The Effect of COPD Co-Morbidity on Health Care Outcomes and Mortality in CHF

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Introduction

Heart failure (HF) and chronic obstructive pulmonary disease (COPD) each impact considerable disease burden, including high health care utilization and mortality [1][2]. In view of their high prevalence in the adult population, [3][4] it is not surprising they commonly coexist in the same individual. As would be expected from their individual effects on prognosis, their coexistence in the same patient adds to the risk of poor subsequent healthcare and mortality outcomes. [5][6]. Most studies evaluating the effect of COPD on HF outcomes were based on clinical diagnosis, without necessarily requiring spirometric confirmation. Relying solely on clinical features to identify COPD is uncommon in clinical practice, [7][8][9] despite its running counter to the current COPD guidelines stating that spirometry is required to make the diagnosis [10]. Adding to the problem, it appears that a sizeable percentage of patients with symptoms severe enough to warrant admission to the hospital with purported exacerbations of COPD do not meet airflow limitation thresholds when spirometry is performed, indicating misdiagnosis in some cases [11][12]. The issue of potentially misdiagnosing COPD by relying on clinical features only has been addressed by some studies through utilizing spirometry to confirm the diagnosis [13][14][15]. In view of the relative paucity of studies evaluating the effect between COPD comorbidity on outcomes in uncompromised patients requiring hospitalization, we compared subsequent health care utilization and all-cause mortality in those with confirmed airflow limitation.

Objectives:

• Primary objective:
  - To determine if spirometrically-confirmed COPD in CHF patients affects mortality following the index admission to the CHF floor for CHF exacerbation.
• Secondary objectives:
  - To establish an association between mortality and age among CHF patients.
  - To establish an association between mortality and gender among CHF patients.
  - To establish an association between mortality and FEV1 (T个百分), FVC (T个百分), and FEV1/FVC among CHF patients.
  - To establish an association between mortality and COPD severity among CHF patients.

Methods

This study, which was approved by our Institutional Review Board, was a retrospective analysis that included data from patients hospitalized with CHF at the Saint Francis Hospital heart failure unit with mortality data from the State of Connecticut Department of Public Health. Merging was performed using name and date of birth. Spirometric data, including forced expiratory volume in one second (FEV1) and forced vital capacity (FVC), and the predictive values (NHAMES) was obtained from record review.

• An FEV1/FVC < 0.70 defined airways obstruction consistent with COPD, and GOLD criteria were used to determine severity of obstruction.

• T-test analysis was used to establish an association between mortality and age and age and the FEV1/FVC ratio among CHF patients.

• Chi-square analysis was used to establish an association between mortality and gender and COPD status among CHF patients.

• Logistic regression was used to compare all-cause mortality in those with and without spirometrically-confirmed COPD.

• Those patients without spirometry results were not included in the analysis.

• 3040 patients were admitted to the CHF clinic from 2015-2020.

• 907 of these patients had at least one pulmonary function test since 2015.

• 28 of these patients had missing data from their pt’s, leaving 979 patients included in analysis.

• Heart failure severity variables were also not included in this analysis.

Results

Table 1: T-test analysis associating mortality with age, FEV1 (%pred.), FVC (%pred.), and FEV1/FVC.

<table>
<thead>
<tr>
<th>Expired</th>
<th>Yes</th>
<th>No</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age, mean (SD)</td>
<td>76.94 (11.98)</td>
<td>70.46</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>FEV1 (%pred.), mean (SD)</td>
<td>63.49 (21.03)</td>
<td>68.26 (19.67)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>FVC (%pred.), mean (SD)</td>
<td>65.16 (18.42)</td>
<td>68.16 (17.87)</td>
<td>0.02</td>
</tr>
<tr>
<td>FEV1/FVC, mean (SD)</td>
<td>0.71 (0.12)</td>
<td>0.75 (0.11)</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

Table 2: Chi-square analysis associating mortality with gender and COPD status.

<table>
<thead>
<tr>
<th>Expired</th>
<th>Yes</th>
<th>No</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender, n (%)</td>
<td>Male 171 (36.23%)</td>
<td>301 (63.77%)</td>
<td>0.92</td>
</tr>
<tr>
<td>COPD, n (%)</td>
<td>Severe 54 (50%)</td>
<td>54 (50%)</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Non-severe 75 (44.91%)</td>
<td>92 (55.09%)</td>
<td>0.01</td>
<td></td>
</tr>
<tr>
<td>None 190 (31.20%)</td>
<td>419 (68.80%)</td>
<td></td>
<td></td>
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</tbody>
</table>

Table 3: Logistic regression predicting mortality with COPD status.

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Odds Ratio</th>
<th>95% Confidence Intervals</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate COPD vs. None</td>
<td>1.93 (1.28, 2.90)</td>
<td>&lt;0.01</td>
<td></td>
</tr>
<tr>
<td>Severe COPD vs. None</td>
<td>1.69 (1.05, 2.72)</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>Very Severe COPD vs None</td>
<td>3.06 (1.02, 9.18)</td>
<td>0.04</td>
<td></td>
</tr>
</tbody>
</table>

Conclusions

• Patients who expired were older at index hospitalization (p=0.0001).

• There were no differences in mortality by gender (p=0.9246).

• Patients who expired over the five-year period had a shorter duration of time from discharge to follow-up.

• Patients who expired had a lower FEV1 (%pred.) (p=0.0008).

• Patients who expired had a lower FVC (%pred.) (p=0.0182).

• Patients who expired had lower FEV1/FVC (p=0.0001).

• Fewer patients expired depending on the severity of their COPD (p=0.0001).

• Patients with severe COPD had a higher mortality rate than those with moderate COPD and no COPD, respectively.

• Patients with moderate COPD were 1.927 times more likely to expire compared to those with no COPD (p=0.0017).

• Patients with severe COPD were 1.691 times more likely to expire compared to those with no COPD (p=0.0465).

• Overall, for those patients who had spirometry, airways obstruction of moderate severity or greater is associated with higher all-cause mortality.

• Further analysis of mortality risk, including using markers of CHF severity as covariates are warranted.

References


Acknowledgements

1. Frank H Netter MD School of Medicine, Quinnipiac University
2. Saint Francis Hospital and Medical Center – Trinity Health of New England