Introduction
B-type natriuretic peptide (BNP) is a cardiac neuropeptide predominantly released from the ventricles in response to stretch of ventricular myocytes or increase in wall tension. Values of BNP have guided physicians in fluid and diuretic therapy in patients with cardiac dysfunction but BNP levels reflect distension of cardiac chamber and may not represent intravascular blood volume (BV) status.

Methods
- Plasma volume (PV) was measured using radioisotope iodine-131 labeled albumin injected over 1 minute with serial blood draws over 12, 18, 24, 30 and 36 minutes extrapolated to time zero (BVA-100, Daxor, N.Y). Simultaneous Hematocrit measurement (Red cell volume/plasma volume) allowed calculation of Blood Volume (BV = PV + Red cell volume)
- BV Values are expressed in mL as well as % deviation from ideal volumes. The predicted normal BV was determined from patient’s height, weight and deviation from ideal body weight as described by Feldshuh and Enson. The range of normal values and degrees of deviation are presented below.

<table>
<thead>
<tr>
<th>Whole Blood Volume</th>
<th>Red Cell Volume</th>
<th>Plasma Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>± 8%</td>
<td>± 10%</td>
</tr>
<tr>
<td>Mild Deviation</td>
<td>9-16%</td>
<td>11-20%</td>
</tr>
<tr>
<td>Moderate Deviation</td>
<td>17-24%</td>
<td>21-30%</td>
</tr>
<tr>
<td>Severe Deviation</td>
<td>25-32%</td>
<td>31-40%</td>
</tr>
<tr>
<td>Extreme Deviation</td>
<td>&gt;32%</td>
<td>&gt;41%</td>
</tr>
</tbody>
</table>

- Diagnosis (number of patients):
  - Septic Shock (14)
  - Trauma (11)
  - Hemorrhagic shock (5)
- Co-Morbidities (number of patients):
  - Cardiac (19)
  - Pulmonary (11)
  - Renal failure (8)
  - Liver failure (1)

Results
- Thirty SICU patients contributed 58 data points of Blood volume and BNP obtained simultaneously. Average age was 63 ±13 years, with 12 females and 18 males.

<table>
<thead>
<tr>
<th>BNP Level</th>
<th>N</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;100 pg/mL</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>101-500 pg/mL</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>&gt;500 pg/mL</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

- Diagnosis (number of patients):
  - Septic Shock (14)
  - Trauma (11)
  - Hemorrhagic shock (5)
- Co-Morbidities (number of patients):
  - Cardiac (19)
  - Pulmonary (11)
  - Renal failure (8)
  - Liver failure (1)

Discussion
- BNP may correlate with myocardial distension but may not represent intravascular volume status.
- ACC/AHA Practice Guidelines: Recommendations for use of cardiac biomarkers in Heart failure. Level of evidence CLASS II b.

CONCLUSION
There was no correlation between BNP levels and blood volume in critically ill surgical patients. Further studies need to clarify the role of BNP and BV in guiding fluid management especially in situations where the 2 values are incongruent.

Feldschuh J, Enson V: Circulation 1977;56:698

N=6

In Hypervolemic states, 29 of 31 (94%) instances demonstrated elevated BNP >100 pg/mL.
In Hypovolemic states, 13 of 14 (93%) instances demonstrated elevated BNP >100 pg/mL.
In Euvolemic states, 11 of 13 (85%) had elevated BNP.