The Role of Cardiac Rehabilitation in Heart Failure

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History of Cardiac Rehab

- **Late 1700’s**: Europe - first mention of exercise in heart disease
  “…who set himself the task of sawing wood for ½ hr every day was 6 mos later nearly cured…”
- **Early 1990’s**: initial positive attitude toward physical fitness was forgotten (Bedrest)
- **1940-1950s**: Management slowly evolved from “armchair” to more gradual progression culminating with Dr. Paul Dudley White’s treatment of Pres. Dwight D. Eisenhower

Great Read

take heart
Paul Dudley White
History Lesson (continued)

- **1960-1990s:** Formal CR Programs (MGH 1979) developed as well as national (AACVPR) and local (MACVPR) CR organizations. Insurance and other regulatory influences came into play.

- **2000-beyond:** Focus on quality and outcomes for CR with institution of AACVPR program certification process, national outcome data registry, federal mandate for CR, and NQF endorsement of performance measures for referral to CR.

What is Cardiac Rehab?

10 Essential Core Components

- Patient Assessment
- Weight Management
- BP Management
- Lipid Management
- Diabetes Management
- Tobacco Cessation
- Psychosocial Assessment and Intervention
- Nutritional Counseling
- Exercise Evaluation/Training
- Physical Activity Counseling

From 2001 ACC/AHA HF Practice Guidelines: Stages in the evolution of HF and recommended therapy by stage.

Committee Members et al. Circulation 2001;104:2996-3007

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**What’s the Problem?**
Pathophysiological Mechanisms of Exercise Intolerance in Heart Failure

- **Cardiac**
  - Systolic and/or diastolic dysfunction
  - Reduced stroke volume
  - Elevated filling pressures
  - Secondary pulmonary hypertension and RV dysfunction
  - Mitral regurgitation
  - Reduced chronotropic reserve

- **Ventilatory system**
  - Exaggerated minute ventilation relative to CO production
  - Pulmonary hypertension and resulting pulmonary vascular damage and fibrosis
  - Ventilation/perfusion mismatch
  - Alveolar edema

- **Skeletal muscle**
  - Reduced muscle mass
  - Reduced Type I fibers relative to Type II fibers
  - Reduced enzymes for oxidative metabolism and generation of ATP

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**What’s the benefit of Cardiac Rehab for HF patients?**

- Exercise training in addition to psychosocial, risk factor management and/or educational interventions is considered Class I indication (useful and effective) in CAD pts with CAD

- Meta analysis of 71 trials (n=13,824) demonstrated reduced all cause cardiac mortality, nonfatal reinfarction, reduced rehospitalization and significant positive changes in modifiable RF (TC, TG, BP)
  
  Oldridge et al, 2012, Future Cardiology

- Exercise training in individuals with HF had significant effect on improving functional capacity, oxygen consumption, 6 minute walk test distances, symptoms, self efficacy for exercise, and QOL
  
  Norman 2012, Journal of Geriatric Physical Therapy

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**Benefits Cardiac Rehab**

- Depression: gender differences in depressive symptoms of HF pts
  - Men= financial status, functional capacity, perceived control and anxiety
  - Women= BMI, perceived control and anxiety
  
  Eastwood et al 2012, Eur Jour CV Nsg

- Methods of improving self efficacy improve self care in HF population with multiple comorbidities
  
  Dickson et al 2013, Nsg Research
Benefits Cardiac Rehab

- TIME-CHF Trial: the patient’s ability to estimate his own daily “working” capacity (DASI) seems to carry a higher prognostic value than that estimated from repeat functional exercise testing.
  
  Spruit et al 2012, JACC

HF ACTION Randomized Control Trial

- Clearly established the efficacy and safety of exercise training in pts with chronic HF (reduced EF)
- Multicenter randomized control trial of 2331 outpts with HF
- Intervention: Usual care plus aerobic exercise training (36 supervised sessions followed by home care) vs. usual care alone
- Mean age 59, 28% F, 38% NYHA Class III or IV symptoms, 51% ischemic HF, median LVEF 25%
- Conclusions: Exercise training was associated with significant reductions for both all-cause mortality or hospitalization and CV mortality or HF hospitalization.
  
  O’Connor et al 2009, JAMA

HF ACTION: Improved Quality of Life (QOL)

- Significant improvement in overall QOL score (KCCQ) as well as key subscales for health status including physical limitations, symptoms, and social limitations
  
  Flynn et al 2009, JAMA
What’s the story with HFpEF?

- Few studies have examined benefit in the heart failure with preserved EF population
- 3 studies (2 randomized with blinding of outcomes and 1 multicenter) demonstrated endurance training can ↑exercise capacity and symptoms—but what’s the mechanism??
- Small study HFpEF: pts had reduced exercise capacity, distensibility and dynamic Starling mechanism pre training
- Results: After 1 yr, endurance exercise training failed to impart favorable effects on CV stiffness or function in HFpEF
  Fujimoto et al 2012, AHJ

Central disappointment but peripheral promise!

- Improvements in peak VO2 due to either improvements in cardiac output (HRxSV) and/or arteriovenous difference (A-VO2 diff)
- CO= “central” CV response to exercise
- A-VO2 Diff= “peripheral” response and is determined by skeletal muscle perfusion
- Fujimoto’s study suggested that improved skeletal muscle perfusion likely plays a major role in the adaptation to exercise training in HFpEF.

HF Action Trial demonstrated that exercise training:

A. Reduced all-cause mortality or hospitalization, CV mortality and HF hospitalization
B. Isn’t worth it
C. Negatively impacts quality of life for HF pts
D. Is much ado about nothing
Cardiac Rehab for HF patients

1. Assessment: H&P, comprehensive RF analysis, psychosocial and nutrition evals, and assessment ex capacity (6 min walk test may be as good prognostically as symptom limited ETT).

2. Individual Treatment Plan (ITP): problem focused with specific goals/outcomes, plans/interventions/education and evaluation/progress assessments every 30 days duration program

Components: Knowledge (disease process and meds), Lipids, Blood Sugar Control, Smoking Cessation, Weight Management, Psychosocial Factors, Nutritional Considerations, and Activity/Exercise

Training Considerations for HF pts

- Standard “ex prescription” is aerobic activity 30 min 5x or more per week with parameters for intensity (70-85% max attained HR on ETT), duration, frequency
- Approach: interval training vs. continuous
  Giannuzzi et al 2003, Circulation; Wisloff et al 2007, Circulation
- Modality: strength/resistance training shown benefits
  Beekers et al 2008, Eur Heart Jour

Challenges and Opportunities

- Adherence
- Referral to CR
- Insurance (Medicare)
MGH Experience: HF pts in Cardiac Rehab

- 292 pts with diagnosis CM, LV Failure (only 10 pts had EF>50%)

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MGH Experience

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Success!

Graduates: completed average 24 sessions

- DASI ↑ 93%
- GMS: 66% ↑PA and 53% ↓NA
- LDL at goal: 26% improvement from entry
- HDL at goal: 50% improvement from entry
- Sub Max ex capacity: 56% ↑(METs)
- BP at goal: 85% ↑from entry
Thank you!