

# Putting Heart Disease Guidelines Into Practice: Kaiser Permanente Leads the Way

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## Abstract

The recently revised American Heart Association (AHA)/American College of Cardiology (ACC) secondary prevention guidelines for management of coronary artery disease (CAD) patients, which incorporates findings from the latest clinical trials and consensus statements, has the potential for saving tens of thousands of lives annually. In general, however, these guidelines are poorly implemented. This article reviews four programs that have improved implementation of the guidelines by changing the health care delivery system. The programs include the UCLA Medical Center's Cardiac Hospitalization Atherosclerosis Management Program (CHAMP), the American Heart Association's Get With the Guidelines (GWTG) program, the American College of Cardiology's Guidelines Applied to Practice (GAP), and the Kaiser Permanente Northern California (KPNC) Cardiovascular Disease Management Programs. These programs share features including in-hospital multidisciplinary teams led by at least one "champion"; clinician prompts, including preprinted orders and checklists; and feedback to clinicians and hospitals as part of quality improvement.

## Introduction

In their 2001 update of the 1995 clinical guidelines for prevention of heart attack and death in patients with atherosclerotic cardiovascular disease, the American Heart Association (AHA) and the American College of Cardiologists (ACC) incorporated findings from numerous clinical trials and other consensus statements.<sup>1</sup> In summary, the new guidelines call for

- lipid management consistent with the National Heart, Lung, and Blood Institute's Adult Treatment Panel III (ATP III) report<sup>2</sup>
- wider use of beta-blockers<sup>3</sup>
- use of angiotensin-converting enzyme (ACE) inhibitors, even in certain high-risk patients without history of an acute cardiac event<sup>4</sup>
- use of clopidogrel in appropriate patients for whom aspirin is contraindicated<sup>5</sup>
- attainment of a lower body mass index (BMI)
- diabetes management consistent with the American Diabetes Association's guidelines for risk factor management<sup>6</sup>

The guidelines no longer call for use of estrogen replacement therapy in postmenopausal women due to recent findings.<sup>7,8</sup>

Figure 1<sup>1</sup> lists the updated guidelines for secondary prevention of heart attack and death in patients with coronary and other vascular diseases. Recommendations and goals that differ from the 1995 guidelines are listed in Table 1.

## Use of Practice Guidelines Improves Patient Outcomes

Because the guidelines are derived from numerous clinical trials, hospitals that have implemented earlier iterations of the AHA/ACC guidelines for management of acute myocardial infarction (AMI) have found improved patient outcomes. The UCLA Medical Center's Cardiac Hospitalization Atherosclerosis Management Program (CHAMP) instituted a systematic approach to increasing use of the AHA/ACC guidelines. Before CHAMP, 14.8% of MI patients had recurrent MI or died; after CHAMP, rates of death or recurrent MI fell to 6.4%.<sup>9</sup>

Similarly, Peterson recently presented data from the NRMI-4 Registry that documented a strong relationship between the processes used by hospitals for MI care and patient outcomes. Specifically, hospitals that more closely followed AHA/ACC guidelines had significantly lower overall in-hospital mortality than did hospitals that delivered care less consistent with the guidelines (Eric Peterson, MD, MPH, personal communication, October 15, 2002).<sup>a</sup>

A pilot study from the Cooperative Cardiovascular Project provided additional support for the observation that patient outcomes improve when clinical guidelines are implemented in medical practice. That study showed a decrease in long-term mortality for a sample of elderly patients with myocardial

... patient outcomes improve when clinical guidelines are implemented in medical practice.



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Figure 1. AHA/ACC secondary prevention for patients with coronary and other vascular disease: 2001 update			
Goals	Intervention recommendations		
Smoking: <i>Goal</i> complete cessation	Assess tobacco use. Strongly encourage patient and family to stop smoking and to avoid secondhand smoke. Provide counseling, pharmacological therapy, including nicotine replacement and bupropion, and formal smoking cessation programs as appropriate.		
BP control: <i>Goal</i> <140/90 mm Hg or <130/85 mm Hg if heart failure or renal insufficiency <130/80 mm Hg if diabetes	Initiate lifestyle modification (weight control, physical activity, alcohol moderation, moderate sodium restriction, and emphasis on fruits, vegetables, and low-fat dairy products) in all patients with blood pressure $\geq$ 130 mm Hg systolic or 80 mm Hg diastolic. Add blood pressure medication, individualized to other patient requirements and characteristics (ie, age, race, need for drugs with specific benefits) if blood pressure is not <140 mm Hg systolic or 90 mm Hg diastolic or if blood pressure is not <130 mm Hg systolic or 85 mm Hg diastolic for individuals with heart failure or renal insufficiency (<80 mm Hg diastolic for individuals with diabetes).		
Lipid management: <i>Primary goal</i> LDL <100 mg/dL	LDL <100 mg/dL (baseline or on-treatment) Further LDL-lowering therapy not required Consider fibrate or niacin (if low HDL or high TG)	LDL 100-129 mg/dL (baseline or on-treatment) Therapeutic options: Intensify LDL-lowering therapy (statin or resin <sup>a</sup> ) Fibrate or niacin (if low HDL or high TG) Consider combined drug therapy (statin + fibrate or niacin) (if low HDL or high TG)	LDL $\geq$ 130 mg/dL (baseline or on-treatment) Intensify LDL-lowering therapy (statin or resin <sup>a</sup> ) Add or increase drug therapy with lifestyle therapies
Lipid management: <i>Secondary goal</i> if TG $\geq$ 200 mg/dL, then non-HDL <sup>b</sup> should be <130 mg/dL	If TG $\geq$ 150 mg/dL or HDL <40 mg/dL: Emphasize weight management and physical activity. Advise smoking cessation. If TG 200-499 mg/dL: Consider fibrate or niacin <i>after</i> LDL-lowering therapy <sup>a</sup> If TG $\geq$ 500 mg/dL: Consider fibrate or niacin <i>before</i> LDL-lowering therapy <sup>a</sup> Consider omega-3 fatty acids as adjunct for high TG		
Physical activity: <i>Minimum goal</i> 30 minutes three to four days per week <i>Optimal</i> daily	Assess risk, preferably with exercise test, to guide prescription. Encourage minimum of 30 to 60 minutes of activity, preferably daily or at least three or four times weekly (walking, jogging, cycling, or other aerobic activity) supplemented by an increase in daily lifestyle activities (eg, walking breaks at work, gardening, household work). Advise medically supervised programs for moderate- to high-risk patients.		
Weight management: <i>Goal</i> BMI 18.5-24.9 kg/m <sup>2</sup>	Calculate BMI and measure waist circumference as part of evaluation. Monitor response of BMI and waist circumference to therapy. Start weight management and physical activity as appropriate. Desirable BMI range is 18.5-24.9 kg/m <sup>2</sup> . When BMI $\geq$ 25 kg/m <sup>2</sup> , goal for waist circumference is $\leq$ 40 inches in men and $\leq$ 35 inches in women.		
Diabetes management: <i>Goal</i> HbA <sub>1c</sub> <7%	Appropriate hypoglycemic therapy to achieve near-normal fasting plasma glucose, as indicated by HbA <sub>1c</sub> . Treatment of other risks (eg, physical activity, weight management, blood pressure, and cholesterol management).		
Antiplatelet agents/ anticoagulants:	Start and continue indefinitely aspirin 75 to 325 mg/d if not contraindicated. Consider clopidogrel 75 mg/d or warfarin if aspirin contraindicated. Manage warfarin to international normalized ratio = 2.0 to 3.0 in post-MI patients when clinically indicated or for those not able to take aspirin or clopidogrel		
ACE inhibitors:	Treat all patients indefinitely post MI; start early in stable high-risk patients (anterior MI, previous MI, Killip class II [S <sub>3</sub> gallop, rales, radiographic CHF]). Consider chronic therapy for all other patients with coronary or other vascular disease unless contraindicated.		
$\beta$ -Blockers:	Start in all post-MI and acute ischemic syndrome patients. Continue indefinitely. Observe unusual contraindications. Use as needed to manage angina, rhythm, or blood pressure in all other patients.		

BP indicates blood pressure; TG, triglycerides; BMI, body mass index; HbA<sub>1c</sub>, major fraction of adult hemoglobin; MI, myocardial infarction; and CHF, congestive heart failure.

<sup>a</sup> The use of resin is relatively contraindicated when TG >200 mg/dL.

<sup>b</sup> Non-HDL cholesterol = total cholesterol minus HDL cholesterol.

Figure 1. AHA/ACC 2001 guidelines for secondary prevention of heart attack.

Reproduced by permission of the American Heart Association from: Smith SC Jr, Blair SN, Bonow RO, et al. AHA/ACC Scientific Statement: AHA/ACC guidelines for preventing heart attack and death in patients with atherosclerotic cardiovascular disease: 2001 Update: a statement for health care professionals from the American Heart Association and the American College of Cardiology. *Circulation* 2001 Sep 25;104(13):1577-9.<sup>1</sup>

infarction treated in hospitals that participated in a quality improvement program using evidence-based forms of therapy.<sup>10</sup>

Moreover, analysis of treatment patterns from the observational NRMIs registries that collected treatment data during the past decade from more than 1.5 million patients with myocardial infarction showed improved adherence to the AHA/ACC guidelines for management of AMI and a 16% reduction in early mortality.<sup>11</sup>

### Need for Wider Implementation of Evidence-Based Clinical Guidelines

Despite evidence that following these guidelines will improve patient outcomes, overall

implementation nationally is far from optimal (Figure 2).<sup>12</sup> However, this shortfall in implementation cannot be attributed to a lack of physician awareness of the guidelines. For example, in a large-scale study,<sup>13</sup> 95% of clinicians were aware of the National Cholesterol Education Program (NCEP) guideline for lipid management, yet only 18% of their patients with coronary heart disease were treated to LDL goal. The more likely explanation for poor implementation of evidence-based guidelines is that the guidelines are generally not well integrated into the health care delivery system. Recently, at least four documented efforts were implemented to solve this problem: the UCLA Medical Center's Cardiac Hospital-

ization Atherosclerosis Management Program (CHAMP),<sup>9</sup> the American Heart Association's Get With the Guidelines (GWTG) program,<sup>14</sup> the American College of Cardiology's Guidelines Applied to Practice (GAP) program,<sup>15</sup> and Kaiser Permanente Northern California's (KPNC) Cardiovascular Disease Management Program.<sup>16,17</sup>

### Cardiac Hospitalization Atherosclerosis Management Program (CHAMP)

The CHAMP program, begun in 1994 and still in use, focuses on implementing guidelines that call for prescribing aspirin, cholesterol-lowering medication, beta-blockers, and

**Table 1: New goals and intervention recommendations introduced by the 2001 update of the AHA/ACC guidelines for secondary prevention of heart attack**

Topic	Goals added in 2001 update	Intervention recommendations added in 2001 update		
Smoking		Assess tobacco use; avoid secondhand smoke; provide bupropion as part of pharmacological therapy.		
Blood Pressure Control	Control blood pressure in diabetic patients to <130/80 mm Hg	Emphasize consumption of fruits, vegetables, and low-fat dairy products in all patients with blood pressure ≥130 Hg mm systolic or 80 mm Hg diastolic; in diabetic patients, add blood pressure medication <i>if</i> blood pressure is not <80 mm Hg diastolic.		
Lipid management		Promote weight management; encourage increased consumption of omega-3 fatty acids; in patients with an acute event, assess fasting lipid profile within 24 hours of hospital admission and consider adding drug therapy at discharge from hospital. Add drug therapy according to the following guide:		
		<ul style="list-style-type: none"> <li>For LDL &lt;100 mg/dL (baseline or on-treatment), consider fibrate or niacin if low HDL level or high triglyceride level.</li> </ul>	<ul style="list-style-type: none"> <li>For LDL 100-129 mg/dL (baseline or on-treatment), consider therapeutic options:                             <ul style="list-style-type: none"> <li>Intensify LDL-lowering therapy (statin or resin<sup>a</sup>).</li> <li>Fibrate or niacin (if low HDL level or high triglyceride level).</li> <li>Consider combined drug therapy (statin + fibrate or niacin) (if low HDL or high TG).</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>For LDL ≥130 mg/dL (baseline or on-treatment), consider therapeutic options:                             <ul style="list-style-type: none"> <li>Intensify LDL-lowering therapy (statin or resin<sup>a</sup>).</li> <li>Add or increase drug therapy with lifestyle therapies.</li> </ul> </li> </ul>
	If triglyceride level ≥200 mg/dL, non-HDL cholesterol <sup>b</sup> level should be <130 mg/dL	If triglyceride level ≥150 mg/dL or HDL <40 mg/dL, emphasize weight management and physical activity; advise smoking cessation. If triglyceride level 200-499 mg/dL, consider niacin or fibrate <i>after</i> LDL-lowering therapy. <sup>a</sup> If triglyceride level ≥500 mg/dL, consider using fibrate or niacin <i>before</i> LDL-lowering therapy. <sup>a</sup> Consider using omega-3 fatty acids as adjunct for high triglyceride level.		
Physical Activity	Optimal goal: daily	Encourage activity preferably daily or at least 3 to 4 times weekly.		
Weight management	BMI 18.5-24.9 kg/m <sup>2</sup>	Monitor response of BMI and waist circumference to therapy. Desirable BMI range is 18.5-24.9 kg/m <sup>2</sup> . In women, goal for waist circumference is ≤35 inches when BMI ≥25 kg/m <sup>2</sup> .		
Antiplatelet agents/anticoagulants		Continue indefinitely aspirin 75 to 325 mg/day if not contraindicated. Consider clopidogrel 75 mg/day if aspirin contraindicated. Manage warfarin to international normalized ratio = 2.0 to 3.0 in post-MI patients when clinically indicated or for those not able to take clopidogrel.		
ACE inhibitors		Treat all patients indefinitely post-MI. Consider chronic therapy for all other patients with coronary or other vascular disease unless contraindicated.		
β-blockers		Start in all post-MI and acute ischemic syndrome patients. Continue indefinitely.		

BMI = body mass index; MI = myocardial infarction.

<sup>a</sup>Use of resin is relatively contraindicated when triglyceride level >200 mg/dL.

<sup>b</sup>Non-HDL cholesterol = total cholesterol minus HDL cholesterol.

**Figure 2. Implementation statistics**

Indicator	Rate	Optimal
ASA	85% <sup>a</sup>	100%
β-Blocker	72% <sup>a</sup>	100%
ACE-I	71% <sup>a</sup>	100%
Smoking cessation	40% <sup>a</sup>	100%
Lipid lowering	37% <sup>b</sup>	96%

<sup>a</sup> HCFA, 1998<sup>b</sup> NRM1 2nd Q 2000

Figure 2. Implementation statistics for Medicare fee-for-service patients. ASA = acetylsalicylic acid (aspirin); ACE-I = angiotensin-converting enzyme inhibitor; HCFA = Health Care Financing Administration (renamed Centers for Medicare & Medicaid Services (CMS) in July 2001); NRM1 = National Register of Myocardial Infarction.

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ACE inhibitors in conjunction with counseling about diet and exercise before CAD patients are discharged from the hospital. Implementation of this program includes use of focused treatment guidelines, standardized admission orders, educational lectures, and tracking and reporting of adherence to the evidence-based treatment guidelines. Compared with the two-year period preceding implementation of the program, CHAMP increased adherence to treatment guidelines (Table 2). These improvements were also sustained at one-year follow-up—a finding demonstrating that therapies begun in the hospital are more likely to be continued. CHAMP patients also had better clinical outcomes (Table 3).<sup>9</sup>

Although these findings are impressive, they must be interpreted with regard to the fact that the study was observational only and lacked a concurrent control group.

### Get With the Guidelines (GWTG) Program

CHAMP results inspired the American Heart Association to develop Get With the Guidelines,<sup>14</sup> an in-hospital program that standardizes discharge protocols for CAD patients. Its

**Table 2: Pre-CHAMP and post-CHAMP treatment rates at discharge from hospital and at one-year followup**

Therapy	Pre-CHAMP		Post-CHAMP	
	At discharge	One year	At discharge	One year
Aspirin	78%	68%	92% <sup>a</sup>	94% <sup>a</sup>
β-Blocker	12%	18%	61% <sup>a</sup>	57% <sup>a</sup>
Nitrates	62%	42%	34% <sup>a</sup>	18% <sup>a</sup>
Calcium blocker	68%	58%	12% <sup>a</sup>	6% <sup>a</sup>
ACE inhibitor	4%	16%	56% <sup>a</sup>	48% <sup>a</sup>
Statin	6%	10%	86% <sup>a</sup>	91% <sup>a</sup>

<sup>a</sup>  $p < 0.01$ , pre- vs post-CHAMP at discharge from hospital and at one-year followup.

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**Table 3: Pre-CHAMP and post-CHAMP clinical events the first year after discharge for myocardial infarction**

	Pre-CHAMP (1992/1993) (n = 256)	Post-CHAMP (1994/1995) (n = 302)
Recurrent myocardial infarction	20 (7.8%)	10 (3.1%) <sup>a</sup>
Heart failure	12 (4.7%)	8 (2.6%)
Hospitalization	38 (14.8%)	23 (7.6%) <sup>a</sup>
Sudden death	3 (1.2%)	2 (0.6%)
Cardiac mortality	13 (5.1%)	6 (2.0%) <sup>a</sup>
Noncardiac mortality	2 (0.8%)	2 (0.6%)
Total mortality	18 (7.0%)	10 (3.3%) <sup>a</sup>

<sup>a</sup>  $p < 0.05$ .

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centerpiece is a Patient Management Tool that is available online as a one-page form. The form includes a checklist of medications recommended by the AHA/ACC guidelines and reminds the discharging clinician to refer the patient to smoking cessation, nutrition, and physical activity counseling as appropriate. The provider who is responsible for discharge clicks in the appropriate boxes to record medications and referrals given to the patient. The online Patient Management Tool also includes “pop-up” explanations and evidence-based justification of each recommendation in the guidelines.

To increase the likelihood that when discharged from the hospital patients will follow a plan consistent with AHA/ACC guidelines, the AHA encourages health care practitioners to complete the online form immediately at discharge instead of retrospec-

tively. To reinforce continuity of care, the Patient Management Tool can generate a discharge note for the patient and for the medical chart and can fax a discharge letter to the patient's primary care practitioner. The tool can also store data that the hospital can transmit to third parties, which can include the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) to satisfy requirements for reporting core measures. The data collected by the Patient Management Tool can also be relayed back to clinicians and hospitals in a graphic format for convenient comparison with national performance on adherence to guidelines. Offering regular performance feedback using this benchmarking tool has been shown to drive improvements to systems of care.

GWTG was piloted in four hospitals in New

England, and results showed that the program improved smoking cessation, lipid measurement and treatment, blood pressure control, and referral to cardiac rehabilitation.<sup>12</sup> The American Heart Association is introducing GWTG in California, beginning with the southern part of the state (in 2001).

### The Guidelines Applied to Practice (GAP) Program

The ACC's GAP program for acute myocardial infarction provides another illustration of how adherence to clinical guidelines improves when the system is changed so that guidelines are integrated into the tools of practice and thus become institutionalized.<sup>15</sup> GAP uses a toolkit which includes standard orders, a clinician pocket guide, a clinical pathway, patient education materials, chart reminders, and examples of how to report performance. GAP has increased use of aspirin (81% vs 87%,  $p = 0.02$ ) and beta blockers (65% vs 74%,  $p = 0.04$ ) at admission to the hospital; and use of aspirin (84% vs 92%,  $p = 0.002$ ) and smoking cessation (53% vs 65%,  $p = .02$ ) at discharge from the hospital. Adherence to other quality indicators was improved, although improvement did not reach statistical significance.<sup>15</sup>

### KPNC Cardiovascular Disease Management Programs

KPNC's approach toward development of clinical guidelines and critical pathways has been truly visionary. Systematic efforts to implement evidence-based cardiovascular guidelines have been in place at KPNC since the early 1990s to reduce mortality in CAD patients. The program is supported at each KPNC facility by a multidisciplinary team of champions including cardiologists, intensivists, emergency department physicians, internists, critical care nurses, and pharmacists. KPNC's horizontal and vertical integration of health care delivery facilitates systematic implementation of guidelines.

Standing orders and preprinted discharge sheets promote adherence to secondary prevention guidelines during inpatient care. After patients are discharged from the hospital, MULTIFIT and the Cholesterol Management Program assure that patients continue to re-

ceive recommended care.

MULTIFIT is an individualized, nurse-managed program intended to reduce risk through lifestyle changes and adherence to medications. Patients recovering from heart attack who choose to enroll in MULTIFIT receive their first consultation with the nurse-manager while still in the hospital. These patients receive counseling about smoking cessation, lipid management, medication use, proper nutrition, and other risk-reduction strategies. After patients return home, they receive continuous encouragement and guidance for making lifestyle changes at scheduled phone calls with the MULTIFIT nurse and by receiving written progress reports by mail. Patients participate with MULTIFIT for a period ranging from six months to a year, depending on progress. The MULTIFIT program currently serves approximately 3100 patients per year.

Patients who have completed MULTIFIT or who declined enrollment in MULTIFIT can enroll in the Cholesterol Management Program (CMP), which addresses both primary and secondary prevention of CAD. Priority is given to four groups of patients: CAD patients whose plasma lipid levels are not at goal (plasma LDL level  $<100$  mg/dL [2.59 mmol/L]); patients who have high triglyceride levels; MULTIFIT graduates; and diabetic patients whose plasma lipid levels are not at goal. Through phone calls, mailings, and referrals to health education programs, a nurse-manager or pharmacist-manager helps patients to change their lifestyles as needed. With the aid of a computer program, the case manager assesses each patient's risk and tracks results of lipid tests as well as medication use. The CMP currently serves 65,660 patients per year.

Outreach is facilitated by the Patient Integrated Log and Outpatient Tracking (PILOT) system, which searches KPNC's CAD registry to identify (and mail letters to) patients who must return to the clinic for lipid tests, medication management, and other follow-up care.

The CAD registry also supports a Population Care Registry, which generates a Mem-

ber Summary Sheet for the clinician at the time of a patient visit. The summary sheet is placed on the face of the patient chart by the medical assistant and contains patient-specific information (eg, medication prescribed, dates of lipid tests taken and scheduled, smoking status) and prompts the clinician about needed tests and medication adjustment. The CAD registry is also one of the databases used to generate the Preventive Health Prompt, a patient-focused strategy in which patients registering for a health care visit are given a receipt that includes a record of screening examinations given and due. For patients listed in the CAD registry, the receipt shows the date when lipid levels should next be tested.

These strategies have improved patient outcomes.<sup>16</sup> For example, in KPNC, LDL control (ie, plasma LDL level  $<130$  mg/dL [3.36 mmol/L]) in CAD patients improved from 22% (in 1996) to 81% (in 1999).<sup>17</sup> In 1997, the rate was 97% among eligible patients recovering from myocardial infarction (MI) who received beta-blockers at discharge from the hospital.<sup>17</sup> After adjustments are made for age and sex, mortality from heart disease is 30% lower in the KPNC population than in the non-KPNC population in California.<sup>17</sup> Of the 16 North-

ern California hospitals recognized by the Office of Statewide Health Planning and Development as having significantly lower-than-expected rates of mortality from acute MI, nine were Kaiser Permanente facilities.<sup>18</sup>

**KPNC's approach toward development of clinical guidelines and critical pathways has been truly visionary.**

### Conclusions

These programs share three important similarities. First, recognizing that system change must be driven by strong intent, each program uses in-hospital multidisciplinary teams led by at least one "champion." Second, each program uses prompts (eg, preprinted orders and checklists) to ensure that following guidelines is not dependent on clinicians' memory. Third, as part of continuous quality improvement, each program provides feedback to clinicians and hospitals regarding their per-

formance. The KPNC model adds an outpatient component that assures patients continue recommended care. ❖

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## Far From Discouraging

Every day you may make progress. Every step may be fruitful. Yet there will stretch out before you an ever-lengthening, ever ascending, ever-improving path. You know you will never get to the end of the journey. But this, so far from discouraging, only adds to the joy and glory of the climb.

— Winston Churchill, 1874-1965, *British Statesman*