Early Serial Assessment of Aggregate Vasoactive Support and Mortality in Cardiogenic Shock: Insights from the Critical Care Cardiology Trials Network Registry

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BACKGROUND

- Vasoactive agents (e.g., vasopressors or inotropes), are routinely employed as 1st line therapy for cardiogenic shock (CS).
- The intensity of pharmacologic support may be used as a marker of CS severity and as an independent correlate of mortality.
- CS is a dynamic state, in which iterative assessment of overall trajectory may influence clinical assessment of severity and decision making for therapies.
- Relationships between early changes in aggregate vasoactive burden and outcomes in CS are not well-defined.

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.
- Dosing of all vasoactive agents was captured in the electronic case record form at 4h and 24h from CICU admission.
- The vasoactive-inotropic score (VIS) was used to quantify the intensity of vasoactive support at each time point.
  - VIS = dobutamine + dopamine + 10*phenylephrine + 10*milrinone + 100*epinephrine + 100*norepinephrine + 10,000*vasopressin (in µg/kg/min [or U/kg/min])
  - A VIS of 10 = norepinephrine or epinephrine at a dose of 8 µg/min in an 80-kg patient
- Associations between change in VIS from 4h to 24h with CICU mortality, were examined categorically using previously applied thresholds and continuously per 10-point increase in VIS.
- Discrimination of CICU mortality by change in VIS was contrasted with the 24h SOFA score and clinician-determined SCAI stage.

RESULTS

- A total of 3,665 patients who presented with CS with available VIS at 4h and 24h were included.
- Examining associations at static timepoints, CICU mortality increased stepwise for across both 4h and 24h VIS values (13% to 45% and 11% to 73% for VIS <10 vs. ≥40; p-trend < 0.0001).
- Stratifying by the 4h VIS, a greater proportion of those with higher starting VIS at 4h had decreases ≥10 by 24h (**Fig 1A**).

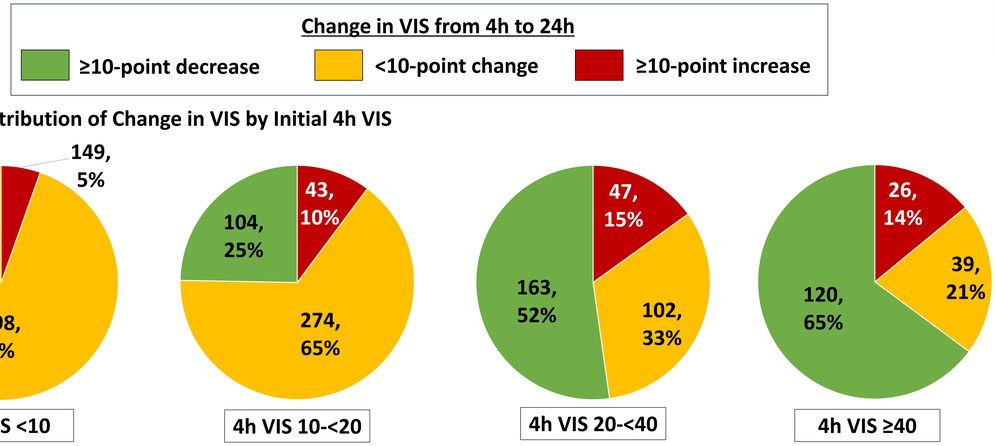

Figure 1A: Distribution of Change in VIS by Initial 4h VIS

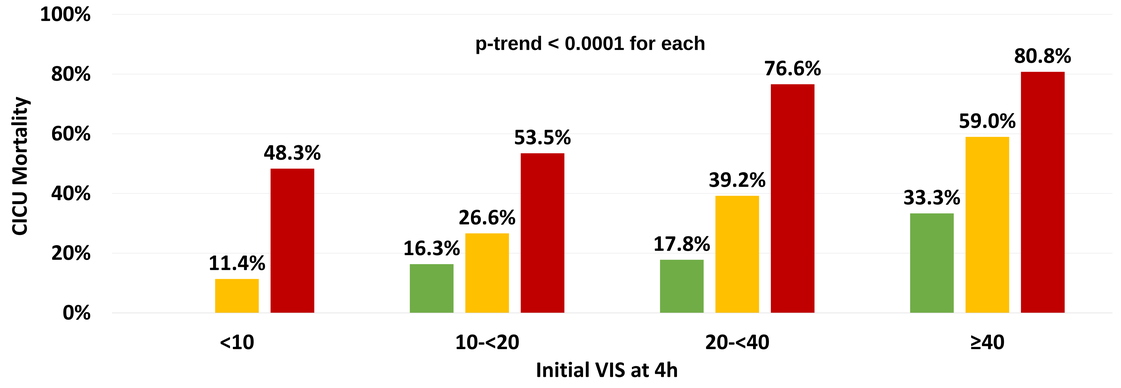

Figure 1B: CICU Mortality by Change in VIS Stratified by The Initial 4h VIS

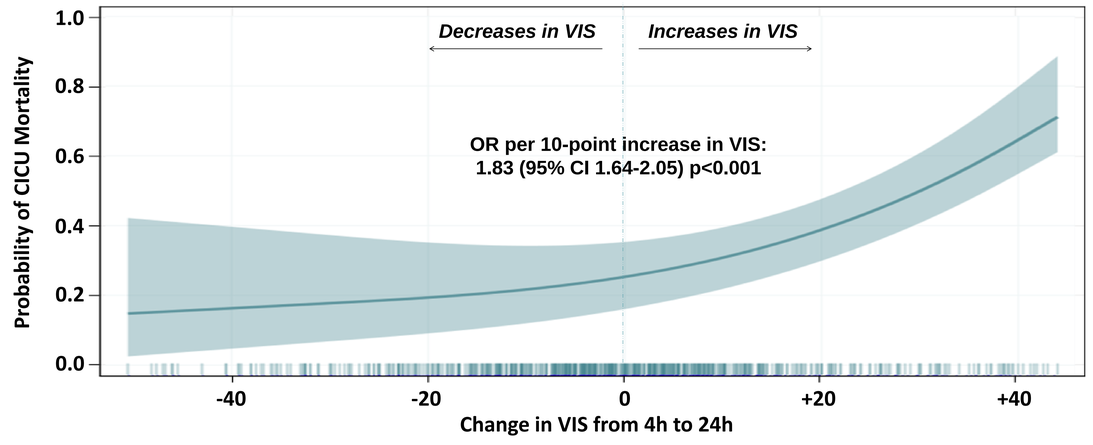

Figure 2: Probability of CICU Mortality by Continuous Change in VIS

RESULTS (Continued)

- Accounting for the initial 4h VIS, changes in VIS from 4h to 24h were associated with a 2-to->4-fold difference in mortality (**Fig 1B**).
- Examined continuously accounting for the initial 4h VIS, increases or decreases in VIS from 4h to 24h were associated with higher or lower CICU mortality (**Fig 2**).
- All prognostic associations were consistent across CS subtypes (AMI-CS vs. HF-CS) and by preceding cardiac arrest status.
- Stratifying by MCS:
  - Those supported by MCS at each time point had higher VIS than those unsupported by MCS (median 4h and 24h VIS 5.0 vs 3.5 and 5.0 vs. 2.5, respectively; p<0.0001 for each).
  - A higher VIS at each timepoint was associated with higher mortality irrespective of MCS, but with attenuation of the risk relationship in those with MCS (p-interaction < 0.01 for each timepoint):

OR (95% CI) for CICU mortality per 10-pt higher VIS		
Timepoint	**MCS**	**No MCS**
4h	1.18 (1.09-1.28)	1.38 (1.29-1.46)
24h	1.36 (1.23-1.49)	1.84 (1.69-2.01)

- Change in VIS from 4h to 24h had good discrimination of CICU mortality (C-stat 0.72 [0.70-0.75]), and improved discrimination of:
  - 24h SOFA score: C-stat 0.72 (0.69-0.74) to 0.76 (0.74-0.78)
  - 24h SCAI stage: C-stat 0.72 (0.70-0.74) to 0.77 (0.75-0.79)

CONCLUSIONS

- Early changes in the magnitude of vasoactive support in CS are associated with a gradient of risk for CICU mortality and provide incremental prognostic information.
- These data suggest that early vasoactive trajectory, which may be seamlessly integrated into EHRs, can improve CS prognostication, with potential to be leveraged for clinical decision-making and research applications in CS.

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DISCLOSURE OF FACULTY RELATIONSHIPS:
The authors report no relevant conflicts of interest