Management Of Chronic Ischemic Heart Disease

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Coronary Blood Supply
Coronary arteries are the network of blood vessels that supply the heart. In this photograph, the left coronary artery has been injected with a red dye, and the right coronary artery with white.
Atherosclerosis

Normal vessel → Minimal CAD → Moderate CAD → Severe CAD

Coronary artery
## Canadian Cardiovascular Society Grading Scale (CCS)

### Table 2

#### Canadian Cardiovascular Society Angina Classification

<table>
<thead>
<tr>
<th>Angina Class</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Angina with strenuous or prolonged activity</td>
</tr>
<tr>
<td>II</td>
<td>Angina with slightly greater than normal activity (fast-paced walking or climbing stairs)</td>
</tr>
<tr>
<td>III</td>
<td>Angina resulting in marked limitation of normal activity</td>
</tr>
<tr>
<td>IV</td>
<td>Angina at rest</td>
</tr>
</tbody>
</table>
Stable Angina vs Unstable Angina

Stable Angina

**Typical Angina (definite)**
1. Substernal Chest discomfort
2. Provoked by exertion or emotion stress
3. Relieved by rest or NTG

**Atypical angina (Propable)**
- 2 of the above characteristics

**Noncardian chest pain**
- 1 or 0

Unstable Angina (Acute Coronary Syndrome)

- Prolonged (.20 min) anginal pain at rest
- New onset (*de novo*) angina (*Class II or III of CCS*)
- Recent destabilization of previously stable angina (Cresendo angina)
- Post MI Angina
Acute or Chronic?
Angina treatment: Objectives

Reduce ischemia and relieve anginal symptoms

Improve quality of life

Prevent MI and death

Improve quantity of life

Comprehensive management of myocardial ischemia

- Symptom management
- Antiplatelet therapy
- Lifestyle modification
- Aggressive risk factor reduction
ACC/AHA guidelines: Chest pain evaluation

- Contraindications to stress testing
  - Yes → Consider angiography
  - No → Symptoms/clinical findings warrant angiography

- Symptoms/clinical findings warrant angiography
  - Yes → Consider angiography
  - No → Patient able to exercise

- Patient able to exercise
  - Yes → Previous coronary revascularization
    - Yes → Exercise imaging study → Treatment*
    - No → Resting ECG interpretable
      - Yes → Exercise test → Treatment*
      - No → Consider imaging study/angiography
  - No → Pharmacologic imaging study → Low/intermediate risk → Treatment*

*If adequate information on diagnosis/prognosis available

Aspirin and anti-anginals
Beta blocker and blood pressure
Cholesterol and cigarettes
Diet and diabetes
Education and exercise

ACE mnemonic: the 10 most important elements of stable angina
(Aspirin and Anti Angina)
Aspirin Recommendations

**A**
Start and continue indefinitely aspirin 75 to 162 mg/d in all patients unless contraindicated

For patients undergoing CABG, aspirin (100 to 325 mg/d) should be started within 48 hours after surgery to reduce saphenous vein graft closure

**B**
Post-PCI-stented patients should receive 325 mg per day of aspirin for 1 month for bare metal stent, 3 months for sirolimus-eluting stent and 6 months for paclitaxel-eluting stent
## Aspirin Evidence: Secondary Prevention

Effect of antiplatelet therapy* on vascular events**

<table>
<thead>
<tr>
<th>Category</th>
<th>% Odds Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute myocardial infarction</td>
<td></td>
</tr>
<tr>
<td>Acute stroke</td>
<td></td>
</tr>
<tr>
<td>Prior myocardial infarction</td>
<td></td>
</tr>
<tr>
<td>Prior stroke/transient ischemic attack</td>
<td></td>
</tr>
<tr>
<td>Other high risk</td>
<td></td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td></td>
</tr>
<tr>
<td>(e.g. unstable angina, heart failure)</td>
<td></td>
</tr>
<tr>
<td>Peripheral arterial disease</td>
<td></td>
</tr>
<tr>
<td>(e.g. intermittent claudication)</td>
<td></td>
</tr>
<tr>
<td>High risk of embolism (e.g. atrial fibrillation)</td>
<td></td>
</tr>
<tr>
<td>Other (e.g. diabetes mellitus)</td>
<td></td>
</tr>
<tr>
<td>All trials</td>
<td></td>
</tr>
</tbody>
</table>

*Aspirin was the predominant antiplatelet agent studied

**Vascular events include MI, stroke, or death

B

(Beta Blocker and Blood Pressure)
Beta Blockade Effects on Ischemic Heart

- **Heart rate**: ↓↓
- **Afterload**: ↓
- **Wall stress**: 
- **Heart size**: ↑
- **Contractility**: ↓
- **O₂ wastage**: ↓

**O₂ demand vs O₂ supply**

- **Subendocardial ischemia**
- **Collaterals**

**Increased diastolic perfusion**
- Less exercise vasoconstriction
- More spasm? ↓

**Demand ↓↓↓**  **Supply ↓↑**

**O₂ deficit ↓↓**
- Anaerobic metabolism
**β-blocker Recommendations**

1. **A**
   - Start and continue indefinitely in all post MI, ACS, LV dysfunction with or without HF symptoms, unless contraindicated.

2. **C**
   - Consider chronic therapy for all other patients with coronary or other vascular disease or diabetes unless contraindicated.

*Precautions but still indicated include mild to moderate asthma or chronic obstructive pulmonary disease, insulin dependent diabetes mellitus, severe peripheral arterial disease, and a PR interval >0.24 seconds.

MI = Myocardial infarction, HF = Heart Failure
**β-blocker Evidence**

Summary of Secondary Prevention Trials of β-blocker Therapy

<table>
<thead>
<tr>
<th>Phase of Treatment</th>
<th>Total # Patients</th>
<th>RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute treatment</td>
<td>28,970</td>
<td>0.87 (0.77-0.98)</td>
</tr>
<tr>
<td>Secondary prevention</td>
<td>24,298</td>
<td>0.77 (0.70-0.84)</td>
</tr>
<tr>
<td>Overall</td>
<td>53,268</td>
<td>0.81 (0.75-0.87)</td>
</tr>
</tbody>
</table>

CI=Confidence interval, RR=Relative risk

β-blocker better

Placebo better

**β-blocker Evidence: Post MI with Left Ventricular Dysfunction**

Carvedilol Post-Infarct Survival Control in LV Dysfunction (CAPRICORN)

6,644 patients with LVEF <0.40 after a MI with or without HF randomized to carvedilol or placebo for 24 months

Blood Pressure Control Recommendations

Goal: <140/90 mm Hg or <130/80 if diabetes or chronic kidney disease

Blood pressure 120/80 mm Hg or greater:
- Initiate or maintain lifestyle modification: weight control, increased physical activity, alcohol moderation, sodium reduction, and increased consumption of fresh fruits and vegetables and low fat dairy products

Blood pressure 140/90 mm Hg or greater (or 130/80 or greater for chronic kidney disease or diabetes)
- As tolerated, add blood pressure medication, treating initially with beta blockers and/or ACE inhibitors with addition of other drugs such as thiazides as needed to achieve goal blood pressure
Blood Pressure: Lower is Better

Ischemic Heart Disease Mortality

<table>
<thead>
<tr>
<th>Age at Risk (Y)</th>
<th>Ischemic Heart Disease Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>80-89</td>
<td></td>
</tr>
<tr>
<td>70-79</td>
<td></td>
</tr>
<tr>
<td>60-69</td>
<td></td>
</tr>
<tr>
<td>50-59</td>
<td></td>
</tr>
<tr>
<td>40-49</td>
<td></td>
</tr>
</tbody>
</table>

Usual Systolic BP (mm Hg)

Usual Diastolic BP (mm Hg)

BP = Blood pressure
Prospective Studies Collaboration. Lancet. 2002;360:1903-1913
Blood Pressure: Risk of CHD with Active Treatment

Veterans Administration, 1967
Veterans Administration, 1970
Hypertension Stroke Study, 1974
USPHS Study, 1977
EWPHE Study, 1985
Coope and Warrender, 1986
SHEP Study, 1991
STOP-Hypertension Study, 1991
MRC Study, 1992
Syst-Eur Study, 1997

CHD=Coronary heart disease

## JNC VII Guidelines for Management and Treatment

<table>
<thead>
<tr>
<th>BP classification</th>
<th>SBP* mmHg</th>
<th>DBP* mmHg</th>
<th>Lifestyle modification</th>
<th>Initial drug therapy</th>
<th>With compelling indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>&lt;120</td>
<td>&lt;80</td>
<td>Encourage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pre-hypertension</td>
<td>120–139</td>
<td>80–89</td>
<td>Yes</td>
<td>Drug(s) for compelling indications. ‡</td>
<td></td>
</tr>
<tr>
<td>Stage 1 Hypertension</td>
<td>140–159</td>
<td>90–99</td>
<td>Yes</td>
<td>Drug(s) for the compelling indications. ‡</td>
<td></td>
</tr>
<tr>
<td>Stage 2 Hypertension</td>
<td>≥160</td>
<td>≥100</td>
<td>Yes</td>
<td>Other antihypertensive drugs (diuretics, ACEI, ARB, BB, CCB) as needed.</td>
<td></td>
</tr>
</tbody>
</table>

ACEI=Angiotensin converting enzyme inhibitor, ARB=Angiotensin receptor blocker, BB=β-blocker, BP=Blood pressure, CCB=Calcium channel blocker, DBP=Diastolic blood pressure, SBP=Systolic blood pressure

*Treatment determined by highest blood pressure category. †Initial combined therapy should be used cautiously in those at risk for orthostatic hypotension.

‡Treat patients with chronic kidney disease or diabetes mellitus to blood pressure goal of <130/80 mmHg.

Chobanian AV et al. JAMA. 2003;289:2560-2572
### JNC VII Lifestyle Modifications for BP Control

<table>
<thead>
<tr>
<th>Modification</th>
<th>Recommendation</th>
<th>Approximate SBP Reduction Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight reduction</td>
<td>Maintain normal body weight (BMI=18.5-24.9)</td>
<td>5-20 mmHg/10 kg weight lost</td>
</tr>
<tr>
<td>Adopt DASH eating plan</td>
<td>Diet rich in fruits, vegetables, low fat dairy and reduced in fat</td>
<td>8-14 mmHg</td>
</tr>
<tr>
<td>Restrict sodium intake</td>
<td>&lt;2.4 grams of sodium per day</td>
<td>2-8 mmHg</td>
</tr>
<tr>
<td>Physical activity</td>
<td>Regular aerobic exercise for at least 30 minutes on most days of the week</td>
<td>4-9 mmHg</td>
</tr>
<tr>
<td>Moderate alcohol consumption</td>
<td>≤2 drinks/day for men and ≤1 drink/day for women</td>
<td>2-4 mmHg</td>
</tr>
</tbody>
</table>

BMI=Body mass index, SBP=Systolic blood pressure  
Chobanian AV et al. *JAMA.* 2003;289:2560-2572
<table>
<thead>
<tr>
<th>Compelling Indication</th>
<th>Initial Therapy Options</th>
<th>Clinical-Trial Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heart Failure</td>
<td>Diuretic, BB, ACEI, ARB, Aldo Ant</td>
<td>MERIT-HF, COPERNICUS, CIBIS, SOLVD, AIRE, TRACE, Val-HeFT, RALES</td>
</tr>
<tr>
<td>Post-MI</td>
<td>BB, ACEI, Aldo Ant</td>
<td>ACC/AHA Post-MI Guideline, BHAT, SAVE, Capricorn, EPHESUS</td>
</tr>
<tr>
<td>High CAD Risk</td>
<td>Diuretic, BB, ACEI, CCB</td>
<td>ALLHAT, HOPE, ANBP2, LIFE, CONVINCE</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>Diuretic, BB, ACEI, ARB, CCB</td>
<td>NKF-ADA Guideline, UKPDS, ALLHAT</td>
</tr>
<tr>
<td>Chronic Kidney Disease</td>
<td>ACEI, ARB</td>
<td>NKF Guideline, Captopril Trial, RENAAAL, IDNT, REIN, AASK</td>
</tr>
<tr>
<td>Recurrent Stroke Prevention</td>
<td>Diuretic, ACEI</td>
<td>PROGRESS</td>
</tr>
</tbody>
</table>

ACEI=Angiotensin converting enzyme inhibitor, Aldo Ant=Aldosterone antagonist, ARB=Angiotensin receptor blocker, BB=b-blocker, CAD=Coronary artery disease, CCB=Calcium channel blocker, MI=Myocardial Infarction

Chobanian AV et al, JAMA, 2003;289:2560-2572
C

(Cholesterol and Cigarette)
Cigarette Smoking Recommendations

Goal: Complete Cessation and No Exposure to Environmental Tobacco Smoke

- Ask about tobacco use status at every visit.
- Advise every tobacco user to quit.
- Assess the tobacco user’s willingness to quit.
- Assist by counseling and developing a plan for quitting.
- Arrange follow-up, referral to special programs, or pharmacotherapy (including nicotine replacement and bupropion).
- Urge avoidance of exposure to environmental tobacco smoke at work and home.
# Lipid Management Goals: NCEP

<table>
<thead>
<tr>
<th>Risk Category</th>
<th>C Goal</th>
<th>Drug Therapy</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>High risk:</strong> CHD or CHD risk equivalents (10-year risk &gt;20%) and non-HDL-C should be &lt; 130 mg/dL</td>
<td>&lt;100 mg/dL if TG &gt; 200 mg/dL, ≥100 mg/dL</td>
<td>≥100 mg/dL (&lt;100 mg/dL: consider drug options)</td>
</tr>
<tr>
<td><strong>Very high risk:</strong> ACS or established CHD plus: multiple major risk factors (especially diabetes) or severe and poorly controlled risk factors</td>
<td>&lt;70 mg/dL, non-HDL-C &lt; 100 mg/dL</td>
<td>All patients</td>
</tr>
</tbody>
</table>

ATP=Adult Treatment Panel, CHD=Coronary heart disease, LDL-C=Low-density lipoprotein cholesterol, TLC=Therapeutic lifestyle changes

Lipid Management Recommendations

For all patients:

- Start dietary therapy (<7% of total calories as saturated fat and <200 mg/d cholesterol)

- Adding plant stanol/sterols (2 gm/day) and viscous fiber (>10 mg/day) will further lower LDL

- Promote daily physical activity and weight management.

- Encourage increased consumption of omega-3 fatty acids in fish or 1 g/day omega-3 fatty acids in capsule form for risk reduction.
**Lipid Management Recommendations**

- If TG are 200-499 mg/dL, non-HDL-C should be < 130 mg/dL
- Further reduction of non-HDL to < 100 mg/dL is reasonable
- Therapeutic options to reduce non-HDL-C:
  - More intense LDL-C lowering therapy I (B) or Niacin (after LDL-C lowering therapy) IIa (B) or Fibrate (after LDL-C lowering therapy) IIa (B)
  - If TG are ≥ 500 mg/dL, therapeutic options to prevent pancreatitis are fibrate or niacin before LDL lowering therapy; and treat LDL-C to goal after TG-lowering therapy. Achieve non-HDL-C < 130 mg/dL, if possible
Lipid Management Goal

I IIa IIb III

A

LDL-C should be less than 100 mg/dL

I IIa IIb III

A

Further reduction to LDL-C to < 70 mg/dL is reasonable

If TG >200 mg/dL, non-HDL-C should be < 130 mg/dL*

*Non-HDL-C = total cholesterol minus HDL-C
D
(Diet and Diabetes)
Weight Management Recommendations

Goal: BMI 18.5 to 24.9 kg/m²
Waist Circumference: Men: < 40 inches
Women: < 35 inches

Assess BMI and/or waist circumference on each visit and consistently encourage weight maintenance/reduction through an appropriate balance of physical activity, caloric intake, and formal behavioral programs when indicated.

If waist circumference (measured at the iliac crest) ≥ 35 inches in women and ≥ 40 inches in men initiate lifestyle changes and consider treatment strategies for metabolic syndrome as indicated.

The initial goal of weight loss therapy should be to reduce body weight by approximately 10 percent from baseline. With success, further weight loss can be attempted if indicated.

*BMI is calculated as the weight in kilograms divided by the body surface area in meters². Overweight state is defined by BMI=25-30 kg/m². Obesity is defined by a BMI >30 kg/m².
CV Risk Increases with Body Mass Index

Hemorrhagic Stroke

Ischemic Stroke

Ischemic Heart Disease

CV=Cardiovascular

Body mass index is calculated as the weight in kilograms divided by the body surface area in meters².

Mhurchu N et al. *Int J Epidemiol* 2004;33:751-758
Definition of the Metabolic Syndrome

Defined by presence of ≥3 risk factors

<table>
<thead>
<tr>
<th>Risk Factor</th>
<th>Defining Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waist circumference (abdominal obesity)</td>
<td>≥40 in (&gt;102 cm) in men</td>
</tr>
<tr>
<td></td>
<td>&gt;35 in (&gt;88 cm) in women</td>
</tr>
<tr>
<td>Triglyceride level</td>
<td>≥150 mg/dl</td>
</tr>
<tr>
<td>HDL-C level</td>
<td>&lt;40 mg/dl in men</td>
</tr>
<tr>
<td></td>
<td>&lt;50 mg/dl in women</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>≥130/&gt;85 mmHg</td>
</tr>
<tr>
<td>Fasting glucose</td>
<td>≥100 mg/dl</td>
</tr>
</tbody>
</table>

HDL-C=High-density lipoprotein cholesterol

Diabetes Mellitus Recommendations

Goal: Hb A1c < 7%

Lifestyle and pharmacotherapy to achieve near normal HbA1C (<7%).

Vigorous modification of other risk factors (e.g., physical activity, weight management, blood pressure control, and cholesterol management as recommended).

Coordinate diabetic care with patient’s primary care physician or endocrinologist.

HbA1c = Glycosylated hemoglobin
E

(Education and Exercise)
Physical Activity Recommendations

Goal: 30 minutes 7 days/week, minimum 5 days/week

Assess risk with a physical activity history and/or an exercise test, to guide prescription

Encourage 30 to 60 minutes of moderate intensity aerobic activity such as brisk walking, on most, preferably all, days of the week, supplemented by an increase in daily lifestyle activities

Advise medically supervised programs for high-risk patients (e.g. recent acute coronary syndrome or revascularization, HE)
TERIMA KASIH