How Time to Prehospital Intervention Affects OHCA Survival for Different Subpopulations


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Background

- Common (mis)interpretation of Valenzuela et al. (1997) is that OHCA survival decreases by 10% for every minute longer it takes EMS to administer CPR, based on 1,872 OHCA.
- It is unknown how this statistic varies by subpopulations in a much larger and more recent data set.

Objectives

1. Confirm Valenzuela et al.'s results on a data set 10x as large.
2. Extend Valenzuela et al.'s results for different subpopulations.

Data

- Included all non-traumatic, non-EMS witnessed, treated, public and private, witnessed and unwitnessed OHCA.
- Exclusions: younger than 18, dead on arrival, DNR, non-cardiac etiologies.
- Data from Toronto and surrounding regions from Rescu Epistry-Cardiac Arrest database.

Models

- Developed logistic regression models.
- Performance was measured using area under the ROC curve (AUC).
- Used percent change in the odds of survival to interpret effect of variables.

Basic Model

- Recreated Valenzuela et al.'s simplified model.

Advanced Model

- Developed a base model and 8 subpopulation models.
- These models were generated by filtering on the following non-modifiable variables from the overall dataset:
  - Public arrests
  - Private arrests
  - Bystander witnessed arrests
  - Unwitnessed arrests
  - Patients who are 65 and older
  - Patients who are under 65
  - Arrests with bystander resuscitation
  - Arrests with no bystander resuscitation

Disclosures

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Results: Valenzuela Comparison

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>% Change</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>-1.1</td>
<td>-67.62</td>
<td>Y</td>
</tr>
<tr>
<td>Time between Dispatch Call and EMS CPR</td>
<td>-0.11</td>
<td>-10.16</td>
<td>Y</td>
</tr>
<tr>
<td>Time between Dispatch Call and EMS AED</td>
<td>-0.08</td>
<td>-7.31</td>
<td>Y</td>
</tr>
</tbody>
</table>

Valenzuela (1997)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>% Change</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.26</td>
<td>29.69</td>
<td>Y</td>
</tr>
<tr>
<td>Time between Dispatch Call and EMS CPR</td>
<td>-0.106</td>
<td>-10.06</td>
<td>Y</td>
</tr>
<tr>
<td>Time between Dispatch Call and EMS AED</td>
<td>-0.139</td>
<td>-12.98</td>
<td>Y</td>
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</table>

Results: Effect of Time For Different Subpopulations

<table>
<thead>
<tr>
<th>Time to Intervention (min)</th>
<th>Survival Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>0.45</td>
</tr>
<tr>
<td>10</td>
<td>0.35</td>
</tr>
</tbody>
</table>

Conclusion

Basic Model

- Validated that a minute increase in time to intervention results in a 10% decrease in the odds of survival on a larger data set.
- Demonstrated that the effect of time to intervention has on survival changes for different subpopulations.

Advanced Model

- Had a much higher AUC (average 0.85), demonstrating a stronger model.
- Demonstrates that the relationship between patient contact time and survival differs depending on the non-modifiable characteristics of the arrest.
- Largest change in odds of survival (16.4%) was for OHCA with bystander resuscitation, suggests that OHCA are even more time sensitive than originally thought and a minute improvement can have a 70% greater improvement on odds then originally thought.

Table 1a: Coefficient value percent change in the odds of survival for a unit increase in each variable for the Valenzuela model applied to our data.

Table 1b: Coefficient value percent change in the odds of survival for a unit increase in each variable for the original Valenzuela model.