ECMO in the Emergency Department

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Why ECMO in the ED?

- Requires significant staffing
  - Nursing 2:1 care
  - Perfusionist
  - At least one Physician
- Cost
  - Equipment
  - ICU space
  - On call time
  - Nursing resources
  - ED throughput suffers

Why ECMO in the ED?

- Training
  - Patient selection
  - Ultrasound guided line placement
  - Nursing
  - Transport
  - Perfusion
  - Residents/Fellows
- Danger to staff
Why ECMO in the ED?

- ECLS – improves coronary blood flow, oxygenation of blood, and end organ perfusion.
- Goal with ECMO in the ED is to provide a bridge to destination therapy.
  - PCI
  - Transplant
  - LVAD
  - Support and rest to allow organ recovery
- In the right patient, performed at the right time ECMO increases positive neurological outcomes and survival to hospital discharge.

How do I build an ECMO program in my ED?

- Equipment
- Review the modes of ECMO
- Specialized ECMO team
  - EMS/Air ambulance
  - ED
  - CT surgery/Intensivist
  - Nursing
  - Perfusion
- Inter-departmental Guidelines
  - Evidence based through review of the available literature

ECMO Alert in the Emergency Department at PHSMC

**Inclusion criteria:**
- Age between 18-60 years old And
- Persistent cardiopulmonary arrest despite 10 minutes of traditional resuscitative efforts Or
- Shock (SBP < 70 mmHg) refractory to standard therapies

**Exclusion criteria:**
- Un-witnessed arrest, out-of-hospital arrest
- Chest compressions not initiated within 10 min of arrest
- Pre-existing severe neurological disease prior to arrest (including traumatic brain injury, stroke, or severe dementia)
- DNR/DNI
- Terminal or other end stage disease
- Life expectancy less than 2 years
- Contraindication to anticoagulation
ECMO Alert in the Emergency Department at PHSMC

- 5-10 minutes of ACLS without ROSC
- Dial 8888 – "ECMO Alert in ED room #" by the Code ECMO, the HVICU charge nurse will bring the ECMO cart and pre-primed ECMO circuit to the ED. The perfusionist will be notified and report to the ED.
- ED will send: Type and cross for 4 units, PT, PTT, INR, LFTs, CBC, iStat should be run with a Chem/VBG
- Goal of 60 minutes from Cardiac Arrest to ECMO
- Patient will be taken to the HVICU, Cath lab, or to other clinical area based on HVICU attending’s judgment

Developing a Guideline – Patient selection

Unwitnessed all die

Developing a Guideline – Patient selection

Pre-Arrest Do Best
Developing a Guideline -- Timing

Witessed arrest.
ECMO out to 60 minutes
18-75 y/o

Lancet 2008
Cardiopulmonary resuscitation with assisted extracorporeal life-support versus conventional cardiopulmonary resuscitation in adults with in-hospital cardiac arrest: an observational study and propensity analysis.

57 Cases over 6 years
59 Cases over 3 years

ECPR much better results than traditional CPR for each time period.

Between 30-60 minutes had comparable survival to discharge rates.
Developing a Guideline—Timing

- Greater than 60 minutes sees a decrease in survival rates, but still superior to CPR.

Developing a Guideline -- Age

<table>
<thead>
<tr>
<th>Extracorporeal membrane oxygenation to support cardiopulmonary resuscitation in adults</th>
<th>No significant age correlation</th>
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<tbody>
<tr>
<td>Age 40-74</td>
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<table>
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<tr>
<th>Extracorporeal life support contraindicated in elderly patients*</th>
<th>&gt;75 y/o do just as well</th>
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<tbody>
<tr>
<td>Age 18-80</td>
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| Chen’s 2 studies mentioned above included 18-75 |

**“Pie in the Sky”**

- ED physicians agree ECMO would be beneficial to their patients
- However, they do not believe the systems can be effectively put into place where they practice.

“Pie in the Sky”

- Things that have been done in the ED recently to improve patient’s chance of discharge, neurologically intact, post-arrest:
  - Rapid PCI
    - Looking for reversible cause to restore ROSC
  - Rapid defib
  - Hypothermia post arrest
  - Continuous chest compression CPR

Guidelines for improved patient care

- Standard processes have been proven to improve patient care
- Why not an ECMO alert?
- Current guidelines:
  - Heart Alert
  - Brain Attack
  - Vascular Alert
  - Trauma Activation (adult and pediatric)
  - ECMO Alert

Setting this up in your Emergency Department

- Requires a coordinated team to provide ECMO services fast 24/7
- Requires rapid identification by the Emergency physician of the appropriate patient.
- The data tells us the benefit of this program
  - Better survival to hospital discharges, with significantly improved neurological outcomes
FUTURE

- Further refining the ECMO Alert
  - ED physicians to place ultrasound guided femoral A line and femoral venous central line.
  - Expanding ECMO Alert to inpatient units
  - Expanding for Asthma/Flu criteria
- Requires a coordinated team
- In the next 5-10 years may be calling the ECMO team rather than the cardiologist.
- Better patient selection=better patient outcome

Thank You
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