Withdrawal of life-sustaining therapy for perceived neurological prognosis and outcomes after out-of-hospital cardiac arrest

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Disclosures

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Background

- Brain injury drives poor outcomes after resuscitation from out-of-hospital cardiac arrest (OHCA)
- Withdrawal of life-sustaining therapy for perceived poor neurological prognosis (WLST-N) is the most common proximate cause of death

Background

- Accurate neurological prognostication is challenging after cardiac arrest
  - Guidelines recommend delaying neurological prognostication and WLST-N at least 72h after ROSC

- WLST-N before 72h (WLST-N<72) may contribute to preventable mortality and self-fulfilling prophecies

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Aims

• Quantify incidence and timing of WLST-N
  – $H_a$: WLST-N<72 is common

• Estimate effect of WLST-N<72 on outcomes
  – $H_a$: Predicted survival for patients exposed to WLST-N<72 is greater than nil
Methods

• Secondary analysis of ROC PRIMED trial
  – 2x2 factorial RCT:
    Early vs delayed rhythm analysis
    Impedance threshold device
  – No difference in outcome for either comparison
Cohort selection

• ≥18 years of age with EMS-treated OHCA
  – Excluded trauma, exsanguination, pregnant, prisoner

• Achieved ROSC

• Transported to participating hospital

• Survived >60 min after hospital arrival
Categorizing outcomes

• Trial coordinators recorded date and proximate cause of death for all subjects:
  – **Unstable** (ongoing life-support impossible or futile)
  – **Brain death**
  – **Non-neurological considerations** (preexisting illnesses, advanced directives, surrogate representation of patient’s wishes)
  – **WLST-N**

• Outcomes: Survival, favorable outcome (mRS ≤3)
Statistical methods

• Divided subjects into two cohorts
  – **Exposed** to WLST-N<72
  – **Not exposed** (including those with WLST-N after 72h)
• WLST-N is uniformly fatal
• Two parallel methods to estimate impact of exposure on outcome
  – **Propensity score**: \( P(\text{exposure to WLST-N<72}|\text{covariates}) \)
    \( \rightarrow \) 1:1 propensity matched cohorts + measure outcomes in unexposed matched cohort
  – **Adjusted logistic regression** models built using unexposed cohort, then applied to exposed cohort
• Extrapolated nationally using epidemiological data
Results

• 4,265 subjects met inclusion criteria
• 22% (919, 33% of non-survivors) exposed to WLST-N<72
  – Exposed: 0% survival, 0% favorable outcomes
  – Unexposed: 45% survival, 33% favorable outcome
Propensity match

- Multiple differences between exposed and unexposed cohorts; none persisted after matching
  - Age, sex, race/ethnicity
  - 9 major medical comorbidities
  - Residential status
  - Shockable rhythm
  - CPR intervals
  - Witnessed arrest
  - STEMI
  - TTM/hypothermia
  - Cardiac catheterization w/in 24h
Predicted outcomes for cohort exposed to WLST-N <72

<table>
<thead>
<tr>
<th></th>
<th>Predicted outcomes</th>
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<tbody>
<tr>
<td><strong>Survival</strong></td>
<td></td>
</tr>
<tr>
<td>Propensity:</td>
<td>25% (22 – 28%)</td>
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<tr>
<td>Logistic:</td>
<td>26% (23 – 100%)</td>
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<tr>
<td><strong>Favorable outcome</strong></td>
<td></td>
</tr>
<tr>
<td>Propensity:</td>
<td>16% (14 – 19%)</td>
</tr>
<tr>
<td>Logistic:</td>
<td>16% (14 – 100%)</td>
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National implications

- 22% (9,185) exposed to WLST-N<72h
- 25% (41,750) survive to admission
- 167,000 EMS-treated OHCA annually

Predicted outcomes:

<table>
<thead>
<tr>
<th>Survival</th>
<th>Predicted outcomes</th>
<th>Lives annually</th>
<th>% improved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propensity: 25% (22 – 28%)</td>
<td>2,296 to 2,388</td>
<td>5.5 to 5.7%</td>
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<tr>
<td>Logistic: 26% (23 – 100%)</td>
<td>(2,021 to 9,185)</td>
<td>(4.8 to 100%)</td>
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<table>
<thead>
<tr>
<th>Favorable outcome</th>
<th>Predicted outcomes</th>
<th>Lives annually</th>
<th>% improved</th>
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<tbody>
<tr>
<td>Propensity: 16% (14 – 19%)</td>
<td>1,470</td>
<td>3.5%</td>
<td></td>
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<tr>
<td>Logistic: 16% (14 – 100%)</td>
<td>(1,286 to 9,185)</td>
<td>(3.1 to 100%)</td>
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Limitations

• Association, not causality
• Unmeasured confounders
• Potential imprecision in adjudication of cause of death
• RCT subjects may receive different/better care
Conclusions

• After OHCA, WLST-N<72 is common

• Reducing WLST-N<72 may be an opportunity to decreased mortality and improve neurological outcomes after OHCA
Questions?

Thank you