Who Can Return to Work With Cardiovascular Disease?

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Objectives

Cardiovascular Risks of Physically Demanding Work
Use of Exercise Testing to Determine Work Capacity
Dealing with Definite or Probable Syncope
Who Can Return to Work With Cardiovascular Disease?

- Really, Almost Everyone
- But Not Everyone Does…Why Not?
- Patient Motivation
- Physician Cooperation
- The Job’s Physical and Environmental Demands
- The Patient’s Cardiovascular Condition
- Regulatory issues (e.g. OSHA, FF, DOT)
Objectives

Cardiovascular Risks of Physically Demanding Work

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Dealing with Definite or Probable Syncope
Most Cardiac / Cardiovascular Conditions in Adults Are Due to Atherosclerotic Disease
IVUS Reveals Angiographically Invisible Lesions

Images courtesy of Steven E. Nissen MD, Intravascular Ultrasound Laboratory, Cleveland Clinic
Vigorous Exertion Increases the Risk of An Acute Cardiac Event---Why?

Because Atherosclerosis Often First Affects The “Coronary” Arteries
Incidence of Death During Jogging in Rhode Island From 1975 Through 1980

Paul D. Thompson, MD; Erik J. Funk, MD; Richard A. Carleton, MD; William Q. Sturner, MD

(JAMA 1982;247:2535-2538)

Table 4.—Incidence of Death During Jogging for Rhode Island Male Joggers

<table>
<thead>
<tr>
<th>Age Group, yr</th>
<th>% of Population Jogging (Mean±SE)</th>
<th>Total Joggers</th>
<th>Joggers per Death</th>
<th>Jogging per Death, hr</th>
<th>Deaths per Activity-Hour: Jogging/Other Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>30-39</td>
<td>2.9±2.8</td>
<td>1,550</td>
<td>9,281</td>
<td>482,600</td>
<td>99</td>
</tr>
<tr>
<td>40-49</td>
<td>16.7±7.6</td>
<td>7,464</td>
<td>8,993</td>
<td>467,600</td>
<td>13</td>
</tr>
<tr>
<td>50-64</td>
<td>5.4±3.7</td>
<td>3,987</td>
<td>5,950</td>
<td>309,400</td>
<td>5</td>
</tr>
<tr>
<td>30-64</td>
<td>7.4±2.6</td>
<td>12,728</td>
<td>7,620</td>
<td>396,000</td>
<td>7</td>
</tr>
</tbody>
</table>

*SE indicates standard error of the estimate.
Relative Risk of MI onset

Habitual Frequency of Vigorous Exertion

Mittleman et al, NEJM 1993
Most MIs Are Caused by Lesions of Minimal Stenosis

MI Patients (No.)

Stenosis Prior to MI

- >70%
- 50%-70%
- <50%

MI=Myocardial Infarction

Acute Coronary Thrombosis in Boston Marathon Runners

Alfred J. Albano, M.D.
Tufts Medical Center
Boston, MA

Paul D. Thompson, M.D.
Hartford Hospital
Hartford, CT

Navin K. Kapur, M.D.
Tufts Medical Center
Boston, MA
What Defines a Work / Exercise Related Cardiac Event?

Time - Symptom Onset During or <1 Hour After Exertion

Exercise Levels - 6 METS or 6 Times Resting Energy Expenditure
The definition of exertion-related cardiac events

M Rai, P D Thompson

Table 1: Exertion-related myocardial infarction

<table>
<thead>
<tr>
<th>Author</th>
<th>Number of MI patients</th>
<th>Number of patients with exertion-related MI</th>
<th>Definition of exertion-related MI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Willich</td>
<td>1194</td>
<td>69</td>
<td>During and ≤ 1 h after exertion</td>
</tr>
<tr>
<td>Mittleman</td>
<td>1228</td>
<td>54</td>
<td>During and ≤ 1 h after exertion</td>
</tr>
<tr>
<td>Stewart</td>
<td>2468</td>
<td>669</td>
<td>During and ≤ 30 min after exertion</td>
</tr>
<tr>
<td>Gin</td>
<td>640</td>
<td>64</td>
<td>During and ≤ 1 h after exertion</td>
</tr>
<tr>
<td>Hallqvist</td>
<td>660</td>
<td>42</td>
<td>During and ≤ 1 h after exertion</td>
</tr>
<tr>
<td>Strike</td>
<td>295</td>
<td>26</td>
<td>During and ≤ 1 h after exertion</td>
</tr>
<tr>
<td>Baylin</td>
<td>480</td>
<td>53</td>
<td>During and ≤ 1 h after exertion</td>
</tr>
<tr>
<td>von Klot</td>
<td>1301</td>
<td>243</td>
<td>During and ≤ 2 h after exertion</td>
</tr>
</tbody>
</table>

MI, myocardial infarction; ND, not defined.

Table 2: Exertion-related sudden cardiac death

<table>
<thead>
<tr>
<th>Author</th>
<th>Number of deaths</th>
<th>Number of exertion-related SCD</th>
<th>Definition of exertion-related SCD</th>
</tr>
</thead>
<tbody>
<tr>
<td>French</td>
<td>80</td>
<td>41</td>
<td>During and within “several hours” after exertion</td>
</tr>
<tr>
<td>Opie</td>
<td>21</td>
<td>18</td>
<td>During and ≤ 1 h after exertion</td>
</tr>
<tr>
<td>Maron</td>
<td>20</td>
<td>26</td>
<td>ND (probably during and immediately after exertion)</td>
</tr>
<tr>
<td>Thompson</td>
<td>18</td>
<td>13</td>
<td>During and immediately after exertion</td>
</tr>
<tr>
<td>Waller</td>
<td>5</td>
<td>5</td>
<td>During exertion</td>
</tr>
<tr>
<td>Thompson</td>
<td>12</td>
<td>11</td>
<td>During and immediately after exertion</td>
</tr>
<tr>
<td>Jackson</td>
<td>9</td>
<td>7</td>
<td>ND (probably during and ≤ 30 minutes after exertion)</td>
</tr>
<tr>
<td>Sugishita</td>
<td>226</td>
<td></td>
<td>ND (probably during and immediately after exertion)</td>
</tr>
<tr>
<td>Northcote</td>
<td>30</td>
<td></td>
<td>ND (probably within 1 h of exertion)</td>
</tr>
<tr>
<td>Siscovick</td>
<td>133</td>
<td>9</td>
<td>ND (probably “during exertion”)</td>
</tr>
<tr>
<td>Northcote</td>
<td>60</td>
<td></td>
<td>ND (probably within 1 h of exertion)</td>
</tr>
<tr>
<td>Burke</td>
<td>690</td>
<td>34</td>
<td>During and ≤ 1 h after exertion</td>
</tr>
<tr>
<td>Van Camp</td>
<td>160</td>
<td>160</td>
<td>During and ≤ 1 h after exertion</td>
</tr>
<tr>
<td>Maron</td>
<td>4</td>
<td>4</td>
<td>ND (probably during and immediately (15 minutes) after exertion)</td>
</tr>
<tr>
<td>Corrado</td>
<td>269</td>
<td>40</td>
<td>ND (probably during and immediately after exertion)</td>
</tr>
<tr>
<td>Maron</td>
<td>3</td>
<td>3</td>
<td>ND (probably during exertion)</td>
</tr>
<tr>
<td>Albert</td>
<td>122</td>
<td></td>
<td>During and ≤ 30 minutes after exertion</td>
</tr>
<tr>
<td>Eckart</td>
<td>126</td>
<td>108</td>
<td>During and ≤ 1 h after exertion</td>
</tr>
</tbody>
</table>

ND, not defined; SCD, sudden cardiac death.
6 Met Work Activities

Carpentry - Installing Rain Gutters, Building a Fence
Sawing Hardwood
Roofing
Mowing Lawn, Walking, With Hand Mower
Shoveling Snow, by Hand
Carrying 16 to 24 lb Load, Upstairs
Objectives

Cardiovascular Risks of Physically Demanding Work
Use of Exercise Testing to Determine Work Capacity
Dealing with Definite or Probable Syncope
To Measure Work or Exercise Performance

- Measure the Work - Foot-Pounds, Horsepower
- Exercise Workload or Really Workrate
- Treadmill Speed & Grade, Cycle Resistance
- Measure Fuel Consumption -
- Exercise Oxygen Uptake
- Maximal Capacity is Maximal Oxygen Uptake or VO$_2$max
Maximal Oxygen Uptake

- Highly reproducible characteristic of an individual
- Decreases with age about 10% per decade
- Generally lower in females
- Expressed as L O₂ / min or ml O₂ / kg / min
How To Supply the $O_2$

- Increased Cardiac Output
- Increased A-V $O_2$ Difference
\[ \dot{V}O_2 = \text{No. RBC's} \times \frac{O_2 \text{ Content of } RBC_{\text{in}} - RBC_{\text{out}}}{\text{Moved/Min}} \]

\[ \dot{V}O_2 = \text{Cardiac Output} \times A - VO_2 \text{ diff} \]

(ml/min) \times (cc/min) = (ml/cc)
The Normal Acute Response to Exercise

- Increased oxygen uptake
- Increased cardiac output
- Increased heart rate
- Increased stroke volume
- Increased arterio-venous oxygen difference
Cardiac Output is Coupled With \( O_2 \) Demand

- Cardiac Output (Q) and \( VO_2 \) are Closely Coupled with a Linear Slope of \( \approx 5-6 \) Q to 1 \( VO_2 \)
- Other cardiac changes (HR, BP, vascular distribution) are linearly related to the degree of exercise stress (usually expressed as % \( VO_2 \) max)
H − Lactate + HCO\textsubscript{3} = H\textsubscript{2}O + CO\textsubscript{2}
Maximal Estimated Heart Rates

- Usually Estimated at 220 - age
- But the 95% Confidence Limit is ± 45 Beats Per Minute
How To Tell the Goldbrickers

• They Do Not Reach a High Heart Rate
• Generally 85% of Their Predicted Max
• Their CO2 Production / O2 Consumption is <1.0
What Happens to Myocardial $O_2$ Demand?

- Tension ≈ Systolic Blood Pressure
- $MVO_2 = SBP \times HR \times Ejection Time$ (Triple Product)
- Or, $MVO_2 = SBP \times HR$ (Double Product)
Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Task Force 8: Coronary Artery Disease

A Scientific Statement from the American Heart Association and American College of Cardiology
Older Athletes May Compete

- No Ischemia on Exercise Testing
- Normal Heart Function
- No Symptoms
- No Exercise Induced Arrythmia
Objectives

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Use of Exercise Testing to Determine Work Capacity
Dealing with Definite or Probable Syncope
Syncope

- Sudden Loss of Consciousness
- Potential Danger Driving, Heights, Sharps
- Make the Diagnosis…Vasovagal or Not
- No Dangerous Activities Until Syncope Free For 3-6 Months
- Without a Clear Cause (Drug Cessation) or Treatment (New Defibrillator)
The Benefits of Fitter Employees, Exercise Training (Wellness, Total Worker Health) Programs
William Heberden had “little or nothing to advance...” for the Treatment of Angina Pectoris but did Know of One Patient “who set himself the task of sawing wood for half an hour everyday and was nearly cured.”

Commentary on the history and cure of diseases (1802) in Cardiac Classics 1941
Can an applicant with a history of CVD work in a specific job?
Accommodation and Compliance Series

Employees with Heart Conditions

Job Accommodation Network
PO Box 6080
Morgantown, WV 26506-6080
(800)526-7234 (V)
(877)781-9403 (TTY)
jan@askjan.org
askjan.org

A service of the U.S. Department of Labor’s Office of Disability Employment Policy

http://askjan.org/media/downloads/HeartA&C'Series.pdf
Can an existing employee return to work after medical treatment for CVD?
How do you evaluate an individual for work with a markedly elevated Blood Pressure?
Heat
Magnetic fields with potential for impact on pacemakers / defibrillators
In Football (And in OM) Punting Can Be Better Than the Alternatives

Find a Reasonable General Cardiologist
Not Too Liberal
Not Too Restrictive
Punt the Ball to Him / Her
Considerations if you disagree with an applicant/employee's physician and deny employment or disability benefits perhaps leading to loss of employment opportunity/termination with subsequent loss of work, health, disability and pension benefits?
If someone does not want to do heavy work after having stents placed or S/P MI with preserved LV function - and the attending physician supports this - should we send them back to work?