Opioid Prescriptions following Major Spine Surgery: A Meta-Analysis and Risk Factors

Yu Tung Lo, MBBS, BSc1,5; Michelle Lim-Watson, MPH, MBA2; Yookyung Seo2*; Noemi Fluetsch, MPH2; Moudi M. Alasmari, PharmD, MSc, PhD3; Mona Y. Alsheikh, PharmD, MSc, PhD4; Nayan Lamba, MD1; Timothy R. Smith, MD, PhD, MPH1; Linda S. Aglio, MD, MS1,6; Rania A. Mekary, PhD, MSc, MSc1,2

*Presenting Author

Affiliations:

1. Computational Neuroscience Outcomes Center, Department of Neurosurgery, Brigham and Women’s Hospital, 75 Francis St, Boston MA 02115

2. School of Pharmacy, MCPHS University, Boston MA, USA

3. College of Medicine, King Saud Bin Abdulaziz University for Health Sciences, Jeddah, Saudi Arabia

4. Clinical Pharmacy Department, School of Pharmacy, Taif University, Taif, Saudi Arabia

5. Department of Neurosurgery, National Neuroscience Institute, 11 Jln Tan Tock Seng, Singapore 308433

6. Brigham and Women’s Hospital, Department of Anesthesia, 75 Francis St, Boston MA 02115
Disclosure

• The authors report no funding sources or conflict of interest concerning the materials or methods used in the study or the findings specified in this paper.
Introduction

- Opioids are frequently prescribed for several months after spine surgery as the exact duration of opioid utilization after the surgery has not been established.
- The long-term use of opioids following spine surgery may lead to opioid dependence in those patients who were opioid-naïve prior to the surgery.
- Despite the widespread use of opioids in patients undergoing spine surgery, little is known about the prevalence and risk factors of long-term opioid utilization post-spine surgery.
- The objectives of this meta-analysis:
  - Determine the prevalence of chronic opioid utilization (≥3 months) following major spine surgery
  - Describe the major risk factors predisposing patients to prolonged opioid usage following spine surgery
  - Identify potential at-risk populations in order to guide further interventions
Methods

• A systematic literature review was conducted in PubMed, EMBASE and the Cochrane database in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines

• Inclusion criteria
  • Adult patients ≥ 18 years of age
  • Documentation of postoperative opioid use for three months or more
  • Open spinal surgeries performed for the treatment of chronic back or neck pain and/or radiculopathic pain

• The random-effects model using the Dersimonain and Laird method

• $I^2$ index to evaluate heterogeneity among included studies

• The Egger’s regression test and the Begg’s rank correlation test to quantify publication bias
Results

• Based on the eligibility criteria, a total of 24 studies were included in this meta-analysis. Out of 24 studies, 6 were non-claims studies, and 18 were claims/registries studies.

• The mean age for the non-claims studies ranged from 48.5 (SD, 9.0) to 63.5 (SD, 11.1) years old, and for the claims/registries studies ranged from 39.4 (SD, 8.7) to 60.3 (SD, 17) years old.

• The proportion of males ranged from 33.3 to 55% and from 39.3 to 76.9% in the non-claims studies and the claims/registries studies, respectively.

• The definition of chronic opioid use ranged from 3 months up to 24 months.

• Three factors including pre-operative use of opioids, pre-existing psychiatric conditions (depression and/or anxiety) and gender were found to be associated with long-term postoperative opioid utilization and included in the pooled analyses.
Results

• The analysis demonstrated that 46% (95% CI, 33-61%) and 40% (95% CI, 25-56%) of patients were estimated to use opioids chronically after major spine surgery per the six non-claims studies and the eight claims/registries, respectively. (Figure 1)

• No evidence of publication bias was illustrated with Egger’s linear regression test (P=0.75 for non-claims studies and 0.43 for claims/registries) and Begg’s rank correlation test (P=0.85 and 0.68, respectively) for post-operative long-term opioid use.

• In claims/registries studies, the prevalence of post-operative long-term opioid use was significantly greater in patients who used opioids pre-operatively than opioid-naïve patients in that patients on opioids pre-operatively were 2.08 (95% CI, 0.36-11.89) times more likely to have long-term postoperative opioids than those who did not use opioids pre-operatively (P=0.002). (Figure 2)

• In non-claims studies, no significant difference in the prevalence of post-operative long-term opioid use was found between patients who were on opioids pre-operatively and those who were not. (OR, 2.08; 95% CI, 0.36-11.89; P=0.54) (Figure 2)
Results

• A significantly positive association was observed between pre-existing psychiatric conditions including depression and anxiety and long-term postoperative opioid use in claims/registries studies (OR, 1.79; 95% CI, 1.36-2.36), but not in the non-claims studies (OR, 1.09; 95% CI, 0.85-1.39). (Figure 3) (P-interaction comparing non-claims to claims: 0.01)

• There was no significant difference in long-term postoperative opioid use between males and females in both non-claims studies (OR, 1.01; 95% CI, 0.83-1.22) and claims/registries studies (OR, 0.94; 95% CI, 0.78-1.13) (Figure 4) (P-interaction comparing non-claims to claims: 0.63)
Figure 1. Prevalence of long-term opioid use following spine surgery

Figure 2. Influence of pre-operative use of opioids in the odds of long-term opioid use following spine surgery

Figure 3. Influence of pre-existing psychiatric conditions in the odds of long-term opioid use following spine surgery

Figure 4. Gender differences in long-term opioid use following spine surgery
Discussion

• The random effects model used in this meta-analysis took into account the different observed point estimates for the different population types and gave an overall weighted estimate of the prevalence of postoperative long-term opioid use.

• Limitations
  • Various definitions of long-term opioid use among studies
  • All of the included studies determined opioid use by measuring the number of opioid prescriptions.
  • A considerable number of claims database studies were excluded from the quantitative meta-analysis due to the risk of over-sampling patients included in more than one study.
  • All of the included studies were conducted in the United States except one study which was conducted in Australia.

• Post-surgical protocols should be optimized to identify patients at risk of postoperative chronic opioid use and develop pain management strategies which include active monitoring of patients on opioids and interventions of weaning to lower potency analgesics as soon as possible.
Summary Points

• Spine surgery is associated with a significantly higher rate of long-term postoperative opioid use.

• Particular populations such as patients who use opioids preoperatively or who have psychiatric conditions at baseline are at a greater risk of chronic opioid use after major spine surgery.