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Medication errors with anesthetics in pediatric patients: A systematic review and meta-analysis

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Corresponding author:
Olga Morales-Ríos

magdalaqfb@yahoo.com.mx

Author Affiliation:
Hospital Infantil de México Federico Gómez/Universidad Nacional Autónoma de México.

Colín-Estrada, Y; Sánchez-Rodríguez, MA; Hernández-Galindo, MT; Castrejón-Delgado, L; Martínez-Rosas, WL; Mendoza-Núnez, VM; Viazcán-Sánchez, EL; Morales-Ríos, OM.

ADMINISTRATIVE INFORMATION

Support - None.

Review Stage at time of this submission - The review has not yet started.

Conflicts of interest - None declared.

INPLASY registration number: INPLASY202580047

Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 14 August 2025 and was last updated on 14 August 2025.

INTRODUCTION

Review question / Objective Medication errors during anesthesia represent significant risks, especially in the pediatric population, due to their unique physiological characteristics and dosage sensitivities. Understanding the prevalence and types of these errors is crucial to improving patient safety. This study aims to synthesize current knowledge on the most common medication errors involving anesthetics in pediatric patients through a systematic review and meta-analysis. The following question will be addressed: What are the most common medication errors with anesthetics in pediatric patients and their causes? A PEO strategy was used P: Pediatric patients undergoing anesthetic procedures. E: Anesthetic medications O: Medication errors.

Rationale Medication errors with anesthetic agents represent a significant concern in pediatric patients due to their unique physiological vulnerabilities and the complexity of dosing requirements. These errors can lead to serious adverse events, impacting patient safety and treatment outcomes. Various factors contribute to the occurrence of medication errors in this population, including the similarity of drug names, calculation errors in dosing, lack of standardized protocols, and inadequate training of healthcare personnel. Although multiple studies have investigated medication errors in anesthesia, findings vary widely due to differences in study design, settings, and definitions of errors. Moreover, some reviews exclude data from regional databases and gray literature, limiting the comprehensiveness of the evidence. A systematic synthesis that encompasses a broad range of sources is necessary to gain a deeper understanding of the prevalence, types, and causes of anesthetic medication errors in pediatric patients, thereby informing effective prevention strategies and enhancing clinical safety.

Condition being studied Medication errors involving anesthetic agents in pediatric patients represent a critical challenge for clinical safety due

to the unique physiological characteristics of this population, such as variable metabolism, dose sensitivity, and the necessity for precise calculations based on weight and age. These errors may occur during prescribing, preparation, administration, or monitoring of anesthetics, potentially leading to severe adverse events ranging from toxic reactions to inadequate anesthesia, thereby putting the patient's life at risk.
Despite increased awareness of these errors, the available information remains heterogeneous and fragmented because of differences in study designs, clinical settings, and criteria used to define and report errors. Moreover, many previous reviews do not include sources from regional databases or gray literature, limiting the comprehensive understanding of the problem.
It is essential to accurately clarify the prevalence, types, causes, and consequences of medication errors with anesthetic agents in the pediatric population. Additionally, evaluating current prevention and management strategies is necessary to strengthen patient safety. This systematic review and meta-analysis aim to synthesize the most current and comprehensive scientific evidence, integrating studies from diverse contexts to provide a solid foundation that guides clinical practice and health policy in pediatric anesthesia.

METHODS

Search strategy Search terms for PubMed, Scopus and Web of Science were: (("medication errors" OR "drug errors" OR "medication mistakes" OR "medical error" OR "inappropriate prescribing") AND (anesthetics OR anesthesia OR anaesthesia) AND (pediatrics OR children OR "child" OR "infant" OR "newborn" OR "pediatry" OR "paediatric")) for SciELO LILACS and Dialnet: errores de medicación OR seguridad AND anestesia AND pediátricos OR niños.

Participant or population Pediatric patients (<18 years) undergoing surgical procedures.

Intervention It will not apply.

Comparator It will not apply.

Study designs to be included Observational studies such as cohort, cross-sectional, and/or case-control studies.

Eligibility criteria This review will include observational studies of cross-sectional, cohort, and/or case-control designs involving pediatric patients under 18 years old. Only articles that report quantitative results concerning medication errors with anesthetic agents in pediatric patients will be considered. Publications in both English and Spanish will be included.

Information sources A systematic search will be performed of scientific data on six databases: PubMed, Web of Science, Scopus, SciELO, LILACS, and Dialnet.

Main outcome(s) Prevalence and types of medication errors with anesthetic agents, causes of these errors, and their clinical consequences in pediatric patients.

Additional outcome(s) None.

Data management For this review, studies will be assessed and selected according to predefined inclusion and exclusion criteria. Two reviewers will participate in the study selection to decide their inclusion. When a discrepancy arises, a third party will intervene.

Quality assessment / Risk of bias analysis New Castle-Ottawa bias risk tool will be used to assess quality.

Strategy of data synthesis A systematic review chart will be elaborated, considering the elements of the achromic PEO. Software MedCalc V. 23.0.2 will be used to create the possibility to carry out a meta-analysis and a model of random effects to estimate the effect size.

Subgroup analysis None.

Sensitivity analysis None.

Language restriction They will only be considered for inclusion studies published in English and Spanish.

Country(ies) involved Mexico.

Keywords Medication errors; anesthetics; pediatric patients.

Contributions of each author
Author 1 - Yessica Colín-Estrada.
Author 2 - Martha Asunción Sánchez-Rodríguez.
Author 3 - María Teresa Hernández-Galindo.
Author 4 - Lizett Castrejón-Delgado.
Author 5 - Wendolyne Leticia Martínez-Rosas.
Author 6 - Víctor Manuel Mendoza-Núnez.
Author 7 - Esthela de la Luz Viazcán-Sánchez.
Author 8 - Olga Magdala Morales-Ríos.