Cardiac Rehabilitation
Past, Present and Future:
A Cardiologist’s Perspective

Asia-Pacific TCT
Seoul, Korea. April 2009

Philip A Ades MD
University of Vermont College of Medicine
Burlington, VT USA
Cardiac Rehabilitation: Definition

- “CR services are comprehensive, long-term programs involving medical evaluation, prescribed exercise, cardiac risk factor modification, education and counseling.” (USPHS)

- **Goals:**
  - Enhance the physical, psychosocial and vocational status of the cardiac patient
  - Stabilize/reverse the atherosclerotic process
Burlington, Vermont, USA
Cardiac Rehabilitation and Prevention
University of Vermont College of Medicine
Indoor View
Outline

• Historical Perspective
• Present Status of CR: Strengths and Challenges
• The Future of Cardiac Rehabilitation
  – Population Trends in U.S. and Far East
    • Aging of the Population
    • Increasing rates of Obesity and Type II Diabetes
• Treatment Programs in Cardiac Rehabilitation
  – Prevention of Disability
  – Treatment and Prevention of Obesity and Type II Diabetes
• CR Performance Measures
• Conclusions
Cardiac Rehabilitation: Historical

Safety of Physical Activity Post M.I.

- 1930’s: 6 weeks bedrest
- 1940’s: Chair Therapy
- 1950’s: 3-5 minutes walking/day at 4 weeks
- 1960’s: In hospital re-ambulation (Phase I)
- 1970’s: Outpatient C.R. (Highly structured ECG monitoring, MD on-site)
- 2000’s: 3-day MI Admits, Minimal Deconditioning, Focus on Risk Reduction
Cardiac Rehabilitation: Historical

- CR through the 1980’s was focused almost entirely on exercise.
- The assumption was that exercise alone would “fix” other risk factors such as hypertension, hyperlipidemia, Obesity
Present Status of CR
Cardiac Rehab as Secondary Prevention

**The 1990’s**

- **Mortality Data** - Exercise Alone: \( N = 4000 \)
- 25% Decrease Overall and Cardiac Mortality
- **Angiographic Trials**: Exercise and low-fat diet
  Decreased progression CAD and CV events.
- **Multi-risk Interventions**: Exercise, Diet, Meds:
  Decreased progression, CV events, Hospitalization

O’Connor GT: Circulation 1989, 80; 234
Schuler G: Circulation 1992, 86; 1
Ornish D: Lancet, 1990; 336
Haskell WL: Circulation: 1994, 89; 975
Core Components of Cardiac Rehabilitation/Secondary Prevention Programs

- Patient Assessment
- Exercise Training
- Risk Reduction:
  - Nutritional/Behavioral/ Medical
    - Lipids
    - Smoking Cessation
    - Diabetes
    - Physical Activity Counseling
  - Hypertension
  - Weight Management
  - Psychosocial
- Long-Term Follow-up

*Circulation* 2007;115;2675. Balady, Williams, Ades et al.
Strengths of U.S. CR Model

• CR is a recognized “standard of care” for patients after coronary event: Supported by Position Statements of AHA, ACC, AACVPR, Medicare.

• Effective at inducing a short-term increase in exercise capacity that is sometimes sustained and is associated with a survival benefit.

• Evolving towards individualized preventive care

• Staffed by caring, patient-oriented professionals (RN, PT, Ex.Phys., MD)
Weaknesses of U.S. CR Model

- Low overall participation (14-50%) with substantial geographic variations of availability.
- In many settings, a “Cookie-Cutter” exercise-only approach.
- Fairly ineffective for Rx of Risk Factors, Obesity and other nutritional issues
- Unavailable to uninsured and under-insured (10-20%)
- Long-term exercise compliance < 50%
- Relative lack of support by Physician Community
The Future of Cardiac Rehabilitation

• Population Trends

  – Aging of the Cardiac Population
    • 50% of CR patients in the U.S. are now over 65 years
    • 16% of CR patients now over 75 years
  – Increasing Rates of Obesity and Type II Diabetes.
    • 80% of patients entering CR are overweight (BMI>25)
    • > 50% have metabolic syndrome
Cardiac Rehabilitation in the Elderly

Goals

1. Treat/Prevent Coronary Disability

2. Extend Disability-Free Survival
## Background

**Framingham Disability Study**

<table>
<thead>
<tr>
<th>Age</th>
<th>With C.A.D. (%)</th>
<th>No C.A.D. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>55-69 years</td>
<td>67/49 (Female/Male)</td>
<td>25/9 (Female/Male)</td>
</tr>
<tr>
<td>70-88 years</td>
<td>79/49</td>
<td>49/27</td>
</tr>
</tbody>
</table>

Mean Peak VO$_2$ (ml*kg$^{-1}$*min$^{-1}$)

Age Category, years

Ades PA, Savage PD et al. Circulation 2006
CR in the Elderly

- Standard CR programming (primarily treadmill walking and cycling) associated with increased Physical Function by questionnaire (SF-36)

- Resistance training in older coronary patients associated with increase in measured performance of daily activities (climbing stairs, carrying groceries etc.)

Ades PA  Archives Int Med 1992
Brochu M   J Appl Physiol 2002
CR in the Elderly: Survival Benefit

- Study of 601,099 U.S. Medicare participants, all age 65 or older
- 21-34% decrease in 5-year mortality rates depending on statistical techniques.
- Dose-response noted: > 24 sessions CR had 19% lower mortality than < 24 sessions.

Suaya J et al. JACC 2009
Treatment of Obesity in C.R.

- Prevalence of Overweight/Obesity in CR > 80% in U.S.
- Prevalence of Metabolic Syndrome in CR > 50% in U.S.
- Weight loss *does not occur spontaneously* in CR
  - Treatment Options:
    - Decrease Caloric Intake
    - Increase Caloric Expenditure
Dietary Weight Loss in CHD Patients:

- Calorie Goals
- Dietary Records
- Weekly Review
- “Troubleshooting”
- Nurse or Dietician Coordinated

J Harvey Berino Ph D.  Cor Art Dis: 1998 9:795-798
### Weight Loss in Cardiac Rehabilitation

(BMI > 27)  

<table>
<thead>
<tr>
<th></th>
<th>Weight Loss Group (N= 26)</th>
<th>Control Group (N= 151)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Post</td>
</tr>
<tr>
<td>Weight (lb)</td>
<td>211</td>
<td>201*+</td>
</tr>
<tr>
<td>Triglycerides (mg/dL)</td>
<td>196</td>
<td>162*</td>
</tr>
<tr>
<td>LDL-Chol (mg/dL)</td>
<td>95</td>
<td>94</td>
</tr>
<tr>
<td>HDL-Chol (mg/dL)</td>
<td>38</td>
<td>40</td>
</tr>
<tr>
<td>Chol/HDL ratio</td>
<td>4.5</td>
<td>4.1*+</td>
</tr>
<tr>
<td>Waist (cm)</td>
<td>109</td>
<td>105*</td>
</tr>
</tbody>
</table>

* = P<0.05 vs. baseline,  
+ = P<0.05 vs. other group

Weight Loss in CR: Role of Exercise

• Exercise should be oriented towards increasing caloric expenditure
• “Walk Daily and Walk far”
• Can eventually accomplish 2-3000 kcal calories burned per week by walking 3-4 Km per day
Weight Loss Over 5 and 12 months: High-Caloric Expenditure Exercise vs. “Standard” CR.

Ades PA, Savage PD, Toth MJ et al. Circulation May 2009
Weight Loss in CR: Risk Factor Benefits

- Diminished insulin resistance
- Improved lipid profile
- Decreased blood pressure
- Decreased HS-CRP
- Decreased PAI-1
Conclusions: The Future of CR

- Cardiac Rehabilitation is standard of care after an acute coronary event in the U.S.
- Needs to respond to demographic trends of aging and obesity
- Needs to optimize functional and medical outcomes on a long-term horizon
- Needs to maximize participation rates in CR through referral by hospital computer systems
- CR should be considered a “Quality Indicator” as with the use of preventive medications such as aspirin and statins.
Thank You Kindly