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Risk factors for surgical site infection following lumbar spine surgery: a meta-analysis

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ADMINISTRATIVE INFORMATION

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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 27 January 2025 and was last updated on 27 January 2025.

INTRODUCTION

Review question / Objective To understand the incidence of surgical site infection (SSI) following lumbar surgery and explore the influencing factors of infection to provide a reference for clinical intervention.

Condition being studied Clinical studies related to the risk factors of SSI following lumbar surgery published between the establishment of the database and June 2024 were collected. This study will only focus on postoperative infection in lumbar region on the basis of previous studies, and include more databases, and further explore some high-value influencing factors according to the results of the above two reviews. This study aims to compile and analyse published data on SSIs following lumbar spine surgeries, seeking to provide robust evidence from a larger sample size to inform clinical decision-making. This study will only focus on postoperative infection in lumbar region on the basis of previous studies, and

include more databases, and further explore some high-value influencing factors according to the results of the above two reviews. This study aims to compile and analyse published data on SSIs following lumbar spine surgeries, seeking to provide robust evidence from a larger sample size to inform clinical decision-making. Clinical studies related to the risk factors of SSI following lumbar surgery published between the establishment of the database and June 2024 were collected. This study will only focus on postoperative infection in lumbar region on the basis of previous studies, and include more databases, and further explore some high-value influencing factors according to the results of the above two reviews. This study aims to compile and analyse published data on SSIs following lumbar spine surgeries, seeking to provide robust evidence from a larger sample size to inform clinical decision-making. This study will only focus on postoperative infection in lumbar region on the basis of previous studies, and include more databases, and further explore some high-value influencing factors according to the

results of the above two reviews. This study aims to compile and analyse published data on SSIs following lumbar spine surgeries, seeking to provide robust evidence from a larger sample size to inform clinical decision-making.

METHODS

Search strategy As this meta-analysis did not involve human or animal participants.

Participant or population n/a.

Intervention n/a.

Comparator n/a.

Study designs to be included Studies with case-control or cohort designs. 17 documents were screened out, including eight Chinese-language documents and nine English-language documents. This included two randomised controlled studies and 15 retrospective studies. studies with case-control or cohort designs.

Eligibility criteria The inclusion criteria were as follows: (1) studies with case-control or cohort designs; (2) surgical intervention involving lumbar spine procedures, specifically analysing risk factors for postoperative SSIs, including preoperative, intraoperative and postoperative factors; (3) the definitions of postoperative SSIs were clearly articulated, with well-defined diagnostic criteria for the associated risk factors; and (4) studies providing data on odds ratio (OR) and 95% CIs for the relevant risk factors necessary for meta-analysis.

The exclusion criteria included (1) studies involving non-human subjects or surgeries unrelated to lumbar spine procedures, as well as infections at non-surgical sites; (2) duplicate studies or those with overlapping data; (3) reviews, meta-analyses, commentaries or conference abstracts; (4) studies lacking full-text availability, that had incomplete data or lacked necessary effect sizes; (5) studies with methodological deficiencies or questionable statistical analysis; and (6) the Newcastle-Ottawa Scale (NOS) and Cochrane risk-of-bias tool evaluations determined that it was a low-risk study.

Information sources PubMed, Cochrane Library, Embase, Web of Science and the China National Knowledge Infrastructure (CNKI) database.

Main outcome(s) The duration of operation, heart disease, diabetes, prophylactic use of vancomycin, BMI, surgical segments, ASA score and

postoperative drainage time are related to the risk of infection following lumbar surgery.

Quality assessment / Risk of bias analysis The NOS was used to evaluate the observational studies. The results showed that the quality evaluation score of two out of 16 observational studies was 8, that of seven studies was 7 and that of six studies was 6. The evaluation results of the randomised controlled studies using the Cochrane risk assessment tool indicated that one study involving random sequence generation and the blinding of participants and personnel had high risk, as did another with the blinding of participants and personnel and where the risk of random sequence generation was unclear. The remainder were evaluated as low risk. The funnel diagram of the relationship between influencing factors and SSIs after lumbar surgery is basically symmetrical. The publication bias of this study is very small and the conclusion is reliable.

Strategy of data synthesis Cochrane's Review Manager software (RevMan 5.4) was used to analyse the data extracted from the included studies. In preliminary analyses, we assessed the consistency of different studies. If $P \geq 0.10$ and $I^2 \leq 50\%$, it was deemed that there was no significant heterogeneity between studies, meaning the fixed effects model could be used for analysis. However, when $P \leq 0.10$ and $I^2 \geq 50\%$, this indicated that there was heterogeneity between studies. This heterogeneity was further interrogated by performing sensitivity analyses and assessing the potential impact of each study on the overall outcome. If an individual study significantly influenced heterogeneity, it was excluded, and the meta-analysis was rerun. In cases where the source of heterogeneity remained unclear, data were combined using a random effects model. Funnel plots were created to evaluate publication bias.

Subgroup analysis There was no subgroup analysis, and the retrospective study was divided into infection group and non-infection group, and the cohort study was divided into preventive use of vancomycin powder group and control group.

Sensitivity analysis Because this study excluded low-quality articles and controlled the surgical site, the influencing factors included in the included documents were inconsistent, and one factor included quantitative, binary and multi-classified, resulting in a small number of documents for analysis, because sensitivity analysis was not done.

Country(ies) involved China.

Keywords Lumbar surgery; infection; risk factors; meta-analysis.

Contributions of each author

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Author 3 - Xingliang Wang.