statistically significant (P=0.056), preinduction fentanyl showed a trend towards reduced risk of coughing.
Results	The fentanyl pretreatment group had a higher frequency of apnea (94% vs 64%; P=0.0003) and longer duration of manual ventilation (3 [interquartile range (IQR), 1.5-5] min vs 1 [0-1.5] min; P=0.0001) at induction. In contrast, the fentanyl pretreatment group had a lower frequency of movements (16% vs 51%; P=0.0001). The rates of intraoperative breath holding (6.1% vs 8.5%) and laryngospasm (2% vs 4.3%) in the two groups were similar. All subjects experiencing laryngospasm were smokers. Adjusting for smoking status did not affect the differences noted in apnea, duration of manual ventilation, or
Conclusions	Preinduction fentanyl increased the frequency of apnea at induction and duration of manual ventilation but reduced the frequency of movements. In addition, it reduced intraoperative coughing in smokers.
Appraisal: Worth to Practice/Level	Strengths: A standardized maintenance anesthetic technique was utilized for all subjects. Heart rate (HR), mean arterial blood pressure (MAP), RR, oxygen saturation (SpO ₂), ETCO ₂ , and end-tidal desflurane concentration were recorded every 15 minutes. All subjects received antiemetic prophylaxis with dexamethasone 4 mg IV after induction of anesthesia and ondansetron 4 mg IV approximately 20 to 30 minutes before the end of surgery. Limitations: The use of lidocaine during induction of anesthesia could have influenced the frequency of movement and respiratory events; however, its use to reduce pain during injection of propofol has become a standard of care, and both the groups received lidocaine. It is also possible that the anti-inflammatory and analgesic efficacy of dexamethasone may have contributed to the reduced airway reflexes, particularly at the time of LMA removal.
THEME	Con-induction with Fentanyl increases the frequency of apnea

Evaluation Table 14

Citation	Dwivedi MB, Dwivedi S, Singh H, Nagrale M. What happens to the hemodynamic responses for laryngeal mask airway insertion when we supplement propofol with butorphanol or fentanyl for induction of anesthesia: A comparative assessment and critical review. <i>International Journal of Critical Illness & Injury Science</i> . 2016;6(1):40-44. doi:10.4103/2229-5151.177369
Design/Method	RCT study. Comparison of hemodynamic response of LMA using either butorphanol or fentanyl in combination with propofol. The combination of propofol and butorphanol was compared with the combination of propofol and fentanyl for hemodynamic responses to LMA insertion.
Sample/Setting	Hundred patients of ASA I and ASA II with Mallampati-II and III between the age of 18–60 years who were randomly selected and divided into two groups of 50 each, i.e., Group F (propofol and fentanyl) and Group B (propofol and butorphanol). Age <18 years and more 60 years, ASA III and IV, Mallampati-III and IV. One minute after giving intravenous (IV) opioids, induction was achieved with IV propofol 2.5 mg/kg. Depth of anesthesia was assessed, and LMA was inserted.
Major Variables Studied and Their Definitions	Independent variable: IV1 is fentanyl and propofol vs IV2 propofol and butorphanol Dependent variable: DV1 is systolic blood pressure (SBP); DV2 is diastolic blood pressure (DBP); DV3 is mean arterial pressure (MAP); DV4 is respiratory rate (RR); DV5 is SpO ₂ ; and DV6 is insertion condition.

	Continuous variables: age, weight, heart rate, systolic blood pressure, diastolic blood pressure, mean blood pressure and apnea time.
Measurement and Data Analysis	Compiled, and statistically analyzed by computer software package "SPSS version 14.0.
Findings	Significant decreases in the mean arterial pressure in the propofol group over the first 5 min of induction were found. The values of mean SBP, DBP, and MBP in our study were lowest at 5 min of insertion of LMA with statistically significant decrease in Group F than in Group B.
Results	After insertion of LMA, statistically significant drop-in mean heart rate, systolic blood pressure (BP), diastolic BP, and mean BP was noted in Group F as compared to Group B ($P < 0.05$).
Conclusions	Co-induction agent with propofol 2.5 mg/kg, butorphanol 30 µg/kg is a better alternative to fentanyl 1.5 mg/kg as far as hemodynamic stability is concerned. Bradycardia caused by propofol is taken care of by the release of catecholamines due to butorphanol leading to stable hemodynamics.
Appraisal: Worth to Practice/Level	Strength: All patients were preoxygenated with 100% O ₂ for 3 min before induction. All baseline hemodynamic variables including heart rate (HR), SBP, DBP, and MBP were comparable before premedication Limitations: Small study. Risk of harm: Incidence of hypotension, hypertension, or dysrhythmias was noted. These changes could affect a certain patient population. Feasibility of use: adequate since adequate monitoring was available.
THEME	Butorphanol a synthetic, nonnarcotic analgesic was preferred over fentanyl

Evaluation Table 15

Citation	Akanksha Dutt, Anjum Khan Joad, Mamta Sharma. Induction for classic laryngeal mask airway insertion: Does low-dose fentanyl work? <i>Journal of Anaesthesiology Clinical Pharmacology</i> . 2012;28(2):210-213. doi:10.4103/0970-9185.94877
Design/Method	Randomized double-blind study. Following preoxygenation, ondansetron 0.1 mg/kg IV was given. The study drug, fentanyl 1 or 2 mcg/kg was given IV over 10 s by an anesthesiologist blinded to the drug dose. Two minutes after administration of this, propofol 2.5 mg/kg was injected IV over 1 min.
Sample/Setting	96 patients were randomly distributed into F1 (fentanyl 1 mcg/kg) and F2 (fentanyl 2 mcg/kg) groups with both groups having a fixed dose of propofol (2.5mg/kg). The conditions for LMA insertion, hemodynamic profile, bronchoscopic view, and incidence of sore throat were compared. Patients were (ASA) grades 1 and 2, between 18 and 60 years of age, undergoing elective surgery (modified radical mastectomy, mastectomy, or superficial surgery of the upper limb).
Major Variables Studied and Their Definitions	Independent variable: IV1 is fentanyl (1mcg/ kg) and propofol in a fixed dose (2.5mg/ kg) vs IV2 fentanyl (2mcgkg) and propofol (2.5mg/kg) Dependent variable: DV1 is systolic blood pressure (SBP); DV2 is mean arterial pressure (MAP); DV3 is bradycardia Continuous variables: age, weight, ASA status, airway (Mallampati grade).

Measurement and Data Analysis	<p>Depth of anesthesia: The jaw thrust was used as an indicator of adequate depth of anesthesia.</p> <p>LMA insertion conditions were graded on a three-point scale using six variables – mouth opening, ease of LMA insertion, swallowing, coughing, patient movements, and laryngospasm</p> <p>Sample size was calculated using Medcalc (Medcalc Software, Mariakerke, Belgium). Statistical analysis was done using chi-square method. Hemodynamic parameters were analyzed by “t” test.</p>
Findings	<p>There was a significant fall in systolic blood pressures and mean arterial pressure and higher incidence of bradycardia in the group receiving fentanyl 2 mcg/kg. The patients who received fentanyl 1 mcg/kg remained more hemodynamically stable compared to those receiving fentanyl 2 mcg/kg in our cancer patient population.</p>
Results	<p>The results indicate that as the pre-administered dose of fentanyl was increased from 1 to 2 mcg/ kg, the supplementary doses of propofol required for facilitating LMA Classic insertion decreased, even though this decrease was not statistically significant.</p>
Conclusions	<p>Both doses of fentanyl (1 and 2 mcg/kg) provide comparable insertion conditions for LMA. Fentanyl in the lower dose provides a more stable hemodynamic profile.</p>
Appraisal: Worth to Practice/Level	<p>Strength: Optimal ventilation was constantly assessed by adequate chest expansion, square wave capnography, and stable oxygenation. Following successful LMA insertion, position of LMA was assessed using fiberoptic bronchoscope and graded.</p> <p>Limitations: Small study.</p> <p>Risk of harm: Significant fall in systolic and mean arterial pressure in F2 group. Two of these patients needed atropine IV to reverse bradycardia. In patients with poor hemodynamic profiles (e.g., ASA 3 and 4, patients with history of ischemic heart disease, patients with valvular heart disease/using beta blockers), where a tight control of blood pressures and heart rates would be required, the same fall in pressures could become clinically significant.</p> <p>Feasibility of use: adequate, since fiberoptic bronchoscope and additional supportive medications were readily available.</p>
THEME	<p>Fentanyl in doses of 2mcg/kg reduces hemodynamic stability.</p>

Appendix B



Office of Research Integrity
Research Compliance, MARC 414

Linnet Flores

EJ

April 8, 2021

“Improve knowledge of Utilizing Dexmedetomidine and Propofol for Laryngeal Mask Airway Insertion: A quality Improvement Project”

IRB-21-0149
110233

04/08/21

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.

or

discontinued.

Special Conditions: N/A

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

EJ

Appendix C



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

July 15, 2021

Emie Dieudonne
3501 Johnson Street
Hollywood, Fl. 33021

IRB Project#: MHS.2021.080

Project Title: "Improve Knowledge in Utilizing Dexmedetomidine and Propofol for Laryngeal Mask Airway Insertion: A Quality Improvement Project"

Submission Type: Non-Human Subject Research Determination (Reference# 007426)

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



Pretest and Posttest Questionnaire:

The effect of Dexmedetomidine and Propofol for Facilitating Laryngeal Mask Insertion

INTRODUCTION

The primary aim of this QI project is to improve the knowledge of CRNAs pertaining to the use of dexmedetomidine and propofol combination during LMA insertion

Please answer the question below to the best of your ability. The questions are meant to measure knowledge and perceptions on the efficacy of Dexmedetomidine- Propofol versus Fentanyl- Propofol combination for laryngeal mask insertion.

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 DNP/PhD/MD Other

6. **How many years have you been an anesthesia provider?**

Over 10 5-10 years 2-5 years 1-2 years

QUESTIONNAIRE**1. Select which statement is TRUE about dexmedetomidine**

- a. Dexmedetomidine action on the locus ceruleus preserves hypercapnic ventilatory drive, and this effect gives the appearance of a natural sleep
- b. The respiratory effect of dexmedetomidine is because one of its actions on mu2 receptors in the central nervous system
- c. Dexmedetomidine is considered an opioid agonist
- d. Commonly reported side effects include respiratory depression and miosis.

CORRECT ANSWER: A

2. In which receptor does dexmedetomidine exert its action

- a. G- protein-coupled receptors
- b. α_2 -receptors
- c. Kappa receptor
- d. Delta receptor

CORRECT ANSWER: B

3. What are the MOST common side effects of fentanyl?

- a. Respiratory depression, nausea, and vomiting
- b. Respiratory depression, bradycardia, vomiting
- c. Bradycardia, hypotension, and headache
- d. Tachycardia, hypertension, headache.

CORRECT ANSWER: A

4. What is the MOST common side effect of dexmedetomidine?

- a. Hypotension
- b. Hypertension
- c. Respiratory depression
- d. Tachycardia

CORRECT ANSWER: A

5. Which dose of dexmedetomidine has been reported to blunt the sympatho-adrenal responses to laryngeal mask insertion?

- a. 2 mcg/kg
- b. 1mcg/kg
- c. 1mg/kg
- d. 2mg/kg

CORRECT ANSWER: B

6. How much could dexmedetomidine pretreatment reduce propofol requirements during LMA insertion?

- a. 10%
- b. 15%
- c. 28%
- d. 38%

CORRECT ANSWER: D

7. According to research which of the following combination of induction agents provides the best insertion conditions without compromising the patient's hemodynamic state?

- a. Dexmetomidine 1mcg/kg followed by propofol 2.5 mg/kg
- b. Fentanyl 1mcg/kg followed by propofol 2 mg/kg
- c. Dexmetomidine 1mcg/kg followed by propofol 2 mg/kg
- d. Fentanyl 1mcg/kg followed by propofol 2.5 mg/kg

CORRECT ANSWER: C

8. Which statements is CORRECT about fentanyl?

- a. The incidence of patients having prolonged apnea increases with increasing doses of fentanyl
- b. Fentanyl provides better hemodynamic stability than dexmedetomidine

- c. The use of fentanyl reduces propofol requirements
- d. Fentanyl combined with propofol provides the same conditions for LMA insertion than dexmedetomidine combined with propofol

CORRECT ANSWER: A

9. Which of the following statement is CORRECT about dexmedetomidine?

- a. Pretreatment with dexmedetomidine 1mcg/kg could reduce the propofol requirement by 38 % for facilitating LMA insertion without prolonged respiratory depression and hemodynamic instability.
- b. When comparing fentanyl and dexmedetomidine for attenuating sympathetic response to LMA insertion, dexmedetomidine shows to increase heart rate up to 18% higher than baseline.
- c. Administration of dexmedetomidine before induction of anesthesia can result in a higher frequency of apnea and the need for manual ventilation.
- d. When combined with propofol, dexmedetomidine causes respiratory compromise by inhibiting the stimulatory effects of carbon dioxide leading to apnea

CORRECT ANSWER: A

10. How much rise in systolic blood pressure can be seen in patients treated with fentanyl during the Post LMA phase?

- a. 68%
- b. 15%
- c. 20%
- d. 40%

CORRECT ANSWER: D

11. How likely are you to use dexmedetomidine as an alternative to fentanyl during LMA insertion?

- a. Most likely

- b. Somewhat likely
- c. Somewhat unlikely
- d. Most unlikely

12. How likely are you to recommend the use of dexmedetomidine over fentanyl during LMA insertion?

- a. Most likely
- b. Somewhat likely
- c. Somewhat unlikely
- d. Most unlikely

Appendix E: Educational PowerPoint

FIU

Improve knowledge of Utilizing Dexmedetomidine and Propofol for Laryngeal Mask Airway Insertion: A Quality Improvement Project

Lisset Flores RN, BSN
DNP Candidate
Ann B Miller DNP, CRNA, APRN

Learning Goals:

- Recognize the need to improve patient's hemodynamic and respiratory stability during LMA insertion
- Discuss the impact of using an opioid such as fentanyl versus dexmedetomidine
- Understand the pharmacokinetics and pharmacodynamics of dexmedetomidine
- Discuss the clinical benefits of using dexmedetomidine during LMA insertion

FIU Background

- Numerous studies have focused on the ideal balance of anesthesia to provide optimum sedation for LMA insertion.
- Intravenous propofol has been the drug of choice to produce sedation and hypnosis due to its rapid induction and recovery time.
- Due to the cardio-respiratory effects when using propofol alone and lack of analgesic effects, opioids such as fentanyl, have been the adjunct of choice to inhibit the sympathetic response associated with LMA placement.
- When combined with propofol, fentanyl causes respiratory compromise by inhibiting the stimulatory effects of carbon dioxide loading to breathe.
- Dexmedetomidine action on the locus coeruleus preserves hypoxic ventilatory drive and has shown to be beneficial for sedation and analgesia without resulting in cardio-respiratory depression.

FIU Pharmacokinetic and Pharmacodynamics of Dexmedetomidine

- Dexmedetomidine is a selective α_2 -adrenergic agonist with sedative and analgesic properties.
- Dexmedetomidine is a highly protein-bound drug. In plasma, 94% of dexmedetomidine is bound to albumin and α_1 -glycoprotein.
- An elimination half-life of 2.1-3.1 hours has been reported in healthy volunteers.
- The relative effect of dexmedetomidine depends on plasma concentration, between 0.2 and 0.3 μ g/ml, resulting in sedation and smooth sedation.
- Sedation with dexmedetomidine results in a more physiologic sleep-wake cycle and patients remain rousable and cooperative, thereby reducing the risk of delirium.

FIU Benefits of Dexmedetomidine during LMA insertion

- Provides hemodynamic stability regarding blood pressure and mean arterial pressure parameters.
- Data suggest better preservation of spontaneous respirations with less apneic events. There is also description of less manual ventilation.
- Easier insertion condition with less coughing and bucking with reference to the Masi score.
- Reduces propofol dose requirements during induction by 38% for LMA insertion.
- Dexmedetomidine in a dose of 1 μ g/kg has shown to blunt the sympathetic-adrenal response to LMA insertion while fentanyl 1 μ g/kg has shown to not suppress this response adequately.

FIU Pharmacokinetics of Fentanyl

- Fentanyl is a short acting synthetic opioid agonist.
- The onset of action is almost immediate when the drug is given intravenously; however, the maximal analgesic and respiratory depressant effect may not be noted for several minutes.
- 80% of the dose leaves plasma within 5 minutes, and 94.0% leaves by 1 hour to heart, lung, and brain, and then to muscle and fat. Removal from muscle and fat is slower than uptake, because both tissues act as storage sites with a half-life elimination of 3.1 to 7.9 hour.
- A single IV dose results in redistribution rather than elimination.
- Fentanyl is primarily transformed in the liver and has a high first pass renal clearance of 73% of the intravenous dose excreted as metabolites. Less than 10% is excreted as an unchanged drug.

FIU Pharmacodynamics of Fentanyl

- A dose of 100 μ g (0.1 mg or 2.0 mL) is approximately equivalent in analgesic activity to 10 mg of morphine.
- As the dose of opioid is increased, the decrease in pulmonary exchange becomes greater.
- The peak respiratory depressant effect of a single intravenous dose of Fentanyl is noted 5 to 15 minutes following injection.
- Direct relation between the C_f fentanyl and respiratory depression as a clinical effect. Plasma concentrations greater than 2 ng/ml are associated with significant respiratory depression.

Clinical Effects of Fentanyl During LMA Insertion

- Co-administration of propofol and fentanyl at a dose of 1 mg/kg is associated with a higher incidence of apnea.
- Higher incidence of hypertension and tachycardia during LMA insertion.
- Significant rise in SpO₂ up to 40% during the Post-LMA phase.
- Fentanyl-induced cough immediately before induction of anesthesia occurs in about 30% of patients.
- Higher incidence of nausea and vomiting.

FIU Recommendations for Practice Change

- Preserve spontaneous respirations during LMA insertion.
- Improve hemodynamic stability
- Reduce propofol requirements
- Administer 1mg/kg of dexmedetomidine 30 seconds prior to induction of propofol.
- Administer propofol at a dose of 1.5mg/kg
- Avoid the use of fentanyl during LMA insertion.

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