Comparison of Bystander Fatigue and CPR Quality when Using Continuous Chest Compressions Versus 30:2 Compressions to Ventilations: A Randomized Cross-over Trial

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Background
- Out-of-hospital Cardiac Arrest (OOHCA) is the number one cause of death in Canada
- Cardiopulmonary Resuscitation (CPR) increases OOHCA survival 3 to 4 times
- Bystanders often hesitate to initiate CPR because of its mouth-to-mouth component
- Resuscitation Guidelines changed from 30:2 compressions to ventilations ratio (2005) to continuous chest compressions (CCC, 2010)
- Meant to increase bystander CPR rates and minimize compression interruptions
- Effect of CCC on CPR quality and bystander fatigue is unknown
- People 55 and older are the group most susceptible to perform CPR on a real victim

Objectives
- To compare bystander fatigue and CPR quality after 5 minutes of CPR using CCC versus 30:2 in a population aged ≥ 55

Methods
- Randomized cross-over trial with participants aged ≥ 55, Clinical Frailty Score (CFS) ≤ 3, and no physical limitation or disease limiting CPR
- Recruitment at 3 campuses of The Ottawa Hospital and the Kanata Seniors’ Centre
- After a practice session, participants completed two 5-minute CPR sessions on an Actar manikin (using 30:2 ratio, and CCC) – we used concealed blocked random assignment
- Participants allowed to rest after practice session and between CPR sessions
- Bystander fatigue measures: Validated Borg scale of perceived exertion, heart rate (HR), and mean arterial pressure (MAP) before and after each CPR session; also completed a survey
- CPR quality measures: No. of compressions/min and no. of compressions with adequate depth (measured by Zoll R-series Cardiac Monitor)
- Desired sample size = 60
- Received institutional ethics approval

Paired T-test Comparisons Between 30:2 and CCC (N=63)

<table>
<thead>
<tr>
<th>Participant Fatigue After CPR sessions</th>
<th>30:2</th>
<th>CCC</th>
<th>Mean difference</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Borg Scale*</td>
<td>11.0</td>
<td>11.5</td>
<td>0.5</td>
<td>0.1 - 0.9</td>
</tr>
<tr>
<td>MAP*</td>
<td>107.3</td>
<td>110.3</td>
<td>3.0</td>
<td>-6.6 - 6.7</td>
</tr>
<tr>
<td>HR*</td>
<td>82.9</td>
<td>82.3</td>
<td>-0.6</td>
<td>-3.5 - 2.3</td>
</tr>
<tr>
<td>CPR Quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CC’s / min</td>
<td>101.8</td>
<td>99.7</td>
<td>-2.1</td>
<td>-3.7 - -0.1</td>
</tr>
<tr>
<td>Total correct CCC**</td>
<td>324.9</td>
<td>331.5</td>
<td>6.6</td>
<td>23.2 - 91.5</td>
</tr>
</tbody>
</table>

*none of these differences are clinically relevant

**clinically and statistically different

Discussion
- No differences attributable to group assignment (successful randomization)
- Participants maintained a similar level of exertion regardless of the task demand; we did not find clinically relevant differences in fatigue level between groups, but participants preferred the 30:2 method
- CPR quality decreased faster in the CCC group, but the number of adequate compressions per minute remained higher

Conclusions
- CPR quality decreased faster over time with the CCC method, but produced more chest compressions of good quality compared to the 30:2 method, with similar level of fatigue

Acknowledgement
- We are indebted to our many volunteer study participants, to Zoll for lending us their cardiac monitors, and to the Dept. of Emergency Medicine’s financial support