CPR : Chest Compression to Ventilation Ratio-Adult

Citation

Olasgavengen T, Mancini MB, Berg, RA, Brooks S, Castren M, Chung SP, Considine J, Escalante R, Gazmuri R, Hatanaka T, Koster R, Kudenchuk P, Lim SH, Lofgren B, Nation K, Nishiyma C, Perkins GD, Ristagno G, Sakamoto T, Sayre, M, Sierra A, Smyth M, Stanton D, Travers A, Valliancourt C, Morley JP, Nolan,J. CPR: Chest Compression to Ventilation Ratio-Adult Consensus on Science and Treatment Recommendation [Internet]. Brussels, Belgium: International Liaison Committee on Resuscitation (ILCOR), Basic Life Support Task Force, 2017 July 30. Available from: http://www.ilcor.org

CPR: Compression to Ventilation PICOST

The PICOST (Population, Intervention, Comparator, Outcome, Study Designs and Timeframe)
Population: Patients of all ages (i.e., neonates, children, adults) with cardiac arrest from any cause and across all settings (in-hospital and outof-hospital). Studies that included animals were not eligible. Intervention: All manual CPR methods including Compression-only CPR (CO-CPR), Continuous Compression CPR (CC-CPR), and CPR with different compression-to-ventilation ratios. CO-CPR included compression with no ventilations, while CC-CPR included compression with asynchronous ventilations or minimally-interrupted cardiac resuscitation (MICR) Studies that mentioned the use of a mechanical device during CPR were only considered if the same device was used across all relevant intervention arms and would therefore not confound the observed effect.
Comparators: Studies had to compare at least two different CPR methods from the eligible interventions; studies without a comparator were excluded.
Outcomes: The primary outcome was favorable neurological outcomes, measured by cerebral performance or a modified Rankin Score. Secondary outcomes were survival, ROSC, and quality of life.
Study designs: Randomised controlled trials (RCTs) and non-randomised studies (non-randomised controlled trials, interrupted time series, controlled before-and-after studies, cohort studies) were eligible for inclusion. Study designs without a comparator group (e.g., case series, cross-sectional studies), reviews, and pooled analyses were excluded.
Timeframe: Published studies in English searched on January 15, 2016

For the critical outcome of favorable neurological function, we identified very low quality evidence from two cohort studies (Olasveengen 2009 407, Kudenchuk 2012 1787). In a meta-analysis of these studies patients who received 30:2 CPR had improved favorable neurological function of RR 1.34 (1.02, 1.76); RD 1.72 (0.52, 2.91)) when compared to 15:2 CPR. The quality of evidence was downgraded for serious indirectness.

For the critical outcome of survival, we identified very low quality evidence from seven cohort studies (Steinmetz 2008 908, Garza 2009 2597, Olasveengen 2009 407, Sayre 2009 469, Robinson 2010 1648, Deasy 2011 984, Kudenchuk 2012 1787). In meta-analysis of six cohort studies (Steinmetz 2008 908, Olasveengen 2009 407, Sayre 2009 469, Robinson 2010 1648, Deasy 2011 984, Kudenchuk 2012 1787) patients who received 30:2 CPR had improved survival

(RR 1.37 (1.19, 1.59); RD 2.48 (1.57, 3.38)) when compared to 15:2 CPR. The quality of evidence was downgraded for serious indirectness. In unadjusted analysis of crude data from one cohort study (Garza 2009 2597) patients who received 50:2 CPR had improved survival (RR 1.96 (1.28-2.99); RD 21.48 (6.90, 36.06)) when compared to 15:2 CPR. The quality of evidence was downgraded for serious risk of bias and indirectness.

For the critical outcomes of return of spontaneous circulation, we identified very low quality evidence from nine cohort studies (Hostler 2007, Bobrow 2008 1158, Steinmetz 2008 908, Garza 2009 2597, Olasveengen 2009 407, Sayre 2009 469, Robinson 2010 1648, Deasy 2011 984, Kudenchuk 2012 1787). In a meta-analysis of seven cohort studies (Hostler 2007, Steinmetz 2008 908, Olasveengen 2009 407, Sayre 2009 469, Robinson 2010 1648, Deasy 2011 984, Kudenchuk 2012 1787) patients who received 30:2 CPR had a slightly higher return of spontaneous circulation (RR 1.11 (1.00, 1.23); RD 10.48 (0.41, 20.55)) when compared to those who received 15:2 CPR. The quality of evidence was downgraded for serious risk of bias, inconsistency and indirectness. In unadjusted analysis of crude data from one cohort study (Garza 2009 2597) patients who received 50:2 CPR had increased return of spontaneous circulation (RR 1.58 (1.17, 2.13); RD 21.89 (6.88, 36.90)) when compared to those who received 15:2 CPR. The quality of evidence was downgraded for serious risk of bias and indirectness.

Treatment recommendations

We suggest a compression–ventilation ratio of 30:2 compared with any other compression–ventilation ratio in patients with cardiac arrest (weak recommendation, very low-quality evidence).

Values and Preferences

In making this recommendation, we placed a high priority on consistency with our 2005, 2010, and 2015 treatment recommendations and the findings identified in this review, which suggest that the bundle of care (which included changing to a compression to ventilation ratio of 30:2 from 15:2) resulted in more lives being saved. We note that there would likely be substantial resource implications (e.g., reprogramming, retraining) associated with a change in recommendation, and an absence of any data addressing our critical outcomes to suggest our current recommendation should be changed.

Knowledge gaps

Current knowledge gaps include but are not limited to:

- True effect 30:2 versus 15:2 without any other concurrent changes in practice.
- Possible benefit of longer compression to ventilation ratios, more compressions per ventilations.
- The ability of CPR providers to deliver two effective ventilations during the short allotted pause in chest compressions during CPR.

Is there a ratio-dependent critical volume of air movement required to maintain