

Cardiovascular Disease Prevention: Part 2, What Works—What Doesn't?

Dr Pasternak is associate professor of medicine at Harvard Medical School and director of preventive cardiology and cardiac rehabilitation at Massachusetts General Hospital in Boston. This article is based on a lecture Dr Pasternak presented at the 31st Annual New York Cardiovascular Symposium, sponsored by the American College of Cardiology.

ABSTRACT: Interventions that you can universally recommend to patients to reduce cardiovascular risk are smoking cessation, treatment of dyslipidemia, management of hypertension, amelioration of psychosocial factors (eg, treatment of depression and anger management), increased physical activity, and dietary modification (to control lipid levels and blood pressure as well as obesity). You can help patients "stay the course" by explaining the benefits of preventive interventions. Compliance can also be promoted with lower-cost therapies, convenient dosing schedules, health education programs, and good follow-up and feedback. A tracking system, in which patients are reminded of upcoming visits and are called when they miss appointments or prescription refills, is helpful.

The current epidemic of coronary heart disease (CHD) results from cultural, perhaps even more than biologic, factors. Numerous cardiovascular risk factors can be invoked, but risk reduction should focus on the factors that are best understood and most easily modified.

Preventive medicine saves lives and improves quality of life. The tools exist now to significantly reduce the risk of cardiovascular disease, largely by simple means that can be employed in primary care. As the Framingham Heart Study investigators wrote almost 3 decades ago, "Practitioners must come to regard the occurrence of stroke, coronary heart disease, congestive heart failure, and peripheral vascular disease . . . as a medical fail-

ure rather than the starting point of medical treatment."¹

On page 2957 of this issue, I discussed the risk factors for cardiovascular disease and described the interventions that are known to be effective. In this article, I offer practical advice on implementing these interventions in your practice.

RISK REDUCTION RECOMMENDATIONS

Table 1 lists risk factor management strategies for patients with coronary or other vascular disease.² In primary care, five interventions to reduce the risk of cardiovascular morbidity and mortality can be recommended universally (Table 2). Smoking cessation, treatment of dyslipidemia, control of hypertension, and a healthful diet have proved effective in reducing cardiovascular risk. Although the benefits of increased physical activity and modification of psychosocial factors (such as treatment of depression) have not been demonstrated in large randomized trials, the available evidence suggests that they should also be included in every cardiovascular risk reduction program.

Even in the absence of cardiovascular clinical outcome data, improved physical fitness and psychosocial status invariably enhance quality of life. Any one of these interventions would likely be beneficial for most patients; the more that can be implemented, the better.

Smoking cessation. The evidence is overwhelming that cigarette smok-

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ing increases the risk of cardiovascular disease.³ We now know that smoking just one cigarette can change platelet function and produce coronary artery vasospasm—two essential events on the pathway to myocardial ischemia and infarction.^{4,5} In a study in which smokers with atypical chest pain underwent cardiac catheterization, those with normal coronary angiographic

findings were given one cigarette to smoke (in the catheterization laboratory) and angiographic evaluation was repeated.⁵ In one instance, a 50% stenosis, reversible with nitroglycerin, was detectable 5 minutes after smoking. Similar changes occurred in other patients. One can imagine that if there were a vulnerable plaque at the point of focal spasm, the risk of plaque rupture

and myocardial infarction (MI) would be high.

The basic approaches to smoking cessation do work. Some 50% of all Americans who have ever smoked have quit. As with most forms of motivational and educational training, ongoing patient education is an important component in the overall success of smoking cessation programs.

Programs that focus on the "stages of change" have proved effective. In these programs, the level of the patient's readiness to change behavior is assessed:

- **Precontemplation:** Not even thinking about smoking cessation.
- **Contemplation:** Beginning to consider it.
- **Action:** Ready to stop smoking.
- **Maintenance:** In need of reinforcement of smoking cessation.

The behavioral intervention is directed at moving the patient to the next stage.

Such programs do not take much of a physician's time, but whatever time is necessary to reinforce the patient's efforts is well spent. Delivering the message of smoking cessation personally and powerfully can have a tremendous impact on the success rate. Conversely, *not* inquiring whether a patient is still smoking conveys the message that "it's OK" to continue to smoke.

Treating dyslipidemia. The link between total blood cholesterol levels and CHD-related events is conclusive; risk continuously and gradually declines as the total cholesterol level is lowered to less than 180 mg/dL. Most of the risk is related to low-density lipoprotein (LDL) cholesterol levels.

The Adult Treatment Panel (ATP-II) of the National Cholesterol Education Program (NCEP) has provided guidelines for treating hypercholesterolemia and identifying and managing risk factors related to elevated serum total and LDL cholesterol levels.⁶ The guidelines use a categoric

Table 1 - 10 Keys to high-quality preventive cardiology in primary care

- Document smoking status of all patients with coronary or other vascular disease.
- Make a smoking cessation program available for the smoking patient and his or her family.
- Document your advice to stop smoking and your offer of self-help smoking cessation materials for all eligible patients who are hospitalized with coronary or other vascular disease.
- Order a fasting lipoprotein profile immediately following the onset of coronary or other vascular disease. (Remember, lipid levels can be accurately measured within 24 h of MI.)
- Offer all patients with coronary or other vascular disease nutritional evaluation and counseling at the time of diagnosis.
- Unless contraindications exist, prescribe lipid-lowering drug therapy—along with nutritional therapy—for all patients with coronary or other vascular disease who have an LDL cholesterol level of > 130 mg/dL; consider such therapy for patients with LDL cholesterol levels between 100 and 129 mg/dL.
- Provide exercise counseling and an exercise prescription at the time coronary or other vascular disease is diagnosed (or after recovery from MI or CABG surgery) for all patients in whom such intervention is appropriate; consider enrolling such patients in cardiac rehabilitation programs.
- Offer aspirin therapy to all eligible patients at the time of diagnosis of coronary or other atherosclerotic disease. If aspirin therapy is contraindicated, document the contraindication in the medical record.
- Measure and document blood pressure at every visit of patients with coronary or other vascular disease.
- Offer and document lifestyle and drug treatment plans if the average of three blood pressure measurements is \geq 140 mm Hg systolic or 90 mm Hg diastolic. Based on JNC-VI guidelines, consider drug therapy for patients with blood pressures of 130 - 139/85 - 89 mm Hg if heart failure, diabetes mellitus, or renal insufficiency is present.¹⁴

MI, myocardial infarction; LDL, low-density lipoprotein; CABG, coronary artery bypass graft; JNC-VI, Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure.

Adapted from Pearson TA, Fuster V. *J Am Coll Cardiol*. 1996.⁷

rather than a global risk assessment score. Risk is divided into three categories, each with its own implication for intervention (Table 3).

Current guidelines have tended to focus more on short-term (10-year) risk, which is known to be high in patients who have CHD or multiple risk factors. It is important to consider long-term risk as well, which can be high, for example, because of elevated LDL cholesterol levels. Even in the absence of other risk factors for CHD, a high LDL cholesterol level over a lifetime poses considerable risk.

Clinical trials support the lowering of LDL cholesterol levels in both primary and secondary prevention. For every decrease of 1 mg/dL in LDL cholesterol level, the relative risk of CHD declines approximately 1% to 2%.⁶ It has been suggested that if the NCEP ATP-II guidelines were followed to the letter, 7% of the population would require drug therapy for dyslipidemia. Given that CHD kills 1 of every 2.4 Americans, such a percentage does not seem high—and the benefit would be considerable.

The 3-hydroxy-3-methylglutaryl-coenzyme A (HMG-CoA) reductase in-

Table 2 – Universal recommendations for cardiovascular prevention in primary care

- Stop smoking
- Treat dyslipidemia
- Control blood pressure
- Modify psychosocial factors (eg, treat depression and manage anger)
- Increase physical activity
- Modify diet (to control lipid levels and blood pressure as well as obesity)

hibitors (or “statins”), in particular, dramatically lower total and LDL cholesterol levels at reasonably low cost and without significant adverse effects in most patients. In the Cholesterol and Recurrent Events (CARE) trial, for example, pravastatin significantly lowered the risk of cardiovascular events in patients with previous MI and total cholesterol levels below 240 mg/dL and baseline LDL cholesterol levels between 115 mg/dL and 174 mg/dL.⁷

Dietary interventions to lower total and LDL cholesterol levels have focused on reducing consumption of certain foods that are rich in saturated fat and cholesterol. Unfortunately, the

simple arithmetic of calorie intake and metabolism has been overlooked. If a person consumes too many calories—regardless of the source—and does not expend sufficient energy, weight gain and concomitant morbidity will ensue.

There is a lack of confidence in the efficacy of dietary interventions, however. It is widely perceived that diet is ineffective in altering lipid levels favorably and in reducing cardiovascular risk and that patients cannot adhere to a diet permanently.

Diet can and does work—in the right patient. Some patients have had decreases in LDL cholesterol levels of

Table 3 – Risk stratification in dyslipidemia

Risk factors	LDL cholesterol level at which to initiate therapy (mg/dL)		
	Diet alone	Diet and drug therapy	NCEP LDL cholesterol goal (mg/dL)
No CHD and < two risk factors*	≥ 160	≥ 190	< 160
No CHD and ≥ two risk factors	≥ 130	≥ 160	< 130
CHD	> 100†	≥ 130	≤ 100

LDL, low-density lipoprotein; NCEP, National Cholesterol Education Program; CHD, coronary heart disease.

*Positive risk factors are family history of early CHD (first-degree relative with CHD before age 55 if male or before age 65 if female), age (men aged ≥ 45; women aged ≥ 55), premature menopause without estrogen replacement, smoking, high blood pressure, diabetes mellitus, and low high-density lipoprotein (HDL) cholesterol level (< 35 mg/dL). If the HDL cholesterol level is > 60 mg/dL, subtract one risk factor.

†If the LDL cholesterol level is 100–129 mg/dL, consider drug therapy.

Adapted from National Cholesterol Education Program (NCEP) Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults. JAMA. 1993.⁶

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as much as 40% when they switched from a standard American diet to the diet advocated by the NCEP. Unfortunately, it is not possible at present to predict which patients will have this kind of response. Furthermore, compliance must be high to achieve results. Since it is impossible to predict which patients will adhere to dietary modification, the process depends on trial and error and a considerable amount of encouragement.

It is worth being optimistic, though, for patients who do reduce their dietary cholesterol and saturated fat intake markedly will generally experience benefit commensurate with their effort. Recently, it has also become clear that substituting fats (monounsaturated for saturated) and carbohydrates (complex ones for simple starches) lowers risk effectively and is a more palatable way to modify diet.

Controlling blood pressure. Nearly 50 million Americans are hypertensive. Hypertension is more frequent and severe in African Americans. Lowering blood pressure reduces the rate of cardiovascular events, including myocardial ischemia and MI, stroke, and congestive heart failure.³

Although cutoffs for diagnosing hypertension (140/90 mm Hg) have been established, it is well documented that the relationship between cardiovascular risk and both systolic and diastolic pressures is direct and continuous across a range of blood pressures. In addition, evidence that target-organ damage can occur even when hypertension is not severe strongly supports early and aggressive blood pressure control.

The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC-VI) differs in some respects from previous JNC reports and shares some similarities with the NCEP.⁸ For example, a normal or optimal blood pressure is defined as 120/80 mm Hg; thus, a person whose pressure is less than 140/90 mm Hg (the accepted standard definition of hypertension) may require antihypertensive therapy because of co-morbid conditions (Table 4). The report describes categories of optimal, normal, and high-normal blood pressures and several stages of clinical hypertension. In addition, it stratifies patients according to risk and suggests different management ap-

proaches for each risk level (Table 5).

The clinical setting dictates drug selection in hypertension management. Diuretics are most appropriate for patients with isolated systolic hypertension, such as older persons without other known cardiovascular disease. If an older patient is unable to tolerate a diuretic, I would consider an angiotensin-converting enzyme (ACE) inhibitor or a long-acting dihydropyridine calcium channel blocker. For younger patients, particularly those with CHD, β -blockers are favored.

Patients with systolic dysfunction usually do well with ACE inhibitors or diuretics. Patients with previous MI should usually receive a β -blocker (without intrinsic sympathomimetic activity) or, if there is systolic dysfunction, an ACE inhibitor. For diabetic patients, ACE inhibitors are recommended, especially if proteinuria is present. ACE inhibitors can preserve renal function in diabetic patients.

Left ventricular hypertrophy (LVH) in response to chronic pressure or volume overload is associated with increased cardiovascular risk. It can be diagnosed by echocardiography long before electrocardiographic evidence of ventricular hypertrophy can be seen. Reduction in blood pressure, by lifestyle change or medication, can induce regression of LVH and, according to Framingham Heart Study data, can reduce cardiovascular risk.⁹

Treating depression and managing anger. The ability of anger, hostility, stress, and depression to result in a broken heart is not mythical. Emerging data point to the role of adverse psychosocial factors in raising cardiovascular risk significantly.

It is not necessary to wait for clinical cardiac outcomes data before including management of depression, anger, and stress in the overall therapeutic approach. Clearly, patients feel better when free-flowing hostility, excessive stress levels, and depression are treated. Tools are available to mea-

Table 4 - Classifying blood pressure in adults*

Category	Blood pressure (mm Hg)	
	Systolic	Diastolic
Optimal	< 120	< 80
Normal	< 130	< 85
High-normal	130 - 139	85 - 89
Stage 1 hypertension	140 - 159	90 - 99
Stage 2 hypertension	160 - 179	100 - 109
Stage 3 hypertension	\geq 180	\geq 110

*When systolic and diastolic pressures fall into different categories, select the higher category.

Adapted from Pasternak RC et al. *J Am Coll Cardiol.* 1996⁸; and Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Arch Intern Med.* 1997.⁹

Table 5 - Risk stratification and treatment of high blood pressure*

Blood pressure stages (mm Hg)	Risk group A (no risk factors; no TOD/CCD)	Risk group B (at least one risk factor, not including diabetes; no TOD/CCD)	Risk group C (TOD/CCD and/or diabetes, with or without other risk factors)
High-normal (130 - 139/85 - 89)	Lifestyle modification	Lifestyle modification	Drug therapy [†]
Stage 1 (140 - 159/90 - 99)	Lifestyle modification (up to 12 months)	Lifestyle modification (up to 6 months) [‡]	Drug therapy
Stages 2 and 3 (≥ 160/≥ 100)	Drug therapy	Drug therapy	Drug therapy

TOD, target organ disease; CCD, clinical cardiovascular disease.

*Lifestyle modification should be adjunctive therapy for all patients for whom drug therapy is recommended.

[†]For patients with heart failure, renal insufficiency, or diabetes mellitus.

[‡]For patients with multiple risk factors, consider drugs as initial therapy along with lifestyle modification.

Adapted from Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. *Arch Intern Med.* 1997.⁸

sure these psychosocial factors, but they are not widely used.

Of the available diagnostic instruments, I find the Medical Outcomes Study Short Form 36 (SF 36) to be quite helpful. This form is completed by the patient and is easily scored.

The destructive power of depression is tremendous. In an observational study of 220 patients who sustained an MI, major depression was the single most important predictor of mortality at 6 months, even after adjustment for all other clinical factors.¹⁰ Depression in this study was more predictive than previous MIs, the presence of heart failure, or failure to receive thrombolytic therapy.

Similarly, anger and hostility are strongly associated with the development of CHD. A prospective study in persons who initially had no angiographically detectable CHD showed that CHD events were most likely to develop in those with higher levels of anger and hostility.¹¹ In addition, episodes of acute anger have been shown to trigger acute MI.¹²

The first step in managing adverse psychosocial conditions is simply

recognizing their importance and asking straightforward questions to uncover their presence. While some degree of anxiety or mood change is inevitable following a cardiac event or procedure, it is usually not difficult to uncover more severe degrees of dysfunction, which were generally present before the event as well.

Once adverse psychosocial conditions are recognized, management approaches depend on several factors, including the expertise of the primary care physician, the availability of qualified consultants, and the patient's own interest and willingness to seek help. Often, a good multidisciplinary cardiac rehabilitation program can serve both to help triage such patients and to assist with supportive therapies, such as teaching stress-reducing techniques.

Increasing physical activity. One of the best suggestions you can give patients is to increase physical activity. If a drug provided all the benefits that exercise does, it would be at the top of our list of prescribed medications. The value of exercise in reducing CHD-related events has been demonstrated in more than 50 studies.³ The occasional

exercise-related MI or sudden cardiac death does not reduce the statistical benefit of regular exercise.

Although the outcomes of exercise are difficult to measure, the benefits of exercise are well known: It reduces stress, improves mood, discharges anger, improves myocardial oxygen supply and demand, lowers triglyceride levels, raises high-density lipoprotein cholesterol levels, reduces blood pressure, decreases platelet aggregation, and improves other clotting factors.³ Brisk walking is a readily available form of exercise that reduces cardiovascular risk.

The greatest reduction in risk occurs when moderate exercise levels are maintained by previously sedentary persons.

Despite the evidence from meta-analyses that exercise cuts overall post-MI mortality by 25%, exercise is a grossly underused intervention for risk reduction. Even among patients who have lived through a "teachable moment" during MI, coronary revascularization, or other cardiac event or intervention, exercise participation is remarkably low. In 1998, less than 20%

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of eligible patients entered cardiac rehabilitation programs.

To encourage patients to engage in physical activity, the following strategies may prove useful:

- Strongly emphasize the importance of cardiac rehabilitation programs.
- Make patients aware of local exercise programs at gyms, health clubs, and senior centers.
- Suggest that they find a partner for walking as well as other activities.

In addition, the American Heart Association and the National Heart, Lung, and Blood Institute offer patient education materials that contain useful tips on how to increase physical activity as well as other approaches to reducing cardiovascular risk.

MAKING PREVENTION PALATABLE

Prevention is still not mainstream, and both patients and physicians are often reluctant to devote time and effort to it. Clinical trial results do not readily translate into clinical practice in communities around the country. In particular, they do not take into account patient compliance and the challenges of patient education, motivation, and long-term interest. In well-known clinical trials of lipid-lowering therapy, compliance at 4 to 5 years is 70% to 90%; in practice, compliance is often much less—approximately 70% at 6 months and as low as 15% beyond 2 years.

Consider the Heart and Estrogen/Progestin Replacement Study (HERS), in which 2,763 women with CHD received hormone replacement therapy.¹³ Only 47%, however, were taking lipid-lowering medication, and a scant 9% had met the ATP-II goal of reducing LDL cholesterol levels to less than 100 mg/dL. Such a sharp drop-off in compliance is typical of any long-term therapy, especially among persons who have no symptoms. This study also demonstrates the concomitant problem of an inability to reach es-

tablished goals—even if treatment is undertaken.

Why patients are noncompliant.

Patients do not comply with medical recommendations for many reasons. Frequently, they lack knowledge, time, money, confidence to proceed, and positive reinforcement necessary to maintain commitment to a lifestyle change or a long-term medication regimen. There are often behavioral issues involved, and complicated strategies may be required to overcome these barriers.

Roadblocks to compliance include medication cost, lack of reimbursement, unclear instructions, ignorance, adverse drug effects, and inconvenient dosing schedules. When instructions are oral rather than written, when the patient has no active role in the treatment plan, and when waiting times in physicians' offices are prolonged, compliance is likely to be poor. Lack of patient education can also result in poor compliance.

Why physicians may fail to inspire compliance. Ignorance, skepticism, disenfranchisement, and lack of time can thwart physicians' best intentions. When physicians have inadequate knowledge about an intervention or incorrect or incomplete data, they are less willing to promote it to patients or to believe in it themselves. Poor communication between specialists and generalists can reduce the ability of the generalist to advocate an intervention.

Following guidelines that are inconsistent or too complex is counterproductive. Guidelines may be inconsistent because of conflicting evidence or differences in guideline development methods, judgments regarding benefits of interventions, or economic objectives and considerations.

Paradigms that are inappropriate or no longer applicable reduce a physician's effectiveness in motivating patients. For example, a physician who follows the traditional episode-centered

model of care delivery will probably be less likely to effect preventive changes than one who accepts disease management strategies and critical pathways based on continuity of care.

What physicians can do to engage patients. Compliance can be promoted with lower-cost therapies, convenient dosing schedules, health education programs, and good follow-up and feedback. A tracking system, in which patients are reminded of upcoming visits and are called when they miss appointments or prescription refills, is helpful. Several innovative programs are based on the use of standing orders, simple and unambiguous guidelines, and critical pathways for physicians and allied health professionals. Programs involving pharmacists have also been developed to enhance compliance with risk-reduction strategies.

A simple but innovative program, developed at the University of California, Los Angeles School of Medicine, is one example of a compliance-enhancing program (personal communication, G. C. Fonarow). The goal was to increase the use of statins to manage dyslipidemia after hospitalization for CHD. The percentage of patients treated at the start of the program was 6%; 4 years later, 90% of patients who were discharged were receiving statins to reduce cardiovascular risk.

In the Multiple Risk Factor Intervention Trial (MULTIFIT) program, which was designed by a team at Stanford University Medical Center, nurses act as case managers who communicate with patients, the laboratory, specialists, and the primary care physician.¹⁴ The essence of the program's success lies in the coordination of outpatient activities and the use of a straightforward set of clinical guidelines.

Among patients who received usual care, 53% stopped smoking, 5% reduced LDL cholesterol levels to less than 130 mg/dL, and 15% reached