Trends in the epidemiology of out-of-hospital cardiac arrest precipitated by suspected drug overdose

Mr. Saeed Alqahtani  
Dr. Ziad Nehme  
Prof. Brett Williams  
Prof. Stephen Bernard  
Prof. Karen Smith
Background

Why is it important?
- Out-of-hospital cardiac arrest (OHCA) is a major public health problem. Berdowski 2010
- Millions of deaths each year. Berdowski 2010
- Rate of survival is low (7.6%). Sasson 2010
- Bystander CPR & defibrillation can yield additional survival. Wissenberg 2013 & Perkins 2016
- Benefit of such interventions in drug overdose (DO) OHCA is unknown

What is known?
- A distinct subset of OHCA of non-cardiac aetiologies. Perkins 2015
- Unwitnessed, less bystander CPR & often present in asystole. Alqahtani 2018
- As such survival to hospital discharge is as low as 6%. Alqahtani 2018

What is unknown?
- long-term trends in the incidence, epidemiology & survival outcomes.
- 12-month functional recovery and health-related quality-of-life (HRQoL) outcomes.
Aims

Describe long-term trends
- Incidence.
- Epidemiology.
- Survival outcomes.

Summarise 12-month functional recovery & HRQoL outcomes
- Glasgow Outcome Scale-Extended (GOSE).
- EuroQol-5D-3-L (EQ-5D).
- Twelve-Item Short Form (SF-12).

Assess predictors of survival
- CPR.
- Initial arrest rhythm.
- Year (per year increase)
Methods

Design & Setting

- 18-year case review.
- Ambulance Victoria Cardiac Arrest Registry (VACAR).
- Adult EMS-attended DO OHCAs (≥ 16 years).
- Single EMS, servicing ≈ 6.3 million people.
- VACAR used Utstein definitions.
- Treatment protocols are aligned with ANZCR.

Statistical analysis

- Linear regression to assess trends in incidence.
- Non-parametric test to assess trends in characteristics & outcomes.
- Logistic regression to predict survival to hospital discharge
- Descriptive statistics to summarise 12-month outcomes.
Results

Figure 1. Crude incidence rate of EMS-attended and EMS-treated cases over time
Results

Table 1. Baseline characteristics of EMS-treated cases stratified by study year

<table>
<thead>
<tr>
<th>Variable</th>
<th>Overall n=1545</th>
<th>2000-03 n=270</th>
<th>2004-08 n=368</th>
<th>2009-13 n=445</th>
<th>2014-07 n=462</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years, mean</td>
<td>37.4</td>
<td>32.9</td>
<td>35.8</td>
<td>38.0</td>
<td>40.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Witnessed status, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not witnessed</td>
<td>76.0</td>
<td>76.3</td>
<td>75.7</td>
<td>79.4</td>
<td>72.8</td>
<td>0.262</td>
</tr>
<tr>
<td>Bystander witnessed</td>
<td>16.3</td>
<td>17.2</td>
<td>18.3</td>
<td>12.9</td>
<td>17.4</td>
<td>0.778</td>
</tr>
<tr>
<td>EMS witnessed</td>
<td>7.7</td>
<td>6.5</td>
<td>6.0</td>
<td>7.7</td>
<td>9.8</td>
<td>0.029</td>
</tr>
<tr>
<td>First documented rhythm, %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VF/VT</td>
<td>6.1</td>
<td>7.2</td>
<td>8.0</td>
<td>5.9</td>
<td>4.1</td>
<td>0.068</td>
</tr>
<tr>
<td>PEA</td>
<td>18.5</td>
<td>13.6</td>
<td>17.9</td>
<td>17.1</td>
<td>23.1</td>
<td>0.001</td>
</tr>
<tr>
<td>Asystole</td>
<td>75.4</td>
<td>79.2</td>
<td>74.1</td>
<td>77.0</td>
<td>72.8</td>
<td>0.064</td>
</tr>
<tr>
<td>Bystander CPR, n (%)</td>
<td>44.0</td>
<td>26.7</td>
<td>27.5</td>
<td>52.4</td>
<td>59.3</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>EMS response time, median</td>
<td>7.2</td>
<td>7.0</td>
<td>7.0</td>
<td>7.8</td>
<td>7.3</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Results

Figure 2. Long-term trends in the proportion of patients surviving to hospital discharge, surviving the event, and achieving prehospital ROSC.
Results

Figure 3. The proportion of 12 month survivors reporting problems across the five EQ-5D health domains (n=26).
### Results

**Table 2.** Adjusted odds ratio (95% CI) for survival to hospital discharge.

<table>
<thead>
<tr>
<th>Predictors</th>
<th>OR (95% CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.97 (0.95, 0.99)</td>
<td>0.002</td>
</tr>
<tr>
<td>Witnessed arrest</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not witnessed</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>Public witnessed</td>
<td>2.95 (1.77, 4.94)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>EMS witnessed</td>
<td>4.32 (2.20, 8.46)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Initial monitored rhythm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asystole</td>
<td>Reference</td>
<td></td>
</tr>
<tr>
<td>VF/VT</td>
<td>10.08 (5.01, 20.29)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>PEA</td>
<td>9.00 (5.51, 14.67)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Bystander CPR</td>
<td>0.67 (0.41, 1.11)</td>
<td>0.128</td>
</tr>
<tr>
<td>EMS response time</td>
<td>0.98 (0.96, 1.01)</td>
<td>0.265</td>
</tr>
<tr>
<td>Year</td>
<td>1.02 (0.98, 1.07)</td>
<td>0.244</td>
</tr>
</tbody>
</table>
Discussion

Summary
▪ Incidence remained unchanged
▪ Survival outcomes improved
▪ 15%-48% reported some problems in EQ-5D.

Incidence
▪ Drug-related death is increasing in Australia!! Australia’s Annual Overdose Report 2018

Survival
▪ Increased % of EMS witnessed arrest
▪ Increased % of patients with PEA.

12-month outcomes
▪ Majority reported good HRQoL
▪ However, 50% did not respond
Discussion

So what?

- Opportunities exist to reduce incidence & improve survival.
  - Supervised injecting facilities, naloxone & training at risk population.

Limitations

- Was retrospective.
- Type of DO was unknown.
- Misclassification was likely to occur.

Conflict of interest

- None.


