Critical Care

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Comparison of mechanical versus manual cardiopulmonary resuscitation in cardiac arrest

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To the editor

We read with great interest the article by El-Menyar et al., titled "Mechanical versus manual cardiopulmonary resuscitation (CPR): an umbrella review of contemporary systematic reviews and more", recently published in *Critical Care* [1]. The findings from the umbrella review and the new systematic review in this study suggest that mechanical CPR is not superior to manual CPR in achieving return of spontaneous circulation (ROSC).

Although this article offers valuable insights, several issues warrant further discussion and clarification. In Fig. 2's Forest plot for ROSC from El-Menyar et al.'s article, we observed some issues with the study selection. The umbrella meta-analysis included duplicated studies [2, 3] and studies with no ROSC-related data upon our detailed review [4, 5]. Additionally, the inclusion of just the abstracts from three studies [6, 7, 8] could potentially limit the robustness of the findings. Moreover, when replicating the authors' search strategy, we identified a missing randomized controlled trial (RCT) comparing mechanical and manual CPR in in-hospital cardiac arrest (IHCA) settings [9].

We consolidated studies from the umbrella review and the new systematic review, excluding improperly included studies and adding the newly identified RCT. Using Stata Version 16.0 (StataCorp, College Station, TX), we conducted subgroup analyses for out-of-hospital cardiac arrest (OHCA) and IHCA patients across RCTs and non-RCTs. For OHCA patients, mechanical CPR did not improve ROSC rates in either study type. However, the IHCA outcomes varied by study type: RCTs showed a higher probability of ROSC with mechanical CPR, whereas non-RCTs indicated a reduced likelihood of achieving ROSC (Figs. 1 and 2).

While our analysis supports the finding that mechanical CPR does not improve ROSC rates in OHCA settings, as highlighted in the meta-analysis by El-Menyar et al., the variable results for IHCA indicate a need for further investigation. In particular, the discrepancies between RCTs and non-RCTs in IHCA settings imply underlying differences that could influence CPR outcomes. These differences may include variations in patient characteristics, response times, and hospital settings. Additionally, limitations in study design, such as selection biases commonly seen in observational studies, could also be contributing factors. Further large-scale RCTs are required to determine the effectiveness of mechanical versus manual CPR in improving patient outcomes during cardiac arrest.

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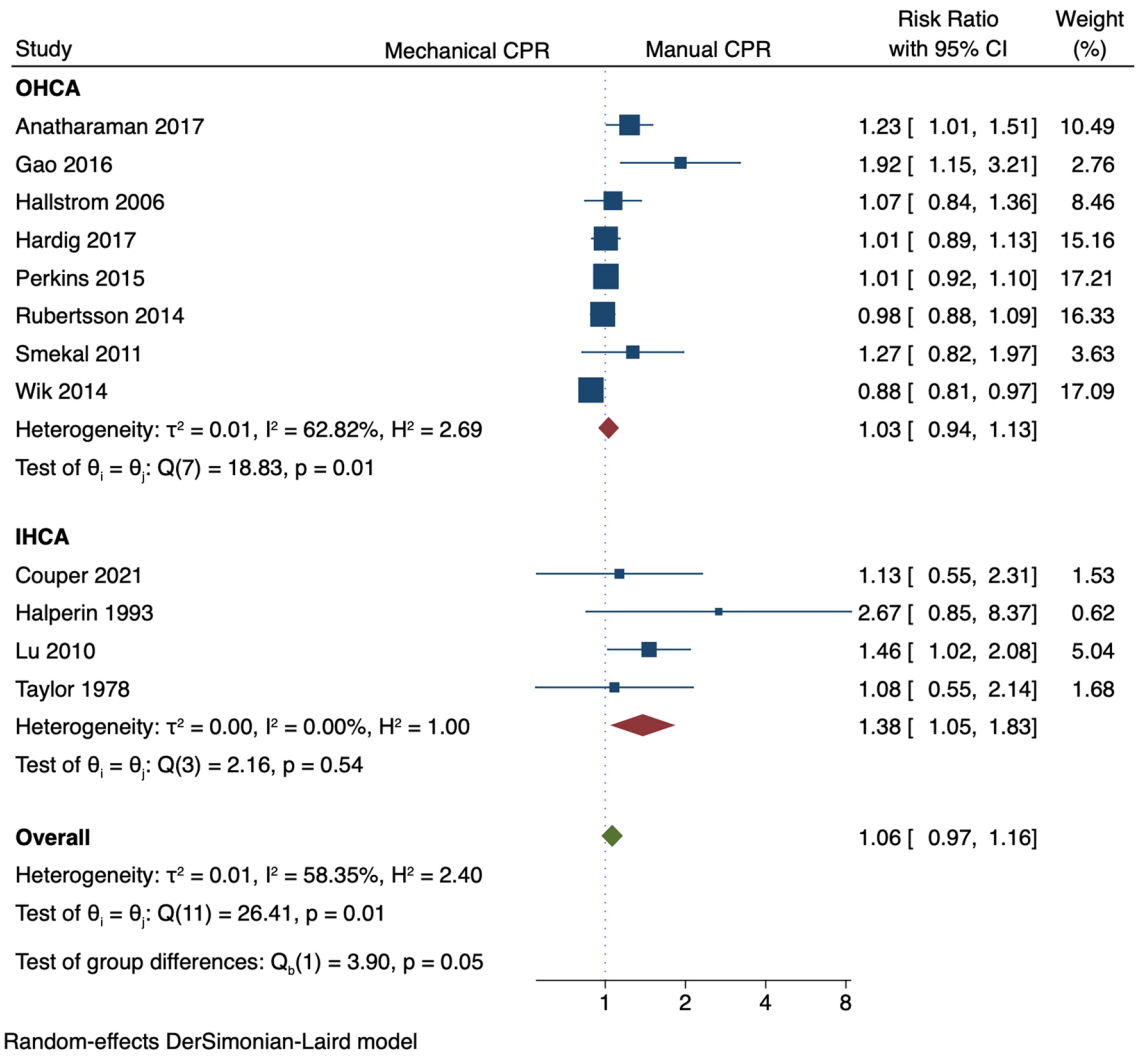

Fig. 1 Forest plot of ROSC in mechanical CPR versus manual CPR in RCTs. ROSC, return of spontaneous circulation; CPR, cardiopulmonary resuscitation; OHCA, out-of-hospital cardiac arrest; IHCA, in-hospital cardiac arrest; RCT, randomized controlled trial; CI, confidence interval

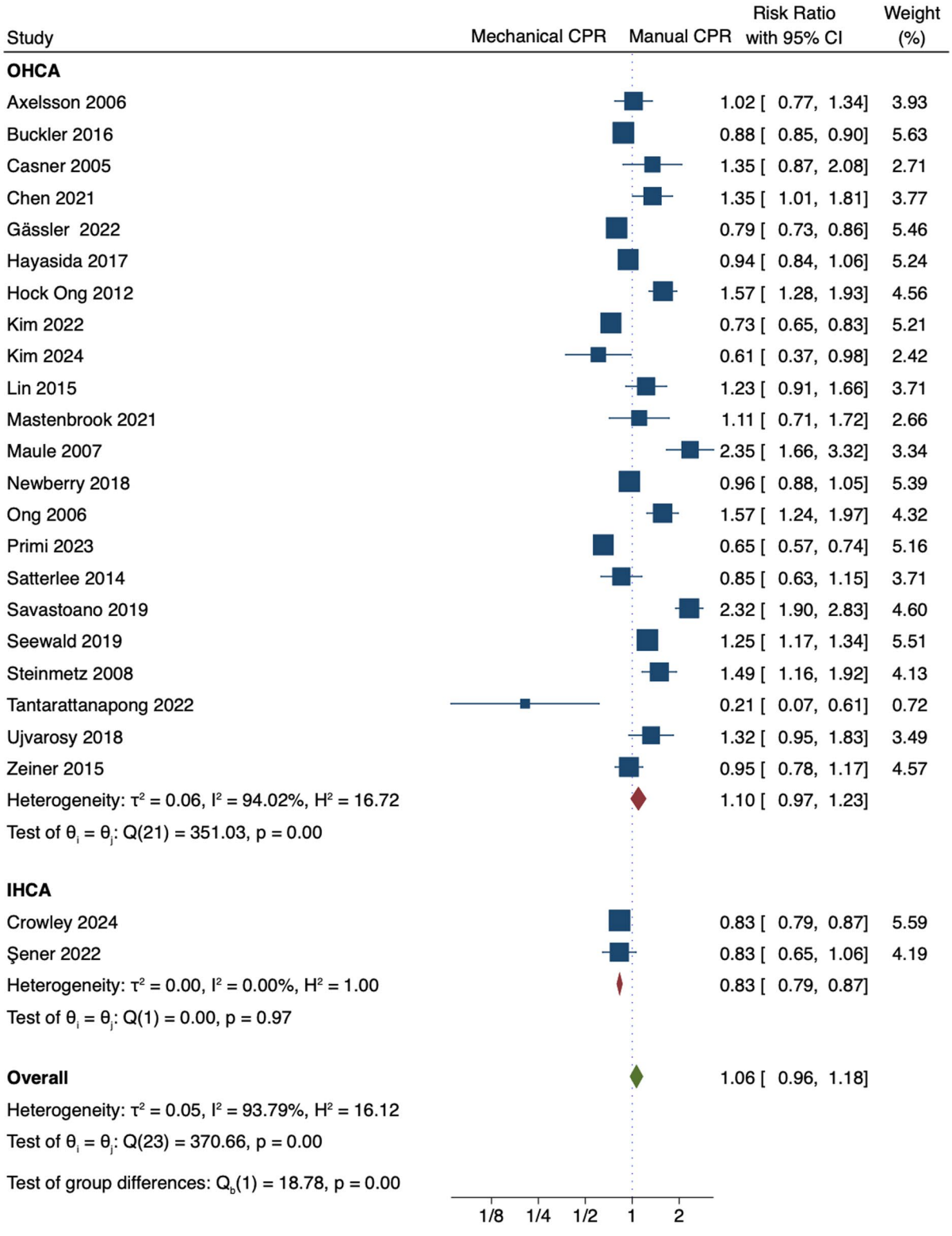

Fig. 2 Forest plot of ROSC in mechanical CPR versus manual CPR in non-RCTs. ROSC, return of spontaneous circulation; CPR, cardiopulmonary resuscitation; OHCA, out-of-hospital cardiac arrest; IHCA, in-hospital cardiac arrest; RCT, randomized controlled trial; CI, confidence interval

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Author contributions
YZ and QW were responsible for literature research, data extraction, and figure production. DC was responsible for supervision. All the authors participated in the draft writing, review, and editing.

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Data availability
No datasets were generated or analysed during the current study.

Declarations

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Ethical approval and consent to participate
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