**Increasing Compression Rate and Depth Positively Correlate with End-Tidal Carbon Dioxide During Actual CPR Performance**

**Kelsey Sheak**, Douglas J Wiebe, Univ of Pennsylvania, Philadelphia, PA; Saeed Babaieizadeh, Philips Healthcare, Andover, MA; Trevor C Yuen, Univ of Chicago, Chicago, IL; Dana Zive, Oregon Health and Science Univ, Portland, OR; Pamela C Owens, Univ of Texas Southwestern, Dallas, TX; Dana P Edelson, Univ of Chicago, Chicago, IL; Mohamud Daya, Oregon Health and Science Univ, Portland, OR; Ahamed H Idris, Univ of Texas Southwestern, Dallas, TX; Benjamin S Abella, Marion Leary, Univ of Pennsylvania, Philadelphia, PA

**Background:** Current resuscitation guidelines suggest the use of continuous capnography to monitor the effectiveness of CPR. While laboratory data support this concept, little published clinical data exist to support this recommendation. The quantitative relationship between chest compression (CC) delivery and capnographic measurement (specifically, end-tidal CO2 (ETCO2)) is poorly understood, and has important implications for CPR quality assessment.

**Objectives:** We hypothesized that increasing rate and depth of CC will be associated in real-time with increasing ETCO2 during both in-hospital cardiac arrest (IHCA) and out-of-hospital cardiac arrest (OHCA).

**Methods:** In a multicenter cohort study, we captured time synchronized ETCO2 and CPR quality data from resuscitation events at 4 sites between 04/2006 – 05/2013 using CPR-sensing defibrillators (Philips Mrx-QCPR). ETCO2 and CC rate and depth were averaged over 15-sec epochs. A linear regression analysis was performed to evaluate the relationship between CCs and ETCO2.

**Results:** 29,028 epochs were processed for analysis from 583 arrest events (227 IHCA, 356 OHCA). Average age of the entire cohort was 63.7±17.1 and 213 (37%) were female. ROSC was achieved in 42% of IHCA patients and 27% of OHCA patients. CC rate range was 95-125 per min, CC depth range was 31-59 mm and ventilation rate range was 4-48 per min. CC rate was not significantly associated with ETCO2. CC depth was significantly associated with increased ETCO2. For every 10 mm increase in depth, ETCO2 increased by 1.4 mmHg (p<.001). Ventilation rate was inversely related to higher ETCO2. For every 10 breaths per min increase in ventilation rate, ETCO2 was decreased by 3.0 mmHg (p<.001) (see table).

**Conclusions:** ETCO2 during CPR directly correlated with CC depth, supporting the possible role of capnography as an approach to monitor the quality of CPR delivery. Confounding by ventilation rate may be an important consideration for future work.

**Table: Change in ETCO2 by compression rate, depth and ventilation rate**

<table>
<thead>
<tr>
<th></th>
<th>Overall = 29028</th>
<th>IHCA = 10364</th>
<th>OHCA = 18724</th>
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</thead>
<tbody>
<tr>
<td>10 mm increase in CC depth</td>
<td>↑ 1.4 mmHg*</td>
<td>↑ 1.7 mmHg*</td>
<td>↑ 1.3 mmHg*</td>
</tr>
<tr>
<td>10 per min increase in CC rate</td>
<td>↓ 0.6 mmHg</td>
<td>↓ 0.8 mmHg</td>
<td>↓ 0.2 mmHg</td>
</tr>
<tr>
<td>10 per min increase in ventilation</td>
<td>↓ 3.0 mmHg*</td>
<td>↓ 2.0 mmHg*</td>
<td>↓ 3.6 mmHg*</td>
</tr>
</tbody>
</table>

*↑ denotes increase; ↓ denotes decrease; IHCA, in-hospital cardiac arrest; OHCA, out-of-hospital cardiac arrest; * p < .001

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