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A cost reducing ECMO model: a single institutional experience.

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Introduction

- Shortage of ECMO specialists.
- ELSO to form new guidelines.
- Board certified nurses who have at least one year of critical care experience can be trained as ECMO specialists.
- ECMO program expansion.
- Financial concerns were reported.
- However, the financial concerns were not weighed against the long-term cost benefit of training nurses as ECMO specialists.

Objective

We aim to describe our experiences in implementing a new cost-reducing ECMO model in an ICU setting involving multidisciplinary providers (registered nurses, midlevel providers and intensivists) as ECMO specialists.

Methods

(Implementing the program)

Group I
- New technology:
  - ECMO circuit
  - Oximetry
- The education platform:
  - Didactic sessions
  - Hands-on sessions
  - Regular competency tests
  - Competency checklist

Group II
- Allocation of dedicated space
- Development of algorithms
- Recruitment of new specialists

Role of new specialists:
- Continuous bedside perfusion monitoring.
- Assess the ECMO circuit
- Assist the perfusionist in initiating ECMO
- No changes in nursing ratio (1:1 nurse to patient ratio)
- PRN Perfusionists’ services

Competency checklist

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Competency checklist

CRITICAL BEHAVIOR

1. Reviews and follows Nursing Procedure-Care of the Patient with Adult Extracorporeal Membrane Oxygenation
   - ECMO
     1. States location, purpose, indications and contraindications of use.
     2. Identifies resources to troubleshoot
     3. Describes the process of percutaneous cannulation and ECMO start up
     4. Describes the difference between V-V and V-A ECMO
   - ECMO PUMP/CART
     1. States location of the ECMO cart
     2. States contents of the ECMO cart
     3. Identifies that the ECMO cart has had a daily check completed by perfusionist
     4. Identifies the on/off power switch
     5. Identifies the battery indicator
     6. Identifies the display screen
     7. Identifies the pump and oxygenator
     8. Identifies the flow sensor
   - ECMO CIRCUIT
     1. States location of backup circuit and states procedures for obtaining replacement back-up equipment
     2. Demonstrates the appropriate technique in assessing the ECMO circuit and keeps circuit visible

PATIENT CARE

1. Performs a thorough patient assessment, (respiratory, neurological, cannula site, and vital signs) and the interpretation of the assessment
2. Discuss the interpretation of clinical signs and symptoms appropriately and communicates with physicians
3. Demonstrates or describes the relationship of the ECMO blood flow to oxygen delivery and oxygen consumption
4. Reviews the relationship of sweep gas and carbon dioxide removal
5. Evaluates the interpretation of the patient arterial blood gas and the appropriate response with sweep gas and carbon dioxide removal
6. Documents on ECMO flowsheet
7. Identifies the correct interventions for laboratory values
8. Maintains hourly I/O record status
9. Evaluates the correct interventions for laboratory values
10. Maintains hourly I/O record status

TROUBLESHOOTING

1. States procedures for protecting patient when equipment fails
2. Demonstrates the ability to clamp the line and move pump to back up
3. Demonstrates hand cranking of the pump
4. Performs the various interventions in the management of hemorrhage (Ex: cannula site, IV sites, GI, etc.)
5. Discuss possible complications and emergency scenarios including device failure, bleeding, lower limb ischemia, decreased flow, chatter, arrhythmia, decreased cerebral oximetry or SO2
6. States location of backup circuit and states procedures for obtaining replacement back-up equipment
7. Demonstrates the appropriate technique in assessing the ECMO circuit and keeps circuit visible

Contact information

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Results

Demographics

<table>
<thead>
<tr>
<th></th>
<th>Group I</th>
<th>Group II</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of patients</td>
<td>28</td>
<td>46</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>44±15</td>
<td>49±14</td>
<td>0.183</td>
</tr>
<tr>
<td>Males</td>
<td>14 (50%)</td>
<td>26 (57%)</td>
<td>0.636</td>
</tr>
<tr>
<td>BMI</td>
<td>27.9 ± 7.7</td>
<td>31.5 ± 8.6</td>
<td>0.077</td>
</tr>
<tr>
<td>Duration of ECMO</td>
<td>8.2 ± 5.5 d</td>
<td>8.1 ± 6.9 d</td>
<td>0.971</td>
</tr>
</tbody>
</table>

Safety management issue

<table>
<thead>
<tr>
<th></th>
<th>Group I</th>
<th>Group II</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dislodged cannula</td>
<td>0%</td>
<td>2.10%</td>
<td>0.622</td>
</tr>
<tr>
<td>Mortality</td>
<td>12 (42%)</td>
<td>27 (59%)</td>
<td>0.233</td>
</tr>
</tbody>
</table>

Conclusion

We demonstrated that the ICU run ECMO model decreases hospital cost by reducing the cost of continuous bedside perfusion support with no loss in safety and outcomes.