Large single center experience in pediatric oncology and bone marrow transplant patients on ECMO: How should we decide candidacy?

Jordan Marquess
*Children's Mercy Hospital*

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Large Single Center Experience in Pediatric Oncology and Bone Marrow Transplant Patients on ECMO: A Reflection on Candidacy

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Contributors: Brittany Lyons MD, Debbie Newton MSN RN CCRN, Kari Davidson MSN RN CCRN and Mikaela Miller

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Disclosures

• No disclosures or conflicts for presenter, authors and mentor
Outline

• Background
• Methods
• Results
• Conclusions
• Limitations
ECMO basics

• A form of life-support that provides oxygenation, CO2 removal, and cardiac output.

• **VV**: VenoVenous ECMO → bypasses lungs

• **VA**: VenoArterial ECMO → bypasses heart and lungs
Background

- ECMO survival for the general pediatric population: 50-60%

- ECMO is rarely used or considered in the pediatric oncology/bone marrow transplant (BMT) populations due to concerns for high mortality and high rates of complications.

- There is a paucity of data to determine ECMO candidacy for these patients.

- Our center has one of the highest known number of pediatric patients in this population treated with ECMO.
Methods

• A retrospective single center cohort study was conducted at Children’s Mercy Kansas City.

• Children aged 0-17 years with a history of primary oncologic diagnosis or BMT who required VA- or VV- ECMO from 2015-2020.
Our Sample

• 12 total patients included in study
• Most common underlying diagnosis was leukemia/lymphoma (8/12).
• Solid tumors
  • Neuroblastoma
  • Wilm’s tumor
• Non-oncologic
  • Aplastic anemia
  • PIK3 mutation
## Results

<table>
<thead>
<tr>
<th></th>
<th>Survived to Hospital Discharge</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (N=7)</td>
<td>No (N=5)</td>
</tr>
<tr>
<td>Age at cannulation</td>
<td>13.9 (4.4-16.1)</td>
<td>4.4 (3.7-4.8)</td>
</tr>
<tr>
<td>Diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Leukemia/Lymphoma</td>
<td>3 (42.9%)</td>
<td>5 (100.0%)</td>
</tr>
<tr>
<td>-Solid Organ</td>
<td>2 (28.6%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>-Non-oncology</td>
<td>2 (28.6%)</td>
<td>0 (0.0%)</td>
</tr>
<tr>
<td>Bone marrow transplant?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-Received BMT</td>
<td>4 (67%)</td>
<td>2 (33%)</td>
</tr>
<tr>
<td>-Did not receive BMT</td>
<td>3 (50%)</td>
<td>3 (50%)</td>
</tr>
</tbody>
</table>

**Survival to De-Cannulation**

- Yes: 58%
- No: 42%

*Children's Mercy Kansas City*
# Results

<table>
<thead>
<tr>
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<th>Survived to Hospital Discharge</th>
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<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes (N=7)</td>
<td>No (N=%)</td>
<td>0.99</td>
</tr>
<tr>
<td><strong>ECMO Complications</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Hemorrhagic</td>
<td>3 (42.9%)</td>
<td>3 (60.0%)</td>
<td>0.99</td>
</tr>
<tr>
<td>- Thromboembolic</td>
<td>1 (14.3%)</td>
<td>0 (0.0%)</td>
<td>0.99</td>
</tr>
<tr>
<td>- Component/circuit change</td>
<td>5 (71.4%)</td>
<td>2 (40.0%)</td>
<td>0.56</td>
</tr>
<tr>
<td>- Blood Product Use</td>
<td>3 (42.9%)</td>
<td>4 (80.0%)</td>
<td>0.29</td>
</tr>
<tr>
<td>- Infection</td>
<td>2 (28.6%)</td>
<td>2 (40.0%)</td>
<td>0.99</td>
</tr>
<tr>
<td><strong>Days on ECMO</strong></td>
<td>12.0 (7.5-32.0)</td>
<td>5.0 (4.0-18.0)</td>
<td>0.22</td>
</tr>
<tr>
<td><strong>Length of Hospital Stay</strong></td>
<td>115.0 (70.0-187.0)</td>
<td>10.0 (10.0-38.0)</td>
<td>0.02</td>
</tr>
</tbody>
</table>
Conclusion

• Younger patients and those with leukemia or lymphoma had higher mortality.
• History of BMT did not predict higher mortality.
• Complications on ECMO did not suggest higher mortality.
• Longer ECMO runs did not suggest higher mortality.

• Oncology and BMT pediatric patients should not be presumptively excluded from ECMO therapy.
Limitations

• Vast variability of patient population, including primary diagnoses
• Small patient population, difficulty with powering study
• Varying definitions of morbidity and mortality in published literature
Next Steps

• Newly established guidelines regarding BMT patients’ cannulation to VA ECMO
• Retroactively apply guidelines to our BMT patients at CMH and compare their outcomes
  • Capturing their clinical course
  • Are we successful at cannulating this patient population?
  • Can we support them with ECMO without/ despite complications from the transplant?
References


References
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• Mikaela Miller, MS, MPH, MA, Biostatistician
Questions?