Timing of Advanced Airway Placement after Out-of-Hospital Cardiac Arrest: Earlier is Better

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Acknowledgements and Disclosures

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Background
- Resuscitation from cardiac arrest requires multiple interventions
- ACLS specifies the optimal timing intra-arrest interventions
- Advanced airways are frequently placed by EMS
- Optimal timing of advanced airway placement is unknown
Aim and Hypothesis

- **Aim**: Evaluate the effect that advanced airway timing has on the probability of return of spontaneous circulation (ROSC)
- **Hypothesis**: There exists a time after which the importance of obtaining an advanced airway outweighs other interventions

Methods

- **Data Source**: ROC PRIMED study
- **Inclusion Criteria**: Adult out-of-hospital cardiac arrest
  - Advanced airway placed by EMS
- **Exclusion Criteria**: Unwitnessed arrest
  - EMS witnessed arrest
  - Traumatic etiology
  - Advanced airway after ROSC
- **Exposure Variable**: Time from EMS arrival to advanced airway
- **Outcome Variable**: Prehospital ROSC

- **Statistical Model**: Cox proportional hazards model
- Time to advanced airway modeled using non-linear cubic splines
- Observations stop at (1) ROSC, (2) ED Arrival, or (3) Termination
- Adjusted for age, sex, bystander CPR, EMS response time
- Resuscitation duration accounted for by Cox model
- Stratified by initial cardiac rhythm
Results

• Selection of Study Population

<table>
<thead>
<tr>
<th>Study Cohort</th>
<th>n=7,547</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusion Criteria</td>
<td>n=8,405</td>
</tr>
<tr>
<td>Advanced Airway Placement</td>
<td>n=5,590</td>
</tr>
<tr>
<td>ROC PRIMED Cohort</td>
<td>n=27,917</td>
</tr>
</tbody>
</table>

Results

• Demographics

| Age (mean, SD) | 67 (15) |
| Sex (male %) | 5211 (69.0%) |
| Bystander Cardiopulmonary Resuscitation (%) | |
| Yes | 3694 (48.9%) |
| No | 3619 (48.0%) |
| Unknown | 234 (3.1%) |
| Initial Cardiac Rhythm (%) | |
| Ventricular Tachycardia or Ventricular Fibrillation | 2838 (37.6%) |
| Pulseless Electrical Activity | 1908 (25.3%) |
| Asystole | 2255 (29.9%) |
| No Shock from Automated External Defibrillator | 546 (7.2%) |

Results

• Resuscitation Events

<table>
<thead>
<tr>
<th>Event</th>
<th>Median, IQR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advanced Airway Attempt (median, IQR)</td>
<td>1 (1-1)</td>
</tr>
<tr>
<td>Prehospital ROSC (%)</td>
<td>3220 (42.7%)</td>
</tr>
<tr>
<td>Prehospital Termination of Resuscitation (%)</td>
<td>2382 (31.6%)</td>
</tr>
<tr>
<td>Time to Event (minutes, median, IQR)</td>
<td></td>
</tr>
<tr>
<td>Cardiac Arrest Onset to EMS Arrival</td>
<td>5.6 (4.7-7.0)</td>
</tr>
<tr>
<td>EMS Arrival to Advanced Airway</td>
<td>10.4 (7.3-14.8)</td>
</tr>
<tr>
<td>EMS Arrival to Prehospital ROSC</td>
<td>19.2 (14.3-25.2)</td>
</tr>
<tr>
<td>EMS Arrival to Termination of Resuscitation</td>
<td>31.9 (26.7-37.1)</td>
</tr>
<tr>
<td>EMS Arrival to Hospital Arrival</td>
<td>35.9 (28.9-44.0)</td>
</tr>
</tbody>
</table>
Results

• **Time from EMS Arrival to Advanced Airway**

![Graph showing distribution of time from EMS arrival to advanced airway. Median: 10.4, IQR: 7.2 to 14.8.]

• **ROSC Decreases as Time to Advanced Airway Increases**

   - Shockable Rhythms
   - Non-shockable Rhythms

![Graphs showing survival curves for shockable and non-shockable rhythms. Earlier is better.]}

• **Survival Curves → Earlier is Better**

![Graphs showing survival curves for shockable and non-shockable rhythms. Earlier is better.]
Results

- **Survival Curves → Earlier is Better**

  - Shockable Rhythms
  - Non-shockable Rhythms
### Limitations

- Does not address BVM-only strategy
- Number of airway attempts
- Endotracheal tubes vs. supraglottic airways
- EMS system-specific data

### Conclusions

- Advanced airway placement by EMS for out-of-hospital cardiac arrest has a time-dependent association with ROSC
- Early advanced airways are associated with increased probability of ROSC and a decreased time to ROSC

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