Prehospital ETCO$_2$ is Predictive of Death in Intubated and Non-Intubated Patients

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Background

- Prehospital trauma triage is limited to basic vital signs and a physical assessment.
- Other advanced diagnostics are expensive and not common place on ambulances, such as ultrasound and point-of-care testing.
- ETCO$_2$ devices are universal on ambulances and routinely used.

Methods

- Prospective, observational study with a large EMS system and two level one trauma centers
- Paramedics placed patients at risk for severe injury on either a nasal capnography cannula (NCC) or an ETCO$_2$ in-line ventilator circuit monitoring device (ILVC).
- Included any adult patient (≥15 years old) who sustained a primary injury with at least one prehospital ETCO$_2$ value.
- AUROC$_2$s were calculated for lowest prehospital ETCO$_2$ values, minimum prehospital systolic blood pressure (SBP), and highest prehospital shock index (SI).

Hypothesis

Prehospital ETCO$_2$ values are predictive of mortality and massive transfusion in intubated (via ILVC) and non-intubated (via NCC) patients.

Demographics

<table>
<thead>
<tr>
<th>Category</th>
<th>Total (n=549)</th>
<th>N (% or IQR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td>4 (0.7)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td>130 (23.7)</td>
</tr>
<tr>
<td>ISS</td>
<td></td>
<td>197 (35.9)</td>
</tr>
<tr>
<td>Massive Transfusion</td>
<td></td>
<td>30 (5.5)</td>
</tr>
<tr>
<td>Mortality</td>
<td></td>
<td>54 (9.8)</td>
</tr>
<tr>
<td>Mechanism</td>
<td></td>
<td>412 (76.7)</td>
</tr>
<tr>
<td>ETCO$_2$ Device</td>
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<td>61 (11.1)</td>
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</tbody>
</table>

Results

**Overall Cohort**

- **Mortality**
  - Sensitivity = 62.69%
  - Specificity = 80.40%
  - PPV = 25.59%
  - NPV = 95.22%

- **Massive Transfusion**
  - Sensitivity = 63.33%
  - Specificity = 78.42%
  - PPV = 14.50%
  - NPV = 97.37%

- **Excluding Prehospital Cardiac Arrest**
  - **Mortality**
    - Sensitivity = 80.40%
    - Specificity = 90.45%
    - PPV = 26.65%
    - NPV = 95.18%
  - **Massive Transfusion**
    - Sensitivity = 78.42%
    - Specificity = 80.40%
    - PPV = 14.50%
    - NPV = 97.37%

Discussion and Conclusions

- Prior work has demonstrated that prehospital ETCO$_2$ in intubated patients predict mortality.
- ETCO$_2$ values in this population were obtained predominantly (89%) from non-intubated patients via NCC.
- Minimum prehospital ETCO$_2$ was a significant predictor of both mortality and massive transfusion in overall cohort.
- ETCO$_2$ was the only significant predictor of mortality in the cohort that excluded prehospital cardiac arrest but did not outperform SBP or SI to a level of statistical significance.
- Prehospital ETCO$_2$ gives providers valuable insight into injury severity and shock in both intubated and non-intubated patients.

Future Directions

- These findings warrant further study in a multi-institutional trial with both urban and rural EMS systems.
- May inform three major components of patient care and field trauma triage:
  - EMS Transport Destination
  - Prehospital Interventions (TXA, Blood)
  - Hospital Resource Allocation

Disclosures

- The authors do not have any conflicts of interests nor disclosures.

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References

*Authors and affiliations listed in the original publication.*