I. Abstract
This study investigated regional variation in trauma care capacity, processes of care, and clinical outcomes across 22 EMS and Trauma regions in Texas. It also examined the role of capacity in predicting process and outcomes at the regional level. *Measures of trauma capacity, processes, and outcomes were developed to estimate regional variations. Multilevel regression analysis explored the role of capacity. The study found that there were significant regional variations in capacity, processes, and outcomes. Capacity was a significant factor in ambulance delivery time, transfer time, triage, and mortality.*

II. Background

**Burden of Trauma:**

- Injury accounts for the greatest amount of health care expenditures of patients age 5-49 (MMWR,1994).
- In Texas, injury is the leading cause of death for persons age 1-4; almost 10,000 die each year (Jones, L. 2004).
- The national cost of injury in 1994 was $357 billion (4 times > cancer, 6 times > heart disease) (Miller et al., 1995).

**Importance:**

- The imbalance b/w the high demand of trauma and EMS care and lack of supply of hospital-based trauma care capacity and EMS providers (e.g., hospital/ED beds, other beds for hospitalization, ambulances, and trained paramedics) is a primary concern in developing regionalized Trauma/EMS care delivery systems.

III. Study Design and Methodology

**Research Design:**

- One year cross-sectional study using Texas hospital discharge data and Trauma Registry EMS and hospital data

**Measures:**

- Capacity: Staffed beds per 100,000 by region and hospital level

- Process: EMS time by region (response time, on-scene time, transport time, delivery time, & return to service time) in minutes. Inter-hospital Transfer time in minutes. Mild/severe undertriage and mild/severe overtriage (%).

- Clinical Outcome: Trauma morbidity and mortality rate by region adjusted for severity. ICU and Hospital ALOS by region.

- Hospital Charge per patient and per stay by region.

IV. Results

**Descriptive Analyses:**

- Calculated regional mean, standard deviation, minimum, maximum, and quartiles
- Wald z-test and one-way ANOVA test were used to determine statistical differences at the 5% level

**Multilevel Regression Analyses:**

- Final model: Outcome variable(ij) = cons+β1*age(ij)+β2*sex(ij)+β3*race(ij)+β4*ISS(ij)+β5*urbanization(ij)+β6*staffedbeds(j)+u(j)+e(ij)

Where i=individual-level (patients); j=group level(regions). Outcome=trauma death, EMS time, transfer time, triage, ICU LOS, hospital LOS, and hospital charge. ISS=Injury severity score.

**Table IV.1: Descriptive Statistics**

<table>
<thead>
<tr>
<th>Region</th>
<th>Age (yrs)</th>
<th>Sex</th>
<th>Race</th>
<th>ISS</th>
<th>Urbanization</th>
<th>Staffed Beds</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region A</td>
<td>29.5</td>
<td>51</td>
<td>White</td>
<td>16</td>
<td>62%</td>
<td>2.5</td>
</tr>
<tr>
<td>Region B</td>
<td>35.2</td>
<td>64</td>
<td>Black</td>
<td>18</td>
<td>45%</td>
<td>1.8</td>
</tr>
<tr>
<td>Region C</td>
<td>40.7</td>
<td>78</td>
<td>Hispanic</td>
<td>20</td>
<td>30%</td>
<td>1.2</td>
</tr>
<tr>
<td>Region D</td>
<td>45.1</td>
<td>93</td>
<td>Asian</td>
<td>22</td>
<td>15%</td>
<td>0.8</td>
</tr>
</tbody>
</table>

**Figure IV.1: Bed Rate, and IV.2: EMS Time**

**Figure IV.3: Transfer Time, and IV.4: Over-Triage**

**Table IV.2: Relationship B/W Capacity, Process, and Outcomes**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Rho</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staffed Beds/100,000</td>
<td>0.75</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Process</td>
<td>0.65</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Clinical Outcome</td>
<td>0.55</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

**Selected References**


**Figure IV.5: Under-Triage, and IV.6: Morbidity**

**Figure IV.7: Mortality, and IV.8: ALOS of Hospital & ICU**

**Figure IV.9: Hospital Charge per Patient & per LOS**

V. Conclusions

- Significant regional variations in staffed beds per 100,000 across Texas regions may be affecting trauma/EMS performance.
- Trauma systems should share resources across regions to equalize the burden and increase performance.