



# Cardiac Rehab and the Effects of Exercise Post STEMI

DAVID UKESTAD  
CARDIAC REHAB  
ACSM CCEP, CEP

FINANCIAL DISCLOSURE:  
No relevant financial relationship exists

# Overview



- ▶ Significant Statistics
- ▶ Risk Factors for Cardiovascular Disease
- ▶ Reduction in Risk Factors Through Exercise
- ▶ Cardiac Rehab
- ▶ Cardiac Rehab and the Effects of Exercise Post STEMI
- ▶ Questions?

Significant Statistics



# Significant Statistics

American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) 2008

- ▶ Cardiovascular Disease (CVD) accounts for almost 50% of all deaths in the U.S.
- ▶ CVD affects 13 million Americans each year
  - ▶ 7.1 million men
  - ▶ 5.9 million women



# Significant Statistics

American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) 2008

- ▶ 1.5 million Americans sustain a myocardial infarctions (MI) each year
  - ▶ 500,000 are fatal
  - ▶ 5% of MIs occur before age 40
  - ▶ 45% of MI occur before age 65
- ▶ MI is the single leading cause of death in America
  - ▶ 41% of MIs will result in death





# Risk Factors for Cardiovascular Disease

# Risk Factors for Cardiovascular Disease

American College of Sports Medicine Tenth Edition 2016

## ▶ Non-Modifiable Risk Factors

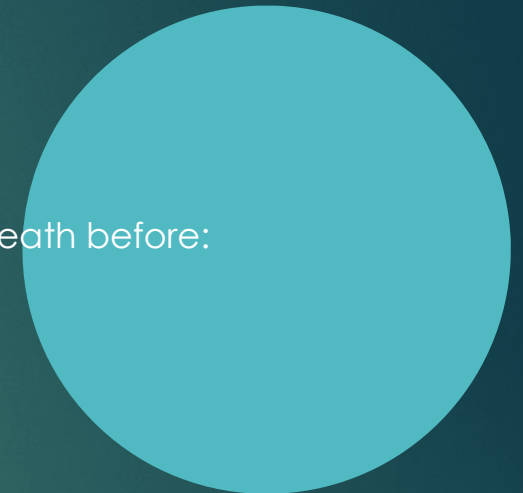
### ▶ Family History

▶ Myocardial Infarction, coronary revascularization, or sudden death before:

- ▶ 55 yrs in father or other male first-degree relative
- ▶ 65 yrs in mother or other female first-degree relative

### ▶ Age

- ▶ Men  $\geq$  45 yrs
- ▶ Women  $\geq$  55 yrs



# Risk Factors for Cardiovascular Disease

American College of Sports Medicine Tenth Edition 2016

## ▶ Modifiable Risk Factors

### ▶ Cigarette Smoking

- ▶ Current cigarette smoker or those who quit within the previous 6 months or exposure to environmental tobacco smoke

### ▶ Physical Inactivity

- ▶ Not participating in at least 30 minutes of moderate intensity physical activity (40%-59% VO<sub>2</sub>R) on at least 3 days of the week for at least 3 months

### ▶ Obesity

- ▶ Body Mass Index (BMI)  $\geq 30$  kg\*m<sup>2</sup>
  - ▶ Or waist girth >102 cm (40 in) for men
  - ▶ Or waist girth > 88 cm (35 in) for women



# Risk Factors for Cardiovascular Disease

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## ▶ Modifiable Risk Factors Cont.

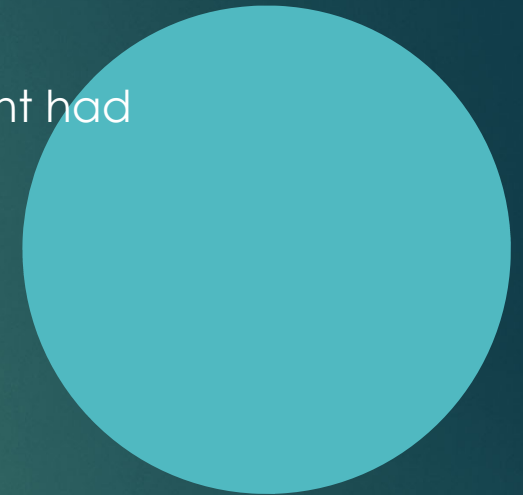
- ▶ Hypertension confirmed by measurements on at least two separate occasions
  - ▶ Systolic BP  $\geq$  140 mm Hg
  - ▶ Diastolic  $\geq$  90 mm Hg
- ▶ Dyslipidemia
  - ▶ LDL  $\geq$  130
  - ▶ HDL  $<$  40
  - ▶ Total Cholesterol  $\geq$  200
- ▶ Diabetes
  - ▶ Fasting plasma glucose  $\geq$  126 mg \* dl
  - ▶ Or HbA1C  $\geq$  6.5%



# Risk Factors for Cardiovascular Disease

American College of Sports Medicine (JAMA 2003:891)

- ▶ 87 to 100% of pts who experienced a fatal coronary event had exposure to 1 of these 4 risk factors
  - ▶ Hyperlipidemia
  - ▶ Hypertension
  - ▶ Smoking
  - ▶ Diabetes





# Reduction in Risk Factors Through Exercise

# Reduction of Risk Factors Through Exercise

American College of Sports Medicine Tenth Edition 2016

## Modifiable Risk Factor

1. Physical Inactivity
2. Obesity
3. Hypertension
4. Dyslipidemia
5. Diabetes

## Benefit of Exercise

1. Significant health benefits can be recognized with a minimum of 150 minutes of exercise per week
2. Reduces total body fat and intra-abdominal fat
3. Reduces resting systolic/diastolic pressure by 10-15 mm Hg
4. Increases HDL to decrease serum triglycerides and detrimental effects of LDL on arterial health
5. Reduce insulin needs, improved glucose tolerance

# Reduction of Risk Factors Through Exercise

American College of Sports Medicine Tenth Edition 2016

- ▶ Exercise to reduce the risk of cardiovascular disease
  - ▶ Reducing the risk of total cholesterol by 40 mg/dl confers a significant reduction in relative risk of developing cardiovascular disease
  - ▶ For each 1 MET increase in exercise capacity confers an 8-17% reduction in mortality
  - ▶ Normalization of weight to BMI <25 with regular exercise can contribute to a 90% reduction in cardiovascular disease events
  - ▶ Significant health benefits can be recognized with a minimum of 150 minutes of cardiovascular exercise per week
  - ▶ A progressive increase in activity to 200-300 minutes per week (3.3 to 3.5 hours) may facilitate long-term weight control

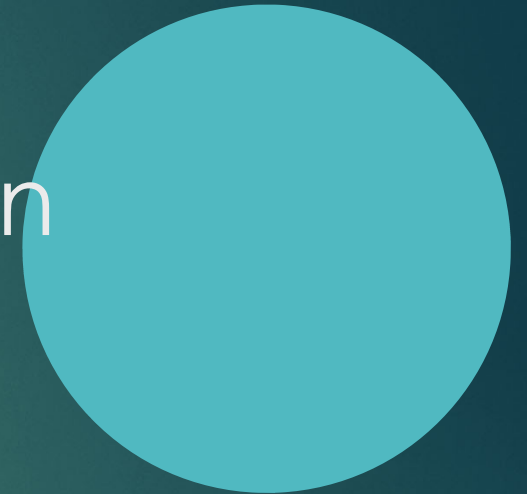
# Reduction of Risk Factors Through Exercise

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- ▶ Other Benefits of Exercise
  - ▶ Decreased Anxiety and Depression
  - ▶ Improved cognitive function
  - ▶ Enhanced physical function and independent living in older adults
  - ▶ Enhanced feelings of well-being
  - ▶ Enhanced performance of work, recreational, and sport activities
  - ▶ Reduced risk of falls and injuries from falls in older adults
  - ▶ Prevention or mitigation of functional limitations in older adults
  - ▶ Effective therapy for many chronic diseases



# Cardiac Rehabilitation



# Cardiac Rehabilitation

American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) 2020

- ▶ Medically supervised secondary prevention program for patients diagnosed with cardiovascular disease
  - ▶ Physician/FNP/PA referral required
  - ▶ Education for lifestyle modification and exercise
  - ▶ Supervised by a variety of healthcare professionals
    - ▶ Clinical Exercise Physiologists (CEP), RN, RT, PT, ext..
- ▶ 3 phases of Cardiac Rehab
  - ▶ Phase I: In patient setting
  - ▶ Phase II: Outpatient setting
  - ▶ Phase III: Maintenance



# Cardiac Rehabilitation

American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) 2020

- ▶ Who is eligible with Medicare coverage?:
  - ▶ MI
  - ▶ CABG
  - ▶ Heart Valve repair or replacement (including TAVR)
  - ▶ Angina
  - ▶ Stent
  - ▶ Heart Transplant
  - ▶ Congestive Heart Failure
  - ▶ PAD
- ▶ Private insurances vary in coverage for eligible diagnoses



# Cardiac Rehabilitation

American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) 2020

- ▶ Core Program Components
  - ▶ Baseline patient Assessment
  - ▶ Nutritional counseling
  - ▶ Pharmacological counseling
  - ▶ Psychosocial management
  - ▶ Physical activity counseling
  - ▶ Exercise prescription



# Cardiac Rehabilitation

American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) 2020

## ▶ Common Program Components

### ▶ Initial and on-going evaluation includes

- ▶ Medical History
- ▶ Risk factor Identification and lifestyle education assessment
- ▶ Functional assessment
- ▶ Psychosocial and quality of life indicators

### ▶ Monitored Sessions

- ▶ ECG, HR, and BP are closely monitored
- ▶ Signs/symptoms of exercise related physiologic parameters
- ▶ Muscular-skeletal status
  - ▶ Wound healing/sternotomy integrity
- ▶ Case Management (hypo/hypertension, diabetes management, medication management)



# Cardiac Rehabilitation

American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR) 2010

- ▶ Underutilization of Cardiac Rehab
  - ▶ Nearly 12.5 million Americans are eligible for secondary prevention
  - ▶ On average only 15% of these eligible candidates received cardiac rehab
    - ▶ Ranges between 11% to 38% depending on area of the country
- ▶ Sooner is Better!!!
  - ▶ Scheduling first apt soon after they leave the hospital is key
  - ▶ Median time from hospital discharge to CR enrollment is 35 days
  - ▶ Enrolling patients into cardiac rehab only **10 days** after discharge significantly improves attendance



# Cardiac Rehab and the Effects of Exercise Post STEMI

# Cardiac Rehab and the Effects of Exercise Post STEMI

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- ▶ Myocardial Infarction: Complete blockage of blood flow to cardiac tissue
  - ▶ Commonly caused by blood clot that is unable to pass through blockage and becomes lodged in existing occlusion
  - ▶ If blockage is not reversed permanent tissue necrosis occurs and may be fatal
  - ▶ ST segment elevation found on ECG indicates an acute MI (STEMI)

# Cardiac Rehab and the Effects of Exercise Post STEMI

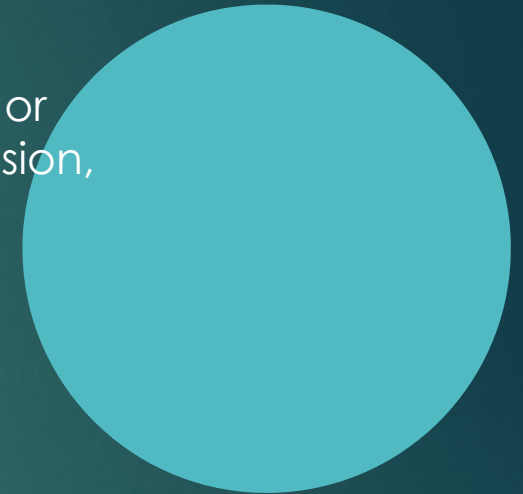
American College of Sports Medicine Tenth Edition 2016

- ▶ Secondary Prevention
  - ▶ Cardiovascular and all-cause mortality are reduced in patients with post-myocardial infarction (MI) who participate in cardiac rehab, especially as a component of multifactorial risk factor reduction
  - ▶ Reduced Risk of fatal MI ( $\geq 25\%$ )
- ▶ Increase capillary density in skeletal and cardiac muscle
  - ▶ Improved delivery of O<sub>2</sub> and nutrients to skeletal and cardiac muscle
  - ▶ High red blood cell mean transit time
  - ▶ **IMPROVED CARDIAC OUTPUT**

# Cardiac Rehab and the Effects of Exercise Post STEMI

American College of Sports Medicine Tenth Edition 2016

- ▶ Increase exercise threshold for the onset of disease signs or symptoms (angina pectoris, ischemic ST-segment depression, claudication)
  - ▶ Reduced need for anti-angina meds
- ▶ Reduce blood platelet adhesiveness and aggregation
  - ▶ Decreased risk of thrombotic even
  - ▶ Protect against cardiovascular disease





# Cardiac Rehab and the Effects of Exercise Post STEMI

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- ▶ Other Benefits of Cardiac Rehabilitation post STEMI include:
  - ▶ Reduced inflammation
  - ▶ Improved quality of life
  - ▶ Increase knowledge of disease process and prevention strategies
  - ▶ Improved compliance with medical regimen
  - ▶ Improved metabolic profile
  - ▶ Decreased cost of physician office visits and hospitalizations ( $\leq 35\%$ )
  - ▶ Decrease ER visits

# Cardiac Rehab and the Effects of Exercise Post STEMI

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## Cardiac Arrest

1 / 169,344 pt exercise hours

## Myocardial Infarction

0 / 338,638 pt exercise hours

## Fatal Events

1 / 338,638 pt exercise hours



Past 5 Year Average Report for CHI St. Alexius  
Cardiac Rehab  
AACVPR Data based on 428 patients

- ▶ % Diagnosis
  - ▶ NSTEMI: 29%
  - ▶ STEMI: 16.1%
  - ▶ PCI: 37.4%
  - ▶ CABG: 13.1%
  - ▶ CHF: 4.4%



Past 5 Year Average Report for CHI St. Alexius  
Cardiac Rehab  
AACVPR Data based on 428 patients

- ▶ Quality Metrics
  - ▶ Mean Completed Session: 24
  - ▶ Mean Program Duration (days): 90
  - ▶ Mean wait time (days): 10
  - ▶ Attendance rate: 81%



# Past 5 Year Average Report for CHI St. Alexius Cardiac Rehab AACVPR Data based on 428 patients

- ▶ % Risk Factors
  - ▶ Tobacco Status (Intake)
    - ▶ Current ( $\leq 30$  days): 7.9%
    - ▶ Former ( $>6$  months): 36%
    - ▶ Never Smoker: 51.9%
  - ▶ Hypertension: 76%
  - ▶ Hyperlipidemia: 83.4%
  - ▶ Diabetes: 29.2%



Past 5 Year Average Report for CHI St. Alexius  
Cardiac Rehab  
AACVPR Data based on 428 patients

- ▶ % Risk Levels
  - ▶ Low: 28.5%
  - ▶ Intermediate: 59.8%
  - ▶ High: 10.3%
  - ▶ Unknown: 0.5%



# Past 5 Year Average Outcomes Report for CHI St. Alexius Cardiac Rehab AACVPR Data based on 428 patients

## Outcome Measures on Initial Day

- ▶ SBP (mm Hg): 118
- ▶ DBP (mm Hg): 67
- ▶ Total Cholesterol: 165
- ▶ Triglycerides: 156
- ▶ HDL – Cholesterol: 42
- ▶ LDL – Cholesterol: 92
- ▶ Non – HDL Cholesterol: 122
- ▶ FBG (mg/dl): 131

## Outcome Measures on DC Day

- ▶ SBP (mm Hg): 113
- ▶ DBP (mm Hg): 64
- ▶ Total Cholesterol: 159
- ▶ Triglycerides: 138
- ▶ HDL – Cholesterol: 43
- ▶ LDL – Cholesterol: 89
- ▶ Non – HDL Cholesterol: 116
- ▶ FBG (mg/dl): 124

# Past 5 Year Average Outcomes Report for CHI St. Alexius Cardiac Rehab AACVPR Data based on 428 patients

## Outcome Measure on Initial Day

- ▶ Max METs: 2.7
- ▶ 6-Minute Walk Distance: 1,165.6 ft
- ▶ Peak METs during CR: 2.9
- ▶ Pre Rate Your Plate Score: 50
- ▶ Pre PHQ (Psychosocial) Score: 1.4
- ▶ Pre Dartmouth COOP Score: 22.0

## Outcome Measure on DC Day

- ▶ Max METs: 3.1
- ▶ 6-Minute Walk Distance: 1,399.7 ft
- ▶ Peak METs during CR: 4.5
- ▶ Post Rate Your Plate Score: 54
- ▶ Post PHQ (Psychosocial) Score: 1.0
- ▶ Post Dartmouth COOP Score: 17.5



## Subsequent

### Extensive Analysis to Control for Potential Confounding:

Coronary Artery Disease Cardiac Rehab and Survival in Older Coronary Patients. Suaya, JA., et al. J AM Coll 2009;54:25-33

- ▶ Attendance in cardiac Rehab is key
  - ▶ Post 1-year, cardiac rehab participants ( $\geq 24$  sessions) had a 58% relative risk reduction for mortality
  - ▶ After 5 years, cardiac rehab participants had a 34% relative risk reduction for mortality
  - ▶ “Mortality reductions extended to all demographics and clinical subgroups including patients with acute myocardial infarction, those receiving revascularization procedures, and those with congestive heart failure.”

# Dose Response Relationship for CR Sessions and Risk of Death/MI

Relationship Between Cardiac Rehabilitation and Long-Term Risk of Death and Myocardial Infarction Among Elderly Medicare Beneficiaries. Hammill, BG, et al. Circulation. 2010;121:6370

36 vs 24 Sessions  
Attended

36 vs 12 Sessions  
Attended

36 vs 1 session  
Attended

14% reduction of  
death

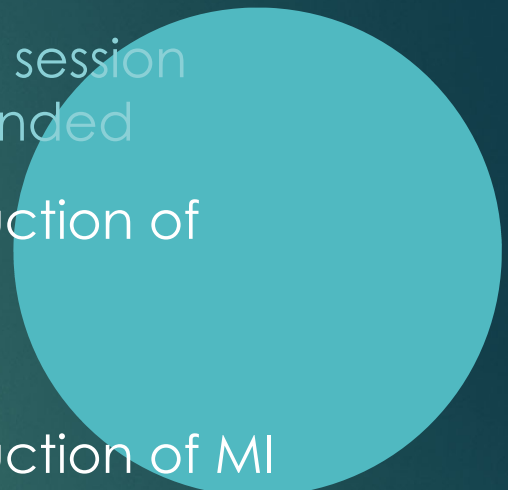
22% reduction of  
death

47% reduction of  
death

12% reduction of MI

23% reduction of MI

31% reduction of MI



Questions???

