Task Force #4—Adherence Issues and Behavior Changes: Achieving a Long-Term Solution

Ira S. Ockene, MD, FACC, Co-Chair, Laura L. Hayman, PhD, RN, FAAN, Co-Chair, Richard C. Pasternak, MD, FACC, Eleanor Schron, MS, RN, FAAN, Jacqueline Dunbar-Jacob, PhD, RN, FAAN

INTRODUCTION: THE CHALLENGE OF ADHERENCE

Adherence (equivalent to compliance) to lifestyle and medication recommendations for the prevention of cardiovascular disease (CVD) is a crucial element in the path from the science of risk-factor modification to the actual reduction of risk factors and consequent prevention of disease-related events. Lack of adherence to therapeutic regimens has been documented for decades, particularly for preventive interventions requiring changes in behavior such as smoking cessation, change in eating patterns, physical activity, and adherence to pharmacologic therapy (1,2). Pharmacologic industry data (IMS Health; NDC Health Information Services) document that by the end of one year, adherence to preventive pharmacologic therapy has dropped to less than 50% across several broad classes of drugs, including hydroxymethyl-glutaryl-coenzyme-A (HMG-CoA) reductase inhibitors and angiotensin-converting enzyme inhibitors. Although non-adherence may consist of dropping therapy altogether, there is also, a significant problem with individuals who remain in treatment but fail to follow the treatment regimen in sufficient quantity or appropriate dosages.
ADHERENCE: A PROBLEM THAT MUST BE ADDRESSED ON MULTIPLE LEVELS

Adherence is commonly seen as a patient problem. The physician (MD) or nurse practitioner (NP) prescribes a regimen, and it is the patient’s role to follow that regimen. In 1997, a multidisciplinary task force of the American Heart Association (AHA) addressed the problem of adherence in a special report, “The Multilevel Compliance Challenge” (15). This document details the reality that adherence must be addressed on several levels, including the patient, the provider, and the health care system. Patients need the knowledge, attitude, and skills to follow an appropriately prescribed regimen (16), and similarly, providers need the knowledge, attitude, and skills to: follow established guidelines in prescribing that regimen; ensure that patients understand the reason for the prescribed drugs, the possible side effects, the interactions with other agents, and the manner in which the drug is to be taken; and ensure that the recommended regimen is not unnecessarily complex and is therefore possible to follow. When caregivers do not follow guidelines, it is often thought that they need education or training and that the provision of such training alone will suffice. This is, however, generally not sufficient (17). Finally, the system or organization within which providers work needs to provide resources and set policies that support optimal practices, particularly prevention-oriented activities (15). These resources can include other health care professionals as part of the treatment team to augment the role of primary providers and to provide more intensive intervention where needed. There is substantial evidence that the involvement of other health care professionals to support treatment plans improves the effectiveness of interventions and increases the prevalence of patient behavior change or adherence (18). Such resources can augment the very limited amount of time available to busy practitioners. Furthermore, policies within organizations can mandate provision of the following: time for educating MD/NPs about guidelines; training in treatment strategies such as patient-centered counseling; dissemination of guidelines and of appropriate tools that assist in the implementation of guidelines; and office support mechanisms (prompts, algorithms, and the setting up of systems to screen and follow up patients for specific problems such as elevated lipids) (19).

The patient: factors that affect adherence. The patients must assume the ultimate responsibility for making behavioral changes, and whether or not a patient adheres to a prescribed regimen is a complex issue. It is affected by knowledge, attitudes, skills, and the environment, the health care provider’s practices, and the health care system (15).
Research on patient factors that affect adherence has been inconclusive. As described previously, the relationship of gender, socioeconomic status, and marital status to adherence is weak and inconsistent (3). However, some relationships have emerged. Organic factors such as the memory impairment often experienced by CHD patients (20), as well as the somatic side effects of medications (21–24), can reduce adherence. Cognitive variables, specifically attitudes toward medication intake (24,25) and self-efficacy (the extent to which an individual believes he or she is able to change a behavior) (4,26–28) have been associated with adherence to a variety of health behaviors. However, most studies have been retrospective, and it is unclear whether these beliefs or expectations predict, or are the result, of adherence. With regard to affective states, mixed findings have been reported for the influence of negative affect (e.g., depression, anxiety) on adherence to health behaviors. Some reports suggest that depression and anxiety have a detrimental influence on adherence (29–32), whereas others have failed to find such an influence (33–35). Hostility and conscientiousness, however, two rather stable personality characteristics, have been shown in several studies to be associated with adherence. Hostile hypertensive patients reported skipping more doses of medication than individuals with lower hostility scores (31). Likewise, “conscientiousness” (defined as an individual’s determination, persistence, and ability to do what is necessary) has been reported to correlate with adherence (3,36,37).

The concept of “reasoned decision making” is also relevant. It is thought that patients have no reasonable option but to comply with the advice and instructions they receive. Donovan and Blake (38) point out that this concept of adherence may be irrelevant for patients who carry out a personal cost-benefit analysis, weighing the costs and risks of each treatment against the benefits as they perceive them. Patient perceptions and the personal and social circumstances within which they live are shown to be crucial to their decision-making. Thus, an apparently irrational act of non-adherence (from a physician’s point of view) may be a very rational action when seen from a patient’s point of view. This reasoning leads the authors to encourage the development of more open, cooperative physician-patient relationships (38). In a related discussion, Redelmeier et al. (39) describe patient strategies in which intuitive thought processes and feelings may lead individuals to make choices that are not ultimately in their best interests. Such strategies help to explain situations in which risk perceptions conflict with standard scientific analyses. The authors suggest that an awareness of how people reason is an important clinical skill.

Many patients are unaware of the extent of their deviation from therapeutic prescriptions. This is reflected in discrepancies between patient’s self-reporting of their treatment behaviors and monitored reports of those same behaviors (40). For these patients, it may be necessary to first raise their awareness of their behaviors. Alternatively, it may be necessary for providers to present greater detail and specificity in instructions. Another important factor is the prevalence of multiple co-morbidities, leading to treatment regimens that are particularly complex. Among the older population, the occurrence of co-morbid conditions is high (41). Indeed, the risk of poor adherence is higher among persons with three or more co-morbid conditions (42). A common example is a patient with type II diabetes, hypertension, and hyperlipidemia.

Patients need knowledge and skills such as problem-solving, self-monitoring, developing self-prompting and reminder systems, setting appropriate and realistic goals, rewarding new behaviors, and identifying lapses (43–46). As discussed subsequently (and presented in Table 1), health care providers can help patients identify the strategies and skills needed and assist patients in building these skills.

**The provider’s role in adherence.** There is substantial evidence that brief provider interventions can have a significant positive effect on patients’ adherence to a plan and maintenance of changes in health behaviors such as smoking, diet, and alcohol use (18,47,48). A physician or nurse can also assist a patient to identify strategies that enhance adherence to a prescribed regimen. However, caregivers are often too busy to follow up patients optimally. In this context, a reminder system and a team approach can provide assistance. The collective efforts of the multidisciplinary team also provide the kind of social support (49) that plays an important role in influencing adherence behaviors (50,51) and patient satisfaction with care, a significant predictor of adherence to prescribed regimens (52).

**The systems-based factors that affect adherence.** The system within which health care providers work, by either providing or not providing a supportive environment that facilitates providers’ adherence-related activities, can markedly alter the likelihood that physicians or nurses will perform the necessary activities (e.g., prescribing appropriate medication and providing patient-centered counseling on the use of medication or lifestyle change) (53). Likewise, systems can help facilitate adherence by providing support from other health care professionals (e.g., pharmacist support) and other resources (e.g., databases, tracking systems, algorithms, prompts, and handouts) (47,54). Approaches to the problem of adherence that are restricted to the patient level or the provider level alone are not likely to yield as successful an outcome as those that also engage the entire framework within which the provider-patient interaction takes place (15). As pointed out by Koeck (55), “if care is to be of higher quality and lower cost, the key to improvement lies in better organizational structures and processes.” A final system-based factor is cost itself. This is particularly true for the cost of medications and for refill policies. Lack of coverage, high co-payments, and frequent refill requirements are all powerful adherence disincentives.
Healthcare organizations must adopt systems to rapidly and efficiently incorporate innovation into medical practice. Patients must communicate with providers about prevention and treatment services. Patients must engage in essential prevention and treatment behaviors. Several conceptual theories and models of health behavior change and intervention underlie approaches to adherence. These models were developed to explain various aspects of human behavior and have been shown to be predictive of response to behavioral interventions. They include the Stages of Change Model (56), the Health Belief Model (57), Social Cognitive Theory (58,59), the Relapse Prevention Model (60,61), and Social–Ecological Models (62,63), each of which is briefly described below.

Over the last decade, the Transtheoretical Stages of Change Model has been applied in research and practice initiatives focused on individual-level behavior change in adults, adolescents, and children (56,64–66). Stages-of-change theory reflects the stages of any behavioral intervention process: pre-contemplation (individual is not thinking about changing the targeted behavior); contemplation (individual is considering but is not yet ready to engage in behavior change); preparation (individual intends to take action in the next month); action (individual begins the actual process of behavior change); and maintenance (individual develops and implements strategies to prevent relapse). This model has also been applied in conjunction with other theoretical approaches, including the social cognitive theoretical model (SCT) and its components (67,68). Clinicians are taught that because change occurs over several stages, that by correctly targeting their intervention assistance, they can move the pre-contemplator to contemplation.

### Table 1. Actions to Increase Adherence to Prevention and Treatment Recommendations

<table>
<thead>
<tr>
<th>Patients must engage in essential prevention and treatment behaviors.</th>
<th>Specific Strategies</th>
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<tr>
<td>- Decide to control risk factors.</td>
<td>- Understand rationale, importance of commitment.</td>
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<td>- Negotiate goals with provider.</td>
<td>- Develop communications skills.</td>
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<td>- Develop skills for adopting and maintaining recommended behaviors.</td>
<td>- Use reminder systems.</td>
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<td>- Monitor progress toward goals.</td>
<td>- Use self-monitoring skills.</td>
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<td>- Resolve problems that block achievement of goals.</td>
<td>- Develop problem-solving skills, use social support networks.</td>
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<td>Patients must communicate with providers about prevention and treatment services.</td>
<td>- Define own needs on basis of experience.</td>
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<td>- Provide tracking and reporting systems.</td>
<td>- Validate rationale for continuing to follow recommendations.</td>
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<td>- Provide education and training for providers.</td>
<td>- Provide continuous quality improvement training.</td>
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<td>- Develop computer-based systems (electronic medical records).</td>
<td>- Implement pharmacy patient profile and recall review systems.</td>
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<td>- Incorporate behavioral strategies into counseling.</td>
<td>- Use electronic transmission storage of patient's self-monitored data.</td>
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<td>Providers must document and respond to patients' progress towards goals.</td>
<td>- Obtain patient data on lifestyle behavior before visit.</td>
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<td>- Create an evidence-based practice.</td>
<td>- Provide training in behavioral science, office set-up for all personnel.</td>
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<td>- Assess patient's compliance at each visit.</td>
<td>- Use preappointment reminders.</td>
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<td>- Develop reminder systems to ensure identification and follow-up of patients' status.</td>
<td>- Use telephone follow-up.</td>
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<tr>
<td>Providers must foster effective communication with patients.</td>
<td>- Use self-monitoring skills.</td>
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<td>- Provide clear, direct messages about importance of a behavior or therapy.</td>
<td>- Use reminder systems.</td>
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<td>- Include patterns in decisions about prevention and treatment goals and related strategies.</td>
<td>- Use active listening.</td>
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<tr>
<td>- Incorporate behavioral strategies into counseling.</td>
<td>- Develop multicomponent strategies (i.e., cognitive and behavioral).</td>
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<tr>
<td>Healthcare organizations must</td>
<td>- Develop incentives tied to desired patient and provider outcomes.</td>
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<tr>
<td>- Develop an environment that supports prevention and treatment interventions.</td>
<td>- Incorporate nursing case management.</td>
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<tr>
<td>- Provide tracking and reporting systems.</td>
<td>- Implement pharmacy patient profile and recall review systems.</td>
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<tr>
<td>- Provide education and training for providers.</td>
<td>- Use electronic transmission storage of patient's self-monitored data.</td>
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<tr>
<td>- Provide adequate reimbursement for allocation of time for all healthcare professions.</td>
<td>- Obtain patient data on lifestyle behavior before visit.</td>
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### COUNSELING AND THEORETICAL MODELS

Several conceptual theories and models of health behavior change and intervention underlie approaches to adherence. These models were developed to explain various aspects of human behavior and have been shown to be predictive of response to behavioral interventions. They include the Stages of Change Model (56), the Health Belief Model (57), Social Cognitive Theory (58,59), the Relapse Prevention Model (60,61), and Social–Ecological Models (62,63), each of which is briefly described below.

Over the last decade, the Transtheoretical Stages of Change Model has been applied in research and practice initiatives focused on individual-level behavior change in adults, adolescents, and children (56,64–66). Stages-of-change theory reflects the stages of any behavioral intervention process: pre-contemplation (individual is not thinking about changing the targeted behavior); contemplation (individual is considering but is not yet ready to engage in behavior change); preparation (individual intends to take action in the next month); action (individual begins the actual process of behavior change); and maintenance (individual develops and implements strategies to prevent relapse). This model has also been applied in conjunction with other theoretical approaches, including the social cognitive theoretical model (SCT) and its components (67,68). Clinicians are taught that because change occurs over several stages, that by correctly targeting their intervention assistance, they can move the pre-contemplator to contemplation.
tion and the contemplator to action. Thus, patients in the action stage respond well to forceful encouragement and support, whereas a patient in the pre-contemplator stage is likely to be antagonized by an overly forceful approach—in such individuals the provision of information and a low-key approach is more likely to be fruitful. It is helpful to remind health care professionals and patients of this process so that neither becomes discouraged or alienated from the other.

The SCT model has been applied in both individual and population-based behavior change strategies focused on primary and secondary prevention of CVD across the life span (69–72). It emphasizes interpersonal, cognitive, and environmental influences on behavior and incorporates methods of behavior modification. The basic components of SCT as applied to CVD-related behavior change strategies (on an individual level) include self-monitoring and analysis of behavior, self-management (including stimulus control of external cues), behavioral skill training, replacement of health-compromising behaviors with health-promoting behaviors, and reinforcement of newly acquired desirable behaviors. Self-efficacy, the individual's confidence in performing a particular behavior, is an important SCT-related construct that has been associated with motivation to engage in health-promoting behaviors in adolescents and adults (59). The utility and effectiveness of SCT-derived strategies has been supported in a recent comprehensive review of the empirical literature focused on adherence across four regimens of cardiovascular (CV) risk reduction, including pharmacological therapy, exercise, nutrition, and smoking cessation (73). Specifically, SCT-derived (and other theoretically-based) strategies demonstrated to be successful in improving adherence to CVD-prevention regimens include: signed agreements (written contracts between patient and physician–provider); behavioral skill training (formal and informal teaching-learning sessions focused on patient acquisition of specific skills necessary to change behaviors); self-monitoring (maintaining a written record/log of baseline levels and changes over time in behavior[s targeted for change]); self-efficacy enhancement (strategies designed to increase patient confidence in the ability to engage in a particular behavior, such as counseling small steps that enhance self-efficacy); spouse and/or social support (inclusion of patient's spouse or significant other in the plan for behavior change using principles of direct modeling of health behaviors [e.g., smoking cessation] and reinforcement); telephone/mail contact and external cognitive aids (follow-up reminder letters of scheduled or missed appointments and medication refills).

As emphasized by Burke et al. (73) in the above-cited review, even in well-controlled and monitored clinical trials that incorporated theoretically-derived strategies, adherence is less than optimal and there are significant discrepancies between adherence rates reported in clinical-trial and clinical-practice settings. Although the efficacy of CVD risk reduction programs is well established by clinical trials, the extent to which primary and secondary prevention is effective in practice depends largely on adherence. Furthermore, approximately 50% of individuals discontinue participation in secondary prevention programs (cardiac rehabilitation) within the first year; thus, a critical time-period for targeting adherence-promoting strategies is early in the course of treatment. While promotion of long-term adherence is a multilevel, multi-systems challenge, on the individual-patient level, the sustained application of SCT and other related strategies by physicians and other health care providers is associated with improved adherence rates and treatment outcomes.

On a population level, components of SCT have been successfully applied to community and school-based CV health promotion focused on tobacco use, nutrition, and physical activity behaviors. The multi-center Child and Adolescent Trial for Cardiovascular Health (CATCH) emphasized the environmental components of SCT as they relate to interventions focused on changing the school health and physical education curricula, school food service, policies for school tobacco use, and structured activities for families of CATCH students. The versatility and short-term effectiveness of SCT-derived school-based environmental interventions was demonstrated.

All of these models can be incorporated in a patient-centered counseling approach, a style of engaging patients that has been shown to be efficacious when used to assist patients in developing and adhering to treatment plans for risk-behavior change (e.g., smoking, high-fat diet, and high-risk alcohol use) (47,48,54). This approach uses telephone counselors to help treat patients for smoking (74,75) and nutritionists to help patients make dietary change. Patient-centered counseling also responds to recommendations emphasizing the need for providers to use open-ended questions to engage patients in decision making (38,39). It encourages health care professionals to ask patients about their perception of risk and to help them weigh costs and benefits of change or of adherence to a regimen. Patient-centered counseling is also designed to be time-efficient. This model uses questions related to five content areas: 1) desire and motivation to change behavior; 2) past experiences with the behavioral change; 3) factors that inhibit the change (barriers/impediments); 4) resources for change (strengths); and 5) the plan for change and follow-up. It emphasizes the use of past experiences of change to help patients develop motivation and positive self-efficacy. As in the Health Belief Model, patient-centered counseling addresses an individual's beliefs regarding the perceived risk associated with certain behaviors, his or her vulnerability to worsening disease, and the taking of action to change behavior in order to decrease the risk.

Principles of the Relapse Prevention Model (60,61) are also important in counseling. They include stressing the need to recognize cues and characteristics of high-risk situations (assessment skills) and to develop specific skills (e.g., communication, initiation of support, stress manage-
ment) to mobilize a coping response to promote behavioral change.

Intervention at the level of the health care system, no matter how well delivered, does not account for the influence of the larger society within which we all live. Maintaining healthy behaviors over time (e.g., during the transition from the school-age years to adolescence and into adulthood, or over many years of disease-free life) requires system changes that go beyond the family and school level. Social-ecological models that address multilevel system changes have recently been advocated to address this goal (62,63,76,77).

Ecological frameworks recognize that behavior is affected by several levels of influence including: intra-personal factors (e.g., motivation, skills, knowledge); interpersonal processes (e.g., social support, social network, social norms); institutional or organizational factors (e.g., school and/or workplace policies); community factors (e.g., social capital and neighborhood effects); and public policy (e.g., regulatory laws and tobacco taxes). By definition and design, ecological models suggest that interventions must be directed at all of these factors. Central to each of the ecological frameworks that have recently emerged across disciplines is the importance of social context. In relation to adherence and CVD-prevention strategies, ecological models strongly suggest that interventions be focused beyond the individual patient, provider, and respective system of health care. A systematic integration of social, governmental, and policy-level factors into behavior-change interventions within communities is suggested as one ecologically-derived approach. Thus, for example, increasing physical activity in urban areas requires at least safe streets and adequate parks, recreation areas and lighting. Ultimately improving health may require societal interventions such as the redesigning of streets and elimination of drive-up windows—changes not amenable to patient, physician, or medical-system intervention. Even beyond this, there are powerful societal trends whose recourse seems difficult to envision. An example of such trends is described by Philipson and Posner (78), who note that over a period of many decades in the U.S., food, which used to consume a large part of a family’s budget, has become very cheap (a few dollars will buy a day’s worth of high-fat calories at a fast food restaurant), whereas physical activity, once something most adults were paid to do (because most jobs were physically demanding) has become quite expensive, either literally as dollars spent or as time, an equally valuable commodity for many people.

Optimally, approaches in individual-level behavior change should be integrated within population-based approaches that take into account the ecologic framework within which the intervention is planned to occur and should be linked across delivery channels. Thus, CVD-prevention programs offered through an individual’s employee benefits programs could be promoted through interventions at the workplace. These, in turn, could be linked to local and statewide preventive efforts through departments of health. By design, these initiatives in prevention would require policy changes on a number of levels, including the workplace. Early in 2001, the White House issued an executive memorandum directing agencies to review, revise, and establish policies as necessary to maximize federal employees’ participation in agency-sponsored preventive health activities. The directive included the formulation of a policy providing for excused absences each year for participation in preventive health screenings.

GENERAL STRATEGIES FOR INCREASING ADHERENCE

Strategies for increasing adherence with prevention and treatment recommendations have been studied over the past twenty-five years. As discussed before, recent literature supports a multilevel approach, including an emphasis on patients, providers, and systems and health care organizations (15,79). Effective interventions use a variety of behavioral, cognitive, and educational strategies. On the patient level, skills such as problem-solving, self-monitoring, developing prompts or reminder systems, identifying a risk for relapse to a former behavior, enlisting social support, setting appropriate and realistic goals, and rewarding achievement of new behaviors are useful in a variety of situations (15). Adherence is augmented the most when a combination of strategies is used.

As a first step, the patient must recognize that adherence is a problem. This will be obvious when the patient has completely stopped treatment or a component of treatment. However, it is more common for a patient to adhere only variably and be unwilling to report the variability or unaware to what extent this is a problem. For patients not having the desired treatment outcome (e.g., a lower blood pressure [BP] after being prescribed an antihypertensive agent) and who deny adherence problems, it can be very useful to review refill records or at least have the patient bring in the medication containers so that refill dates can be reviewed. Other options such as electronic monitors or electronic diaries can be of value if they are available. Medication, exercise, diet, and glucose monitoring can all be examined by using such technologies.

Once adherence problems have been identified, effective communication between patients and health care providers is essential and forms the basis for the actions and strategies detailed in Table 1. Providers, including physicians, nurses, pharmacists, health educators, nutritionists, and psychologists, may promote adherence through education, motivation, monitoring, and feedback. Evidence supports the use of the following:

- simplifying the regimen
- tailoring the regimen to the patient’s lifestyle and needs
- asking the patient about adherence at every visit
- having the patient bring in medication containers and reviewing them together, with attention to renewal dates as a marker of adherence
● involving the patient as a partner in the treatment process
● providing clear written and oral instructions
● using behavioral strategies such as reminder systems, cues, self-monitoring, feedback, and reinforcement.

Additional training may be needed to enable providers to offer effective counseling for interventions. Examples of this would be strategies developed for smoking cessation and nutritional change (80, 81). In general, considering a patient’s level of change and need to improve self-efficacy, counseling should often take a gradual step-by-step approach to improving adherence, particularly when the patient needs to adhere to recommendations in several areas. However, individuals such as Dean Ornish (82) have argued that for many patients, particularly those in secondary prevention mode, a better response can be obtained by challenging her or him to make large changes that produce measurable beneficial results, not only in terms of laboratory measurements but also in terms of symptoms. This has been demonstrated in studies such as the Multicenter Lifestyle Demonstration Project (82), in which an intensive multifactorial intervention of comprehensive lifestyle change was studied as a direct alternative to revascularization in selected patients. In this study, 77% of the experimental group of patients were able to avoid revascularization for at least three years without increasing cardiac morbidity or mortality. The patients reported reductions in angina comparable to that of which could be achieved with revascularization. Such an approach can be very fruitful when applied to appropriately motivated patients (82, 83).

Telephone counseling (TC) can be an important adjunct to direct counseling and is an effective mechanism for the simultaneous addressing of educational, psychosocial, and practical barriers to adherence (84). An important study of the adjunctive use of TC to aid risk-factor management in patients with CHD was carried out by DeBusk et al. (85). They developed a physician-directed, nurse-managed, case management system for risk-factor modification and, in a randomized controlled trial, compared the results with those of usual medical care. The intervention was done on smoking, nutrition, exercise, and lipid-lowering therapy and showed significant improvement in several areas of lifestyle behavior. Another study supporting the efficacy of TC was designed to improve the dietary self-care of diabetics (86). Patients received TC calls 1 week and 3 weeks after their physician visit, in combination with immediate computer-generated feedback, a 20-min meeting with an intervention staff member, a copy of a mutually developed goal-setting/strategy worksheet, a self-help pamphlet in which sections relevant to their goal had been highlighted, and videos aimed at enhancing self-efficacy. This brief intervention resulted in significant differences in cholesterol levels at the three-month follow-up.

There is substantial support for TC in smoking intervention. Ockene et al. (75, 87) demonstrated a significant improvement in smoking cessation rates when a TC protocol was used to counsel smokers with CHD. Orleans et al. (88) found that TC intervention increased the use of self-help materials, and yielded significantly higher short- and long-term cessation rates. Likewise, in a study by Lando et al. (89) the use of two TC calls (averaging less than 15 min each) led to significant differences in validated six-month cessation rates. A meta-analysis of TC for smoking cessation also supports the effectiveness of counseling calls both at short- and long-term follow-up (90). In one cited study, there was a dose-response effect, with six calls being more effective than one, which was in turn more effective than written materials. Telephone counseling calls have been well received in a number of studies (54, 75, 91, 92).

Health care organizations can influence the provision of preventive and treatment services through the establishment of tracking and reporting systems, the provision of educational and training programs, and the appropriate reimbursement of providers (15). The ability to incorporate innovations into medical practice has also been associated with changes in practice behavior and positive patient outcomes (80, 85). Professional and governmental organizations have established web sites to disseminate valuable information and tools for patients, health care professionals, and health care organizations to assist in developing and maintaining successful health programs. The AHA (www.americanheart.org) Compliance Action Program includes AHA Guidelines, a Patient Tracking Form to track CVD risk factors for patients, risk-factor patient information sheets, and many other resources. The AHA has also launched a robust, web-based, tailored behavior-change program called “My Heart Watch” (http://www.myheartwatch.org) as well as several sites for specific risk factors such as elevated cholesterol and physical inactivity. Web sites of the individual institutes that comprise the National Institutes of Health (NIH) provide a remarkable array of resources. The National Heart, Lung, and Blood Institute (NHLBI) (http://nhlbi.nih.gov), can be accessed for instruments to manage risk factors, including hypertension, hypercholesterolemia, and obesity. In addition, The National Diabetes Education Program (http://ndep.nih.gov/), a partnership of the NIH, the Centers for Disease Control and Prevention, and over 200 public and private organizations, offers information on diabetes control.

**RISK-FACTOR-SPECIFIC STRATEGIES AND RESOURCES FOR INCREASING ADHERENCE**

**Smoking.** There are many effective approaches for smoking cessation. One is the Patient Centered Counseling Program developed by Ockene et al. (54). Another is detailed in the “Quick Reference Guide for Smoking Cessation Specialists” (18).

Briefly, approaches for smoking cessation should include the following:
● Ensure that all persons are aware of the health hazards of cigarette smoking by using posters/handouts in the waiting room.

● Query all persons regarding their smoking habits on every visit.

● Explore barriers to and resources for smoking cessation.

● Provide targeted and negotiated counseling according to a patient’s level of knowledge, stage of readiness for change, and assessment of resources/barriers.

● Consider the use of smoking cessation aids that have proven useful in the setting of a counseling approach: nicotine-containing patches, gum, or inhalers; buproprion.

● Schedule follow-up visits to discuss a patient’s progress in addressing smoking cessation.

Hypertension. One risk factor for which adherence to medication-taking has improved, although it is not yet optimal, is hypertension. Evidence-based recommendations exist to guide the provider (93,94). Programs in which multidisciplinary teams address patients’ beliefs and concerns and provide follow-up, feedback, and free medication if needed are the most successful. Practitioners should follow The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (JNC VI) guidelines for the detection, evaluation, and treatment of persons with high BP (93).


These can be summarized as follows for all patients:

● Briefly assess dietary intake of saturated fat and cholesterol.


● Provide shopping and food preparation pamphlets/handouts highlighting low-saturated fat foods, including reduced-fat dairy products, leaner meats, lower-fat ground meat, and reduced-fat baked goods.

● Make full use of office personnel to promote public health message.

The following summary is for hyperlipidemic patients:

● Consider readiness to change and level of motivation.

● Promote ATP III therapeutic lifestyle changes diet using individualized diet counseling that provides acceptable substitutions for favorite foods contributing to a patient’s elevated LDL level—counseling often best performed by a registered dietitian.

● Reinforcement of dietary principles during follow-up visits at which LDL response to diet is assessed.

Obesity. A practical guide for the “Identification, Evaluation, and Treatment of Overweight and Obesity in Adults,” www.nhlbi/cardiovascular/obesity, is an evidenced-based report designed to assist health care practitioners in providing patients with the direction and support needed to lose weight and maintain the weight loss. Ten suggested steps for treating overweight and obesity in the primary care setting follow:

1. Measure height and weight.
3. Assess co-morbidities.
4. Should your patient be treated?
5. Is the patient ready and motivated?
6. Which diet should you recommend?
7. Discuss a physical activity goal.
8. Review the Weekly Food and Activity Diary.
9. Give the patient copies of the dietary information.
10. Enter the patient’s information.

The most significant problem in the treatment of individuals who are overweight or obese, but who have lost weight, is the maintenance of behaviors that led to the weight loss (96,97). Several studies have focused on strategies for improving the maintenance of weight loss. A review of the strategies shown to be effective in enhancing long-term weight maintenance was reported by Burke (98). Ongoing contact between a health care professional and a patient yielded the most consistent improvement in maintenance. Ensuring that the individual incorporates regular physical activity into the weight loss program is also essential for long-term success. Individuals who had strong social support while participating in a weight loss treatment program showed improved adherence to the program and greater weight loss and maintenance than those who were pursuing treatment alone (99). These strategies highlight the need to view the treatment of obesity in the context of a chronic disorder, similar to hyperlipidemia, wherein an individual needs ongoing follow-up, evaluation, and reinforcement.

Diabetes. Numerous resources are available to assist patients, providers, and organizations, including work-sites in the control of diabetes (http://ndep.nih.gov/materials/pubs/making-a-difference/making-a-difference.pdf). For diabetic patients, the recommendations listed under the obesity, physical activity, and diet headings are especially pertinent.

Physical activity. Programs to promote physical activity are available and feasible. Prochaska et al. (100,101) describe a particularly interesting program using interactive health communication technologies designed to promote physical activity and healthy nutrition for adolescents and adults that can be incorporated into clinical settings (Patient-centered Assessment and Counseling for Exercise plus Nutrition [PACE+] programs). At a minimum, phy-
that progress has been quite variable. On the simplest level, the Medication-taking behavior. On the simplest level, the provider should always ask about adherence to medication and should encourage patients to bring in medication containers for a review of refill dates. If available, use of an electronic medication event monitoring system provides unobtrusive monitoring of day and exact time of medication-taking events and provides more reliable information about adherence than pill counts or self-reporting. Selected strategies identified in Tables 1 and 2 are also applicable to medication-taking behavior.

**SUMMARY AND FUTURE DIRECTIONS**

In the past decade, considerable attention has focused on the central and essential role of adherence as it relates to primary and secondary prevention of CVD. Although adherence awareness and recognition of the need for multilevel approaches have increased, accumulated data suggest that progress has been quite variable—particularly with adherence to preventive interventions. This is true despite growing evidence regarding the efficacy of preventive and therapeutic regimens designed to reduce the risk and burden of CVD. Our most impressive achievements have been in smoking cessation, and considerable progress has also been made in controlling high BP and reducing the population’s intake of fat and saturated fat. On the other hand, the percentage of the population that is obese continues to rise, and average physical activity levels continue to decline. In addition, there is substantial evidence that individuals are substituting sugar for fat in their diet. Perhaps as a consequence, there is an epidemic of diabetes. As Claude Lenfant, Director of the NHLBI has noted, “the real challenge of this new millennium may indeed be to strike an appropriate balance between the pursuit of exciting new knowledge and the full application of strategies known to be extremely effective, but considered underused” (102).

Adherence-enhancing research, focused on all three levels—the patient, the provider, and the system—has been increasingly emphasized over the past decade. This line of inquiry has contributed important knowledge to our understanding of patient and provider behaviors as well as issues embedded within our health care system. Although there is controversy regarding targeted areas for future adherence research, there is also consensus regarding the need to disseminate and apply in practice the multilevel strategies associated with adherence-enhancement. Achieving a long-term solution will require more emphasis on the multilevel contexts that influence the development and maintenance of prevention-related health behaviors. To achieve the CVD-prevention goals on a population level, mechanisms for the systematic integration of social, health, governmental and policy-level factors must be added to individual-level approaches.

**Table 2. Strategies Demonstrated to Be Successful in Improving Compliance to Cardiovascular Disease Prevention Regimens**

<table>
<thead>
<tr>
<th>Strategy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signed agreements</td>
</tr>
<tr>
<td>Behavioral skill training</td>
</tr>
<tr>
<td>Self-monitoring</td>
</tr>
<tr>
<td>Telephone/mail contact</td>
</tr>
<tr>
<td>Spouse support</td>
</tr>
<tr>
<td>Self-efficacy enhancement</td>
</tr>
<tr>
<td>Contingency contracting</td>
</tr>
<tr>
<td>Exercise prescription: frequent short periods</td>
</tr>
<tr>
<td>External cognitive aids: appointment reminder letter; follow-up letter for missed appointments; medication refill reminder, unit-of-use packaging, medication reminder chart</td>
</tr>
<tr>
<td>Persuasive communication</td>
</tr>
<tr>
<td>Convenience: work site clinic (nurse-managed)</td>
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<tr>
<td>Nurse-managed intervention</td>
</tr>
<tr>
<td>School-based food service program plus education</td>
</tr>
</tbody>
</table>


