Although mortality rates from cardiovascular disease (CVD) declined by 26% from 1995 to 2005, it remains the leading cause of death for US adults. The American Heart Association (AHA) set a 2020 impact goal to “improve the cardiovascular health of all Americans by 20% while reducing deaths from CVD and stroke by 20%.” To this end, the AHA recommended prevention as a first-line strategy and identified “life’s simple seven,” lifestyle behaviors and risk factors described in Table 1, which, if appropriately followed or adhered to, will improve cardiovascular health.

Adherence refers to the extent to which patient behaviors align with clinical recommendations. The prevention behaviors offered by the AHA can be categorized as follows: (1) lifestyle behaviors, (2) screening, and (3) medication use. Lifestyle behaviors include a healthy diet, maintaining a healthy weight, engaging in physical activity, and not smoking. Screenings include those for blood pressure, lipid levels, and diabetes mellitus. Medication use refers to over-the-counter medications such as aspirin and prescription medications such as lipid-lowering agents and antihypertensive medications.

Adherence to preventive therapies is suboptimal. For example, only 5% of adults engage in the recommended amount of physical activity. In comparison, about 43% of adults with a history of CVD or equivalent CVD risk take statins and 57% of adults 25 years old had their cholesterol tested at least once in the past 5 years. High-risk lifestyle behaviors are most prevalent in populations with limited income and education, ethnic/racial minority populations, and in low-income communities. The challenge is even more complicated because having multiple risk factors is common. A 2001 National Health Interview Survey reported a clustering of smoking, obesity, physical inactivity, and excessive alcohol intake (41% of US adults had 2 and 17% had 3). Increased adherence to preventive therapies would greatly improve cardiovascular health, leading to reduced health disparities and healthcare costs.

Adherence to Preventive Therapies for Cardiovascular Health Is a Complex Process Influenced by Multiple Factors

To improve adherence to preventive therapies, we must first understand the multiple levels that influence adherence. Within the healthcare system, adherence to preventive therapies is affected by patients, clinicians, and systems. The Expanded Chronic Care Model (ECCM), an adaptation of the original CCM, provides a helpful framework for understanding how to integrate healthcare system–based approaches with community-based health promotion efforts. The ECCM contains 3 components: (1) self-management, (2) delivery system design, (3) decision support, and (4) information systems. The ECCM added 3 components relevant to the community: (1) building public health policy, (2) creating supportive environments, and (3) strengthening community action (Figure 1).

We review each of the components of the ECCM and provide examples of how they can be implemented to improve adherence to preventive therapies (Table 2).

Self-management refers to an individual’s ability to manage their preventive health behaviors with an emphasis on building skills and capabilities. A successful self-management program recognizes and addresses individual and social determinants affecting an individual’s ability to develop skills and capabilities and to perform behaviors. Specific social determinants such as race, ethnicity, or educational level should be addressed in self-management programs by tailoring interventions to a specific group.

Delivery system design involves expanding the focus of the healthcare system to support delivery of health care and health promotion in communities. The original CCM focuses on providing clinical care using a team-based approach and expanding care to include preventive behaviors. Individual determinants include psychosocial factors such as negative emotional states (eg, depression) and stressors that adversely affect the development of CVD, the prognosis of patients with CVD, and adherence to preventive therapies. Specific social determinants such as race, ethnicity, or educational level should be addressed in self-management programs by tailoring interventions to a specific group.

The challenge is even more complicated because having multiple risk factors is common. A 2001 National Health Interview Survey reported a clustering of smoking, obesity, physical inactivity, and excessive alcohol intake (41% of US adults had 2 and 17% had 3).
Healthy body weight

Body mass index

Non-drug treated blood pressure

Non-drug treated total cholesterol level

Non-drug treated fasting glucose level

Healthy diet

4.5 or more cups of fruit/vegetables daily; 2 or more 3.5-oz servings of fish/wk; \( \leq 450 \text{ kcal} \) of sugar-sweetened beverages/wk; 3 or more 1-oz servings of fiber-rich whole grains/d; \( < 1500 \text{ g sodium/d} \)

Source: the American Heart Association.

*In the context of a diet that is appropriate in energy balance, pursuing an overall dietary pattern that is consistent with a DASH (dietary approaches to stop hypertension)-type eating plan, including but not limited to these 5 dietary goals.

Information systems, created by linking healthcare systems and community initiatives, can generate data to understand a community’s needs, barriers, and resources, which are critical for making informed healthcare system changes and for justifying, developing, and implementing programs to meet community prevention needs. Beginning in 2012, the Internal Revenue Service (Section 5013) will require that nonprofit hospitals conduct community needs assessments in collaboration with community stakeholders and community members every 3 years. Collection of data on assets and resources within a community can identify opportunities for building successful health initiatives, including school curriculum refinements, community organization programs, and service delivery reform. Close collaboration with community leaders and partnering with community members in assessment implementation are key.17 Electronic health record systems and their attendant databases can provide real-time information on delivery of preventive services and cardiovascular risk factors, easily identify community-based assets and services, and allow the identification and tracking of priority problems.

Building public health policy is necessary to address system-level barriers and implement environmental changes that facilitate adherence. For example, the cost of preventive therapies is a significant obstacle to adherence, as evidenced by CVD prevention studies linking higher medication copayments with higher rates of nonadherence and discontinuation of statin medications.18,19 Health insurance policy changes that result in decreases in costs to patients and reimbursable services for time spent addressing preventive therapies for providers may improve adherence. Larger-scale public health policies also may help. Substantial effort and collaboration with community, political, and healthcare leaders is required to develop and implement effective public health policy. There is also a role for researchers as sources of evidence-based information to inform policies.

Creating supportive environments can improve adherence to preventive therapies. The first step is to understand how a community’s environment can help or hinder preventive behaviors through systematic assessment of environmental factors that impact lifestyle behaviors such as access to sidewalks and parks, access to stores that sell healthy foods versus fast food restaurants and convenience stores, and urban design and safety.20 Following the assessment, altering the built environment requires collaboration with government agencies at multiple levels, such as in zoning, food regulatory services, urban planning, transportation, and parks/recreation. The American Recovery and Reinvestment Act of 2009 allocated $650 million to the CDC for Communities Putting Prevention to Work to reduce obesity and smoking by mobilizing resources for policy, systems, organizational, and environmental changes (see http://www.cdc.gov/chronicdisease/recovery/).

Strengthening community action advocates for empowering communities to participate in the improvement of population health, is critical to success.21 Since 2003, the Healthy Communities Program of the CDC has funded >230 communities nationwide through 4 major initiatives. The goal is to provide funding coupled with evidence-based tools, strategies, and training that will build community capacity to create policy, systems,
Table 2. The Expanded Chronic Care Model: Key Design Elements and Steps for Implementation

<table>
<thead>
<tr>
<th>Components and Design Elements</th>
<th>Implementation</th>
<th>Examples</th>
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<tbody>
<tr>
<td>Self management</td>
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<tr>
<td>Address individual determinants of health</td>
<td>Assess deficits in knowledge and health behavior</td>
<td>Programs for stress management, diet and exercise counseling in the community or healthcare system</td>
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<tr>
<td></td>
<td>Develop programs that address these deficits</td>
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<tr>
<td></td>
<td>Promote and provide specific programs to address wellness and coping with disease</td>
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<tr>
<td>Address social determinants of health</td>
<td>Assess the community that the institution serves on SES, race/ethnicity, country of origin, etc.</td>
<td>Lay health advisors to improve preventive behaviors in diverse populations</td>
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<td></td>
<td>Identify ways to improve utilization by patients with health disparities</td>
<td>After-school physical activity programs in low SES areas</td>
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<td></td>
<td>Identify system and community policies to address social determinants of health</td>
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<td></td>
<td>Involve policymakers in the discussion of potential policy changes</td>
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<tr>
<td></td>
<td>Implement policy changes</td>
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<tr>
<td>Delivery system design</td>
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<tr>
<td>Link healthcare system to community</td>
<td>Increase presence of the healthcare system in the community</td>
<td>Encourage providers to volunteer</td>
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<td></td>
<td>Implement mechanisms to link clinical offices to community activities</td>
<td>Sponsor wellness fairs at businesses and community events</td>
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<td>Increase focus and advocacy on prevention</td>
<td>Emphasis of prevention by key healthcare system leadership</td>
<td>Reimburse preventive services</td>
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<td></td>
<td>Advocate and educate providers about the importance of prevention</td>
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<td></td>
<td>Advocate for importance of patient-reported outcomes in the EHR and the use of the EHR for clinical and community determinants of health</td>
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<td>Decision support</td>
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<td>Gather information on diseases and treatment and wellness</td>
<td>Understand and promote recommended treatment and prevention guidelines (eg, USPSTF guidelines)</td>
<td>Implement and use EHR to manage patient information and remind providers of guidelines</td>
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<td></td>
<td>Assess barriers to implementing guidelines</td>
<td>Provide time for counseling and intervention</td>
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<td></td>
<td>Discuss strategies to address barriers with providers and staff</td>
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<tr>
<td></td>
<td>Design, implement, and test strategies for implementing treatment and prevention guidelines</td>
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<tr>
<td>Information systems</td>
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<td>Assess the healthcare system’s and community’s strengths and weaknesses</td>
<td>Conduct comprehensive assessment to understand risk factors, disease rates, and avoidance of preventive health services and inform programs and services</td>
<td>Use needs assessment data to target community-based prevention campaigns</td>
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<td></td>
<td>Use information to justify and develop programs for disease management and prevention</td>
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<tr>
<td>Revise the healthcare system</td>
<td>Create new programs in the healthcare system and the community</td>
<td>Provide information to facilitate changes to healthcare delivery and school curriculum to emphasize wellness and healthcare utilization</td>
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<td></td>
<td>Regularly evaluate the impact of these programs on health</td>
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<td>Build public health policy</td>
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<tr>
<td>Develop policies</td>
<td>Use existing literature to understand which policies are likely to affect change</td>
<td>Decrease medication copayments to increase adherence</td>
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<td>Collaborate with legislative and organizational leaders to develop policies</td>
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<td>Seek community feedback on potential policy changes</td>
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<td>Implement policies</td>
<td>Examine what aspects of the community facilitate the policy change and what aspects need to change</td>
<td>Policy reducing amount of trans fat allowed in food and posting calorie information in fast food restaurants</td>
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<td>Advertise and promote the policy change throughout the community</td>
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<td></td>
<td>Examine the impact of the policy</td>
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<td>Create supportive environments</td>
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<tr>
<td>Assess the environment</td>
<td>Conduct environmental scan of communities with high disease rates</td>
<td>Conduct GIS to assess environmental factors that contribute to obesity</td>
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<td>Meet with residents to discuss ways to improve their community</td>
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<tr>
<td></td>
<td>Meet with community leaders to discuss improvements</td>
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<tr>
<td>Enact environmental changes</td>
<td>Identify a plan for community improvements</td>
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<td></td>
<td>Monitor changes and impact on behavior</td>
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<tr>
<td></td>
<td>Widening bike lanes</td>
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<td></td>
<td>Smoke-free workplaces</td>
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<td></td>
<td>Trucks that bring healthy food to low SES neighborhoods</td>
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(Continued)
and environmental changes that improve population health (http://www.cdc.gov/healthycommunitiesprogram/). In this component, the healthcare system serves as a collaborative member of the community, advocating for policy changes and using its resources and capabilities to assist with establishing health priorities.

In summary, it is important to think broadly and consider all components of the ECCM to increase adherence to preventive therapies. Given the challenge of improving adherence to preventive therapies, a multitude of approaches conducted in both healthcare and community-based settings are warranted to improve population cardiovascular health.

**To Improve Adherence to Evidence-Based Therapies, We Must Improve Access, Increase Implementation and Translation, Improve Linkage of Services, and Increase Demand**

Evidence-based practice guidelines provide compelling support for the importance of clinical and community-based interventions to facilitate lifestyle behavior change, use of screening, and use of medication for CVD prevention. However, implementation of and adherence to preventive therapies are presently suboptimal. To close the gap between what burden of illness is avoidable and what we currently achieve through evidence-based preventive therapies, we propose 4 approaches that can be integrated into the ECCM: (1) improve access, (2) increase implementation and translation, (3) provide links between clinical and community-based therapies, and (4) increase patient demand and utilization (Figure 2).

**Improve Access to Evidence-Based Preventive Therapies**

Access to preventive therapies can be improved via all components of the ECCM. For example, a major barrier to preventive services is cost, both actual and perceived, and public health policies can address this barrier. The Affordable Care Act (ACA), represents a major step toward increasing access to preventive therapies by eliminating patient copayments for preventive services, including blood pressure screening, cholesterol screening, and diet counseling (http://www.healthcare.gov/law/about/provisions/services/lists.html).

Related to delivery system design, the ACA also supports the patient-centered medical home movement, which improves the coordination of care by creating community health teams to manage chronic disease and to “personalize, prioritize and integrate care to improve the health of whole people, families, communities and populations” (http://www.healthcare.gov/law/about/groups/disparities/index.html). Patient-centered medical homes also could improve access to preventive services by promoting the importance of maintaining a regular provider, because lack of consistent care is another major barrier to use of preventive therapies.

Patient-centered medical homes are beginning to be implemented, and initial results are promising. The National Demonstration Project examined 36 family medicine practices across the country and found that integration of patient-centered medical home components into practice resulted in improved access to care and patient receipt of preventive services 2 years after implementation.

For patients who do not seek routine health care, outreach strategies in nontraditional health settings or at opportunistic...
times such as during emergency room visits may improve access to preventive therapies.

Technology provides another way to improve access or extend the reach of preventive therapies to address the self-management component of the ECCM. Telehealth sessions (delivered via telephone, video, or Internet) offer a way to meet with patients who cannot attend clinic visits. Although effective, telehealth is not widely implemented, possibly because the cost effectiveness of this approach in reaching rural populations is equivocal and because patients may lack the necessary technology. The increasing popularity of voice-over-Internet Protocols (eg, Skype), which do not require specialized equipment, may reduce these barriers. As such initiatives increase, systematic evaluation plans must be included. Short-term measures that document population reach and quality of services delivered are needed, as are long-term assessments of population health metrics. This requires planning and resources, including investment in information technology services such as electronic health records and other databases to track information.

Increase Implementation and Translation of Preventive Therapies

The majority of research on promoting adherence to preventive therapies has focused on intervention development, including efficacy trials to establish internal validity and impact on outcomes under tightly controlled conditions. Establishing effectiveness of interventions in real-world settings such as a community, hospital, or clinic is difficult, and efficacious interventions are usually not translated into routine practice. This gap led the National Institutes of Health to prioritize research assessing implementation of efficacious guidelines and interventions into routine practice to improve treatment and outcomes. Implementation research is the scientific study of methods to promote the rapid uptake of evidence-based therapies that improve health.

McGlynn and colleagues observed that adults living in 12 metropolitan US areas received only 55% of indicated care according to 439 quality measures for 30 acute and chronic conditions and preventive services. This study highlights the major gap between evidence and practice in healthcare settings. Within healthcare settings, challenges to implementing an intervention include low support from administrators, differences in opinion among staff and administrators relative to what implementation should entail, ambiguous staff roles, poor clinician cooperation, and insufficient culturally relevant materials. Strategies from the decision support and information systems component of the ECCM could be used to address these challenges.

Efficacy-based interventions are often developed and tested in affluent populations with demonstrated motivation to make behavioral changes and not in low–socioeconomic-status populations and different racial and ethnic groups. To improve adherence, evidence-based programs must be tailored to address challenges specific to certain groups while still retaining the intervention’s core elements. A group’s specific challenges can be identified using qualitative research methods, such as the community needs assessments advocated by the information systems component of the ECCM.

One way to tailor interventions is to use community-based participatory research (CBPR) approaches, defined as "a collaborative approach to research that equitably involves all partners in the research process and recognizes the unique strengths that each brings." This approach is a highly collaborative effort where researchers engage the community by involving them in every stage of the intervention process with the goal of implementing a culturally focused effective intervention. A seminal research project, the Diabetes Prevention Project (DPP), demonstrated that an intensive state-of-the-art behavioral program (Lifestyle Program) was more effective at reducing diabetes risk than metformin and a placebo condition. However, implementing this protocol into practice is not feasible for many reasons, including cost and limited resources, and that the intervention was tested with motivated and well-educated patients. Many researchers have attempted to modify this protocol in a variety of settings, populations, and formats. Using a CBPR approach, our team successfully adapted the core behavioral strategies of the DPP Lifestyle Program to tailor the intervention for low-income Latinos. Whole-heartedly engaging the community partners was essential to the program’s success. To realize the potential of CBPR, greater investments are needed, including increased funding, training of academic researchers and community partners in CBPR approaches, lifestyle risk behaviors and behavior change, and healthcare systems by the National Institutes of Health and other funding agencies.

Link Clinical Interventions and Public Health Interventions

Population-wide health behavior change requires linking evidence-based clinical and community interventions. Linked systems are a key element of delivery system design and offer a win-win arrangement: Providers can have important information about their patients and their contexts, thus enabling better patient care; patients can obtain intensive and convenient support; and community resources can receive more referrals/clients and improve reach. Clinical and community interventions are often viewed as discrete when they should be viewed as synergistic and integratable. Use of electronic health records is an excellent way to link knowledge about individuals from both the clinical and community perspectives.

Guidelines for linking clinical and community interventions are needed. Several case studies provide guidance on how interventions can be linked. For example, the US Preventive Services Task Force and the Community Preventive Services Task Force issued recommendations for prevention and treatment of tobacco use. These were combined into the Treating Tobacco Use and Dependence: Clinical Practice Guideline and the 2007 Best Practices for Comprehensive Tobacco Control Programs of the CDC, which recommends integrated evidence-based clinical, community, and state programs and policies, including mass media campaigns, cessation interventions, smoke-free air laws, and tobacco tax increases.

An example of a statewide comprehensive coordinated program is the Massachusetts Tobacco Control Program. This program connected the activities of clinical settings, the media, community agencies, academic institutions, and local and state policymakers and was recognized by the CDC and
others as a best practice program from its inception in 1993 through 2002. During this time, Massachusetts showed a more rapid decline in smoking prevalence compared to 40 states lacking state programs.51 Linkage of clinical and community strategies needs substantial financial investment; supportive local, state, and federal policies; and appropriate training of clinical and community workforces.47

Increase Patients’ Demand for and Therefore Use of Preventive Therapies

Despite the availability of effective treatments, there is a gap in consumer demand for preventive therapies, which limits their use. Shiffman noted that the number of smokers quitting could be doubled by doubling consumer awareness of current tobacco treatments, equaling the public health gain of developing new treatments.52 He also noted, “Generating consumer interest in the demand for cessation treatment is essentially a marketing task.”52 To engage targeted groups, messages need to be framed so that they are appealing and comprehensible,53,54 and available resources, such as technology, should be used. Several studies show that using a social marketing approach can produce beneficial outcomes in prevention behaviors.55 These efforts make use of collaborations between healthcare organizations, public health agencies, government entities such as the CDC, and media.

However, collaborative marketing is beyond the expertise of the typical healthcare setting. Developing strong partnerships between the healthcare industry and consumer marketing companies is a needed step. Additionally, techniques advocated by the information systems component of the ECCM such as collection of data on community assets and resources can help ensure that the interventions implemented are informed by community needs.

We Can Improve Adherence to Preventive Therapies for Cardiovascular Health

Improving adherence to preventive therapies for cardiovascular health is attainable; however, reaching this goal is a complex process that requires multiple approaches in multiple sectors and financial investment. We describe 4 strategies consistent with the ECCM that can help improve adherence. The responsibility of adherence is often on the individual. However larger organizational, community, and societal efforts are critical to improving adherence, although challenging to implement. The Obama Administration’s support of prevention programs and policies that address societal context, coupled with an emphasis on translating evidence-based guidelines and interventions for diverse populations to routine practice in healthcare and community settings, provides an excellent foundation for improving adherence. The administration has made disease prevention a priority. It is now up to policy-makers, administrators, community organizations, clinicians, and scientists to support these efforts by improving access, promoting prevention to increase demand, and developing and evaluating evidence-based ECCM strategies.

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References


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