Long Term Follow-Up Study on Morbidity and Mortality; Cardiac Rehabilitation Patients

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Long Term Outcome Comparison
Cardiac Rehab (CR) and Non-CR (NCR) Patients
Literature Review: Morbidity and Mortality Studies Related to CRII Participation

- Long-Term Outcome Studies 12 months (Lewin & Doherty, 2013)
- MI patients 20% reduction for all-cause mortality (West, Jones, & Henderson, 2013)
- CR participation associated with lower risk of re-infarction (OR 0.53) (Lewin & Doherty, 2013)
- MI & CABG pts reduction in cardiovascular mortality (RR .074) & risk hospital admission (RR 0.82) (Anderson, et al., 2015)
- Literature findings for mortality & morbidity inconsistent (Lewin and Doherty, 2013)
- Trials, meta-analysis, & systemic reviews are dated (Oldridge, Guyatt, & Fisher, 1988; West, Jones, & Henderson, 2012).
- More studies with intervention & comparison groups needed
Research Question?

Would MI and CABG patients who participated in 8 or more CRII sessions following a cardiac event have better long term health related outcomes in terms of decreased morbidity and mortality?
Cardiac Rehab II Program

2001-2003

- OP CRII on-site tertiary urban based hospital 350 plus beds
- Majority of Referrals from CV Surgeons & CR Phase I
- 28-40 IEs per month.
- Average 40-50 patients visits Mon., Wed., & Fri.
- Average total number CRII visits – 20/per patient.
- Staff – MD, RNs, ES, Techs, Dietetic Interns, Spiritual Care & Behavioral Health, Hospital Volunteer
- Prescribed Exercise & Education:
  - Education includes: Nutrition, Exercise, Medications, Stress Management, CAD Interventions, Smoking Cessation, lipid control
METHODOLOGY

- **Study Design** – Retrospective comparative study

- **Setting** – Rocky Mountain Region – Hospital & CRII Program are part of a large multi-state health care organization

- **Sample** - Consecutive Sampling (N=361) CR (n=188) and Non-CR (n=173) patients hospitalized for CABG, MI with Stent &/or PTCA
**Intervention- CRII**

- Referral from CRI & scheduled prior to hospital D/C
- 55 mins warm-ups, aerobic, resistance training, cool downs & 5 mins relaxation training & “joke”/day
- Education – group context during exercise (lecture & video)
- At D/C referred to off-site CR III, YMCA, Gym, or home based
Methodology

- **Data Collection** - Record review using hospital Electronic Medical Records (EMR) and State Department of Public Health & Environment

- **Record Review** –
  - Subject list – Patients admitted Nov. 2001-Feb. 2003
  - **Records**
    - Mortality – State Health Dec 2001-Dec 2015
  - Data Abstraction – Jan 2016-Feb 2016
Statistical Analysis

- Binary Logistic Regression & Survival Analysis
- Predictive Model – covariates
  - Gender
  - Age at cardiac event
  - Prior history of heart disease
  - Myocardial Infarction
  - CABG
  - Stent
  - PTCA
  - Intervention - Cardiac Rehabilitation
RESULTS

- N=361 patients- CR 52% (n=188) & 48% NCR (n=173)
- Male 72% (n=259)  Female 28% (n=102)
- Age Range 38 y.o.-91 y.o.
- Mean age - 68 y.o.
- Prior History 33%
- Number of sessions range 8-36/per patient
Outcome Results for CR Participants

- 28% were readmitted for a cardiac event (5-10 year following index cardiac event)
- 34% deceased (1-13 yrs. following index cardiac event)
Morbidity Outcome Results

CRII participants had a 0.48 odds ratio ($p = .005$) of being readmitted for a subsequent cardiac event compared with patients who did not receive the intervention of CRII.
Mortality Outcome Results

CRII participants had a 0.22 odds ratio ($p < .001$) of subsequently being deceased compared to those who did not receive the intervention of CRII.
Predicting Hospital Readmission for Cardiac Event

Table 1

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Log Odds</th>
<th>Wald Test</th>
<th>Ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>-0.26</td>
<td>0.45</td>
<td>0.77</td>
<td>.502</td>
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<tr>
<td>Prior history of heart disease</td>
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<td>0.92</td>
<td>1.41</td>
<td>.338</td>
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<tr>
<td>Age at cardiac event</td>
<td>0.01</td>
<td>0.12</td>
<td>1.01</td>
<td>.731</td>
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<tr>
<td>Myocardial infraction</td>
<td>0.32</td>
<td>0.42</td>
<td>1.38</td>
<td>.518</td>
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<tr>
<td>CABG</td>
<td>-0.01</td>
<td>0.00</td>
<td>0.99</td>
<td>.981</td>
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<tr>
<td>Stent</td>
<td>0.71</td>
<td>0.67</td>
<td>2.02</td>
<td>.413</td>
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<tr>
<td>PTCA</td>
<td>-0.85</td>
<td>0.98</td>
<td>0.43</td>
<td>.322</td>
</tr>
<tr>
<td>Intervention</td>
<td>-0.74</td>
<td>4.36</td>
<td>0.48</td>
<td>.037</td>
</tr>
</tbody>
</table>

Note. Reported are adjusted odds ratios (AOR), after controlling for all other predictors in the model.
## Predicting Mortality

### Table 2
Logistic Regression: Predicting Death

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Log Odds</th>
<th>Wald test</th>
<th>Adjusted Odds</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
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<td>0.32</td>
<td>1.19</td>
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<tr>
<td>Prior history of heart disease</td>
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<td>40.51</td>
<td>1.09</td>
<td>&lt; .001</td>
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<tr>
<td>Myocardial infraction</td>
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<td>.090</td>
</tr>
<tr>
<td>CABG</td>
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<td>0.16</td>
<td>0.83</td>
<td>.689</td>
</tr>
<tr>
<td>Stent</td>
<td>-0.33</td>
<td>0.32</td>
<td>0.72</td>
<td>.574</td>
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<td>PTCA</td>
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<td>0.63</td>
<td>.419</td>
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<tr>
<td>Intervention</td>
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<td>26.16</td>
<td>0.22</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

*Note. Reported are adjusted odds ratios (AOR), after controlling for all other predictors in the model.*
## Table 3
Survival Analysis: Predicting Death Hazard (Event) Variability Across Years

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Log Hazards</th>
<th>Wald test</th>
<th>Adjusted Hazards Ratio</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
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<td>0.01</td>
<td>1.01</td>
<td>.975</td>
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<tr>
<td>Prior history of heart disease</td>
<td>0.39</td>
<td>4.51</td>
<td>1.48</td>
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<tr>
<td>Age at cardiac event</td>
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<td>47.95</td>
<td>1.07</td>
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<tr>
<td>Myocardial infarction</td>
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<td>2.87</td>
<td>0.57</td>
<td>.090</td>
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<tr>
<td>CABG</td>
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<td>1.15</td>
<td>0.70</td>
<td>.283</td>
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<tr>
<td>Stent</td>
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<td>0.71</td>
<td>.410</td>
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<tr>
<td>PTCA</td>
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<td>0.79</td>
<td>0.71</td>
<td>.374</td>
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<tr>
<td>Intervention</td>
<td>-1.02</td>
<td>25.71</td>
<td>0.36</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

*Note.* Reported are adjusted hazards ratios, after controlling for all other predictors in the model.
Survival Probability – All Participants
Survival Analysis

- 3 years post event - 93% survival
- 6 years post event - 87% survival
- 9 years post event - 80% survival
- 12 years post event - 74% survival
Long Term Survival CR and Non-CR

[Graph showing survival probability over years after a cardiac event for two groups: treatment and control.]
Results

- Intervention of CRII compared to no CRII shows increased long-term individual survival

- Contributing factors to mortality include:
  - Previous history of heart disease
  - Older age at the occurrence of the cardiac event
  - No CRII Intervention
Summary of Findings

The CRII group exhibited a higher survival trajectory than the control group, with this difference becoming more pronounced with passage of time.

Individuals within the CRII group were also less likely to encounter a subsequent cardiac event following the index hospital admission.
References

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