RUTGERS HEALTH
School of Nursing
Nurse Anesthesiology Program

The Dose-response Effect of Intravenous Dexamethasone for Postoperative Nausea and Vomiting in Women Undergoing Laparoscopic Surgery: A Systematic Review and Meta-Analysis

Russell Lynn Memorial Student Lecture Series

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Objectives

Examine the following with regard to optimal dosing of intravenous dexamethasone for postoperative nausea and vomiting (PONV) prophylaxis :

- Background
- Significance
- Methods
- Current phase of systematic review development
- Anticipated results
- Dissemination of information

Review Question

What dose of intravenous dexamethasone is the most effective at reducing postoperative nausea and vomiting in women undergoing laparoscopic surgery?

Purpose of the Review

Examine the *best available evidence* to determine the dose-response effect of **intravenous dexamethasone** for postoperative nausea and vomiting (PONV) in adult women undergoing **laparoscopic surgery**

Background

*In 2023, **15 million laparoscopic procedures** were conducted* *(Matrick, 2023)*

- Rates of PONV in surgical population = 20-30% overall, and **80% with high risk**
  - *Laparoscopy, tonsillectomy, strabismus*
- Patient risk factors increase rates of PONV
- **Dexamethasone**, a corticosteroid, is a well established antiemetic and is considered **first-line prophylaxis for PONV**
- Uncertainty of optimal intravenous dose range
  - Prior studies showed lack of significance between 4-5mg and 8-10mg
  - More recent studies utilize 0.01mg/kg or 8mg with affirmative significance

Apfel Score - Risk Factors	
1) Female Gender **2) Non-smoker** **3) History of PONV or motion sickness** **4) Postoperative Opioids** *** Each risk factor = 1 point*	
Total Points	**0 - 4**
PONV Risk **1 point = 10%** **2 points = = 40%** **3 points = 60%** **4 points = 80%**	

Figure 1. Apfel Scores. Adapted from "Risk Score for PONV in Adults" Gan et al., 2020. Retrieved from https://doi.org/10.1213/ANE.0000000000004833

Significance

Money, time, and patient experience

Effects of PONV

- Increased healthcare costs
- Increased length of stay, particularly in the postanesthesia care unit (PACU) - up to twice that of those without PONV
- Dissatisfaction with care
- Increases in adverse patient outcomes

Gap in Knowledge

1. High prevalence of PONV in women undergoing laparoscopy without population specific systematic review
2. Variable utilization of dexamethasone doses among anesthesia providers
3. Availability of updated research without analysis for quality

Method

Systematic Review: A summary of research results that uses **clearly defined**, **reliable**, **objective**, and **reproducible** methods to systematically search, critically appraise, and synthesize the current evidence on a specific research question.

- Helps minimize bias and errors → providing reliable findings from which conclusions or decisions can be drawn.

Key Characteristics

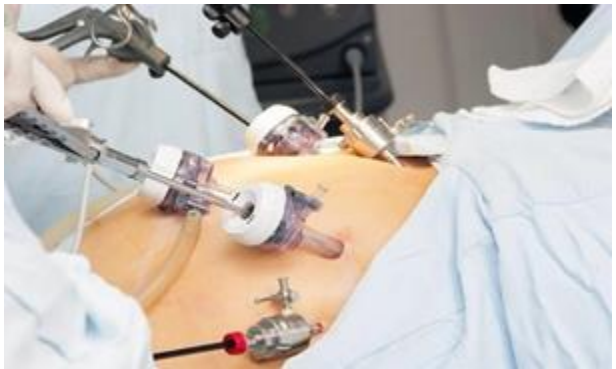
- Clear objectives with pre-defined eligibility criteria
- Explicit, reproducible methodology
- A systematic search attempting to identify all eligible studies
- Assesses the validity of the findings, and excluding biases
- Systematic presentation and synthesis of the findings

Meta- Analysis

A valid, objective, and scientific method of analyzing and combining different results utilizing statistical analysis of similar studies

Participants

- **Women**
  - Apfel Score Risk Factors → females have higher incidence rate
    - Strongest patient-specific predictor
- **Age**: ≥ 18 years old
  - Age < 50 is a significant risk factor for PONV
- **Laparoscopic procedure**
  - Gynecological and cholecystectomy have highest incidence of PONV
  - Theory: insufflation for pneumoperitoneum increases PONV
    - Related to abdominal distention
    - Delayed gastric emptying



Types of studies

- **Randomized Control Trials (RCTs)** → "Gold standard"
  - Prospective studies that measure effectiveness of a new intervention or treatment

**Due to insufficient quantity of studies, consideration for…

- **Cohort studies** (prospective and retrospective)
  - *Observational studies* of a group of individuals sharing some characteristic → followed over time and outcomes measured at one or more time points

Intervention and Control

Intervention: Utilization of specific doses of dexamethasone to prevent postoperative nausea and vomiting (PONV)

Control: No dexamethasone dose given

Comparators: Dexamethasone 4mg
Dexamethasone 8ı

Search Strategy

Databases used:

- **Ovid** → Medline content only
  - More focused and narrow searches
- **Pubmed** → Medline + citations in the National Library of Medicine (NLM)
  - More user friendly
  - Includes additional content (e-books)
- **CINAHL** → emphasizes nursing & allied health disciplines
  - Includes journals articles, books, dissertations, computer programs

Inclusion criteria:

- Full-text, English-only
- Peer-reviewed
- Quantitative RCTs within last 10 years
- Female patients undergoing laparoscopic procedures, who received IV dexamethasone for PONV
- Must report dose-response of IV dexamethasone

Exclusion criteria:

- Male patients
- Systematic reviews
- Qualitative studies
- Non-laparoscopic surgical procedures
- Dexamethasone dosage not reported

Concept Map Utilized to Determine Keywords for Searches

Concept 1: Dexamethasone dose OR everything in this column	**Concept 2:** Postoperative nausea and vomiting OR everything in this column	**Concept 3:** Women OR everything in this column	**Concept 4:** Laparoscopic OR everything in this column
Text Words Decadron Steroid Corticosteroid "Dose dexamethasone" "Dose Decadron" "Dexamethasone mg" "Decadron mg" Mesh: Dexamethasone	Text Words "Postoperative nausea and vomiting" PONV "Postoperative emesis" "Post-op nausea and vomiting" "Post operative nausea and vomiting" Mesh: "Postoperative nausea and Vomiting"	Text Words Women Females 18-45" "Young women" "Adult women" Mesh: Women	Text Words Laparoscopic Robotic "Robot assisted" Video "Video assisted" Mesh: Laparoscopic

Data Analysis

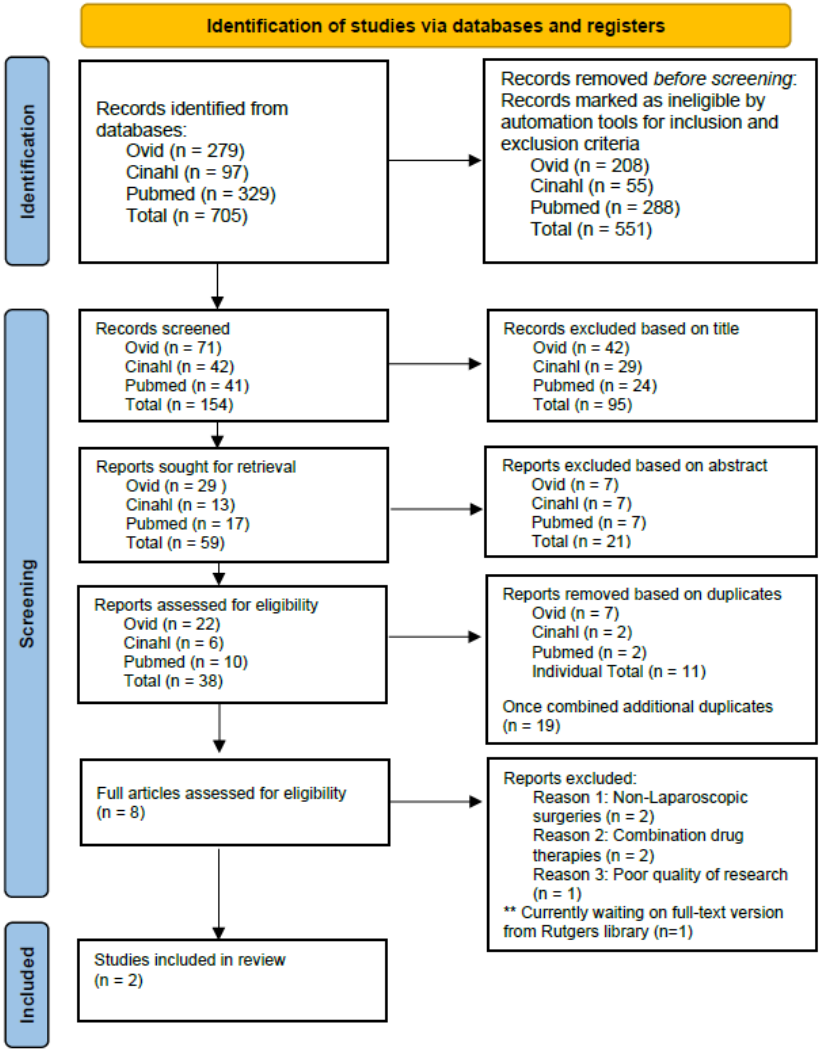
- Quantitative data will be pooled in a statistical meta-analysis using a random effects model
- Effect size will be expressed as:
  - Odds ratio or risk ratio- categorical data
  - Weighted mean differences- continuous data
- 95% confidence intervals will be calculated for analysis
- Standard Chi-square- utilized to statistically assess heterogeneity
- Table of evidence with findings will be constructed

- If statistical pooling is not possible:
  - Findings will be analyzed using cochrane's SWiM method and will be presented in narrative form

Search Findings

- 705 studies were found across 3 databases.
- 154 studies were screened after applying exclusion criteria
- Screening process
  - 95 studies excluded based on title
  - 51 excluded after abstract / duplicate examination
- Remaining 8 studies were further assessed for eligibility
  - Studies excluded based on type of surgery performed, type of pharmacologic therapy utilized, quality of study, and design
- 2 studies eligible to be included in this systematic review

PRISMA Diagram



Next STEPS

- **Critical Appraisal**
- **Data Extraction**
- **Data Synthesis**

Quality Appraisal Strategy

- Eligible RCTs will be critically appraised by two independent reviewers for methodological quality
  - The standard JBI critical appraisal checklist for experimental and quasi-experimental studies will be utilized
  - Studies will be included that answer “met” to 80% of questions
- Disagreements in study quality will be resolved with a third reviewer
- Results will appear in both narrative and table format
- Studies which do not meet criteria will be placed in the table with reasons for exclusion noted

Critical Appraisal to Assess for Validity and the Presence of Bias

Addressing Bias

Type of bias	Method to reduce bias	When and whom
Selection	Randomization Allocation concealment	Patients, trial coordinators/investigators and allocators during the process of screening for inclusion and allocation to groups
Performance	Blinding	Trial participants and those delivering the intervention throughout the trial period
Detection	Blinding	The participant (if self-reported outcomes) or those assessing outcomes at the time of outcome assessment
Attrition	Complete follow up Intention-to-treat analysis	Trial investigators collecting and analysing data

Critical Appraisal Tool: JBI Critical Appraisal Checklist

JBI Critical Appraisal Checklist for Randomized Controlled Trials

Reviewer _____ Date _____

Author _____ Year _____ Record Number_____

Question	Yes	No	Unclear	Not applicable
1. Was true randomization used for the assignment of participants to treatment groups?	☐	☐	☐	☐
2. Was allocation to treatment groups concealed?	☐	☐	☐	☐
3. Were treatment groups similar at baseline?	☐	☐	☐	☐
4. Were participants blind to treatment assignment?	☐	☐	☐	☐
5. Were those delivering treatment blind to treatment assignment?	☐	☐	☐	☐
6. Were outcome 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 reliably?	☐	☐	☐	☐
12. Was appropriate statistical analysis used?	☐	☐	☐	☐
13. Was the trial design appropriate, and any deviations from the standard RCT design accounted for in the conduct and analysis of the trial?	☐	☐	☐	☐

Overall appraisal: Include ☐ Exclude ☐ Seek further info ☐

Comments (Including reason for exclusion):

_____

Data Extraction

- A standardized data collection tool will extract data from the studies which will be included in this systematic review
- Data to be extracted will consist of patient demographic characteristics and study outcomes

- Patient demographic characteristics
  - Age
  - Gender
  - Race
  - Ethnicity
  - History of laparoscopic surgery
- Outcomes
  - Presence of postoperative nausea and vomiting
  - Dose of dexamethasone

Data Synthesis

Gathering updated studies in support of the most efficacious dose of dexamethasone, will allow us to draw conclusions as to the optimal dose that should be administered for PONV prophylaxis.

We will then make recommendations, based on these findings, to anesthesia providers for the optimal dose of dexamethasone.

Anticipated Outcomes

- A gap in quality RCTs and research persists
- No controversy exists that dexamethasone is a valuable tool in treating and preventing PONV, but there remains a question on optimal dosing derived from the most recent evidence. High Dose (8-10mg) appears to be more effective than lower dose (4mg)

By determining if there is a most efficacious dose based on the literature available, we strive to ***provide clinical information*** *for anesthesia providers to make* ***informed patient care decisions, decrease postoperative nausea and vomiting****, and* ***reduce PONV related costs*** *to hospitals and patients.*

Use of Findings

- Findings of this project will be disseminated to anesthesia providers to make informed patient care decisions, decrease PONV, reduce hospital costs, and increase patient satisfaction

- Contact the International Anesthesia Research Society to share findings and update the current clinical practice guidelines for management of PONV

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