Identifying Determinants of Disparities in Lung Cancer Survival Rates from Electronic Health Record Data

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Introduction

• Lung cancer is one of the most common cancer in the United States for both males and females.
• Incidence and mortality rates are higher among Blacks as compared to Whites with lung cancer.
• The major drivers of disparity in lung cancer survival include screening adherence, access to care and hereditary factors.
• The goal of this pilot study was to identify major drivers that affect disparities in lung cancer survival using data from electronic health records

Method

Dataset

• A de-identified dataset was generated from Epic Electronic Health Record system at the Mount Sinai Health System in New York City that include lung cancer patients.
• Time period: Jan 2003 – Nov 2020
• We identified two subsets of patients:
  • Short Term Survival: Patients deceased within one year of cancer diagnosis
  • Long Term Survival: Patients survived over 5 years after cancer diagnosis

Logistic Regression

• Logistic regression was performed to investigate the effect of demographical and cancer factors on patients’ duration of survival after cancer diagnosis.
• The independent variables are age, sex, race, cancer stage and genetic testing
• The dependent variable was defined as whether a patient survived a short time
  • Short Term Survival: 1
  • Long Term Survival: 0

Gene Mutation

• Identify genetic variants that affect the survival of these lung cancer patients and analyzed variants distribution by race groups

Results

Logistic Regression

• Gender, race and cancer stage were important factors
• Patients who were diagnosed at early stages of lung cancer were more likely to survive over 5 years than those who were diagnosed at advanced stages of lung cancer
• Black patients and male patients had higher odds of being deceased in a shorter period of time after diagnoses

Gene Mutation

• 214 patients had somatic genetic testing results.
• KRAS was the most common mutation.
• There was higher proportion of Black patients than White patients with TP53 gene mutations who survived a shorter time

Summary statistics

• Total number of patients: 1099
• Short Term Survival: 349
• Long Term Survival: 750

Table 1. Summary statistics of short term and long term survival patients.

<table>
<thead>
<tr>
<th>Age at Diagnosis</th>
<th>Short Term Survival</th>
<th>Long Term Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>mean</td>
<td>68.42</td>
<td>mean 66.55</td>
</tr>
<tr>
<td>std</td>
<td>11.07</td>
<td>std 10.57</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>Short Term Survival</th>
<th>Long Term Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>147</td>
<td>446</td>
</tr>
<tr>
<td>Male</td>
<td>202</td>
<td>304</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Race</th>
<th>Short Term Survival</th>
<th>Long Term Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black or African American</td>
<td>90 25.8%</td>
<td>93 12.4%</td>
</tr>
<tr>
<td>Other</td>
<td>88</td>
<td>162</td>
</tr>
<tr>
<td>White</td>
<td>171</td>
<td>495</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage</th>
<th>Short Term Survival</th>
<th>Long Term Survival</th>
</tr>
</thead>
<tbody>
<tr>
<td>stage1</td>
<td>11 3.2%</td>
<td>385 51.3%</td>
</tr>
<tr>
<td>stage2</td>
<td>16 4.6%</td>
<td>61 8.1%</td>
</tr>
<tr>
<td>stage3</td>
<td>78 22.3%</td>
<td>147 19.6%</td>
</tr>
<tr>
<td>stage4</td>
<td>244 69.9%</td>
<td>157 20.9%</td>
</tr>
</tbody>
</table>

Conclusion

• Gender, race, cancer stage and somatic mutations were important factors that affects the length of survival of lung cancer patients after diagnoses.
• Male and Black and Hispanic patients who were diagnosed in later cancer stages were the people most susceptible to shorter length of survival after cancer diagnosis.
• KRAS was the most common genetic mutation among lung cancer patients.
• Patients with TP53 mutations were at higher odds of being deceased in less than a year after cancer diagnoses.
• Black patients had a higher proportion of the TP53 mutations

References