RUTGERS HEALTH

Nurse Anesthesiology Program

School of Nursing

The Effect of Intravenous Dexamethasone on the Duration of Peripheral Nerve Blocks in Orthopedic Surgical Adult Patients: A Systematic Review

Russell Lynn Memorial Student Lecture Series

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Objectives

Examine the effect of intravenous dexamethasone for adult orthopedic surgical patients receiving a peripheral nerve block:

- Background & Significance
- Methodology
- Data & Search Results
- Discussion

Review Question

In adult orthopedic surgical patients receiving regional anesthesia, how does intravenous dexamethasone affect the duration of peripheral nerve blocks?

Concept Map

Keywords/Concept Map

AND ALL CONCEPTS TOGETHER			
Concept 1: Adult Orthopedic Surgical Patients **OR** everything in this column	*Concept 2:* Regional Anesthesia **OR** everything in this column	*Concept 3*: Dexamethasone **OR** everything in this column	*Concept 4:* Duration **OR** everything in this column
Keywords: • Adult*[tw] • Orthopedic*[tiab] MeSH: • Adult*[MeSH] • Orthopedic*[MeSH]	Keywords: • "Regional Anesthesia"[tiab] • "Peripheral Block*"[tiab] • "Nerve Block*"[tiab] • "Local Anesthesia*"[tiab] • "Local Anaesthesia*"[tiab] • "Infraclavicular Block*"[tiab] • "Supraclavicular Block*"[tiab] • "Interscalene Block*"[tiab] • "Axillary Block*"[tiab] • "Brachial Plexus Block*"[tiab] • "Suprainguinal Fascia Iliaca Block*"[tiab] • "Femoral Block*"[tiab] • "Adductor canal Block*"[tiab] • "Popliteal Block*"[tiab] • "Sciatic Block*"[tiab] • "Rectus sheath Block*"[tiab] • Bupivacaine[tiab] • Ropivacaine[tiab] • Mepivacaine[tiab] • Lidocaine[tiab] MeSH • "Anesthetics, local" [MeSH]	Keywords: • "Intravenous Dexamethasone"[tiab] • "IV Dexamethasone"[tiab] • "Intravenous Decadron"[tiab] • "IV Decadron"[tiab]	Keywords: • "Duration"[tiab] • "Sensory block duration"[tw] • "Motor block duration"[tw] • "Time"[tiab] • "Prolonged analgesia"[tiab] • "Analgesia duration"[tiab] • "Analgesia"[tiab] • "Pain"[tiab] • "Pain score"[tiab] • "Pain assessment"[tiab] • "Pain duration"[tiab] • "Pain?relief duration"[tw] • "Rescue analgesia administration"[tw]

Purpose of the Review

Regional Anesthesia: Recognized to reduce general anesthesia (GA) incidence, reduce postoperative nausea and vomiting (PONV), decrease opioids usage, allow early mobilization, and aid in maintaining hemodynamic stability. Overall, is favored over GA for patients at high risk of intraoperative adverse events

Purpose: Review aims to evaluate whether intravenous dexamethasone can extend analgesia of PNBs to provide opioid-free analgesia, reduce hospital stays and postoperative complications

Background & Significance

- **Rapidly growing outpatient orthopedic surgery** relies on regional anesthesia for enhanced pain management
- **Peripheral Nerve Blocks (PNBs) reduce opioid use**, enhance mobility, and improve postoperative recovery
- Opioids account for 45% of orthopedic surgery prescriptions in U.S.
- 20% of patients develop long-term opioid dependence following orthopedic surgery
- **Adverse events raise concern for the safety profile of *perineural* dexamethasone** when used to prolong PNB analgesia
- **Dexamethasone's** exact mechanism of PNB analgesia prolongation is unclear; may involve potassium channel inhibition via C fiber glucocorticoid receptors, vasoconstriction slowing absorption, or anti-inflammatory through blocking phospholipase A2 activation in arachidonic pathway

Methodology

- **Study Design:** Systematic Review

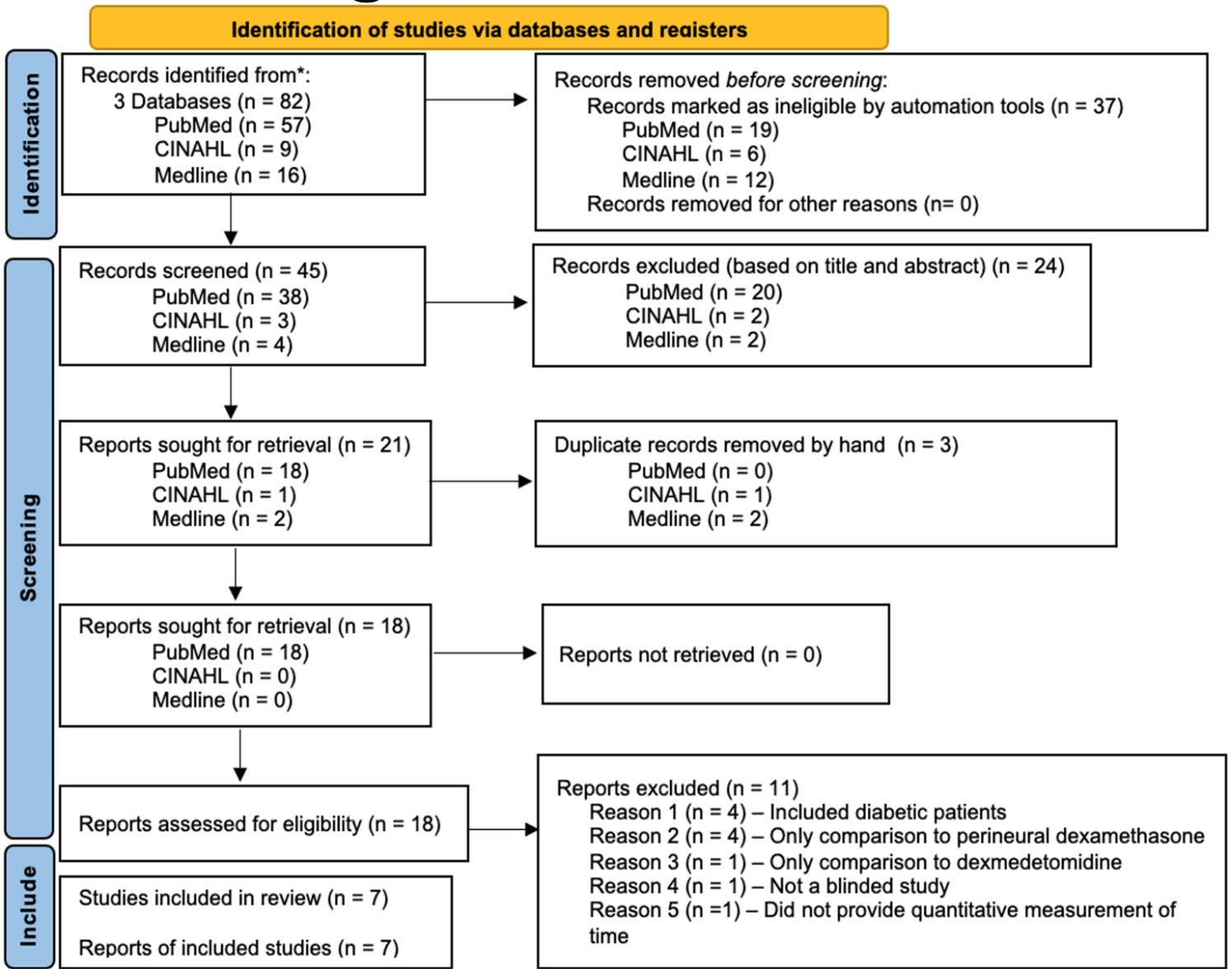
- **Population:** Adults, ASA classification I-III undergoing orthopedic surgery with regional anesthesia
- **Reports Used**: Randomized Controlled Trials (RCTs)

- **Primary Outcome**: PNB duration
- **Secondary Outcomes:** Pain scores & opioid consumption

- **Intervention:** IV dexamethasone with PNB
- **Control**: PNB alone (no IV dexamethasone)

- **Inclusion Criteria:** Adults, ASA I-III, RCTs, English, full-text, peer-reviewed studies without time restriction
- **Exclusion Criteria**: Pediatrics, ASA IV-VI, peripheral neuropathies, diabetes, chronic steroid use, qualitative studies, & animal studies

PRISMA - Diagram



Data Extraction

- **Used JBI critical appraisal checklist for RCTs → 11 excluded after appraisal**
- **7 RCTs**; 5 double-blind studies & 2 ensured blinding via medication preparation
- **Cochrane's SWiM (Synthesis Without Meta-Analysis) method** for narrative analysis to **ensure transparency** in reporting intervention effects

JBI Critical Appraisal Checklist for Randomized Controlled Trials

	Yes	No	Unclear	NA
1. Was true randomization used for assignment of participants to treatment groups?	□	□	□	□
2. Was allocation to treatment groups concealed?	□	□	□	□
3. Were treatment groups similar at the baseline?	□	□	□	□
4. Were participants blind to treatment assignment?	□	□	□	□
5. Were those delivering treatment blind to treatment assignment?	□	□	□	□
6. Were outcomes assessors blind to treatment assignment?	□	□	□	□
7. Were treatment groups treated identically other than the intervention of interest?	□	□	□	□
8. Was follow up complete and if not, were differences between groups in terms of their follow up adequately described and analyzed?	□	□	□	□
9. Were participants analyzed in the groups to which they were randomized?	□	□	□	□
10. Were outcomes measured in the same way for treatment groups?	□	□	□	□
11. Were outcomes measured in a reliable way?	□	□	□	□
12. Was appropriate statistical analysis used?	□	□	□	□
13. Was the trial design appropriate, and any deviations from the standard RCT design (individual randomization, parallel groups) accounted for in conduct and analysis of trial?	□	□	□	□

Overall appraisal: Include □ Exclude □ Seek further info □

Comments (Including reason for exclusion):

Search Results

- All 7 articles = **Prospective, randomized controlled trial studies**
- 5/7 stated they were double-blinded studies
    - Other 2 studies described that individuals not involved responsible for medication preparation & patient assessment, indicating concealed & blinded patient group allocation
- **Total Sample Size = 759**
    - Intervention Group (IV dexamethasone administration) = 522 patients
    - Control Group (Normal saline / placebo administration) = 237 patients

Article	Outcome Measure	Intervention Group	Control Group
8 mg - Dexamethasone Studies (N = 5)			
Abdallah et al. (2015) - Upper extremity surgery - **Supraclavicular brachial plexus block** - Sample size = 50	Time from block to first report of pain	25 hours ($p < 0.001$)	13.2 hours
	Motor block duration	30.1 hours ($p < 0.001$)	19.7 hours
	Opioid use	12.5 mg ($p = 0.013$)	22.1 mg
Dawson et al. (2016) - Metatarsal osteotomy - **Ankle block** - Sample size = 60	Time from block to return of sensation	20.9 hours ($p = 0.0067$)	14.6 hours
	Full sensory/motor recovery	24.0 hours ($p = 0.0022$)	17.6 hours
	Opioid use	No statistical significance	
Morales-Muñoz et al. (2017) - Knee replacement - **Femoral nerve block** - Sample size = 54	Time from block to first analgesic demand	2.66 hours – No statistical significance	3.1 hours
	Pain scores	No statistical significance	
Rosenfeld et al. (2016) - Shoulder surgery - **Interscalene block** - Sample size = 78	Time from block to complete sensory block resolved	18.2 hours ($p = 0.001$)	13.8 hours
	Opioid use	17.1 mg ($p = 0.001$)	24.1 mg
Turner et al. (2018) - Hip arthroplasty - **Psoas compartment block** - Sample size = 230	Time from block placed to return sharp pinprick sensation	4 mg: 18.5 hours – No statistical significance 8 mg: 18.1 hours – No statistical significance	19.6 mg
	Time from block to first analgesia	4 mg: 7.9 hours – No statistical significance 8mg: 8.88 hours ($p = 0.047$)	7.2 hours
	Opioid use	- No significant difference opioid use	
Varied Doses - Dexamethasone Studies (N = 2)			
Desmet et al. (2015) - Shoulder surgery - **Interscalene block** - Sample size = 239	Time from block to first analgesic	1.25mg: 14 hours ($p = 0.05$) 2.5mg: 17.4 hours ($p < 0.0001$) 10mg: 20.1 hours ($p < 0.0001$)	12.2 hours
	Opioid use	Higher doses reduced opioid consumption ($p < 0.0001$)	
Holmberg et al. (2020) - Volar plate surgery - **Infraclavicular brachial plexus block** - Sample size = 47	Time from block to worst pain score	16mg: 21.5 hours ($p < 0.001$)	12.7 hours
	Opioid use	5mg ($p = 0.037$)	10 mg
Total Sample Size = 758			

Discussion

Key Findings

- IV dexamethasone prolongs PNB duration in orthopedics from 12-13 hours to 20-25 hours
- Reduced opioid consumption across all studies
- Postoperative pain results varied with differences in patients, surgeries, and measurements

Implications

- Supports multimodal pain management and opioid-sparing anesthesia strategies
- Reduces need for rescue pain medications, opioid side effects, and addiction risk
- Potential role in Enhanced Recovery After Surgery (ERAS) protocols to improve recovery, reduces hospital stays, and lowers complication risks
- Concerns over neurotoxicity have limited its perineural use
- Considered a safe, effective option when administered IV

Discussion

Limitations

- Study variations (doses, anesthesia techniques) impact result comparability
- IV dexamethasone effects on pain score vary
- Some studies relied on subjective pain scores
- Small sample sizes limit generalizability

Recommendations

- Standardized methodologies needed for future research (consistent dosage, PNB types, and measurement criteria)
- Larger RCTs with diverse patient populations to enhance generalizability
- Objective measurements (sensory/motor tests) should be prioritized over subjective pain scores
- Long-term safety and efficacy studies required

Conclusion

The results of this review demonstrate that IV dexamethasone is a valuable tool for prolonging analgesia and reducing opioid consumption in adult orthopedic surgical patients receiving a PNB. While dexamethasone's effect on pain scores depends on various factors, it generally provides significant benefits in managing postoperative pain.

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Any questions?

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