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Incidence and Determinants of Postoperative Depression/Anxiety After Spinal Surgery: Systematic Review and Meta-analysis V.3

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Abstract

To be completed upon manuscript submission. The abstract will include background, objectives, eligibility criteria, sources, risk of bias methods, synthesis methods, results (where applicable), limitations, and implications for practice/research.

Troubleshooting

Objectives

- 1 Compare the incidence of new-onset depression or anxiety after spinal surgery by the following secondary objectives:
Procedure type (fusion vs decompression)
Surgical level (cervical vs lumbar)
Surgical indication (degenerative vs trauma)
Perioperative opioid use (presence/absence or dose quantiles)

Methods

- 2 Apply a PICO framework: Population = adults undergoing spinal surgery; Intervention/Exposure = type of spinal procedure and opioid use; Comparator = subgroup contrasts (e.g., cervical vs lumbar); Outcome = incidence of new-onset depression or anxiety within 12 months.
- 3 Define eligibility criteria as follows:
Population: Adults (≥ 18 years) undergoing any spinal surgical procedure (cervical, thoracic, lumbar) with no documented diagnosis of depression or anxiety prior to surgery.
Exposure/Intervention: Surgical intervention for degenerative, traumatic, or other spinal conditions.
Comparator: Subgroups as listed in secondary objectives.
Outcomes: New-onset depression or anxiety within 12 months post-op, defined as:
 - 3.1 ICD-10 F32–F33 (depression) or F40–F41 (anxiety)
First-time prescription of SSRI, SNRI, or anxiolytic
Psychiatric consult note documenting new diagnosis
Study Designs: RCTs, prospective/retrospective cohort studies, case-control studies.
Exclude case reports, narrative reviews, editorials, animal studies.
Language & Date Limits: English only; no date restrictions (limiting to English is due to resource constraints and lack of translation capacity).
Grouping for Synthesis: Studies will be grouped by surgical type, level, indication, and opioid exposure.
- 4 Search PubMed, Embase, and PsycINFO from inception to the date of final search. All searches will be run on the most up-to-date versions of these databases available at the time. The most recent search date is July 29, 2025, and the searches will be updated prior to final data synthesis to ensure inclusion of recent studies. Additional sources will include reference lists of included studies and relevant reviews.
- 5 Use the following full search strategies for each database:
Embase – First string (n=1584):

#1 'spine surgery'/exp OR 'lumbar spine':ab,ti OR 'cervical spine':ab,ti OR 'thoracic spine':ab,ti

#2 'depression'/exp OR depress*:ab,ti OR 'anxiety':ab,ti OR 'anxiety'/exp

#3 'incidence'/exp OR 'new diagnosis':ab,ti OR 'new onset':ab,ti OR postop*:ab,ti

#4 #1 AND #2 AND #3

Embase – Second string (n=167):

#1 'spine surgery'/exp OR 'lumbar spine surgery':ab,ti OR 'cervical spine surgery':ab,ti OR 'thoracic spine surgery':ab,ti

#2 'depression'/exp OR depress*:ab,ti OR 'anxiety'/exp OR anxiety:ab,ti OR 'mood disorder'/exp OR 'mood disorder':ab,ti OR 'mental health':ab,ti OR psychological:ab,ti OR psychiatric:ab,ti

#3 'incidence':ab,ti OR 'new diagnosis':ab,ti OR 'new onset':ab,ti

#4 postoperative*:ab,ti OR postop*:ab,ti OR 'post op*':ab,ti OR 'after surgery':ab,ti OR 'post operative*':ab,ti OR 'post operative':ab,ti OR 'post surg*':ab,ti

#5 1 AND 2 AND 3 AND 4

PsycINFO – First string (n=15):

(noft(incidence) OR noft(new diagnosis) OR noft(new onset) OR noft(postop*))

AND (noft(depress*) OR noft(anxiety))

AND (noft(spine surgery) OR noft(lumbar spine surgery) OR noft(cervical spine surgery) OR noft(thoracic spine surgery))

PsycINFO – Second string (n=19):

(noft(postoperative) OR noft(post-operative) OR noft(post-op*) OR noft(after surgery) OR noft(postop*) OR noft(post surgery) OR noft(post-surgery) OR noft(post-surg*))

AND (noft(incidence) OR noft(new diagnosis) OR noft(new onset))

AND (noft(depress*) OR noft(anxiety) OR noft(mood disorder*) OR noft(mental health) OR noft(psychiatric) OR noft(psychological))

AND (noft(spine surgery) OR noft(lumbar spine surgery) OR noft(cervical spine surgery) OR noft(thoracic spine surgery))

6 PubMed – First string (n=475):

(((((Spine Surgery [Mesh]) OR (lumbar spine surgery[tiab])) OR (cervical spine surgery[tiab])) OR (thoracic spine surgery[tiab])))

AND (((((depression[Mesh]) OR (depress*[tiab])) OR (anxiety[Mesh])) OR (anxiety[tiab])))

AND (((((incidence[Mesh]) OR (new diagnosis[tiab])) OR (new onset[tiab])) OR (postop*[tiab])))

PubMed – Second string (n=20):

((((((((depression[Mesh]) OR (depress*[tiab])) OR (Anxiety[Mesh])) OR (anxiety[tiab])) OR (mental health[tiab])) OR (psychological[tiab])) OR (psychiatric[tiab])) OR (mood disorders[Mesh])) OR (mood disorder*[tiab]))

AND (((((((post operative [tiab]) OR (post-operative [tiab])) OR (after surgery [tiab])) OR (post-op*[tiab])) OR (postop*[tiab])) OR (postoperative[tiab])))

AND ((((((Spine surgery [Mesh]) OR (lumbar spine surgery [tiab])) OR (cervical spine surgery [tiab])) OR (thoracic spine surgery [tiab])))



AND (((Incidence[Mesh]) OR (new diagnosis [tiab]) OR (new onset[tiab])))

PubMed – Third string (n=20):

((((((((post operative [tiab]) OR (post-operative [tiab])) OR (after surgery [tiab])) OR (post-op*[tiab])) OR (postop*[tiab])) OR (postoperative[tiab])))) OR (post surgery [tiab])) OR (post-surg*[tiab]))

AND ((((((depression[Mesh]) OR (depress*[tiab])) OR (Anxiety[Mesh])) OR (anxiety[tiab])) OR (mental health[tiab])) OR (psychological[tiab])) OR (psychiatric[tiab])) OR (mood disorders[Mesh])) OR (mood disorder*[tiab]))

AND (((incidence [Mesh]) OR (new diagnosis [tiab]) OR (new onset[tiab])))

Selection Process

- 7 Import all retrieved records into Rayyan for screening. Two reviewers will independently screen titles and abstracts against eligibility criteria, blinded to each other's decisions. Full-text review will also be performed in duplicate. Discrepancies will be resolved by discussion or by a third reviewer if consensus cannot be reached. Use Rayyan's duplicate detection function to identify and remove duplicate records before screening.

Data Collection Process

- 8 Pilot a standardized Excel extraction form. Two reviewers will extract data independently, including abstracts, topics, study characteristics, patient demographics, surgical details, opioid exposure, outcome definitions, and follow-up. Duplicates will be identified and removed by one reviewer. Discrepancies will be resolved through discussion or adjudication by a third reviewer.

Data Items

- 9 Outcomes:
Primary outcome: new-onset depression or anxiety within 12 months post-op, defined as ICD-10 F32–F33 (depression) or F40–F41 (anxiety), first-time prescription of SSRI/SNRI/anxiolytic, or a psychiatric consult note documenting a new diagnosis.
Secondary outcomes: subgroup-specific incidence rates by procedure type, surgical level, surgical indication, and perioperative opioid exposure (presence/absence or dose quantiles). Also collect information on time to diagnosis within the 12-month period, where reported.
Other variables:
Study characteristics (year, country, setting, funding); patient demographics (age, sex, comorbidities); surgical details (approach, urgency, length of stay); opioid exposure (drug, dose, duration, peri- vs post-op); follow-up period and attrition; risk of bias ratings.



Study Risk of Bias Assessment

- 10 Conduct risk of bias assessment in Rayyan after study selection. For cohort and case-control studies, use the Newcastle-Ottawa Scale. For RCTs, use the Cochrane RoB 2 tool. Two reviewers will independently assess risk of bias, with disagreements resolved through discussion or adjudication by a third reviewer.

Effect Measures

- 11 Use the proportion of patients with new-onset depression or anxiety within 12 months post-surgery as the primary measure. For subgroup comparisons, calculate relative risks (RR) or odds ratios (OR) with 95% confidence intervals.

Synthesis Methods

- 12 First, conduct a narrative synthesis of all included studies, grouped by study design and outcome definition. If data are sufficiently homogeneous, perform a random-effects meta-analysis to pool incidence estimates and effect measures. Quantify heterogeneity using the I^2 statistic and τ^2 . Conduct subgroup analyses for procedure type, surgical level, indication, and opioid exposure. Perform sensitivity analyses excluding high-risk of bias studies. Where meta-analysis is not possible, summarize effect estimates in structured tables and explore patterns narratively.

Protocol references

Handpicked references: PMID: 32150130, 29649613, 38343416, 40401763, 40417705.