Benefits of Physical Activity and Cardiac Rehab - Empowering your Patients

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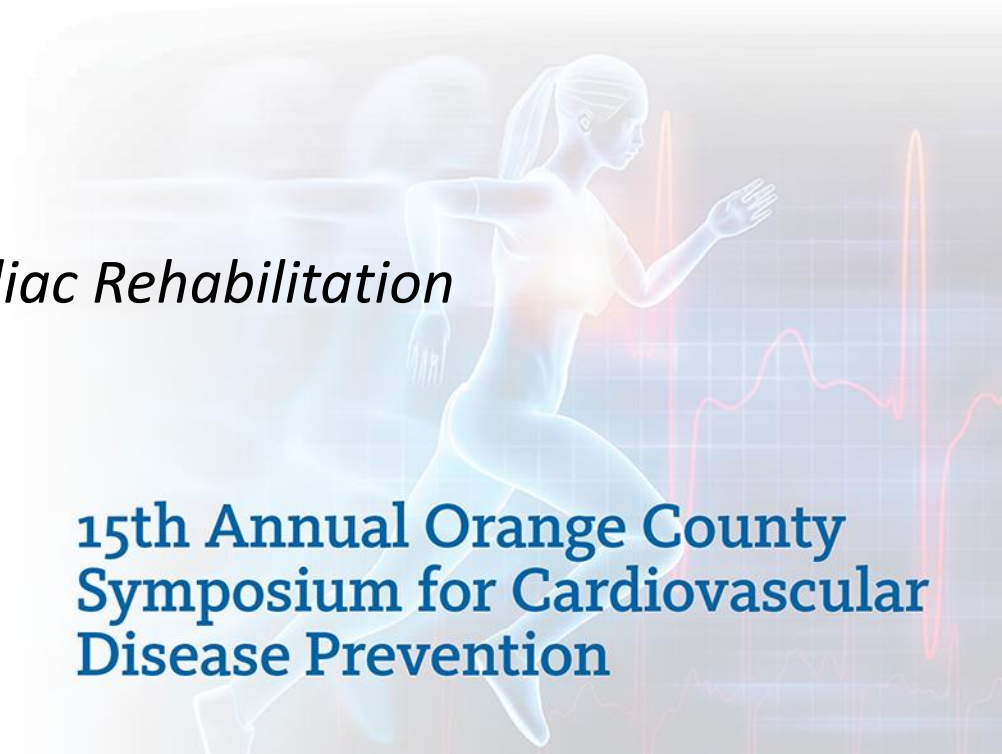

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Disclosure

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 Samueli Integrative Health Institute

Projections of Cardiovascular Diseases

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

Year	All CVD*	Hypertension	CHD	HF	Stroke
2010	36.9	33.9	8.0	2.8	3.2
2015	37.8	34.8	8.3	3.0	3.4
2020	38.7	35.7	8.6	3.1	3.6
2025	39.7	36.5	8.9	3.3	3.8
2030	40.5	37.3	9.3	3.5	4.0
% 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

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

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

Prevalence of Cardiovascular Disease 2017-2020

CVD in the United States

Population group	Total CVD prevalence,* 2017–2020: ≥20 y of age	Prevalence, 2017–2020: ≥20 y of age†
Both sexes	127 900 000 (48.6%)	28 600 000 (9.9%)
Males	65 400 000 (52.4%)	14 800 000 (10.9%)
Females	62 500 000 (44.8%)	13 800 000 (9.2%)
NH White males	51.2%	11.3%
NH White females	44.6%	9.2%
NH Black males	58.9%	11.3%
NH Black females	59.0%	11.1%
Hispanic males	51.9%	8.7%
Hispanic females	37.3%	8.4%
NH Asian males	51.5%	6.9%
NH Asian females	38.5%	4.9%
NH American Indian/Alaska Native	…	…

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

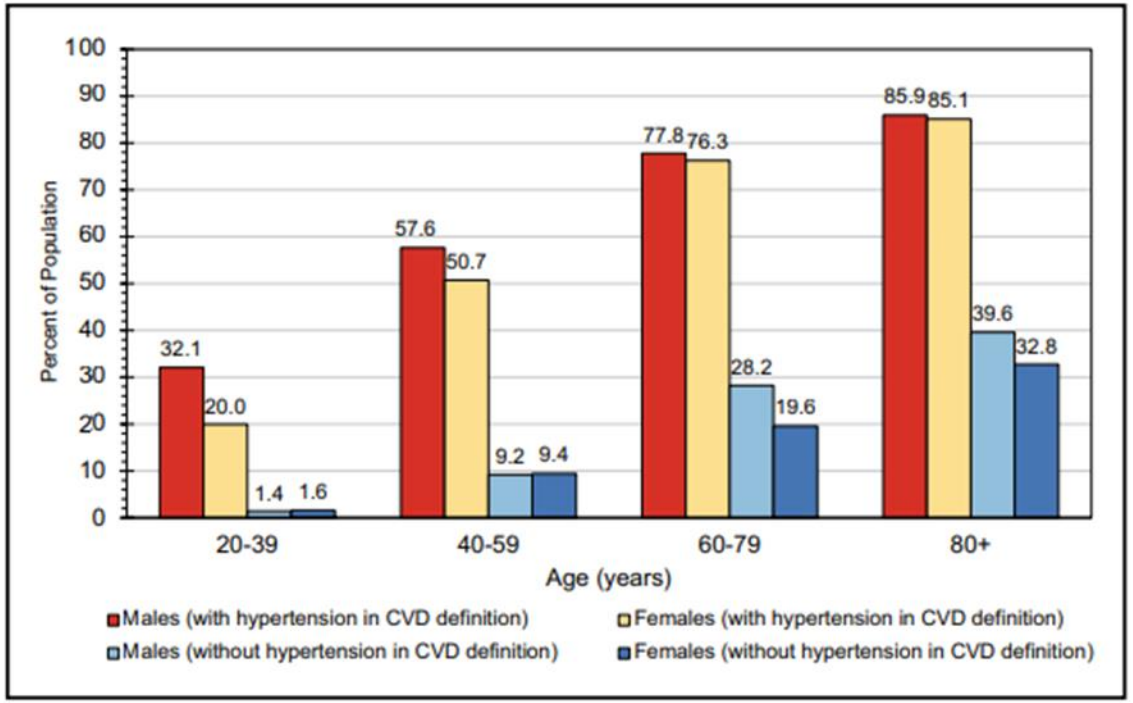


Chart 14-1. Prevalence of CVD in US adults ≥20 years of age by age and sex (NHANES, 2017–2020).

(American Heart Association, 2023)

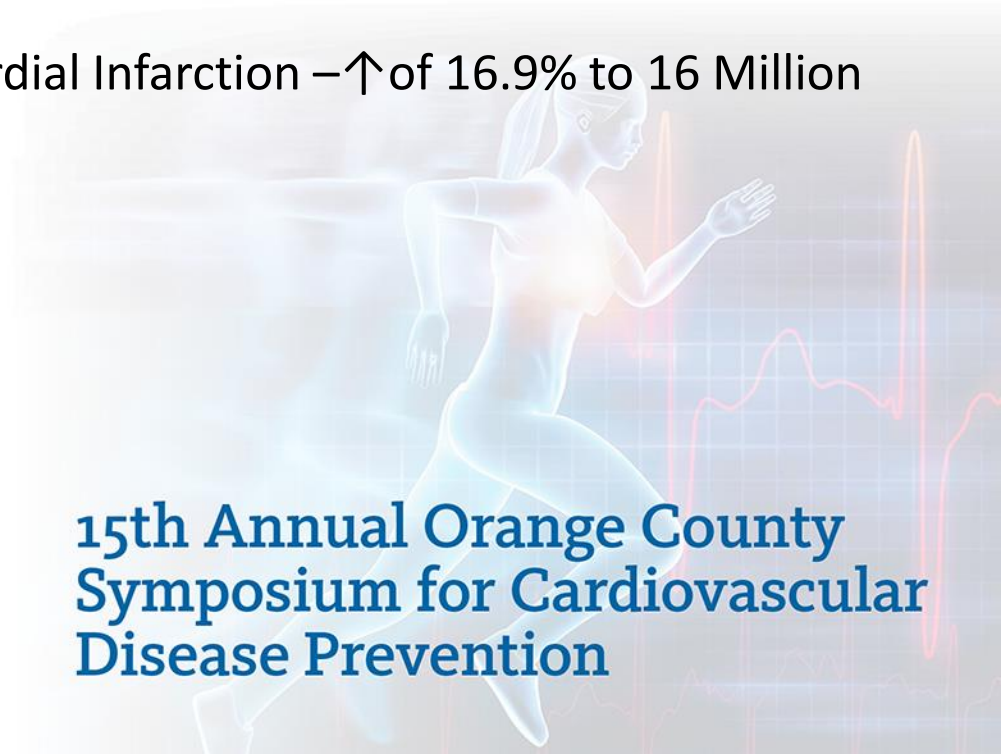
Projections Of Future Cardiovascular Risk Factors and Disease In The United States From 2025 To 2060

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

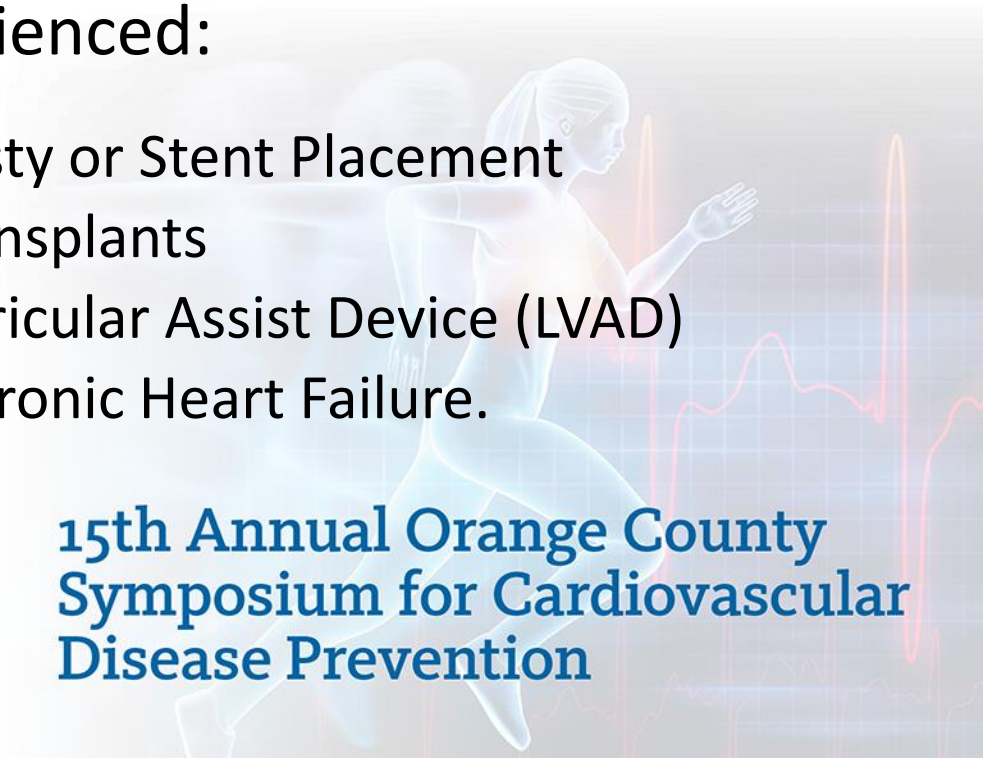
- Ischemic Heart Disease – ↑of 30.7% to 29 Million
- Heart Failure – ↑ of 33.4% to 13 Million
- Myocardial Infarction –↑of 16.9% to 16 Million



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.



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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

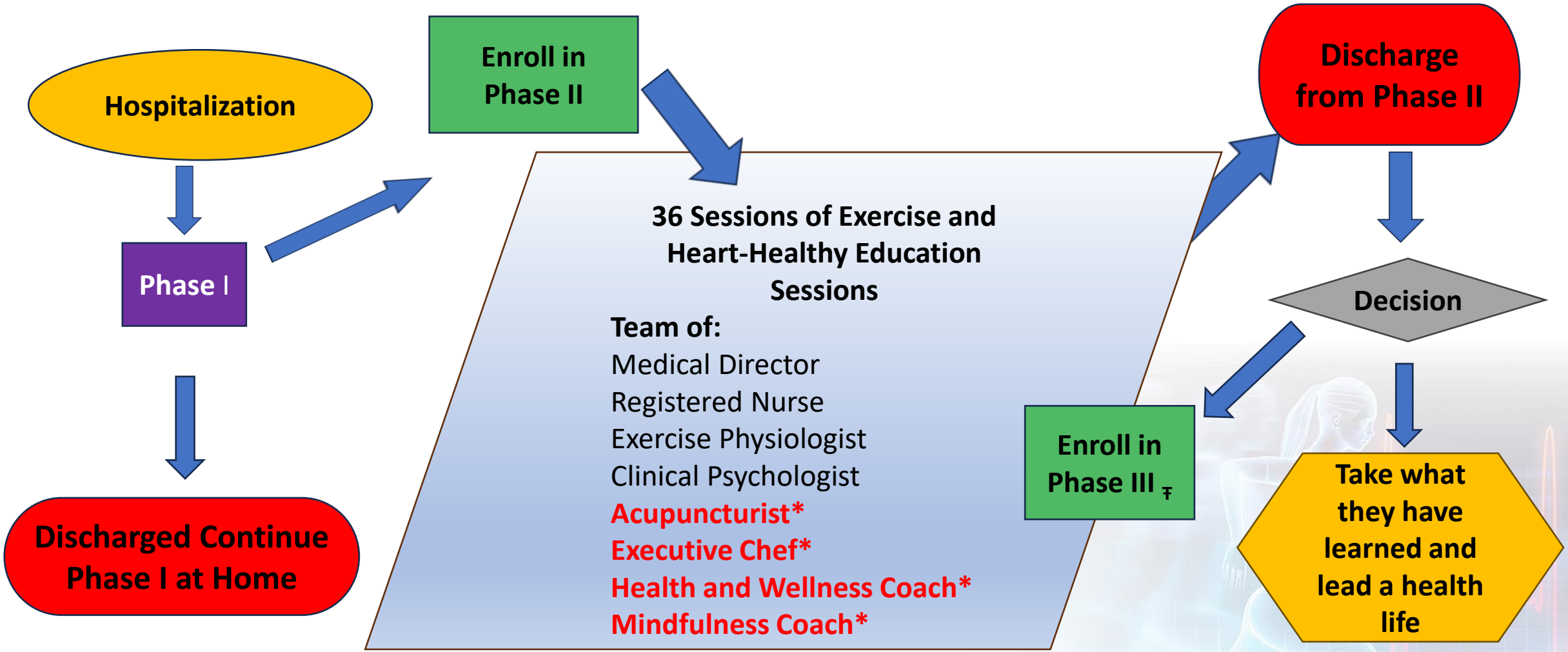
Phase II: Outpatient

- 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



(*Offered at SSIHI)

(₸ Not currently offered at SSIHI)

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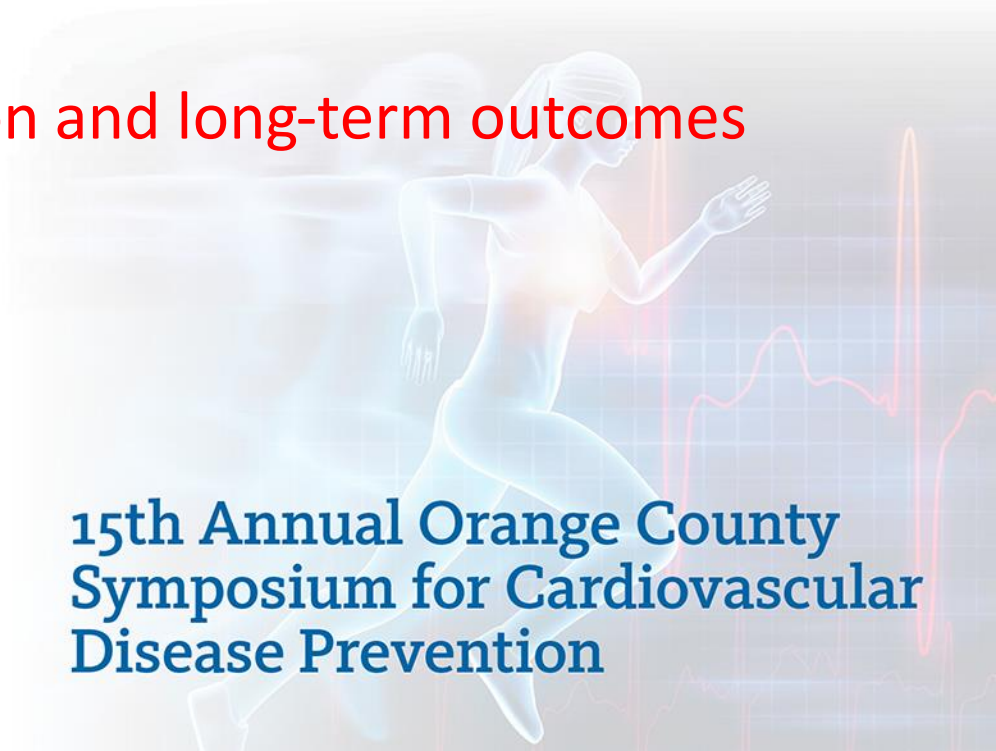
Benefits of
Cardiac Rehabilitation

- 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

Effects of Exercise to Improve Cardiovascular Health

*Kelsey Pinckard, Kedryn K. Baskin and Kristin I. Stanford**

Department of Physiology and Cell Biology, Dorothy M. Davis Heart and Lung Research Institute, The Ohio State University Wexner Medical Center, Columbus, OH, United States

- 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)

Exercise vs Pharma Therapy

Joint Statement from the American Heart Association and American College of Cardiology

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Myocardial Perfusion

Exercise Therapy is Safe, May Improve Quality of Life for Many People with Heart Failure

New scientific statement notes exercise improved quality of life more than medication for one of the most common types of heart failure

Mar 21, 2023

Print Font Size A A A

Contact: Sam Roth, sroth@acc.org,

DALLAS and WASHINGTON (Mar 21, 2023) - For many people who have heart failure, supervised exercise training is safe and may offer substantial improvement in exercise capacity and quality of life, even more than medications, according to a new, joint scientific statement from the American Heart Association and the American College of Cardiology. The statement is published today in both the American Heart Association's flagship journal **Circulation** and in the **Journal of the American College of Cardiology**.

"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 Commitee

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

Benefits

Benefits to People

Individuals who attend 36 sessions have a **47%** lower risk of death and a **31%** lower risk of heart attack than those who attend only **1** session.

Benefits to Health Systems

Costs per year of life saved range from **$4,950 to $9,200** per person.

Cardiac rehab participation also reduces hospital readmissions.

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

Comments from Patients over the Years

My doctor told me….

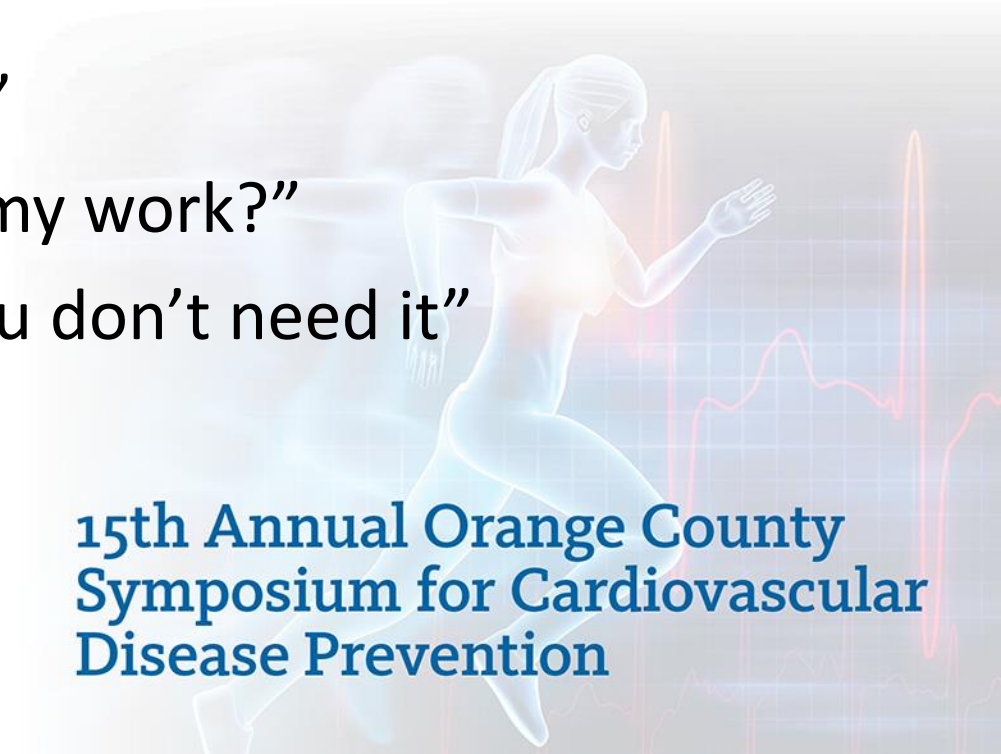
"When you're in cardiac rehab…don't take it too seriously"

"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"



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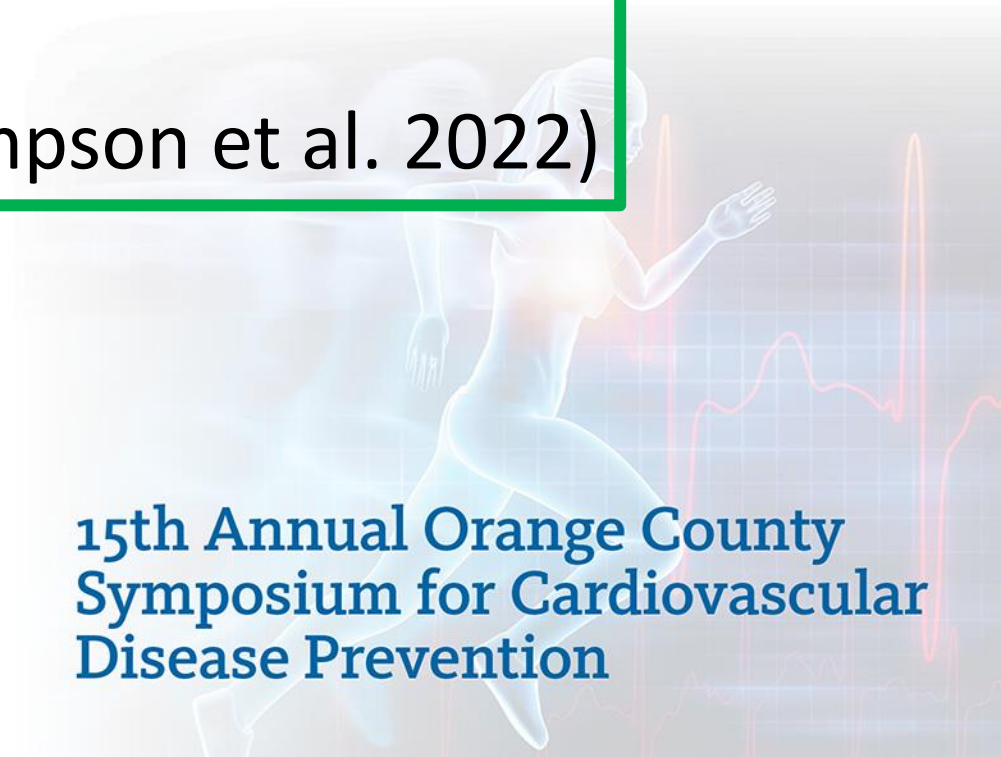
Exercise-based cardiac rehabilitation (CR) is an underutilized service with well-documented clinical and functional benefits for patients with cardiovascular disease.

-(Thompson et al. 2022)



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Circulation: Cardiovascular Quality and Outcomes

ORIGINAL ARTICLE

Tracking Cardiac Rehabilitation Participation and Completion Among Medicare Beneficiaries to Inform the Efforts of a National Initiative

BACKGROUND: Despite cardiac rehabilitation (CR) being shown to improve health outcomes among patients with heart disease, its use has been suboptimal. In response, the Million Hearts Cardiac Rehabilitation Collaborative developed a road map to improve CR use, including increasing participation rates to ≥70% by 2022. This observational study provides current estimates to measure progress and identifies the populations and regions most at risk for CR service underutilization.

METHODS AND RESULTS: We identified Medicare fee-for-service beneficiaries who were CR eligible in 2016, and assessed CR participation (≥1 CR session attended), timely initiation (participation within 21 days of event), and completion (≥36 sessions attended) through 2017. Measures were assessed overall, by beneficiary characteristics and geography, and by primary CR-qualifying event type (acute myocardial infarction hospitalization; coronary artery bypass surgery; heart valve repair/

Matthew D. Ritchey, PT, DPT, OCS, MPH
Sha Maresh, DrPH
Jessica McNeely, PhD
Thomas Shaffer, MHS
Sandra L. Jackson, PhD, MPH
Steven J. Keteyian, PhD
Clinton A. Brawner, PhD
Mary A. Whooley, MD
Tiffany Chang, MPH
Haley Stolp, MPH
Linda Schieb, MSPH
Janet Wright, MD

"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)

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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)

Enrollment rates by sex:

3:2
number of **men vs. women** who initiated CR sessions.

Enrollment rates by race/ethnicity:

2:1
number of **non-Hispanic White vs. non-Hispanic Black people** who initiated CR sessions.

** hospitalization for acute myocardial infarction; coronary artery bypass graft surgery; heart valve repair or replacement; percutaneous coronary intervention; or heart or heart-lung transplant.*

Keteyian SJ, Jackson SL, Chang A, et al. Tracking Cardiac Rehabilitation Utilization in Medicare Beneficiaries: 2017 Update. *J Cardiopulm Rehabil Prev*. 2022;42(4):235-245.

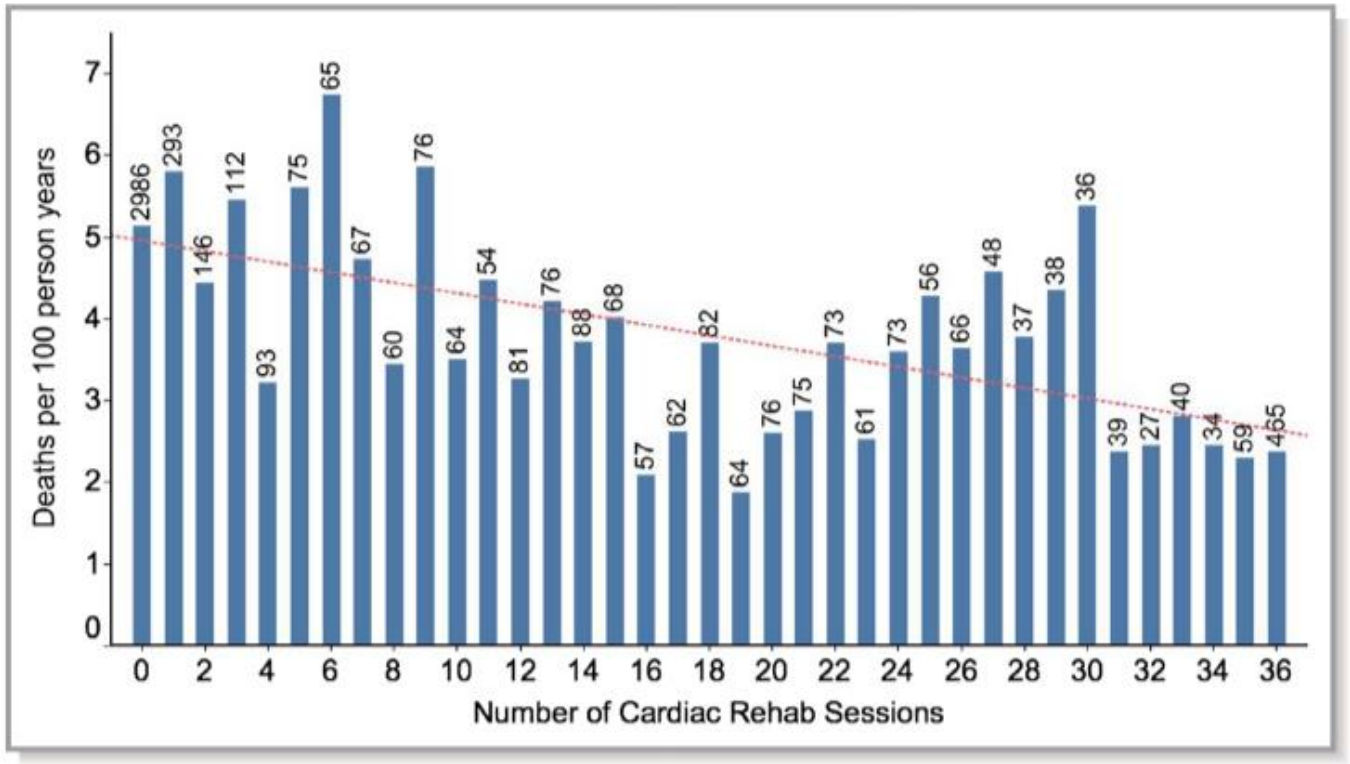

Figure 3. Mortality rate after percutaneous coronary intervention by number of sessions of cardiac rehabilitation attended among propensity-matched patients. The dotted red line represents the linear trend in mortality by number of sessions. The numbers above each bar represent the number of patients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

(Beatty et al., 2018)

33% lower mortality rate than non-participants
"Dose Dependent"

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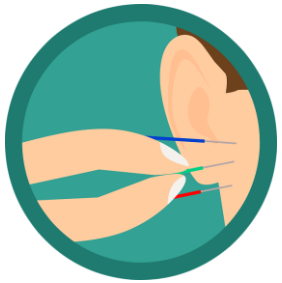
Cardiac Rehab at SSIHI

"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."



Acupuncture

Exercise training evaluation

Patient assessment

Physical activity counseling

Nutrition counseling

Culinary Teaching

Psychosocial management

Core Components of Cardiac Rehab

Weight management

Mindfulness

Tobacco cessation

Blood pressure management

Tai Chi and Qi Gong

Diabetes management

Lipid management

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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.

TABLE 6.5

Aerobic (Cardiovascular Endurance) Exercise Evidence-Based Recommendations

FITT-VP	Evidence-Based Recommendation
Frequency	• ≥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.
Intensity	• Moderate and/or vigorous intensity is recommended for most adults. • Light-to-moderate intensity exercise may be beneficial in deconditioned individuals.
Time	• 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. • <20 min of exercise per day can be beneficial, especially in previously sedentary individuals.
Type	• Regular, purposeful exercise that involves major muscle groups and is continuous and rhythmic in nature is recommended.
Volume	• 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} steps is beneficial. • Exercising below these volumes may still be beneficial for individuals unable or unwilling to reach this amount of exercise.
Pattern	• 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 <10 min may yield favorable adaptations in very deconditioned individuals.
Progression	• 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.

Adapted from (37).

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

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

METs

Metabolic Equivalents: Oxygen Consumption

1 MET=3.5mL*kg^{-1}*min.$^{-1}$

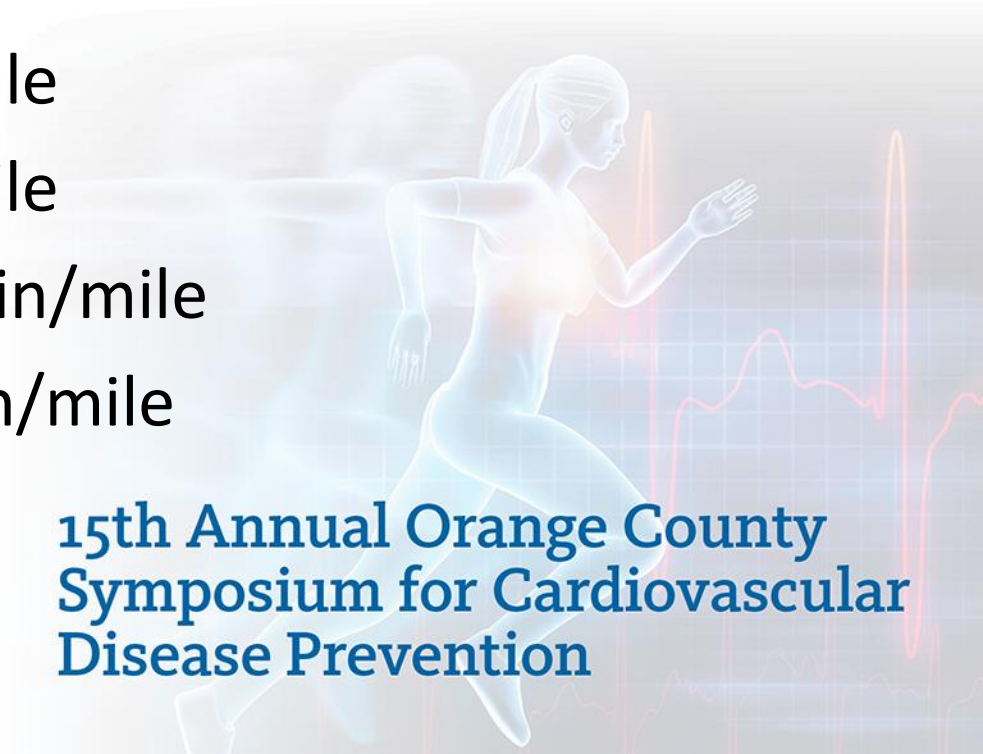
1 METs = Life

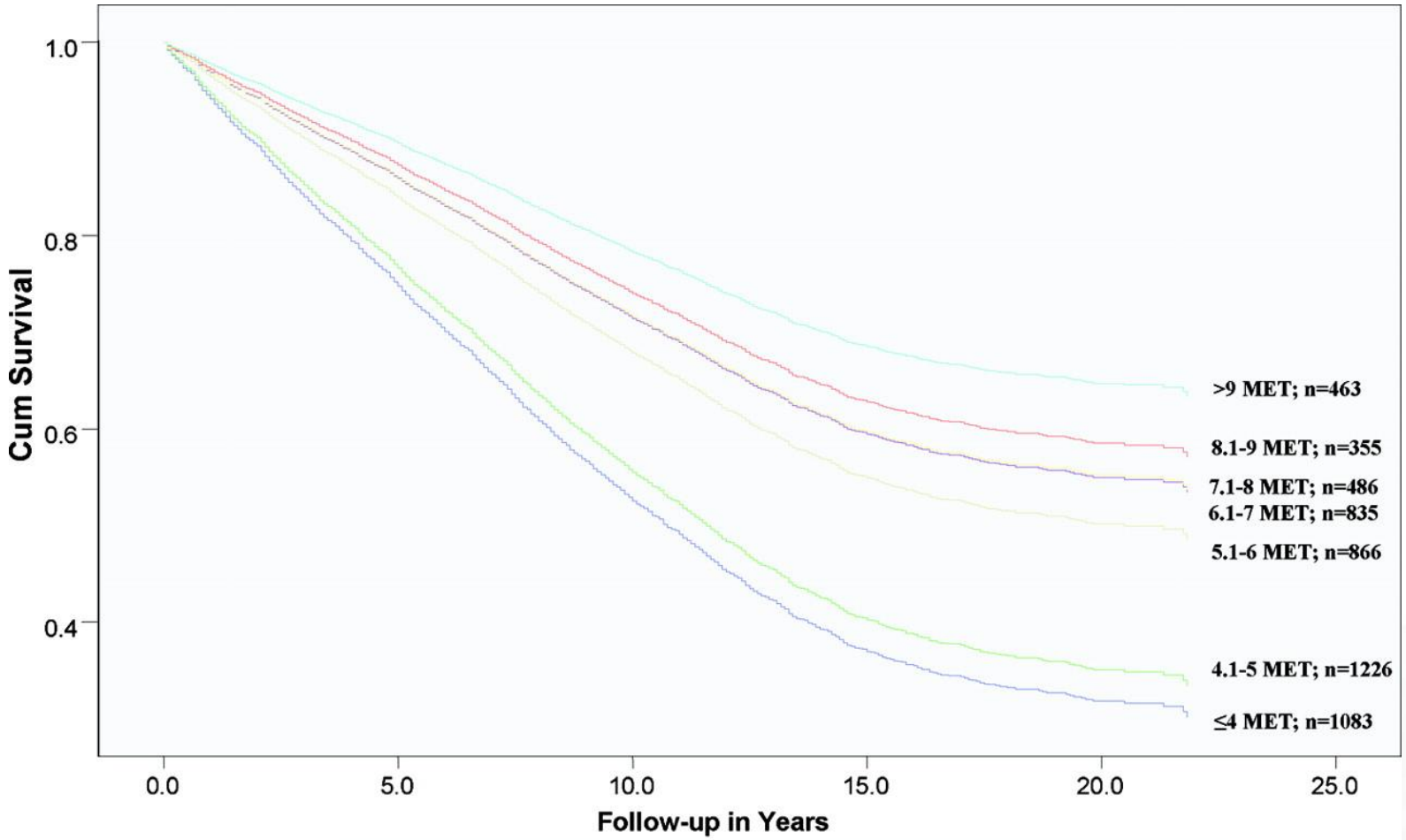
2.0 METs = 40 min/mile

3.0 METs = 24 min/mile

5.0 METs = Light Jog, 15 min/mile

10 METs= Running, 10min/mile

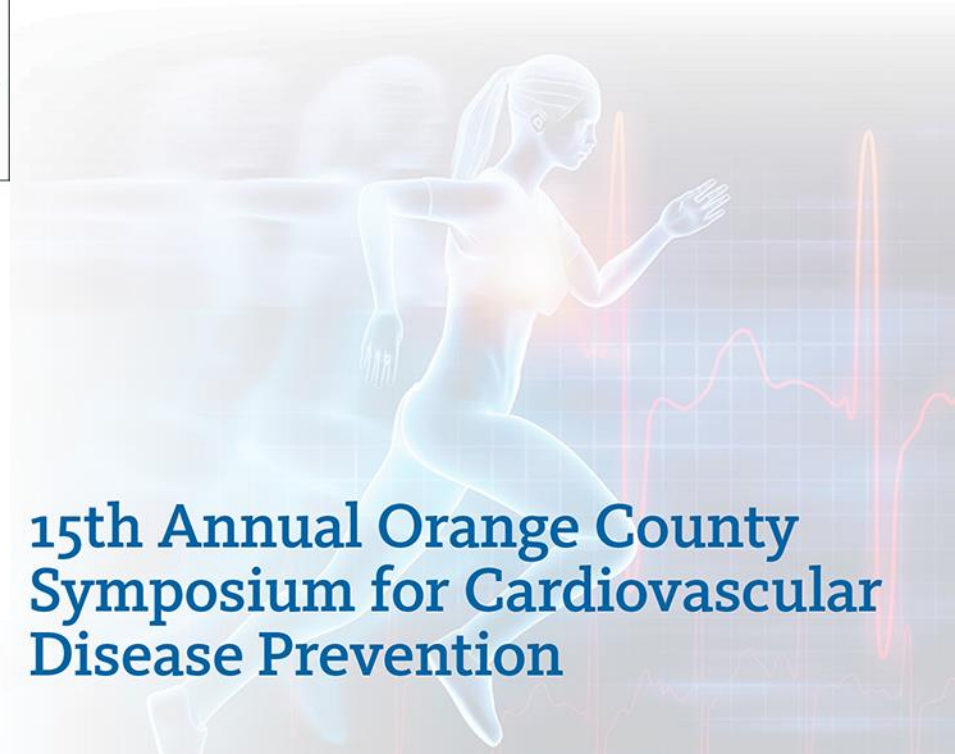




	Number of Cumulative Events/Number of Cases at Risk			
Fitness Categories	**5 years**	**10 years**	**15 years**	**20 years**
≤4 METs	337/724	535/379	608/186	615/63
4.1-5.0 METs	302/853	525/400	605/176	622/48
5.1-6 METs	121/656	233/330	289/122	298/36
6.1-7 METs	93/644	179/343	241/168	260/49
7.1-8.0 METs	51/386	108/180	140/72	146/22
8.1-9.0 METs	43/275	70/151	87/39	95/18
>9 METs	27/343	64/210	100/55	101/25

(Kokkinos et al., 2010)

Increasing your fitness level enhances your chances of achieving longevity.



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High-Intensity Interval Training to Maximize Cardiac Benefits of Exercise Training?

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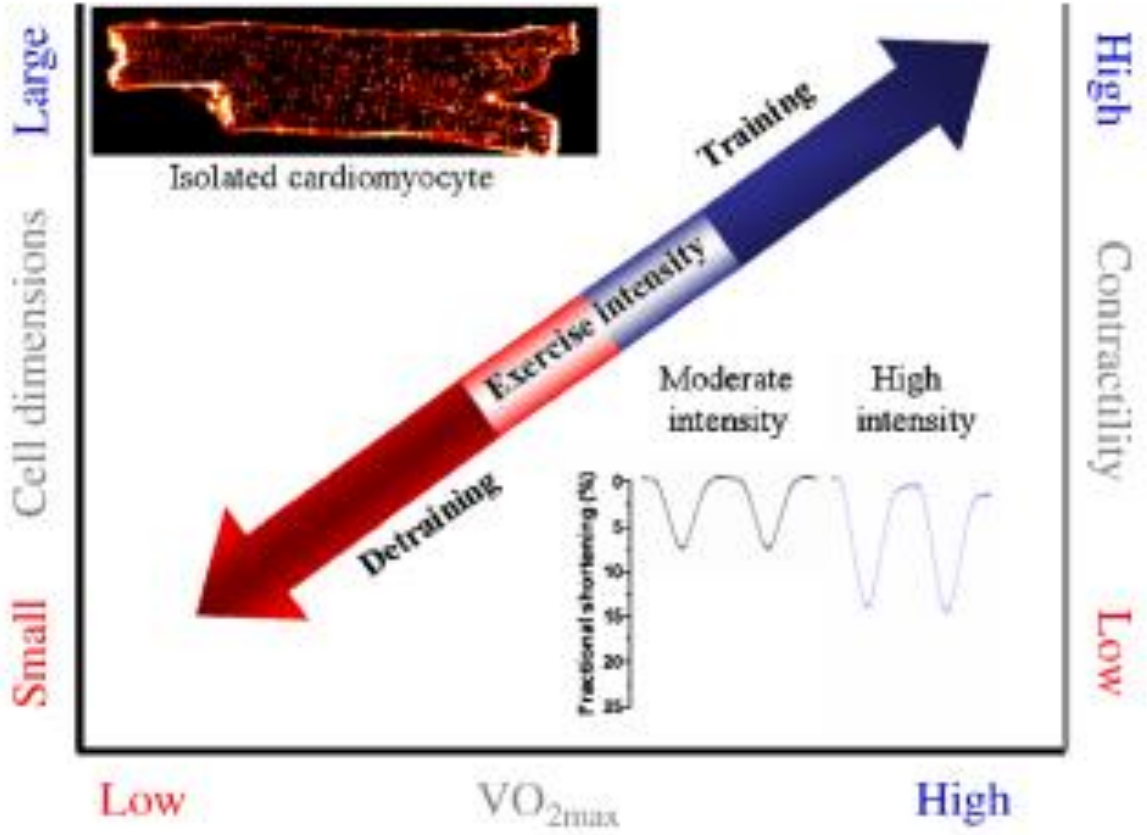

(Wisløff et al., 2009)

Open Access Journal of Sports Medicine

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REVIEW

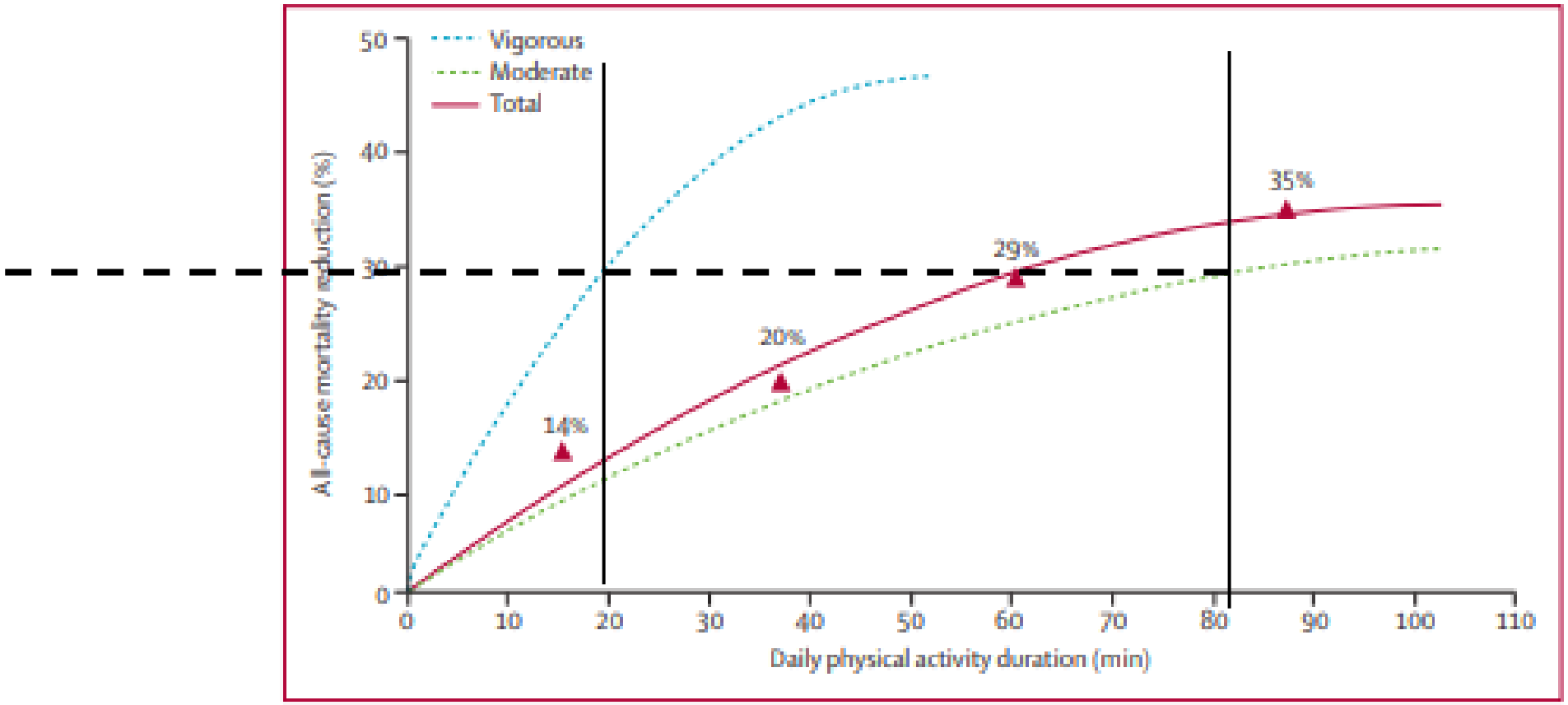
High-intensity interval training versus moderate-intensity continuous training within cardiac rehabilitation: a systematic review and meta-analysis

This article was published in the following Dove Press journal:
Open Access Journal of Sports Medicine

"**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."

(Hannan et al., 2018)

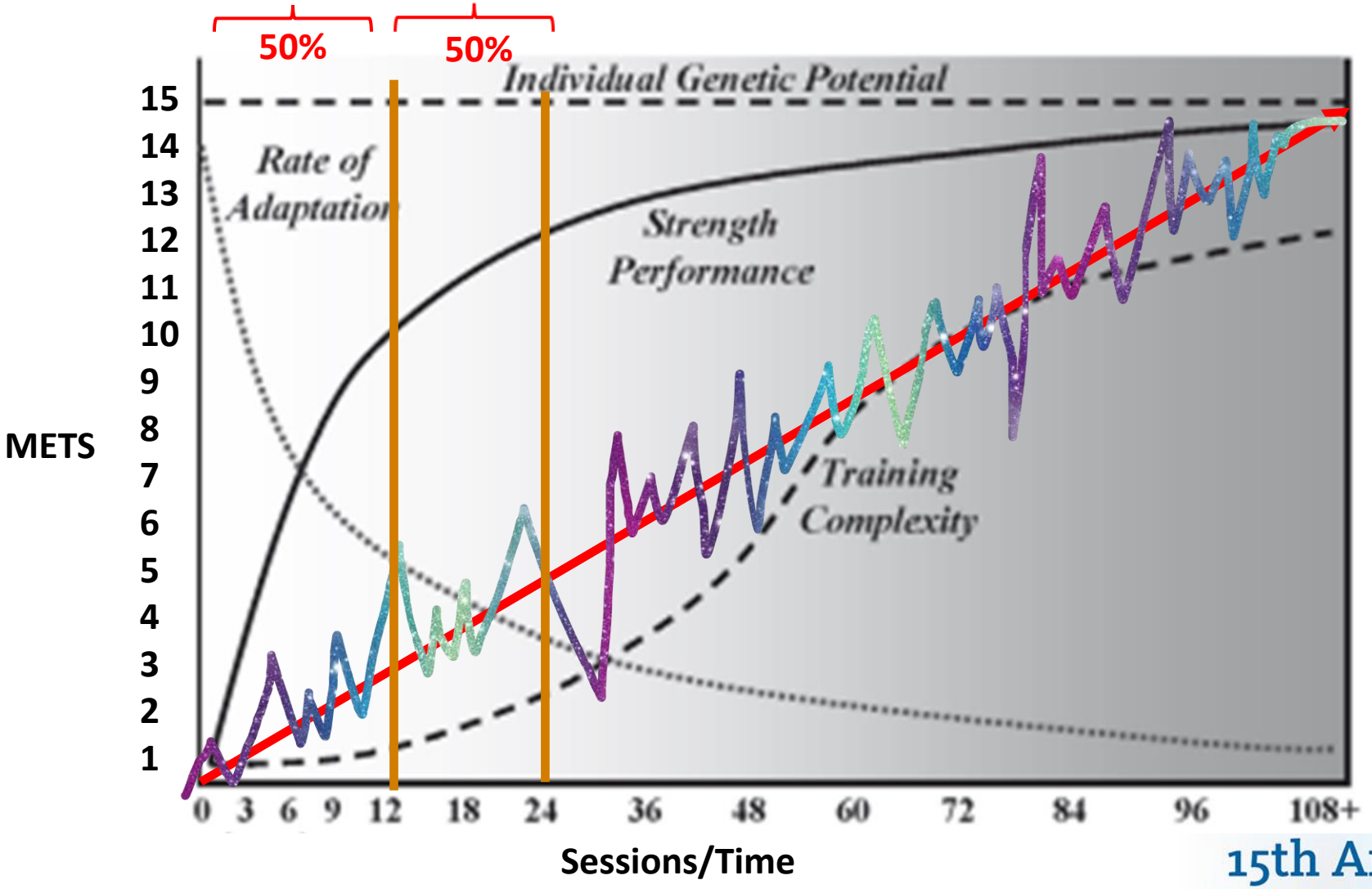
Intensity Effects of Daily Exercise



(Wen et al., 2011)

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



Specific Adaptation To Increased/Imposed Demands

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

(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

Red = Measured

Black = Ideal

Exploring the Future of Cardiac Rehabilitation

UCI Intensive Cardiac Rehabilitation

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Acupuncture

Exploring Mind-Body Connection and Outcomes in Cardiac Rehab

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Virtual to AI

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

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