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Risk Factors and Incidence of Unplanned Hospital Readmission After Surgery for Spinal Metastases: A Systematic Review and Meta-Analysis

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ADMINISTRATIVE INFORMATION

Support - Nil.

Review Stage at time of this submission - Completed but not published.

Conflicts of interest - None declared.

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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 31 March 2026 and was last updated on 31 March 2026.

INTRODUCTION

Review question / Objective (1) To estimate the pooled incidence of 30-day and 90-day unplanned readmission after open surgery for spinal metastases. (2) To identify independently associated risk factors through meta-analysis where feasible and narrative synthesis otherwise.

Rationale Spinal metastases affect up to 40% of cancer patients. Surgical intervention is critical for managing neurological compromise, instability, and pain. Unplanned readmission is a key quality indicator, yet no prior systematic review has synthesised readmission incidence and risk factors specifically for this population. Individual studies report rates of 10–24%, with heterogeneous risk factor profiles and no established consensus on predictive variables.

Condition being studied Unplanned hospital readmission following open surgery for spinal metastases in adult patients (age ≥18 years).

METHODS

Search strategy Controlled vocabulary (MeSH, Emtree) and free-text synonyms organised into two concept blocks: (A) spinal metastases / metastatic spinal cord compression; (B) hospital readmission. Database-specific syntax adapted for each platform. Full search strategies provided in Supplementary Appendix A.

Participant or population Patient with spinal metastatic tumor.

Intervention Open surgery (decompression, stabilisation, or corpectomy) for spinal metastases.

Comparator Nil.

Study designs to be included (A) spinal metastases / metastatic spinal cord compression; (B) hospital readmission.

Eligibility criteria Inclusion criteria (1) Adults ≥18 years undergoing open surgery (decompression,

stabilisation, or corpectomy) for spinal metastases; (2) Reported unplanned hospital readmission as primary or secondary outcome; (3) Observational cohort or case-control studies published from January 2010 onward in English.
Exclusion criteria (1) Studies exclusively evaluating vertebroplasty or kyphoplasty; (2) Exclusively primary spinal tumour populations without extractable metastatic subgroup data; (3) Conference abstracts; (4) Fewer than 10 patients with metastatic disease.

Information sources PubMed/MEDLINE, Embase, Cochrane CENTRAL, Scopus, Web of Science.

Main outcome(s) Primary outcome: Pooled 30-day unplanned readmission incidence after surgery for spinal metastases. Secondary outcome: Pooled 90-day unplanned readmission incidence. Risk factors independently associated with readmission (multivariate-adjusted effect sizes).

Additional outcome(s) Causes of readmission (narrative synthesis). Subgroup-specific readmission incidence by data source (single-centre vs national database studies).

Data management Standardised spreadsheet: study characteristics, patient demographics, surgical details, readmission definitions and rates, causes of readmission, and multivariate-adjusted risk factor effect sizes (OR, HR, aOR) with 95% CI.

Quality assessment / Risk of bias analysis Newcastle-Ottawa Scale (NOS) for cohort studies. Scores ≥7/9 = good quality, 5–6 = fair, <5 = poor.

Strategy of data synthesis Incidence pooling: Freeman-Tukey double arcsine transformation with DerSimonian-Laird random-effects model. Sensitivity analyses: (1) Hartung-Knapp-Sidik-Jonkman (HKSJ) adjustment; (2) Restricted maximum likelihood (REML) estimator; (3) Leave-one-out analysis. Heterogeneity: Cochran Q, I^2, τ^2, 95% prediction interval. Subgroup analysis: Single-centre vs national database studies (pre-specified). Meta-regression: Publication year and log-transformed sample size. Risk factor pooling: Inverse-variance random-effects meta-analysis where ≥2 studies reported the same factor; narrative synthesis otherwise. Publication bias: Funnel plot (formal testing not performed, k < 10). Evidence certainty: GRADE framework.

Subgroup analysis Pre-specified: single-centre cohort studies vs national database studies.

Sensitivity analysis (1) HKSJ adjustment for random-effects CI; (2) REML estimator for between-study variance; (3) Leave-one-out analysis excluding each study sequentially.

Language restriction English.

Country(ies) involved Taiwan/Department of Neurosurgery, Chang Gung Memorial Hospital, Taoyuan, Taiwan.

Keywords spinal metastases; readmission; risk factors; meta-analysis; systematic review; spine surgery.

Contributions of each author

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