

# INPLASY

## Association between arterial carbon dioxide tension and poor outcomes after cardiac arrest: A meta-analysis of randomized controlled trials and cohort studies

INPLASY2024100120

doi: 10.37766/inplasy2024.10.0120

Received: 28 October 2024

Published: 28 October 2024

Xue, RT; Sun, RH; Wang, M; Guo, H; Chang, J.

### Corresponding author:

Hao Guo

xyzgmm@163.com

### Author Affiliation:

Department of Anesthesiology,  
Department of Anesthesiology,  
Renmin Hospital, Hubei University  
of Medicine.

### ADMINISTRATIVE INFORMATION

**Support** - None.

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

**Conflicts of interest** - None declared.

**INPLASY registration number:** INPLASY2024100120

**Amendments** - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 28 October 2024 and was last updated on 3 January 2025.

### INTRODUCTION

**Review question / Objective** We performed a meta-analysis to evaluate whether hypocapnia or hypercapnia is associated with an increased risk of hospital mortality and poor neurological outcomes in adult patients with CA.

**Condition being studied** Arterial carbon dioxide tension (PaCO<sub>2</sub>) abnormalities are common after cardiac arrest (CA). PaCO<sub>2</sub> is a regulator of cerebral blood flow after brain injury and has become a subject of great concern for CA prognosis. Although CA guidelines advocate the maintenance of PaCO<sub>2</sub> at 35 to 45mm Hg after spontaneous circulatory recovery (ROSC), there is conflicting evidence regarding PaCO<sub>2</sub> after CA and its association with clinical outcomes.

### METHODS

**Search strategy** A systematic literature search was conducted up to October 1, 2024, on

PubMed, Embase, and the Cochrane Library databases without language limitations. The search terms used were as follows: MeSH in PubMed, Emtree in Embase, and keywords in Cochrane Library.

**Participant or population** Adult patients suffered an in-hospital cardiac arrest(IHCA) or out-of-hospital(OHCA).

**Intervention** Exposure: PaCO<sub>2</sub>.

**Comparator** hypocapnia versus normalcapnia; hypercapnia versus normalcapnia.

**Study designs to be included** Prospective or retrospective cohort study with adjusted model or randomized controlled trials (RCT).

**Eligibility criteria** (1) populations: adult patients with an in-hospital (IHCA) or out-of-hospital CA (OHCA). (2) exposure: PaCO<sub>2</sub>; (3) comparison: low PaCO<sub>2</sub> (hypocapnia) or high PaCO<sub>2</sub> (hypercapnia) vs. normal PaCO<sub>2</sub> (normocapnia). The individual

---

study was used to define the cut-points for hypocapnia and hypercapnia; (4) outcomes: hospital mortality and/or poor neurological outcome at the longest follow-up; and (5) study design: prospective or retrospective cohort study with adjusted model or randomized controlled trials (RCT).

**Information sources** PubMed, Embase, and the Cochrane Library databases.

**Main outcome(s)** hospital mortality.

**Quality assessment / Risk of bias analysis** The quality of the included cohort studies was assessed using the Newcastle–Ottawa scale. The Cochrane Risk of Bias Tool was used to assess the risk of bias for RCTs.

**Strategy of data synthesis** The meta-analyses were performed by computing odds ratios (ORs) with 95% CIs for hospital mortality and poor neurological outcome using a random-effects model, accounting for clinical heterogeneity. Heterogeneity across studies was assessed by using the Q statistic with its P value and I<sup>2</sup> statistic.

**Subgroup analysis** Study design: (PC versus RC); Sample size (1000); CA setting; (IHCA versus OHCA versus both); ECOM (yes vs. no), and PaCO<sub>2</sub> definition (45 vs. others).

**Sensitivity analysis** Excluding one study to test the robustness of the result.

**Country(ies) involved** China.

**Keywords** hypocapnia; hypercapnia; hospital mortality; neurological outcome.

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

Author 1 - Ru Ting Xue.

Email: 547304441@qq.com

Author 2 - Ran-Hong Sun.

Email: 745219404@qq.com

Author 3 - Min Wang.

Email: 442138889@qq.com

Author 4 - Hao Guo.

Email: xyzgmm@163.com

Author 5 - Jie Chang.

Email: 306146030@qq.com