Background and Importance

- Early administration of epinephrine (<5 minutes) in patients with non-shockable rhythms is associated with increased return of spontaneous circulation (ROSC) and survival, while poor compliance to the Advanced Cardiovascular Life Support (ACLS) guidelines leads to poor patient outcomes\(^1,3\).
- The presence of a pharmacist on the resuscitation team is associated with increased ACLS compliance. Integration of a pharmacist into the resuscitation process is not the current practice in Hong Kong\(^4,5\).

Aim and Objectives

- Primary objective: Evaluate the association between time of adrenaline administration for in-hospital cardiac arrest (IHCA) patients with non-shockable rhythms and patients’ survival outcomes.
- Secondary objectives: Assess the compliance of adrenaline and amiodarone administration to the ACLS guideline.

Materials & Methods

- Design: Retrospective observational study.
- Location: Pamela Youde Nethersole Eastern Hospital (PYNEH) and Prince of Wales Hospital (PWH), Hong Kong.
- Study period: 1 January 2016 to 31 December 2016.

Inclusion criteria

All patients aged 18 or above with the onset of cardiac arrest during an inpatient hospital stay with a shockable (VT or VF) or non-shockable rhythm (asystole or PEA).

Exclusion criteria

Patients with no cardiopulmonary resuscitation (CPR) attempt.
Patients with a ‘Do Not Resuscitate’ agreement.
Patients who had ROSC prior to adrenaline administration.
Patients with missing or incomplete key process information.

IHCA episodes

- Initial non-shockable rhythm (1<sup>st</sup> episode only).
- All episodes.
- Early (<5 minutes) or late (>5 minutes) epinephrine administration vs ROSC/survival to discharge.
- Time of epinephrine administration vs ROSC/survival to discharge.
- *Association analysed by logistic regression with adjustment of potential confounding factors.

Table 1. Compliance assessment criteria

<table>
<thead>
<tr>
<th>Drug</th>
<th>Compliance assessment criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adrenaline</td>
<td>Dose: Standard dose 1 mg IV/IO</td>
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<tr>
<td></td>
<td>Time: every 3 to 5 minutes (except patients with documented pulse/blood pressure between doses), after defibrillation and a 2-minute CPR period (for shockable rhythm).</td>
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<tr>
<td>Amiodarone</td>
<td>Indication: for shockable rhythm only</td>
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<td></td>
<td>Dose: 1&lt;sup&gt;st&lt;/sup&gt; dose 300 mg IV/IO, 2&lt;sup&gt;nd&lt;/sup&gt; dose 150mg IV/IO</td>
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<tr>
<td></td>
<td>Time: after CPR, defibrillation and epinephrine administration</td>
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</tbody>
</table>

Table 2. Demographics and outcomes after adjustment of confounding factors in patients with early and late adrenaline administration

<table>
<thead>
<tr>
<th>Demographics &amp; Outcomes</th>
<th>Epinephrine administration in ≤5 mins (n=240)</th>
<th>Epinephrine administration in &gt;5 mins (n=109)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age ± SD</td>
<td>75.0 ± 13.2</td>
<td>75.7 ± 13.3</td>
<td>0.618</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>161 (67.1%)</td>
<td>56 (51.4%)</td>
<td>0.005</td>
</tr>
<tr>
<td>Female</td>
<td>79 (32.9%)</td>
<td>53 (48.6%)</td>
<td></td>
</tr>
<tr>
<td>ICU/CCU/HDU Care</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mean time to CPR ± SD</td>
<td>0.15 ± 0.55</td>
<td>1.10 ± 5.13</td>
<td>0.005</td>
</tr>
<tr>
<td>Mean Charlson</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Comorbidity Index ± SD</td>
<td>3.55 ± 2.33</td>
<td>3.28 ± 2.37</td>
<td>0.327</td>
</tr>
</tbody>
</table>

Outcomes

- ROSC: 118 (49.2%) vs 38 (34.9%) (p=0.013)
- Survival to discharge: 10 (4.2%) vs 2 (1.8%) (p=0.281)

Results

- After adjusting with the confounding effect of ICU/CCU/HDU care, early administration of adrenaline was significantly associated with increased rate of ROSC (adjusted OR=1.630; 95% CI 1.008–2.635; p=0.046), but not survival to discharge (p=0.265). A shorter time to adrenaline administration (as continuous interval) was significantly associated with increased rate of ROSC (p=0.002) and survival to discharge (p=0.029).
- Median time to epinephrine: 3 minutes (IQR = 1–6 minutes).

Secondary Outcomes:

- Compliance of drug administration to ACLS guideline (n=397).
- Overall compliance rate for adrenaline: 83.6% (331 out of 396).
- Overall compliance rate for amiodarone: 33.3% (6 out of 18).

Figure 2. Compliance rate of drug administration to ACLS guideline

- Key non-compliance findings:
  - Adrenaline (N=396): Non-standard dosages given (N=14), Not given every 3 to 5 minutes (N=47), Early administration in patients with a shockable rhythm (N=9).
  - Amiodarone (N=18): Omission of 300 mg loading dose (N=9), Early administration (N=5).

Conclusion and Relevance

- Our study found that time of epinephrine administration was significantly associated with better results in ROSC and survival to discharge in IHCA patients with non-shockable rhythm.
- After adjusting for potential confounding factors, early epinephrine administration was associated with significantly improved ROSC, but not survival to discharge.
- Overall compliance rate of drug administration to ACLS guidelines was 81.1%.