The influence of Pediatric Cardiopulmonary Resuscitation (CPR) Coach in the quality of CPR from resuscitation teams

Source: Cheng A, Duff JP, Kessler D, Tofil NM, Davidson J, Lin Y, Chatfield J, Brown LL, Hunt EA, Nye M, Gaither S, Collier H, MacKinnon L, Lowe K, Lambert V. Optimizing CPR Performance with CPR Coaching for Pediatric Cardiac Arrest: A Randomized Simulation-based Clinical Trial. Resuscitation (2018).

Survival rates from pediatric cardiopulmonary arrest (CPA) are still poor. Despite high-quality cardiopulmonary resuscitation (CPR) improves survival and neurological outcomes, the adherence to guidelines is low. The use of CPR feedback defibrillators provides real-time feedback on rate and depth of chest compressions (CC) and measures time with and without CC. The use of these devices enhanced the quality of CPR in simulated CPA compared to the control[1], but one multicenter trial showed that teams that used the visual feedback device improved their adherence to guidelines, but still had <40% compliance for chest compressions depth[2]. The aim of the article from Cheng et al. was to determine if integrating a trained CPR Coach within the resuscitation team in an attempt to help teams translate visual feedback from the CPR feedback defibrillator and optimize CPR delivery with CC improvement during simulated CPA. The CPR Coach also could allow the team leader to focus on advanced life support and treating reversible causes.

They conducted a prospective, multicenter, randomized controlled trial approved by Research Ethics Board, recruited participants and allocated randomly from Pediatric Intensive Care Unit and/or Emergency Departments from two American and two Canadian hospitals. Pediatric health care providers were recruited into teams of five: a team leader, an airway provider, two CPR providers (classical resuscitation team) and either a bedside provider or a CPR Coach depending on the study arm, respectively control group and intervention group.

The participants completed a demographic questionnaire and each resuscitation team participated in an 18-minute pediatric CPA scenario (i.e. hyperkalemic CPA with progression from pulseless ventricular tachycardia - ventricular fibrillation - pulseless electrical activity) with CPR quality parameters collected from a feedback defibrillator using identical pediatric manikins. All participants watched a five-minute orientation video describing how to use the CPR feedback defibrillator and the intervention group viewed an additional one-minute video describing the CPR Coach concept. CPR Coaches were trained with training video and simulation 48 hours prior to the CPA scenario in a standardized fashion by one-hour.

Coaches were instructed to point at the CPR feedback output on the defibrillator; give corrective or positive feedback as necessary; coordinate the appropriate compression: ventilation ratio prior to intubation and key tasks to reduce pause duration; remind CPR providers to deliver continuous compressions during intubation attempt or defibrillator charging.

As results, 42 teams (205 participants) were recruited in almost one year. One team was excluded from the study due to a violation of study protocol. The analyses included data from 40 teams (200 participants, 720 one-minute CPR epochs) and were performed with a significant level of 0,05. Demographic data revealed no significant differences between groups with and without CPR Coach at baseline using descriptive statistics. Independent t-tests were conducted to explore the effect of intervention between groups with and without CPR Coach.

Integrating a CPR Coach resulted in a significant improvement versus control group using confidence interval (CI) of 95% in the primary outcome of percentage of overall excellent CPR [63.3 (53.3, 73.3) vs. 31.5 (21.5, 41.5), p<0.001], also in the secondary outcomes: percentage of CC meeting guidelines for depth [69.5 (58.3, 80.7) vs. 38.0 (26.8, 49.2), p<0.001], mean compression depth [52.3 (50.2, 54.4) vs. 47.7 (45.7, 49.9), p<0.001], chest compression fraction (%) [81.9 (78.7, 85.1) vs. 76.5 (72.2,80.8), p = 0.04].

The pause durations pre-shock, peri-shock and post-shock in Resuscitation teams were shorter with CPR Coach versus control group using CI 95% with p<0.05, just the pauses durations peri-shock exceeds 10 seconds in part of control group [9,4 (6.7,12.0)] versus CPR Coach group [5.5 (4.7,6.4)]. There was an improvement not statistically significant in percentage of CC meeting guidelines for rate in Resuscitation teams with Coach versus without Coach [88.0 (81.6, 94.4) vs. 79.5 (73.1, 85.9), p=0.07]. There was no significant difference between groups for mean CC rate.

Commentary by: Renata Carneiro da Cruz.
Faculty of Medicine of Federal University of Rio de Janeiro.

The study has the merit of being one of the few that evaluates the impact of using CPR coaching in Resuscitation Teams with the use of CPR feedback defibrillator. The study had a great number of participants in the sample and showed significant improvement in CPR quality during simulated CPA in Resuscitation team with CPR Coach versus control group.

It has some limitations pointed by the authors that evaluated just one simulated CPA scenario and implementing CPR coaching in the hospitals would need human resource implications, but they suggest reallocation of existing resources.

In Brazil, CPR feedback defibrillator is available in few hospitals. The European Resuscitation Guidelines1,2mention that the effect of CPR feedback or prompt devices has been studied in two randomized trials and 11 observational studies. However just one study demonstrated a significant higher ROSC rate in patients where feedback and the methodology of this study was not clear, because feedback was activated at the discretion of the physician and there was no details of the decision-making process to activate or not the feedback. We need more studies to evaluate if the use of CPR feedback defibrillator and CPR Coaches can improve survival outcomes in CPA and also their cost-benefit.

References

1. Raper J, Alvarado MC, Murphy KL, Baxter MG. Multiple anesthetic exposure in infant monkeys alters emotional reactivity to an acute stressor. Anesthesiology 2015; 123:1084–1092.

2. Coleman K, Robertson ND, Dissen GA, et al. Isoflurane anesthesia has longterm consequences on motor and behavioral development in infant rhesus macaques. Anesthesiology 2017; 126:74–84.