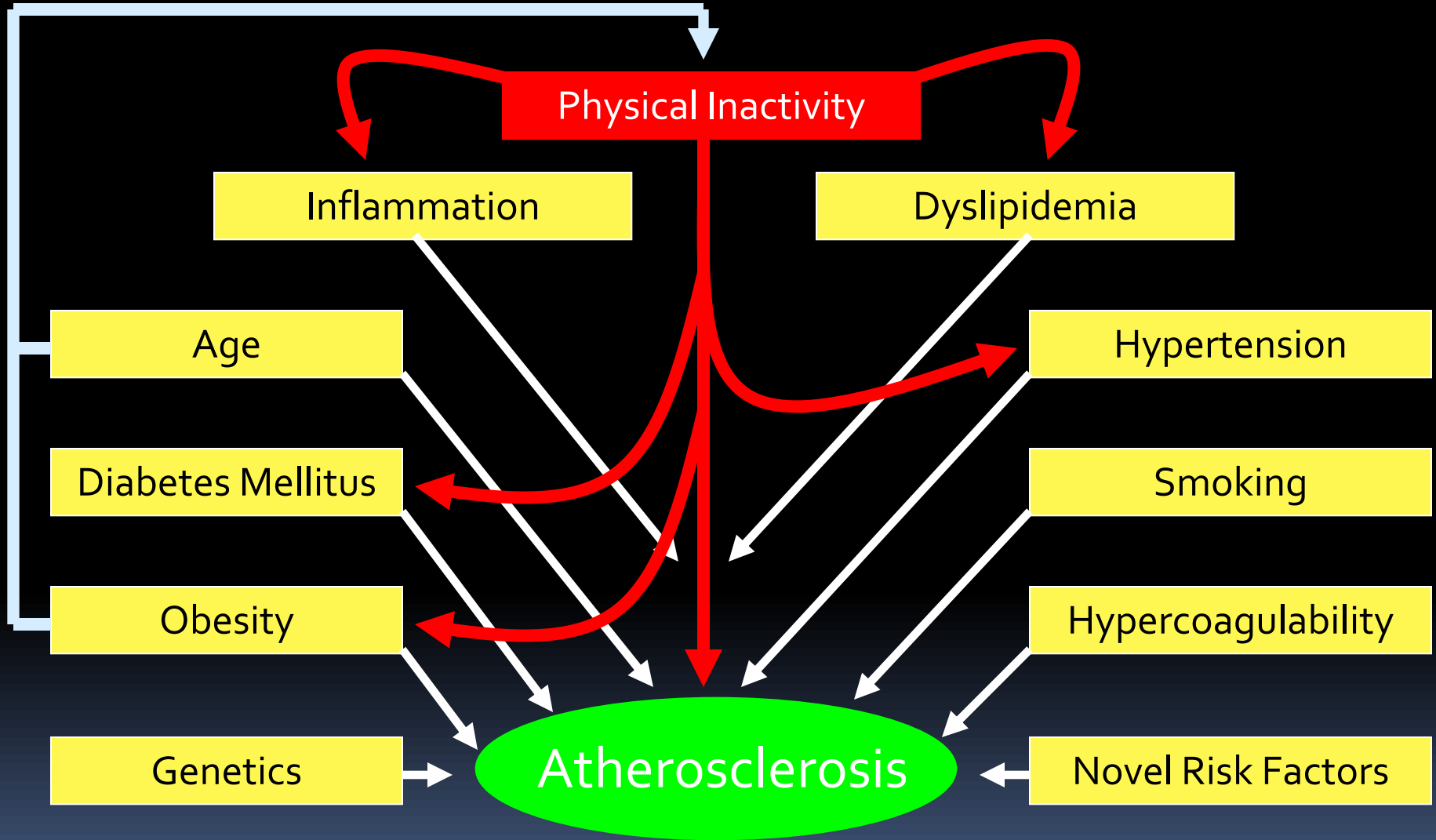




PHYSICAL ACTIVITY AND SPORTS IN PATIENTS WITH CARDIAC DISEASES

HRVOJE PINTARIĆ MD, PHD

Adverse Effects of Physical Inactivity




CORONARY HEART DISEASE AND PHYSICAL ACTIVITY OF WORK

Approximately 50% lower risk of CHD in those with physically demanding (i.e. mail carriers) vs those with sedentary occupations (i.e. desk clerks).

Morris JN, et al. Lancet 1953;2:1053-1120

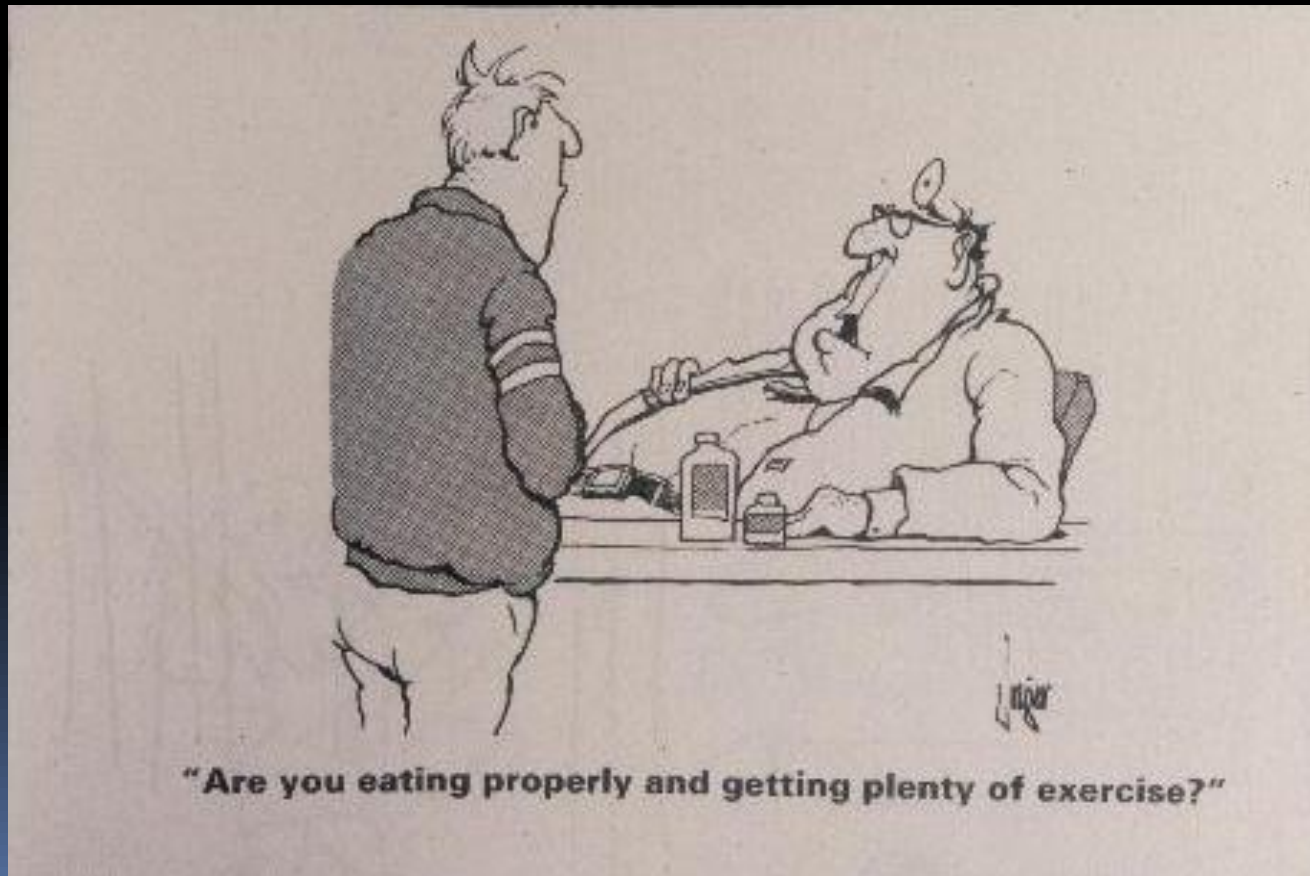


Physicians and their Patients

- 47% of primary care physicians include an exercise history as part of their initial examination (self report)
 - Only 13% of *patients* report physicians giving advice about exercise
- 

Physicians and their Patients

- Physically active physicians are more likely to discuss exercise with their patients



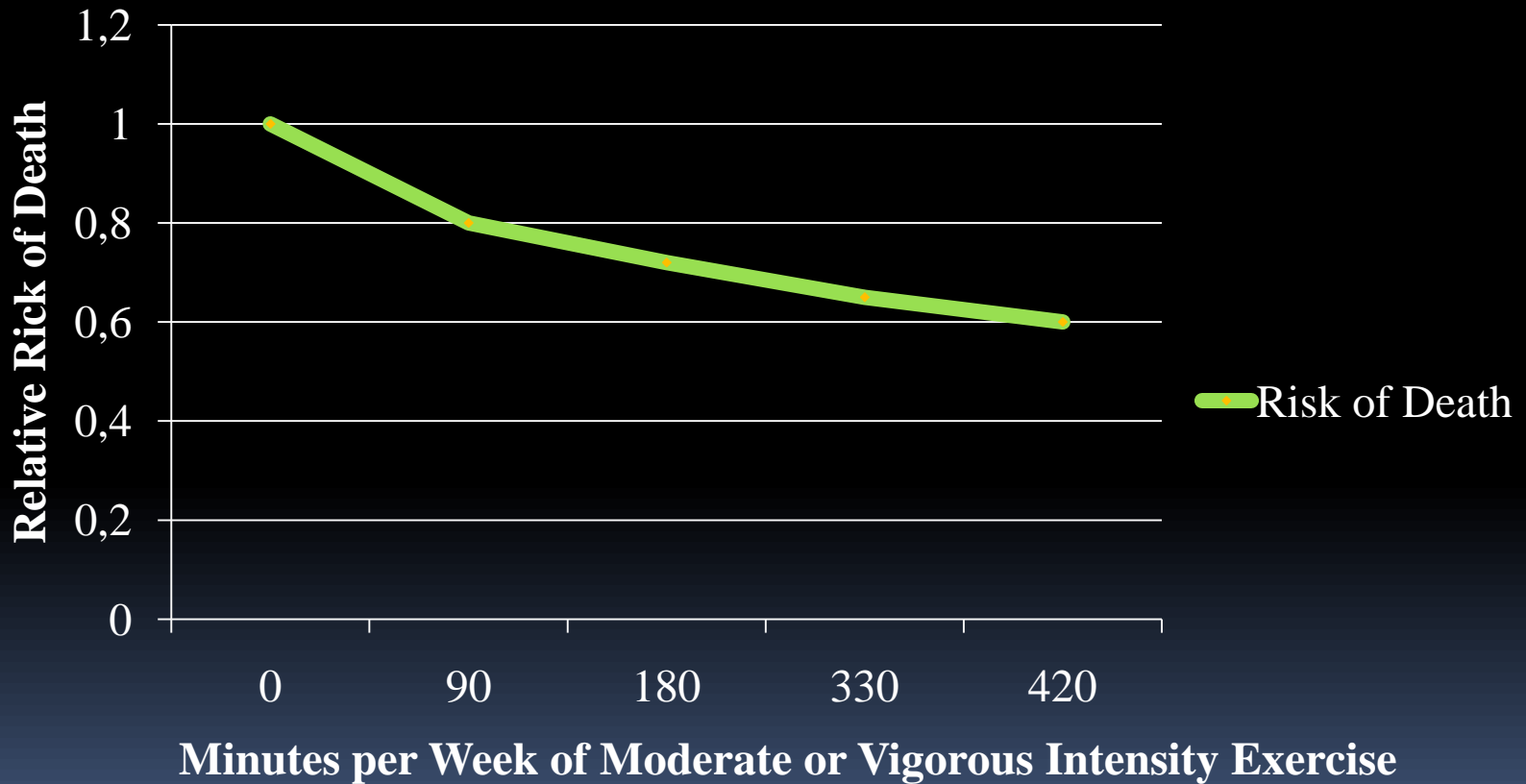
Indications for Exercise

- Longevity
- Quality of Life
- Socialization
- Weight control
- Disease prevention
- Disease management
-(I could go on)



Longevity

The more you exercise, the lower your risk of death



Strong Evidence of Benefit from Physical Activity for...

lower risk of:

- Early death
- Heart disease
- Stroke
- Type 2 diabetes
- High blood pressure
- Dyslipidemia
- Metabolic syndrome
- Colon and breast Ca
- Prevention of wt gain
- Wt loss w/dieting
- Improved C-R & muscular fitness
- Prevention of falls
- Reduced depression
- Better cognitive fxn (older adults)



Moderate evidence for...

- Wt maintenance after loss
- Lower risk of hip fx
- Increased bone density
- Improved sleep quality
- Lower risk lung and endometrial Ca



Contraindications for Exercise

- Acute cardiac event happening now
- Uncontrolled arrhythmia causing sx's
- Severe aortic stenosis
- Uncontrolled heart failure
- Acute pulmonary embolism
- Acute myocarditis
- Dissecting aneurysm



THE OVERLOAD PRINCIPLE

The performance of a Biological System will Improve Only If the Demand Imposed upon it is Greater than the System is Currently Accustomed.



THE OVERLOAD PRINCIPLE

Frequency, Duration
and/or Intensity Must be Increased Periodically.



REVERSIBILITY PRINCIPLE

Training adaptations diminish if stimulation (training) is discontinued for a length of time (12 -90 days).



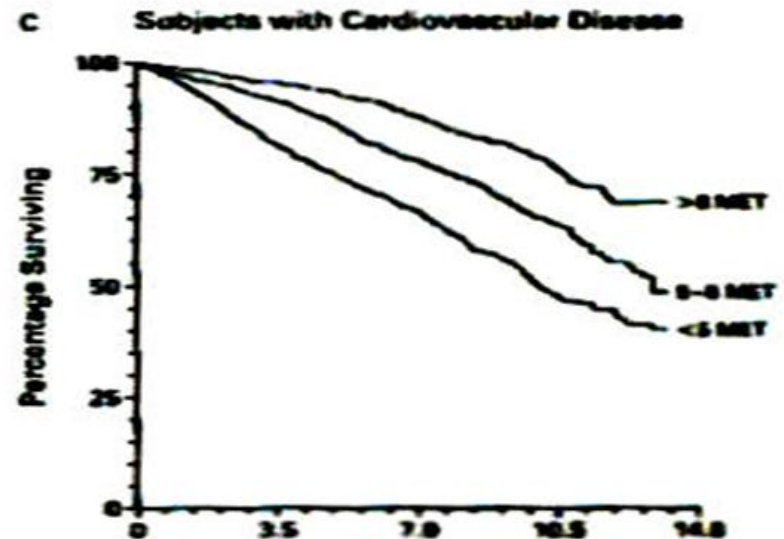
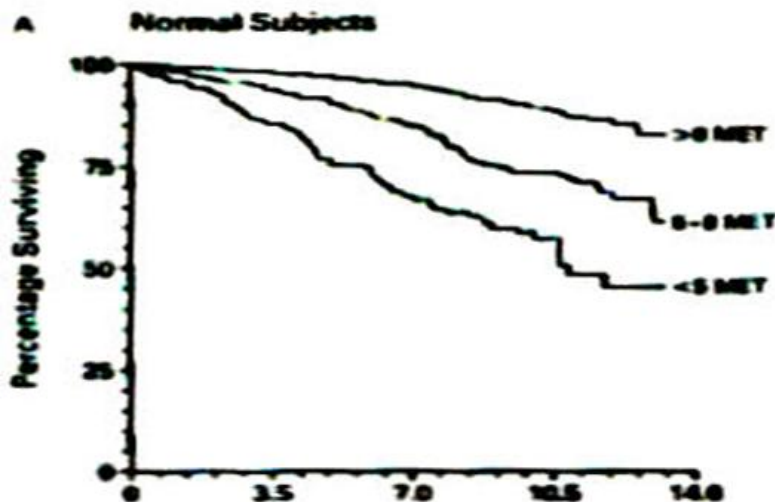
Length of Training

Most Exercise Benefits Are Evident Within 12 Weeks of Consistent Training.



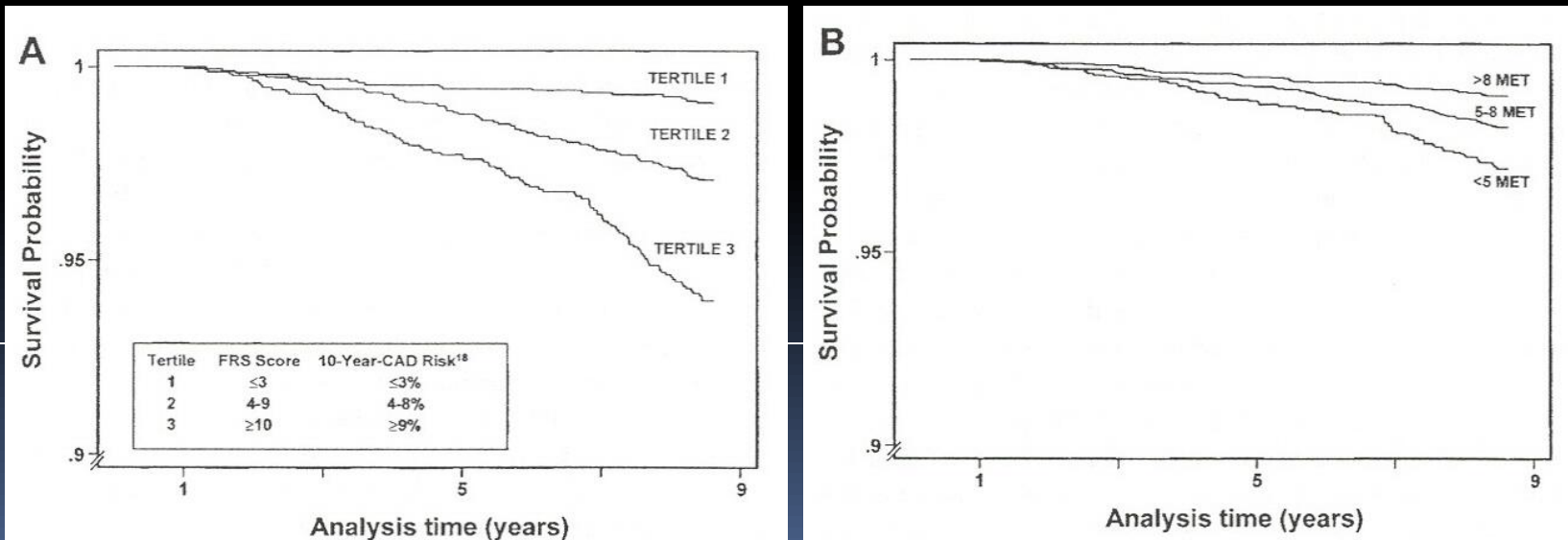
Myers J et al. NEJM 2002;346:793-801

- Exercise Capacity is a more powerful predictor of mortality for CVD than other established risk factors.
- A linear reduction in mortality. For **each 1 MET** increase in exercise capacity, a **12%** decrease in mortality was observed.



Gulati M, et al. Circulation 2003;108:1554-59

- Exercise capacity is a strong and independent predictor of all-cause mortality in asymptomatic women, even after adjusting for traditional cardiac risk factors.
- For **each 1 MET** increase in exercise capacity, a **17%**, decrease in mortality was observed.



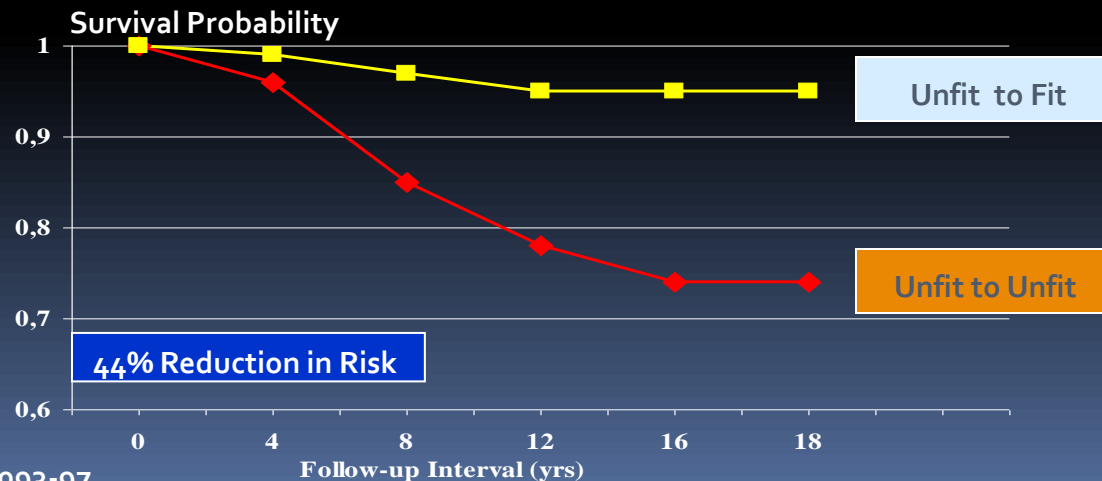
SURVIVAL OF THE FITTEST



“...in the last 15 years, many epidemiological studies have shown an unequivocal and robust relationship of fitness, physical activity, and exercise to reduce overall and CVD mortality.”

Balady JG, *New Engl J Med* 2002;346 (11):852-53

Survival for Fit & Unfit Men (n=9,777)



Blair et al, *JAMA* 1995;273:1093-97

Evidence for Current Cardiovascular Disease Prevention Guidelines

AHA/ACCF Secondary Prevention and Risk Reduction
Therapy for Patients With Coronary and Other
Atherosclerotic Vascular Disease: 2011 Update

European Guidelines on cardiovascular disease
prevention in clinical practice: version 2012

Best Practice Guidelines
for Cardiac Rehabilitation
and Secondary Prevention

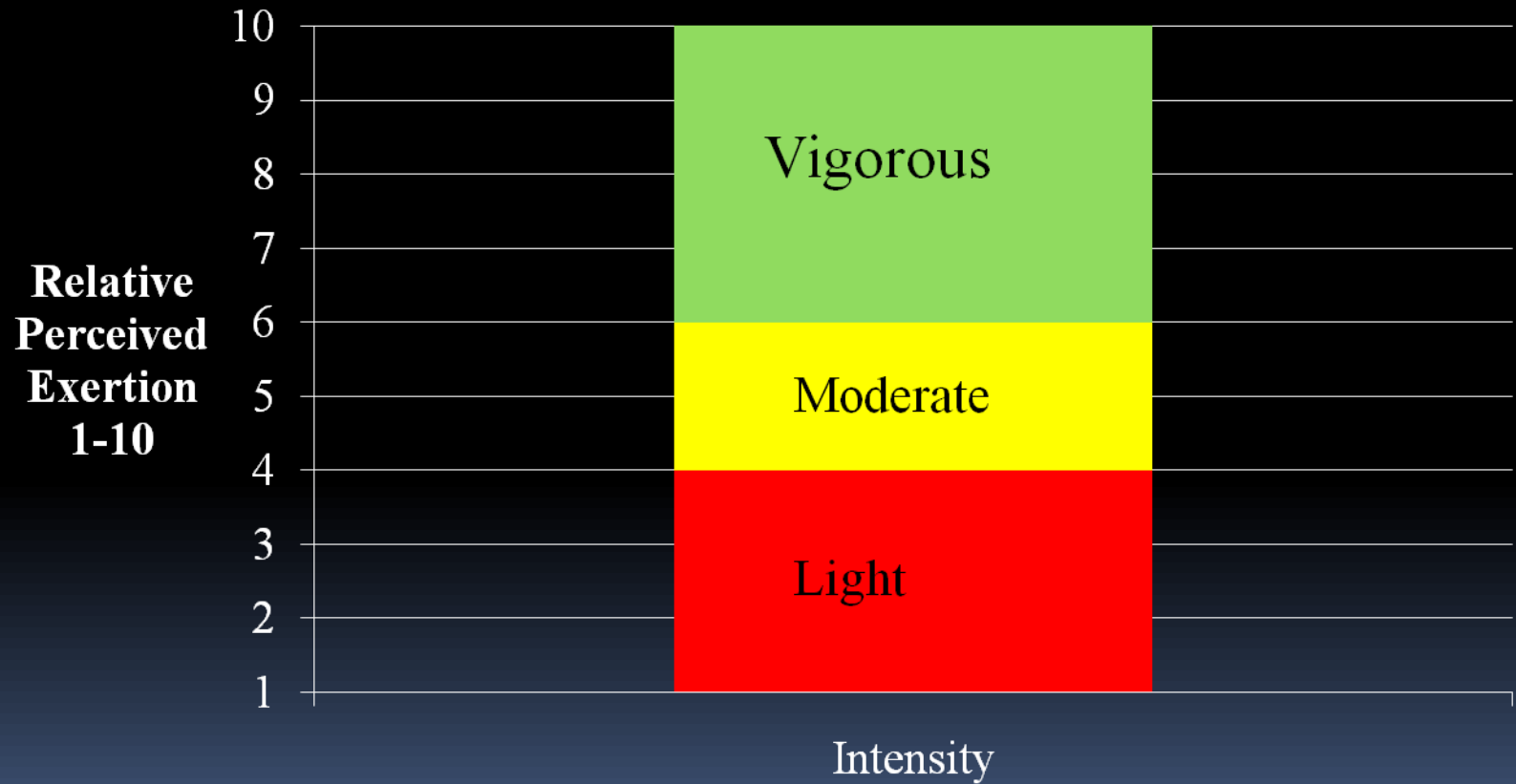
PRODUCED BY THE HEART RESEARCH CENTRE ON
BEHALF OF DEPARTMENT OF HUMAN SERVICES VICTORIA

Role of Cardiac Rehabilitation in Secondary Prevention



Exercise Intensity: Relative Perceived Exertion

Use 1-10 Scale



Current Indications for Cardiac Rehabilitation (Medicare)

- Post-MI
- Post-CABG
- Angina

- PCI
- Valve replacement or repair
- Heart transplant

- Indications for CHF continue to be evaluated by HCFA

Characteristics of Various Cardiac Diseases and Procedures

	MI	CABG	CHF	OHT	AVR/ MVR
↓ Functional Capacity	±	+	+	+	+
Coronary atherosclerosis	+	+	±	±	±
Sternotomy	-	+	-	+	+
↓ LV Function	±	±	+	-	±

Prognosis Post MI

- Mortality in the first year post MI averages **10%**
- Subsequently mortality **5%** per year
- **85%** of deaths due to CAD
 - 50% of these sudden
 - 50% within first 3 months
 - 33% within the first three weeks

Cardiac Rehabilitation

- In the era of emergent PCI, do we still need cardiac rehabilitation?
- Patients with emergent PCI have little myocardial damage, preserved LV function, and little residual ischemia, but ...

Cardiac Rehabilitation and Mortality Impact in PCI

- Mayo Clinic CR-PCI Study
 - Post PCI patients, 1994-2008
 - Cardiac rehabilitation vs no CR
 - Adjusted Propensity Score Analysis techniques
 - All-cause mortality **45% lower for CR participants**
 - Mortality benefit began in **year one and persisted**

Presented at ACC Annual Meeting, March 2010

The Exercise Training Intervention after Coronary Angioplasty

- Randomised 118 patients after coronary revascularization
- 6 months of exercise training vs usual care
- Trained patients significant **increases in peak VO₂** (26%)
- Quality of life parameters **increases in 27%**
- **Fewer cardiac events** (11.9% vs 32.2%)
- **Hospital readmissions** (18.6% vs 46%)
- Residual coronary stenosis **decrease by 30%**
- Recurrent cardiac event **reduced by 29%**

Cardiac Rehabilitation

- Doesn't everyone already go to cardiac rehabilitation?
- Participation rates post-MI in Rochester in 1982-1998 were ~ 75% for men and 40% for women
 - Similar in 2013
 - Highest rates post-CABG, lowest after elective PCI
- Rates of 13 - 41% for men and 7 - 22% for women reported in various regional and national surveys

Cardiac Rehabilitation

- Wouldn't most patients with cardiac disease benefit from rehabilitation program ?



Effect of Exercise-based Cardiac Rehabilitation on Cardiac Events


Outcome	Mean Difference	95% CI	Statistically Significant?
Exercise-only intervention			
Total mortality	-27%	-2% to -40%	Yes
Cardiac mortality	-31%	-6% to -49%	Yes
Nonfatal MI	-4%	-31% to +35%	No
Comprehensive rehabilitation			
Total mortality	-13%	-29% to +5%	No
Cardiac mortality	-26%	-4% to -43%	Yes
Nonfatal MI	-12%	-30%--12%	No

CI indicates confidence intervals. CIs not including zero are statistically significant.

- Meta analysis include 51 randomized trials
- Include 8440 patients: CABG, PTCA, MI, angina, middle-age men
- Supervised exercise for 6 months, follow up 2 years later



Risk

- Cardiac rehab programs
 - Cardiac arrest: 1 in 117000 (patient-hours of participation)
 - Nonfatal MI: 1: in 220000
 - Death : 1: 750000
- 

How to Write an Exercise Prescription for a Patient with a Cardiac Disease



Benefits of Exercise Training After Valve Replacement



Benefits of Exercise Training After Valve Replacement

- 3 published training studies, all with favorable results in terms of $\text{VO}_{2\text{max}}$ and exercise performance
- Other potential benefits
 - Recovery of muscular strength following sternotomy
 - Advice on management of chronic anti-coagulation
 - Monitoring of blood pressure

Exercise Training after Heart Transplant



Cardiovascular Benefits of Exercise Training after OHT

- Increased VO_2 max ~10-25%
- Increased peak power output
- Decreased submaximal exercise ventilation
- Reduced rest and submaximal exercise BP

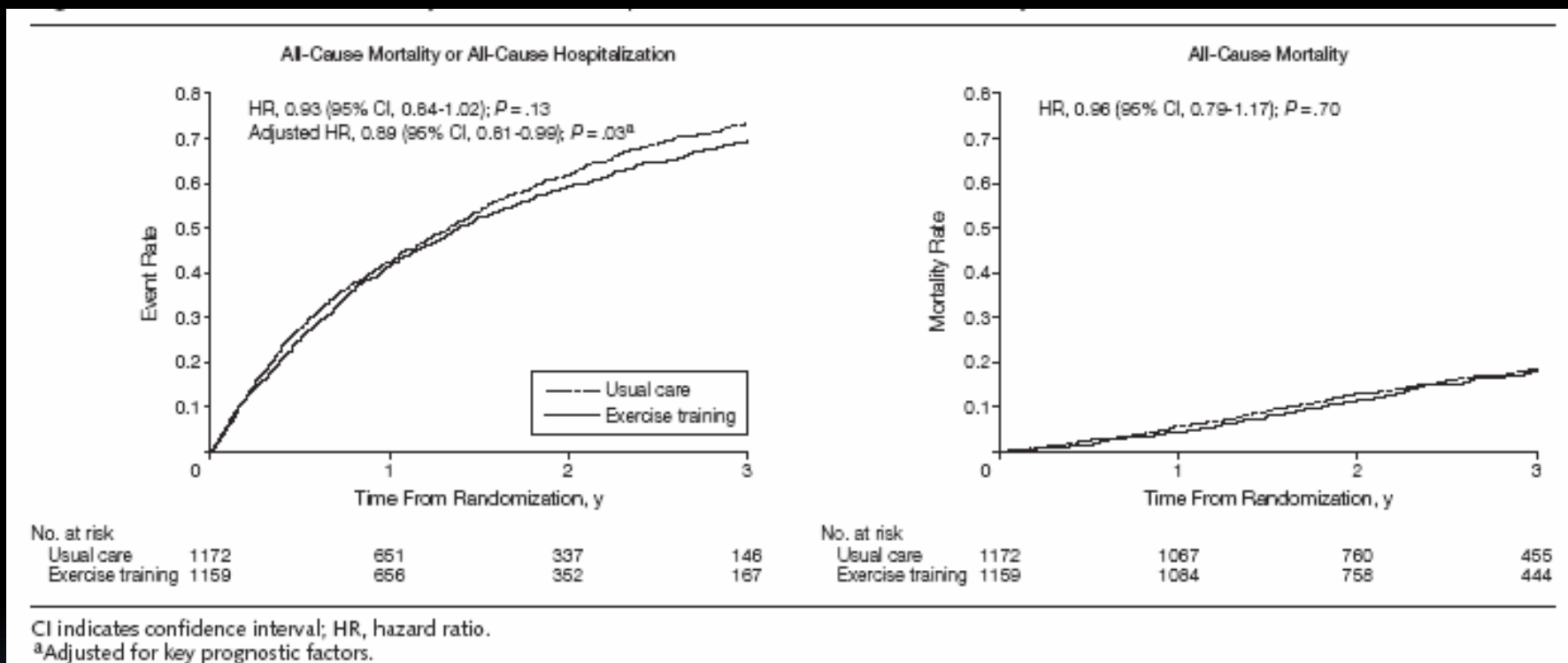
Exercise Training in Chronic Heart Failure



Exercise Training in CHF: Mortality and Morbidity Effects

- HF ACTION:
Heart Failure and A Controlled Trial
Investigating Outcomes of Exercise TrainIng
- RCT: usual care vs structured exercise training; 50 sites in US and Canada
- 5 year follow-up
- Outcomes = death, hospitalization

HF-ACTION Results



- All-cause mortality: no difference
- Modest reduction in clinical events

Peripheral Artery Disease

- Symptomatic PAD frequently characterized by intermittent claudication, which limits walking distance and interferes with daily activities
- Patients with PAD at high risk for other cardiovascular events including acute MI and stroke (both ~2% per year)
- High mortality = 8.2% per year versus 6.3% per year in post-MI patients

Exercise training for Patients with PAD

- Patients with PAD will likely benefit from exercise training and aggressive risk factor management
- Cardiac rehabilitation is a vehicle which can help to provide such therapy
- Efforts should be made to increase utilization of cardiac rehabilitation for PAD patients

AHA Scientific Statement: Recommendations for the Acceptability of Recreational (Noncompetitive) Sports Activities and Exercise in Patients With Genetic CVD

- GCVD
 - HCM, LQTS, Marfan syndrome, ARVC, Brugada syndrome
- Recreational sports are categorized with regard to high, moderate and low levels of exercise
- Graded on relative scale (from 0 to 5) for eligibility
 - 0 to 1: indicating generally not advised or strongly discouraged
 - 4 to 5: indicating probably permitted
 - 2 to 3: indicating intermediate and to be assessed clinically in an individual basis

AHA Scientific Statement: Recommendations for the Acceptability of Recreational (Noncompetitive) Sports Activities and Exercise in Patients With GCVDs

Intensity Level	HCM	LQTS	Marfan Syndrome	ARVC	Brugada Syndrome
High					
Basketball	0	0	2	1	2
Full court	0	0	2	1	2
Half court	1	1	0	1	1
Body building	0	0	1	0	0
Ice hockey	0	2	2	0	2
Racquetball/squash	1	1	1	1	1
Rock climbing	0	0	2	0	2
Running (downhill)	2	2	2	1	1
Skiing (cross-country)	2	3	2	1	4
Soccer	0	0	2	0	2
Tennis (singles)	0	0	3	0	2
Touch (flag) football	1	1	3	1	3
Windsurfing	1	0	1	1	1

AHA Scientific Statement: Recommendations for the Acceptability of Recreational (Noncompetitive) Sports Activities and Exercise in Patients With GCVDs

Intensity Level	HCM	LQTS	Marfan Syndrome	ARVC	Brugada Syndrome
Moderate					
Baseball/softball	2	2	2	2	4
Biking	4	4	3	2	5
Modest hiking	4	5	5	2	4
Motocycling	3	1	2	2	2
Jogging	3	3	3	2	5
Sailing	3	3	2	2	4
Surfing	2	0	1	1	1
Swimming (lap)	5	0	3	3	4
Tennis (doubles)	4	4	4	3	4
Treadmill/stationary bicycle	5	5	4	3	5
Weightlifting (free weights)	1	1	0	1	1
Hiking	3	3	3	2	4

AHA Scientific Statement: Recommendations for the Acceptability of Recreational (Noncompetitive) Sports Activities and Exercise in Patients With GCVDs

Intensity Level	HCM	LQTS	Marfan Syndrome	ARVC	Brugada Syndrome
Low					
Bowling	5	5	5	4	5
Golf	5	5	5	4	5
Horseback riding	3	3	3	3	3
Scuba diving	0	0	0	0	0
Skating	5	5	5	4	5
Snorkeling	5	0	5	4	4
Weights (non-free weights)	4	4	0	4	4
Brisk walking	5	5	5	5	5

Exercise Training in patients with congenital and valvular heart disease



Attitude toward exercise and sport

- most **children** with heart disease without or with heart surgery – **no restriction to recreational sports activities, physical education.**

Cardiomyopathy, chronic myocarditis – steered away from all competitive sports and many exercise activities (mainly weight training, strenuous' exercise). Total abstinence from physical activities is not required.

Congenital and valvular heart disease in adults

- **Valvular heart disease** – mitral valve prolaps, mitral valve stenosis and insufficiency, tricuspidal valve stenosis and insufficiency, aortic stenosis and incompetence, pulmonary stenosis and insufficiency
- very rare nowadays (ASD more than 40 %)
- **Physical work capacity** is either normal or slightly below normal

TABLE 18-6. Physical Work Capacity of Adults with Congenital Heart Disease*

Lesion	Number of Subjects	Work Capacity Level		
		% 2 SD Below Normal	% Above Mean	% Below Mean
Coarctation of aorta	15	0	33	67
Patent ductus arteriosus and ventricular septal defect	35	31	13	56
Atrial septal defect		18	20	63
Preoperative	56			
Postoperative	38	5	26	68
Total		21	19	60


*From Frick et al.¹²

Exercise programs

- **Exercise testing** – help for assessing functional status, cardiac arrhythmias
- **AIM** – improving working capacity of skeletal muscles. Intensity – 40 – 50 % of VO_2max , 4 – 5/week, 20 – 30 min.
- **Possible adverse effects** – arrhythmia, anginal pain, acute heart failure, syncope.



In AS and PS

- EC directly related to the degree of peak pressure gradient, after surgical or balloon angioplasty no limitation of EC.
 - In cyanotic lesions – EC very limited, after successful surgery – light exercise recommended
- 

Patients with disorders of cardiac rhythm

- **Exercise testing** – evaluation of heart's response to physical activity, bring out occult arrhythmias, assistance in diagnosis of arrhythmias in patients with palpitations, syncope, light-headedness, exercise testing in combination with Holter ECG monitoring – complex information of rhythm disorders, mainly in problems with sinus node function and conduction system

Pacemakers and implantable cardioverter defibrillators

- Type and settings of pacemaker should be noted
- Fixed-rate pacemakers
 - Activity intensity must be gauged by other methods
 - RPE
- ICD
 - Limit target heart rate at least 10 to 15 beats/min lower than the threshold discharge rate

What about Older Adults >65, or those with chronic diseases?



- Aerobic exercise: same
- Strength exercise: slightly lighter weights
- Flexibility activity 2 days/wk, 10 min
- Balance exercise if at risk for falls

Nelson ME et al. Physical activity and public health in older adults: Recommendation from the ACSM and the AHA. *Med Sci Sports Exer* 2007;39(8):1435.

AHA Science Advisory

Depression and Coronary Heart Disease

Recommendations for Screening, Referral, and Treatment

A Science Advisory From the American Heart Association Prevention Committee of the Council on Cardiovascular Nursing, Council on Clinical Cardiology, Council on Epidemiology and Prevention, and Interdisciplinary Council on Quality of Care and Outcomes Research


Endorsed by the American Psychiatric Association

Judith H. Lichtman, PhD, MPH, Co-Chair; J. Thomas Bigger, Jr, MD;
James A. Blumenthal, PhD, ABPP; Nancy Frasure-Smith, PhD; Peter G. Kaufmann, PhD;
François Lespérance, MD; Daniel B. Mark, MD, MPH; David S. Sheps, MD, MSPH;
C. Barr Taylor, MD; Erika Sivarajan Froelicher, RN, MA, MPH, PhD, Co-Chair

Abstract—Depression is commonly present in patients with coronary heart disease (CHD) and is independently associated with increased cardiovascular morbidity and mortality. Screening tests for depressive symptoms should be applied to identify patients who may require further assessment and treatment. This multispecialty consensus document reviews the evidence linking depression with CHD and provides recommendations for healthcare providers for the assessment, referral, and treatment of depression. (*Circulation*. 2008;118:1768-1775.)

Key Words: AHA Scientific Statement ■ depression ■ coronary disease ■ psychosocial factors
■ assessment, patient outcomes

... **Sexual Activity**...



Levine GN, Steinke EE, Bakaeen FG,
Bozkurt B, Cheitlin MD, Conti JB et al.
**Sexual Activity and Cardiovascular
Disease: A Scientific Statement From
the American Heart Association.**
Circulation: 2012; 125: 1058-1072

Coronary Artery Disease Recommendations

- Sexual activity is reasonable for patients **with no or mild angina** (*Class IIa; Level of Evidence B*).
- Sexual activity is reasonable **1 or more weeks after uncomplicated MI** if the patient is without cardiac symptoms during mild to moderate physical activity (*Class IIa; Level of Evidence C*).

Coronary Artery Disease Recommendations


- Sexual activity is reasonable for patients **who have undergone complete coronary revascularization** (*Class IIa; Level of Evidence B*) and may be resumed (a) several days after percutaneous coronary intervention (**PCI**) if the **vascular access site** is without complications (*Class IIa; Level of Evidence C*) or (b) **6 to 8 weeks** after standard coronary artery bypass graft surgery (**CABG**), provided the **sternotomy** is well healed (*Class IIa; Level of Evidence B*).

Coronary Artery Disease Recommendations

- Sexual activity is reasonable for patients who have undergone **noncoronary open heart surgery** and may be resumed 6 to 8 weeks after the **procedure**, provided the sternotomy is well healed (*Class IIa; Level of Evidence C*).
- For patients with **incomplete** coronary revascularization, **exercise stress testing can be considered** to assess the extent and severity of residual ischemia (*Class IIb; Level of Evidence C*).



Coronary Artery Disease Recommendations

- Sexual activity should be deferred for patients with unstable or refractory angina until their condition is stabilized and optimally managed (*Class III; Level of Evidence C*).
- 

Heart Failure Recommendations

- Sexual activity is reasonable for patients with compensated and/or mild (NYHA class I or II) heart failure (*Class IIa; Level of Evidence B*).
- Sexual activity is not advised for patients with decompensated or advanced (NYHA class III or IV) heart failure until their condition is stabilized and optimally managed (*Class III; Level of Evidence C*).

Valvular Heart Disease

Recommendations

- Sexual activity is reasonable for patients with **mild or moderate valvular heart disease** and no or mild symptoms (*Class IIa; Level of Evidence C*).
- Sexual activity is reasonable for patients with **normally functioning prosthetic valves**, successfully repaired valves, and successful transcatheter valve interventions (*Class IIa; Level of Evidence C*).
- Sexual activity is **not advised for patients with severe or significantly symptomatic valvular disease** until their condition is stabilized and optimally managed (*Class III; Level of Evidence C*).

Arrhythmias, Pacemakers, and ICD s: Recommendations

- Sexual activity is reasonable for patients with atrial fibrillation or atrial flutter and well-controlled ventricular rate (*Class IIa; Level of Evidence C*).
- Sexual activity is reasonable for patients with a history of atrioventricular nodal reentry tachycardia, atrioventricular reentry tachycardia, or atrial tachycardia with controlled arrhythmias (*Class IIa; Level of Evidence C*).
- Sexual activity is reasonable for patients with pacemakers (*Class IIa; Level of Evidence C*).

Arrhythmias, Pacemakers, and ICD s: Recommendations

- Sexual activity is reasonable for patients with an ICD implanted for primary prevention (*Class IIa; Level of Evidence C*).
- Sexual activity is reasonable for patients with an ICD used for secondary prevention in whom moderate physical activity ($\geq 3-5$ METS) does not precipitate ventricular tachycardia or fibrillation and who do not receive frequent multiple appropriate shocks (*Level of Evidence C*).

Arrhythmias, Pacemakers, and ICD s: Recommendations

- Sexual activity should be deferred for patients with atrial fibrillation and poorly controlled ventricular rate, uncontrolled or symptomatic supraventricular arrhythmias, and spontaneous or exercise-induced ventricular tachycardia until the condition is optimally managed (*Class III; Level of Evidence C*).
- Sexual activity should be deferred in patients with an ICD who have received multiple shocks until the causative arrhythmia is stabilized and optimally controlled (*Class III; Level of Evidence C*).

Hypertrophic Cardiomyopathy Recommendations

- Sexual activity is reasonable for **most patients with** hypertrophic cardiomyopathy (**HCM**) (*Class IIa; Level of Evidence C*).
- Sexual activity **should be deferred** for patients with HCM who are **severely symptomatic** until their condition is stabilized (*Class III; Level of Evidence C*).

Cardiovascular Drugs and Sexual Function: Recommendations

- Cardiovascular drugs that can improve symptoms and survival **should not be withheld** because of concerns about the potential impact on sexual function (*Class III: Harm; Level of Evidence C*).

Pharmacotherapy for Sexual Dysfunction PDE5 Inhibitors

Recommendations

- PDE5 inhibitors are useful for the treatment of ED in patients with stable CVD (*Class I; Level of Evidence A*).
- The safety of PDE5 inhibitors is unknown in patients with severe aortic stenosis or HCM (*Class IIb; Level of Evidence C*).

Pharmacotherapy for Sexual Dysfunction PDE5 Inhibitors

Recommendations

- PDE5 inhibitors **should not** be used in patients receiving **nitrate therapy** (*Class III; Level of Evidence B*).
- Nitrates **should not** be administered to patients within **24 hours** of sildenafil or vardenafil administration or within 48 hours of tadalafil administration (*Class III; Level of Evidence B*).

CONCLUSIONS

- Patients with cardiac diseases will benefit from exercise training and aggressive risk factor management
- Cardiac rehabilitation is a vehicle which can help to provide such therapy

CONCLUSIONS

- Every patient is a potential “athlete” who needs exercise for HEALTH, not competition
- Physical activity is a VITAL SIGN and a STRONG PREDICTOR OF HEALTH
- Sexual activity is an important component of patient and partner quality of life for men and women with CVD

Thank you !

