

The Effect of Deep vs. Standard Depth of General Anesthesia on Acute Postoperative Pain

Emily Anderson, SRNA & Haile FitzGerald, SRNA
Rosalind Franklin University



Objectives

- Describe the impact of postoperative pain on patient recovery.
- Emphasize the economic impact of the opioid crisis.
- Describe the effect of a deeper plan of anesthesia on postoperative pain and other secondary outcomes such as PONV and patient satisfaction.

Pain, the Big Picture

- Approximately 80% of surgical patients experience pain postoperatively, with 86% of these patients describing their pain as moderate, severe, or extreme¹
- Delays in patient mobility, an increase in the duration of hospitalization, and interference with rehabilitation are just a few complications of inadequate postoperative pain control²
 - Cost?? Can be up to \$1,000,000
- Pain prevention and effective pain treatment may improve clinical outcomes, avoid clinical complications, save health care resources, and improve the quality of life¹

1. Apfelbaum JL, Chen C, Mehta SS, Gan TJ. Postoperative pain experience: results from a national survey suggest postoperative pain continues to be undermanaged. *Anesth & Analg* 2003;97(2):534-540.

2. Reza Faiz SH, Seyed Siamdoust SA, Rahimzadeh P, Houshmand L. An investigation into the effect of depth of anesthesia on postoperative pain in laparoscopic cholecystectomy surgery: a double-blind clinical trial. *J Pain Res* 2017;10:2311-2317.

First line treatment for pain??



<https://www.addictionresource.net/dilauid/>

OPIOIDS!



<https://www.wtvm.com/news/fentanyl-takes-top-spot-as-drug-most-frequently-involved-in-deadly-overdoses/>

Statistics

- 80% of the global opioid supply is administered in the United States⁴
- More than **115 deaths per DAY** in the United States as a result of opioid overdosing⁵
- In 2016, opioid overdoses accounted for more than 42,000 deaths, exceeding any previous year on record; an estimated 40% of these opioid overdose deaths involved a prescription opioid⁶

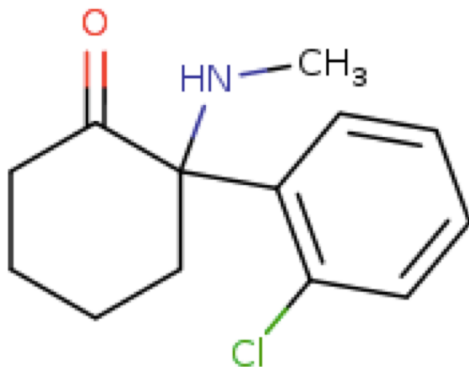
4. Manchikanti L, Singh A. Therapeutic opioids: A ten-year perspective on the complexities and complications of the escalating use, abuse, and nonmedical use of opioids. *Pain Physician* 2008;11(2):S63–88.

5. National Institute on Drug Abuse. Opioid overdose crisis [Internet]. 2018 Mar [cited 2018 Oct 29]. Available from: <https://www.drugabuse.gov/drugs-abuse/opioids/opioid-overdose-crisis>

6. U.S. Department of Health and Human Services. What is the U.S. opioid epidemic? [Internet]. 2019 [cited 2018 Oct 29]. Available from: <https://www.hhs.gov/opioids/about-the-epidemic/index.html>.

What do we do??

- Variety of modalities other than opioids to treat pain:
 - Regional techniques
 - NSAIDS
 - Alpha-2 agonists
 - NMDA antagonists



<https://chem.nlm.nih.gov/chemidplus/m/6740-88-1>



<https://www.sonosite.com/products/sonosite-si>

Our Research Topic

- While researchers continue to investigate multi-modal non-opioid drug therapies and alternative strategies to attenuate the human physiologic response to pain, some existing studies suggest that deepening general anesthesia for surgical patients may decrease acute postoperative pain.
- The objective?? A systematic review aimed at synthesizing the best available evidence related to the effect of the depth of general anesthesia on acute postoperative pain in adult patients.

Research Strategy

- Partnering with a research librarian, major information sources including MEDLINE, Embase, CINAHL, and Google Scholar were searched to locate studies published between 1992 and 2019.
- Research articles were eliminated based on specific inclusion and exclusion criteria.
- Two reviewers assessed the methodological quality of included studies using standardized critical appraisal instruments from the Joanna Briggs Institute System for the Unified Management, Assessment and Review of Information (JBISUMARI).

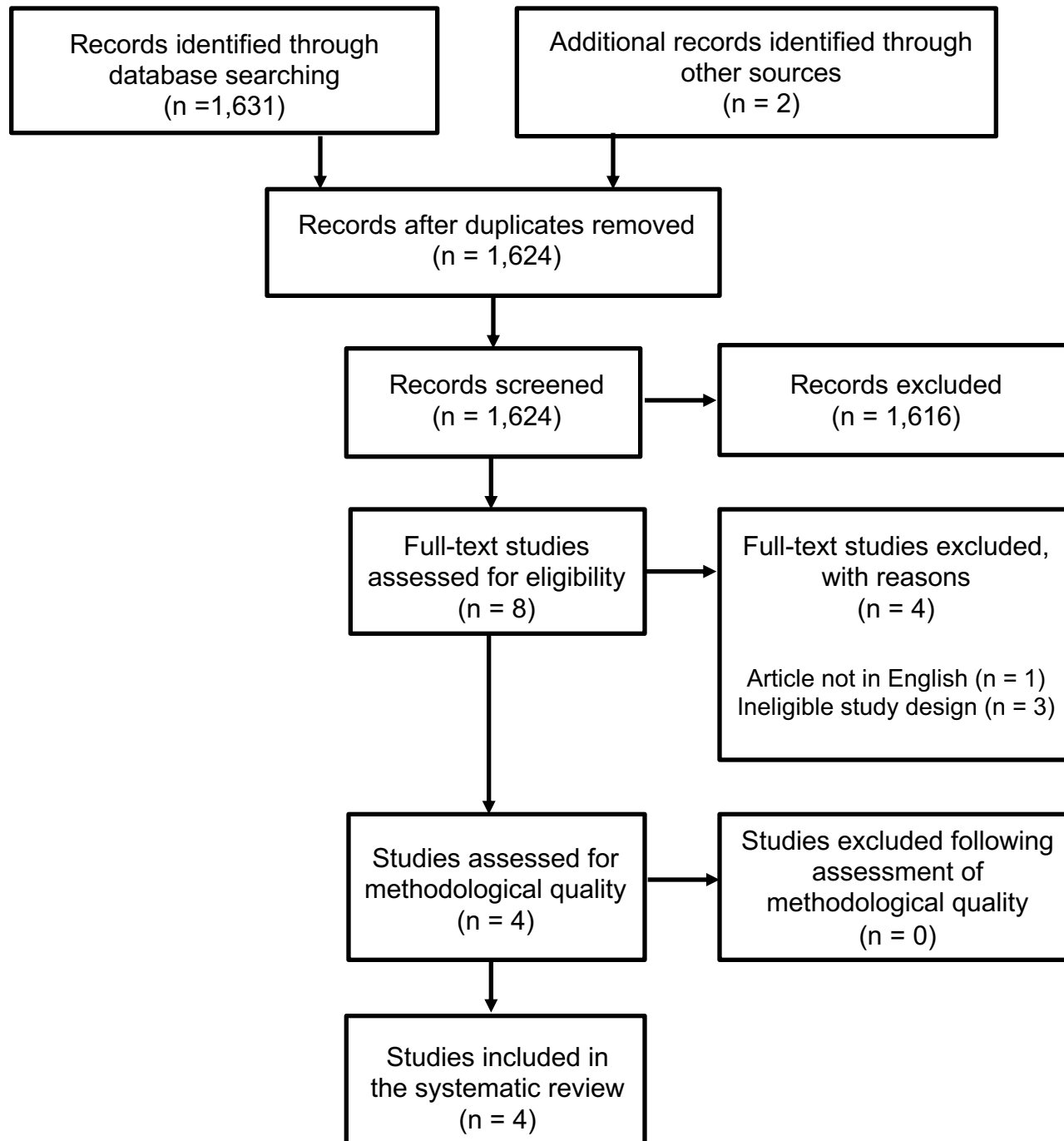
Systematic Review Inclusion and Exclusion Criteria

Inclusion

- Adult patients who are 18 years or over
- Undergoing *elective* surgical procedures under general anesthesia
 - General anesthesia will refer to both a total intravenous anesthetic approach (TIVA), as well as the use of inhalational agents.

Exclusion

- Patients receiving regional anesthesia techniques, including neuraxial anesthesia or peripheral nerve blocks, will be excluded, as these techniques may affect acute postoperative pain scores.
- Given differences in general anesthetic dosing requirements for children, as compared to adults, only studies including adult patients will be included in this review.



Outcomes & Findings

- Four studies totaling 335 participants were included in this review
- All included studies evaluated the effect of depth of anesthesia on postoperative pain scores as the primary outcome
- Secondary outcomes included patient satisfaction, delayed awakening, postoperative nausea and vomiting, and postoperative analgesia requirements

Postoperative Pain

Law et al.	Reza Faiz et al.	Sahni et al.	Soumpasis et al.
<u>Mean scores S vs D</u> *Awake: 4.0 (0-8) vs. 4 (0-8); p=0.56 *20-24 hours: 3.0 (1-5) vs. 3.0 (1.5-4.5); p=0.83 *Note: no significant difference in pain scores between group S and group D	<u>Mean scores S vs D (Rest/Cough)</u> *Awake: 5.70/7.43 vs. 4.01/5.60; p =0.001 *8 hours: 3.83/5.13 vs. 2.57/3.73; p= 0.001 *16 hours: 2.40/3.23 vs. 1.47/2.27; p= 0.001 *24 hours: 1.70/2.37 vs. 1.13/1.70; p= 0.001	<u>Mean scores S vs D (Rest/Cough)</u> *Zero hour: 41.75/55.25 vs. 31.50/43.25; p<0.05 *8 hours: 41.50/54.25 vs. 30.00/41.75; p<0.05 *16 hours: 23/30 vs. 21/30; Not Significant *24 hours: 17/21 vs. 13/19; Not Significant	<u>Mean scores S vs D (Rest/Cough)</u> *8 hours: 2/2 vs. 1/1; p<0.05 *24 hours: 1/1 vs. 0/0; NS

Patient Satisfaction

Reza Faiz et al.	Sahni et al.
*Patient satisfaction was higher at all examined times in group D when compared to the group S	*Patient satisfaction was higher at all examined times in group D when compared to the group S

Delayed Awakening

Sahni et al.

*Time to eye opening and verbal commands was significantly longer in group D than in group S

PONV

Law et al.	Reza Faiz et al.	Sahni et al.
*No statistically significant differences in PONV between S vs D	*Statistically significant decrease in PONV at 8 hours postoperatively in group D *No difference between groups in other time intervals	*Statistically significant decrease in PONV at 0 hours postoperatively in group D *No difference between groups in other time intervals

Rescue Analgesia Requirements

Law et al.	Reza Faiz et al.	Sahni et al.	Soumpasis et al.
*No statistically significant differences in the need for rescue analgesia between S vs D	*The need for additional analgesia postoperatively in group D was significantly less than group S	*The need for additional analgesia postoperatively in group D was significantly less than group S	*The need for additional analgesia postoperatively in group D was significantly less than group S

What Does This Mean?

- If the use of deep general anesthesia results in reduction in acute postoperative pain without adverse effects on patient safety, it would represent another opportunity to reduce opioid use in surgical patients
- Based on the majority of findings, this review concludes that a deeper general anesthetic is associated with a decrease in postoperative pain scores, need for rescue analgesics, postoperative nausea and vomiting, and increased patient satisfaction scores.

Limitations

1. Limited number of studies meeting inclusion criteria
2. Limited sample sizes
3. Inconsistent methodology among the studies in measuring both the primary outcome of interest, as well as the secondary outcomes of interest
4. Different types of general anesthesia among the included studies (potent inhalational agents, total intravenous anesthesia, or a combination)
5. Different rescue analgesic regimens for postoperative pain

Clinical Implications

- Despite the statistically significant findings of these studies, the difference in pain scores between groups may not be clinically significant.
- The evidence synthesized in this review has been graded as moderate in terms of certainty using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) approach for grading the certainty of evidence.
 - Largely due to small sample sizes
- While the results of this review show promise toward this goal, the aforementioned limitations prevent a strong recommendation of adopting of this anesthetic strategy at this time.

Conclusion

- Further research is needed to establish the pain management benefits associated with the use of deep general anesthesia, as well as the potential impact on patient safety associated with its use.
- Future studies, using larger sample sizes, should be designed to incorporate standardization of:
 1. Measurement of the primary outcome variable (acute postoperative pain)
 2. Measurement of secondary outcomes variables (PONV, patient satisfaction, postoperative cognitive decline)
 3. Anesthetic technique

References

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6. U.S. Department of Health and Human Services. What is the U.S. opioid epidemic? [Internet]. 2019 [cited 2018 Oct 29]. Available from: <https://www.hhs.gov/opioids/about-the-epidemic/index.html>.
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