ICU MORTALITY IN SUB-SAHARAN AFRICA: THE MODIFIED SEQUENTIAL ORGAN FUNCTION ASSESSMENT SCORE

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Critical Care in Sub-Saharan Africa?

• Significant M&M can be averted with cost-effective interventions
  – Sepsis, trauma, obstetric emergencies
  – The human resource (regardless of the available equipment) is the most important resource for critical care

Deaths preventable with Critical Care

Critical Care Epidemiology

- **US**: 5 million ICU admissions/yr
- **Uganda**: 1000 “ICU admissions/yr”

- Can a scoring system be used to identify critically-ill patients in resource-constrained settings?
- Can a scoring system help allocate resources to improve health outcomes?
Scoring Systems

• Optimization is imperative – a scoring system is needed

• APACHE was the first scoring tool (Bouch & Thompson, 2008)

• SOFA score- simple, objective and accurate (Vincent, 1998; Ferreira, 2001)
Scoring Systems

- Blood gas analysis is a rarity in resource limited settings
  - Most popular scoring systems require blood gas analysis

- Modified SOFA score; PaO2/FiO2 can be replaced with SPO2/FiO2 (Pandharipande, 2009)

- 6 organ systems; CNS, CVS, RS, Liver, Renal, Coagulation
  - 0-normal, 4- worst organ function; total 0-24
<table>
<thead>
<tr>
<th>SOFA score</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Respiratory</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \text{SPO}_2/\text{FiO}_2 )</td>
<td>&gt;400</td>
<td>221–301</td>
<td>142–220</td>
<td>67–141</td>
<td>&lt;67</td>
</tr>
<tr>
<td>Coagulation</td>
<td>&gt;150</td>
<td>&lt;150</td>
<td>&lt;100</td>
<td>&lt;50</td>
<td>&lt;20</td>
</tr>
<tr>
<td>( \text{Platelets} \times 10^9/\text{mm}^3 )</td>
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<tr>
<td>Liver</td>
<td>&lt;1.2</td>
<td>1.2–1.9</td>
<td>2.0–5.9</td>
<td>6.0–11.9</td>
<td>&gt;12.0</td>
</tr>
<tr>
<td>( \text{Bilirubin (mg/dL)} )</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Cardiovascular</td>
<td></td>
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</tr>
<tr>
<td>Hypotension</td>
<td>No hypotension</td>
<td>MAP &lt;70</td>
<td>Dopamine ( \leq 5 \text{ug/kg/min} ) or dobutamine (any dose)</td>
<td>Dopamine &gt;5 \text{ug/kg/min} or norepinephrine ( \leq 0.1 \text{ug/kg/min} )</td>
<td>Dopamine &gt;15 \text{ug/kg/min} or norepinephrine &gt;0.1 \text{ug/kg/min}</td>
</tr>
<tr>
<td>CNS</td>
<td>15</td>
<td>13–14</td>
<td>10–12</td>
<td>6–9</td>
<td>&lt;6</td>
</tr>
<tr>
<td>( \text{Glasgow Coma Score} )</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Renal</td>
<td>&lt;1.2</td>
<td>1.2–1.9</td>
<td>2.0–3.4</td>
<td>3.5–4.9 or &lt;500</td>
<td>&gt;5.0 or &lt;200</td>
</tr>
<tr>
<td>( \text{Creatinine (mg/dL)/urine output (ml/d)} )</td>
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Study Objectives

– To evaluate the feasibility of the mSOFA score in Mulago National Referral Hospital general ICU

– To determine the correlation between the mSOFA scores and mortality in patients admitted to the Mulago Hospital ICU in a year
Methods

• Prospective observational cohort study, MNRH General ICU
  • One year period; Feb, 2014-Jan, 2015

• Consecutively enrolled >12yrs; excluded postop <48hrs, low risk monitoring

• Collected demographic, laboratory and clinical data
  – mSOFA score on admission and at 48hours, follow-up til discharge/death

• Primary outcome; Mortality
Population Characteristics

- ICU mortality 47.5%
  - Median age 34 years
  - Median Ventilation time: 3 days (IQR: 0.5-8)
  - Median LOS: 6 days

- Reasons for admission
  - Respiratory failure: 23.5%
  - Severe sepsis/septic shock: 13.6%
  - Severe head injury: 11.8%

170 patients recruited
52 excluded
118 analyzed
Blood gas analysis

- Median survival time of 12 days with (95% CI 6.38-17.62)
Comparison of SOFA scores:

- Initial mSOFA score: Higher in non-survivors, p = 0.007
- Mean mSOFA score: Higher in non-survivors, p = 0.0001
- Highest mSOFA score: Higher in non-survivors, p = 0.0001
- Delta mSOFA: Higher in non-survivors, p = 0.0001

Graphs showing mortality vs. initial SOFA, mean SOFA, and highest SOFA scores.
Limitations

• Ideally SOFA scores should be measured daily

• Inadequate power to show significant association at multivariate analysis

• Generalizability limited
Conclusions/Recommendations

• mSOFA score is feasible in our setting

• It can be used to differentiate between survivors and non-survivors

• A larger study is needed, preferably multi-centered to determine utility in resource allocation to improve outcomes for critically ill patients