Sepsis: an analysis of New Jersey Hospital Discharge Data

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BACKGROUND

• Sepsis affects approximately 1.7 million adults in the United States each year and potentially contributes to more than 250,000 deaths.1
• According to CDC data from 2017, septicemia was the fifth leading cause of death among New Jersey (NJ) residents totaling 1,898 deaths1 with a rate of 6.17 per 100,000 persons compared to the national average of 10.6 per 100,000.
• In NJ, there is heterogeneity in the incidence of septicemia related mortality.

PURPOSE: The purpose of the study is to evaluate whether this heterogeneity in sepsis mortality is associated with regional disparities in community such as socioeconomic level and the individual risk for sepsis-related morbidity and mortality in hospitalized patients.

HYPOTHESIS: We hypothesized that communities with higher rates of poverty would experience higher rates of mortality due to sepsis. Further, we investigated the impact of other variables, such as race, age, and gender, on sepsis mortality.

METHODS

• Using the New Jersey Discharge Data Collection System database (NJDDCS), a retrospective case-control study of acute care patients discharged with a diagnosis that included sepsis was performed.
• Population of interest were identified using computerized discharge ICDB0 diagnostic code, A41 for “Other Sepsis.” The diagnostic category “other sepsis” includes the eight child codes of A41 other sepsis: A41.0 Sepsis due to Staphylococcus aureus, A41.1 Sepsis due to other specified staphylococcus, A41.2 Sepsis due to unspecified staphylococcus, A41.3 Sepsis due to Hemophilus influenzae, A41.4 Sepsis due to anerobes, A41.5 Sepsis due to other Gram-negatives organism, A41.8 Other specified sepsis, and A41.9 Sepsis, unspecified organism. To analysis cases of mortality, a modifier code was applied.
• We reviewed demographic data including age (percentage of the population 65 years and older), gender, and race.
• To analyze socioeconomic status, the American Community Survey (ACS) was used to extract data on the percentage of families in New Jersey living below the poverty level at the zip code level.
• The ACS is the largest household survey that the Census Bureau administers. It is sent to approximately 295,000 addresses monthly (or 3.5 million per year) and is used by many public-sector, private-sector, and not-for-profit stakeholders to allocate funding, track shifting demographics, plan for emergencies, and learn about local communities.


• Distribution of race, % (Missing 6)
  - White 40646, 70%
  - Black 1762, 3%
  - Asian 1789, 3%
  - Other 1552, 2%
  - Unknown/Declined 176

• Distribution of poverty rates <25% 2733,44% 3127 11.8%
  >25 to <=50% 11847,19% 1515 12.8%
  >50 to <=75% 11502,19% 1595 13.9%
  >75% 11478,19% 1565 13.6%

DISCUSSION

• Contrary to previous reports that show disparities in sepsis-related health outcomes (incidence and mortality) with race differences, this analysis did not find an increase in sepsis mortality associated with race or gender.
• However, it showed a statistically significant association in mortality from sepsis with age and poverty.
• Patients residing in zip codes with high poverty rates were 1.1-1.2 times more likely to not survive hospitalization for sepsis compared to patients residing in less impoverished zip codes.
• While this report shows that age and poverty appear to be associated with sepsis related mortality, this significance would need to be examined in models adjusted for other clinical and socioeconomic variables.

LIMITATIONS

• This study did not examine differences in clinical metrics among patients, such as severity of illness scores (SOFA, sepsis related organ dysfunction/failure score).
• Data was limited to administrative data from NJDDCS, which may also have issues related to accuracy, specificity and completeness. As a result, further investigation and research is needed in order to make the clinical presentation of patients with sepsis reporting, coding and management of hospitalized adult sepsis patients.
• In addition, multivariable analysis is needed to find patterns and relationships between more than one variable simultaneously. Variables to consider for multivariable analysis may include but are not limited to gender, age, race/ethnicity, health insurance, transfer from another hospital, admission on weekend, teaching status of the hospital, and number of organ dysfunctions.

REFERENCES

3. Rhee K, Pauline Thomas, Dr. Steven Friedman
4. Rutgers School of Public Health
5. Data on file. Rutgers University, New Brunswick, NJ. All rights reserved. All information in United States sepsis mortality analyses and studies is the property of the United States government and is not subject to copyright protection. 2017;51(3):310-334. DOI: 10.1111/1538-4632.12124.

Table 1 summarizes demographic data of patients hospitalized with sepsis and associated deaths.

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Sepsis-related inpatient hospitalizations, n = 62,160</th>
<th>Sepsis-associated deaths, n = 7,892</th>
<th>% of death of Age, Race, and Poverty level (Case Fatality rate)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;45 years old</td>
<td>10531, 17%</td>
<td>332</td>
<td>3%</td>
</tr>
<tr>
<td>45-65 years old</td>
<td>16023, 26%</td>
<td>1,776</td>
<td>11%</td>
</tr>
<tr>
<td>65-85 years old</td>
<td>25730, 41%</td>
<td>3,881</td>
<td>15%</td>
</tr>
<tr>
<td>&gt;85 years old</td>
<td>9876, 16%</td>
<td>1,903</td>
<td>20%</td>
</tr>
</tbody>
</table>

Table 2 shows hospitalization for sepsis and sepsis death (per 100,000) by race

<table>
<thead>
<tr>
<th>Race</th>
<th>Sepsis death rate per 100,000</th>
<th>Sepsis death rate per 100,000</th>
<th>Sepsis death rate per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>6.07M, 67.9%</td>
<td>40566/6.07M = 668</td>
<td>5473/6.07M = 90</td>
</tr>
<tr>
<td>Black</td>
<td>6.07M, 67.9%</td>
<td>40566/6.07M = 668</td>
<td>5473/6.07M = 90</td>
</tr>
<tr>
<td>Asian</td>
<td>841K, 9.41%</td>
<td>1105/841K = 155</td>
<td>189/841K = 22</td>
</tr>
<tr>
<td>Multiracial</td>
<td>232K, 2.6%</td>
<td>69/232K = 30</td>
<td>6/232K = 3</td>
</tr>
<tr>
<td>Other</td>
<td>590K, 6.6%</td>
<td>507/590K = 860</td>
<td>525/590K = 89</td>
</tr>
</tbody>
</table>

Table 3 compares demographic data between survivors and non-survivors.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Survivor</th>
<th>Non-survivor</th>
<th>OR</th>
<th>CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>F</td>
<td>25032</td>
<td>3854</td>
<td>1.02</td>
</tr>
<tr>
<td>Age &lt;45 years old</td>
<td>10199</td>
<td>332</td>
<td>1</td>
<td>3.4</td>
</tr>
<tr>
<td>45-65 years old</td>
<td>14247</td>
<td>1776</td>
<td>3.8</td>
<td>4.9-6.1</td>
</tr>
<tr>
<td>65-85 years old</td>
<td>21849</td>
<td>3881</td>
<td>5.5</td>
<td>6.5-8.3</td>
</tr>
<tr>
<td>&gt;85 years old</td>
<td>7973</td>
<td>1903</td>
<td>7.3</td>
<td>6.5-8.3</td>
</tr>
</tbody>
</table>

LIMITATIONS

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