Evaluation of Guideline-Directed Medication Therapy for Heart Failure with Reduced Ejection Fraction Patients at Discharge on 30-Day Readmission Rates at Two Tertiary Healthcare Centers

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Evaluation of Guideline-Directed Medication Therapy for Heart Failure with Reduced Ejection Fraction Patients at Discharge on 30-Day Readmission Rates at Two Tertiary Healthcare Centers

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Candidate; Alan Rankin, MD; Joshua Remick, MD

Background
- Heart failure with reduced ejection fraction (HFrEF) is a chronic, progressive disease leading to symptoms such as dyspnea, cough, edema, and exercise intolerance.1
- The use of an angiotensin converting enzyme inhibitor (ACEi), angiotensin II receptor blocker (ARB), or angiotensin receptor-neprilysin inhibitor (ARNI) in combination with a beta blocker (BB) is guideline-supported Class I recommended therapy for HFrEF.2
- Multiple studies of these medication classes have shown improvement in HFrEF patient morbidity, as well as decreases in hospital readmission rates.1,3
- Patients who had a history of angioedema as a result of ACE, ARB, or ARNI use, or any hypersensitivity or unacceptable side effects to these medications met inclusion criteria.4

Methods

Study Design
Retrospective chart review of patients admitted to either one of our two tertiary medical centers from January 1, 2018 to December 31, 2019 with a primary diagnosis of HFrEF

Inclusion Criteria
Patients must be ≥ 18 years of age and have an LVEF ≤40%

Exclusion Criteria
Patients who had a history of angioedema as a result of ACE, ARB, ARNI, or BB use, or any hypotension or unacceptable side effects to these medications

Data Collection
- Readmission to either of our tertiary medical centers within 30 days of discharge, or no readmission
- GDMT prescribed on discharge
- Lowest SBP on readmission (if applicable)
- Highest SCr on readmission (if applicable)
- Highest K on readmission (if applicable)
- Lowest SBP on readmission (if applicable)
- Lowest SBP variable

Table 1. Patient Baseline Characteristics

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Study Population (N = 1,247)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age – Years (Mean)</td>
<td>68 (range 20-98)</td>
</tr>
<tr>
<td>Cause of HF</td>
<td>Ischemic cardiomyopathy 444 (29%) Non-ischemic cardiomyopathy 384 (23%) Idiopathic cause 268 (12%)</td>
</tr>
<tr>
<td>Discharged on GDMT</td>
<td>ACE or ARB only 67 (7%) Entresto (ARNI) only 28 (2%) Beta blocker (BB) only 268 (22%) ACE or ARB and BB 575 (46%) ARNI and BB 156 (12%) No GDMT 211 (17%) Readmitted within 30 days 202 (16%)</td>
</tr>
</tbody>
</table>

Table 2. Primary Outcome

<table>
<thead>
<tr>
<th>Therapy at Discharge</th>
<th>Readmission with Therapy</th>
<th>Readmission without Therapy</th>
<th>Association Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACEi or ARB Only</td>
<td>68 (8%)</td>
<td>56 (7%)</td>
<td>0.0036 (1.7, 9.0)</td>
</tr>
<tr>
<td>Entresto (ARNI) Only</td>
<td>28 (4%)</td>
<td>20 (3%)</td>
<td>0.1234 (0.5, 1.1)</td>
</tr>
<tr>
<td>Beta blocker (BB) Only</td>
<td>268 (22%)</td>
<td>200 (26%)</td>
<td>0.0658 (1.0, 1.1)</td>
</tr>
<tr>
<td>ACEi or BB and BB</td>
<td>575 (46%)</td>
<td>385 (50%)</td>
<td>0.1157 (0.7, 1.6)</td>
</tr>
<tr>
<td>ARNI and BB</td>
<td>156 (12%)</td>
<td>101 (13%)</td>
<td>0.0081 (1.0, 1.5)</td>
</tr>
<tr>
<td>No GDMT</td>
<td>211 (17%)</td>
<td>146 (19%)</td>
<td>0.9179 (0.5, 1.6)</td>
</tr>
</tbody>
</table>

Table 3. Secondary Outcomes

<table>
<thead>
<tr>
<th>Lowest SBP on Readmission</th>
<th>ACEi or ARB Only</th>
<th>Entresto (ARNI) Only</th>
<th>Beta blocker (BB) Only</th>
<th>ACEi or ARB and BB</th>
<th>ARNI and BB</th>
<th>No GDMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>16.3</td>
<td>12.3</td>
<td>15.9</td>
<td>16.8</td>
<td>11.9</td>
<td>15.6</td>
</tr>
<tr>
<td>P-value</td>
<td>0.7923</td>
<td>0.1918</td>
<td>0.9135</td>
<td>0.8179</td>
<td>0.3937</td>
<td>0.0081</td>
</tr>
</tbody>
</table>

Table 4. Highest SCr on Readmission

<table>
<thead>
<tr>
<th>Highest SCr on Readmission</th>
<th>ACEi or ARB Only</th>
<th>Entresto (ARNI) Only</th>
<th>Beta blocker (BB) Only</th>
<th>ACEi or ARB and BB</th>
<th>ARNI and BB</th>
<th>No GDMT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>1.7</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>P-value</td>
<td>&lt;0.0001</td>
<td>0.8982</td>
<td>0.9463</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All statistical analysis was performed by Providence biostatistician Shih-Ting Chiu

Discussion

A total of 1,999 patient admissions underwent chart review with 752 not meeting inclusion criteria and 1,247 included in the final analysis.

Primary Objective
- Patients discharged on any GDMT had significantly less readmission rates within 30 days than those discharged without any GDMT (p = 0.0369)
- Patients discharged on an ACEi or ARB alone had significantly more readmissions within 30 days than patients discharged on no GDMT (p = 0.0283)
- No other subgroups of GDMT showed statistically significant results for readmission rate

Cause of HFrEF
- No significant differences were found between 30-day readmission rate and cause of heart failure (p = 0.3769)

Incidence of Angioedema
- 1 patient discharged on an ARNI and BB, and 3 patients discharged on an ACE or ARB in combination with a BB had angioedema. All were nonsignificant

Highest SCR on Readmission
- Patients discharged on an ACEi or ARB or on an ACEi or ARB in combination with a BB yielded a significantly lower SCR on readmission compared to no GDMT (p <0.0001 and p = 0.0002, respectively)
- Discharging on an ARNI and BB compared to not discharging an ARNI and BB was also statistically significant for lower SCR (p = 0.0443)

Lowest SBP on Readmission
- Patients discharged on a BB or on any GDMT had a significantly higher SBP on readmission compared to no GDMT (p = 0.0135 and p = 0.0081, respectively)

Limitations
- Retrospective chart review
- Overlapping GDMT variables
- Only 30-day readmissions reported, did not follow readmissions at a later point in time
- Some patients discharged on no GDMT had died during their admission

Conclusion

Patients admitted between January 1, 2018 and December 31, 2019 with a primary diagnosis of HFrEF and an LVEF ≤40% that are discharged on any GDMT were found to have less readmissions for any reason within 30 days compared to those discharged without any GDMT. However, subgroups of individual GDMT may not have a lower rate of readmission. SCR and SBP may be impacted by type of GDMT on which patients were discharged, but no differences were found in potassium levels for any GDMT compared to patients discharged on no GDMT. No significant difference was detected in readmission rates based on the cause of heart failure. Further research with prospective randomized controlled trials is needed to determine statistical significance of subgroups of GDMT on the rate of readmission within 30 days.

References