Benefits of Physical Activity and Cardiac Rehab - Empowering your Patients

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Disclosure

I have no financial disclosure or conflicts of interest with the presented material in this presentation.
Overview

• Prevalence and Projections of Cardiovascular Disease
• What is Cardiac Rehabilitation?
• Utilization of Cardiac Rehabilitation
• Is Exercise as Effective in Treating Cardiovascular Disease?
• What is the usual pattern for exercise progression?
• Future of Cardiac Rehabilitation at UCI Susan Samuei Integrative Health Institute
# Projections of Cardiovascular Diseases

(Heidenreich et al. Forecasting the Future of Cardiovascular Disease, 2011)

## Table 1. Projections of Crude CVD Prevalence (%), 2010–2030 in the United States

<table>
<thead>
<tr>
<th>Year</th>
<th>All CVD*</th>
<th>Hypertension</th>
<th>CHD</th>
<th>HF</th>
<th>Stroke</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>36.9</td>
<td>33.9</td>
<td>8.0</td>
<td>2.8</td>
<td>3.2</td>
</tr>
<tr>
<td>2015</td>
<td>37.8</td>
<td>34.8</td>
<td>8.3</td>
<td>3.0</td>
<td>3.4</td>
</tr>
<tr>
<td>2020</td>
<td>38.7</td>
<td>35.7</td>
<td>8.6</td>
<td>3.1</td>
<td>3.6</td>
</tr>
<tr>
<td>2025</td>
<td>39.7</td>
<td>36.5</td>
<td>8.9</td>
<td>3.3</td>
<td>3.8</td>
</tr>
<tr>
<td>2030</td>
<td>40.5</td>
<td>37.3</td>
<td>9.3</td>
<td>3.5</td>
<td>4.0</td>
</tr>
</tbody>
</table>

% Change 9.9 9.9 16.6 25.0 24.9

CVD indicates cardiovascular disease; CHD, coronary heart disease; HF, heart failure.
*This category includes hypertension, CHD, HF, and stroke.

## Table 2. Projected Direct (Medical) Costs of CVD, 2010–2030 (in Billions 2008$) in the United States

<table>
<thead>
<tr>
<th>Year</th>
<th>All CVD*</th>
<th>Hypertension</th>
<th>CHD</th>
<th>HF</th>
<th>Stroke</th>
<th>Hypertension as Risk Factor†</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>$272.5</td>
<td>$69.9</td>
<td>$35.7</td>
<td>$24.7</td>
<td>$28.3</td>
<td>$130.7</td>
</tr>
<tr>
<td>2015</td>
<td>$358.0</td>
<td>$91.4</td>
<td>$46.8</td>
<td>$32.4</td>
<td>$38.0</td>
<td>$170.4</td>
</tr>
<tr>
<td>2020</td>
<td>$470.3</td>
<td>$119.1</td>
<td>$61.4</td>
<td>$42.9</td>
<td>$51.3</td>
<td>$222.5</td>
</tr>
<tr>
<td>2025</td>
<td>$621.6</td>
<td>$155.0</td>
<td>$81.1</td>
<td>$57.5</td>
<td>$70.0</td>
<td>$293.6</td>
</tr>
<tr>
<td>2030</td>
<td>$818.1</td>
<td>$200.3</td>
<td>$106.4</td>
<td>$77.7</td>
<td>$95.6</td>
<td>$389.0</td>
</tr>
</tbody>
</table>

% Change 200 186 198 215 238 198

CVD indicates cardiovascular disease; CHD, coronary heart disease; HF, heart failure.
*This category includes hypertension, CHD, HF, stroke, and cardiac dysrhythmias, rheumatic heart disease, cardiomyopathy, pulmonary heart disease, and other or ill-defined “heart” diseases. It does not include hypertension as a risk factor.
†This category includes a portion of the costs of complications associated with hypertension, including CHF, CHD, stroke, and other CVD. The costs of hypertension as a risk factor should not be summed with other CVD conditions to calculate the costs of all CVD.

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Prevalence of Cardiovascular Disease 2017-2020

CVD in the United States

<table>
<thead>
<tr>
<th>Population group</th>
<th>Total CVD prevalence,* 2017–2020 ≥20 y of age</th>
<th>Prevalence, 2017–2020 ≥20 y of age†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Both sexes</td>
<td>127,500,000 (48.6%)</td>
<td>28,600,000 (9.9%)</td>
</tr>
<tr>
<td>Males</td>
<td>55,400,000 (32.4%)</td>
<td>14,800,000 (10.9%)</td>
</tr>
<tr>
<td>Female</td>
<td>52,500,000 (44.8%)</td>
<td>13,800,000 (9.2%)</td>
</tr>
<tr>
<td>NH White males</td>
<td>51.2%</td>
<td>11.3%</td>
</tr>
<tr>
<td>NH White females</td>
<td>44.6%</td>
<td>9.2%</td>
</tr>
<tr>
<td>NH Black males</td>
<td>55.9%</td>
<td>11.3%</td>
</tr>
<tr>
<td>NH Black females</td>
<td>50.0%</td>
<td>11.1%</td>
</tr>
<tr>
<td>Hispanic males</td>
<td>51.9%</td>
<td>8.7%</td>
</tr>
<tr>
<td>Hispanic females</td>
<td>37.3%</td>
<td>8.4%</td>
</tr>
<tr>
<td>NH Asian males</td>
<td>31.5%</td>
<td>6.9%</td>
</tr>
<tr>
<td>NH Asian females</td>
<td>38.5%</td>
<td>4.0%</td>
</tr>
<tr>
<td>NH American Indian/Alaska Native</td>
<td>...</td>
<td>...</td>
</tr>
</tbody>
</table>

*Total CVD prevalence includes coronary heart disease, heart failure, stroke, and hypertension.
†Prevalence excluding hypertension.

(American Heart Association, 2023)
Projections Of Future Cardiovascular Risk Factors and Disease In The United States From 2025 To 2060

**Chronic Conditions**
- Diabetes – ↑ of 39.3% to 55 Million
- HTN – ↑ of 27.1% to 162 Million
- Dyslipidemia – ↑ of 27.6% to 126 Million
- Obesity – ↑ of 18.3% to 126 Million

**Cardiovascular Disease**
- Ischemic Heart Disease – ↑ of 30.7% to 29 Million
- Heart Failure – ↑ of 33.4% to 13 Million
- Myocardial Infarction – ↑ of 16.9% to 16 Million

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What is Cardiac Rehabilitation

A component of **preventive cardiology** focusing on strategies and interventions aimed at reducing the risk of another cardiovascular event. A personalized program that combines **education** and **supervised exercise** to improve the health and recovery from individuals that have experienced:

- Myocardial Infarction
- Bypass Surgery (CABG)
- Stable Angina
- Heart Valve Repair or Replacement
- Angioplasty or Stent Placement
- Heart Transplants
- Left Ventricular Assist Device (LVAD)
- Stable Chronic Heart Failure.
What are the Phases of Cardiac Rehab

**Phase I: Inpatient**
- Usually begins in the hospital
- Initial education about their condition
- Light activity such as sitting up, standing and slow walk

**Phase II: Outpatient**
- Focus on increasing physical activity and exercise tolerance through a structured program
- Monitored session 3 times/week
- Education on heart-healthy habits

**Phase III: Maintenance**
- Independent exercise and self-monitoring while under supervision
- May continue attending education sessions
- Not typically covered by insurance
Workflow of Cardiac Rehabilitation

**Hospitalization**

**Phase I**

- Enroll in Phase II

**36 Sessions of Exercise and Heart-Healthy Education Sessions**

Team of:
- Medical Director
- Registered Nurse
- Exercise Physiologist
- Clinical Psychologist
- Acupuncturist*
- Executive Chef*
- Health and Wellness Coach*
- Mindfulness Coach*

(*Offered at SSIHI)

(† Not currently offered at SSIHI)

**Discharge from Phase II**

**Decision**

- Enroll in Phase III †

**Discharged Continue Phase I at Home**

Take what they have learned and lead a healthy life

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Benefits of Cardiac Rehabilitation

• Reduced all-cause mortality ranging from 15%-28%
• Reduced cardiac mortality from 26%-31%
• Reduced cardiovascular events
• Reduced readmission rates to hospital
• A strong relationship between number of CR session and long-term outcomes
• Improved adherence with preventive medications
• Improved function and exercise capacity
• Improved quality of life
Benefits of Exercise for Cardiovascular Therapy

- Endothelium-dependent vasodilatation
- Ejection fraction
- Exercise tolerance
- Quality of life
- Reduced cardiovascular disease-related mortality

- Enhanced glucose uptake
- Improved insulin secretion and sensitivity
- Increased mitochondrial biogenesis
- Enhanced fatty acid oxidation
- Improved myocardial perfusion via blood vessel dilation
- Reduced inflammation, guarding against atherosclerosis

(Pinckard, Baskin, & Stanford, 2019)
“Exercising helps improve the heart’s pumping ability, decreases blood vessel stiffness and improves the function and energy capacity of skeletal muscle,” Sachdev said. “Exercise capacity is an independent, clinically meaningful patient outcome, and research has indicated that guided exercise therapy is actually more effective at improving quality of life for people who have HFpEF than most medications.”

-Vandana Sachdev, M.D.
Chair of Scientific Writing Committee

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Is Cardiac Rehabilitation a Crucial and Integral Component of the Recovery Process?

Million Hearts® Cardiac Rehabilitation: Saving Lives, Restoring Health, Preventing Disease [Infographic], [https://millionhearts.hhs.gov/files/Cardiac_Rehab_Infographic-508.pdf](https://millionhearts.hhs.gov/files/Cardiac_Rehab_Infographic-508.pdf)

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Comments from Patients over the Years

My doctor told me....

“When you’re in cardiac rehab...don’t take it too seriously”
“You don’t need it”
“Go live your life...”
“Why are you going to ruin my work?”
“You workout and are athletic...you don’t need it”
Exercise-based cardiac rehabilitation (CR) is an underutilized service with well-documented clinical and functional benefits for patients with cardiovascular disease.

-(Thompson et al. 2022)
In 2016, of the 366,103 Medicare fee-for-service beneficiaries eligible for outpatient cardiac rehabilitation, approximately 89,327 (24.4%) participated in CR, of which 21,700 initiated within 21 days and 5,840 completed CR.”

(Ritchey et al, 2020)
CARDIAC REHABILITATION IS UNDERUSED

Cardiac Rehabilitation Enrollment, Engagement, and Completion Among Medicare Beneficiaries Aged 65 and Over who had a primary qualifying event* in 2017:

- 29% of patients initiated CR sessions
- 23% of patients attended up to 12 sessions
- 17% of patients attended up to 24 sessions
- 8% of patients attended up to 36 sessions (considered to be a full dose of CR)

**Figure 3.** Mortality rate after percutaneous coronary intervention by number of sessions of cardiac rehabilitation attended among propensity-matched patients. The dotted red line represents the linear trend in mortality by number of sessions. The numbers above each bar represent the number of patients attending each number of sessions.

(Beaty et al., 2018)

33% lower mortality rate than non-participants “Dose Dependent”

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*Beaty et al., 2018*

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Cardiac Rehab at SSIHI

“An all-encompassing whole-person care program that integrates education and supervised exercise within a collaborative team framework, tailoring care to each patient's unique needs within a supportive group environment. This holistic approach fosters a cohesive atmosphere aimed at enhancing the health and recovery of individuals who have undergone a cardiovascular event.”
Core Components of Cardiac Rehab

- Acupuncture
- Mindfulness
- Physical activity counseling
- Exercise training evaluation
- Patient assessment
- Nutrition counseling
- Weight management
- Psychosocial management
- Tobacco cessation
- Diabetes management
- Lipid management
- Blood pressure management
- Tai Chi and Qi Gong

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SSIHI Cardiac Rehab

1. Group setting for 8 patient, with the ability to extend to 10 patients based on diagnosis severity.

2. Structured using the FITT principle

3. Patients take their own pre and post vitals – reinforce self-management

4. Exercise and Progression
   • Steady state cardio: Measured in METS
   • Intervals: When appropriate/Patient is ready
   • Active recovery: When necessary
   • Resistance Exercise: Utilizing body weight and/or weight machine or free-weights

5. 30-to-45-minute education session pre or post every exercise session.
FITT-VP Principle

**Frequency:** 3-5 days a week

**Intensity:**
- **Light:** 2 – 3 METs
- **Moderate:** 3.0-5.9 METs
- **Vigorous:** 6.0 < METs

**Time:** 30-60 minutes

**Type:** Purposeful exercise involving major muscle groups

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**TABLE 6.5**

Aerobic (Cardiovascular Endurance) Exercise Evidence-Based Recommendations

<table>
<thead>
<tr>
<th>FITT-VP</th>
<th>Evidence-Based Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency</strong></td>
<td>≥5 d · wk⁻¹ of moderate exercise, or ≥3 d · wk⁻¹ of vigorous exercise, or a combination of moderate and vigorous exercise on ≥3–5 d · wk⁻¹ is recommended.</td>
</tr>
<tr>
<td><strong>Intensity</strong></td>
<td>Moderate and/or vigorous intensity is recommended for most adults. Light-to-moderate intensity exercise may be beneficial in deconditioned individuals.</td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td>30–60 min · d⁻¹ of purposeful moderate exercise, or 20–60 min · d⁻¹ of vigorous exercise, or a combination of moderate and vigorous exercise per day is recommended for most adults. &lt;20 min of exercise per day can be beneficial, especially in previously sedentary individuals.</td>
</tr>
<tr>
<td><strong>Type</strong></td>
<td>Regular, purposeful exercise that involves major muscle groups and is continuous and rhythmic in nature is recommended.</td>
</tr>
<tr>
<td><strong>Volume</strong></td>
<td>A target volume of ≥500–1,000 MET-min · wk⁻¹ is recommended. Increasing pedometer step counts by ≥2,000 steps · d⁻¹ to reach a daily step count ≥7,000 steps · d⁻¹ is beneficial. Exercising below these volumes may still be beneficial for individuals unable or unwilling to reach this amount of exercise.</td>
</tr>
<tr>
<td><strong>Pattern</strong></td>
<td>Exercise may be performed in one continuous session, in one interval session, or in multiple sessions of ≥10 min to accumulate the desired duration and volume of exercise per day. Exercise bouts of &lt;10 min may yield favorable adaptations in very deconditioned individuals.</td>
</tr>
<tr>
<td><strong>Progression</strong></td>
<td>A gradual progression of exercise volume by adjusting exercise duration, frequency, and/or intensity is reasonable until the desired exercise goal (maintenance) is attained. This approach of “start low and go slow” may enhance adherence and reduce risks of musculoskeletal injury and adverse cardiac events.</td>
</tr>
</tbody>
</table>

Adapted from (37).

(American College of Sports Medicine, 2018, p.271).
METs

Metabolic Equivalents: Oxygen Consumption

1 MET = 3.5 mL·kg⁻¹·min⁻¹

1 MET = Life
2.0 METs = 40 min/mile
3.0 METs = 24 min/mile
5.0 METs = Light Jog, 15 min/mile
10 METs = Running, 10 min/mile
Increasing your fitness level enhances your chances of achieving longevity.

(Kokkinos et al., 2010)
“HIIT is superior to MICT in improving cardiorespiratory fitness in participants of cardiac rehabilitation (CR). Improvements in cardiorespiratory fitness are significant for CR programs of >6-week duration. Programs of 7–12 weeks’ duration resulted in the largest improvements in cardiorespiratory fitness for patients with coronary artery disease. HIIT appears to be as safe as MICT for CR participants.”

(Wisløff et al., 2009)
The benefits of 20 minutes of vigorous intensity exercise appear to be equal to 80 minutes of moderate intensity exercise.
Progression = S.A.I.D. Principal

As your body adapts to your fitness/gains, you must increase intensity to see progress.

Specific Adaptation To Increased/Imposed Demands

(Rippetoe & Baker, 2014)
Measured Outcomes

• Exercise Capacity (Functional Capacity)
  • Metabolic Equivalents (METS)
  • Stress ECHO/CPET

• Cardiovascular Risk Factors
  • Blood pressure Management
  • Body weight and BMI w/Body fat %
  • Lipid profiles
  • Blood glucose/Diabetes management

• Psychosocial Measures
  • Depression and Anxiety assessments
  • Quality of Life assessments

• Functional Status
  • Assessing ability to perform “Activity’s of Daily Living” ADL’s

• Nutrition and Diet Quality
  • Evaluate diet habits and improve in diet quality
Exploring the Future of Cardiac Rehabilitation

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UCI Intensive Cardiac Rehabilitation

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Acupuncture

Exploring Mind-Body Connection and Outcomes in Cardiac Rehab

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In a response to historic underuse of center-based cardiac rehabilitation, UCI is actively involved in a grant proposal aimed at providing virtual cardiac rehab to a broader range of patients, with a special focus on underserved communities.
Questions

The Heartbeat of Cardiac Care

15th Annual Orange County Symposium for Cardiovascular Disease Prevention
Citations

Citations


