Efficacy of Dexamethasone, Dexmedetomidine, and Clonidine as Adjuvants in Supraclavicular Blocks: Doctoral Defense

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Objectives

Upon completion of this presentation, the participant will be able to:

appraise	the current evidence regarding the use of dexamethasone, dexmedetomidine, and clonidine as perineural adjuvants for prolonging supraclavicular block duration,
describe	the five phases of the Stetler Model for evidence-based practice,
evaluate	the implementation and measurement strategies of the dissemination,
interpret	the statistical analysis of the results from the dissemination, and
summarize	the overall impact of the project.

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Presentation Overview

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Background

02
Evidence-based Practice Model

03
Analysis & Results

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Project Impact & Future Research

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01

Background

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Evolving Anesthetic Practice

Complications associated with general anesthesia[1]

Anaphylaxis	Aspiration, PONV	Awareness with recall	Cardiovascular instability	Respiratory depression	Stroke	MH

Growing practice of ultrasound-guided regional anesthesia[2]

Real-time visualization of anatomic structures	Enhanced needle placement & anesthetic localization	Optimized efficiency & safety	Gold standard for upper extremity PNBs

PONV: Postoperative nausea and vomiting; **MH**: Malignant hyperthermia; **PNB**: Peripheral nerve block
1. American Society of Anesthesiologists, n.d.; 2. McCartney et al., 2010

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Peripheral Nerve Blocks

Supraclavicular Brachial Plexus Block

Indications[1]

- Surgical anesthesia → Mid-humerus level to distal extremities[2]
- Postoperative or chronic pain management → Multiple comorbidities
- Patients at high-risk for general anesthesia → PONV
- OSA

"Spinal of the Arm"



https://myblockbuddy.com/all-lessons/supraclavicular-block/

PONV: Postoperative nausea and vomiting; **OSA**: Obstructive sleep apnea
1. Capek & Dolan, 2015; 2. Chan et al., 2003

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From Interest to Implementation

PNB Benefits[1]
- Fewer complications
- Improved pain management
- Decreased opioid use
- Reduced LOS/readmission

Adjuvant Benefits[2]
- Reduce total LA dose
- Decrease risk for LAST
- Enhance block quality

Common Adjuvants[3]
- Dexamethasone
- Dexmedetomidine
- Clonidine

Project Focus

Educate on the evidence-based use of dexamethasone, dexmedetomidine, and clonidine as perineural adjuvants for prolonging supraclavicular blocks in adult patients undergoing upper limb surgery

PNB: Peripheral nerve block; **LOS**: Length of stay; **LA**: Local anesthetic; **LAST**: Local anesthetic systemic toxicity
1. Gabriel & Ilfeld, 2018; 2. Abe et al., 2023; 3. Gola et al., 2020

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Evidence-based Practice Model

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Stetler Model of Evidence-based Practice

I **Preparation**

II **Validation**

III **Comparative Evaluation & Decision Making**

IV **Translation & Application**

V **Evaluation**

Stetler, 2001

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Phase I: Preparation

PICOT Revision

P	In adult patients receiving supraclavicular brachial plexus blocks for upper limb surgery,
I	how does the use of dexamethasone as an adjuvant to local anesthetic,
C	compared to dexmedetomidine and **clonidine** as an adjuvant to local anesthetic,
O	affect the duration of the block
T	during the first 24 hours postoperatively?

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Phase I: Preparation

Literature Review

Texas Medical Center (TMC) Library	Databases	MeSH/Emtree Terms	Key Terms	Filters	Search Techniques
• Librarian consultation	• Cochrane Library • CINAHL • EMBASE • PubMed • TMC Search Portal	• "Brachial Plexus Block" • "Dexamethasone" • "Dexmedetomidine" • "Clonidine"	• Brachial Plexus Anesthesia • Dexamethasone • Dexmedetomidine • Clonidine • Supraclavicular Block • Block duration	• 2014-2025 • English • Peer-reviewed • Full text • Adult population	• Boolean operators ○ 'AND' ○ 'OR' • Truncation ○ (*) • Snowballing

Reviewed for relevance and excluded duplicates

18 Articles → 11 Original, 7 Expansion

CINAHL: Cumulative Index to Nursing and Allied Health Literature; **EMBASE**: Excerpta Medica Database; **MeSH**: Medical Subject Headings

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Phase II: Validation

Level of Evidence Oxford Centre for Evidence-Based Medicine (OCEBM)		
Level I	Meta-analysis	
Level II	Experimental Design	11
Level III	Quasi-experimental Design	7
Level IV	Non-experimental Design	
Level V	Case Report/Clinical Expertise	

OCEBM Levels of Evidence Working Group, 2011

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Phase II: Validation

Strength of Evidence United States Preventive Services Task Force (USPSTF)		
A	Strongly recommend	5
B	Recommend	13
C	Selectively recommend	
D	Recommend against	
I	Insufficient evidence	

U.S. Preventive Services Task Force, 2018

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Phase III: Comparative Evaluation & Decision Making

Summary of Findings

Primary Outcome Block Duration		
Dexmedetomidine*[1-8] > Dexamethasone*[9-14] > Clonidine*[8, 15] prolonged sensory and motor block duration		
Secondary Outcomes		
Dexmedetomidine	Dexamethasone	Clonidine
• Prolonged analgesic duration*[1-8] • Decreased postoperative pain*[1, 3, 4] • Reduced total analgesic consumption*[1, 3, 6] • Sedation*[7, 17] • Hypotension and bradycardia*[4]	• Prolonged analgesic duration*[9-13, 16] • Decreased postoperative pain*[9, 16] • Reduced total analgesic consumption*[9, 12, 16]	• Prolonged analgesic duration*[8, 15] • Sedation[4, 8] (not statistically significant) • Bradycardia[7, 13] (not statistically significant)

*$p < .05$

1. A et al., 2023; 2. Agarwal et al., 2023; 3. Apoorva et al., 2025; 4. Bafna et al., 2015; 5. Mokkarala & Badugu, 2022; 6. Nazir et al., 2019; 7. Prapurna et al., 2022; 8. U. Yadav et al., 2024; 9. Ali et al., 2020; 10. Prasad et al., 2020; 11. Sharma et al., 2023; 12. Srihari et al., 2021; 13. S. Yadav et al., 2023; 14. Zaman et al., 2023; 15. Nasir et al., 2017; 16. Jiang et al., 2023; 17. Singh et al., 2020

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Phase III: Comparative Evaluation & Decision Making

Recommendations

- **Patient Population**
  - 18-60 years old
  - ASA I-II
  - Elective upper limb surgeries with supraclavicular block
- **Block Administration**
  - Single injection
  - Ultrasound guidance
- **Adjuvant Doses**
  - 8 mg Dexamethasone*
  - OR
  - 1 µg/kg (IBW) Dexmedetomidine*
- **Local Anesthetic**
  - 0.5% Bupivacaine
  - OR
  - 0.5% Ropivacaine

IBW: Ideal body weight
*Perineural administration is considered off-label

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Phase IV: Translation & Application

Dissemination

Intervention
- Education on adjuvant use to prolong supraclavicular blocks

Audience & Setting
- S.R.N.A.s
- Baylor College of Medicine
- May 28, 2025 from 1400-1500

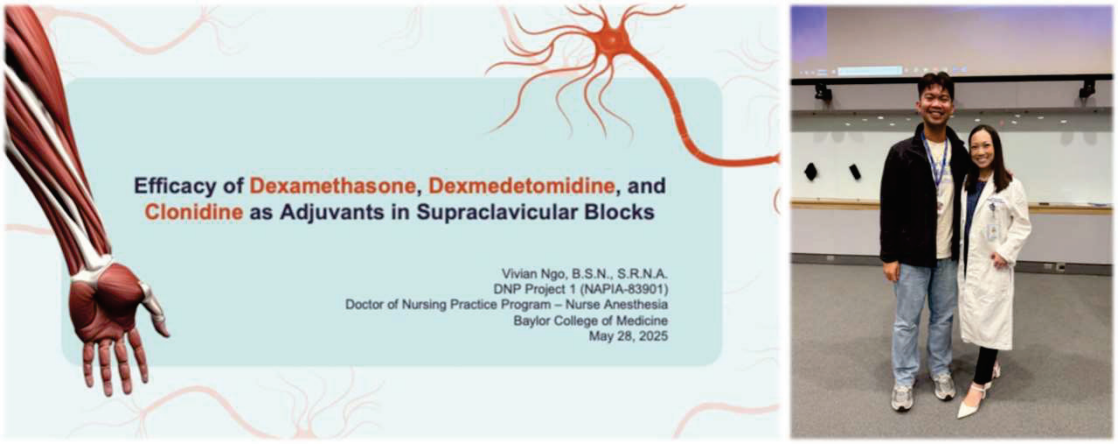
Methods
- PowerPoint presentation
- Pre-test & post-test
- Evaluation survey

Desired Outcomes
- Successful transfer of knowledge
- Delivery of an effective presentation
- Increased willingness to engage in practice change

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Dissemination



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Phase IV: Translation & Application

Dissemination framework

Method

Educational Approach

- PowerPoint
- Oral presentation
- Cost-effective
- Structured & adaptable information
- Visually appealing
- Tests & surveys

Theoretical foundations

Andragogy[1]

- Self direction
- Experience
- Motivation through relevance

Cognitive Learning Theory[2]

- Active processing
- Individualized learning
- Knowledge integration

Application

- S.R.N.A.s are adult learners
- Relevant and applicable content
- Supports diverse learning styles
- Active engagement
- Reinforced knowledge

1. Knowles, 1978; 2. Henrichs & Thompson, 2017

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Phase V: Evaluation

Desired Deliverables, Outcomes, and Impacts

Deliverables	Outcomes
PowerPoint presentation Pre-test & post-test Learner assessment & program evaluation survey	Successful transfer of knowledge Delivery of an effective presentation Increased willingness to engage in practice change

Impacts
Increase utilization of ultrasound-guided peripheral nerve blocks Reduce patient complications related to general anesthesia Improve pain management & patient satisfaction

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Analysis & Results

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Evaluation of Outcomes

Successful Transfer of Knowledge

- Evaluation: Pre-test & Post-test
  - Paper copies
  - Five identical multiple-choice/multi-select questions
    - NBCRNA item development guidelines
  - Based on learning objectives
    - Bloom's taxonomy
- Analysis: SPSS Software
  - Descriptive & inferential statistics
    - Test scores
    - Performance of individual questions



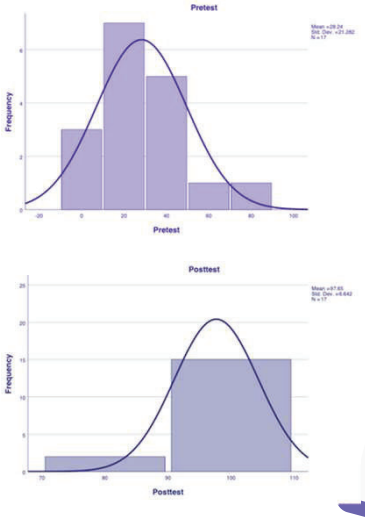
NBCRNA: National Board of Certification and Recertification for Nurse Anesthetists; **SPSS**: Statistical Package for the Social Sciences

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Descriptive Statistics

Measures of Central Tendency & Dispersion

n = 17	Pre-test	Post-test
Mean	28.24	97.65
Median	20.00	100.00
Mode	20	100
Central Tendency	Mean > Median = Mode	Mean < Median = Mode
Variance	452.941	44.118
Standard Deviation	21.282	6.642
Standard Error of the Mean	5.162	1.611
Interpretation	Asymmetrical	Asymmetrical



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Descriptive Statistics

Data Distribution

Skewness

Measure of asymmetry

	Pre-test	Post-test
Skewness	0.790	-2.610
Skewness interpretation	Moderate skew	High skew
***z*-score**	1.44	-4.75
***z*-score interpretation**	Relatively normal	Non-normal

Kurtosis

Measure of "tailedness"

	Pre-test	Post-test
Excess kurtosis	0.885	5.440
Excess kurtosis interpretation	Mesokurtic	Leptokurtic
***z*-score**	0.83	5.12
***z*-score interpretation**	Normal	Non-normal

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Descriptive Statistics

Tests of Normality

	Pre-test	Post-test
Shapiro-Wilk (SW)	0.044	< .001
SW interpretation	Reject H_0	Reject H_0
Chi-Squared Goodness of Fit (X^2)	> .05	< .001
X^2 interpretation	Fail to Reject H_0	Reject H_0

H_0 = Variable is normally distributed
α = .05

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Inferential Statistics

Nonparametric & Parametric Tests

Wilcoxon Signed Rank Test (WSRT) Nonparametric – Non-normally Distributed Data	
***p*-value**	< .001
WSRT Effect Size (*r*)	0.63 (*Large*)
Hodges-Lehmann	**Median** difference = 70 95% CI [60, 80]
Interpretation	Reject H_0
H_0: Median difference between paired observations is zero α = .05	

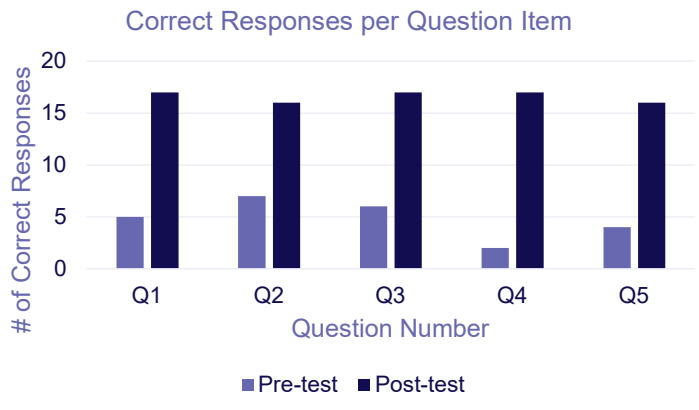
Paired Samples *t*-Test Parametric – Normally Distributed Data		
***p*-value**	< .001	
Cohen's *d* Effect Size	uncorrected	2.944 (*Huge*)
	Hedges' correction	2.803 (*Huge*)
Paired Differences	**Mean** difference = 69.412 95% CI [57.290, 81.534]	
Interpretation	Reject H_0	
H_0: Mean difference between paired observations is zero α = .05		

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Test Results

Pre-test & Post-test Questions



Correct Responses per Question Item		
	Pre-test	**Post-test**
Q1	5	17
Q2	7	16
Q3	6	17
Q4	2	17
Q5	4	16

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Inferential Statistics

Individual Item Analysis

Question	Δ	Cochran's *Q*	*p*-value	Interpretation	Chance Corrected Value ($\mathcal{R}$)	Effect Size
1	12	12.000	< .001	Reject H_0	0.52	Large
2	**9**	**7.364**	.007	Reject H_0	0.29	Small
3	11	11.000	< .001	Reject H_0	0.45	Medium
4	15	15.000	< .001	Reject H_0	0.78	Large
5	12	12.000	< .001	Reject H_0	0.49	Medium
H_0 = The proportion of successes is equal for both groups α = .05						

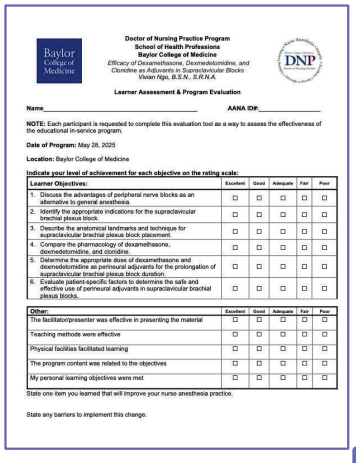
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Evaluation of Outcomes

Delivery of an Effective Presentation & Willingness to Engage in Practice Change

- Evaluation: Learner Assessment & Program Evaluation Survey
  - 5-point Likert scale
    - 1 point (*poor*) to 5 points (*excellent*)
    - Achievement of learning objectives
    - Quality of presentation
  - Free response
    - One item learned that will improve practice
    - Barriers to implementation in practice
- Analysis:
  - Average (mean) participant score per statement
  - Written feedback



Baylor College of Medicine

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DNP

Learner Assessment & Program Evaluation

Name_____ **AANA ID#:**_____

NOTE: Each participant is requested to complete this evaluation tool as a way to assess the effectiveness of the educational in-service program.

Date of Program: May 28, 2025

Location: Baylor College of Medicine

Indicate your level of achievement for each objective on the rating scale:

Learner Objectives:	Excellent	Good	Adequate	Fair	Poor
1. Discuss the advantages of peripheral nerve blocks as an alternative to general anesthesia.	☐	☐	☐	☐	☐
2. Identify the appropriate indications for the supraclavicular brachial plexus block.	☐	☐	☐	☐	☐
3. Describe the anatomical landmarks and technique for supraclavicular brachial plexus block placement.	☐	☐	☐	☐	☐
4. Compare the pharmacology of dexamethasone, dexmedetomidine, and clonidine.	☐	☐	☐	☐	☐
5. Determine the appropriate dose of dexamethasone and dexmedetomidine as perineural adjuvants for the prolongation of supraclavicular brachial plexus block duration.	☐	☐	☐	☐	☐
6. Evaluate patient-specific factors to determine the safe and effective use of perineural adjuvants in supraclavicular brachial plexus blocks.	☐	☐	☐	☐	☐

Other:	Excellent	Good	Adequate	Fair	Poor
The facilitator/presenter was effective in presenting the material	☐	☐	☐	☐	☐
Teaching methods were effective	☐	☐	☐	☐	☐
Physical facilities facilitated learning	☐	☐	☐	☐	☐
The program content was related to the objectives	☐	☐	☐	☐	☐
My personal learning objectives were met	☐	☐	☐	☐	☐

State one item you learned that will improve your nurse anesthesia practice.

State any barriers to implement this change.

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Learner Assessment & Program Evaluation

Mean Participant Responses

Achievement of Learning Objectives	
Question	**Mean**
1	5.0
2	5.0
3	5.0
4	5.0
5	5.0
6	5.0
Overall	5.0

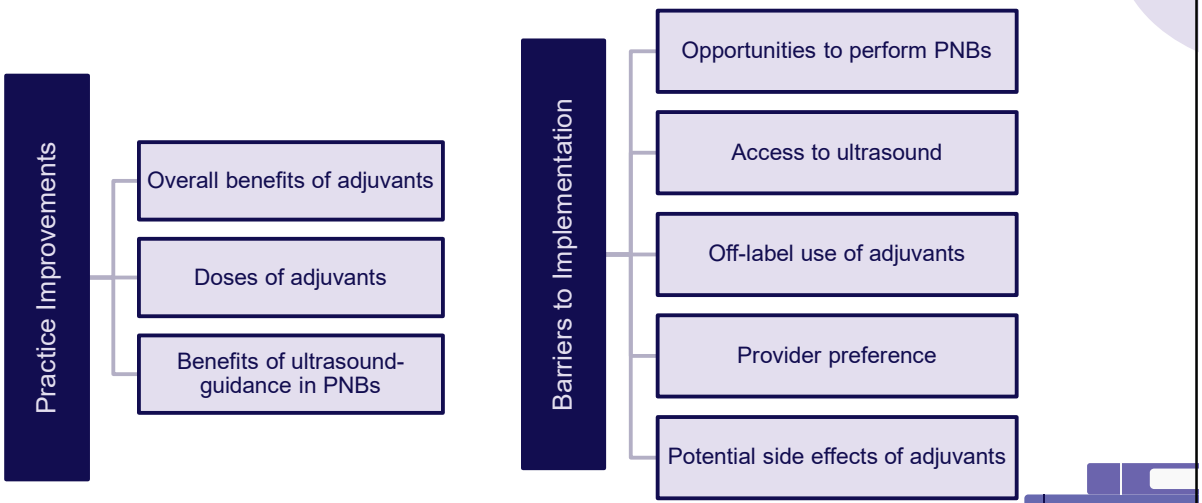
Quality of Presentation	
Question	**Mean**
1	5.0
2	5.0
3	5.0
4	5.0
5	5.0
Overall	5.0

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Learner Assessment & Program Evaluation

Qualitative Feedback



PNB: Peripheral nerve block

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Project Impact & Future Research

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Project Impact

Desired Outcomes	Evaluation	Analysis	Results
Successful transfer of knowledge	Pre-test & Post-test	• Mean & median scores: **increased** • Standard deviation: **decreased** • WSRT: $p < .001$ (**large**) • Paired *t*-test: $p < .001$ (**huge**) • Cochran's *Q*: $p < .05$ (**small-large**)	**Successful**
Delivery of an effective presentation	Evaluation Survey • Likert scale	Learner objectives: • Mean score: **5.0** Presentation quality: • Mean score: **5.0**	**Successful**
Increased willingness to engage in practice change	Evaluation Survey • Free response	Written feedback: • **Positive**	**Successful**

WSRT: Wilcoxon Signed Rank Test

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Limitations

Research			Dissemination
Inconsistent evaluation methods for block duration	Variability in dose and drug combinations	Restricted to ASA I-II	Participant reservations due to limited clinical experience
Small sample sizes & lack of control group in some studies	No direct comparisons of all three adjuvants in most studies	No cost-effectiveness analyses	Voluntary attendance

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ASA: American Society of Anesthesiologists

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Future Research & Practice

- Standardized assessment and measurement of block duration
- Consistent dosing of local anesthetics & adjuvants for comparison
- Inclusion of ASA III
- Larger-scale randomized controlled trials
- Direct comparisons of all three adjuvants, with cost-effectiveness analyses

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ASA: American Society of Anesthesiologists

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Thank You

Questions?

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