Cardiovascular Rehabilitation

Carmen M. Terzic, MD, PhD is a Consultant in the Department of Physical Medicine and Rehabilitation and Division of Cardiovascular Diseases at the Mayo Clinic in Rochester, MN.

Dr. Terzic is an Associate Professor in the College of Medicine.

She is board certified in PM&R.

Clinical interests include Cardiovascular and Musculoskeletal Rehabilitation.

Research interest: Stem cells and Cardiovascular Diseases.
Cardiovascular Rehabilitation
Online curriculum

Carmen M. Terzic, MD, PhD
Disclosures

• Financial- None
Objectives

• Recognize the goals and expected outcomes of a cardiac rehabilitation program

• Understand the benefits of a cardiac rehabilitation program

• Identify all elements in a exercise prescription
Cardiovascular Diseases

• Leading cause of mortality in both men and women

• Prevalence: 82,200,000 people in U.S.A.
Cardiovascular Rehabilitation-Definition

- Multidisciplinary and systematic approach to exercise training and risk factors management through regular patient evaluation and monitoring and support of compliance and adherence.

- Gold standard of cardiac care for patients after cardiac events of cardiac procedures.
Cardiovascular Rehabilitation Program

• Multidisciplinary team that include: nurses, exercise physiologists, cardiologists, physiatrists, PT, OT, dietitians, psychologists, endocrinologist.

• Participants in a cardiac rehabilitation include patients: after an acute coronary syndrome, cardiac surgery (CABG, valve replacement, transplant, ventricular reductions surgery and congenital heart repair), patients with compensate congestive heart failure.
Cardiovascular Rehabilitation Program - Outcomes

• Smoking cessation
• Lipid management
• Diet modification and Weight control
• Blood pressure control
• Improved exercise tolerance
• Symptom control
• Return to work
• Psychological well-being/stress management
• Maximizing the medical treatment of comorbidities
Cardiovascular Rehabilitation Program - Phases

- **Phase I**: Inpatient/Hospital-based. Start within 24-48 hours after admission until discharge.

- **Phase II-III**: start 1-2 weeks post event, lasting up to 12 weeks or one year (36 sessions). Supervised program.

- **Phase IV**: ambulatory program.
Cardiovascular Rehabilitation Program- Phase I

**Purpose:** activity progression, education, psychosocial support, discharge plans.

**Goal:** reduce anxiety, increase independence and confidence, reduce deconditioning

**Activities:**
- Sitting to standing to ambulation (5-10 min, 2-4x/day)
- ADLs, stair climbing, upper body exercise,
- Disease education, management of risk factors.
Cardiovascular Rehabilitation Program

Phase II-III:
• Start 1-2 weeks post event, lasting up to 12 weeks (36 sessions)

• Medical supervision/EKG monitoring during exercise sessions.

• Emphasis on risk factor control through education, classes, medication adherence/compliance

• Goal: acquire skill and knowledge for behavioral changes and lifestyle modifications
Cardiovascular Rehabilitation-Phase II Assessments

- Patient Assessment (PMH, FH, SH, PE, Tests)

- Functional capacity to guide cardiac rehabilitation exercise:
  - Six Minute Walk Test
  - Cardiopulmonary stress test (e.g. treadmill testing following a ramp, modified Naughton or Naughton-Balke protocol)
Cardiovascular Rehabilitation-Phase II Assessments

- Nutritional Counseling
  - Dietitian Appointment /Weight Management

- Mediterranean style diet

- Goal: BMI 18.5-24.9. Waist circumference <102 cm men; <89 cm women

- Body composition by dual-energy X-ray absorptiometry scan (DEXA)
Cardiovascular Rehabilitation-Phase II Assessments

• Sleep Apnea Screening

  • Independent risk factor for ischemic heart disease and other vascular diseases as well as all cause mortality

• Overnight oximetry

  • If Overnight oximetry is abnormal consider further evaluation (polysomnography)
Random-effects meta-analysis of the relationship between obstructive sleep apnea (OSA) and risk of coronary heart disease (CHD). CI = confidence interval; F = female; M = male; RR = relative risk.

Dong, Atherosclerosis, 2013.
Cardiovascular Rehabilitation-Phase II Assessments

• Assessment of Nicotine use/Counseling on smoking cessation
  • Nicotine center referral if needed

• Psychosocial Management
  • e.g. PHQ-9 Depression Assessment
  • State-Trait Anxiety Inventory
Depression is associated with an increased risk for a combination of death or rehospitalization for heart failure, myocardial infarction, or stroke.

Stenman, The American Journal of Cardiology, 2014
Cardiovascular Rehabilitation-Phase II Assessments

• Tests
  • Lipid Management: Goals:
    • LDL < 70 mg/dL
    • Non-HDL cholesterol < 100 mg/dL
    • Total LDL particle concentration < 800 nmol/L
  • Glucose: Goals
    • < 100 for non-diabetic patients
    • Hemoglobin A1c < 7.0% for diabetic patients
Cardiovascular Rehabilitation-Phase II Assessments

• Blood pressure control: Goal
  • < 130/85
  • <130/80 if diabetic
Cardiovascular Rehabilitation-Phase II

- Physical Activity Counseling/Education
  - Cardiovascular conditioning exercise a minimum of 40 minutes/day, 7 days/week
  - Target heart rate or perceived exertion recommendation should be maintained for at least 20 minutes per session
  - Exercise Training: aerobic, stretching, strengthening, balance exercises
Cardiovascular Rehabilitation-Phase II
Aerobic exercise prescription

- Intensity of Aerobic exercise: most crucial factor
  % of peak HR: 45%-85% (ACSM)

- **Heart Rate Reserve**: have been the most employed method to calculate intensity of exercise

- **Borg Rating Perceived Exertion Scale**: is widely used as well
Cardiovascular Rehabilitation-Phase II
Aerobic exercise prescription

• Karvonen Formula:
  • Heart Rate Reserve (HRR): Calculation based of the result of the stress test (peak heart rate). Steps:
    1- (peak heart rate) – (resting heart rate) = heart rate reserve
    2- Define target % of the heart rate reserve (between 60-80%)
    3- Add resting heart rate to provide target heart rate
Cardiovascular Rehabilitation-Phase II
Aerobic exercise prescription

- **Heart Rate Reserve (HRR):** example
  
  1- If peak heart rate is 150 and resting heart rate is 70
  
  Heart rate reserve (HRR) = 150-70
  
  \[ HRR = 80 \]
  
  2- 60% of the heart rate reserve
  
  \[ 80 \times 0.6 = 48 \]
  
  3- Add resting heart rate to provide target heart rate
  
  \[ 48 + 70 = 118 \]

  **TARGET HEART RATE = 118**
Cardiovascular Rehabilitation-Phase II
Aerobic exercise prescription

- Borg Rating Perceived Exertion Scale

<table>
<thead>
<tr>
<th>Grade</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>No exertion at all</td>
</tr>
<tr>
<td>7</td>
<td>Extremely light</td>
</tr>
<tr>
<td>8</td>
<td>Very light</td>
</tr>
<tr>
<td>9</td>
<td>Light</td>
</tr>
<tr>
<td>10</td>
<td>Somewhat hard</td>
</tr>
<tr>
<td>11</td>
<td>Hard (heavy)</td>
</tr>
<tr>
<td>12</td>
<td>Very hard</td>
</tr>
<tr>
<td>13</td>
<td>Extremely hard</td>
</tr>
<tr>
<td>14</td>
<td>Maximal exertion</td>
</tr>
</tbody>
</table>

**Patient instructions:**
This is a scale for rating perceived exertion. Perceived exertion is the overall effort or distress of your body during exercise.

The number 6 represents no perceived exertion or leg discomfort and 20 represents the greatest amount of exertion that you have ever experienced.

At various times during the exercise test you will be asked to select a number that indicates your rating of perceived exertion at the time.

Do you have any questions?

Borg RPE scale
Cardiovascular Rehabilitation-Phase II  
Aerobic Exercise Prescription

• Each aerobic exercise program should begin with a warm-up phase of 5 minutes at lower intensity
• The conditioning phase should be maintained for at least 20 minutes
• Then, a cool down phase at low intensity for at least 5 minutes is performed.

• Goal 30-40 minutes aerobic exercise everyday
Cardiovascular Rehabilitation-Phase II
Aerobic Exercise Contraindications

- Unstable angina
- Resting Diastolic BP >100
- BP drop of 20 mmHg during exercise
- Moderate to severe aortic stenosis
- Acute systemic illness or fever
- Uncontrolled atrial arrhythmias
- Uncontrolled ventricular arrhythmias
- Uncontrolled sinus tachycardia
- Third-Degree atrioventricular block
- Active pericarditis or myocarditis
- Uncontrolled Cardiac Heart Failure
- Resting systolic BP >200
- Recent embolism
- Thrombophlebitis
- Uncontrolled Diabetes
Cardiovascular Rehabilitation-Phase II

• Physical Activity Counseling/Education

• Resistance Exercises
  • 2-3 times a week.
  • Consider precautions in CABG, heart failure, hypertensive patients.
  • Include all major group muscles in the lower and upper extremities
  • Perceived exertion 11-13 after 10-15 repetitions (muscle fatigue)
  • 1 to 3 sets
Cardiovascular Rehabilitation-Phase II
Aerobic Exercise Prescription

• Stretching/Flexibility Exercises

• Balance Exercises

Single stance  Forward left lift
Cardiovascular Rehabilitation-Phase II
Medications

- Aspirin
- Platelet Inhibitors
- Beta blocker
- ACE-inhibitor
- Statin
- Sub-lingual nitroglycerine
Home Based Exercise Program

Follow up evaluation performed by a physician at 3-6-9 and 12 months. Then every 6 or 12 months.

Evaluation include:
Physical exam
Review exercise program
Laboratory test: lipid profile, glucose, liver function tests, creatinine
Review nutrition plan
Adjust medications as needed
Control of weight
Benefits of Cardiovascular Rehabilitation Programs
Cardiovascular Rehabilitation-Phase II Benefits

• Improves Exercise Capacity: 10% to 40% increase in aerobic capacity (VO2 peak)
• Improves symptoms of Exertional Intolerance: dyspnea, fatigue and claudication
• Improves Endothelium Function
• Antithrombotic effect
• Peripheral adaptation: skeletal muscles
Cardiovascular Rehabilitation-Phase II
Benefits

• Improves Autonomic Function: increase vagal activity, attenuate sympathetic hyperactivity, increase heart rate variability

• Improvement in the blood lipid profile:
  • Total cholesterol (7 to 13 mg/d)
  • LDL (3 to 11 mg/dL), triglycerides (14 to 22 mg/dL)
  • HDL by 2 mg/dL
Cardiovascular Rehabilitation-Phase II

Benefits

• Improve Insulin Resistance

• Lower blood pressure in hypertensive and normal individuals by 6 to 9 mm Hg (systolic and diastolic)

• Improves: distress, anxiety, and depression
Cardiovascular Rehabilitation-Phase II

Benefits

• Reduces Mortality: 18.6% deaths in patients performing cardiac rehabilitation program versus 29.4% with controls

• Meta-analyses
  • reduce total mortality: 20-27%
  • reduce cardiovascular mortality: 22-31%
Readmission/Mortality After Myocardial Infarction for Cardiac Rehabilitation Participants and Non-Participants

Cardiovascular Rehabilitation-Phase II

Benefits

• Improve disability, overall fitness, endurance, independence in activities of daily living, muscular strength, balance, decrease falls, quality of life

• Financial issues: cardiac rehabilitation improves prognosis after myocardial infarction in a highly cost effective manner by reducing recurrent hospitalization, health care expenditures while prolonging life
Suggested Reading material

• Guidelines for cardiac rehabilitation and secondary prevention programs. American Association Cardiovascular and Pulmonary Rehabilitation (AACVPR)

• Textbooks
  • General PMR
    • Braddom’s
    • DeLisa’s
    • Frontera’s
References

Dalal et al., Cardiac rehabilitation. BMJ. 2015; 351.


Thank you for viewing this presentation.

For additional information on courses offered by the Mayo School of Continuous Professional Development please visit ce.mayo.edu