International Platform of Registered Systematic Review and Meta-analysis Protocols

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

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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 11 November 2024.

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 (PaCO2) abnormalities are common after cardiac arrest (CA). PaCO2 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 PaCO2 at 35 to 45mm Hg after spontaneous circulatory recovery (ROSC), there is conflicting evidence regarding PaCO2 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: PaCO2.

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: PaCO2; (3) comparison: low PaCO2 (hypocapnia) or high PaCO2 (hypercapnia) vs. normal PaCO2 (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 and Embase.

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 I2 statistic.

Subgroup analysis Study design: (PC versus RC); Sample size (1000); CA setting; (IHCA versus OHCA versus both); ECOM (yes vs. no), and PaCO2 definition (45 vs. others).

Sensitivity analysis Excluding one study to text the robust of the result.

Country(ies) involved China.

Keywords hypocapnia; hypercapnia; hospital mortality; neurological outcome.

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