Elements of a Comprehensive ECMO Program*

Mazen Odish, MD

*Hint it’s not just placing them on ECMO
Who gets ECMO?

- Scarce and resource intensive
- Access may not be equal
- Ensure equitable care
- Regional Disaster Planning
- Triage of ECMO resources
  - ECMO center cooperation
- ECMO indications by survival and duration of support

Regional Planning for Extracorporeal Membrane Oxygenation Allocation During Coronavirus Disease 2019

Matthew E. Prekker, MD, MPH; Melissa E. Brunsvold, MD; J. Kyle Bohman, MD; Gwnyth Fischer, MD; Kendra L. Gram, MD; John M. Litell, DO; Ramiro Saavedra-Romero, MD; and John L. Hick, MD

How do you provide ECMO fairly?

- **San Diego County ECMO Consortium** addresses the needs of our large county and neighbors
  - 4 ECMO centers share equipment, expertise
  - Distribution of patients

- **Uniform inclusion/exclusion** that varies based on available resources (stricter as resources dwindle)

- >300 patients evaluated, 95 placed on ECMO
How do you get to ECMO?

One Hundred Transports on Extracorporeal Support to an Extracorporeal Membrane Oxygenation Center

Mauer Biscotti, MD, Cara Agerstrand, MD, Darryl Abrams, MD, Mark Ginsburg, MD, Joshua Sonett, MD, Linda Mongero, CCP, Hiroo Takayama, MD, Daniel Brodie, MD,* and Matthew Bacchetta, MD*

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“Mobile ECMO”

• Minimal complications
• Required training with transport and cannulation team
Mobile ECMO at UCSD

• 19 patients with COVID-19 in the last 6 months
• 4 southern California counties, 12 hospitals
• Challenges
  • Eyeball test
  • Unknown neurologic status
Who provides bedside ECMO care?

http://www.abcp.org/pd/ann_rep.pdf
elso.org
Who provides bedside ECMO care at UCSD? -> RNs

- Expanded Capacity
- Non-inferior outcomes
- Cheaper

A cost-reducing extracorporeal membrane oxygenation (ECMO) program model: a single institution experience

NC Cavarocchi, S Wallace, EY Hong, A Tropea, J Byrne, HT Pitcher and H Hirose

<table>
<thead>
<tr>
<th></th>
<th>Perfusionist-Run</th>
<th>Nurse-Run</th>
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<tbody>
<tr>
<td>Year</td>
<td>2017</td>
<td>2018 &amp; 2019</td>
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<tr>
<td>ECMO specialists (n)</td>
<td>8</td>
<td>56</td>
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<tr>
<td>Total ECMO cases (number of VA-ECMO)</td>
<td>30 (23)</td>
<td>99 (60)</td>
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<tr>
<td>Survival to discharge – total (%)</td>
<td>8/29 (27.5%)</td>
<td>49/94 (52%)</td>
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<td>Complications per ECMO day, mean ± SD</td>
<td>0.42 ± 0.52</td>
<td>0.34 ± 0.49</td>
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How to set the ventilator on ECMO
How to set the ventilator on ECMO

ELSO Guidelines

- RR 4 – 10
- Driving Pressure <15 cm H2O
- Pplat ≤ 25
- PEEP 10 – 15
  - We titrate via esophageal manometry

Lung rest initially
Proning on ECMO

- Safe
- During lung rest
- NMB not necessary
Should we rest the lung further?

- Unclear
- Biomarker evidence that lower ventilator pressures are better
- No large studies
- Active research

Ultra-Protective Ventilation Reduces Biotrauma in Patients on Venovenous Extracorporeal Membrane Oxygenation for Severe Acute Respiratory Distress Syndrome*

Sacha Rozencwaig, MD; Amélie Guihot, MD, PhD; Guillaume Franchineau, MD; Mickael Lescroat, MD; Nicolas Bréchot, MD, PhD; Guillaume Hékimian, MD; Guillaume Lebreton, MD, PhD; Brigitte Autran, MD, PhD; Charles-Edouard Luyt, MD, PhD; Alain Combes, MD, PhD; Matthieu Schmidt, MD, PhD

Effect of Driving Pressure Change During Extracorporeal Membrane Oxygenation in Adults With Acute Respiratory Distress Syndrome: A Randomized Crossover Physiologic Study

Lorenzo Del Sorbo, MD; Alberto Goffi, MD; George Tomlinson, PhD; Tommaso Pettenazzo, MD; Francesca Facchin, MD, PhD; Alice Vendramin, MD; Ewan C. Goligher, MD, PhD; Marcelo Cypel, MD; Arthur S. Slutsky, MD; Shaf Keshavjee, MD; Niall D. Ferguson, MD; Eddy Fan, MD, PhD; for the International ECMO Network (ECMOnet)
Mobilizing patients on ECMO

Safety and Feasibility of Early Physical Therapy for Patients on Extracorporeal Membrane Oxygenator: University of Maryland Medical Center Experience*

Chris L. Wells, PhD, PT, CCS, ATC¹; Jenny Forrester, PT, DPT¹; Joshua Vogel, PT, DPT¹; Raymond Rector, CCP, LP¹; Ali Tabatabai, MD²; Daniel Herr, MD, FCCM²

- Safe even with femoral cannulation
- Minimal complications
- Lacking data on mortality and length of stay
Mobility and Physical Therapy

• Nurses with in-bed mobility
• PT/OT with out of bed mobility
• Limited to patient room
  • COVID-19 precautions
• Minimizing sedation
• Mobilized 22/35 (62%) of our COVID-19 patients

* May be limited by PPE
Continuing improvement of an ECMO program

Quality Improvement and Patient / Family Experience

- ECMO committee monthly meeting
- Daily expert rounding
- Scheduled weekly family meetings – on zoom*
- Automated palliative care consult

Education

- Bimonthly multidisciplinary rounds
  - Discuss cases, education, and literature review
- Monthly ECMO labs for nurse ECMO specialists
- Annual seminar for critical care and cardiology providers
- Quarterly ECMO course and hands-on session
It takes a team of dedicated professionals to run an ECMO Program

- Travis Pollema, DO – ECMO Director
- Cassia Yi, RN, MSN – ECMO Coordinator
- Robert Owens, MD
- Perfusionists
- Nurse ECMO specialists
- CT Surgery
- Pulmonary and Anesthesia Critical Care
- Cardiology
- Physical and occupational therapy
- Palliative care
- Pharmacy
- Pulmonary Vascular Teams (PAH/CTEPH/PE)
- Heart and Lung Transplant Teams
To Recap: Elements of a Comprehensive ECMO Program

- Equitable care
  - Disaster / pandemic planning
  - Regional cooperation
  - Mobile ECMO
- Nurse-run ECMO with perfusion backup
- Ventilator management – rest the lung
- Minimizing sedation and maximizing mobility on ECMO
- Quality improvement and education
- Team approach to comprehensive ECMO care
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