Author’s response to reviews

Title: ROSC rates and live discharge rates after cardiopulmonary resuscitation by different CPR teams - a retrospective cohort study

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Author’s response to reviews:

We thank the reviewers for the many helpful suggestions. We have carefully reviewed all comments, and revised the manuscript accordingly. Detailed point-by-point responses are provided below, and changes in the manuscript are shown in blue font.

Reviewer 1 (Quintin Quinones):

In "Differences in patient outcomes for cardiopulmonary resuscitation performed by rapid response, resident, and emergency teams" the authors seek to answer the clinically important question of whether the use of a dedicated Rapid Response Team (RRT) results in superior outcomes than resident or emergency room (ER) teams when responding to cardiac arrest. Retrospective chart review was used to compare the outcomes of the three groups. The RRT group responds to in hospital cardiac arrest M-F 7a-10p and Sat 7a-midnight. The resident team covers in hospital cardiac arrests M-f 10p-7a and Sat midnight to 7a and all day Sunday. The ER team covers all cardiac arrest in the ER as well as the out of hospital cardiac arrest at all hours. Patients in these different groups are comparable based on age, sex, and Charleson Comorbidity Index is similar among the groups.
Odds ratios for ROSC are reported as 0.59 and 0.71 for the resident and RRT groups respectively. Based on this data the authors conclude that the hospital should be staffed with a dedicated RRT at all times.

Unfortunately the authors are unable to control for the fact that the resident team operates at night and on the weekends when the hospital is often minimally staffed. The difference in outcomes could simply be due to a difference in how quickly cardiac arrest is identified and the resident team is notified at night vs. how the hospital functions during daylight hours. The authors simply do not have the data to draw their conclusion based on the data in this study. Such a bold statement would require a comparison between outcomes of the RRT and resident code team during similar hours and a similar environment.

Response: We agree with the reviewer's observation; we acknowledge that we were unable to control for the fact that the resident team operates at night and on the weekends, while the rapid response (RR) team works during daytime. However, we have now emphasized this caveat and highlighted some of the pertinent points in the discussion and methods sections, respectively (lines 206-212 and 106-113). While there is a difference in the operating schedules between the two CPR teams, both the teams were activated by the same broadcasting system during the night and day. Further, as previously published (Kim et al, Critical Care Medicine, 2017), the number of doctors and nurses participating in each CPR team were similar. Furthermore, considering the similar nurse-to-patient ratios during the daytime and nighttime in SNUBH, it is unlikely that the occurrence of sudden cardiopulmonary arrests in patients was detected late during the nighttime.

I agree that attending physician involvement in cardiopulmonary resuscitation would likely show a higher rate of ROSC than a resident run service. However, to be able to draw this conclusion the study must compare how the two teams function during similar time of day in the hospital.

Strengths:

1. Interesting and highly relevant clinical question

2. Patients well matched between groups by age, sex, and comorbidity
Weaknesses:

1. While patients are matched the clinical environment is very different on nights and weekends.

2. Nursing, monitoring, and the time to recognize and report cardiac arrest is not accounted for

3. Differences in availability of equipment or other support staff day to night is not accounted for

4. The authors conclusion that a 24 hour RRT team is required is not well supported by their data.

Response: We have now provided a detailed description, in the methods section, on how the CPR teams are activated (involving a uniform system for reporting cardiac arrests) in SNUBH (lines 106-113). In the discussion, we also highlight the presence of similar nurse-to-patient ratios both during day and night time, suggesting that late detection and reporting of cardiac arrests at nighttime is unlikely to occur (lines 209-212).

Proofreading:

1. Several items are misspelled in table 1: Defibrillation, endotracheal, Charlson, and intubation

Response: We have now corrected the misspelled words and edited the manuscript thoroughly to improve readability.
Reviewer 2 (Claudius Balzer):

This is a review of BANE-D-17-00314 entitled: "Differences in patient outcomes for cardiopulmonary resuscitation performed by rapid response, resident, and emergency teams" by Tak Kyu Oh et al. In this manuscript, the authors examined the outcome of patients after cardiac arrest and resuscitation performed by three different teams in- and out-of-hospital. Results show that resuscitation by groups with more work experience causes a higher rate of ROSC, while long term survival is not related to quality of team performances.

The authors have collected and analyzed a large data set; however, interpretation of their work needs to be improved. My greatest concern is the inclusion of out-of-hospital cardiac arrests. Due to a completely different setting, with limited availability of all necessary resources, the outcome in relation to team performance should not be compared to in-hospital cardiac arrests. This can be seen in Table 1, showing a lower number on defibrillation and advanced airway attempts compared to in-hospital cardiac arrests. Even though this was mentioned in the limitations, it may have a statistically significant influence.

Response: The reviewer raises an important point. We agree with the reviewer that due to a completely different setting, with limited availability of all necessary resources, the outcomes of CPR for out-of-hospital cardiac arrest cases in relation to team performance should not be compared to those of in-hospital cardiac arrests. Nevertheless, we think that this comparison provides valuable information, particularly because out-of-hospital cardiac arrests are generally known to have a much worse prognosis than in-hospital cardiac arrests. In this regard, it is interesting to note that the initial outcome of CPR (rate of ROSC) for the out-of-hospital cardiac arrests performed by the EM team does not differ, after adjustment of age, sex, and comorbidity, from that for the in-hospital cardiac arrests performed by the RR team. This will be important information to report, demonstrating how efficient the EM team is in providing CPR to out-of-hospital cardiac arrest cases in a good system.

We have now highlighted all these points in the discussion section (lines 224-237). While a fair comparison of outcomes is not possible between CPR administered in in-hospital and out-of-hospital cardiac arrest cases, our study is the first to report that the initial outcome of CPR for the out-of-hospital cardiac arrests performed by the EM team, along with the Emergency Medical Service (EMS) system is not different from the initial outcome of CPR for the in-hospital cardiac arrests performed by the RR team.
Further comments:

- Methods: May want to provide a hypothesis with a post-hoc power analysis.

Response: As requested by the reviewer, we have now added a post-hoc power analysis in the Methods section (lines 146-148).

- Results: Tables are confusing because of missing units or unclear definitions of "yes" and "no".

Response: We have now edited the tables to improve readability by adding the missing units.

- Conclusion: The authors should discuss, why they recommend better training because of higher ROSC rates, even if the live discharge rate is not improved. May want to use an alternative title: "Experienced teams improve ROSC rate, but not live discharge rate of patients after cardiac arrest and resuscitation".

Response: As suggested by the reviewer, we have now changed the title of this article as follows: "Experienced CPR teams improve ROSC rate but not live discharge rate among patients resuscitated from cardio-pulmonary arrest."

At the least, the authors should send this manuscript to an expert in English editing and academic writing. There are numerous errors in sentence structure, missing commas, redundant words, and many spelling mistakes (e.g. Table 1).

I feel there are interesting findings here, worthy of publication, but considerable revision is required.

Response: We have now thoroughly edited the manuscript to correct grammatical errors and improve readability.