You Call THAT CPR? What Are You Thinking?

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“To improve is to change; to be perfect is to change often.”

–Winston Churchill
Objectives

- Discuss Components of an EBM Code
- “Stay and Play”
- Apneic Oxygenation prior to controlled ventilations
- Continuous Compressions
- Dual Sequential Defibrillation
- Therapeutic Hypothermia
Stay n’ Play vs Load n’ Go

- Odds of survival without Field ROSC are very low.
- Quality of compressions predicts survival
- CPR sucks en-route
- CPR in an ambulance is dangerous
Movement Worsens the Quality of Chest Compressions

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Introduction

The quality of compressions, particularly achieving an adequate depth at an appropriate rate with maximized flow time, has been demonstrated to increase survival from out of hospital cardiac arrest. Several papers have looked at the effect of transport on these measures of CPR quality. None have investigated the effect of moving the patient from the scene to the ambulance, nor from the ambulance to the Emergency Department. Anecdotal evidence suggests that these ‘transitions’ are not conducive to high quality compressions. The current study aims to investigate this.

Methods

We utilized the accelerometer technology included in our cardiac monitor (Phillips MRx with Q-CPR) to measure and report on the three separate metrics on the quality of compressions: compression rate, percentage of all compressions with adequate depth (2”) and the “Flow Time”. Flow time is defined as the percentage of time during which compressions should be performed that they actually are performed. We performed CPR on an adult CPR manikin in several different “stations”: on the ground, in transition from the ground to the ambulance, stationary in the non-moving ambulance, while driving with red lights & sirens (Code 3), and in transition from the ambulance to a simulated ED stretcher. All driving was conducted in a regulation ambulance on a closed course being used for an Emergency Vehicle Operators Course (EVOC). We used a convenience sample of newly hired paramedics and paramedic instructors as the compressors. Each round of CPR was limited to approximately 4 minutes to minimize rescuer fatigue. The data of each episode of CPR was described using specialized reporting software unique to this monitor (Event Review Pro, Phillips). This data was then analyzed using a database and spreadsheet (Microsoft Access and Excel). Statistical testing was performed using the student’s t-test with a p value of less than 0.05 being considered significant. IRB approval for this study was obtained from Scott & White Hospital/Texas A&M HSC COM.

Results

Because of the similarity in the quality of compressions between the two transition stations, the two modes of driving and the two stationary stations, we combined these groups for analysis into three groups: moving (Code 1 and Code 3 driving), stationary (ground and parked ambulance) and transition (ground to ambulance and ambulance to stretcher). The results are summarized as follows:

Summary of Data

<table>
<thead>
<tr>
<th>Group</th>
<th>Avg Compression Rate</th>
<th>Avg Adequate Depth</th>
<th>Avg Flow Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving</td>
<td>111.81</td>
<td>90.76%</td>
<td>99.04%</td>
</tr>
<tr>
<td>Stationary</td>
<td>111.69</td>
<td>99.94%</td>
<td>99.04%</td>
</tr>
<tr>
<td>Transition</td>
<td>118.69</td>
<td>71.76%</td>
<td>88.93%</td>
</tr>
<tr>
<td>Grand Total</td>
<td>114.06</td>
<td>87.49%</td>
<td>95.97%</td>
</tr>
</tbody>
</table>

T-test Results

<table>
<thead>
<tr>
<th>Comparison</th>
<th>p-value</th>
<th>Adequate Depth</th>
<th>Flow Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving vs Stationary</td>
<td>0.48</td>
<td>0.003</td>
<td>0.013</td>
</tr>
<tr>
<td>Transition vs Moving</td>
<td>0.014</td>
<td>0.005</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Transition vs Stationary</td>
<td>0.007</td>
<td>&lt;0.0001</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

Conclusion

We found that movement does negatively affect the quality of chest compressions during CPR on a manikin. Specifically, stationary CPR was statistically better than CPR done enroute but both were markedly better than CPR performed in transition. This reinforces prior studies suggesting that chest compressions are best performed without movement. The unique finding of this study is the effect of moving patients from the scene to the ambulance and from the ambulance to a simulated ED. The primary limitation of this study is that it was performed on manikins under controlled circumstances. An analysis of these effects on real patients in a real world environment would increase the ability to generalize these results.

Bibliography