Pre-shock and Normotensive Cardiogenic Shock in the Critical Care Cardiology Trials Network Registry

Siddharth M. Patel, MD, MPH,1 David D. Berg, MD, MPH,1 Erin A. Bohula, MD, DPhil,1 Jeong-Gun Park, PhD,2 Jason N. Katz, MD, MHS,2 Sean van Diepen, MD, MSc,3 David A. Morrow, MD, MPH,1 for the CCCTN Investigators

1TIMI Study Group, Brigham and Women’s Hospital & Harvard Medical School, Boston, MA, USA; 2Division of Cardiology, Department of Medicine, Duke University, Durham, NC, USA; 3Department of Critical Care Medicine and Division of Cardiology, Department of Medicine, University of Alberta, Edmonton, Alberta, Canada.

BACKGROUND

• Epidemiology and prognostic implications of pre-shock and normotensive cardiogenic shock (CS) are not well defined.
• Optimal staging of risk for pts w/ isolated hypoperfusion vs. isolated hypotension remains unclear.
• We sought to better characterize these phenotypes and associated outcomes across contemporary CICUs.

METHODS

• CICUs in the Critical Care Cardiology Trials Network (CCCTN) contribute all consecutive medical admissions in annual 2-month ‘snap-shots’, with subset reporting shock admissions year-round.
• Admissions classified as isolated low CO, isolated hypotension, normotensive CS, or SCAI stage C CS (Figure 1).
  - Normal perfusion on arrival: admission lactate <2 mmol/L and eGFR ≥45 mL/min/1.73 m²
  - Hypoperfusion during CICU stay: highest lactate ≥2 mmol/L or ALT ≥200 U/L or lowest eGFR ≤45 mL/min/1.73 m²
  - In-hospital mortality by group was defined with 95% CIs reported using the binomial method. Between-group mortality was compared using the global and pairwise χ² tests.

RESULTS

• Of a total of 1,789 CICU admissions were included (Table 1).

Table 1: Baseline Characteristics by Group

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Isolated Low CO (N=81)</th>
<th>Isolated Hypotension (N=152)</th>
<th>Normotensive CS (N=239)</th>
<th>SCAI Stage C CS (N=1317)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (y)</td>
<td>63 (51-73)</td>
<td>66 (55-74)</td>
<td>64 (55-74)</td>
<td>67 (66-76)</td>
</tr>
<tr>
<td>Female (%)</td>
<td>32 (%)</td>
<td>38 (%)</td>
<td>34 (%)</td>
<td>34 (%)</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>27 (24-30)</td>
<td>28 (23-32)</td>
<td>28 (25-33)</td>
<td>27 (24-32)</td>
</tr>
<tr>
<td>Dx of ACS (%)</td>
<td>15 (%)</td>
<td>16 (%)</td>
<td>20 (%)</td>
<td>25 (%)</td>
</tr>
<tr>
<td>Prior HF (%)</td>
<td>73 (%)</td>
<td>70 (%)</td>
<td>59 (%)</td>
<td>55 (%)</td>
</tr>
</tbody>
</table>

• No difference demographics among groups (Table 1); however:
  - ACS presentation w/ SCAI Stage C CS (global p=0.03).
  - Prior HF w/ isolated low CO (global p<0.001).
  - Among pts w/ invasive hemodynamics (Table 2), SVR for normotensive CS and isolated low CO (global p<0.001).
• Overall in-hospital mortality = 20.3%, with marked differences across groups (global p<0.001; Figure 2).
  - Significantly ↑ mortality w/ hypoperfusion (normotensive CS and SCAI stage C CS, 18.0% and 23.0%).
  - Among groups w/ normal perfusion on admission, isolated HoTN had ↑ mortality vs. isolated low CO (10.5% vs. 2.5%; p=0.03).
  - A total of 32 (40%) pts and 50 (33%) pts initially presenting w/ isolated low CO and isolated HoTN, respectively, evolved to have hypoperfusion by labs during CICU course.

CONCLUSIONS

• Normotensive CS is associated with significantly ↑ in-hospital mortality vs. normal perfusion (isolated low CO or isolated hypotension) states.
• These findings indicate hypoperfusion, irrespective of hypotension, is associated with ↑ mortality in CS.
• These data may be useful to inform refinement of CS staging with respect to pre-shock states.

DISCLOSURE OF FACULTY RELATIONSHIPS: