Participation Rates and Outcomes for Heart Failure Patients in Cardiac Rehabilitation

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Background

• Exercise training in patients with chronic heart failure (CHF) with reduced ejection fraction (HFrEF)
  • Reduce combined cardiovascular mortality
  • Reduce hospitalizations
  • Improve aerobic capacity and muscle strength

• CMS expanded cardiac rehabilitation (CR) coverage to include HFrEF
  • Decision Memorandum February 2014

• Delivery of CR services in the clinical setting not well described in the United States
Purpose

• Describe 18 month experience recruiting
  • Hospitalized inpatients
  • Stable outpatients

• Report on number of qualifying patients
  • Attendance rate
  • Exercise training outcomes
Subjects

• Inpatients with acute CHF hospitalizations between June 2014 and December 2015

• Weekly report generated through EMR
  • LVEF ≤35% by echo, catheterization, nuclear imaging
  • Hospitalized with CHF
  • Resided within phase 2 catchment area (Chittenden Co. VT)

• Similar outpatients referred from outpatient cardiology or CHF clinic
Methods

• Information collected from EMR
  • Most recent LVEF
  • HFrEF etiology (ischemic vs non-ischemic)
  • Discharge date
  • Time from original diagnosis (years)

• Exclusion Criteria
  • Concurrent qualifying diagnosis (MI, CABG, PCI, Valve Surgery)
  • Improved LVEF on repeat echocardiogram
Outcomes Analysis

- Baseline measures
  - ANOVA
  - Chi²

- Outcomes data
  - Paired t-tests

- Data reported as mean ± SD

- Statistical significance (p<0.05)

- IBM SPSS Statistics version 22
124 hospitalized CHF patients

- 34 with other CR qualifying diagnosis
- 7 Improved Ejection Fraction on repeat Echocardiogram

83 eligible for CR

- 41 inappropriate for medical reasons
- 8 declined to participate
- 20 did not respond to multiple follow-up calls

36 identified at CHF outpatient clinic

- 1 medically inappropriate

35 enrolled in CR

14 enrolled in CR

49 patients with HFrEF enrolled in CR
CR Attendance

- 17% (14/83) hospitalized inpatients attended CR
- CR participants were similar to non-attendees
  - LVEF
  - Etiology (ischemic vs non-ischemic)
  - Rate of new diagnosis (<4months)
  - Time from original HFrEF diagnosis
- Significant differences were observed by discharge status
  - Home, sub-acute rehab, palliative care, assisted living nursing care
  - 100% (14/14) CR attendees discharged to home vs 55% (38/69) of non-attendees (p<0.0001)
- 97% (35/36) outpatients referred from outpatient cardiology or CHF clinic attended CR
<table>
<thead>
<tr>
<th>Clinical Data and Demographics at Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>n (M/F)</strong></td>
</tr>
<tr>
<td>49 (30/19)</td>
</tr>
<tr>
<td><strong>Age (years)</strong></td>
</tr>
<tr>
<td>68 ± 10</td>
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<tr>
<td><strong>Left Ventricular Ejection Fraction (%)</strong></td>
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<tr>
<td>27 ± 6% (15-35%)</td>
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<tr>
<td><strong>Origin of Referral to CR (Hospital/Outpatient Clinic)</strong></td>
</tr>
<tr>
<td>14/35</td>
</tr>
<tr>
<td><strong>New Diagnosis (≤ 4 months)</strong></td>
</tr>
<tr>
<td>20/49 (41%)</td>
</tr>
<tr>
<td><strong>Time Since HFrEF Diagnosis (yr)</strong></td>
</tr>
<tr>
<td>2.8 ± 4.1</td>
</tr>
<tr>
<td><strong>Days to CR Entry From Hospital Discharge (n=14)</strong></td>
</tr>
<tr>
<td>76 ± 44</td>
</tr>
<tr>
<td><strong>Ischemic Cardiomyopathy</strong></td>
</tr>
<tr>
<td>19/49 (39%)</td>
</tr>
<tr>
<td><strong>Hypertension</strong></td>
</tr>
<tr>
<td>31/49 (63%)</td>
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<tr>
<td><strong>Diabetes Mellitus Type II</strong></td>
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<tr>
<td>14/49 (29%)</td>
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<tr>
<td><strong>Former Smoker</strong></td>
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<tr>
<td>28/49 (57%)</td>
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</table>
Clinical Data and Demographics at Baseline (Continued)

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
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<tbody>
<tr>
<td>Beta-blocker</td>
<td>41/49 (84%)</td>
</tr>
<tr>
<td>ACE/ARB</td>
<td>37/49 (76%)</td>
</tr>
<tr>
<td>Body weight (kg)</td>
<td>88.7 ± 24.6</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>30.4 ± 7.0</td>
</tr>
<tr>
<td>( \text{METS}_{\text{peak}} )</td>
<td>4.8 ± 1.8</td>
</tr>
<tr>
<td>( \text{VO}_{2\text{peak}} ) (mL<em>kg⁻¹</em>min⁻¹) (n=30)</td>
<td>14.6 ± 4.0</td>
</tr>
<tr>
<td>Handgrip Strength (kg)</td>
<td>30 ± 11</td>
</tr>
<tr>
<td>MOS SF-36 Physical Function</td>
<td>57/100 ± 25</td>
</tr>
<tr>
<td>PHQ-9</td>
<td>6 ± 6</td>
</tr>
</tbody>
</table>

*No differences were noted between hospital vs clinical-referred patients*
Outcomes

- 27 patients completed CR
  - 13 dropout for personal reasons
  - 9 dropout with no contact
  - 2 high copays
  - 1 transportation limitations
  - 6 medical reasons
  - 3 were attending CR at time of analysis

- No differences were observed across baseline measures regardless of completion status (p=NS)
  - includes PHQ-9

- Pre and post measures obtained for 19 patients (35±1 sessions completed)
  - 4 refused exit evaluations
  - 3 exercise-limiting orthopedic issues
  - 1 received follow-up care out of state

- No differences were noted in baseline measures between those who did or did not perform exit measures (p=NS)
Cardiac Rehabilitation Training Effects

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>Exit</th>
<th>Change</th>
<th>P value</th>
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</thead>
<tbody>
<tr>
<td><strong>N (M/F)</strong></td>
<td>19 (11/8)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>Age (yr)</strong></td>
<td>67 ± 7</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>METS&lt;sub&gt;peak&lt;/sub&gt;</strong></td>
<td>4.6 ± 1.6</td>
<td>6.2 ± 2.4</td>
<td>1.6 ± 1.2 (+35%)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>**VO&lt;sub&gt;2peak&lt;/sub&gt; (mL<em>kg&lt;sup&gt;-1&lt;/sup&gt;<em>min&lt;sup&gt;-1&lt;/sup&gt;)</em></em> (n=14)</td>
<td>14.4 ± 3.5</td>
<td>16.4 ± 4.6</td>
<td>2.0 ± 2.8 (+14%)</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>Handgrip Strength (kg)</strong></td>
<td>29 ± 9</td>
<td>31 ± 9</td>
<td>2 ± 2 (+7%)</td>
<td>0.02</td>
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<tr>
<td><strong>MOS SF-36 Physical Function</strong></td>
<td>57/100 ± 18</td>
<td>69 ± 22</td>
<td>13 ± 20 (+23%)</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>PHQ-9</strong></td>
<td>5 ± 5</td>
<td>3 ± 4</td>
<td>-2 ± 4 (-40%)</td>
<td>0.05</td>
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Discussion

• Only 17% of HFrEF patients following acute CHF hospitalization attended Phase 2 CR

• Attendees of CR more likely to be discharged to home

• 36 patients directly referred to CR from outpatient cardiology and CHF clinics
  • 97% percent subsequently enrolled (1 diabetic foot ulcers)
  • Absolute enrollment 2.5 times greater compared to hospital setting
Factors Influencing CR Attendance?

- Complex CHF class IV admissions
  - Strength of physician recommendation (Ades et al, 1992)

- Lack automatic referral or quality indicator within discharge summary
  - No contact by liaison during admission (Grace et al, 2011)

- 6-week waiting period
  - Delayed initial visit and entry to CR (Mean 76 days to entry)
  - 1% less likely to attend CR for each 1 day delay (Russell et al, 2011)
  - Early appointments increase attendance at CR orientation by 18% (Pack et al, 2013)

- Determining stable CHF
  - 37% (31/83) discharged sub-acute or rehabilitation or assisted living nursing facilities
  - 49% in-patient candidates eventually deemed inappropriate
Conclusion

• Systematic in-hospital referrals with outpatient follow-up
  • Potential to capture large number of eligible patients
  • Minimize time reviewing EMR

• 6-week waiting period may hinder enrollment
  • Some patients stabilize quickly
  • Evaluation by medical director more appropriate?

• HFrEF recruitment strategies must evolve as more information on population is obtained

• Regardless of referral source HFrEF patients completing CR programs can expect improvements:
  • Aerobic capacity (VO_{2peak} or METs)
  • Muscle strength
  • Depressive symptoms
  • Clinical outcomes
Thank you for attending.

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