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**ADMINISTRATIVE INFORMATION**

**Support -** No funding.

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

**Conflicts of interest -** None declared.

**INPLASY registration number:** INPLASY2025120019

**Amendments -** This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 6 December 2025 and was last updated on 6 December 2025.

**INTRODUCTION**

**Review question / Objective** Acute kidney injury (AKI) is a common complication following cardiac surgery, associated with increased morbidity and mortality. Dexmedetomidine (DEX), a selective  $\alpha_2$ -adrenergic agonist, has shown potential renal protective effects, but evidence remains inconsistent. This study aims to evaluate the efficacy of DEX in preventing AKI and improving renal outcomes in cardiac surgery patients through a systematic review and meta-analysis of randomized controlled trials (RCTs).

**Condition being studied** Dexmedetomidine, Acute Kidney Injury, Renal Outcomes, Cardiac Surgery.

**METHODS**

**Search strategy** #1: ((Dexmedetomidine Hydrochloride [Title/Abstract]) OR (Hydrochloride,

Dexmedetomidine [Title/Abstract])) OR ("Dexmedetomidine"[Mesh])  
#2: (((("Cardiac Surgical Procedures"[Mesh]) OR (Heart Surgical Procedure [Title/Abstract])) OR (Heart Surgical Procedures [Title/Abstract])) OR (Cardiac Surgical Procedure [Title/Abstract])) OR (Cardiac Surgery [Title/Abstract])) OR (Heart Surgery [Title/Abstract])  
#3: #1 AND #2  
#4: (((((((("Acute Kidney Injury"[Mesh]) OR (Acute Kidney Injuries[Title/Abstract])) OR (Acute Renal Injury[Title/Abstract])) OR (Acute Renal Injuries[Title/Abstract])) OR (Acute Kidney Failures[Title/Abstract])) OR (Acute Kidney Failure[Title/Abstract])) OR (Acute Renal Failure[Title/Abstract])) OR (Acute Renal Failures[Title/Abstract])) OR (Acute Renal Insufficiencies[Title/Abstract])) OR (Acute Kidney Insufficiency[Title/Abstract])) OR (Acute Renal Insufficiency[Title/Abstract])) OR (Acute Kidney Insufficiencies[Title/Abstract])  
#5: #3 AND #4.

**Participant or population** Patients undergoing cardiac surgery.

**Intervention** Patients undergoing cardiac surgery received DEX.

**Comparator** Patients undergoing cardiac surgery received placebo, or normal saline.

**Study designs to be included** Only RCTs with complete data were included.

**Eligibility criteria** For the meta-analysis, the inclusion criteria for the current review were as follows: (1) the articles had to be published in English and be full-length articles; (2) case reports, protocols, letters, reviews and meta-analyses, conference abstracts, ongoing study and observational studies were excluded; (3) only RCTs with complete data were included. (4) the intervention arm had to investigate the use of DEX on AKI in cardiac surgery; (5) the control arm had to involve a placebo, or normal saline; and (6) the outcomes had to include the renal function outcome, or the incidence of AKI.

**Information sources** A comprehensive literature search was performed across multiple electronic databases, including PubMed, Cochrane Library, Embase, and Web of Science, from inception until April 2025.

**Main outcome(s)** The primary outcome was defined as the incidence of AKI according to different classification and creatinine clearance rates after surgery. The secondary outcomes included: patient demographics (age, comorbidities: diabetes mellitus, hypertension); intraoperative parameters (surgery duration, aortic cross-clamp time, CPB time); postoperative outcomes (ICU stay, mechanical ventilation duration, hospital stay, complications: bradycardia, hypotension, mortality).

**Quality assessment / Risk of bias analysis** The Cochrane Risk of Bias Tool (RoB 2) was applied to evaluate bias across five domains: randomization process, deviations from intended interventions, missing outcome data, measurement of the outcome, and selection of the reported result.

**Strategy of data synthesis** The primary outcome was the incidence of AKI, analyzed as risk ratios (RR) with 95% confidence intervals (CI) using a random-effects model (Mantel-Haenszel statistical method). For this continuous data, we calculated the mean difference (MD) with the corresponding 95% CI using a random-effects model. Results

initially presented as medians and interquartile ranges (IQR) were transformed to means and SDs using the formula described by Hozo et al.. Assessed via  $I^2$  statistic (threshold:  $>50\%$  = random-effects;  $\leq 50\%$  = fixed-effects).

**Subgroup analysis** Subgroup analyses were conducted to explore heterogeneity (e.g., DEX dosing regimens).

**Sensitivity analysis** Sensitivity analysis was performed with leave-one-out method.

**Country(ies) involved** China.

**Keywords** Dexmedetomidine, Acute Kidney Injury, Renal Outcomes, Cardiac Surgery, Meta-Analysis.

#### **Contributions of each author**

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