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Performance Evaluation of Wireless Bluetooth Continuous Temperature Monitoring Against Traditional Core Temperature Measurement in Surgical Patients: A Systematic Review and Meta-Analysis

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ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - Formal screening of search results against eligibility criteria.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202550029

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 13 May 2025 and was last updated on 13 May 2025.

INTRODUCTION

Review question / Objective This study plans to include randomized controlled trials and prospective cohort studies comparing intraoperative wireless Bluetooth continuous thermometry with conventional core thermometry in a surgical population.

Rationale Temperature measurement is an important part of clinical care, especially in surgical patients, and accurate monitoring of core body temperature is essential for the prevention and management of intraoperative hypothermia or fever. Traditional methods of core temperature measurement, such as nasopharyngeal temperatures, although considered the "gold standard," are invasive and can cause discomfort and potential risk to patients. In recent years, with the advancement of technology, wireless Bluetooth continuous temperature measurement has been gaining attention as a non-invasive technique. The aim of this study was to assess the accuracy of wireless Bluetooth continuous thermometry versus conventional core thermometry in surgical patients through systematic review and meta-analysis. The results of this study will help optimize temperature monitoring strategies in surgical patients.

Condition being studied Environment: Operating room (OR) setting only.
Exclusions: Studies conducted in wards, ICUs, or post-anesthesia care units (PACUs) will not be included.
Population: All surgical patients undergoing procedures in the operating room, regardless of the type of surgery.

METHODS

Participant or population All surgical patients undergoing procedures in the operating room.

Intervention Wireless Bluetooth continuous temperature measurement.

Comparator Traditional core temperature measurements, including pulmonary artery

temperature, bladder temperature, and nasopharyngeal temperature, among others.

Study designs to be included Randomized controlled trials and prospective cohort studies.

Eligibility criteria Studies conducted in animals.
Review studies.
Studies that do not compare core temperature with wireless Bluetooth continuous temperature measurements.
Studies that do not report the mean differences.
Studies for which the full text is not available.
Studies not published in Chinese or English.

Information sources Databases to be searched: PubMed, Cochrane Library, EMBASE, CNKI (China National Knowledge Infrastructure), and SinoMed (China Biology Medicine disc).
Additional sources:
- Contact with authors: We will attempt to contact the corresponding authors of relevant studies to request unpublished data or additional information.
- Trial registers: We will search clinical trial registries such as ClinicalTrials.gov and the International Clinical Trials Registry Platform (ICTRP) to identify ongoing or unpublished studies.
- Grey literature: We will search for grey literature, including conference proceedings, dissertations, and unpublished reports, using databases such as OpenGrey and Google Scholar.

Main outcome(s) The mean difference between wireless Bluetooth continuous temperature measurement and core temperature measurement.

Additional outcome(s) The consistency of detecting fever and hypothermia during surgery between wireless Bluetooth continuous temperature measurement and core temperature measurement.

Quality assessment / Risk of bias analysis Tools:
For randomized controlled trials, the Cochrane Risk of Bias Tool will be used. For prospective cohort studies, the QUADAS-2 (Quality Assessment of Diagnostic Accuracy Studies-2) tool will be applied to assess the risk of bias.
Process: Two reviewers will conduct data screening and extraction. This process includes selecting data from the databases, removing duplicates, screening studies based on titles and abstracts, and assessing full texts against the inclusion and exclusion criteria. Extracted data will be entered into a standardized form. Any discrepancies that cannot be resolved through discussion will be referred to a third experienced researcher for arbitration.
Handling bias: Studies identified as having a high risk of bias will either be excluded from the primary analysis or subjected to sensitivity analysis to evaluate their potential impact on the overall findings.

Strategy of data synthesis A quantitative synthesis will be conducted, focusing on the types of non-invasive temperature measurement techniques of interest. Additionally, a meta-analysis of the accuracy and precision levels of these techniques will be carried out.

Subgroup analysis Patients with fever; patients with hypothermia; adults; children.

Sensitivity analysis Assessment of publication bias: We will conduct the Begg test and/or the Deek test for publication bias to assess the potential impact of unpublished or missing studies on our results.
Handling of publication bias: To address potential publication bias and ensure the robustness of our results, we implemented the following strategies:
- Exclusion of high-risk studies: We excluded studies identified as having a high risk of bias and re-analyzed the data to assess the impact of these exclusions on our conclusions.
- Incorporation of unpublished data: We attempted to contact the authors of relevant studies to obtain unpublished data and included this information in our analysis to provide a more comprehensive view of the evidence.
By employing these strategies, we aimed to mitigate the potential influence of publication bias and ensure that our conclusions are based on a comprehensive and unbiased assessment of the available evidence.

Country(ies) involved Countries involved: China.
Institution: School of Medicine, University of Electronic Science and Technology of China.

Keywords Wireless Bluetooth Temperature Measurement; Core Temperature Monitoring; Surgical Patients; Accuracy and Precision.

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