Regional ECMO Coordination—10 years in 10 minutes

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FEMA Principles of Emergency Management

- Comprehensive
- Progressive
- Risk-Driven
- Integration
- Collaborative
- Flexible
- Professional
Lessons learned from H1N1

- ECMO outreach to “Spoke” hospitals
- Early identification and referral
- Capacity of “Hub” hospital
- Effect of increased ECMO volume on daily operations
- Adaptive staffing models
Outreach and Early Identification
ARDS/COVID patient referral meets Criteria for Prone Ventilation?

- **YES**
  - Initiate Prone Ventilation as per Mechanical Ventilation Protocol

- **NO**
  - Continue Care as per Mechanical Ventilation Protocol

Screen for Inclusion/Exclusion Criteria

- **NO**
  - Send email to ECMOConsults@upmc.edu
    - Include:
      1. Date
      2. Name of patient
      3. MRN or FIN
      4. Indication for ECMO
      5. Exclusion criteria met

- **YES**
  - Notify ECMO Respiratory Failure Team via MedCall 647-7000
Critical Components

• Physician staffing
• Nursing staffing
• Perfusion staffing
• ECMO Devices
• Disposable supplies
• ICU Capacity
<table>
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<tr>
<th>Product Category</th>
<th>Stock Code</th>
<th>Quantity</th>
<th>Description</th>
<th>Supplier</th>
<th>Location</th>
<th>Condition</th>
<th>Date of Stock</th>
<th>Remarks</th>
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*Remarks: additional notes related to the stock.*
# RESP Score

<table>
<thead>
<tr>
<th>Risk Class</th>
<th>Survival</th>
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<tbody>
<tr>
<td>I</td>
<td>92%</td>
</tr>
<tr>
<td>II</td>
<td>76%</td>
</tr>
<tr>
<td>III</td>
<td>57%</td>
</tr>
<tr>
<td>IV</td>
<td>33%</td>
</tr>
<tr>
<td>V</td>
<td>18%</td>
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</table>
Challenges of ECMO Response Planning

- High resource utilization
- Lag time
- Unable to assess benefit early
## Dynamic Criteria

<table>
<thead>
<tr>
<th>Capacity</th>
<th>Selection Criteria</th>
<th>Exclusion Criteria</th>
<th>Survival Rate</th>
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</thead>
<tbody>
<tr>
<td>&lt; 50%</td>
<td>Standard selection criteria and Standard exclusion criteria</td>
<td>Age &lt;65 y/o, Mechanical ventilation &lt;10 days</td>
<td>&gt;57%</td>
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<tr>
<td>50-80%</td>
<td>Enhanced selection criteria and enhanced exclusion criteria</td>
<td>Age &lt;60 y/o, Mechanical Ventilation &lt;7 days, No pre-ECMO cardiac arrest, Pplat &lt;40 cmH₂O</td>
<td>&gt;76%</td>
</tr>
<tr>
<td>&gt; 80%</td>
<td>Stringent selection criteria and enhanced exclusion criteria</td>
<td>Age &lt;50 y/o, Mechanical ventilation &lt;5 day, No pre-ECMO cardiac arrest, Pplat &lt;40 cmH₂O</td>
<td>&gt;92%</td>
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</table>
Shared goals

- Save the most lives
- Ensure capacity to care for those that are most likely to benefit
- Solidarity and support for difficult decisions
- Provide simplicity and clarity for “spoke” hospitals
Benefits of a Regional Approach

- Fairness
- Transparency
- Maximize Benefit
- Coordination of resources
PA Regional Coalitions

Figure 6: Pennsylvania Regional Health Care Coalitions
Regional ECMO Criteria for COVID-19

On Behalf of the Western Pennsylvania ECMO Collaborative Team

The worldwide COVID-19 pandemic is stressing hospital systems across the country. In such a period of uncertainty, collaboration and clarity of mission is needed. Extracorporeal Membrane Oxygenation (ECMO) has been used as rescue therapy for select patients with Acute Respiratory Distress Syndrome (ARDS) for decades but only a few centers have expertise in its use.
Public Health Emergency Management

Allocation of Scarce Critical Care Resources During a Public Health Emergency

Executive Summary

Introduction: The purpose of this document is to provide guidance for the triage of critically ill patients in the event that a public health emergency creates demand for critical care resources (e.g., ventilators, critical care beds) that outstrips the supply. These triage recommendations will be enacted only if: 1) critical care capacity is, or will shortly be, overwhelmed despite taking all appropriate steps to increase the surge capacity to care for critically ill patients; and 2) a regional authority has declared a public health emergency. This allocation framework is grounded in ethical obligations that include the duty to care, duty to steward resources to optimize population health, distributive and procedural justice, and transparency. It is consistent with existing recommendations for how to allocate scarce critical care resources during a public health emergency, and has been informed by extensive consultation with citizens, disaster medicine experts, and ethicists.
Ethics and Challenges

• Selection criteria
  • Age
  • ICU admission v. Transplant
• Stopping rules
• Over capacity systems
• Ventilator and ICU bed shortages
Timeline

15 Mar.
- Italy, France and Spain health systems clearly stressed

16 Mar.
- UPMC ECMO criteria capacity and inventory reviewed

20 Mar.
- Western Pennsylvania collaboration begins

25 Mar.
- First discussions with University of Pennsylvania

30 Mar.
- UPMC System Wide response plan and agreement

2 Apr.
- Regional CMO group and Health Department announce coordinated criteria and plan

7 Apr.
- Weekly Statewide discussions begin

17 Apr.
- Consensus agreement across the state
ELSO Phases of Response

**Conventional Capacity**
- System is running within capacity, judicious ECMO case selection
- Capacity exists
- Judicious patient selection
- Offer V-V, Y-A ECMO in selected COVID-19 patients based on usual criteria
- Offer ECMO for non COVID-19 indications
- ECPR only in expert centres

**Contingency Capacity Tier 1**
- System is running within expanded capacity; triage to maximize ECMO capacity to outcome
- Expanded capacity
- Triage to maximise resource:benefit ratio
- VV, VA ECMO in younger COVID-19 patients with single organ failure
- Judicious ECMO use for non COVID-19 indications
- ECPR not offered

**Contingency Capacity Tier 2**
- Expanded capacity close to saturation, restrictive ECMO selection criteria
- Capacity saturated
- Restrictive ECMO criteria for all indications
- Prioritise non COVID-19 indications with better chance of survival
- VV ECMO in younger, single organ failure COVID-19 patients
- VA ECMO and ECPR not offered

**Crisis Capacity**
- System is overwhelmed, ECMO may no longer be appropriate, concentrate resources to usual care
- Capacity overwhelmed
- ECMO not feasible in both COVID-19 and non-COVID-19 patients
- Triage ICU admissions
- Consider ceasing all futile care to create capacity in the system