ASSOCIATION OF EARLY EMERGENCY CALLS BEFORE PATIENT COLLAPSE WITH SURVIVAL FROM OUT-OF-HOSPITAL CARDIAC ARRESTS

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We have no conflict of interest to disclose.
Background/Purpose

- Early recognition of the life-threatening emergency followed by rapid activation of emergency medical services (EMS) or emergency call is valuable for improving the outcomes.
- Some out-of-hospital cardiac arrests (OHCAs) are witnessed or recognized after emergency calls.
- Furthermore, a subset of these OHCAs are witnessed or recognized by bystanders and dispatchers before EMS arrival at patients.
- This study aimed to confirm the benefit of early emergency calls before patient collapse on survival after OHCAs witnessed by bystanders and/or emergency medical technicians (EMTs).
Methods

We analyzed 278,310 witnessed OHCA cases [EMT-witnessed cases (N = 54,172), bystander-witnessed cases (N = 224,138)] without pre-hospital physician involvement from all Japanese OHCA data prospectively collected between 2006 and 2012.

The data were analyzed for the association of the time interval between the emergency call and patient collapse with neurologically favorable one-month survival.
OHCAs witnessed by EMTs are much more likely to survive than OHCAs witnessed by bystanders.

Survivor: 8609 (3.8%)
Non-survivor: 215,529

Survivor: 4099 (7.2%)
Non-survivor: 50,073

OR (95% CI): 2.05 (1.90-2.04)
Association of time interval with the proportion of EMT-witnessed cases

- **Number of OHCAs**

  - EMT-witnessed: 2,270
  - Bystander-witnessed: 4,776
  - Proportion of EMT-witnessed cases: 95.1%

- **Call-to-collapse / Collapse-to-call interval (min)**

  - >10 min: 44,496
  - 9–10 min: 4,521
  - 7–8 min: 3,033
  - 5–6 min: 1,612
  - 3–4 min: 383
  - 1–2 min: 12,527
  - 0 min: 1,547
  - 1–2 min: 4
  - 3–4 min: 4
  - 5–6 min: 25,695
  - 7–8 min: 32,858
  - 9–10 min: 21,566
  - >10 min: 22,512

- **Proportion of EMT-witnessed cases**

  - 0% to 20%
  - 20% to 40%
  - 40% to 60%
  - 60% to 80%
  - 80% to 100%

- **Time before collapse (call before collapse)**

- **Time after collapse (call before collapse)**
Association of time interval with survival rate in all OHCAs witnessed by EMTs and bystanders

![Graph showing the association of time interval with survival rate in all OHCAs witnessed by EMTs and bystanders.](image)

- **Non-survivor**
- **Survivor**
- **Survival rate for witnessed cases**

### Number of OHCAs

<table>
<thead>
<tr>
<th>Call-to-collapse / Collapse-to-call interval (min)</th>
<th>Number of OHCAs</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;10</td>
<td>43,416</td>
</tr>
<tr>
<td>9-10</td>
<td>4,350</td>
</tr>
<tr>
<td>7-8</td>
<td>1,223</td>
</tr>
<tr>
<td>5-6</td>
<td>7,409</td>
</tr>
<tr>
<td>3-4</td>
<td>10,082</td>
</tr>
<tr>
<td>1-2</td>
<td>14,952</td>
</tr>
<tr>
<td>0</td>
<td>24,507</td>
</tr>
<tr>
<td>1-2</td>
<td>31,587</td>
</tr>
<tr>
<td>3-4</td>
<td>31,587</td>
</tr>
<tr>
<td>5-6</td>
<td>20,974</td>
</tr>
<tr>
<td>7-8</td>
<td>9,634</td>
</tr>
<tr>
<td>9-10</td>
<td>7,943</td>
</tr>
<tr>
<td>&gt;10 min</td>
<td>22,288</td>
</tr>
</tbody>
</table>

### Survival Rate

- **Non-survivor**
- **Survivor**
- **Survival rate for witnessed cases**

- **7.2%**
- **6.2%**
- **5.1%**
- **4.4%**
- **4.5%**
- **4.3%**
- **4.8%**
- **5.5%**
- **3.9%**
- **2.7%**
- **2.2%**
- **1.7%**
- **1.0%**

### Time before collapse (call before collapse)

- **Time before collapse**
- **Time after collapse**
Association of time interval with survival rate in Bystander-witnessed OHCAs

<table>
<thead>
<tr>
<th>Time before collapse (call before collapse)</th>
<th>Time after collapse (call before collapse)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 6</td>
<td>2.9%</td>
</tr>
<tr>
<td>5–6</td>
<td>3.7%</td>
</tr>
<tr>
<td>3–4</td>
<td>4.4%</td>
</tr>
<tr>
<td>1–2</td>
<td>4.2%</td>
</tr>
<tr>
<td>0</td>
<td>4.7%</td>
</tr>
<tr>
<td>1–2</td>
<td>5.5%</td>
</tr>
<tr>
<td>3–4</td>
<td>3.9%</td>
</tr>
<tr>
<td>5–6</td>
<td>2.7%</td>
</tr>
<tr>
<td>7–8</td>
<td>2.2%</td>
</tr>
<tr>
<td>9–10</td>
<td>1.7%</td>
</tr>
<tr>
<td>&gt; 10min</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

Note: * indicates statistical significance.
Association of time interval with incidences of Dispatcher-assisted CPR and bystander CPR survival in Bystander-witnessed OHCAs

**No DA-CPR provided**

- Rate of DA-CPR: 24.4%, 26.5%, 27.9%, 32.0%, 45.1%, 48.5%, 46.9%, 47.6%, 46.3%, 47.2%, 46.2%

**DA-CPR provided**

- Rate of DA-CPR: 3,137, 3,247, 5,064, 7,101, 12,018, 29,307, 17,140, 11,313, 4,727, 3,886, 12,190

**Rate of DA-CPR**

- 0%, 20%, 40%, 60%, 80%, 100%

**Number of OHCAs**

- > 6, 5-6, 3-4, 1-2, 0, 1-2, 3-4, 5-6, 7-8, 9-10, > 10 min

**Call-to-collapse / Collapse-to-call interval (min)**

- Time before collapse (call before collapse)
- Time after collapse (call before collapse)

**No BCPR provided**

- Rate of BCPR: 33.6%, 36.3%, 40.4%, 45.7%, 46.8%, 48.8%, 47.8%, 47.5%, 48.0%, 48.1%, 45.9%

**BCPR provided**

- Rate of BCPR: 6,192, 5,689, 7,463, 8,446, 13,677, 17,140, 11,313, 4,727, 3,886, 12,190

**Rate of BCPR**

- 0%, 20%, 40%, 60%, 80%, 100%
Factors associated with survival after bystander-witnessed OHCAs with emergency call before collapse

<table>
<thead>
<tr>
<th>Factors</th>
<th>Adjusted OR (95%CI)</th>
</tr>
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<tbody>
<tr>
<td>Patients age&lt;sup&gt;a)&lt;/sup&gt;,</td>
<td>0.97 (0.97–0.98)</td>
</tr>
<tr>
<td>Cardiac aetiology,</td>
<td>1.64 (1.45–1.87)</td>
</tr>
<tr>
<td>Shockable rhythms,</td>
<td>5.90 (5.29–6.58)</td>
</tr>
<tr>
<td>BCPR provide,</td>
<td>1.38 (1.25–1.53)</td>
</tr>
<tr>
<td>Call-to-collapse interval&lt;sup&gt;b)&lt;/sup&gt;,</td>
<td>0.92 (0.90–0.94)</td>
</tr>
<tr>
<td>EMT response time after collapse&lt;sup&gt;b)&lt;/sup&gt;,</td>
<td>0.84 (0.82–0.86)</td>
</tr>
</tbody>
</table>

<sup>a) </sup> Odds ratio per 5 years

<sup>b) </sup> Odds ratio per 5 minutes
Summary

- When emergency calls were placed earlier before patient collapse, the proportion of EMT-witnessed cases and survival after OHCAs witnessed by bystanders and EMTs were higher.

- When analyzed only for bystander-witnessed cases, earlier emergency calls placed before patient collapse was associated with lower survival rate and lower incidences of bystander CPR and dispatcher-assisted CPR.

- Multivariable logistic regression in bystander-witnessed OHCAs with emergency call before collapse showed that short call-to-collapse interval and short EMS response time after collapse were associated with survival.
Conclusions

- Early emergency calls before patient collapse efficiently increase the proportion of EMT-witnessed cases and promote survival after witnessed OHCA's.

- However, when the patient's condition deteriorates to cardiac arrest before EMT arrival, early emergency call before collapse may worsen the outcome by interfering with provision of dispatcher-assisted CPR.