Improving Provider Knowledge and Utilization of Intrathecal Dexmedetomidine as an Analgesic Adjunct to Spinal Anesthesia for Cesarean Sections

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Abstract

Background: Spinal anesthesia for cesarean delivery may provide inadequate visceral analgesia, often requiring opioid adjuncts associated with adverse effects. Intrathecal dexmedetomidine (5–10 mcg) is a promising opioid-sparing alternative.

Methods: This quality improvement project used pre- and post-intervention surveys of obstetric CRNAs (n=4). The intervention included targeted education and improved pharmacy access to intrathecal dexmedetomidine.

Results: Following the intervention, weekly utilization increased from 25% to 100%. CRNA knowledge and confidence improved, previously identified barriers were resolved, opioid requirements decreased, spinal block onset was faster with prolonged duration, maternal comfort improved, and side effects were minimal.

Conclusion: Targeted education and access improvements effectively increased adoption of intrathecal dexmedetomidine, supporting its safe and effective use as an opioid-sparing spinal adjuvant that enhances maternal analgesia and satisfaction during cesarean delivery.

Keywords: *dexmedetomidine, intrathecal, spinal, analgesia, adjunct, cesarean section*

Introduction

Background:

- Cesarean delivery accounts for approximately one in three U.S. births
- Spinal anesthesia is used in >95% of cesarean deliveries
- Local anesthetic provides reliable surgical anesthesia but inadequately treats visceral pain during uterine manipulation
- Intrathecal opioids (e.g., fentanyl, preservtive-free morphine) are commonly added but:
  - Provide inconsistent postoperative analgesia
  - Cause pruritus, nausea, and vomiting

Focused practice change

- **Intrathecal dexmedetomidine** is a **safe, evidence-supported spinal adjuvant** that:
  - Enhances visceral analgesia
  - Accelerates onset of spinal block
  - Prolongs sensory block duration
  - Reduces opioid requirements
- Mechanism of action:
  - Presynaptic inhibition of excitatory neurotransmitter release
  - Postsynaptic neuronal hyperpolarization
  - Produces robust opioid-sparing analgesia with minimal systemic effects
- Proposed practice change
  - Evidence supports **5–10 mcg of dexmedetomidine** as a **safe and effective intrathecal dose**
- Improves maternal comfort and recovery *without* added maternal or fetal risk

QI project goal: Increase CRNA knowledge and utilization of intrathecal dexmedetomidine through targeted education

Hypotheses

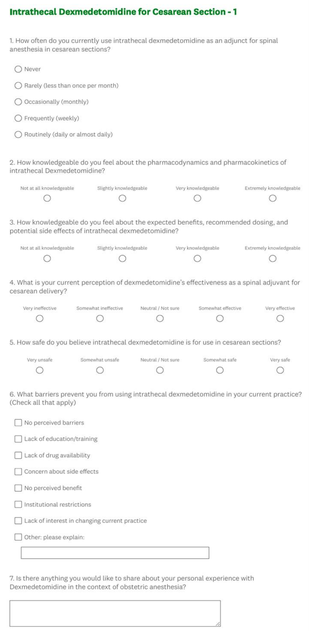
Do parturients undergoing cesarean sections (P) who receive intrathecal dexmedetomidine in their spinal anesthetic (I), compared to those who receive spinal anesthesia without dexmedetomidine (C), experience less postoperative pain (O)?

Methods

- IRB compliant QI design at a community hospital, care-team practice model
- Pre/Post Survey, educational intervention & improved access to preservative-free dexmedetomidine.
- CRNAs completed anonymous surveys assessing knowledge, comfort, use, barriers, and anecdotal

Participants =4 *dedicated OB CRNAs

Survey & Flyer



Intrathecal Dexmedetomidine for Cesarean Section - 1

1. How often do you currently use intrathecal dexmedetomidine as an adjunct for spinal anesthesia in cesarean sections?
- ○ Never
- ○ Rarely (less than once per month)
- ○ Occasionally (monthly)
- ○ Frequently (weekly)
- ○ Routinely (daily or almost daily)

2. How knowledgeable do you feel about the pharmacodynamics and pharmacokinetics of intrathecal Dexmedetomidine?
Not at all knowledgeable | Slightly knowledgeable | Very knowledgeable | Extremely knowledgeable

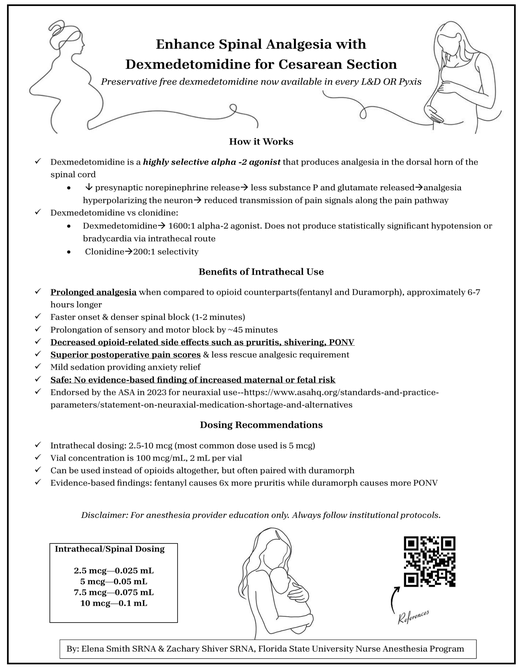
3. How knowledgeable do you feel about the expected benefits, recommended dosing, and potential side effects of intrathecal dexmedetomidine?
Not at all knowledgeable | Slightly knowledgeable | Very knowledgeable | Extremely knowledgeable

4. What is your current perception of dexmedetomidine's effectiveness as a spinal adjuvant for cesarean delivery?
Very ineffective | Somewhat ineffective | Neutral / Not sure | Somewhat effective | Very effective

5. How safe do you believe intrathecal dexmedetomidine is for use in cesarean sections?
Very unsafe | Somewhat unsafe | Neutral / Not sure | Somewhat safe | Very safe

6. What barriers prevent you from using intrathecal dexmedetomidine in your current practice? (Check all that apply)
- ☐ No perceived barriers
- ☐ Lack of education/training
- ☐ Lack of drug availability
- ☐ Concern about side effects
- ☐ No perceived benefit
- ☐ Institutional restrictions
- ☐ Lack of interest in changing current practice
- ☐ Other: please explain:

7. Is there anything you would like to share about your personal experience with Dexmedetomidine in the context of obstetric anesthesia?



Enhance Spinal Analgesia with Dexmedetomidine for Cesarean Section

Preservative free dexmedetomidine now available in every L&D OR Pyxis

How it Works

- ✓ Dexmedetomidine is a ***highly selective alpha -2 agonist*** that produces analgesia in the dorsal horn of the spinal cord
  - ↓ presynaptic norepinephrine release→ less substance P and glutamate released→analgesia hyperpolarizing the neuron→ reduced transmission of pain signals along the pain pathway
- ✓ Dexmedetomidine vs clonidine:
  - Dexmedetomidine→ 1600:1 alpha-2 agonist. Does not produce statistically significant hypotension or bradycardia via intrathecal route
  - Clonidine→200:1 selectivity

Benefits of Intrathecal Use

- ✓ **Prolonged analgesia** when compared to opioid counterparts(fentanyl and Duramorph), approximately 6-7 hours longer
- ✓ Faster onset & denser spinal block (1-2 minutes)
- ✓ Prolongation of sensory and motor block by ~45 minutes
- ✓ **Decreased opioid-related side effects such as pruritis, shivering, PONV**
- ✓ **Superior postoperative pain scores** & less rescue analgesic requirement
- ✓ Mild sedation providing anxiety relief
- ✓ **Safe: No evidence-based finding of increased maternal or fetal risk**
- ✓ Endorsed by the ASA in 2023 for neuraxial use--https://www.asahq.org/standards-and-practice-parameters/statement-on-neuraxial-medication-shortage-and-alternatives

Dosing Recommendations

- ✓ Intrathecal dosing: 2.5-10 mcg (most common dose used is 5 mcg)
- ✓ Vial concentration is 100 mcg/mL, 2 mL per vial
- ✓ Can be used instead of opioids altogether, but often paired with duramorph
- ✓ Evidence-based findings: fentanyl causes 6x more pruritis while duramorph causes more PONV

Disclaimer: For anesthesia provider education only. Always follow institutional protocols.

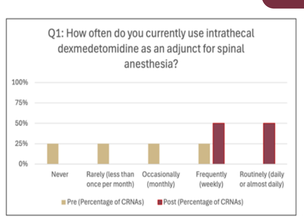
Intrathecal/Spinal Dosing

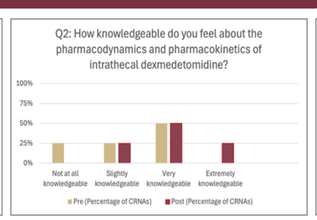
2.5 mcg—0.025 mL
5 mcg—0.05 mL
7.5 mcg—0.075 mL
10 mcg—0.1 mL

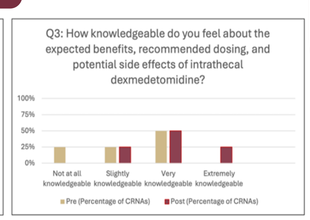
References

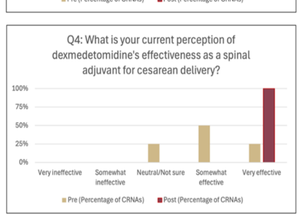
By: Elena Smith SRNA & Zachary Shiver SRNA, Florida State University Nurse Anesthesia Program

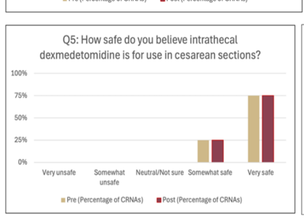
Graphs

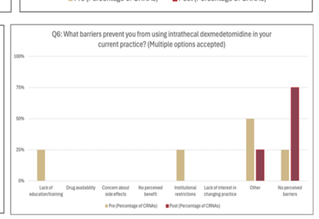












Results

Pre-intervention survey results (n = 4):
- Low utilization of intrathecal dexmedetomidine
- Limited provider knowledge and confidence
- Multiple perceived barriers to use

Intervention:
- Six-week targeted educational intervention

Post-intervention survey results (n = 4):
- **100%** of respondents reported frequent or routine use
- **50%** reported **daily use**
- **75%** rated themselves as **"very knowledgeable"**
- Provider confidence increased across all respondents

Perceived effectiveness:
- **100%** rated intrathecal dexmedetomidine as **"very effective"** post-intervention
- Marked improvement compared with mixed pre-intervention ratings

Perceived safety and barriers:
- Improved perception of safety
- Previously identified barriers largely resolved

Overall impact:
- Substantial improvement in adoption, knowledge, and confidence
- Supported safe clinical use of intrathecal dexmedetomidine for cesarean delivery

Discussion

- The educational intervention led to meaningful improvements in CRNAs' **knowledge, confidence, and clinical use** of intrathecal dexmedetomidine for cesarean delivery
- Post-intervention feedback demonstrated **increased adoption**, improved understanding of dosing and safety, perceived effectiveness, and a reduction in perceived barriers to use
- Clinically, CRNAs reported **decreased intraoperative and postoperative opioid requirements**, improved **maternal comfort**, and **minimal side effects**
- Implementation strategies, including standardized dosing and enhanced medication access, supported safe and consistent clinical application.
- Overall, pairing targeted education with streamlined availability resulted in **sustained practice change**
- These findings support intrathecal dexmedetomidine as a safe, effective, opioid-sparing spinal adjuvant that enhances analgesia while reducing opioid-related complications in cesarean delivery

Conclusions

- **Intervention successfully increased CRNAs' knowledge** and **clinical use** of **intrathecal dexmedetomidine**
- **Barriers** to practice such as lack of access to medication and limited knowledge were addressed and **resolved**, supporting greater adoption
- Patients experienced **reduced opioid requirements** and **improved comfort**
- Side effects were minimal and not clinically significant
- **Dexmedetomidine is a safe, effective intrathecal adjunct that enhances perioperative analgesia for cesarean delivery**

References

References

Aceituno, E., Zieglgansl, A., Swayhoe, R., & Nadeer-Bolduf, Y. (2022). Analgesic characteristics of bupivacaine alone and in combination with dexmedetomidine or meperidine in spinal anesthesia during cesarean section: A double-blind randomized clinical trial study. *Pain Research and Management*, *2022*(1), Article 5111216. https://doi.org/10.1155/2022/5111216

Bansch, P. G., Collins, B. F., Eisenberg, R. K., Cabalum, M. K., Stark, M. C., & Ortega, R. (2017). *Clinical anesthesia* (8th ed.). Wolters Kluwer.

Bareth, M., Govindan, D. K., Prasad, T. K., Hasan, A., & Priyadharsini, K. S. (2024). Intrathecal fentanyl versus intrathecal dexmedetomidine as an adjuvant to isobaric levobupivacaine 0.5% in elective cesarean sections: A randomized controlled trial. *Journal of the Scientific Society*, *51*(3), 395–396.

Bhatia, A., & Mandalaparthi, P. (2016). Dexmedetomidine as an adjuvant in neuraxial blocks: A review. *Journal of Anaesthesiology Clinical Pharmacology*, *39*(4), 487–493. https://doi.org/10.4103/0970-9185.242830

Cichero, N., Ye, X. J., Li, R., & Tobing, T. D. (2023). Dexmedetomidine versus opioids as labor analgesia: A systematic review and meta-analysis of randomized controlled trials. *AANA Journal*, *91*(6).

Centers for Disease Control and Prevention. (2024). *FastStats - Delivery and birth characteristics*. National Center for Health Statistics. https://www.cdc.gov/nchs/fastats/delivery.htm

Committee on Obstetrics, American Society of Anesthesiologists. (2025, October 23). *Statement on concerning medication shortages and alternatives*. https://www.asahq.org/standards-and-practice-parameters/statement-on-neuraxial-medication-shortage-and-alternatives

Desai, S., Jalan, D., & Modi, K. (2024). Comparison of the effects of intrathecal dexmedetomidine versus clonidine as an adjuvant to hyperbaric ropivacaine 0.75% for orthopaedical surgeries: A prospective, randomized, double-blind study. *Journal of Anesthesiology*, *36*(1).

Giacomi, L. G., Cappelen, S., Aarflot, C., Pace, M. C., Pasternak, M. R., Pain, Y., & Sommer, P. (2024). Is intrathecal bupivacaine plus dexmedetomidine superior to bupivacaine in spinal anesthesia for cesarean sections? A systematic review and meta-analysis. *European Review for Medical and Pharmacological Sciences*, *28*(15), 4807–4875. https://doi.org/10.26355/eurrev_202408_36638

Gupta, R., Sethi, A., & Jain, S. (2018). A randomized controlled trial of intrathecal dexmedetomidine and fentanyl in cesarean section: Comparison of anesthetic efficacy and maternal safety. *Journal of Clinical Anesthesia*, *47*, 1–7. https://doi.org/10.1016/j.jclinane.2018.01.007

Jabbari, A., Tabaei, R., & Mousavi, M. (2025). The impact of intrathecal dexmedetomidine administration on fetuses during cesarean sections performed using spinal anesthesia. *Archives of Anesthesiology and Critical Care*.

Li, X. Y., Li, Y. M., Li, X. L., Wang, X. H., & Liu, X. (2020). The efficacy and safety of intrathecal dexmedetomidine for perforin undergoing cesarean section: A double-blind randomized controlled trial. *BMC Anesthesiology*, *20*, Article 1–9.

Low, L., Qian, C., Shen, B., Xiao, H., & Shen, H. (2019). Intrathecal dexmedetomidine can decrease the 95%-effective dose of hyperbaric in spinal anesthesia for cesarean section: A prospective, double-blinded, randomized study. *Medicine*, *98*(9), e14606. https://doi.org/10.1097/MD.0000000000014606

Manchana, M. M., Panasi, M., Elavarasan, K., & Punniyakoti, K. S. (2025). Dexmedetomidine versus clonidine as additives for spinal anesthesia: A comparative study. *Anesthesiology and Pain Medicine*, *15*(4), e158274.

Min, W. K., Singh, S., & Akhtar, T. (2023). To investigate the impact of intrathecal administration of dexmedetomidine and clonidine as adjuvants to 0.5% hyperbaric bupivacaine during spinal anesthesia: A comparative study. *International Journal of Academic Medicine and Pharmacy*, *5*, 1858–1864.

Sahoo, S. K., Chari, P., & Thakur, R. (2021). The role of intrathecal dexmedetomidine in reducing opioid consumption and enhancing analgesia during cesarean section: A prospective randomized trial. *Indian Journal of Anaesthesia*, *65*(2), 579–584. https://doi.org/10.4103/ija.ija_816_20

Saito, H., Shiga, T., Nihuna, T., Hoshijima, S., Hosokawa, Y., Hyuga, S., & Ouchi, T. (2021). Effects of intrathecal opioids on cesarean section: A systematic review and Bayesian network meta-analysis of randomized controlled trials. *Journal of Anesthesia*.

Shen, Q. H., Li, B. J., Zhou, X. Y., Yun, X. Z., & Lu, Y. F. (2020). Dexmedetomidine as an adjuvant for single spinal anesthesia in patients undergoing cesarean section: A systematic review and meta-analysis. *Journal of Interventional Medical Research*, *48*(2), 300060519891365. https://doi.org/10.1177/0300060519891365

Upasi, V., Robin, S., Casey, M., Sanchez, S., Mahoney, K., & McKelvie, D. M. (2020). Efficacy of intrathecal fentanyl for cesarean delivery: A systematic review and meta-analysis of randomized controlled trials with trial sequential analysis. *Anesthesia & Analgesia*, *130*(1), 111–125.

Wang, L., Zhang, G., Wei, X., & Xia, W. (2020). The effect of intrathecal dexmedetomidine on hemodynamic stability and opioid requirement during cesarean sections. *Anesthesia & Analgesia*, *130*(5), 1125–1131. https://doi.org/10.1213/ANE.0000000000004761