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STUDY PROTOCOL

Effectiveness of Non-Pharmacological Interventions on Postoperative Pain in Gastric Cancer: A Systematic Review and NMA Protocol

Shujiu Lei, Hefeng Tian, Haiou Qi

Nursing Department, Sir Run Run Shaw Hospital, Zhejiang University School of Medicine, Hangzhou, People's Republic of China

Correspondence: Haiou Qi, Nursing Department, Sir Run Run Shaw Hospital, Zhejiang University School of Medicine, Hangzhou, People's Republic of China, Email sea7312@163.com

Background and Purpose: Postoperative pain is common in gastric cancer patients and may affect recovery and quality of life. While opioids are widely used, non-pharmacological interventions have emerged as potential alternatives. However, their relative effectiveness remains unclear. Therefore, this protocol describes a systematic review and network meta-analysis (NMA) to evaluate and rank non-pharmacological interventions for postoperative pain in gastric cancer patients.

Methods: Nine electronic databases will be searched up to February 2026. Randomized controlled trials comparing non-pharmacological interventions for postoperative pain will be included. Primary outcomes will be pain intensity; secondary outcomes will include analgesic consumption, quality of life, and adverse events.

Results: Through this network meta-analysis protocol, we will directly and indirectly compare all non-pharmacological nursing interventions and rank their probability of effectiveness. We expect to identify the most effective non-pharmacological or combination of interventions for postoperative pain in gastric cancer patients.

Conclusion: This review aims to summarize available evidence and inform the selection of non-pharmacological pain management strategies for gastric cancer patients.

Keywords: postoperative pain, gastric cancer, non-pharmacological interventions, systematic review, network meta-analysis

Introduction

Gastric cancer is one of the most common malignant tumors in the world, and its morbidity and mortality rate are among the highest, which poses a serious threat to human public health.[1] According to the latest data released by the International Agency for Research on Cancer of the World Health Organization, more than 1.2 million new cases of gastric cancer are reported every year and nearly 800,000 deaths are reported.[2] From the perspective of clinical harm, gastric cancer not only causes local symptoms such as upper abdominal pain, loss of appetite and weight loss, but also causes systemic complications such as anemia, malnutrition, and immune dysfunction due to tumor invasion.[3] With the progression of the disease, the tumor may invade the surrounding tissues and organs, causing bleeding or even perforation, which seriously threatens the life safety of the patient, and causes double blow to the patient's physiological function and mental health.[3]

At present, radical gastrectomy is still the first choice of treatment for gastric cancer.[4] However, the operation is complicated and traumatic, and the incidence of postoperative complications is high.[5] The common complications include anastomotic fistula, digestive tract obstruction, and pulmonary infection, among which postoperative pain is one of the most common symptoms.[5,6] Patients with gastric cancer are more prone to malnutrition due to factors such as early postoperative dietary restrictions and impaired digestive function reconstruction. Pain further suppresses appetite and activity capacity. Postoperative gastric cancer patients often require nasogastric tubes or jejunal feeding tubes, and pain-induced limitation of coughing and sputum production increases the risk of complications such as pulmonary

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infection and atelectasis. The quality of pain management is directly related to respiratory function recovery and infection prevention and control. Relevant studies indicate a relatively high incidence of postoperative pain.[7] If the pain is not effectively controlled, a series of pathophysiological reactions will be triggered. Pain may cause patients to be afraid to turn over and get out of bed, thus increasing the risk of deep vein thrombosis and atelectasis.[8] It may inhibit patients' respiratory function, increase the risk of pulmonary infection, and may cause anxiety, sleep disorders, and other psychological problems.[9,10]

For a long time, drug therapy (especially opioids) has been the cornerstone of postoperative pain management.[11] However, opioid-related side effects, such as nausea, vomiting, intestinal obstruction, constipation, respiratory depression, and addiction, are particularly prominent in gastric cancer patients, which seriously hinder the recovery of gastrointestinal function after surgery and may even prolong the hospitalization time.[11,12] Therefore, the search for effective and less side effects of pain management strategies has become an important research direction in the perioperative medicine of gastric cancer.

In this context, non-pharmacological pain intervention has gradually garnered clinical attention as an important adjunct to multimodal analgesia.[13,14] This method mainly regulates pain perception through different mechanisms, such as physical, psychological, or behavioral, and provides an important supplement or alternative for postoperative pain management.[12] Currently, non-pharmacological interventions for postoperative pain in gastric cancer patients are diverse, including physical therapies (transcutaneous electrical nerve stimulation, cold, or heat compresses), psychological interventions (cognitive behavioral therapy, relaxation training, music therapy), and complementary and alternative medicine therapies (acupuncture, acupoint massage).[15–23] These non-pharmacological approaches can provide adjunctive analgesic effects without increasing drug burden by activating endogenous analgesic pathways, modulating emotional stress responses, and improving patients' pain perception. We systematically integrate these non-pharmacological interventions into existing postoperative pain management protocols, aiming to establish a more comprehensive, balanced, and individualized analgesic system to optimize postoperative recovery outcomes in gastric cancer patients. In recent years, multiple randomized controlled trials have confirmed the effectiveness of non-pharmacological interventions in managing postoperative pain following gastric cancer surgery.[18,20]

The number of existing research is increasing, but the current evidence system has significant limitations. Most randomized controlled trials directly compare a single non-pharmacological intervention with routine care, and previous systematic reviews and meta-analyses have also only demonstrated the efficacy of a single non-pharmacological intervention, while there is a lack of studies that directly compare different non-pharmacological interventions. This makes it difficult for medical staff to determine which non-pharmacological intervention is most suitable for postoperative pain management in gastric cancer. Traditional systematic reviews and meta-analyses can only conduct direct pairwise comparisons but cannot comprehensively utilize indirect evidence to evaluate and rank multiple interventions. The Network meta-analysis (NNA) can overcome the limitation of traditional meta-analysis in "pairwise comparisons" by integrating direct and indirect evidence, enabling simultaneous comparison, ranking, and optimization of multiple interventions. The vast majority of randomized controlled trials involving non-pharmacological interventions used conventional care, placebo, or pharmacological analgesia as controls. This common control measure provides a bridge for indirect comparison between different interventions. Although different non-pharmacological interventions vary in form, the NMA can explore the moderating effects of covariates such as intervention type, intensity, and timing on effect size through methods like subgroup analysis and meta-regression. This approach provides more comprehensive and precise answers to complex clinical decision-making questions. For fields with diverse intervention types and insufficient head-to-head studies, NMA has become a core tool for evidence-based decision-making. This study will employ systematic review and NMA to conduct quantitative comparisons and probabilistic rankings of the relative effectiveness of all non-pharmacological interventions included. Therefore, this study aims to evaluate the effects of different non-pharmacological interventions and identify the most effective methods to improve postoperative pain in gastric cancer patients through systematic review and NMA.

Methods and Design

This study will employ a methodological design combining systematic reviews with network meta-analysis, strictly adhering to the guidelines of the systematic review of interventions in the Cochrane Handbook[24] and the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement.[25] This study aims to comprehensively integrate existing randomized controlled trials on non-pharmacological interventions for postoperative pain in gastric cancer patients. By combining direct and indirect comparisons, it systematically evaluates the effectiveness of various non-pharmacological approaches and ranks their therapeutic efficacy. The findings will provide high-quality evidence-based medicine to guide clinical decision-making in selecting non-pharmacological management strategies for post-operative pain following gastric cancer surgery. This study protocol has been pre-registered on the International Prospective Register of Systematic Reviews (PROSPERO) under registration number: CRD420261288646.

Eligibility Criteria

Study Design

We will include all published randomized controlled trials on postoperative pain in gastric cancer, whether or not they are blinded. We have no restrictions on language. If the following conditions are met, the corresponding paper will be excluded.

(1) Non-randomized controlled studies (such as cohort studies, case–control studies, and cross-sectional studies), such as cohort studies, case–control studies, and cross-sectional studies.
(2) The study was not complete, the data were missing, and the authors could not be contacted to supplement the literature.
(3) Re-published literature (with priority given to studies with more complete data and larger sample sizes).

Population

We will include patients (≥18 years) with histopathologically confirmed gastric cancer who have undergone radical gastrectomy (such as laparoscopic or open gastrectomy). Postoperative pain symptoms (visual analogue scale score ≥3 or numerical rating scale score ≥3). The clinical data of patients were complete. We will exclude patients who have the following conditions. The patients were complicated with other malignant tumors, severe cardiovascular and cerebrovascular diseases, liver and kidney failure, coagulation disorders, mental disorders or cognitive dysfunction, which made them unable to cooperate with pain assessment. The patient had a history of chronic pain or long-term use of analgesics before surgery.

Interventions

We will evaluate the experimental group using any non-pharmacological treatment to intervene in postoperative pain of gastric cancer. In this study, non-pharmacological interventions refer to nursing or therapeutic measures that do not rely on active pharmaceutical ingredients and exert analgesic effects through physical, psychological, behavioral, or environmental approaches. These interventions can be used in combination with conventional analgesics, but the primary objective is not to replace pharmacotherapy. These interventions encompass physical therapies (percutaneous electrical nerve stimulation, heat/cold compresses, ultrasound therapy, acupuncture, and massage), psychological interventions (cognitive behavioral therapy, mindfulness-based stress reduction, and emotional counseling), rehabilitation care (early ambulation, breathing exercises, and relaxation training), and traditional Chinese medicine modalities (moxibustion, cupping, and acupoint patch therapy). The intervention measures should clearly describe the specific operation method, intervention time, intervention frequency, and intervention course. We will also include in this study the literature that simultaneously employs pharmacological interventions and non-pharmacological interventions. Given the frequent use of combined non-pharmacological interventions in clinical practice to enhance analgesic efficacy, we provide an elaboration on the definition of combined interventions. Combined intervention refers to the simultaneous or sequential application of two or more different types of interventions within the same study. For studies involving combined intervention groups, we independently extract the effect data of the combined intervention group. In the NMA, we will treat combined

interventions as independent intervention nodes for direct and indirect comparison with single non-pharmacological interventions. Secondly, we will conduct subgroup analyses based on the number and composition types of components in combined interventions to explore the efficacy differences between combined interventions and single interventions, as well as the optimal combination patterns. However, we will not include studies that describe interventions in vague terms and do not specify the exact programme.

Comparison

The control group received standard care (such as vital signs monitoring, wound care, and routine health education) or an alternative non-pharmacological intervention. If the control group is treated with medication, it must be ensured that the experimental group is only non-pharmacological, and the two groups have identical drug treatment protocols (drug type, dosage, route of administration, time of administration). We will not include studies in which the control group had no clear intervention or intervention that was indistinguishable from the experimental group.

Outcomes

To ensure consistency and comparability in outcome data extraction, this study pre-specified postoperative outcome time points by integrating the characteristics of postoperative pain in gastric cancer patients with clinical practice of non-pharmacological interventions. The specific predefined time points are as follows. Twenty-four hours postoperatively represents the peak period of acute pain in gastric cancer patients and serves as a critical time point for evaluating the analgesic efficacy of intervention measures. Forty-eight hours postoperatively is selected to evaluate the sustained analgesic effect of the intervention during the acute pain phase. Seventy-two hours postoperatively marks the end of the acute pain phase, during which we need to evaluate the efficacy of interventions in alleviating acute pain and promoting pain resolution. If the outcome data time point in the research report is close to a pre-specified time point, the data will be included in the analysis at the closest pre-specified time point after recording the actual time point.

Based on predefined postoperative outcome time points, this study will further clarify the clinical outcome evaluation time nodes and establish specific assessment criteria and time windows for each node. For each predefined time point, the evaluation time window was set as ±1 hour. If multiple assessment data are reported within the time window, the mean value is calculated for analysis. If the data exceed the time window, they are excluded and recorded in the sensitivity analysis. The primary outcome measure is pain intensity at different postoperative time points (eg, 24h, 48h, and 72h) quantified by visual analogue scale or numerical rating scale scores (0–10), with higher scores indicating greater pain intensity. Secondary outcomes include postoperative analgesic use (proportion of patients requiring additional analgesics after surgery), time to first postoperative analgesic use, postoperative quality of life (SF-36 scale), and adverse events (skin injuries, dizziness, and nausea). The included studies should report at least one primary outcome.

Search Strategies

We will search all the published randomized controlled trials related to postoperative gastric cancer pain. The domestic and international databases used for retrieval include Chinese databases (CNKI, VIP, WanFang) and English databases (PubMed, Embase, Cochrane Library, Web of Science and CINAHL). The search time range is from the establishment of each database to February, 2026. The retrieval strategy is based on the PICO framework, which combines subject words with free words. The subject terms include "Stomach Neoplasms/surgery"[Mesh], "Gastrectomy"[Mesh], "Acupuncture Therapy"[Mesh], "Transcutaneous Electric Nerve Stimulation"[Mesh], "Music Therapy"[Mesh], "Virtual Reality"[Mesh], and "Mind-Body Therapies"[Mesh]. The free words include "gastric cancer*", "stomach cancer*", "gastric carcinoma*", "stomach neoplasm*" "non-pharmacolog*", "nonpharmacolog*", "non-drug", "complementary", "alternative". In addition, we will also manually retrieve the list of references included in the study, as well as conference papers and theses in related fields, to avoid missing any potentially eligible studies. We will search the three clinical trial registries (WHO, Clinical trials.gov, and the International Clinical Trials Registry Platform) to identify ongoing experiments. At the same time, we search grey literature in OpenGrey (http://www.opengrey.eu/) to avoid being missed.

Study Selection

The literature retrieval and screening are independently completed by two researchers who have received systematic review methodology training. The retrieved literature is managed by using Endnote X9 software. First, by reviewing the titles and abstracts of the literature, we initially screen out those that clearly did not meet the eligibility criteria. For the initially included or controversial literature, we will obtain the full text and carefully read it before final screening according to the eligibility criteria. During the screening process, if two researchers have differing opinions, they resolve the issue through discussion and consultation. If the negotiation fails to reach an agreement, the third senior researcher will be invited to arbitrate.

Data Extraction

We will first establish standardized data extraction forms, with two researchers independently extracting data from the included studies. After completion, cross-verification will be conducted to ensure the accuracy and completeness of the extracted data. The data extraction covers the following aspects. The study's basic information includes the first author, publication year, country/region, sample size (number of cases in the experimental and control groups), and study design type (whether blinded or with hidden allocation methods). The baseline data of the study population includes patient age, gender distribution, pathological stage of gastric cancer, surgical approach, and baseline postoperative pain score. The details of intervention include the intervention methods, intervention time, intervention frequency, and intervention course of the experimental group and the control group. The outcome measures include pain scores at different postoperative time points (mean ± SD), analgesic usage rate, time of first analgesic use, quality of life scores, and adverse reaction occurrences. The bias risk assessment includes randomization sequence generation, allocation concealment, blinding of subjects (patients, investigators, and assessors), completeness of outcome data, selective reporting of outcomes, and other potential sources of bias. For studies with incomplete data or ambiguous descriptions, we will contact the study author via Email to obtain additional data. If additional data are not available, this should be stated in the results and the impact on the results should be assessed by sensitivity analysis.

Risk of Bias Assessment

We will use the Cochrane Bias Risk Assessment Tool 2.0 to conduct methodological quality assessments of each included randomized controlled trial. The evaluation covers the randomization process, deviations from established interventions, missing outcome data, outcome measures, and selective reporting of results. Each assessment result may be "low risk", "high risk", or "some concern". The evaluation is independently conducted by two investigators, with cross-verification performed. Disagreements are resolved through discussion or arbitration by a third investigator. The RevMan 5.4 software is used to draw the bias risk assessment diagram and summary diagram, which visually presents the distribution of bias risks in the included studies.

Statistical Analysis

Network Meta - Analysis

We use Stata 17.0 and R 4.3.0 for data processing and analysis. All statistical tests are performed as two-tailed tests with a significance level of $\alpha=0.05$. First, consistency testing is performed on the included outcome measures. We then employ the node-splitting method to evaluate the consistency between direct and indirect comparison results. If $p > 0.05$, it indicates good consistency, and we will use a fixed-effects model for pooled analysis. If $p \leq 0.05$, it indicates inconsistency, and further analysis of the source of inconsistency (study heterogeneity, differences in intervention measures, etc) is required. If the source cannot be clearly identified, a random effects model is used for pooled analysis to reduce the impact of inconsistency on the results. In the process of model fitting, the iterative weighted least squares method is used to estimate the effect size and variance to ensure the convergence of the model. This study selects corresponding effect size indicators based on the type of outcome measures to ensure the rationality and accuracy of data merging. For continuous outcome measures such as pain scores, the mean difference and its 95% confidence interval are used as the effect size. When different measurement tools are used for continuous outcome measures in the study, we will first perform standardization. The standardized mean difference and its 95% confidence interval should be used as the effect

size to eliminate differences caused by different measurement tools. For dichotomous outcome measures (analgesic usage rate and adverse reaction incidence), the risk ratio and its 95% confidence interval are employed as the effect size. Meanwhile, we will construct a network evidence map to visually present the direct comparative relationships between different non-pharmacological intervention options and the distribution of sample sizes.

Ranking of Interventions

We use the surface under the cumulative ranking curve (SUCRA) combined with cumulative rank probability diagram to rank the efficacy of non-pharmacological interventions. The value of SUCRA ranges from 0 to 1. The closer the SUCRA value is to 1, the higher the probability that the intervention demonstrates optimal efficacy among all comparison protocols. The closer the SUCRA value is to 0, the higher the probability of the poorest efficacy. Meanwhile, we will also plot cumulative rank probability diagram to demonstrate the probability distribution characteristics of various intervention measures at different ranking positions through the trend of the curves.

Heterogeneity Assessment

We first conduct a clinical heterogeneity assessment to analyze differences in the study population, intervention measures, and outcome indicators among the included studies. Population characteristics include differences in patient age, cancer stage, surgical approach, and baseline pain levels. The characteristics of interventions include differences in intervention type (eg, physical intervention, psychological intervention, and multimodal intervention), dosage (frequency, duration, and intensity), and timing (preoperative, intraoperative, or postoperative). The evaluation dimensions of outcome measures include differences in pain assessment tools (Visual Analog Scale, Numeric Rating Scale, McGill Pain Questionnaire) and timing of outcome measurement (eg, 24h, 48h, and 72h postoperatively). To better manage clinical heterogeneity, we will conduct a priori subgroup analyses based on key intervention characteristics and patient characteristics. Additionally, we will explore the influence of intervention dose and timing using meta-regression if sufficient data are available. Given the anticipated clinical heterogeneity in gastric cancer postoperative pain studies, we will explicitly justify the selection between fixed-effect and random effect models. The fixed-effect model will be applied when clinical homogeneity is reasonable and statistical heterogeneity is absent or low ($I^2 < 25\%$), assuming a common underlying true effect across studies. In contrast, the random effect model will be adopted when substantial clinical or statistical heterogeneity is present ($I^2 \geq 25\%$), accounting for both within-study and between-study variance. Gastric cancer patients vary widely in age, tumor stage, and surgical approaches, while non-pharmacological interventions differ substantially in modality, intensity, and timing; such variability is expected to introduce between-study heterogeneity. Model selection will be guided jointly by clinical judgment and statistical testing (Q statistic, I^2, and consistency tests) to ensure robust and generalizable effect estimates. For meta-analyses involving direct comparisons, the heterogeneity of the included studies is assessed using the *Q*-test and the I^2 statistic, where the *Q*-test is employed to determine the presence of heterogeneity ($P < 0.10$ indicates statistical heterogeneity). The I^2 statistic is used to assess the degree of heterogeneity ($I^2 < 25\%$: low; 25–50%: moderate; >50%: high). If statistical heterogeneity is present ($P<0.10$ and $I^2 \geq 50\%$), a pooled analysis with a random effects model is performed after excluding clinical heterogeneity, and sensitivity analysis is conducted to explore the source of heterogeneity. Consider meta-regression to explore continuous moderators (eg, intervention duration, patient age, and publication year) when at least 10 studies are available for a given comparison. Heterogeneity within the network meta-analysis will be assessed using the between-study variance parameter (τ^2). Consistency between direct and indirect evidence will be evaluated globally (using design-by-treatment interaction models) and locally (using node-splitting methods). Significant inconsistency will be explored by examining potential effect modifiers.

Assessment of Transitivity and Consistency Assumptions in NMA

This study will rigorously evaluate the transitivity assumption and consistency assumption of the NMA. The core assumption of transitivity is that all comparisons between non-pharmacological interventions and control measures in the network are based on comparable study populations, intervention conditions, and outcome indicators, to ensure the rationality of indirect comparisons. We will evaluate transitivity using the following methods. ① Extract baseline characteristics of all included studies, and compare baseline balance across different intervention combinations through

qualitative description and quantitative analysis. ② For key intervention nodes in the network, stratified NMA will be performed based on potential confounding factors such as surgical methods and intervention duration, and the consistency of effect sizes before and after stratification will be examined. ③ The robustness of the transitivity assumption will be verified by sensitivity analysis. The consistency hypothesis refers to the compatibility between the results of direct comparison and indirect comparison in NMA, with no significant statistical differences. This study will employ node splitting method combined with auxiliary tests to evaluate the consistency assumption of NMA. The specific evaluation methods are as follows. Stata software will be used for node splitting analysis to separate direct and indirect comparison data of each intervention node. We calculate effect sizes and 95% confidence interval and assess consistency through p-values ($p>0.05$ indicates good consistency). Consistency variance test and network funnel plot will be employed to assist in verifying the consistency assumption.

Publication Bias

If the number of included studies exceeds 10, we use a funnel plot to assess publication bias. If the included studies show a symmetrical distribution in the funnel plot, it suggests the absence of significant publication bias. If the included studies exhibit an asymmetric distribution in the funnel plot, it suggests the potential presence of publication bias. Meanwhile, quantitative analysis is performed using the Egger or Begg test. The P-value greater than 0.05 indicates no significant publication bias, while P-value less than 0.05 suggests the presence of potential publication bias. For outcome measures with publication bias, the trim-and-fill method is employed to assess the impact of publication bias on pooled results. Furthermore, publication bias in network meta-analysis is evaluated by constructing network funnel plots.

Reporting of Results

We strictly report the study results in accordance with the requirements of the PRISMA-NMA statement. The study results include the basic characteristics of the included studies, the results of bias risk assessment, the network evidence map, the relative effect size and its 95% confidence interval among the interventions, the SUCRA value and efficacy ranking results, the heterogeneity analysis results, the publication bias test results, and the sensitivity analysis results. For outcome measures that could not be combined for analysis, descriptive analysis is employed for summarization.

Evidence Quality Assessment

The evidence quality level of outcome measures is assessed by the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system. We will employ the CINeMA method, which is specifically designed for network meta-analysis, to comprehensively assess evidence certainty by evaluating the following six dimensions. The six dimensions include study design, risk of bias, inconsistency, indirectness, imprecision, and publication bias. The quality of evidence is divided into four grades, namely high, medium, low, and very low. The evidence quality assessment is independently conducted by two researchers. When there is disagreement, it can be resolved through discussion.

Discussion

To the best of our knowledge, this is the first systematic review and NMA to compare the effectiveness of non-pharmacological interventions for postoperative pain in gastric cancer patients. This study employs the NMA method to integrate all relevant randomized controlled trials, thereby comprehensively evaluating and ranking the efficacy of different non-pharmacological intervention regimens. This approach not only provides high-quality evidence-based medical support for developing individualized and precision postoperative pain management strategies but also holds significant clinical implications for improving postoperative pain management quality and promoting rapid patient recovery.

Currently, clinical practice guidelines for postoperative pain management emphasize multimodal analgesia for patients with postoperative gastric cancer, but provide limited specific recommendations for non-pharmacological adjuvant therapies, which may primarily be due to the lack of high-quality comparative efficacy studies. Traditional meta-analysis of matched studies is only for studies that can be directly compared. The traditional paired meta-analysis method is only for studies that can be directly compared. Nowadays, various non-pharmacological therapies

(percutaneous electrical nerve stimulation, acupuncture, virtual reality) are increasingly emerging. Direct head-to-head clinical trials are very limited. The NMA analysis method integrates both direct and indirect comparative evidence, enabling more effective cross-intervention comparisons and addressing the limitations of head-to-head direct comparison studies. We rank the therapeutic efficacy by accumulating the area under the probability curve, thereby identifying the optimal intervention strategy and providing a more intuitive and comprehensive reference for clinical decision-making. This information is critical for guiding clinical decisions and setting priorities for future research. This study is designed in strict compliance with the PRISMA-NMA guidelines and has been pre-registered on the PROSPERO platform. This approach effectively reduces the risk of selective reporting bias. In terms of study design details, this research will employ standardized literature retrieval strategies in both Chinese and English databases, supplemented by manual reference searches, to minimize the risk of publication bias. During the data processing and analysis phase, consistency checks are performed to verify the compatibility between direct and indirect comparison results. We employ different methods to assess heterogeneity and publication bias and conduct sensitivity analyses to test the robustness of the results.

Although the methodological design of this study is highly rigorous, certain limitations may still exist. First, the quality of the included studies may affect the reliability of the results. The primary reason lies in the intervention nature of certain non-pharmacological treatments, which pose significant challenges in achieving double-blind design, potentially leading to a higher risk of implementation bias. Secondly, the risk of heterogeneity cannot be ignored. Statistical heterogeneity may arise from variations in intervention details (intensity and duration) and study population characteristics (pathological stage of gastric cancer, surgical approach, baseline pain level). Finally, due to the difficulty in publishing negative result studies, there may be publication bias in the included studies.

In the future, with the increasing adoption of the concept of rapid recovery surgery, non-pharmacological interventions will play an increasingly important role in postoperative pain management for gastric cancer. The findings of this study will provide evidence-based support for optimizing the pain management module in the concept of postoperative rapid recovery surgery. Meanwhile, we recommend that future studies further explore the mechanisms of non-pharmacological therapies, integrating biomarker detection technologies to elucidate the molecular mechanisms underlying pain relief by different interventions. This provides a theoretical basis for developing new non-pharmacological interventions. Furthermore, long-term follow-up studies can be conducted to evaluate the impact of non-pharmacological interventions on long-term quality of life and the incidence of chronic pain in postoperative patients, thereby providing more comprehensive evidence-based support for the whole process management of postoperative pain.

Conclusion

This study aims to provide evidence on non-pharmacological interventions for postoperative pain in gastric cancer and may help inform clinical pain management decisions.

Systematic Review Registration

PROSPERO CRD420261288646

Data Sharing Statement

Data available on request from the corresponding author (Haiou Qi).

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Disclosure

The authors declare that they have no conflicts of interest in this work.

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