Chest Wall Recoil

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**EVREV 2:** Keith Couper #34  
**Taskforce:** BLS
COI Disclosure

- Tyler Vadeboncoeur #277
  - Commercial/industry
    - None
  - Potential intellectual conflicts
    - Submitted manuscript on chest compression release velocity

- Keith Couper #34
  - Commercial/industry
    - None
  - Potential intellectual conflicts
    - None
“While allowing complete recoil of the chest after each compression may improve circulation, there is insufficient evidence to determine the optimal method to achieve the goal without compromising other aspects of chest compression technique.”
Population: Adults and children who are in cardiac arrest in any setting

Intervention: Maximizing chest wall recoil

Comparison: Ignoring chest wall recoil

Outcomes: Survival with Favorable neurological/functional outcome (9- Critical); Survival only at discharge (8- Critical); Return of spontaneous circulation (7- Critical); Coronary perfusion pressure (4- Important); Cardiac output/ index (4- Important)
We included all studies that examined the effect of ignoring chest wall recoil vs maximising chest wall recoil on the pre-defined outcomes. This included studies where the subject acted as their own control.

We included animal studies and non-cardiac arrest studies.

The search yielded 430 citations. We included three non-randomised controlled trials for bias assessment.
We suggest that chest wall recoil should be maximized as opposed to ignoring chest wall recoil in adults and children who are in cardiac arrest in any setting. (weak recommendation, very low quality evidence)
## Risk of Bias in studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Year</th>
<th>Design</th>
<th>Total Patients</th>
<th>Population</th>
<th>Industry Funding</th>
<th>Eligibility Criteria</th>
<th>Exposure/Outcome</th>
<th>Confounding</th>
<th>Follow up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yannopoulos</td>
<td>2005</td>
<td>Non-RCT</td>
<td>9</td>
<td>Swine</td>
<td>No</td>
<td>Unclear</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Zuercher</td>
<td>2010</td>
<td>Non-RCT</td>
<td>10</td>
<td>Swine</td>
<td>Yes</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Glatz</td>
<td>2013</td>
<td>Non-RCT</td>
<td>20</td>
<td>Paediatric (non-CA)</td>
<td>Yes</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>
# Evidence profile table(s)

<table>
<thead>
<tr>
<th>Quality assessment</th>
<th>Nº of patients</th>
<th>Effect</th>
<th>Quality</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Nº of studies</td>
<td>Study design</td>
<td>Risk of bias</td>
<td>Inconsistency</td>
</tr>
<tr>
<td>Survival with Favorable neurological/functional outcome - not measured</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Survival only at discharge - not measured</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Return of spontaneous circulation - not measured</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

1) Outcome not reported in included studies
<table>
<thead>
<tr>
<th></th>
<th>Quality assessment</th>
<th>No of patients</th>
<th>Effect</th>
<th>Quality</th>
<th>Importance</th>
</tr>
</thead>
<tbody>
<tr>
<td>No of studies</td>
<td>Study design</td>
<td>Risk of bias</td>
<td>Inconsistency</td>
<td>Indirectness</td>
<td>Imprecision</td>
</tr>
<tr>
<td></td>
<td>Coronary perfusion pressure</td>
<td>3 observational studies</td>
<td>serious</td>
<td>not serious</td>
<td>very serious</td>
</tr>
<tr>
<td></td>
<td>Cardiac output/ Cardiac index</td>
<td>2 observational studies</td>
<td>serious</td>
<td>not serious</td>
<td>very serious</td>
</tr>
</tbody>
</table>

2) Not blinded, confounding not adequately controlled for
3) Animal and non cardiac arrest studies
4) Unable to pool study data
Proposed Consensus on Science statements

For the critical outcomes of Return of Spontaneous Circulation, Survival at Hospital Discharge and Survival with Favorable Neurologic/Functional Outcome we found no evidence to inform the question.

For the important outcome of Coronary Perfusion Pressure (CPP) we found three observational studies (two animal and one human non-cardiac arrest model) representing very low quality evidence, following downgrading for serious risk of bias and very serious indirectness. Yannopoulos et al. 2005; Zuercher et al. 2010; Glatz et al. 2013) All three studies reported reduced coronary perfusion with application of leaning forces. Glatz et al analysed two levels of leaning (10% and 20%) and noted a dose response, with increased levels of leaning force associated with reduced coronary perfusion pressure. Similarly Zuercher et al analysed both 10% and 20% leaning, but the reduction in CPP only became significant at the 20% level.
Proposed Consensus on Science statements

For the important outcome of cardiac output/cardiac index we found two observational studies (one animal and one human non-cardiac arrest model) also representing very low quality evidence downgraded for serious risk of bias and very serious indirectness. (Zuercher et al. 2010; Glatz et al. 2013) The animal study by Zuercher et al reported a reduction in cardiac index when 10% and 20% leaning forces were applied. Glatz et al found that leaning forces had no effect on cardiac index/ output.
We suggest that chest wall recoil should be maximized as opposed to ignoring chest wall recoil in adults and children who are in cardiac arrest in any setting.  
(weak recommendation, very low quality evidence)
Knowledge Gaps

- The impact of chest wall recoil on clinical outcomes.
- The role that chest wall recoil plays in conjunction with other compression variables, namely rate and depth.