Cardiac Rehabilitation

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Introduction

- The first person to introduce exercise systematically into the therapy of cardiovascular disease was M. Oertel in 1875. He successfully treated a patient who was overweight and was short of breath with an increasing number of steps in a hilly terrain. Later he used an arm ergometer for this purpose.

Introduction

- The World Health Organization's current definition addresses the cardiovascular status of the patient before, during, and after the event
- "The rehabilitation of cardiac patients is the sum of activities required to influence favorably the underlying cause of the disease, as well as the best possible physical, mental and social conditions, so that they may by their own efforts, preserve or resume when lost, as normal a place as possible in the society. Rehabilitation cannot be regarded as an isolated form of therapy but must be integrated within the entire treatment"

AHA scientific statement about CR

- Coordinated, multifaceted interventions designed to
  - Stabilizing, slowing or even reversing the progression of the underlying atherosclerotic process →↓morbidity and mortality
  - Optimize a cardiac patient's physical, psychological and social functioning

Heart disease

- Cardiovascular diseases have become the leading cause of mortality
- In comparison with the people of European ancestry, CVD affects people in developing countries at least a decade earlier & in their most productive midlife years,
- The age of CVD death rate in developing countries is higher than the global average

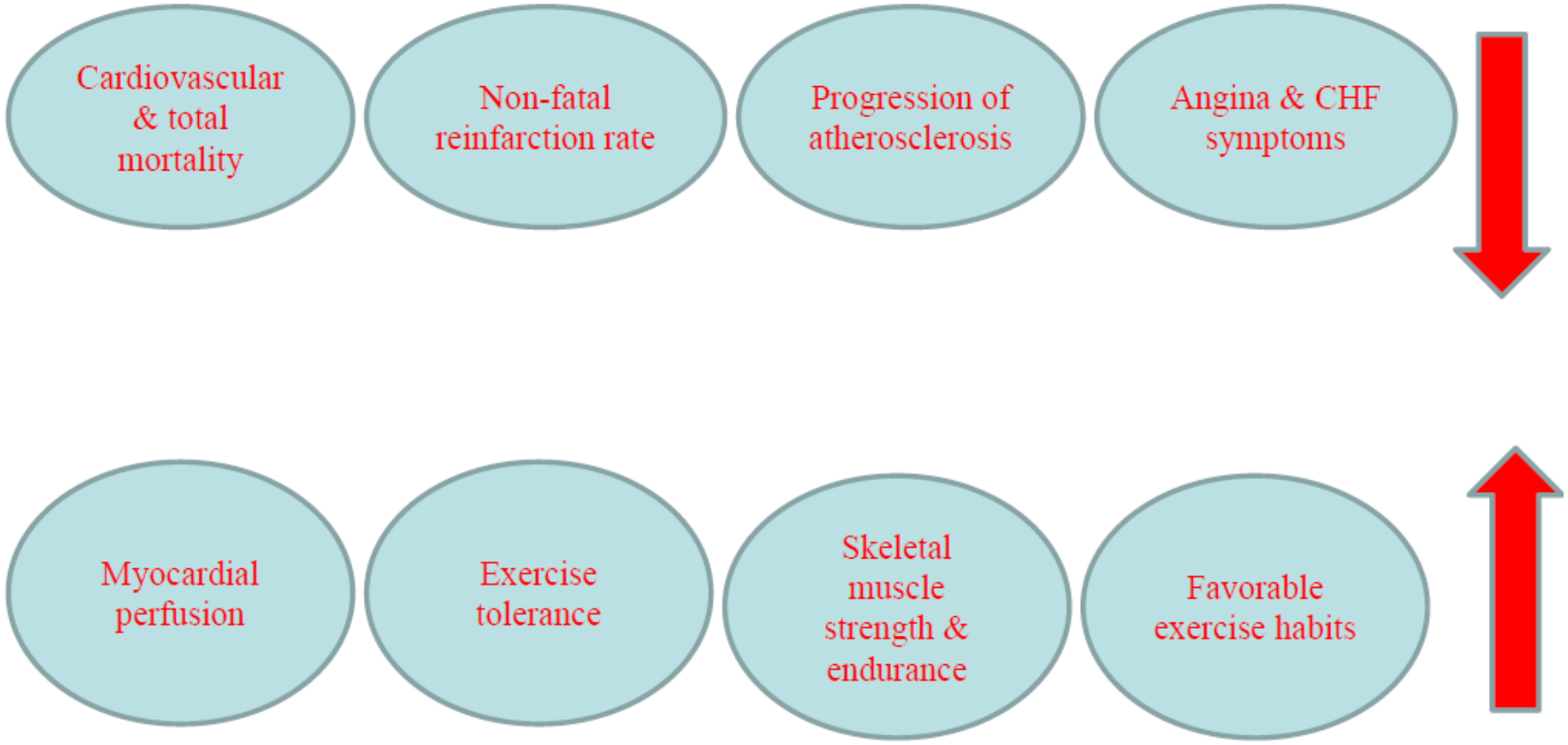
Indications for CR in clinical guidelines

- Myocardial infarction
- Percutaneous coronary intervention
- Coronary bypass grafting
- Chronic stable angina
- Heart failure
- Peripheral arterial disease

Contraindications

- Unstable angina
- Critical aortic stenosis
- Active pericarditis or myocarditis
- Resting SBP >200 mmhg or DBP >110 mmhg
- Uncontrolled CHF
- 30 AV block
- Resting ST-segment depression >2 mm

Benefits of CR



Assessment

- Demographic data
- Date of cardiac event Site of MI
- Size of MI
- Current management Current signs & symptoms Medications
- Occupational & recreational activities Current functional level:
- Functional physical capacity by NYHA four class scale for assessing symptoms of fatigue, palpitations , breathlessness & angina.

Table 13.7 Functional Classifications of Patients with Diseases of the Heart

Functional	Continuous–Intermittent Permissible Workloads	Maximum
Class I	4.0–6.0 cal/min Patients with cardiac disease but without resulting limitations of physical activity. Ordinary physical activity does not cause undue fatigue, palpitation, dyspnea, or anginal pain.	6.5 METs
Class II	3.0–4.0 cal/min Patients with cardiac disease resulting in slight limitation of physical activity. They are comfortable at rest. Ordinary physical activity results in fatigue, palpitation, dyspnea, or anginal pain.	4.5 METs
Class III	2.0–3.0 cal/min Patients with cardiac disease resulting in marked limitation of physical activity. They are comfortable at rest. Less than ordinary physical activity causes fatigue, palpitation, dyspnea, or anginal pain.	3.0 METs
Class IV	1.0–2.0 cal/min Patients with cardiac disease resulting in inability to carry on any physical activity without discomfort. Symptoms of cardiac insufficiency or of the anginal syndrome may be present even at rest. If any physical activity is undertaken, discomfort is increased.	1.5 METs

Exercise testing

- Exercise testing
  - Early exercise testing is advocated to provide both prognostic & therapeutic information

Modified Bruce Protocol (Submaximal Table)

Stage	Minutes	% grade	km/h	MPH	METS
1	3	0	2.7	1.7	3
2	3	5	2.7	1.7	4
3	3	10	2.7	1.7	5
4	3	12	4.0	2.5	7
5	3	14	5.4	3.4	10
6	3	16	6.7	4.2	13
7	3	18	8.0	5.0	15

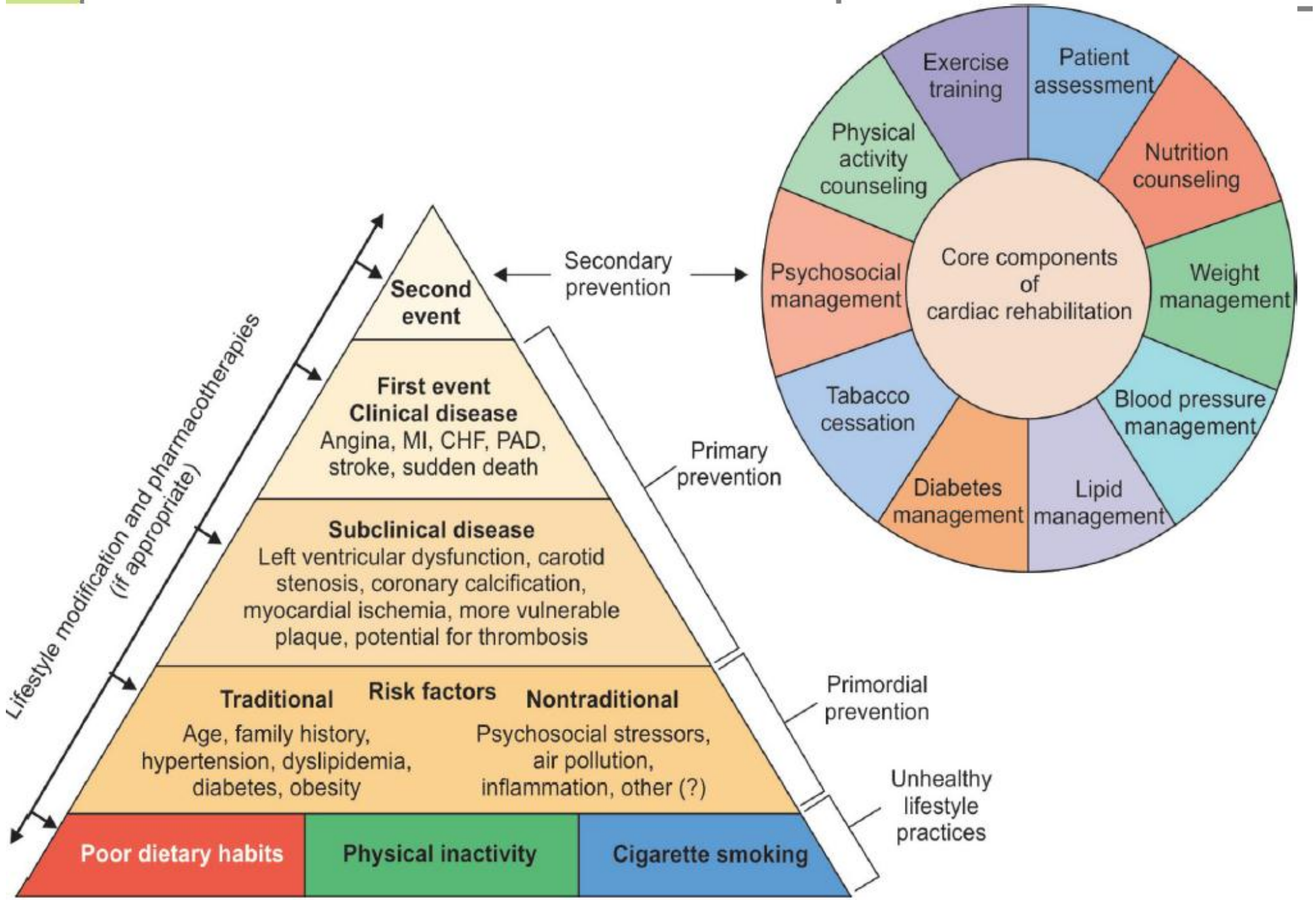
Other points:
Assessment related to cardiac risk factors

Reversible risks	*Irreversible risks*
• Sedentary lifestyle • Cigarette smoking • Hypertension • Low HDL cholesterol (<0.9 mmol/L [35 mg/dL]) • Hypercholesterolemia (>5.20 mmol/L [200 mg/dL]) • High lipoprotein A • Abdominal obesity • Hypertriglyceridemia (>2.8 mmol/L [250 mg/dL]) • Hyperinsulinemia • Diabetes mellitus	• Age • Male gender • Family history of premature CAD (before age 55 in a parent or sibling) • Past history of CAD • Past history of occlusive peripheral vascular disease • Past history of cerebrovascular disease

MET Value of Physical Activities

(metabolic equivalent of task)

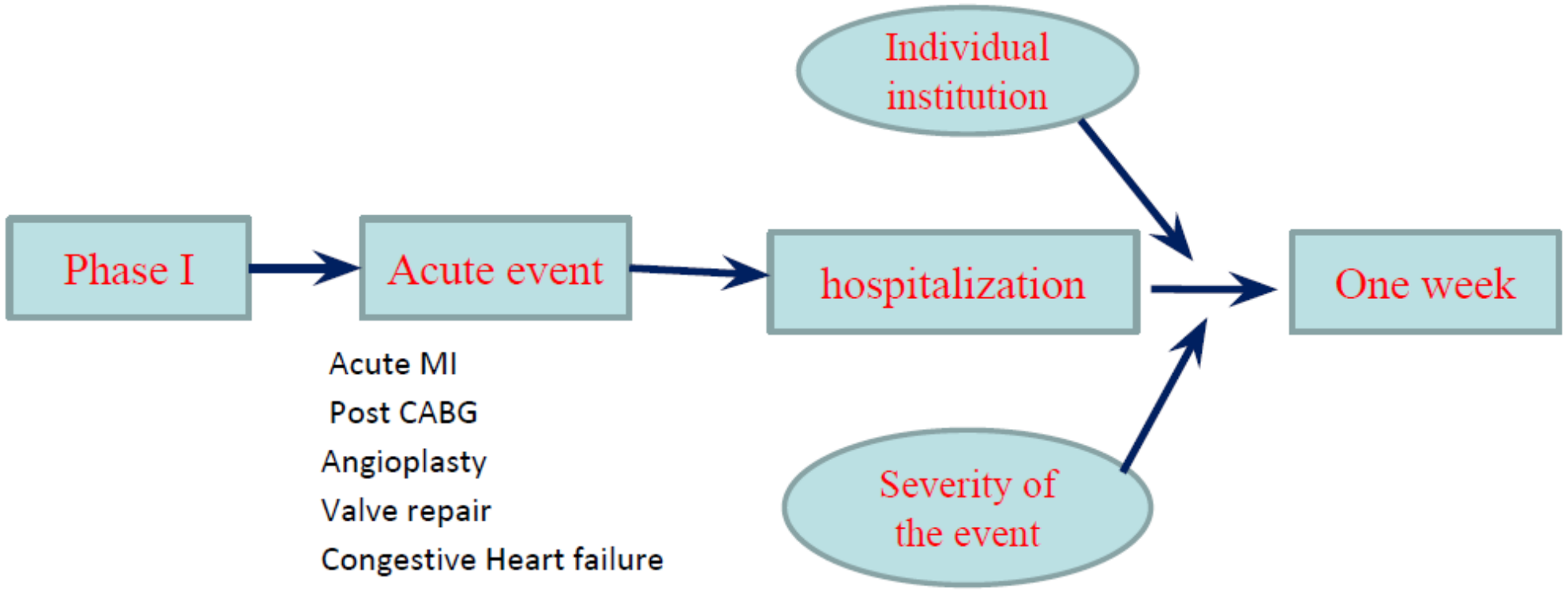
- Light Intensity Exercises; MET < 3
- Sleeping; MET=0.9
- Watching television; MET=1.0
- Writing, deskwork, typing; MET=1.5
- Walking1.7mph(2.7km/h) level ground, strolling very slow; MET=2.3
- Walking, 2.5mph(4km/h); MET=2.9

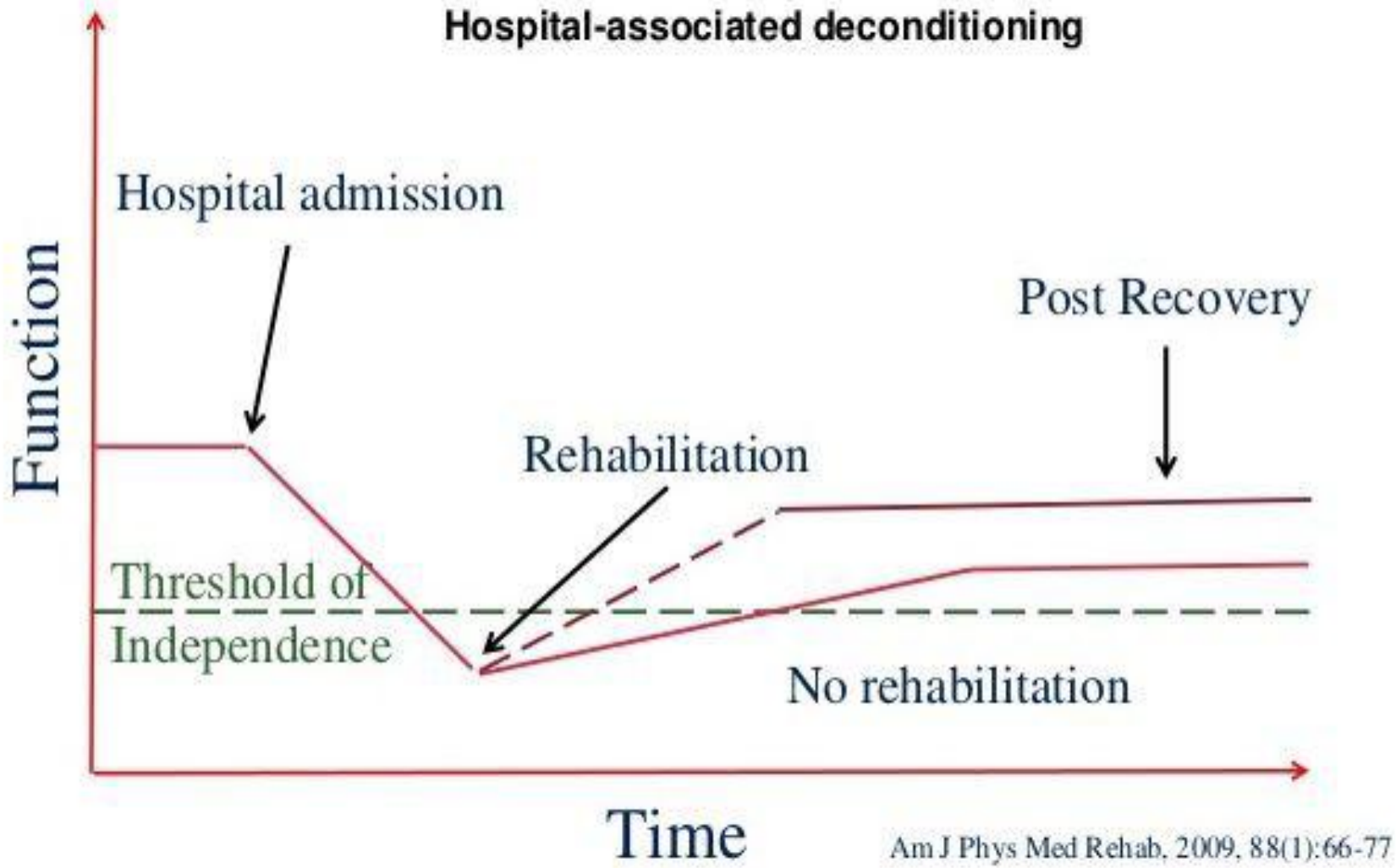

Exercise training
Patient assessment
Physical activity counseling
Nutrition counseling
Psychosocial management
Core components of cardiac rehabilitation
Weight management
Tabacco cessation
Blood pressure management
Diabetes management
Lipid management
Secondary prevention
Second event
First event
Clinical disease
Angina, MI, CHF, PAD, stroke, sudden death
Primary prevention
Subclinical disease
Left ventricular dysfunction, carotid stenosis, coronary calcification, myocardial ischemia, more vulnerable plaque, potential for thrombosis
Lifestyle modification and pharmacotherapies (if appropriate)
Traditional
Risk factors
Nontraditional
Age, family history, hypertension, dyslipidemia, diabetes, obesity
Psychosocial stressors, air pollution, inflammation, other (?)
Primordial prevention
Unhealthy lifestyle practices
Poor dietary habits
Physical inactivity
Cigarette smoking

Phases of CR

- Phase I: In hospital
- Phase II: Convalescence following discharge
- Phase III: Supervised out patient program
- Phase IV: Unsupervised maintenance program

Phase- I


Individual institution
Phase I
Acute event
hospitalization
One week
Acute MI
Post CABG
Angioplasty
Valve repair
Congestive Heart failure
Severity of the event



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Phase I cardiac rehabilitation

- Early mobilization
  - Techniques to prevent lung complications
  - Progressive activity for five-day length of stay

Day	MET level	Activity
Day 1, CCU	1-2	Bed rest until stable, use of bedside commode, out of bed to chair if stable
Day 2, step-down unit	2-3	Sitting warm-ups, walking in room, self care activities
Day 3-5	2-3	Out of bed as tolerated if stable, walk 5-10 min in hall with supervision
	3-4	Shower with seat, walk 5-10 min × 2-3 times/day, up –down one half flight of stairs
	3-4	Treadmill walking or up-down full flight of stairs

Table 2 Presentation of the ACSM recommendations for the prescription of exercises in phase I of cardiac rehabilitation

- Intensity
  - TPE below 13 (scale 6-20)
  - Post AMI: HR below 120 bpm or resting HR + 20 bpm (Arbitrary lower limit)
  - Post-surgery: resting HR + 30 bpm (Arbitrary upper limit)
  - Up to tolerance if non-symptomatic
- Duration
  - Intermittent sessions lasting from 3 to 5 min
  - Resting periods
    - As the patient wishes
    - Lasting from 1 to 2 min
    - Shorter than the time of the exercise sessions
    - Total duration of 20 min
- Frequency
  - Early mobilization: 3 to 4 times per day (1st to 3rd days)
  - Subsequent mobilization: twice per day (As from the 4th day)
- Progression
  - Initially increase the duration by up to 10 to 15 min of exercise time and then increase the intensity

Patient & family education

- Risk factors control
  - -Smoking cessation
  - -Control of HTN & DM
- Lifestyle modification
  - Dietary changes
  - Regular exercise
- Behavior modification
  - Stress management
  - Creation of hobbies

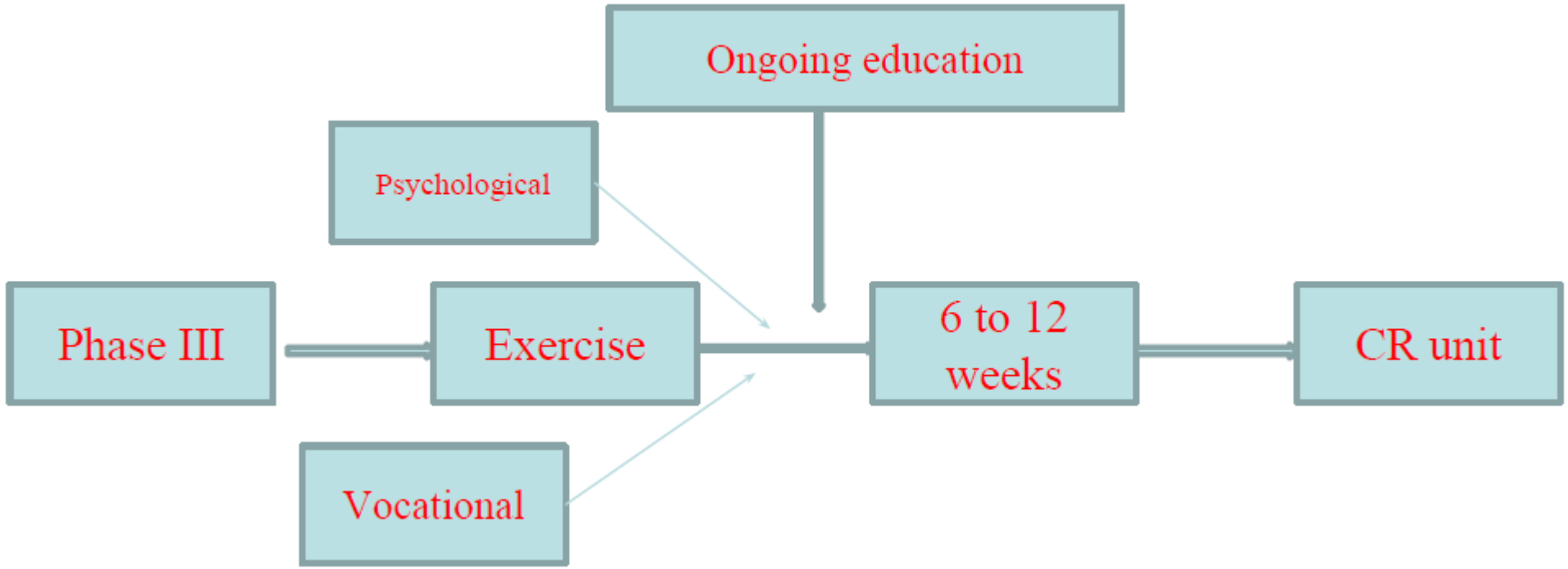
Phase II of CR

- Convalescent phase is designed to allow scar over infarction to mature
- It focus on health education& resumption of physical activity
- Psychological goals- anxiety/depression Mx

Phase II of CR

- Gradual increase in ambulation time
- Goal: 20-30 min×1-2times/day at 4-6wks.
- Pt’s day will be a combination of rest & & low level activity including ambulation & LE -UE mobility

Phase III of CR



- Goals:

-Provision of flexible, individualized exercise program

Phase III of CR

- Program started after symptomatic ETT.
- Aerobic exercise : Warm up(5-10min) & cool down (10-15min) is compulsory
- FITT would be…

	Negative ETT	Positive ETT
Frequency	3 sessions/wk; 6-8 week	3 sessions/wk; 6-8 week
Intensity	65% -80% HRmax Borg's scale 13-15	< MVO2 pt's ischemic threshold Borg's scale 11-13
Type	Aerobic training: continuous or circuit training + Strength training	Aerobic training: continuous or circuit training + Strength training
Time	Aerobic: 20/30-30/45 min	Aerobic: 20/30-30/45 min

1. MVO2=RPP= HR × SBP
2. Graded exs. With telemetry in high-risk population
3. Myocardial oxygen consumption (MVO2)
4. Rate-Pressure Product (RPP) or Double Product (RPP)

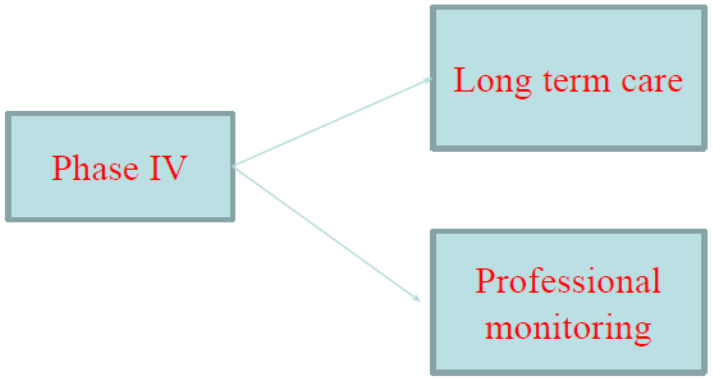
Strength training

- Begin in pt who has been in a CR for at least 3 weeks & is at least 5 weeks post MI or 8 weeks post CABG
  - Weights 1 to 3 lb(0.5-1.5kg)
  - 12-15 repetitions comfortably

American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR)-Strength training

- Exercising large muscle groups before small;
- Stressing exhalation with exertion;
- Avoiding a sustained, tight grip
- Focusing on RPE 11 to 13
- Using slow, controlled movements.
- Stopping exercise with any warning of concerning or uncomfortable signs or symptoms

Phase IV of CR



- Objectives:
  - Secondary prevention
  - Maintenance of achieved functional status
  - Return to work: hobbies & lifestyle modification

AACVPR Guidelines

	Low	Moderate	High
Functional Capacity	>7 METs		< 5 METs
LVEF	≥50%	40-49%	<40%
History	Uncomplicated MI, CABG, PTCA, no CHF		CA survivor, cardiogenic shock post MI or CABG, CHF, post procedure ischemia
Signs or symptoms	Assymptomatic	Signs, symptoms 5-6.9 METs	Signs, symptoms <5 METs
Dysrhythmia	Nil		Complex ventricular arrhythmias, rest or exercise
Hemodynamics	Normal with exercise		Abnormal with exercise
Depression	Nil		Clinically significant depression

Psychological support & Behavioral modification

- All the individuals taking part in cardiac rehabilitation should undergo a valid assessment of anxiety, depression, quality of life and other relevant psychological factors using an appropriate assessment tool
  - stress management at home
  - stress management at work
  - creation of hobbies - time out
  - conflict resolution skills
- PSYCHOLOGICAL CARE:
  - Assist with adjustment
  - Promote positive attitude
  - Facilitate behaviour change
  - Identify need for further support

Smoking Cessation

- Repeated advice on stopping with offers to help
- Nicotine replacement therapies, varenicline, and bupropion individually or in combination
- It is recommended to avoid passive smoking

Diet Modification

- Polyunsaturated fatty acids replacement for
  - Saturated fatty acids to account for <10% of total energy intake
  - Trans-unsaturated fatty acids as little as possible <1%
- <5 g of salt per day
- 30–45 g of fiber per day, preferably from wholegrain products
- >200 g of fruit per day (2–3 servings)
- >200 g of vegetables per day (2–3 servings)
- Fish 1–2 times per week, one of which to be oily fish
- 30 g unsalted nuts per day
- ↓Consumption of alcoholic beverages
- Sugar-sweetened soft drinks and alcoholic beverages consumption must be discouraged

Barriers & Challenges to CR

- Low referral & low attendance rates (major challenges)
- Lack of physician recommendation
- Lack of insurance
- Lower education
- Psychological barriers i.e., depression,
- Social deprivation & lower socio-economic status, dependent spouse at home, lack of transportation, lack of motivation