UND Nurse Anesthesia Program
Student DNP Project
Presentations

2025 Spring Educational Meeting
North Dakota Association of Nurse Anesthetists
Fargo, ND

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Airway Management of the Massively Contaminated Airway through Simulation: A Quality Improvement Project

Aaron St. Aubin, Casey Caylor, Justin Hashbarger
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Massive Airway Contamination

- Airway management during an episode of massive airway contamination is a low-frequency, high-risk event
  - Defined as the presence of foreign material (e.g. blood, vomit, secretions) in the upper airway and tracheobronchial tree

(Root et al., 2020)

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Massive Airway Contamination

- Airway contamination is associated with
  - Higher rates of adverse events (e.g. hypoxemia, pulmonary aspiration, bradycardia, cardiac arrest)
  - Decreased first-pass success
    - Failed first-pass intubation is associated with a 28% increase in complications
  - Prolonged time to intubation

(Branch & Cole, 2024; Olvera et al., 2020; Root et al., 2020)

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Prevalence

- Incidence of pulmonary aspiration during general anesthesia
  - 2 – 7 events per 20,000 cases
    - + 0.5% in emergency surgeries (in the OR)
    - + 2.7% for in-hospital emergencies (outside the OR)
  - National Audit Project 4 (NAP4)
    - Aspiration of gastric contents is the leading cause of mortality among airway management complications
- "Can't Intubate, Can't Oxygenate" situations
  - ~ 1 : 50,000 cases

(Root et al., 2020; Zdravkovic et al., 2023)

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Skill Decay in Advanced Airway Managment

- Low-frequency events can result in skill decay or a gradual loss of proficiency
- Manifests as errors and a longer time to perform a skill
- Deterioration of skills can begin within 3 months of nonuse
  - Notable decline in first-pass success
  - Increased likelihood of repeated intubation attempts
  - Decreased provider confidence

(Branch & Cole, 2024)

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Purpose

To enhance rural healthcare providers' self-perceived confidence at managing and securing a massively contaminated airway by implementing a low-fidelity simulation.

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Literature Review – Search Strategy & Criteria

- **Search Databases:**
  - Clinical Key, Google Scholar, MEDLINE Complete, PubMed, Wiley Online Library
- **Keywords:**
  - "Airway contamination," "airway management," "simulation," "confidence," "rural," "SALAD"
- **Inclusion Criteria:**
  - Published 2014-2024
  - Full-text available
  - Relevant to rural healthcare providers and simulation training for airway contamination
- **Exclusion Criteria:**
  - Older than 10 years
  - Non-full-text articles
  - Irrelevant to project focus

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Simulation

- **Benefits of Simulation**
  - Effective tool for increasing provider confidence and preparedness for high-risk, low-frequency events
  - Improves clinical competencies
    - Critical thinking
    - Decision making
    - Procedural skills
  - Improves confidence
  - Allows for immediate feedback and debriefing
  - Encourages interprofessional collaboration
  - Great for rural healthcare facilities

(Alrashidi et al., 2023; Edwards et al.,2023)

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Suction-Assisted Laryngoscopy and Airway Decontamination

- **Suction Assisted Laryngoscopy and Airway Decontamination (SALAD)**
  - Uses continuous suction to clear blood, vomit, or other contaminants while inserting a laryngoscope
  - Benefits of SALAD
    - Improves 1st pass intubation success
    - Reduces risk of aspiration
    - Decreases amount of pulmonary aspirate
    - Decreases time to intubation
    - Improved provider confidence
- **Developed by Dr. James DuCanto**
  - Anesthesiologist at Aura St. Luke's Medical Center (Milwaukee)

(Fiore et al., 2019; Ko et al., 2020; Pilberry et al., 2019; Root et al., 2020; Wong et al., 2021)

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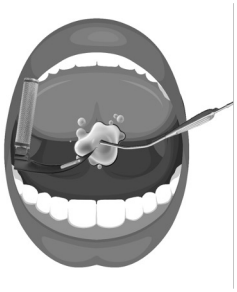
Steps of the SALAD Technique

1. **Initial Insertion**
   - Use a **rigid suction catheter** as a **tongue depressor** to assist with laryngoscope blade insertion into the oropharynx.
2. **Oral Decontamination**
   - Suction **in front of the blade** while advancing.
   - Keep the blade **"high and dry"** - pressed against the **anterior tongue**



(Root et al., 2020)

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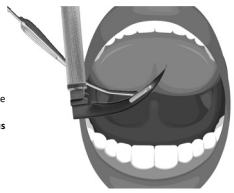
Steps of the SALAD Technique

3. **Hypopharyngeal Decontamination**
   - Continue suctioning deeper into the **hypopharynx**
   - Keep your laryngoscope blade behind your suction
     - This will maintain your source of illumination/optics
4. **Repositioning for intubation**
   - Move suction catheter to the **left corner of the mouth**.
     - Will need to withdraw catheter and place in left side of mouth
     - Tip of catheter should be in the **proximal esophagus** or **just below the vocal cords**
   - Use the **left blade edge to pin the catheter**, keeping it in place during intubation.



(Root et al., 2020)

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Steps of the SALAD Technique

5. **Final Steps**
   - Once the **ETT passes the cords, inflate the cuff**.
   - **Suction the trachea before ventilation** to prevent contamination of the lungs.

- **TIPS:**
  - **SALAD poke -** Before ETT tube delivery, place your finger to the right of the laryngoscope to ensure there is space to advance the ETT.
  - Consider using a **bougie** – increases first pass success
  - Twist the ETT **counter-clockwise** to avoid getting hung up on the right corniculate.

(Root et al., 2020)

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SALAD: Clinical Advantages in Airway Management

Metric	SALAD	Intentional Esophageal Intubation (IEI)	Traditional Suction
Time to Intubation	28–45 sec avg.	~60+ sec	~90 sec or more
First-Pass Success	85–94%	~70–80%	~65–75%
Aspirate Volume in Trachea	↓ 63% vs. traditional	No data	Highest contamination
Visual Obstruction	Significantly reduced	Moderate	High
Cognitive Load on Provider	Lower (continuous suction)	Higher (multiple steps)	Higher (Start-Stop cycles)

Key Takeaways:
- SALAD reduces airway contamination and improves visualization.
- Faster intubation reduces risk of hypoxia.
- Improves first-pass success—critical for preventing aspiration.
- Outperforms IEI and traditional suction methods in dynamic soiling scenarios.

(Fiore et al., 2019; Ko et al., 2020; Pilberry et al., 2019; Wong et al., 2021)

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Design & Methods

- Quasi-experimental, mixed-method pretest-posttest design
- **Population/participants:**
  - Airway providers (MDs, CRNAs, CNPs, paramedics, and respiratory therapists) and RNs
- **Setting:**
  - Critical access hospital in the upper Midwest
- **Recruitment:**
  - Flyers, word of mouth, emails

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Procedure

- Pre-educational survey utilizing 5-point Likert scale used to assess participant confidence
- Role specific education was provided with the opportunity to practice individually
- Combined group simulation of a massively contaminated airway provided to further integrate knowledge and experience as a team
- Post-educational survey utilizing 5-point Likert scale used to assess participant confidence
  - Airway provider post-education survey included binary question (Yes/No) regarding anticipated future us of SALAD technique

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Procedure: Nurses

- Nurses were given a presentation emphasizing skills, equipment, and positioning techniques to assist airway providers with patients who have or are at high risk for airway contamination.
  - **RSI**
    - Application of cricoid pressure
  - **Pre-oxygenation**
  - **Aspiration prevention**
    - Positioning
  - **Essential supplies**
    - Gum elastic bougie
    - Laryngoscope (video assisted and direct)
    - Endotracheal tube
    - Suction catheters
- An educational handout was also provided.

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Procedure: Airway Providers

- Airway providers were given a handout and a presentation on the **SALAD technique** for securement of a massively contaminated airway
  - Supplies
  - Step-wise approach
    - 5 steps
- Practice of the technique was done with a low-fidelity manikin modified to simulate an actively vomiting patient

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Procedure: Group

- Airway providers and nurses then participated in massive airway contamination simulation together
- This enabled participants to apply their knowledge in a team-based setting, and collaboratively to efficiently secure a (simulated) contaminated airway

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Results

- 9 participants
  - 5 Airway providers
  - 4 Nurses
- 8 participants reported prior experience with a massively contaminated airway
  - 62.5% report 1 – 10 cases
  - 37.5% reporter 11 or more cases
- Of the airway providers, 4 reported prior knowledge of SALAD technique
- Of the nurses, 3 reported prior experience in assisting with RSI

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Results: Nurses

- Of the questions asked of nurses, all showed improvement, and all were of statistical significance

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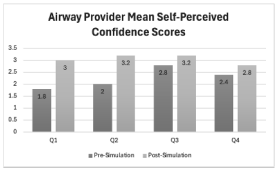
Results: Airway Providers

- Of the questions asked of airway providers, all showed improvement, however, only one was of statistical significance
- For the binary question "Do you believe that learning the suction-assisted laryngoscopy and airway decontamination (SALAD) technique will improve your ability to secure a massively contaminated airway?" responses were 100% affirmative.



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Limitations

- Small sample size
- Variability in professional backgrounds
- Differences between nurses & airway providers
- Pairing of participants
- Focus on self-perceived confidence

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Sustainability

- Intervention can easily be incorporated into a facility skills/simulation day
- All supplies used to educate nurses should be readily available
- Laerdal airway management trainer can be converted to a SALAD simulator for less than $50

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Clinical Implications

- Improve rural healthcare provider confidence by:
  - Increasing knowledge
  - Enhancing clinical skills
  - Promoting interprofessional collaboration

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Conclusions

- This project identified a need for target training related to low-frequency events such as massive airway contamination
- Simulation was an effective tool to improve competency and teamwork during an airway crisis
- Increasing confidence at managing specific airway crisis can contribute to better patient outcomes

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Thank You
Are There Any Questions?

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Implementing Anesthesia Provider Education Regarding Patient Marijuana Use: A Quality Improvement Project

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Problem

- Lack of research and evidence suggests a knowledge gap exists.
  - Limited evidence exists to indicate there is an appropriate level of education regarding the effects of patient marijuana use included within anesthesia didactic curricula.
  - The quantity and quality of research focused on patient marijuana use and the associated anesthetic implications and considerations is deficient.
  - This deficiency, although arguably expected due to the recent increase in marijuana legalization and use, has exposed a void in education requiring attention.

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Project Purpose

- The purpose of this project is to recognize the gap in knowledge of anesthesia providers concerning the perioperative care of patients who use marijuana.

(Clinical News, 2023)

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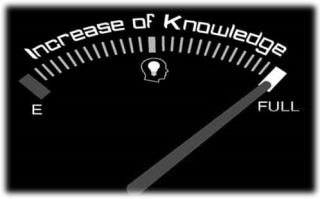
Project Goal

- The primary goal is to increase anesthesia provider knowledge when caring for patients who use marijuana.



(GAWG, 2023)

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Literature Review

- Databases and search engines
  - UND School of Medicine's Medical Library
  - Cochrane Library
  - Google Scholar
  - PubMed
  - CINAHL
- Sources
  - Relevant, credible, valid
  - Scholarly peer-reviewed journal articles
  - Pertinent to the project
  - No later than 2019

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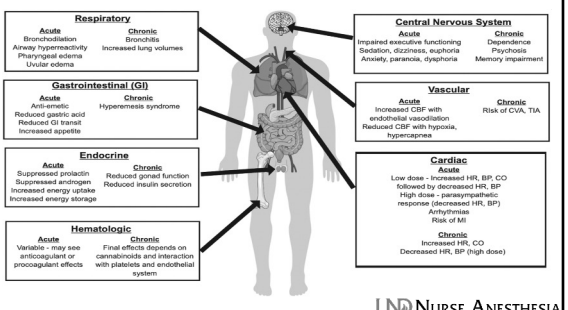
Body System Effects



(Lee et al., 2024)

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Body System Effects

Increased risk of:

- **Bronchospasm**
- **Laryngospasm**
- Tachycardia
- Increased myocardial oxygen demand
- Acute coronary events
- **Pharyngeal edema**
- Transient ischemic attacks and stroke
- Cerebral vasoconstriction
- Stress cardiomyopathy
- **Hyperemesis syndrome**
- **Delayed gastric emptying**
- **Hyperreactive airway**
- Hallucinations
- **Anxiety**
- **Arrhythmias**

(Lee et al., 2024)

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Anesthetic Considerations

- What should you do?
  - Discuss associated risks with the patient
  - Communicate with the perioperative team
  - Adjust anesthetic plan as needed
  - Prepare for potential associated complications
- Monitor for withdrawal: anger, irritability, chills, sweating, shaking, decreased appetite, anxiety, and insomnia

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Anesthetic Implications

- Increased induction dose requirement
  - Propofol: 200 mg vs 280-320 mg
    - +40-60% normal dose
- Increased volatile gas requirement
  - Sevoflurane: ≥ 1 MAC
  - Background Propofol infusion
  - Adjuncts
- Increased risk of emergence delirium and agitation
  - Benzodiazepines
  - Dexmedetomidine

(Irvine et al., 2022)

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Anesthetic Implications

- Increased risk of pulmonary aspiration
  - Gastric POCUS
  - RSI
- Increased risk of post-operative hypothermia
  - Bair hugger
  - Warm blankets
- Increased post-operative narcotic requirement
  - Difficult management of post-operative pain
    - Multi-modal
    - Adjuncts

(Irvine et al., 2022)

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Background Information

- The increasing legalization and prevalence of marijuana use in the United States poses significant challenges for anesthesia providers during the perioperative period.
- Current literature highlights limited provider confidence and inadequate educational content in graduate and continuing education curricula.

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Design and Methods

- Quasi-experimental, one-group, pretest-posttest design
- Electronic implementation via Qualtrics software
- Pretest
  - Demographics: five questions
  - Knowledge: seven questions
  - Confidence: three questions
- Educational module
  - PowerPoint format
  - 11 slides
- Posttest
  - Knowledge: seven questions
  - Confidence: three questions

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Population

- Anesthesia department
  - Twenty-eight certified registered nurse anesthetists (CRNA)
    - 12 CRNAs included in results.
  - Nine physician anesthesiologists
    - Four physician anesthesiologists included in results.

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Setting

- Level II trauma center in the upper Midwest United States.
  - 133 inpatient beds
  - 12 operating rooms
    - An additional 13th procedural suite

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Results

- All three Likert scale questions used to assess provider confidence showed statistical significance, showing an increase in confidence in providing anesthetic care to patients who admit to marijuana use.
- Results of pre- and posttest scores for the seven administered questions were not statistically significant.

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Limitations

- Small sample size, which constrained the statistical power of the findings and limited their generalizability to a broader population of anesthesia providers
- Self-selection bias
- Limited diversity within the sample
- Single implementation site
- Limited implementation timeframe

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Sustainability

- Questionnaires and educational module are readily available for reimplementation.
  - No cost via electronic implementation methodology
  - Applicable to any facility or organization with an Anesthesia department
  - Minimal time investment for completion
- Information may change with time as continued legalization, use, and research occur.

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Implications

- Continue to provide education to anesthesia providers regarding implications and considerations for patient marijuana use.
  - Increase knowledge
  - Increase confidence
- Expand and update as continued legalization, use, and research occur.
- Advocate for individualized anesthesia care plans considering patient marijuana use.

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Conclusion

- This project identified a need for education for anesthesia providers regarding marijuana use in patients.
- The educational module was a valuable tool in education, and it is sustainable.
- Increasing the knowledge and confidence of providers increases their ability to care for patients who use marijuana.
- This could result in increased awareness and ability to treat complications related to marijuana use as they arise.

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Thank You.

Are There Any Questions?

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Transversus Abdominis Plane (TAP) Block Training

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Project Purpose

Provide education to certified registered nurse anesthetists (CRNAs) to increase the knowledge and confidence in administering TAP blocks.

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Introduction

Abdominal surgery is one of the most painful procedures where multimodal anesthesia and analgesia must be balanced to maintain hemodynamic stability.

Poorly controlled post-operative pain following abdominal surgery can lead to an increase in morbidity, reduced functional recovery, and can increase the risk of long-term opioid use.

(Pirie et al., 2020; Brown et al., 2018)

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A Standard Approach

Intravenous (IV) opioid administration has been shown to be the most common and standard treatment for surgical pain management.

Opioids have been proven to be linked to dependency, nausea, vomiting, and an increase in pruritus.

(Ma et al., 2017)

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Regional Anesthesia

The potential benefit of incorporating regional anesthesia into an anesthetic plan extends well beyond acute pain relief.

Regional anesthesia has been linked to a reduction in morbidity, reduction of pulmonary complications, preservation of immune function, a reduction in the inflammatory response, shortened hospital length-of-stay, and a reduction in opioid requirements.

Abdominal regional anesthetic techniques reduce incision-related discomfort by instilling local anesthetic to the anterior abdominal wall muscles and parietal peritoneum.

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Regional Anesthetic Techniques

Several abdominal regional anesthetic options exist to provide postoperative pain relief:

- Quadratus lumborum block (QLB)
- Erector spinae block (ESPB)
- Transversus abdominis plane (TAP) block

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The TAP Block

Introduced in 2001, the TAP block has grown to become a reliable form of multimodal analgesia.

Benefits of the TAP block include:

- Post-operative analgesia
- Reduced post-operative opioid consumption
- Decreased PONV
- Favorable respiratory mechanics

(Mallan et al., 2019)

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Ultrasound-Guidance

Considered the gold-standard for administering TAP blocks

Enables visualization of the fascial planes of the abdominal wall prior to injecting local anesthetic

- This makes the procedure easier and safer compared to the previously used landmark-guided approach

(Tsai et al., 2017)

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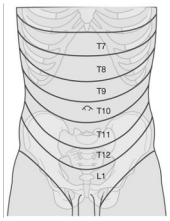
TAP Block Procedure

There are three different TAP block approaches:
- Subcostal
- Lateral
- Posterior



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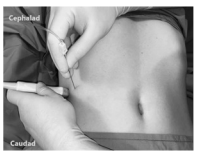
Patient Position

Lateral approach
- Patient will be supine
- A linear ultrasound probe will be placed at the mid-axillary line, superior and parallel to the iliac crest



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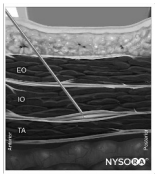
Pertinent Anatomy

Identify the abdominal muscles
- External oblique (EO)
- Internal oblique (IO)
- Transversus abdominis (TA)

A 22g, 5 cm B-bevel needle will be inserted in-plane, from medial to lateral and advanced until entering the fascial plane between the IO and TA



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Literature Review

Purpose: effectively understand key concepts, benefits, and current practice guidelines for performing the TAP block

Databases used: PubMed, CINAHL Ultimate, and Google Scholar

Search terms included: "TAP block," "ultrasound-guided TAP block in abdominal surgery," "post-operative pain," and "ultrasound versus direct visualization AND TAP blocks"

Inclusion Criteria: peer-reviewed publications about abdominal/pelvic surgery within the last 10 years

A total of 473 articles remained following the initial screening for inclusion and exclusion criteria. Levels of evidence were arranged according to research design, quality of the study, and applicability. The final review included a total of **15** articles.

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When to Perform the TAP Block?

Patients undergoing abdominal, gynecologic, or urologic surgeries
- Ex: hernia repairs, colorectal surgeries, and cesarean sections

Use caution in patients with an active infection at the site of injection, on therapeutic anticoagulation, or those where abdominal landmarks are difficult to distinguish

An absolute contraindication is the patient refusal

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Local Anesthetics

Calculate maximum local anesthetic doses prior to drawing up medications

Common local anesthetics include:
- Ropivacaine
- Bupivacaine
- Liposomal bupivacaine (Exparel)

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Exparel

Encapsulates bupivacaine in a suspension of multivesicular liposomes

Provides safe, consistent levels of bupivacaine

In adults, the maximum dose should not exceed 266 mg (20 ml)

Keep a 1:2 ratio of mg dose of bupivacaine to Exparel
- One 20 ml vial of Exparel can be mixed with up to 30 ml of 0.5% bupivacaine OR up to 60 ml of 0.25% bupivacaine

Not recommended for use in patients < 6-years-old, patients < 18-years-old for ISBP block, and/or pregnant patients

(Pacira Pharmaceuticals, 2022)

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DNP Scholarly Project Goals

Increase CRNA familiarity with the TAP block procedure

Improve CRNA confidence in determining what patients might benefit from the TAP block

Improve CRNA confidence in ultrasound manipulation to identify pertinent anatomy for the TAP block

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Design & Methodology

The project was implemented at a Midwest level 1 trauma center

The target population consisted of approximately 80 CRNAs employed at this facility

The initiative of the project aimed to engage at least half (40 CRNAs) of the participants

A total of 72 CRNAs participated in our project!

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Design & Methodology

CRNAs were made aware of the project by flyers created and posted by SRNAs throughout high-traffic anesthesia areas in the hospital

The project itself was carried out during a skills fair at the hospital where CRNAs were encouraged to attend

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Procedures

At the skills fair, CRNAs were asked to complete a pretest

After completion of the pretest, education was provided by two SRNAs while utilizing a poster board for visual and verbal demonstration

CRNAs were then shown how to safely administer a TAP block on a mannequin while utilizing ultrasound guidance through demonstration by the third SRNA

After completion of the above education, CRNAs were to complete the posttest and submit their tests to the SRNAs for test correction

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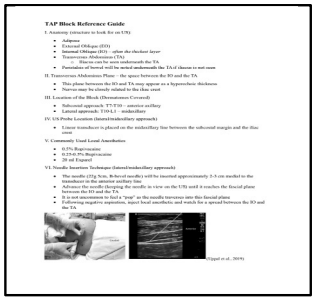
TAP Block Reference Guide

I. Anatomy structure to look for on US:
- Adipose
- External Oblique (EO)
- Internal Oblique (IO) – often the thickest layer
- Transverse Abdominus (TA)
  - Fascia can be seen underneath the TA
- Peritoneum of bowel will be noted underneath the TA if fascia is not seen

II. Transverse Abdominus Plane – the space between the IO and the TA
- This plane between the IO and TA may appear as a hyperechoic thickness
- Nerves may be closely related to the fats seen

III. Location of the Block (Dermatomes Covered)
- Subcostal approach: T7-T10 – anterior axillary
- Lateral approach: T10-L1 – midaxillary

IV. US Probe Location (lateral/midaxillary approach)
- Linear transducer is placed on the midaxillary line between the subcostal margin and the iliac crest

V. Commonly Used Local Anesthetics
- 0.5% Bupivacaine
- 0.25-0.5% Bupivacaine
- 20 ml Exparel

VI. Needle Insertion Technique (lateral/midaxillary approach)
- The needle (22g 3cm, B-bevel needle) will be inserted approximately 2-3 cm medial to the transducer in the anterior axillary line
- Advance the needle using the needle in view on the US until it reaches the fascial plane between the IO and the TA
- It is not uncommon to feel a "pop" as the needle traverses into this fascial plane
- Following negative aspiration, inject local anesthetic and watch for a spread between the IO and the TA

(Ogul et al., 2019)

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Results

72 CRNAs participated in the pretest and posttest

In terms of years of experience as a CRNA, 41 (56.9%) had less than one year to nine years of experience; conversely, 31 (43.1%) had greater than nine years of experience

Table 1

Years Experience	*N*	Percentage
< 1	3	4.2%
1 to 3	14	19.4%
4 to 6	15	20.8%
7 to 9	9	12.5%
> 9	31	43.1%
Total	**72**	**100.0%**

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Results

For the question, *"Within the last year, approximately how many TAP blocks have you performed?"* the results showed that 67 of 72 participants (93.1%) had performed less than one TAP block

Table 2

TAP Blocks	*N*	Percentage
< 1	67	93.1%
1 to 3	2	2.8%
4 to 6	1	1.4%
7 to 9	2	2.8%
Total	**72**	**100.0%**

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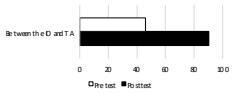
Results

For the question, *"When performing a midaxillary (lateral) TAP block, between which muscle layers is the desired location for injection of the local anesthetic?"*

33 of 72 (45.8%) of participants correctly responded on the pretest survey

65 of 72 (90.3%) of participants correctly responded on the posttest survey



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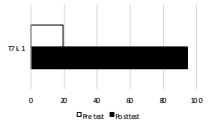
Results

For the question, *"What is the total dermatome level that can be achieved with a TAP block?"*

14 of 72 (19.4%) of participants correctly responded on the pretest survey

68 of 72 (94.4%) of participants correctly responded on the posttest survey



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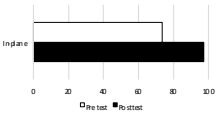
Results

For the question, *"Which needle insertion technique is used for a midaxillary (lateral) approach?"*

53 of 72 (73.6%) of participants correctly responded on the pretest survey

70 of 72 (97.2%) of participants correctly responded on the posttest survey



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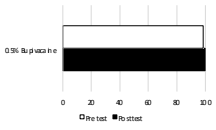
Results

For the question, *"Which local anesthetic might you commonly use when administering a TAP block?"*

71 of 72 (98.6%) of participants correctly responded on the pretest survey

72 of 72 (100.0%) of participants correctly responded on the posttest survey



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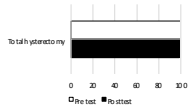
Results

For the question, *"What procedure would you anticipate a patient to benefit from receiving a TAP block?"*

72 of 72 (100.0%) of participants correctly responded on the pretest survey

71 of 72 (98.6%) of participants correctly responded on the posttest survey

This was the only question that shown a decreased percentage from pretest to posttest questions compared to other questions



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Results

The following two questions were ranked by CRNAs on a 5-point Likert scale

"How confident are you in deciding which patient might be appropriate to receive a TAP block?"

"For a patient undergoing abdominal surgery, how confident are you in your skills to administer a TAP block?"

For both questions, the posttest results revealed a significant increase in participants' confidence levels

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Results

Aside from one pretest/posttest score, results were statistically significant in showing improvement in TAP block knowledge and confidence

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Limitations

The pretest/posttest design:

- Lacks control group or randomization

Lack of previous studies for comparison

Only one site was utilized for implementation

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Sustainability

The educational poster can be shared or replicated and is easily modifiable

Cost to complete this project at another skills fair at the same facility is limited to only printing of the poster board, as the facility covered all additional costs for printing

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Future Implications

Continue to educate CRNAs on ultrasound-guided TAP blocks

Expand education to other departments on the benefits based on patient outcomes

Advocate for the ability of CRNAs to perform the TAP block under their scope of practice

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Conclusion

This project identified a need for education and training of the TAP block

The educational poster and oral presentation was shown to be a valuable tool

Further supplementation was provided by the hands-on skills portion with the TAP trainer

Increasing the knowledge and confidence of CRNAs increases their ability to advocate for TAP blocks for their patients

This has the potential to reduce morbidity and mortality following abdominal procedures

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Thank You!

Questions?

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Glucagon-Like Peptide-1 Receptor Agonists: Implications for Anesthesia Practice

Racheal Biffert SRNA, Cody Schumacher SRNA, & Lavonne Tavernit SRNA
University of North Dakota
College of Nursing and Professional Disciplines
Doctorate of Nursing Practice Project

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Thank You

Jennifer Harrison, DNP, CRNA
Robert West
Sanford Health Fargo

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Project Purpose

Improve on the knowledge and confidence of anesthesia providers in the care of patients on Glucagon-Like Peptide 1 (GLP-1) medications.

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Glucagon-Like Peptide-1

- GLP-1 is a gastrointestinal peptide, known as an incretin (Zhao et al., 2021).
- GLP-1 receptors found in other areas (Baggio & Drucker, 2007).
- The exact mechanism of action of GLP-1 is not entirely known.

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What are Glucagon-Like Peptide-1 Receptor Agonists (GLP-1 RA)?

- Used for the management of type 2 diabetes and treatment for obesity.
- Common GLP-1 RAs:
  - Semiglutide (Ozempic, Wegovy)
  - Liraglutide (Victoza)
  - Terzepatide (Mounjaro)

(Collins L. & Costello R.A., 2024.)

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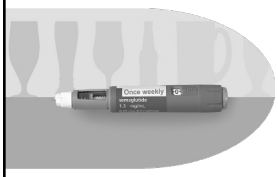
History & Prevalence



- The first GLP-1 RA medication approved by the FDA was in 2005, for the purpose of improved glucose control in the patient with T2DM (Jones et al., 2023).
- In 2017 GLP-1 RAs were approved for use in obese patients seeking a weight loss aid (Jones et al., 2023).

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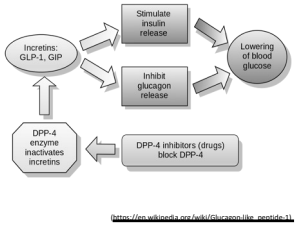
Mechanism of Action



(https://en.wikipedia.org/wiki/Glucagon-like_peptide-1)

- Effects of GLP-1 secretion:
  - Increased glucose-dependent insulin secretion
  - Decreased glucagon secretion
  - Decreased secretion of proinflammatory cytokines

(Lee & Lee, 2017)

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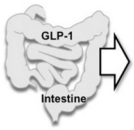
GLP-1 RA Physiologic Properties in the Gastrointestinal Tract

- Key effects on GI function:
  - delayed gastric emptying
  - reduced motility
  - increased colonic transit times.



Stomach • Gastric emptying ↓ • Gastric motility ↓	**Brain** • Food uptake ↓ • Body weight ↓
Colon • Food transit time ↓	**Pancreas** • Insulin biosynthesis ↑ • Glucagon secretion ↓ • β-cell apoptosis ↓ • β-cell survival ↑ • Glucose transporter gene ↑
Adipose tissue • Thermogenesis of BAT ↑ • Browning of white adipose tissue ↑ • Energy expenditure ↑	

(Lee & Lee, 2017)

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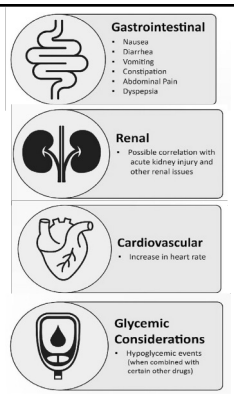
Adverse Effects & Intraoperative Considerations

Most Common Side Effects:

- Nausea
- Vomiting
- Diarrhea



(Wan et al., 2024)

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2023 American Society of Anesthesiologists (ASA) Consensus-Based Guidance on Preoperative Management of Patients (Adults and Children) on Glucagon-Like Peptide-1 (GLP-1) Receptor Agonists

Medication hold recommendations are regardless of:

- Drug Indication
- Dosage
- Procedure

Medication Hold Recommendations	
Orally Dosed	Held either the day before or day of procedure
Weekly Dosed	Held for at least one week before procedure

(Joshi et al., 2023)

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2023 American Society of Anesthesiologists (ASA) Consensus-Based Guidance on Preoperative Management of Patients (Adults and Children) on Glucagon-Like Peptide-1 (GLP-1) Receptor Agonists

- Adverse gastrointestinal side effects are predictive of increased gastric residuals volumes as a result of delayed gastric emptying.
- Pediatric patients taking GLP-1 RA experience similar gastrointestinal side effects as adult patients.

(Joshi et al., 2023)

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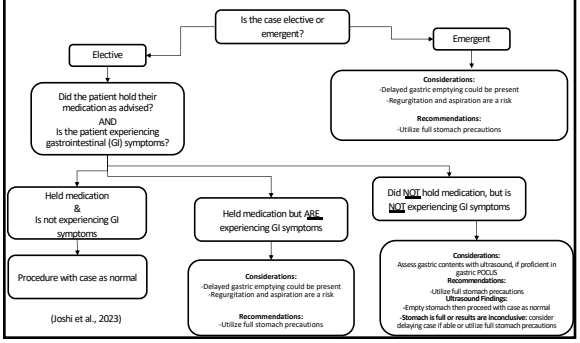
Day of Procedure



(Joshi et al., 2023)

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Design & Methods

- Quasi-experimental, one-group pretest-posttest design
- Population: CRNAs and Anesthesiologists employed by the level 1 trauma hospital in the Midwest
- Pretest
- Educational module
- Posttest

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Results

- 80 participants
  - 72 CRNAs, 8 Anesthesiologists
  - Ranging in experience level

Table 1

Years Experience	N	Percentage
< 1	2	2.5%
1 to 3	14	17.5%
4 to 6	15	18.8%
7 to 9	9	11.3%
> 9	39	48.8%
Not Stated	1	1.3%
Total	80	100.0%

- Confidence
  - Increase in confidence noted after educational module was presented.
- Knowledge
  - Questions 10 & 12 showed no statistically significant increase in scores.
  - Remaining questions were found to have a significant increase in posttest scores.

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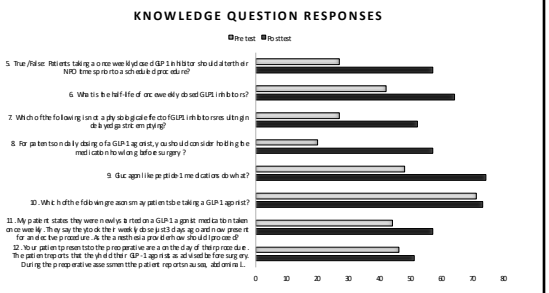
Results



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Implications

- Educational sessions are effective
- Improved knowledge improves patient care

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Conclusions

- Limitations: Single facility, session held in an asynchronous format
- Sustainability: Low cost and ease of updates
- Future Directions: Applicable to many other topics

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Thank You
Are There Any Questions?

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Preprocedural Ultrasound for Epidural Placement

Michelle Ahmeti, Shania Elder, Nicholas Houge

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University of North Dakota

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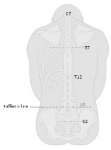
Introduction

Background

- Lumbar epidurals are frequently used for labor analgesia as well as some surgical procedures



Palpation of landmarks for epidural placement can be difficult on obese and pregnant patients

- Ultrasound (US) epidural can help identify appropriate anatomy for lumbar epidural placement

https://www.e-safe-anaesthesia.org/sessions/09_05/d/ELH_Session/1290/lab_5071.html

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Preprocedural Ultrasound

Preprocedural ultrasound scanning is used to identify vertebral levels, estimate depth to epidural space, and identify proper interlaminar space for needle insertion

Method	First attempt success rate
Landmark palpation	51%
Ultrasound scan	87%

Potential epidural complications: hematoma, dural puncture, soft tissue trauma

(Jayanth et al., 2023)

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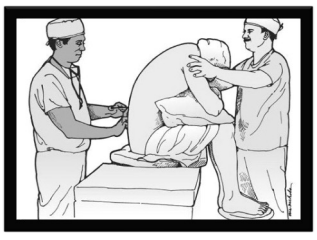
Preprocedural Ultrasound

Ultrasound scanning prior to needle insertion can decrease needle in back times (once proficient in lumbar ultrasound scanning)



https://drasm.co.za/spinal-anaesthesia-3/

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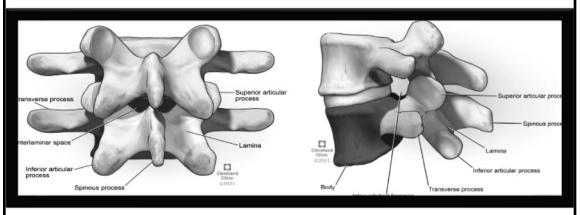
Spinal Anatomy



(Kolli et al, 2021)

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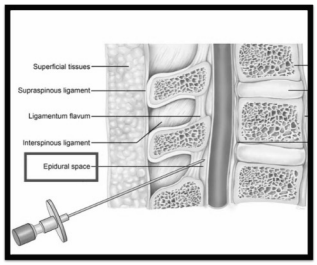
Spinal Anatomy

Average depth to epidural space = 5cm

Changes in OB Spinal Anatomy
- Soft tissue edema
- Lumbar lordosis
- Smaller epidural space



https://kevinjimd.com/treatment/interventional-procedures/epidural-steroid-injection/

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Literature Review

Preprocedural ultrasound for epidurals
- Decreases complications
- Increased first attempt success rates
- Decreases procedural time
- Beneficial for patients with challenging anatomy

Barriers to adopting use
- Lack of dedicated ultrasound for obstetric use
- 20+ scan are needed to become proficient
- Maintenance of ultrasound skills

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Project Purpose

How does implementing a preprocedural lumbar US educational module, compared to standard protocol, influence provider knowledge?

Goal
- Improve CRNA knowledge of preprocedural US scanning for epidural placement to increase utilization in future practice

Data analysis by pretest/ posttest

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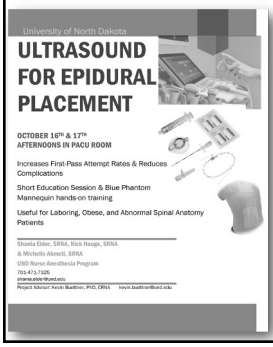
Design & Methods



Design: Quasi-experimental, one-group convenience sampling, pretest-posttest design

Format: Pretest, educational session, hands on learning, posttest

Setting: Rural hospital in the Upper Midwest

Population: 6 CRNAS participated

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Education

Equipment

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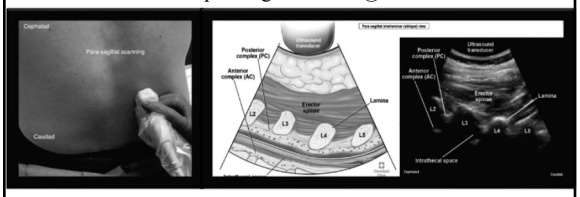
Education

Lumbar US Procedure

1. Start in the parasagittal view @ sacrum



(Kalagara et al., 2021)

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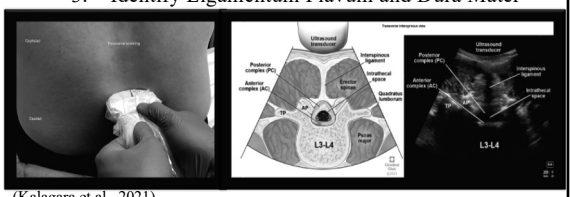
Education

Lumbar US Procedure

2. Rotate to achieve a transverse view @ L3-L4
3. Identify Ligamentum Flavum and Dura Mater



(Kalagara et al., 2021)

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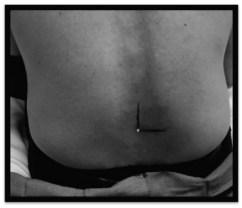
Education

Lumbar US Procedure

5. Measure the depth
6. Mark the intersecting lines



(Kalagara et al., 2021)

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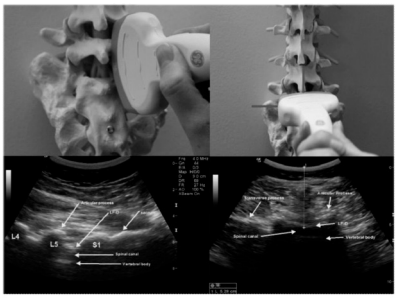
Education



(Elisha et al., 2023)

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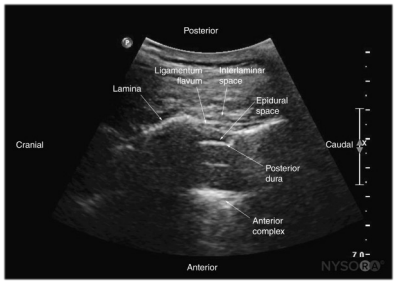
Education



https://www.nysora.com/techniques/neuraxial-and-perineuraxial-techniques/spinal-sonography-and-applications-of-ultrasound-for-central-neuraxial-blocks/

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Participant Demographics

Ultrasound Use

- 5/6 have NOT used ultrasound for lumbar/spinal procedures

Years of Experience

- 5/6 have >10 years of anesthesia experience

Age Distribution

- 4/6 fall within the age range of 41-50 years of age

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Results

Question	Pretest Correct Scores	Posttest Correct Scores
For lumbar epidural scanning, what ultrasound probe should be used?	5/6	6/6
In the image, which letter corresponds to the posterior complex/dura mater?	**3/6**	**6/6**
Which ultrasound view should be used to identify the appropriate interspace level for a lumbar epidural?	**0/6**	**5/6**
In a non-obese patient, what is the average depth to the epidural space?	5/6	6/6
The intrathecal space is?	**0/6**	**2/6**

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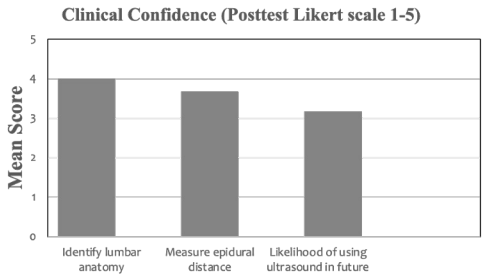
Results



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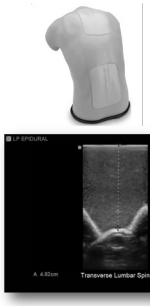
Strengths



- Evidence-based education with hands-on Blue Phantom lumbar trainers
- Provided insights on integrating ultrasound education in current settings
- Achieved high participation (86%), ensuring validity and representation.

https://www.gtsimulators.com/products/lumbar-puncture-and-spinal-epidural-training-model-bplp210

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Limitations

- Small sample size (n=6 CRNAs)
- Convenience sampling resulted in selection and response bias
- Limited access to ultrasound equipment and probes affected engagement and skill acquisition

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Conclusions

- Ultrasound improves accuracy in identifying lumbar vertebral interspaces (Zhang et al., 2023)
- A quasi-experimental pre/post-test design revealed significant improvement in both knowledge and confidence with preprocedural epidural scanning after our educational module with hands on training
- Current evidence-based practice supports preprocedural ultrasound scanning for improved patient satisfaction and reduced complications (Muftić et al., 2022)

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Thank You
Are There Any Questions?

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Airway Fire Prevention and Management: An Education-Based Intervention

Tyler Jorgenson and Jade Podell
University of North Dakota

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Project Purpose

Implement a comprehensive airway fire education program directed at enhancing the knowledge, skills, and awareness of operating room (OR) staff regarding the prevention, recognition, and management of airway fires

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Airway Fire Prevalence

- Defined as a fire occurring in an individual's airway that may or may not include an airway device and/or breathing circuit
- High risk, low occurring events
- 200-600 OR fires/year in the United States (Bysice et al., 2023)
  - Decreased over time with less flammable anesthetic agents and advances in equipment (Akhtar et al., 2016)

One airway fire is still one too many!

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Airway Fire: Morbidity & Mortality

- While less common, their potential for devastating impacts on patient morbidity and mortality remain (Ward, 2017)
- Acute Complications
  - Unexpected mechanical ventilation
  - Airway edema
  - Prolonged hospitalization
- Long-Term Complications
  - Tracheal stenosis
  - Scars
  - Anxiety
  - PTSD

(Day et al., 2018)

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Literature Review

- UND SMHS Library, PubMed, Google Scholar
- Search Terms
  - *Airway fire, otolaryngology, ignition source, fuel source, oxidizer, monopolar (cautery), bipolar (cautery)*
- Inclusion Criteria
  - Full-text articles published within the last 15 years
- Total of 16 articles reviewed from 2010-2023

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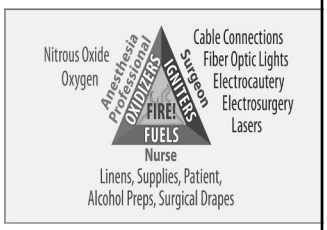
Airway Fire Triad

- 3 essential elements of the classical fire triad include
  1. **Oxygen**
  2. **Fuel**
  3. **Ignition Source**
- Any situation that allows for the combination of these 3 elements around the airway creates the risk for an airway fire



https://images.app.goo.gl/DHn71FyUxYSRv6HQA

(Day et al., 2018)

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Surgical Sites and Procedures

- Most <u>common sites</u> for OR fires
  - Head, face, neck, and upper chest
    - *Oxygen-rich environment* can cause a fire when exposed to an ignition source (Jones et al., 2019)
- An ASA closed claims study analysis found that the <u>main cases</u> that airway fires occur include
  - Tracheostomies, endoscopic procedures, and monitored anesthesia care (MAC) or local procedures
  - Of the *87 airway fire cases identified in this analysis, 76 (86%) of the patients experienced acute complications and <u>one case resulted in death</u>* (Pozin et al., 2023)

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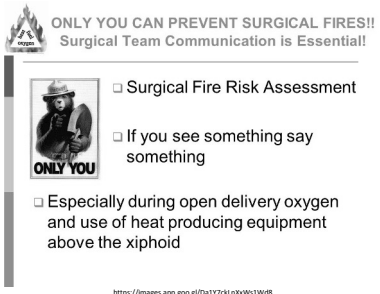
Airway Fire Prevention



https://images.app.goo.gl/Da1Y7ckLnXxWs1Wd8

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Prevention: Oxidizers

https://images.app.goo.gl/V9a7q7gafuLnLxYn8

- Avoid nitrous oxide
- Avoid or minimize oxygen delivery when possible
  - Delivery via a closed-circuit is ideal (cuffed ETT)
- Discontinue or reduce O2 at least 1 minute prior to electrocautery or laser use
- Adequate cuff inflation and place ETT more distal in trachea

(Jones et al., 2019)

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Prevention: Fuel Sources

- Avoid pooling of flammable agents
- Allow alcohol-based skin preps to dry
- Moisten pledgets, sponges, gauze, and throat packs
- Keep unnecessary fuels away from surgical field

https://images.app.goo.gl/pZxLLLVGZQQwrRUt5

(Day et al., 2018)

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Prevention: Ignition Sources

- The most common ignition sources include **electrocautery** and **surgical lasers**
- **Electrocautery**
  - Avoid if possible
    - If needed, use the lowest effective voltage
  - Use coagulation versus cutting mode when possible
    - Lower temperature
  - Bipolar diathermy preferred over monopolar
    - Ignition can still occur with bipolar
  - Avoid in tracheal incisions or with an FiO2>50%

(Jones et al., 2019)

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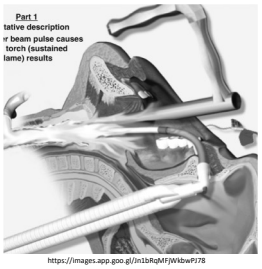
Prevention: Ignition Sources



https://images.app.goo.gl/in1bRqMFjWkbwPJ78

- **Surgical Lasers**
  - Power density and pulse duration should be used at the lowest effective output
  - Active tip of the laser should always be visible and held away from the bronchoscopes and ETTs before activation
  - Deactivate before removal from surgical area and placed in a sheath

(Jones et al., 2019)

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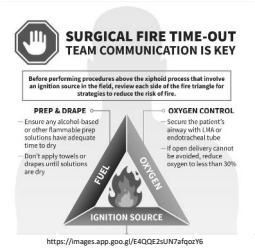
Airway Fire Management

- **Maintain Vigilance**
- Be aware of the signs
  - Flames or flashes
  - Unusual sounds (”pops” or “snaps”)
  - Odors, Smoke, Heat
  - Unexpected movement or discoloration of the breathing circuit, drapes, or patient



https://images.app.goo.gl/E4QQE2sUN7afqqzY6

(Day et al., 2018)

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Airway Fire Management

- **Recognition and Immediate Management**

1. Alert the OR team immediately
2. Stop the procedure ASAP
   - Especially laser/cautery use
3. Disconnect breathing circuit and stop all gas flows
4. Remove ETT/airway device
5. Extinguish the fire and flood airway with sterile H2O or saline
6. Surgeon should remove any debris from and around the airway
7. Re-establish a secure airway or BMV the patient with RA

(Ward, 2017)

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Post-Airway Fire Management

- **Post Fire Care**
- Once the OR is declared safe, address any life-threatening bleeding or injuries
  - Examine airway via a rigid bronchoscope
  - Do not discard any airway devices or equipment
- Depending on the significance of the fire, the patient may need to remain intubated, on mechanical ventilation, and transferred to the ICU for further management
  - Lung injuries may worsen over the next 48 hours

(Jones et al., 2019)

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Contributing Factors & Knowledge Gap

- A Sentinel Event Alert published by The Joint Commission identified the leading contributing factors that demonstrated practice knowledge gaps

1. Weaknesses in teamwork and communication during timeouts and during the procedure
2. Insufficient workflow, staffing, and training on specific equipment
3. Overconfidence, risky behaviors, distractibility, and poor situational awareness
4. Equipment malfunction or failure

(The Joint Commission, 2023)

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DNP Project Design & Methods

- **Design:** Quasi-experimental, one-group pretest-posttest
- **Setting:** Tertiary hospital in the mid-western United States
- **Population/participants:** CRNAs, MDAs, RNs, CSTs
- **Recruitment:**
  - Word of mouth
  - Operating Room manager's assistance for the OR staff's monthly educational meeting

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Participant Demographics

- **31** participants
- **17** of **31** participants have been in their role **7 years or fewer**
- **6** of **31** participants have been in their role **20 years or more**

Table 1

Role	*N*	Percentages
Anesthesiologist	4	12.9%
Circulator/RN	10	32.3%
CRNA	10	32.3%
SRNA	2	6.5%
Surgical Tech	5	16.1%
Total	**31**	**100.0%**

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DNP Project Procedures

- Pretest implemented to understand knowledge base for airway fire management
- Educational handout with SRNA education
- Brief simulation involving an airway fire scenario
- Posttest to evaluate the effectiveness of educational intervention
- *Pretest and Posttest were identical*

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DNP Project Pretest/Posttest

Test questions evaluated participants knowledge of:

- Incidence rates
- Ignition sources, fuel sources, and oxidizers
- High risk procedures
- Classical fire triad
- Management of an airway fire
  - Airway management, extinguishment, and correct procedural steps

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Results

- **6 out of 10** questions showed **statistically significant results** in post-education scores
- **5 out of 10** questions demonstrated **score improvement**
- **Question 10** had statistical significance but showed a **decrease** in correct responses
- Other questions demonstrated slight score improvement, however, not statistically significant results

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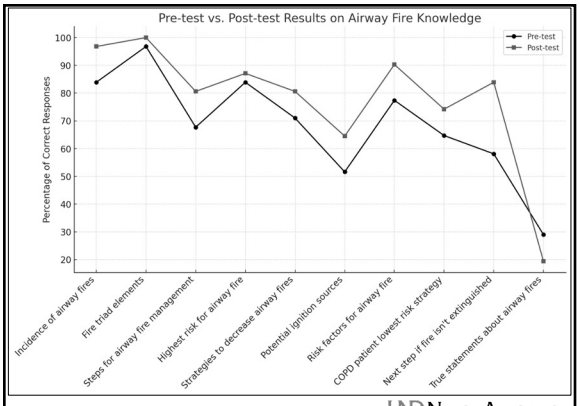

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Results

- **Pretest:** 210 correct responses out of 310 (31 participants x 10 questions) possible responses (67.7%)
- **Posttest:** 241 correct responses out of 310 possible responses (77.7%)
- The difference (increase) of -10.0% was statistically significant: ***p*** = .003
- Overall educational score improvements indicates that the education implemented was successful

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Limitations

- Smaller sample size (N = 31)
  - Expand our sample size
- Educational tool, pretest, & posttest has not been validated with multiple groups
- Presented in a large room/semi-unorganized environment creating room for distractions
- Self-reported test scores introduces potential for response bias
  - Utilize electronic testing methods for data collection to eliminate response bias

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Limitations

- Quasi-experimental design lacks a control group
  - Difficult to attribute perceived changes only to the educational intervention
- Utilizing other study designs could assess long-term impact of this education intervention/ knowledge retention

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Sustainability

Educational handout and test is available to implement at other facilities

Minimal equipment needed

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Future Implications

- Continue to educate OR staff on airway fire prevention, recognition, and management
- Expand this education to other healthcare facilities
- Advocate for procedural timeout with fire risk score prior to start
- Communication, teamwork, and increased interprofessional education

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Conclusion

- Training approaches must ensure comprehensive knowledge acquisition and application
- Advocate for ongoing education and mentorship
- Structuralize regular training programs
  - Integrate hand-outs, scenario-based training methods, and traditional lectures
- Establish an OR team with skills and confidence for procedural emergencies
- Continue to improve patient outcomes and standard of care

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Thank You!

Any Questions?

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Role of the Anesthesia Provider in Organ Procurement

Abigail Kramer, Kevin Robin, and Baylie Nagel
University of North Dakota

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Thank You!

- Sanford Fargo Anesthesiology Department
  - Tammy Hoganson, MS, APRN-CRNA
  - Brooke Keller, DNAP, APRN-CRNA
  - Adrienne Carlsson, DNP, APRN-CRNA
- Jennifer Harrison, DNP, APRN-CRNA
  - Faculty advisor
- UND Nurse Anesthesia Program Faculty
- Mr. Robert West
  - Statistician

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Introduction

- Lack of standardized clinical guidelines for anesthesia management of brain dead donor
- Limited literature focused specifically on intraoperative care
- Most CRNAs see less than 1 brain dead donor each year
  - Providers may lack knowledge and confidence of current clinical recommendations

(Anderson et al., 2015; Brown et al., 2023)

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Background and Significance

- Increasing need for transplantable organs
- In the U.S., most organs procured for transplant are from brain dead donors
- Despite growing need, lack of clinical guidelines for intraoperative management

(Anderson et al., 2015; Brown et al., 2023; Taber-Hight, 2022; Witjes et al., 2019)

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Background

- 2019
  - 39,719 organ transplants completed
  - 32,000 organs procured from 11,870 deceased donors
- December of 2020
  - 119,000 patients listed on the United Network for Organ Sharing (UNOS) Transplant waitlist

(Taber-Hight, 2022)

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Data Trends

2021

Region:
203 donors
572 lives saved

2022

Region:
222 donors
760 lives saved

Sanford Fargo Hospital:
17 donors
• 9 BD
58 lives saved

2023

Region:
256 donors
797 lives saved

Sanford Fargo Hospital:
23 donors
• 15 BD
84 lives saved

(LifeSource, 2022a, 2022b, 2023a, 2023b, 2024)

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Purpose

Increase CRNA knowledge and confidence of anesthesia implications during brain dead donor organ procurement procedures

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Becoming a Donor

- Admission to hospital
- Referral to LifeSource
  - Extensive EMR review
  - Family conversation
- Declaration of brain death by hospital
- Management of care
  - Evaluation
  - Allocation
  - OR logistics

(Clark & Kramer, n.d.; Greer et al., 2023; Kishish et al., 2024)

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Pathophysiology of Brain Death

- Ischemic cerebral response
- Loss of autonomic regulation
- Neurohormonal dysfunction
  - Hypothalamic-pituitary axis (HPA)
- Spinal reflexes
- Inability to maintain fluid balance

(Hall, 2015; Hyun et al., 2024; Lazzeri et al., 2021)

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Potential Gifts

Tissue & Eye

Heart valves
Skin
Bones
Tendons
Arteries/Veins
Nerves
Corneas

Organ

Heart
Lungs (en-bloc or single)
Liver
Pancreas
Kidneys
Intestine
Vascular composite allograft (VCA)

(Clark & Kramer, n.d.; HRSA, 2024)

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Preoperative Assessment

- Scheduled labs
- Do **NOT** need:
  - Blood prep/hold
  - Anesthesia or blood consent
- Organs to be procured
- Communication with LS team
  - Huddle ~30 mins before OR
  - Transport logistics
    - Honor Walk

(Farbos de Luzan et al., 2023)

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OR Team Members

- Hospital
  - Circulating RN
  - Scrub (1-2)
  - Anesthesia providers
  - Occasionally pathology
- LifeSource
  - Donation Coordinator
  - Surgical Coordinator (1-2)
  - Occasionally send own surgeon or recovery specialist
- Organ Teams
  - Each accepting transplant center sends a recovery team
  - 2-5 people per team – varies by organ & transplant center
- Rare
  - Coroner/Medical Examiner
  - Law enforcement official

(Goras et al., 2020)

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OR & Anesthesia Set Up

- Patient comes to OR with ETT, OG, a-line, & CVC
- Additional equipment:
  - Glucometer
  - iStat (point-of-care ABGs)
  - Flexible bronch/fiberoptic scope*
  - Defibrillator & internal paddles

* if recovering lungs

(Farbos de Luzan et al., 2023; LifeSource, n.d.)

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Hemodynamic Goals

- SBP: 90-150 mmHg
- MAP: > 60 mmHg (> 70 if hx HTN)
- HR: 60-100 bpm
- CVP: 4-6 mmHg
- O2 sat: > 95%
- Blood glucose: < 180 mg/dL
- Urine output: 1-2 ml/kg/hr or < 300 ml/hr

- LifeSource patient specific resource sheet
  - Vent settings, last ABG, lines, running drips, etc.

(Kishish et al., 2024)

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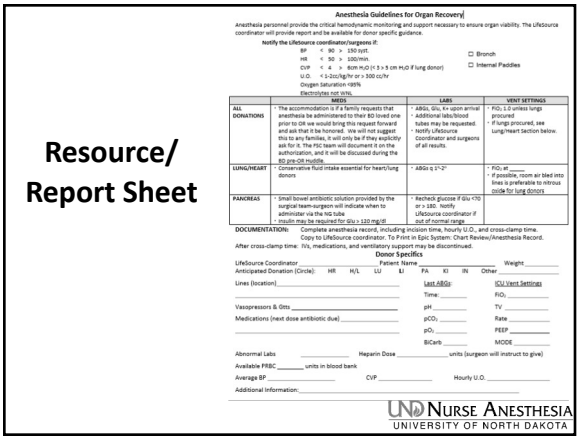
Resource/ Report Sheet



Anesthesia Guidelines for Organ Recovery

Anesthesia personnel provide the critical hemodynamic monitoring and support necessary to ensure organ viability. The LifeSource coordinator will provide report and be available for donor specific guidance.

Notify the LifeSource coordinator/surgeons if:

BP < 90 > 150 syst.
HR < 50 > 100/min.
CVP < 4 > 8cm H_2O (3 > 5 cm H_2O if lung donor)
U.O. < 1-2cc/kg/hr or > 300 cc/hr
Oxygen Saturation <95%
Electrolytes not WNL

☐ Bronch
☐ Internal Paddles

	MEDS	LABS	VENT SETTINGS
ALL DONATIONS	* The accommodation is if a family requests that anesthesia be administered to their BO loved one prior to OR we would bring this request forward and ask that it be honored. We will not suggest this to any families, it will only be if they explicitly ask for it. The PSC team will document it on the authorization, and it will be discussed during the BO pre-OR huddle.	* ABGs, Glu, K+ upon arrival * Additional labs/blood tubes may be requested. * Notify LifeSource Coordinator and surgeons of all results.	* FiO2 1.0 unless lungs procured * If lungs procured, see Lung/Heart Section below.
LUNG/HEART	* Conservative fluid intake essential for heart/lung donors	* ABGs q 1^-2^	* FiO2 at ____ * If possible, room air bled into lines is preferable to nitrous oxide for lung donors
PANCREAS	* Small bowel antibiotic solution provided by the surgical team-surgeon will indicate when to administer via the NG tube * Insulin may be required for Glu > 120 mg/dl	* Recheck glucose if Glu <70 or > 180. Notify LifeSource coordinator if out of normal range	

DOCUMENTATION: Complete anesthesia record, including incision time, hourly U.O., and cross-clamp time. Copy to LifeSource coordinator. To Print in Epic System: Chart Review/Anesthesia Record.

After cross-clamp time: IVs, medications, and ventilatory support may be discontinued.

Donor Specifics

LifeSource Coordinator _____ Patient Name _____ Weight _____
Anticipated Donation (Circle): HR H/L LU LI PA KI IN Other _____
Lines (location)_____
_____
Vasopressors & Gtts _____
Medications (next dose antibiotic due) _____
_____
Abnormal Labs _____ Heparin Dose _____ units (surgeon will instruct to give)
Available PRBC _____ units in blood bank
Average BP _____ CVP _____ Hourly U.O. _____
Additional Information: _____

Last ABGs:
Time: _____
pH _____
pCO_2 _____
pO_2 _____
BiCarb _____

ICU Vent Settings
FiO_2 _____
TV _____
Rate _____
PEEP _____
MODE _____

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Intraoperative Medications

- All brain dead donors
  - **Nondepolarizing** neuromuscular blocker
    - Prior to incision
  - Heparin
    - Prior to cross-clamp (3-5 mins)
    - LS coordinator will advise on dose and timing
    - Do NOT need to check ACT after administration
  - Pancreas
    - Duodenal antibiotic flush through OG
      - Provided by LifeSource

(Davis et al., 2020)

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Anesthesia Considerations

- BP management:
  - **No** Vasopressin
  - Norepinephrine drip
    - Phenylephrine pushes
  - Levothyroxine (T3/T4) infusion
    - Continue intraoperatively
  - HTN treatment
    - Stop T4
    - Cleviprex or Esmolol
    - Propofol
- Inhalational anesthetics
  - Avoid if heart/lungs going for transplant
    - OK if recovering heart for valves
- Fluids
  - Usually dextrose additive
- Insulin
- On scheduled ABX

(Farbos de Luzan et al., 2023; Jaffe, 2020; Kishish et al., 2024; Miller & Thompson 2022)

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Procedure

- OR entrance
  - Give paralytic
- Transfer to anesthesia machine & monitors
  - **Clamp ETT** before switching circuits
- If lung recovery: bronch, recruitment, ABG ~ 20 mins after
- Positioning & prep
- LifeSource Timeout
  - Moment of Silence
- Incision & sternotomy

(Jaffe, 2020; Smith et al., 2020)

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Procedure

- Thoracic
  - Isolate & prepare aorta for canulation in case of emergent XC
  - Manipulation to access pulmonary vasculature
- Abdominal
  - Liver
    - Mobilize from diaphragm
    - Prep for portal cannulation
  - Pancreas
    - Official acceptance usually held until full visualization
    - Hepatic artery anomalies are common & increase the complexity of dissection
  - Kidneys
  - Research
    - Ex. Ovaries, bladder, lungs, liver

(Jaffe, 2020)

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Procedure

- Crossclamp
  - Preservation fluid flushed through organs & cavity packed with ice
    - All meds/gtts/machine shut off – end of anesthesia services
  - **If **LUNGS** procured:
    - Anesthesia **stays** and **continues** ventilation during flush
    - After cardiectomy, lung team will ask for recruitment breaths (Valsalva)
    - Deliver high Vt breath while slowly pulling back ETT
      - Want lungs fully inflated for removal & transport
    - Surgeon staples trachea & performs bilateral pneumonectomy
    - Once lungs removed – end of anesthesia services

(Jaffe, 2020)

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Design & Methods

QUASI-EXPERIMENTAL, ONE-GROUP PRETEST-POSTTEST DESIGN

SETTING: MIDWEST LEVEL 1 TRAUMA AND TRANSPLANT CENTER

POPULATION: ANESTHESIA PROVIDERS

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Implementation

- Completed at department meeting
- Pretest – established baseline knowledge and confidence
- Educational module presented utilizing PowerPoint presentation
- Posttest – assessed educational module effectiveness

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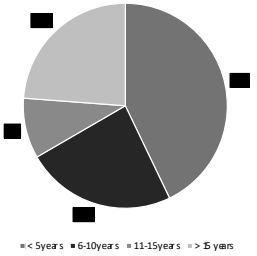
Demographic Results



- 42 Participants
  - 41 CRNAs, 1 student
- ≤ 5 years experience: 18 CRNAs
- > 6 years experience: 24 CRNAs
- 31 reported previous participation in a donor procurement surgery

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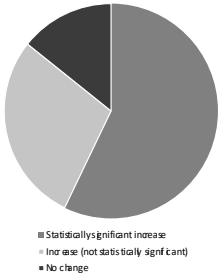
Knowledge Results

- 4/7 showed statistically significant increase
- 2/7 showed an increase in knowledge but were *not* statistically significant
- 1 question scores were equivalent in pre & post tests



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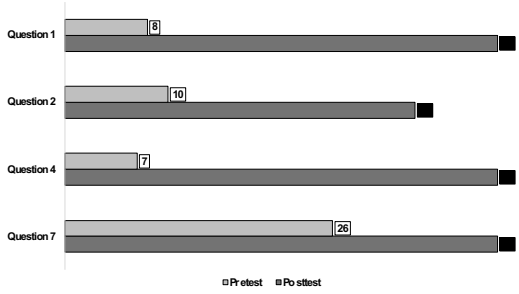

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Results

Statistically significant increase in knowledge of intraoperative procurement process

Overall providers felt more confident in their knowledge and of their role in brain dead organ procurement surgery

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Sustainability

- Educational module has great potential for sustainability
  - Already created
  - No equipment needed other than access to a computer
- Could be implemented as annual mandatory education

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Future Implications

- Expand to other transplant centers
  - Implement educational module with collaboration from the OPO
  - Potential to improve further providers' knowledge and confidence
- Contribute to a standardized approach to education
  - Possibly improve outcomes and increase organ viability

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Conclusion

- Identified the need for education on anesthesia implications and considerations of organ procurement surgery in brain dead donors.
- Educational module increased participants' knowledge and confidence in managing brain dead donors during organ procurement surgeries.

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Thank You

Are there any questions?

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Anesthesia Considerations for Patients Prescribed Medications for Opioid Use Disorder: An Educational Session

Rachel Walsh, BSN, SRNA and Matthew Eriksson, BSN, SRNA
University of North Dakota

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Opioid Use Disorder (OUD)

"The desire to seek out and/or use opioids in spite of the negative consequences associated with the misuse of opioids including social, economical, mental, and physical effects" (Barreveld et al., 2023, p. 489)

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Opioid Use Disorder Statistics

- **6.7-7.6 Million U.S. citizens**
- >75% of ODs were due to opioids
- 81,806 deaths in 2022
- *>200 deaths daily*
- $1.02 trillion U.S. dollars

(Centers for Disease Control and Prevention, 2024; Keyes et al., 2022; Substance Abuse and Mental Health Services Administration, 2022)

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Opioid Use Disorder Pathophysiology

Disruption of the Brain's Reward Circuity

- Baseline: Low Dopamine
- Continuous Use of Opioids: large ***INCREASE*** in Dopamine
- NMDA receptor sensitization

Pharmacological Tolerance and Withdrawal

(Barreveld et al., 2023; Brown and Capili, 2020); Volchow & Blanco, 2021)

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Did You Know?

There is a ***30-100%*** increase in intraoperative opioid requirements

(Elisha et al., 2023)

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Opioid Use Disorder Treatment

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Medications for Opioid Use Disorder Treatment

- 3 FDA Approved Drugs

1) Buprenorphine/Suboxone
2) Methadone
3) Naltrexone

1.2 million individuals currently on medications for opioid use disorder (MOUD)

(Barreveld et al., 2023; Substance Abuse and Mental Health Services Administration, 2022)

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Anesthesia Implications for MOUDs

- MOUD interact with common analgesic agents
- Risks
  - Longer lengths of stay
  - Increased hospital readmission
  - Increased hospital costs
  - Increased rates of relapse
  - ***Increased morbidity and mortality***
- Lack of consensus on how to manage patients taking these medications

(Barreveld et al., 2023; Coluzzi et al., 2017; Jimenez Ruiz et al., 2023; Keyes et al., 2022; Kohan et al., 2021; Larach et al., 2022; Namiranian et al., 2020)

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Purpose of This DNP Scholarly Project

- To educate anesthesia providers on current considerations on how to provide adequate anesthesia and analgesia for patients living with an OUD currently on MOUD.
- Goals
  - Increase ***knowledge*** levels
  - Increase ***confidence*** levels

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Literature Review

- **Aim:** Identified and analyzed published research related to OUD, MOUD, and anesthesia considerations for this patient population.
- **Databases:** PubMed, CINAHL Complete, Google Scholar
- **Inclusion Criteria:** Articles published between years 2017-2024
- **30** total pieces of evidence used for review

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Medications Used for OUD

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Buprenorphine/Suboxone

- **Mechanism of Action**
  - *Partial Mu Agonist*
  - *Kappa Antagonist*
- High binding affinity
- Slow receptor dissociation

Suboxone: *buprenorphine combined with naloxone*

(Barreveld et al., 2023; Sritapan et al., 2020; Volchow & Blanco, 2021).

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Buprenorphine Anesthesia Considerations

Pre-Op	Intra-Op	Post-Op
• **Continue** Daily Dose • Do Not Taper	• Multimodal Techniques • Regional and Local Anesthesia • Short-Acting Opioids	• Non-opioid Analgesics • Divide Total Daily Dose of Buprenorphine into 2-3 doses up to 24 mg/day

(Barreveld et al., 2023, Burn et al., 2022; Kohan et al., 2021; Sritapan et al., 2020)

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Methadone

- **Mechanism of Action**
  - *Full Mu Agonist*
  - *Weak NMDA Antagonist*
- Given orally at a treatment clinic
- Long ½ Life
- Adverse Effects
  - Respiratory depression
  - QT prolongation

(Barreveld et al., 2023; Burns et al., 2022; Koehl et al., 2019).

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Methadone Anesthesia Considerations

Pre-Op	Intra-Op	Post-Op
• **Continue** Daily Dose • EKG *Emergent Situation: IV methadone	• Multimodal Techniques • Regional and Local Anesthesia • Short-Acting Opioids • **QTc monitoring** • Respiratory Depression Risk	• Non-opioid Analgesics • Regional Techniques • Continue Daily Dose Upon Discharge

(Barreveld et al., 2023; Burns et al. 2022; Coluzzi et al., 2017; Kohen et al., 2019; Larach et al., 2022; Sritapan et al., 2020).

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Naltrexone

- **Mechanism of Action**
  - *Mu Opioid Antagonist*
- Tablet or Monthly Injections

(Barreveld et al., 2023; Burns et al., 2022; Singh & Saadabadi, 2023).

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Naltrexone Anesthesia Considerations

Pre-Op	Intra-Op	Post-Op
• MAJOR Surgery: ***Hold*** • Minor Surgery: Consider ***Continuing***	• If held: *multimodal, regional, careful titration of opioids* • If continued: AVOID opioids	• Admit patient to the hospital to monitor pain • Opioid free for 7-10 days

(Barreveld et al., 2023; Coluzzi et al., 2017; Koehl et al., 2019; Larach et al., 2022; Namiranian, et al., 2020)

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DNP Scholarly Project

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DNP Scholarly Project

- Quantitative Pretest-Posttest Design
  - Quasi-experimental
  - Non-randomized
- Setting
  - Upper midwestern U.S. tertiary hospital
- 18 CRNA participants

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Design & Methods

Pretest

Educational Module

Posttest

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Results

- **Confidence Levels**
  - 3-Point Likert Scale
  - ***Statistical Significance*** of increased confidence levels in caring for this patient population resulted
- **Knowledge Levels**
  - Independent-samples t-test
  - ***2 out of 7 questions were statistically significant***

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Interpretation of Results

INCREASED CONFIDENCE LEVELS OBSERVED

A KNOWLEDGE GAP REMAINS REGARDING THIS TOPIC

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Limitations

- Small Sample Size
  - n=18
- Attrition
  - 7 participants dropped out
- Lack of Matching
  - Individuals' pretests were not linked to their posttests

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Implications

- More emphasis on **research and education** regarding OUD, MOUD, and perioperative anesthesia considerations is needed
- The educational materials created for this project can be used at other institutions

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Conclusions

- OUD and MOUD is prevalent and rising in our nation
- Anesthesia providers ***MUST*** have a solid understanding of how to care for this patient population to:
  - Decrease hospital costs
  - Improve the nation economically
  - Decrease rates of relapse
  - ***Decrease rates of morbidity and mortality***

(Barreveld et al., 2023; Centers for Disease Control and Prevention, 2024; Substance Abuse and Mental Health Services Administration, 2022)

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Thank You
Are There Any Questions?

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