Outcomes of Out of Hospital ECMO Transfer: Significance of Initiation Site and Personnel on Survival and Complication Rates

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Introduction

Background on Extracorporeal Membrane Oxygenation (ECMO) Transfer

Inter-regional network allows transfer from a non-ECMO center to ECMO center.
ECMO transfer increases availability of care for indicated patients in institutions with limited resources.

Network System - Hub and Spokes Model

ECMO center acts as the central “hub” that connects with affiliated non-ECMO centers, or “spokes.”

ECMO Transfer: Previous Studies

Demonstrated optimistic survival rate with 67% survival to decannulation.
Similar national ECMO survival: 68%.
Increased survival with proper adherence to inclusion and exclusion criteria.

Objectives

To investigate the outcomes of ECMO transfer from non-ECMO center to ECMO center
Determine the impact of cannulation site and personnel on ECMO survival and complication rate

Methods

Indications for ECMO

Veno-arterial (VA-) ECMO: refractory cardiac failure
Veno-venous (VV-) ECMO: refractory pulmonary failure without hemodynamic compromise

ECMO Patient Transfer Safety

Based on survival of patient 24 hours after cannulation (ECMO Survival Rate)

Technical Complications of ECMO*

Venous-cannula (V-cannula) malposition
No distal profusion cannula (DPC)
Leg ischemia
Cannula malposition
*Each complication episode was combined as a cumulative “Technical Complication Rate”

Table 1: Outcomes and Complications by Initiation site

<table>
<thead>
<tr>
<th></th>
<th>Total (N=108)</th>
<th>Group A (N=49)</th>
<th>Group B (N=59)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECMO Survival</td>
<td>77 (71%)</td>
<td>34 (69%)</td>
<td>43 (73%)</td>
<td>0.649</td>
</tr>
<tr>
<td>Technical complications</td>
<td>57 (53%)</td>
<td>33 (67%)</td>
<td>24 (41%)</td>
<td>0.0006</td>
</tr>
<tr>
<td>V-cannula malposition</td>
<td>9 (8%)</td>
<td>6 (12%)</td>
<td>3 (5%)</td>
<td>0.180</td>
</tr>
<tr>
<td>No DPC</td>
<td>11 (13%)</td>
<td>5 (10%)</td>
<td>6 (10%)</td>
<td>0.631</td>
</tr>
<tr>
<td>Leg ischemia</td>
<td>11 (13%)</td>
<td>7 (14%)</td>
<td>4 (7%)</td>
<td>0.405</td>
</tr>
<tr>
<td>Cannula bleed</td>
<td>34 (31%)</td>
<td>21 (43%)</td>
<td>13 (22%)</td>
<td>0.210</td>
</tr>
</tbody>
</table>

Results

Study period: 2010-2018
Total ECMO transfer cases: 108 (out of 226)

Demographics of patients
108 patients: 74M; 34F
VA-ECMO: 71; VV-ECMO: 37
Age: 49 ± 14 y/o
Retrospective analysis with IRB approval.

Grouping: refer to Figure 1 for algorithm

Group A - ECMO initiated at non-ECMO center;
Group B - ECMO initiated at ECMO center;
Group AOSH - ECMO initiated at non-ECMO center with local personnel;
Group ACenter - ECMO initiated at non-ECMO center but cannulated by ECMO center transport team.

OSH = Outside Hospital/non-ECMO center
Center = ECMO center

ECMO Survival Rate
Total survival rate=71%
No significant differences between the subgroups.

Technical Complication Rate
Initiation Site

Group A (OSH)=67%
Group B (Center)=41%
p=0.006

Cannulation Personnel

Group AOSH (OSH Personnel)=88%
Group ACenter (Center Personnel)=25%
p=0.001

Conclusion

With adherence to transfer protocol, ECMO transfer can be completed safely.
ECMO initiation at non-ECMO centers correlated with a higher technical complication rate, especially when placed by personnel from non-ECMO centers.

Further education of surgeons or cardiologists performing ECMO may be necessary to improve outcomes.

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