Prior to 1990, resistance training was not a part of the recommended guidelines for exercise training and rehabilitation for either the ACSM or the AHA. In 1990, ACSM first recognized resistance/strength training as an integral element of a well-rounded program for healthy adults. Most recently, in February 2000, a Scientific Advisory was released by the AHA on resistance training in healthy adults and in individuals with cardiovascular disease (CVD), recognizing the beneficial relationship to health. Concurrently, the ACSM released the 6th edition of the Guidelines for Exercise Testing and Training and the CACR released the first edition of the Canadian Guidelines for Cardiac Rehabilitation and CVD Prevention, which include specific recommendations for resistance training in cardiac patients. Summarized below is some background information regarding the ACSM, AHA and CACR guidelines. We direct the reader to the original documents for more detailed information (1,2,3,4), and to other articles featured in this edition of Newsbeat.

Health & fitness benefits of resistance training:
Both aerobic endurance exercise and resistance training can positively effect health and fitness variables. Specific benefits of resistance training are outlined below:

- provides an effective method for improving muscular strength and endurance in cardiac patients who may lack physical strength to perform occupational or daily activities;
- plays a role in preventing and managing a number of chronic medical conditions;
- modifies coronary risk factors;
- enhances psychosocial well being;
- moderates the myocardial oxygen demand of some daily activities;
- compliments maintenance of healthy body weight.

Participation criteria:
The AHA has concluded that the safety of resistance training in men with low risk CVD is well established. However, due to a lack of published data, it is unclear if this applies to other cardiac populations such as women or patients with severe left ventricular dysfunction. The routine application of resistance training in moderate-to-high risk cardiac patients is not recommended in the AHA position stand, yet could be considered on an individual basis. The CACR guidelines state that there is insufficient evidence to recommend or prohibit resistance training in patients with a history of CHF or LV dysfunction. All organizations site contraindications to resistance training including:

- unstable angina
- uncontrolled hypertension (SBP=160 mmHg &/or DBP=100mmHg)
- uncontrolled dysrhythmias
- recent history of congestive heart failure (not evaluated or effectively treated)
- severe stenotic or regurgitant valvular disease
- hypertrophic cardiomyopathy

Relative contraindications include:
- poor left ventricular function
- angina or ischemia at low workloads (<5-6 METs)
(CACR guidelines recommend that strength training in patients with an exercise capacity of < 5 METS be done at low intensities and with careful supervision)

Prior to initiating resistance training, the following is recommended:

- participation in a traditional aerobic training program for 2-4 weeks
- orientation of the patient
  - in proper lifting technique
  - range of motion for each exercise
  - correct breathing pattern and avoidance of Val Salva maneuver
- appropriate initial weight load

**Exercise Prescription:**

**Early post event:**
Post coronary artery bypass surgery:

- ROM started in first 24 hours; 10-15 reps; RPE 11 - 13
- Check for sternal stability after 3 months, before commencing resisted exercises

Post myocardial infarction:

- ROM exercises started 2 days post-event; 10-15 reps; RPE 11 - 13
- 2-3 weeks of low-level resistance training (elastic bands, very light hand weights, 1-2 lb, wall pulleys); 8-10 exercises; 1 set; 10-15 reps; 2-3 times/week; RPE 12-13; increase by 1-2 lb every 1-3 weeks.
- Regular barbells and weight machines can be introduced 4-6 weeks post MI

**Post-convalescence:**
Initial load:

- low weight
- 1 set; 10-15 reps; to moderate fatigue, RPE ~13

Progression:

- increase 2-5 lb/week for arms
- increase 5-10 lb/week for legs
- some patients may progress to performing up to 3 sets, whereas others will never do more than one

After 4-6 week adaptation period:

- moderate risk patients exercise to an RPE of 15 (hard) or less
- low risk patients can progress to volitional fatigue

**Special considerations that may require exercise prescription to be modified:**

- degree of left ventricular dysfunction
- concomitant comorbid conditions (eg. hypertension, diabetes)
- neurological, vascular or orthopaedic limitations
NOTE: Pure isometric exercise is not recommended for patients with CVD, as the safety and efficacy has not been established.

**Safety Considerations:**

- Movements should be rhythmical, performed at moderate-to-slow controlled speed, through a full range of motion, with a normal breathing pattern while lifting.

- Keep the exercise session time reasonable (~60 minutes): although greater frequencies and additional sets or combinations of sets and repetitions may elicit larger strength gains, the difference in improvement is usually small.

- Do repetitions rather than single maximal lifts.

- Do unilateral rather than bilateral movements when possible.

- Avoid overhead lifting or do at lower intensities and with reduced repetitions.

- Rest as needed, do not rush the circuit.

- The level of exertion should not exceed the level recommended for aerobic exercise.

Improvement in strength may vary by the participant's initial level of strength and potential for improvement. The relative magnitude of strength increases in the elderly appear to be similar or greater than for younger subjects, when differences in initial strength are considered. The relative improvements resulting from strength training are also similar in men and women. Resistance training can maintain interest and increase diversity in long-term exercise programs yet should complement rather than replace the patient's aerobic training program.

**References:**


- Canadian Guidelines for Cardiac Rehabilitation and Cardiovascular Disease Prevention (1st Edition) 1999 Available through Canadian Association of Cardiac Rehabilitation, Winnipeg, MB.