



Best Practices for Cardiovascular Disease Prevention Programs

A Guide to Effective Health Care System
Interventions and Community Programs
Linked to Clinical Services



Centers for Disease Control and Prevention
National Center for Chronic Disease Prevention
and Health Promotion
Division for Heart Disease and Stroke Prevention

Acknowledgments

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Suggested Citation

Centers for Disease Control and Prevention. *Best Practices for Cardiovascular Disease Prevention Programs: A Guide to Effective Health Care System Interventions and Community Programs Linked to Clinical Services*. Atlanta, GA: Centers for Disease Control and Prevention, US Dept of Health and Human Services; 2017.

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Executive Summary

Heart disease is the leading cause of death in men and women in the United States. Together, heart disease, stroke, and other vascular diseases claim over 800,000 lives each year.^{1,2} An estimated one in every seven US dollars spent on health care goes toward cardiovascular disease (CVD), totaling over \$300 billion in annual health care costs and lost productivity from premature death each year.^{3,4} Several modifiable risk factors for CVD are well known, including hypertension, hyperlipidemia, smoking, being overweight, being inactive, and eating an unhealthy diet. Although treatments for hypertension and hyperlipidemia are very effective and relatively inexpensive, most people with these conditions do not have them under control.

Although individuals can take steps to reduce their own risks of CVD, public health approaches have the potential to reduce risks among entire populations. Changes to policies, practices, and health systems that are designed to lower uncontrolled high blood pressure and cholesterol levels among populations can significantly improve access to health care, quality of care, and patient adherence to treatments.

The Centers for Disease Control and Prevention's Division for Heart Disease and Stroke Prevention (DHDSP) is guided by its mission to provide public health leadership to improve cardiovascular health for all, reduce the burden of CVD, and eliminate disparities associated with heart disease and stroke. DHDSP supports all 50 states and the District of Columbia to work toward achieving this mission, which aligns with the National Center for Chronic Disease Prevention and Health Promotion's (NCCDPHP's) approach to preventing chronic disease through four key domains^{5,6}:

- **Domain 1:** Epidemiology and Surveillance.
- **Domain 2:** Environmental Approaches.
- **Domain 3:** Health Care System Interventions.
- **Domain 4:** Community Programs Linked to Clinical Services.

Because resources are limited and the need to prevent CVD is widespread, decision makers and public health professionals must choose strategies that are effective and sustainable.

Because resources are limited and the need to prevent CVD is widespread, decision makers and public health professionals must choose strategies that are effective and sustainable. The four domains provide a framework for these efforts, and scientific evidence can help guide decisions about which strategies to adopt. In this publication, *Best Practices for Cardiovascular Disease Prevention Programs: A Guide to Effective Health Care System Interventions and Community Programs Linked to Clinical Services* (hereafter called the *Best Practices Guide for CVD Prevention*), we describe and summarize scientific evidence behind effective strategies for lowering high blood pressure and cholesterol levels that can be implemented in health care systems (Domain 3) and that involve community programs linked to clinical services (Domain 4). Following the best practices framework put forth by a CDC work group⁷ and using a translation tool called the Continuum of Evidence of Effectiveness,^{8,9} we have reviewed, identified, and summarized the evidence behind strategies that can be considered best practices for controlling hypertension and hyperlipidemia.

The target audience for this publication includes state and local health departments, decision makers, public health professionals, and other stakeholders interested in using proven strategies to improve cardiovascular health. This publication is not intended as comprehensive guidance, but rather a high-level, supportive resource. Our intention is to present brief, easy-to-follow evidence summaries for effective blood pressure and cholesterol control strategies and to highlight available resources and tools useful for implementing these strategies.

Highlighted strategies include the following:

- Using a team-based care model.
- Elevating pharmacy involvement in patient care.
- Including community health workers on clinical care teams.
- Activating patient involvement through self-management.
- Using clinical decision support systems.
- Reducing out-of-pocket costs for medications.

These strategies were identified through the recommendations of end users, grantees, evaluators, content subject matter experts, and program specialists, and they are based on the priorities of DHDS. Each of the selected strategies was vetted by a DHDS work group, and evidence was reviewed by people with expertise in research methods, program delivery, and the proposed strategies. To be included in the *Best Practices Guide for CVD Prevention*, strategies had to be supported by multiple high-quality research studies that demonstrated evidence of effectiveness in controlling blood pressure or cholesterol levels. In this publication, we describe the strength of evidence behind each strategy and the reported outcomes related to CVD prevention. We also highlight the public health and economic impacts of each strategy, including whether it improves health or reduces health disparities.

In addition, we highlight important issues related to the implementation of each strategy, including settings in which the strategies have been implemented, resources available to support implementation, and policy and law-related considerations. Brief synopses, called Stories from the Field, highlight specific locations where the strategies have been successfully implemented.

This publication also provides several appendices with additional information. [Appendix A](#) provides a summary of the evidence of effectiveness for each strategy. [Appendix B](#) explains the Rapid Synthesis and Translation Process, which was one of the methods used to develop this publication. [Appendix C](#) provides details about the Continuum of Evidence of Effectiveness, which is an interactive, online tool that was used to assess and rate the strength of evidence for each strategy. [Appendix D](#) is a glossary of important terms used in this publication.

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Introduction

Public health strategies to detect, prevent, and control chronic disease can be implemented at many levels, from individual behavioral interventions to environmental or cultural strategies affecting entire communities.

Making changes to health system practices can eliminate barriers to quality care and improve the health of many people. Nowhere is the need for such approaches more apparent than in the efforts to prevent heart disease, the leading cause of death in men and women in the United States. Although treatments for hypertension and hyperlipidemia—two key risk factors for cardiovascular disease (CVD)—are very effective and relatively inexpensive, most people with these conditions do not have them under control.

Research on strategies to lower blood pressure and cholesterol levels in health care settings offers insights about effective practices, but more work is needed to translate this evidence into action.

[The Best Practices Guide for CVD Prevention] highlights strategies that have been found to be effective for widespread control of hypertension and hyperlipidemia, but which are not yet being used widely as standard practice.

This publication, *Best Practices for Cardiovascular Disease Prevention Programs: A Guide to Effective Health Care System Interventions and Community Programs Linked to Clinical Services* (hereafter called the *Best Practices Guide for CVD Prevention*), is intended as a translation resource. It highlights strategies that have been found to be effective for widespread control of hypertension and hyperlipidemia, but which are not yet being used widely as standard practice.

Together, heart disease, stroke, and other vascular diseases claim over 800,000 lives in the United States each year and cost over \$300 billion in annual health care costs and lost productivity from premature death.¹⁻³ An estimated one in every seven US dollars spent on health care goes toward CVD.^{3,4} This costly and deadly disease is at the forefront of public health priorities at the Centers for Disease Control and Prevention (CDC), and health care practitioners at many levels are looking for solutions. Several modifiable risk factors for CVD are well known, including hypertension, hyperlipidemia, smoking, being overweight, being inactive, and eating an unhealthy diet.

Identifying effective ways to directly lower high blood pressure and cholesterol in the US population is a priority for the Centers for Disease Control and Prevention's (CDC's) Division for Heart Disease and Stroke Prevention (DHDSP). Other divisions in CDC's National Center for Chronic Disease Prevention and Health Promotion (NCCDPHP) prioritize other risk factors, such as smoking, diabetes, diet, and obesity. DHDSP supports all 50 states and the District of Columbia to work toward achieving DHDSP's mission to improve cardiovascular health for all, reduce the burden of CVD, and eliminate disparities associated with heart disease and stroke.

Background

Key Domains of Chronic Disease Prevention and Health Promotion

NCCDPHP takes a multifaceted approach to chronic disease detection, prevention, and control by focusing on four key domains: epidemiology and surveillance (Domain 1), environmental approaches (Domain 2), health care system interventions (Domain 3), and community programs linked to clinical services (Domain 4).⁵

Domain 1: Epidemiology and Surveillance

Epidemiology and surveillance involves the use of systems to regularly track and monitor current and emerging trends in chronic diseases and their related risk factors. Investing in this domain allows data to be collected to understand the incidence, prevalence, and risk factors of chronic diseases; identify effective approaches for detection, prevention, and control; and monitor and assess progress toward key program goals.^{5,6} Surveillance is essential for monitoring the detection, prevention, control, and treatment of CVD. CDC uses data from communities, health systems, and administrative systems to assess the burden of CVD. CDC tracks trends in cardiovascular risk factors and disease and shares findings with partners and collaborators working to apply public health strategies to improve cardiovascular health. Grantees of CDC-funded heart disease and stroke prevention programs collect surveillance data and use this information to guide, prioritize, and monitor program delivery.

Domain 2: Environmental Approaches

Environmental approaches involve the use of policy and structural changes to create environments where health is promoted and healthy choices are reinforced. Changes can be made to social and physical environments that make healthy behaviors easier and more convenient for individuals, while maintaining broad reach and sustaining health benefits for overall populations.^{5,6} CDC and its partners are working to make healthier environments a reality for those at greatest risk for CVD. Environmental strategies that can help reduce heart attacks and strokes include creating smoke-free environments and increasing access to healthier foods, including those with less sodium.

Domain 3: Health Care System Interventions

Health care system interventions are strategies used to improve the delivery and quality of care in clinical settings. Health system and quality improvement changes, such as using electronic health records (EHRs) and requiring reporting on blood pressure control, can encourage health care providers to better monitor and address key risk factors for CVD.^{5,6} Such strategies can result in earlier detection, improved disease management, and even prevention of the onset of CVD.

Domain 4: Community Programs Linked to Clinical Services

This domain—sometimes called community-clinical links—refers to strategies that connect community programs with health systems to improve chronic disease prevention, care, and management.⁵ Because this strategy relies on links between community and clinical settings, activities often overlap Domains 3 and 4. Community-clinical links aim to ensure that people with or at high risk for chronic diseases have access to quality community resources and support to prevent, delay, or manage chronic conditions once they occur. Strategies can include referrals by clinicians to community supports to improve chronic disease self-management or referrals by community programs to clinical services.^{5,6} These links can also involve community delivery and third-party payment for effective programs, which can reduce barriers and increase adherence to clinician recommendations.

Focus of the *Best Practices Guide for CVD Prevention*

The *Best Practices Guide for CVD Prevention* focuses specifically on strategies used in Domains 3 and 4, health care systems interventions (Domain 3) and community programs linked to clinical services (Domain 4). Improvements made in these areas can help create environments where people are better able to receive quality care, make healthier choices, and take control of their health. CDC funds state and local programs and key partner organizations to put health care system interventions and community-clinical links into action to prevent CVD. See [Appendix A](#) for a summary of effective strategies within these domains.

Health Care System Interventions (Domain 3)

Examples of health care system interventions include efforts to increase identification of undiagnosed hypertension, adopt clinical hypertension protocols, improve medication adherence, increase the use of health information technology to implement the ABCS (Aspirin when appropriate, Blood pressure control, Cholesterol management, and Smoking cessation), and make other quality improvements in health care practices.

Community Programs Linked to Clinical Services (Domain 4)

Examples of activities involving community-clinical links include health care systems collaborating with community groups that provide evidence-based lifestyle programs; using community health care extenders (i.e., non-MD health care professionals) to support self-managed blood pressure; and collaborating with chronic disease programs for effective program planning, implementation, and evaluation.

Intended Audience

The *Best Practices Guide for CVD Prevention* was developed for state and local health departments, decision makers, public health professionals, and other stakeholders with an interest in implementing effective strategies to improve cardiovascular health. To develop this publication, we searched for interventions and strategies that have been found to be effective for CVD prevention in multiple research and practice settings, but which are not yet widely used or considered standard practice. For each selected strategy, we provide brief summaries of the research evidence and links to information and resources on how to implement the strategy. The information presented here is not comprehensive, but instead provides a quick reference to selected strategies. The *Best Practices Guide for CVD Prevention* can be used as a resource by decision makers and stakeholders who wish to implement CVD prevention strategies that offer the best chances for successful outcomes in their communities and health care systems. In addition to the strategy summaries, this publication provides several appendices with additional information, including a glossary of important terms ([Appendix D](#)).

Guide Development

The strategies presented in this publication were identified and confirmed through an extensive review process, with input from subject matter experts (SMEs) and practice partners both within and external to CDC. Internally, strategies were reviewed and vetted by DHDSP senior leadership and staff in DHDSP's Program Development and Services Branch, Epidemiology and Surveillance Branch, Applied Research and Evaluation Branch, Million Hearts® team, and Office of Policy, External Relations, and Communications. Externally, we worked with academics, partners, and program directors with expertise in chronic care delivery, CVD prevention and control, and public health program management.

In addition to the review process, the *Best Practices Guide for CVD Prevention* was conceptualized and developed using several theoretical models. The concept of identifying public health best practices for hypertension and cholesterol control was primarily guided by the best practices framework developed by a CDC work group.² This framework also guided how we selected strategies, reported their impact, and offered considerations for implementation.

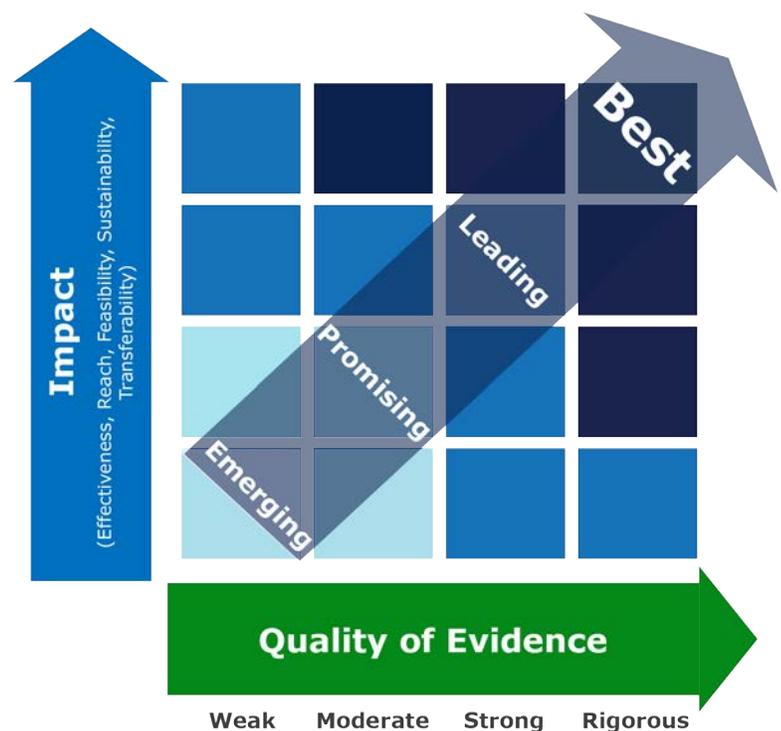
Best Practices Framework

According to the best practices framework (Figure 1), strategies considered best practices should be evidence-based; have high-quality evidence to support them; and demonstrate a positive impact in terms of effectiveness, reach, feasibility, sustainability, and transferability.² Where a particular practice falls on the best practices continuum at any point in time is dependent on the evidence available at that point. Thus, being labeled a “best practice” is not a static designation, but one that can change as new evidence becomes available. Practices can be categorized as emerging, promising, leading, or best.

Other Guiding Frameworks

In addition to using the best practices framework to develop this publication, we also followed a process adapted from the Rapid Synthesis and Translation Process (RSTP).⁸ For more information on RSTP, see [Appendix B](#). RSTP provides a structure for working with SMEs and practice partners to develop an evidence-based translation product. In addition, for each strategy, two evidence reviewers used an interactive, online tool called the Continuum of Evidence of Effectiveness to assess and rate the strength of evidence for each proposed best practice.⁹ For more information about this tool, see [Appendix C](#).

Figure 1. A Conceptual Framework for Planning and Improving Evidence-Based Practices



Interpreting the Results: Best Practice Strategy Template

We used the information collected and assessed through the review process to identify effective strategies, or best practices, for controlling blood pressure or cholesterol levels. We then summarized the evidence to support each of these strategies into a standard template. The sample template presented on the following pages describes what information is provided for each strategy and how this information is organized.

Domain 3: Health Care System Interventions
Team-Based Care

Promoting Team-Based Care to Improve High Blood Pressure Control

Team-based care is a strategy that can be implemented at the health system level to enhance patient care by having two or more health care providers working collaboratively with each patient. Within the context of cardiovascular disease (CVD) prevention, it often involves a multidisciplinary team working in collaboration to educate patients, identify risk factors for disease, prescribe and modify treatments, and maintain an ongoing dialog with patients about their health and care.^{1,2} These teams may include doctors, nurses, pharmacists, community paramedics, primary care providers, community health workers, and others (e.g., dieticians).

Summary	Evidence of Effectiveness						
<p>Team-based care, involving collaboration between doctors, nurses, pharmacists, paramedics, and others, is a cost-effective strategy for increasing medication adherence and lowering blood pressure among diverse populations and in various settings.</p> <p>Stories From the Field: WinMed Health Services (Cincinnati, Ohio).</p>	<table style="width: 100%; text-align: center;"> <tr> <td>Effect </td> <td>Implementation Guidance </td> <td>Research Design </td> </tr> <tr> <td>Internal Validity </td> <td>Independent Replication </td> <td>External & Ecological Validity </td> </tr> </table> <p>Legend: Well supported/Supported Promising/Emerging Unsupported/Harmful </p>	Effect	Implementation Guidance	Research Design	Internal Validity	Independent Replication	External & Ecological Validity
Effect	Implementation Guidance	Research Design					
Internal Validity	Independent Replication	External & Ecological Validity					
	<div style="background-color: #0070c0; color: white; padding: 5px; text-align: center; font-weight: bold;">Evidence of Impact</div> <table style="width: 100%; text-align: center;"> <tr> <td>Health Impact </td> <td>Health Disparity Impact </td> <td>Economic Impact </td> </tr> </table> <p>Legend: Supported Moderate Insufficient </p>	Health Impact	Health Disparity Impact	Economic Impact			
Health Impact	Health Disparity Impact	Economic Impact					

This box provides a short summary of the findings for the strategy.

An example of where the strategy has been implemented is provided here.

A brief description of the strategy starts each section.

Here we provide summary ratings indicating the strength of research evidence behind the strategy.

The reviewers used the Continuum of Evidence of Effectiveness to assess the effectiveness of each strategy according to six dimensions. The interactive continuum tool summarized their ratings for each dimension and we have summarized those results in a table like the example shown here. See Appendix A for a summary of the ratings for all strategies.

The Health Disparity Impact section describes the evidence from the research literature and provides a rationale for the rating for health disparity impact. The rating indicates whether the strategy is effective among the populations with the most need or has the potential to reduce health disparities.

Domain 3: Health Care System Interventions
Team-Based Care

Evidence of Effectiveness

The evidence base for implementing team-based care in health care systems and practices is very strong. Solid evidence exists that this strategy achieves desired outcomes, with studies demonstrating internal and external validity. This strategy has also been independently replicated, which shows reliability of impact. Several randomized controlled trials, which are often considered the gold standard in research, have been conducted and show positive results from using multidisciplinary teams as a way to improve hypertension control. Various organizations, such as the American Medical Association and the Agency for Healthcare Research and Quality (AHRQ), have developed guidelines to help health care systems and practices implement this strategy as part of their policies and protocols.

Evidence of Impact

Health Impact	Health Disparity Impact	Economic Impact
<p>A systematic review by the Community Preventive Services Task Force concluded that team-based care can lead to significantly improved hypertension control, lowered systolic and diastolic blood pressure levels (overall median reduction was 5.4 mmHg and 1.8 mmHg, respectively), and improved patient adherence to hypertensive medication.³</p> <p><i>The evidence base for implementing team-based care in health care systems and practices is very strong.</i></p>	<p>Team-based care has been found to be effective when used among diverse patient populations, including those with members of different racial and ethnic groups (e.g., whites, African Americans) and among patients with multiple health conditions.</p> <p>Evidence also exists that this strategy is effective among low-income populations. Additional research is needed to examine effectiveness among populations that are primarily Hispanic and in communities with other minority populations.³</p>	<p>Team-based care has proven to be cost-effective. The median total cost for providing team-based care for hypertension control was found to be \$355 per person per year. The median cost per quality-adjusted life year (QALY) gained over 20 years was either \$10,511 or \$15,137, depending on the QALY conversion method used.⁴ Both estimates were well below the commonly used and conservative cost-effectiveness threshold of \$50,000 per QALY.</p> <p>Researchers modeled the health and economic impact of nationwide adoption of team-based care for hypertension over 10 years and estimated a net savings to Medicare of \$5.8 billion (2012 US dollars) over this period.¹ This model also estimates an overall national savings of \$25.3 billion in averted disease costs, which offsets an estimated \$22.9 billion cost of using this intervention to the health care system. Costs for patient time over this period are estimated at \$15.8 billion, but are largely offset by an estimated \$11 billion in productivity gains.</p>

The Continuum of Evidence of Effectiveness is designed to assess the quality of the research evidence available, but it cannot directly assess a strategy's potential for public health impact, which is an important component of a best practices designation. To assess this component, reviewers examined the research literature for evidence of a strategy's potential to improve health, reduce health disparities, and show economic sustainability. They assigned ratings for each of these categories. These ratings are provided in a table like the example shown here.

The Health Impact section describes the evidence from the research literature and provides a rationale for the rating for health impact. The rating indicates whether the strategy achieves one or more desired outcomes related to CVD prevention—such as lowered blood pressure, increased adherence to blood pressure medication, or decreased disease and death.

The Economic Impact section describes the evidence available on a variety of economic factors, including overall cost-effectiveness; cost savings to health systems, patients, or other payers; net benefit; and return on investment (ROI). The economic impact rating reflects the degree to which evidence exists that the strategy can have a positive economic impact. Cost figures shown in this section are examples of possible impact according to the best available evidence. All costs are adjusted to 2015 US dollars using the price index for personal consumption expenditures prepared by the Bureau of Economic Analysis in the US Department of Commerce.

Stories from the Field
Team-Based Care 



Team-Based Care at WinMed Health Services

WinMed Health Services, an FQHC in Cincinnati, Ohio, is a 2014 Million Hearts® Hypertension Control Champion that successfully incorporated team-based care to help achieve hypertension control among its patients. To ensure a continuum of complete patient care, WinMed's care teams include physicians, pharmacists, and behavioral and dental professionals. WinMed focuses on increasing health care providers' expertise and skills, providing opportunities for patient education, ensuring that patient care is team-based, and using registry-based information systems. The WinMed care teams use electronic health records to increase proper communication between patients and the different providers. By improving communities and patient education, encouraging greater patient engagement, and adding pharmacists and patient assistants to the health care team, WinMed achieved a 7% increase in hypertension control among its patients from 2013 to 2014.

For more information:
Website: www.winmedinc.org/index.htm

This section describes the strategy as it is being applied in a specific community, clinical, or health care setting. It provides contact information, results and clinical outcomes, and an assessment of factors that affect implementation and sustainability. This information can be useful to state and local health departments, decision makers, public health professionals, and related stakeholders.

This section provides information about the implementation of each strategy, including settings, implementation guidance, resources, and policy and law-related considerations.

Domain 3: Health Care System Interventions
Team-Based Care

Four Considerations for Implementation

- #### 1 Settings

Team-based care has been successfully implemented in multiple settings, including Federally Qualified Health Centers (FQHCs), patient-centered medical homes, and managed health care systems, in various locations throughout the United States.
- #### 2 Policy and Law Related Considerations

Scope-of-practice laws and organizational policies that allow nurses, physician assistants, pharmacists, and other health care providers to practice to the full extent of their licensure and training can facilitate team-based care.
- #### 3 Implementation Guidance

The American Medical Association and AHRQ have developed modules for implementing team-based care:

 - [American Medical Association's STEPSforward: Implementing Team-Based Care](#),⁶
 - [Agency for Healthcare Research and Quality's Practice Facilitation Handbook](#),⁷
- #### 4 Resources

Many federal initiatives and medical institutions support team-based care approaches. Examples include the following:

 - [Centers for Disease Control and Prevention's 6|18 Initiative](#),⁸
 - [National High Blood Pressure Educational Program, supported by the National Heart, Lung, and Blood Institute](#),⁹
 - [American Heart Association](#),⁹
 - [National Academy of Medicine](#).¹⁰

Current, high-level considerations related to policy and laws relevant to implementing the strategy.

Available resources, such as guides, examples, and guidelines that support implementation of the strategy.

Settings in which the strategy was successfully implemented.

Current implementation guidance available to assist with implementation of the strategy.

Limitations of This Guide

Although the *Best Practices Guide for CVD Prevention* is a useful resource on evidence-based strategies for preventing CVD, it has several limitations. First, it does not include every strategy found to be effective in CVD prevention. Other strategies may be used in practice that are not included here because of the approach we used to select and assess the evidence. This guide focuses on practices that are best characterized in the research literature and therefore most amenable to meaningful assessment by the methods we used. Second, this publication provides only a condensed version of the evidence available on each strategy. It is not a systematic review, like *The Guide to Community Preventive Services*, and thus could be missing potentially relevant information about strategy weaknesses and research limitations. References to longer and more detailed systematic reviews and meta-analyses are provided when available.

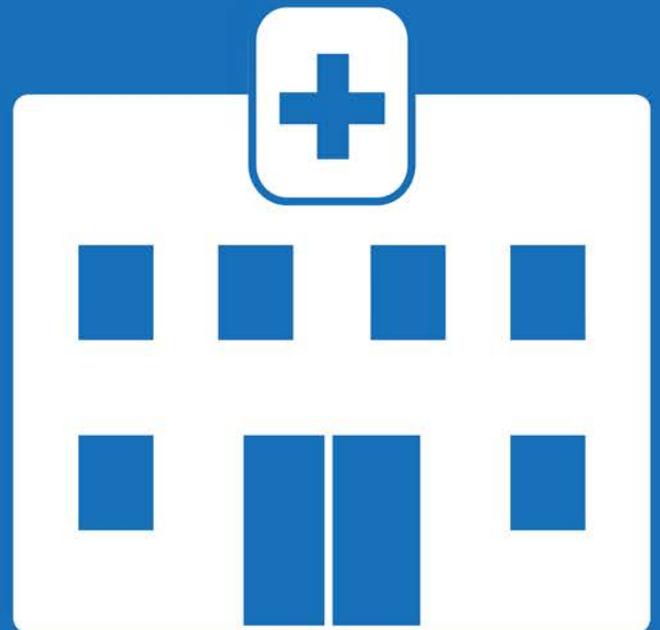
Third, our presentation of evidence is limited by the available literature. Consequently, if key data (for example, on economic factors) were not available at the time we reviewed the evidence, this information is missing. Fourth, information on the economic impact of the strategies is presented using a variety of methods, which limits the ability to make direct comparisons across practices. The numbers presented should be read only as examples of the best available evidence demonstrating positive economic impact. They should not be directly compared to examine the comparative efficiency of the different practices. Fifth, this initial version of the *Best Practices Guide for CVD Prevention* does not provide detailed information on strategy implementation or the estimated costs of implementation. Although we have provided links to available implementation resources when possible, providing complete implementation guidance for each strategy was beyond the scope of this publication. Such information may be included, to the extent possible, in future versions.

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Domain 3:

Effective Strategies in Health Care System Interventions



Health care system interventions have the potential to improve the delivery and quality of care in clinical settings. Effective strategies in this domain can lead to earlier detection, improved disease management, and even prevention of the onset of CVD.



Promoting Team-Based Care to Improve Hypertension Control



Self-Management Support and Education



Pharmacy: Collaborative Practice Agreements to Enable Collaborative Drug Therapy Management



Reducing Out-of-Pocket Costs for Medications



Self-Measured Blood Pressure Monitoring with Clinical Support



Implementing Clinical Decision Support Systems



Promoting Team-Based Care to Improve High Blood Pressure Control

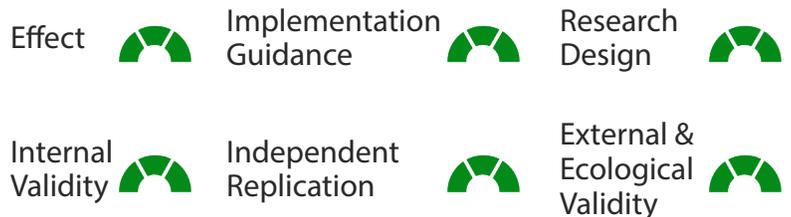
Team-based care is a strategy that can be implemented at the health system level to enhance patient care by having two or more health care providers working collaboratively with each patient. Within the context of cardiovascular disease (CVD) prevention, it often involves a multidisciplinary team working in collaboration to educate patients, identify risk factors for disease, prescribe and modify treatments, and maintain an ongoing dialog with patients about their health and care.^{1,2} These teams may include doctors, nurses, pharmacists, community paramedics, primary care providers, community health workers, and others (e.g., dietitians).

Summary

Team-based care, involving collaboration between doctors, nurses, pharmacists, paramedics, and others, is a cost-effective strategy for increasing medication adherence and lowering blood pressure among diverse populations and in various settings.

Stories From the Field:
WinMed Health Services
(Cincinnati, Ohio).

Evidence of Effectiveness



Legend: Well supported/Supported  Promising/Emerging  Unsupported/Harmful 

Evidence of Impact



Legend: Supported  Moderate  Insufficient 



Evidence of Effectiveness

The evidence base for implementing team-based care in health care systems and practices is very strong. Solid evidence exists that this strategy achieves desired outcomes, with studies demonstrating internal and external validity. This strategy has also been independently replicated, which shows reliability of impact. Several randomized controlled trials, which are often considered the gold standard in research, have been conducted and show positive results from using multidisciplinary teams as a way to improve hypertension control. Various organizations, such as the American Medical Association and the Agency for Healthcare Research and Quality (AHRQ), have developed guidelines to help health care systems and practices implement this strategy as part of their policies and protocols.

Evidence of Impact

Health Impact

A systematic review by the Community Preventive Services Task Force concluded that team-based care can lead to significantly improved hypertension control, lowered systolic and diastolic blood pressure levels (overall median reductions were 5.4 mmHg and 1.8 mmHg, respectively), and improved patient adherence to hypertensive medication.³

The evidence base for implementing team-based care in health care systems and practices is very strong.

Health Disparity Impact

Team-based care has been found to be effective when used among diverse patient populations, including those with members of different racial and ethnic groups (e.g., whites, African Americans) and among patients with multiple health conditions.

Evidence also exists that this strategy is effective among low-income populations. Additional research is needed to examine effectiveness among populations that are primarily Hispanic and in communities with other minority populations.³

Economic Impact

Team-based care has proven to be cost-effective. The median total cost for providing team-based care for hypertension control was found to be \$355 per person per year. The median cost per quality-adjusted life year (QALY) gained over 20 years was either \$10,511 or \$15,137, depending on the QALY conversion method used.⁴ Both estimates were well below the commonly used and conservative cost-effectiveness threshold of \$50,000 per QALY.

Researchers modeled the health and economic impact of nationwide adoption of team-based care for hypertension over 10 years and estimated a net cost savings to Medicare of \$5.8 billion (2012 US dollars) over this period.⁵ This model also estimates an overall national savings of \$25.3 billion in averted disease costs, which offsets an estimated \$22.9 billion cost of using this intervention to the health care system. Costs for patient time over this period are estimated at \$15.8 billion, but are largely offset by an estimated \$11 billion in productivity gains.



Stories from the Field

Team-Based Care



Team-Based Care at WinMed Health Services

WinMed Health Services, an FQHC in Cincinnati, Ohio, is a 2014 Million Hearts® Hypertension Control Champion that successfully incorporated team-based care to help achieve hypertension control among its patients. To ensure a continuum of complete patient care, WinMed's care teams include physicians, pharmacists, and behavioral and dental professionals. WinMed focuses on increasing health care providers' expertise and skills, providing opportunities for patient education, ensuring that patient care is team-based, and using registry-based information systems. The WinMed care teams use electronic health records to increase proper communication between patients and the different providers. By improving community ties and patient education, encouraging greater patient engagement, and adding pharmacists and patient assistants to the health care team, WinMed achieved a 7% increase in hypertension control among its patients from 2013 to 2014.

For more information:

Website: www.winmedinc.org/index.htm



Four Considerations for Implementation

1 Settings

Team-based care has been successfully implemented in multiple settings, including Federally Qualified Health Centers (FQHCs), patient-centered medical homes, and managed health care systems, in various locations throughout the United States.

2 Policy and Law-Related Considerations

Scope-of-practice laws and organizational policies that allow nurses, physician assistants, pharmacists, and other health care providers to practice to the full extent of their licensure and training can facilitate team-based care.

3 Implementation Guidance

The American Medical Association and AHRQ have developed modules for implementing team-based care:

- [American Medical Association's STEPSforward: Implementing Team-Based Care.](#)⁶
- [Agency for Healthcare Research and Quality's Practice Facilitation Handbook.](#)⁷

4 Resources

Many federal initiatives and medical institutions support team-based care approaches. Examples include the following:

- [Centers for Disease Control and Prevention's 6|18 Initiative.](#)⁸
- [National High Blood Pressure Educational Program, supported by the National Heart, Lung, and Blood Institute.](#)²
- [American Heart Association.](#)⁹
- [National Academy of Medicine.](#)¹⁰



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Pharmacy: Collaborative Practice Agreements to Enable Collaborative Drug Therapy Management

Collaborative drug therapy management (CDTM), also known as coordinated drug therapy management, involves developing a collaborative practice agreement (CPA) between one or more health care providers and pharmacists. A CPA allows qualified pharmacists working within the context of a defined protocol to assume professional responsibility for performing patient assessments, counseling, and referrals; ordering laboratory tests; administering drugs; and selecting, initiating, monitoring, continuing, and adjusting drug regimens.¹ The use of CDTM through a CPA is a strategy that can be considered to straddle both Domains 3 (health care system interventions) and 4 (community-clinical links).

Summary

CDTM enabled by a CPA is a formal partnership between qualified pharmacists and prescribers to expand a pharmacist’s scope of practice. CDTM is a cost-effective strategy for lowering blood pressure, blood sugar, and LDL cholesterol levels; improving treatment quality; and increasing medication adherence.

Stories From the Field:
 El Rio Community Center (Pima County, Arizona).

Evidence of Effectiveness

Effect 	Implementation Guidance 	Research Design 
Internal Validity 	Independent Replication 	External & Ecological Validity 

Legend: Well supported/Supported  Promising/Emerging  Unsupported/Harmful 

Evidence of Impact

Health Impact 	Health Disparity Impact 	Economic Impact 
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Legend: Supported  Moderate  Insufficient 



Evidence of Effectiveness

Strong evidence exists that CDTM enabled by a CPA is effective. Solid evidence exists that this strategy achieves desired outcomes, with studies demonstrating internal and external validity. This strategy has also been independently replicated, and systematic reviews assessing the use of CDTM have confirmed reliability of impact. Implementation guidance on CPAs to enable CDTM was found to be lacking in comprehensiveness.

Evidence of Impact

Health Impact

CDTM, enabled by CPAs between pharmacists and other health care providers, has been shown effective in improving clinical and behavioral health indicators, including lowering blood pressure, HbA1c, and LDL cholesterol levels; improving treatment quality through pharmacist compliance with clinical guidelines; and increasing patient knowledge and adherence to medication regimens.²



Health Disparity Impact

The goals of reaching populations at risk and reducing health disparities have been taken into account in the development and implementation of CPAs, particularly by pharmacy organizations (e.g., the American Pharmacists Association), state medical and pharmacy boards, and state pharmacy organizations. However, no studies have directly examined the impact of CPAs between pharmacists and providers serving low-income populations. Because pharmacists often work directly with the public in community settings, they are often considered the public's most accessible health care providers. CPAs can authorize pharmacists to make changes to a patient's medication or dosage, which can reduce the number of visits a patient has to make and lower costs, while also making it easier for patients to adhere to their medications.

Economic Impact

Research suggests that clinical pharmacy services like CDTM can be cost-saving to the health care system, primarily through avoided hospitalizations and emergency room (ER) visits.³ For example, in 2006, Missouri's Pharmacy-Assisted CDTM program resulted in a 12% decrease in any-cause hospitalizations, a 25% reduction in ER visits, and a decrease in drug-related problems among beneficiaries after 1 year. This program was also found to have a 2.5 to 1 ROI to the state, with an estimated savings of \$518.10 per patient per month.³

Strong evidence exists that CDTM enabled by a CPA is effective.

Stories from the Field

Collaborative Practice Agreements



CPAs at El Rio Community Center

El Rio Community Health Center serves over 75,000 people in Pima County, Arizona. In 2011, 20% of El Rio's adult patients (8,954 of 44,952) had diagnosed hypertension, but only 67% of those diagnosed had the condition under control. Pharmacists at El Rio were encouraged to establish CPAs with the center's medical providers. These agreements enable pharmacists to work directly with patients to help them manage their hypertension and other chronic conditions, such as diabetes and hyperlipidemia. Within the scope of the CPA, pharmacists have the discretion to change patient medications. After CDTM was implemented, El Rio reported improved clinical outcomes (e.g., lower cholesterol and blood pressure levels), increased use of recommended screenings, and reduced ER visits. The El Rio case study highlights several important considerations for CDTM implementation. These considerations include instilling mission-driven values through training and orientation, accepting pharmacy student interns, and using broad strategies and networks to improve patient care and increase potential partnerships that may extend the use of CPAs.

For more information:
Phone: 520-670-3909
Website: www.elrio.org



Four Considerations for Implementation

1 Settings

Enabling CDTM through CPAs has been found to be effective in several clinical and community settings, including federally qualified health centers (FQHC), patient-centered medical homes, managed care health systems, community pharmacies, hospital pharmacies, and primary care clinics.

2 Policy and Law-Related Considerations

CPAs are typically authorized through state scope-of-practice laws that may or may not allow for their use within pharmacist scope-of-practice laws. Challenges associated with billing for services exist, even at the federal level.^{12,13} When a CPA is developed, the pharmacist and the prescriber work together to develop the terms of the CPA. They may use recommendations and model language available from various organizations.^{5,6,14}

3 Implementation Guidance

CDC has recently developed a CPA tool kit that provides implementation guidance:

- [Advancing Team-Based Care Through Collaborative Practice Agreements: A Resource and Implementation Guide for Adding Pharmacists to the Care Team.](#)⁴

Guidance from the state level comes from the following sources:

- [National Association of State Pharmacy Associations.](#)⁵
- [American Pharmacy Association.](#)⁶

4 Resources

Several guides and examples are available to educate and guide health care providers, decision makers, insurers, and pharmacists about how pharmacists and other health care providers can better serve patients through CPAs and CDTM. Examples include the following:

- [Collaborative Practice Agreements and Pharmacists' Patient Care Services: A Resource for Pharmacists.](#)⁷
- [A Resource for Nurses, Physician Assistants, and Other Providers.](#)⁸
- [A Resource for Government and Private Payers.](#)⁹
- [A Program Guide for Public Health: Partnering with Pharmacists.](#)¹⁰
- [Agency for Healthcare Research and Quality, Pharmacy Quality Alliance.](#)¹¹



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Self-Measured Blood Pressure Monitoring With Clinical Support

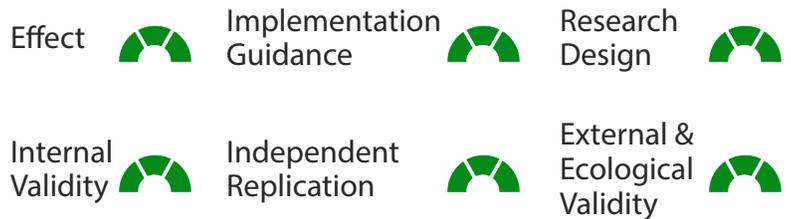
Self-measured blood pressure monitoring (SMBP) involves a patient’s regular use of personal blood pressure monitoring devices to assess and record blood pressure across different points in time outside of a clinical or community or public setting, typically at home.^{1,2} When combined with clinical support (e.g., one-on-one counseling, web-based or telephonic support tools, education), SMBP can enhance the quality and accessibility of care for people with high blood pressure and improve blood pressure control.³

Summary

SMBP with clinical support involves training patients to regularly monitor and record their own blood pressure at home with a personal device and rely on clinical support as needed. SMBP is a cost-effective strategy for lowering blood pressure and increasing medication adherence.

Stories From the Field:
Millgrove Medical Center
(Norristown, Pennsylvania).

Evidence of Effectiveness



Legend: Well supported/Supported  Promising/Emerging  Unsupported/Harmful 

Evidence of Impact



Legend: Supported  Moderate  Insufficient 



Evidence of Effectiveness

The evidence base for implementing SMBP in health care systems and practices is very strong. Studies demonstrate internal and external validity, and there has been independent replication with positive results. Several studies show the positive effect of SMBP in improving blood pressure control. Comprehensive implementation guidance is available to facilitate the adoption of this strategy by health care systems and practices.

Evidence of Impact

Health Impact

SMBP has proven useful in reducing the risk of death and disability associated with hypertension.^{4,5} The research literature has shown that, when combined with additional clinical support, SMBP is effective in reducing hypertension, improving patient knowledge, improving the health system process, and enhancing medication adherence.² SMBP has also been associated with patient empowerment, autonomy, self-efficacy, and lifestyle modification.



Health Disparity Impact

Evidence is insufficient to show that SMBP affects health disparities. Some of this lack of evidence is related to minorities being underrepresented in comparative studies.² In current studies, some findings show that SMBP failed to improve blood pressure control for a largely minority, urban population of Hispanics and people without insurance, a population which is largely understudied.⁶ A statistically significant difference in systolic blood pressure was found for white participants who used SMBP, but not for African Americans or Hispanics. Studies note the potential negative effect of barriers to SMBP for low-income and minority groups. For example, while validated blood pressure monitors for home use are generally considered affordable, the lack of reimbursement for these devices and additional out-of-pocket costs can be barriers for low-income populations.

SMBP has proven useful in reducing the risk of death and disability with hypertension.

Economic Impact

Economic evidence from a review by the Community Preventive Services Task Force indicates that SMBP monitoring strategies are cost-effective when combined with additional clinical support or within a team-based care model.⁷ The median cost per quality-adjusted life year (QALY) gained over a 20-year period for SMBP with additional support was \$2,832 or \$4,046, depending on the QALY conversion method used.⁷ The median cost per QALY gained for SMBP as part of team-based care was \$7,585 or \$10,923.⁷ SMBP has been found to be cost-beneficial for insurers, with an estimated net savings associated with the use of home blood pressure monitors ranging from \$33 to \$168 per member in the first year and from \$420 to \$1,380 per member over 10 years.⁸ The return on investment (ROI) for the insurer ranges from \$0.85 to \$3.75 per \$1 invested in the first year and from \$7.50 to \$19.34 per \$1 invested over 10 years. Because of the clear financial and health benefits of SMBP, experts from the American Heart Association, American Society of Hypertension, and Preventive Cardiovascular Nurses Association recommend that payers cover the costs of home blood pressure monitors, patient training in SMBP techniques, and clinical support.³

Stories from the Field

Self-Measured Blood Pressure



SMBP at Millgrove Medical Center

The family practice of Dr. Nilesh V. Patel at Millgrove Medical Center in Norristown, Pennsylvania, serves 5,300 adult patients in eastern Pennsylvania and is a 2013 Million Hearts Hypertension Control Champion. The practice achieved successful outcomes using SMBP by training patients to monitor and record their blood pressure with a blood pressure cuff at home and then transferring these measurements to the patients' electronic health record (EHR). By using SMBP and EHRs and including pharmacists in a team-based care approach, the practice increased the blood pressure control rate for its patients from 83.4% to 94.9% in 1 year. This improvement translates to an additional 49 patients who are reaching their target blood pressure and significantly reducing their risk of cardiovascular disease.

For more information:

Website: www.millgrovemedical.com

Phone: 610-666-1400



Four Considerations for Implementation

1 Settings

SMBP efforts have been implemented in many clinical and community settings, including FQHCs, general practices, YMCAs, and Veterans Affairs medical centers.

2 Policy and Law-Related Considerations

Insurance coverage for SMBP is not universal, but varies by state and individual insurance plans. Coverage can vary by SMBP components (e.g., blood pressure measurement devices, clinical support, training). Traditional fee-for-service models often reimburse only for office-based visits and services. More information on coverage under Medicare and Medicaid can be found online and through Million Hearts resources.³ When not covered by insurance, health care flexible spending accounts have been recommended to cover the costs of home blood pressure monitors.

3 Implementation Guidance

Through the Million Hearts® initiative, CDC has created a series of translation guides on SMBP for public health practitioners and clinicians. The Million Hearts website also has an SMBP webpage, which has resources, evidence, tools, and information about effective SMBP practices. See these links for more information on implementation:

- [Self-Measured Blood Pressure Monitoring: Action Steps for Clinicians.](#)³
- [Self-Measured Blood Pressure Monitoring: Action Steps for Public Health Practitioners.](#)⁹
- [Self-Measured Blood Pressure Monitoring by Million Hearts.](#)¹⁰

4 Resources

Several federal agencies and initiatives provide resources related to the use of SMBP, including:

- [Community Preventive Services Task Force.](#)¹¹
- [US Preventive Services Task Force.](#)¹²
- [Centers for Disease Control and Prevention's 6|18 Initiative.](#)¹³



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Self-Management Support and Education

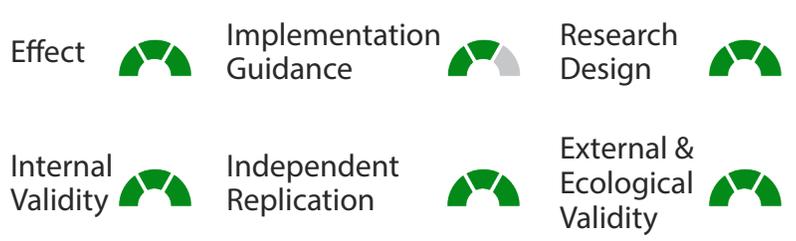
Self-management involves focusing on an individual’s role in managing chronic disease. This term is often associated with self-care and includes an array of activities needed to effectively manage one or more chronic conditions.¹ Self-management support and education is defined as assistance provided by clinicians and public health practitioners to enhance an individual’s self-efficacy in managing one or more chronic conditions. This assistance can include activities such as patient education, support for lifestyle modifications, and support to help individuals develop the skills needed for effective chronic disease management.^{1,2}

Summary

Self-management support and education provided to patients by clinicians and public health practitioners is an effective strategy for improving patient knowledge and self-efficacy, lowering blood pressure, and increasing medication adherence.

Stories From the Field:
ThedaCare (Wisconsin).

Evidence of Effectiveness



Legend: Well supported/Supported  Promising/Emerging  Unsupported/Harmful 

Evidence of Impact



Legend: Supported  Moderate  Insufficient 



Evidence of Effectiveness

The evidence base for implementing self-management support and education for people with chronic disease, including those with hypertension, in health care systems and practices is very strong. Studies demonstrate internal and external validity, and there has been independent replication with positive results. Several studies have been conducted and show the positive effect of self-management support and education in improving blood pressure control. However, limited implementation guidance is available to help health care systems and practices adopt this strategy.

Evidence of Impact

Health Impact

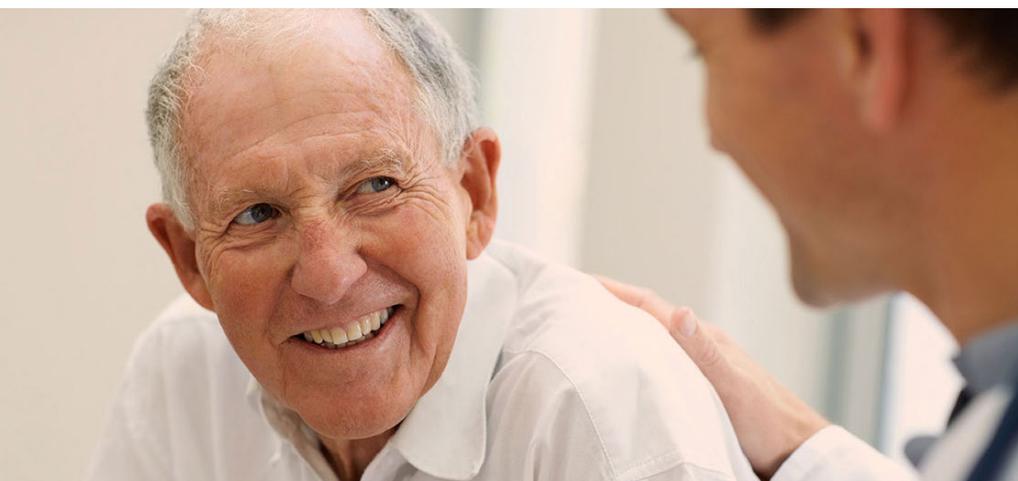
Self-management support and education has been linked specifically to positive cardiovascular outcomes, including lowered blood pressure, increased hypertension-related knowledge, and enhanced competence in hypertension self-management behaviors.¹⁻⁴ Research has also shown that self-management support and education can improve medication adherence, self-efficacy, self-rated health, cognitive symptom management, frequency of aerobic exercise, and depression.⁵

Health Disparity Impact

Self-management programs have been effective among both white and African American participants, but studies note the need to further test programs among other racial and ethnic populations. Certain components of self-management support and education may be more important in rural and low-income settings, where health care resources may be limited, but this issue has not been looked at in-depth and deserves further exploration.⁶

Economic Impact

The costs of chronic disease self-management programs vary depending on the strategy and program components used. Hypertension self-management education programs that use strategies beyond SMBP can be cost-effective.⁷ Chronic disease self-management programs can potentially be cost-saving. For example, one self-management education program was estimated to save health systems \$394 per participant per year, and it has been estimated that health systems could save \$3.9 billion nationally if 5% of adults with one or more chronic conditions were reached.⁸ More research that uses actual cost data rather than modeled estimates is needed to confirm these findings.



Self-management support and education has been linked specifically to positive cardiovascular outcomes.

Stories from the Field

Self-Management Education



Self-Management Education at ThedaCare

ThedaCare health care system serves 100,357 adult patients in northeast Wisconsin. ThedaCare is a 2013 Million Hearts® Hypertension Control Champion that has successfully implemented a self-management program to help adults with hypertension learn self-management skills. Patients in the ThedaCare Physicians program are given educational materials on nutrition, exercise, hypertension medication, health problems associated with hypertension, and smoking cessation. When they complete the program, patients receive a free home blood pressure monitor. After implementing the program, ThedaCare reported steady improvement among patients with uncomplicated hypertension. From 2012 to 2013, the blood pressure control rate among ThedaCare patients increased by 1.4% (81.6% to 83.0%), which equates to 23,136 of ThedaCare's 27,879 patients with high blood pressure having this condition under control. ThedaCare's success is attributed to having strong leadership support and a provider champion for the program.

For more information:
Website: www.thedacare.org
Phone: 920-831-180



Four Considerations for Implementation

1 Settings

Self-management support and education has been implemented in several community and clinical settings, including YMCAs, federally qualified health centers (FQHCs), and managed care health systems.

2 Policy and Law-Related Considerations

In 2016, the Centers for Medicare & Medicaid Services (CMS) finalized regulations for the Cardiac Rehabilitation Incentive Payment Model, which reimburses for cardiac rehabilitation services, including self-management support and education, in selected geographic areas. This regulation covers beneficiaries hospitalized for a heart attack or bypass surgery. More information about this regulation can be found on CMS's [Cardiac Rehabilitation Incentive Payment Model website](#).

3 Implementation Guidance

Health departments can link patients to self-management programs in their communities. One tool developed to help patients find self-management educational programs in their communities is a CDC resource called [Learn More. Feel Better.](#)⁹

4 Resources

Self-management support and education for chronic disease is widely supported by federal and nonfederal initiatives, including [CDC's Million Hearts Initiative](#).¹⁰



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Reducing Out-of-Pocket Costs for Medications

Reducing out-of-pocket costs (ROPC) for patients with hypertension and hyperlipidemia involves program and policy changes that make medications for cardiovascular disease (CVD) prevention more affordable. Costs for medications can be reduced by providing new or expanded coverage and lowering or eliminating out-of-pocket payments by patients (e.g., copayments, coinsurances, deductibles).¹

Summary

Reducing costs on medications for patients with hypertension and hyperlipidemia is an effective strategy for increasing medication adherence and lowering blood pressure and cholesterol levels among diverse populations and in various settings.

Stories From the Field: Kaiser Permanente Northern California.

Evidence of Effectiveness



Legend: Well supported/Supported  Promising/Emerging  Unsupported/Harmful 

Evidence of Impact



Legend: Supported  Moderate  Insufficient 



Evidence of Effectiveness

The evidence base supporting the implementation of ROPC strategies to promote medication adherence is very strong. Studies examining ROPC for medications have demonstrated strong internal and external validity. A review by the Community Preventive Services Task Force concluded that ROPC for medications is effective for increasing medication adherence and results in improved health outcomes. Evaluations of ROPC strategies have been replicated with positive results. Unfortunately, no comprehensive guidance for implementing ROPC strategies is available.

Evidence of Impact

Health Impact

Evidence shows that ROPC for medications for patients with hypertension and hyperlipidemia is effective in improving medication adherence, which results in lower blood pressure and cholesterol levels. The Community Preventive Services Task Force found that ROPC for patients taking blood pressure and cholesterol medications increased medication adherence by 3 percentage points and increased the proportion of patients achieving 80% adherence by 5.1 percentage points, which significantly improved blood pressure and cholesterol outcomes.^{1,2}

Health Disparity Impact

Evidence shows that ROPC for medications is an effective strategy for men and women and for patients from racial and ethnic minority groups. ROPC is especially beneficial for low-income patients, who face the greatest financial barriers to taking medications as prescribed.²

ROPC for medications is an effective strategy for men and women and for patients from racial and ethnic minority groups.

Economic Impact

The evidence base for the economic benefits of ROPC for medications is limited, and findings are inconsistent. The Community Preventive Services Task Force found that the median intervention cost for ROPC for medications was \$174 per person per year. The Task Force's review found that ROPC could reduce health care costs, with a median change of -\$128 per person per year. Health care savings could potentially offset intervention costs, but evidence on net benefits was limited and mixed. Therefore, no overall conclusion could be reached. More research on cost-effectiveness is needed.²



Stories from the Field

Reducing Medication Costs



ROPC at Kaiser Permanente Northern California

Kaiser Permanente Northern California (KPNC) is a 2013 Million Hearts® Hypertension Control Champion because of its hypertension program. The program seeks to improve hypertension control through five key strategies: a comprehensive hypertension registry, performance metrics, evidence-based guidelines for treatment, medical assistant visits for blood pressure measurement, and single-pill combination pharmacotherapy. Two of the five strategies reduced out-of-pocket costs for patients. One eliminated copayments for patients who visited a medical assistant for blood pressure monitoring, while the other introduced a less-expensive, single-pill combination therapy that combined two medications into one. KPNC reported significant improvements since it began using this multicomponent hypertension program. From 2001 to 2013, hypertension control among KPNC's patients increased from 44% to 90%, which translated to more than 200,000 additional patients who had their blood pressure under control. Although the success of this program could not be attributed to any one component alone, ROPC for medications likely played an important role, as prescription rates for hypertension drugs increased significantly after the introduction of the single-pill combination therapy.

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Four Considerations for Implementation

1 Settings

Strategies to reduce ROPC for medications can be implemented by health care providers and plans, government agencies, and employers who offer insurance plans to their employees.¹

2 Policy and Law-Related Considerations

Policies or programs to reduce or eliminate out-of-pocket costs for medications can be coordinated and implemented through health care systems, partnerships, and health care providers or insurance plans. One ROPC policy approach is to reduce or eliminate copayments for generic medications. Providers may need to discuss appropriate generic medications with their patients.¹ Many states have statutory or regulatory requirements that (1) require Medicaid providers to use generics first and (2) require or authorize pharmacists to switch Medicaid patients to an equivalent generic drug if a brand name drug is prescribed.⁵

3 Implementation Guidance

Direct implementation guidance for ROPC was not readily available at the time of this publication. Collaboration between public insurance plans, such as Medicare and Medicaid, and private insurance plans should be considered to promote use of these strategies.

4 Resources

ROPC for medications is a strategy that is supported by several federal initiatives, including:

- [CDC's 6|18 Initiative](#).³
- [CDC's Medication Adherence Action Guide](#).⁴



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Implementing Clinical Decision Support Systems

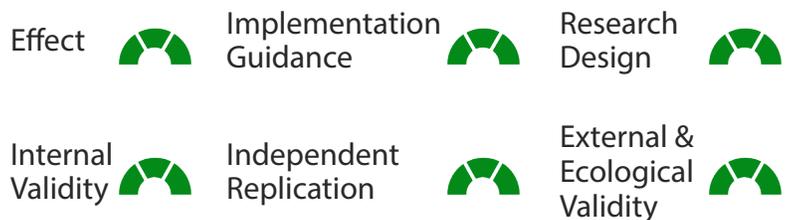
Clinical decision support systems (CDSS) are computer-based programs that analyze data within EHRs to provide prompts and reminders to assist health care providers in implementing evidence-based clinical guidelines at the point of care. Applied to cardiovascular (CVD) prevention, CDSS can be used to facilitate care in various ways—for example, by reminding providers to screen for CVD risk factors, flagging cases of hypertension or hyperlipidemia, providing information on treatment protocols, prompting questions on medication adherence, and providing tailored recommendations for health behavior changes.

Summary

CDSS involves the use of computer-generated reminders and prompts to help health care providers make clinical decisions. It is an effective strategy for increasing the quality of care in screening, testing, and treating patients with high blood pressure and high cholesterol. Evidence that it directly affects health outcomes is lacking.

Stories From the Field: South Omaha Medical Associates, Nebraska Department of Health and Human Services, Douglas County Health Department, and Wide River Health Information Technology.

Evidence of Effectiveness



Legend: Well supported/Supported  Promising/Emerging  Unsupported/Harmful 

Evidence of Impact



Legend: Supported  Moderate  Insufficient 



Evidence of Effectiveness

The evidence base demonstrating the effectiveness of CDSS is very strong. Research studies that examined CDSS had strong internal and external validity, the Community Preventive Services Task Force concluded that CDSS is effective, and CDSS trials have been replicated with positive results. Implementation guidance on CDSS is available from several sources.

Evidence of Impact

Health Impact

A review by the Community Preventive Services Task Force found that CDSS leads to significant improvements in the following three quality of care practices for CVD prevention delivered by health care providers:^{1,2}

- Recommendations for screening (e.g., for blood pressure or cholesterol) and other preventive care (e.g., smoking cessation).
- Evidence-based clinical tests related to CVD.
- CVD-related treatments prescribed.

Evidence exists that CDSS can be tied to lower blood pressure and cholesterol levels, but the findings on this association are inconsistent.

Health Disparity Impact

The ability of CDSS to reduce health disparities is understudied, and several researchers have suggested that further work is needed to directly examine this issue. Some have noted that providers working with underserved communities typically lag behind in the uptake of electronic health records (EHRs) and CDSS, and evidence exists that CDSS leads to successful health outcomes when used in underserved communities.^{3,4} Thus, it is reasonable to conclude that CDSS has the potential to eliminate barriers and reduce disparities in hypertension-related care.

Economic Impact

Economic factors related to the implementation and maintenance of CDSS have not been well-documented. A review by the Community Preventive Services Task Force was inconclusive because of a lack of available data. The Task Force found that current studies are extremely heterogeneous in the range of CDSS functions and CVD risk factors studied and in the completeness or inclusion of major cost factors. Thus, the ability to determine an overall estimate of the cost or economic benefit of CDSS is limited. Of the studies available, health care costs appear to be more likely to decrease than increase after CDSS implementation, but the usefulness of this evidence is limited by incomplete and inconsistent data.⁵ More data on the complete costs of developing, implementing, and operating CDSS systems are needed to fully assess its cost-effectiveness or return on investment.



The evidence base demonstrating the effectiveness of CDSS is very strong.

Stories from the Field

Clinical Decision Support



CDSS at South Omaha Medical Associates

South Omaha Medical Associates (SOMA) is a family-owned, family-operated clinic that is centrally located in South Omaha, Nebraska. It has a higher percentage of low-income patients than clinics in surrounding areas. SOMA collaborated with the Nebraska Department of Health and Human Services, Douglas County Health Department, and Wide River Health Information Technology to assess its technology needs and make plans to implement CDSS. As a result of this assessment, the clinic increased its use of EHRs and implemented systems to better identify patients with undiagnosed hypertension, increase use and monitoring of clinical quality measures, and increase use of clinically supported self-measured blood pressure monitoring. These changes improved workflow at the clinic and led to a 25% increase in patient visits since the start of the collaboration. In addition, Blue Cross Blue Shield awarded SOMA its Blue Distinction Award for meeting overall quality measures for patient safety and outcomes.

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Four Considerations for Implementation

1 Settings

Although CDSS has been implemented in a wide variety of health care settings, most published research has been within the context of primary outpatient care.

2 Policy and Law-Related Considerations

Legal considerations for CDSS begin with the vendors who interpret and translate guidelines into algorithms used by these systems. Vendors must fully disclose the sources used to build the knowledge base for their software and any limitations or weaknesses of the software. Providers must ensure that CDSS programming is updated regularly to account for changes in evidence and guidelines, and that EHRs associated with CDSS include complete and up-to-date information about patients' medical histories and allergies.^{1,8,13} Provider fatigue or avoidance of CDSS guidance has been raised as a barrier to successful outcomes, leading to suggestions that initial and repeat trainings be a mandatory part of CDSS implementation.

3 Implementation Guidance

Implementation guidance for CDSS is available from various sources. The following resources may be particularly useful:

- [Measure Up Pressure Down: Provider Toolkit to Improve Hypertension Control from the American Medical Group Foundation.](#)⁶
- [Clinical Decision Support \(CDS\) Implementation: How-To Guides for CDS Implementation from HealthIT.gov.](#)⁷
- Castillo RS, Kelemen A. Considerations for a successful clinical support system. CIN: Computers, Informatics, Nursing.⁸

4 Resources

CDSS is supported and promoted by many federal initiatives and agencies, including:

- [CDC's Million Hearts Initiative.](#)⁹
- [Office of the National Coordinator for Health Information Technology.](#)¹⁰
- [CMS's Merit-Based Incentive Payment System: Advancing Care Information.](#)¹¹
- [Agency for Healthcare Research and Quality.](#)¹²



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Domain 4:

Effective Strategies in Community Programs Linked to Clinical Services



Community programs linked to clinical services, also called community-clinical links,

connect community programs with health systems to improve chronic disease prevention, care, and management. Effective links can reduce barriers to care and increase patient adherence to clinician recommendations.



Integrating Community Health Workers on Clinical Care Teams and in the Community



Community Pharmacists and Medication Therapy Management



Integrating Community Health Workers on Clinical Care Teams and in the Community

A **community health worker (CHW)** is defined as a frontline public health worker who is a trusted member of a community or who has a thorough understanding of the community being served.¹ This relationship allows CHWs to serve as a link between health and social service programs and the community to promote access to services and improve the quality and cultural competence of service delivery. CHWs also help build individual and community capacity to improve health outcomes by increasing health knowledge and self-sufficiency through a range of activities, such as outreach, community education, informal counseling, social support, and advocacy. The integration of CHWs on clinical care teams is a strategy that can be considered to straddle both Domains 3 (health care system interventions) and 4 (community-clinical links).

Summary

Integrating CHWs on clinical care teams and in the community is an effective strategy for increasing patient knowledge and medication adherence and lowering blood pressure and cholesterol levels among diverse populations and in various settings.

Stories From the Field:
Clinical-Community Health Worker Initiative, Mississippi State Department of Health.

Evidence of Effectiveness



Legend: Well supported/Supported  Promising/Emerging  Unsupported/Harmful 

Evidence of Impact



Legend: Supported  Moderate  Insufficient 



Evidence of Effectiveness

The evidence base demonstrating the effectiveness of integrating CHWs on clinical care teams is very strong. Research studies examining this intervention have had strong internal and external validity, the Community Preventive Services Task Force concluded that the integrating CHWs on clinical care teams is effective, and trials of interventions that integrated CHWs have been replicated with positive results. Implementation guidance for integrating CHWs on clinical care teams is available from several sources.

Evidence of Impact

Health Impact

Integrating CHWs on clinical care teams or in the community as part of cardiovascular disease (CVD) prevention programs can help program participants lower their blood pressure, cholesterol, and blood sugar levels; reduce their CVD risks; be more physically active; and stop smoking.² It can also improve patient knowledge and adherence to medication regimens and improve health care services.²

Health Disparity Impact

By design, the CHW model seeks to eliminate health disparities because the populations served usually include people who have more barriers to care.³ A Community Preventive Services Task Force review found that most studies on CHWs focused on underserved populations and concluded that the CHW model can be effective in improving health and reducing health disparities related to CVD.²

Economic Impact

A review by the Community Preventive Services Task Force concluded that interventions that integrate CHWs on clinical care teams to prevent CVD are cost-effective.² The median cost of intervention was \$329 (range: \$98 to \$422) per person per year, with the main cost drivers being CHW time, costs for training and supervision of CHWs, and cost for any additional interventions or staff. The median change in health care costs after a CHW intervention was a reduction of \$82 (range: -\$415 to \$14) per person per year.

One well-designed study found a return on investment of 1.8 to 1 for a large health plan that served an underserved urban population. Overall evidence for an estimated net benefit indicated that health care cost savings did not exceed the cost of intervention (median net benefit: -\$311 from seven studies). The median cost per quality-adjusted life year (QALY) saved was \$17,670 (range: \$8,233 to \$24,149), and all estimates were well below the commonly used and conservative threshold of \$50,000 per QALY. The review also noted incomplete reporting or inclusion of major cost drivers in some studies. Future studies should assign a cost to CHW services and time, whether those services are voluntary (unpaid) or otherwise.²



Stories from the Field

Community Health Workers



CHWs at Mississippi Delta Health Collaborative

The Mississippi Delta Health Collaborative implemented the Clinical-Community Health Worker Initiative (CCHWI) to improve clinical outcomes for CVD through aspirin use, hemoglobin A1c control, blood pressure control, cholesterol management, and smoking cessation in the 18-county Mississippi Delta region.¹³ The CCHWI model emphasizes the importance of CHWs as integral members of clinical care teams. CHWs received 160 hours of core competency training and 40 hours of training specific to CVD prevention. About 1,100 patients from six participating health care systems—including FQHCs, Rural Health Centers, and private providers—were enrolled because they were diagnosed with hypertension, diabetes, or dyslipidemia. After 4 years, seven CHWs were integrated into the participating health care systems and their duties included visiting patients in their homes. CHWs worked to meet patients' health care needs through chronic disease self-management workshops, trainings on self-measured blood pressure monitoring, and encouragement of medication adherence. From 2012 to 2016, a 1.3% relative decrease in systolic blood pressure and a 1.7% relative decrease in diastolic blood pressure were observed among patients with hypertension who were enrolled in this program.

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Four Considerations for Implementation

1 Settings

CHWs have been integrated in a variety of primary care settings, including federally qualified health centers (FQHCs), managed care health systems, patient-centered medical homes, and community pharmacies.¹⁻⁵

2 Policy and Law-Related Considerations

The need for policies to ensure that CHWs are sustainably reimbursed for their contribution to team-based care is a frequently cited concern.^{1,3,4} There is also debate about whether states should require credentialing or certification of CHWs. Proponents of credentialing would like policies to support the consistency of training and certification of CHWs across the country. Opponents are concerned that credentialing could reduce the CHW workforce and decrease access to CHWs who may have intrinsic and invaluable qualities that cannot be certified or credentialed. More information is available from CDC in the form of a [State Law Fact Sheet](#)¹¹ and [Policy Evidence Assessment Report](#)¹² that address this topic.

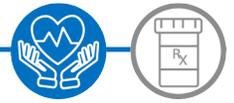
3 Implementation Guidance

CDC has compiled evidence-based research to support the effectiveness of CHWs in the [Community Health Worker Toolkit](#).⁶ This tool kit also includes information that state health departments can use to train and further build capacity for CHWs in their communities, as well as helpful resources that CHWs can use in their communities.

4 Resources

Many public and private institutions support including CHWs on health care teams. Examples include the following:

- [Centers for Disease Control and Prevention's 6|18 Initiative](#).⁷
- [CDC's Million Hearts Initiative](#).⁸
- [The Institute of Medicine and National Academies Press](#).⁹
- [Centers for Medicare & Medicaid Services](#).¹⁰



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Community Pharmacists and Medication Therapy Management

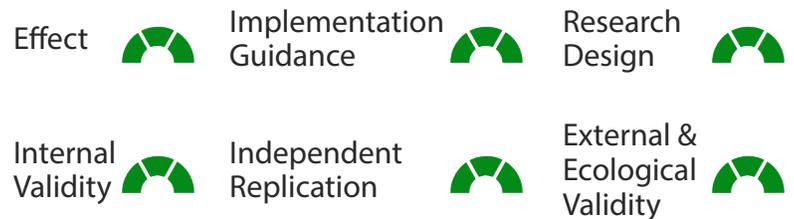
Medication therapy management (MTM) is a distinct service or group of services provided by health care providers, including pharmacists, to ensure the best therapeutic outcomes for patients. MTM includes five core elements: medication therapy review, a personal medication record, a medication-related action plan, intervention or referral, and documentation and follow-up. Within the context of cardiovascular disease (CVD) prevention, MTM can include a broad range of services, often centering on (1) identifying uncontrolled hypertension (2) educating patients on CVD and medication therapies, and (3) advising patients on health behaviors and lifestyle modifications for better health outcomes. MTM is especially effective for patients with multiple chronic conditions, complex medication therapies, high prescription costs, and multiple prescribers. MTM can be performed by pharmacists with or without a collaborative practice agreement (CPA), and it is a strategy that can be considered to straddle both Domains 3 (health care system interventions) and 4 (community-clinical links).

Summary

MTM is care provided by pharmacists with the goal of ensuring the most effective use of drug therapy. It is a cost-effective strategy for increasing patient knowledge and medication adherence and lowering blood pressure.

Stories From the Field:
Ohio Department of Health.

Evidence of Effectiveness



Legend: Well supported/Supported Promising/Emerging Unsupported/Harmful

Evidence of Impact



Legend: Supported Moderate Insufficient



Evidence of Effectiveness

Strong evidence exists that the use of MTM by pharmacists is effective. Although the exact combination of MTM activities tends to vary between settings, studies examining MTM have generally found it to be effective and to have strong internal and external validity. MTM trials have been replicated in many different contexts with positive results. Implementation guidance on MTM is available from several sources, including the guidance provided under Medicare Part D.

Evidence of Impact

Health Impact

In 2015, the Agency for Healthcare Research and Quality (AHRQ) found the evidence behind MTM to be insufficient because of inconsistency in the operationalization of MTM across studies, but concluded that MTM can improve medication adherence.¹ MTM has been shown to be effective for lowering systolic and diastolic blood pressure; lowering LDL cholesterol and other health indicators (e.g., glycosylated A1C, HBA1c); increasing patient knowledge; improving patient quality of life and medication adherence; and improving the safe and effective use of medications, including reducing therapeutic duplication, decreasing total medications prescribed, and increasing adherence for therapeutic care.²⁻⁸

Health Disparity Impact

Expanding the pharmacist's role through MTM is likely to increase access to health care for populations facing the most barriers to care. However, few studies have examined the ability of MTM to reduce health disparities in CVD outcomes. Although some evidence exists that MTM can achieve positive outcomes among minority and low-income populations, the extent of this evidence is limited and inconsistent.^{4,5} More research is needed to directly examine the effect of MTM on different populations.

Economic Impact

Studies have indicated that MTM can produce health care cost savings and a positive ROI for health care systems.⁹⁻¹¹ A study that examined the effect of providing MTM in a large health system for over 10 years found that the cost to providing MTM services was \$76 per patient encounter, and the return on investment (ROI) that resulted from health care cost savings was \$1.29 per \$1 spent on MTM services over this period.¹⁰

Another study that evaluated the use of MTM by a self-insured employer reported an intervention cost of \$145.61 per patient and a ROI to the payer of \$1.67 per \$1 of MTM costs over a 6-month period.¹¹ Despite early findings of potential economic benefits, recent meta-analyses and systematic reviews have identified a need for better cost-effectiveness data on expanded pharmacist care.^{7,8}



Strong evidence exists that the use of MTM by pharmacists is effective.

Stories from the Field

Medication Therapy Management



MTM at Ohio Department of Health

In 2014, the Ohio Department of Health (ODH) teamed up with three Federally Qualified Health Centers (FQHC) sites to assess the effect of MTM counseling sessions on patients with hypertension. This effort involved collaboration among the Ohio State University College of Pharmacy, Ohio Pharmacists Association, Ohio Association of Community Health Centers, and the Health Services Advisory Group. These partners helped plan and develop the assessment. Pharmacists administered MTM to 5,000 patients with hypertension who were receiving care at one of the three FQHC sites. After 6 months, assessments found that hypertension control had increased to 68.6% among these patients. There were key components related to the project's achievement, which included maintaining relevant partnerships, implementing the pilot in one type of pharmacy setting, allowing FQHC sites to develop their own protocols for patient enrollment, using effective dissemination processes, and selecting data points that align with current pharmacy practices. Challenges included finding champions for the MTM model.

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Four Considerations for Implementation

1 Settings

MTM has been implemented in several settings, including federally qualified health centers, patient-centered medical homes, managed care health systems, community pharmacies, hospital pharmacies, and primary care clinics.

2 Policy and Law-Related Considerations

MTM is currently supported under the Centers for Medicare & Medicaid Services (CMS), as a service available to selected Medicare beneficiaries. As a part of Medicare Part D regulations, enrollees with multiple chronic diseases who are taking multiple Part D drugs are [eligible for MTM programs](#).¹² Outside of the CMS guidelines, reimbursement for time and services is a key issue for pharmacists performing MTM. Regional variations in training and scope of practice can limit pharmacists when they attempt to provide MTM services. For MTM to work most effectively, pharmacists and prescribers can develop CPAs with shared blood pressure management protocols. Other policy considerations that need attention are determining the inclusion criteria for patients to receive MTM and encouraging payers to make the service available and offer reimbursement for pharmacists.

3 Implementation Guidance

Implementation guidance has been developed by various organizations, including:

- [Centers for Medicare & Medicaid Services](#).¹²
- American Pharmacists Association's [MTM Central](#),¹³ which includes implementation guidance, an MTM resource library, and information about the added value of MTM.

4 Resources

Several federal agencies are working on initiatives that focus on greater involvement of pharmacists in cardiovascular prevention and MTM. They include the following:

- [Centers for Medicare & Medicaid Services](#).¹²
- AHRQ, which provides the [National Guideline Clearinghouse](#)¹⁴ and a list of resources related to [innovations in MTM](#).¹⁵
- [CDC's 6|18 Initiative](#).¹⁶
- [CDC's Million Hearts Initiative](#).¹⁷



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Appendices

Appendix B. Rapid Synthesis and Translation Process (RSTP)

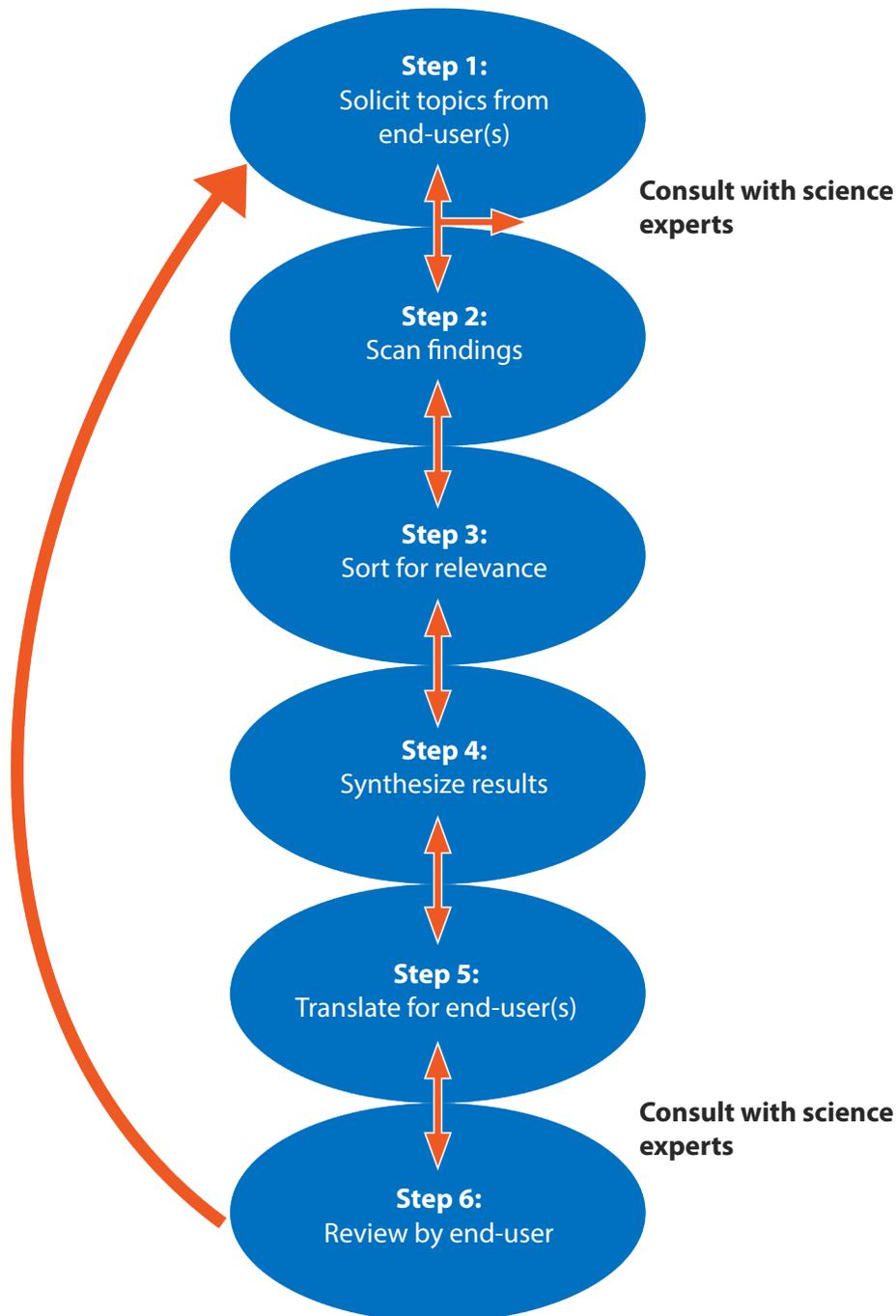
As part of the process of developing the *Best Practices Guide for CVD Prevention*, we adapted the Rapid Synthesis and Translation Process (RSTP) to provide a structure for engaging both subject matter experts (SMEs) and health care practice partners. This conceptual process, developed within CDC's Division of Violence Prevention in the National Center for Injury Prevention and Control, consists of six fundamental steps ([Figure 2](#)), which do not necessarily occur in chronological order.

The following steps and related definitions are applied in our adaptation of the RSTP framework:

- **Step 1: Solicit Topics from End Users** — For the *Best Practices Guide for CVD Prevention*, “end users” were grantees (health care practitioners), evaluators (internal), content SMEs (internal and external), and program specialists (internal).
- **Step 2: Scan Findings** — The *Best Practices Guide for CVD Prevention* development team in CDC's Division for Heart Disease and Stroke Prevention (DHDSP) reviewed the research literature to identify evidence-based strategies for preventing cardiovascular disease (CVD). The strategies determined to be potential best practices were moved to Step 3.
- **Step 3: Sort for Relevance** — Criteria for including strategies in the *Best Practices Guide for CVD Prevention* were determined according to an internal vetting process that included division and branch leadership, internal SMEs, and external SMEs. A group of grantees was also asked to identify practice-based relevance for each strategy.
- **Step 4: Synthesize Results** — Internal SMEs used the Continuum of Evidence of Effectiveness to assess the evidence behind the identified strategies. This interactive, online tool uses a series of questions about each strategy to place it on a continuum of six dimensions of evidence (see [Appendix C](#) for more information). Once this baseline assessment of the evidence was done, only strategies with results and methodology in the highest category (i.e., supported or well-supported) were considered further. The availability of implementation guidance was not a requirement for inclusion. Selected strategies were then reviewed for fit with the best practices framework to assess their potential to improve cardiovascular health, reduce health disparities, and demonstrate economic sustainability.
- **Step 5: Translate to End User(s)** — A small team in DHDSP used the data collected from the SME assessments, the best practice framework review, and additional input from internal program and evaluation experts to draft the *Best Practices Guide for CVD Prevention*.
- **Step 6: Review by End User(s)** — Standard processes for clearance by CDC and the US Department of Health and Human Services were initiated after additional review by a panel of grantees, SMEs, and other potential end users.

For more information on the best practices framework, see Spencer LM, Schooley MW, Anderson LA, et al. Seeking Best Practices: A Conceptual Framework for Planning and Improving Evidence-Based Practices. *Prev Chronic Dis*. 2013;10:130186. doi: <http://dx.doi.org/10.5888/pcd10.130186>.

Figure 2. Rapid Synthesis and Translation Process (RSTP)



Adapted figure from: Thigpen S, Puddy RW, Singer HH, Hall DM. Moving knowledge into action: developing the Rapid Synthesis and Translation Process within the Interactive Systems Framework. *Am J Community Psychol.* 2012;50(3-4):285–294.

Appendix C. Understanding the Continuum of Evidence of Effectiveness Tool

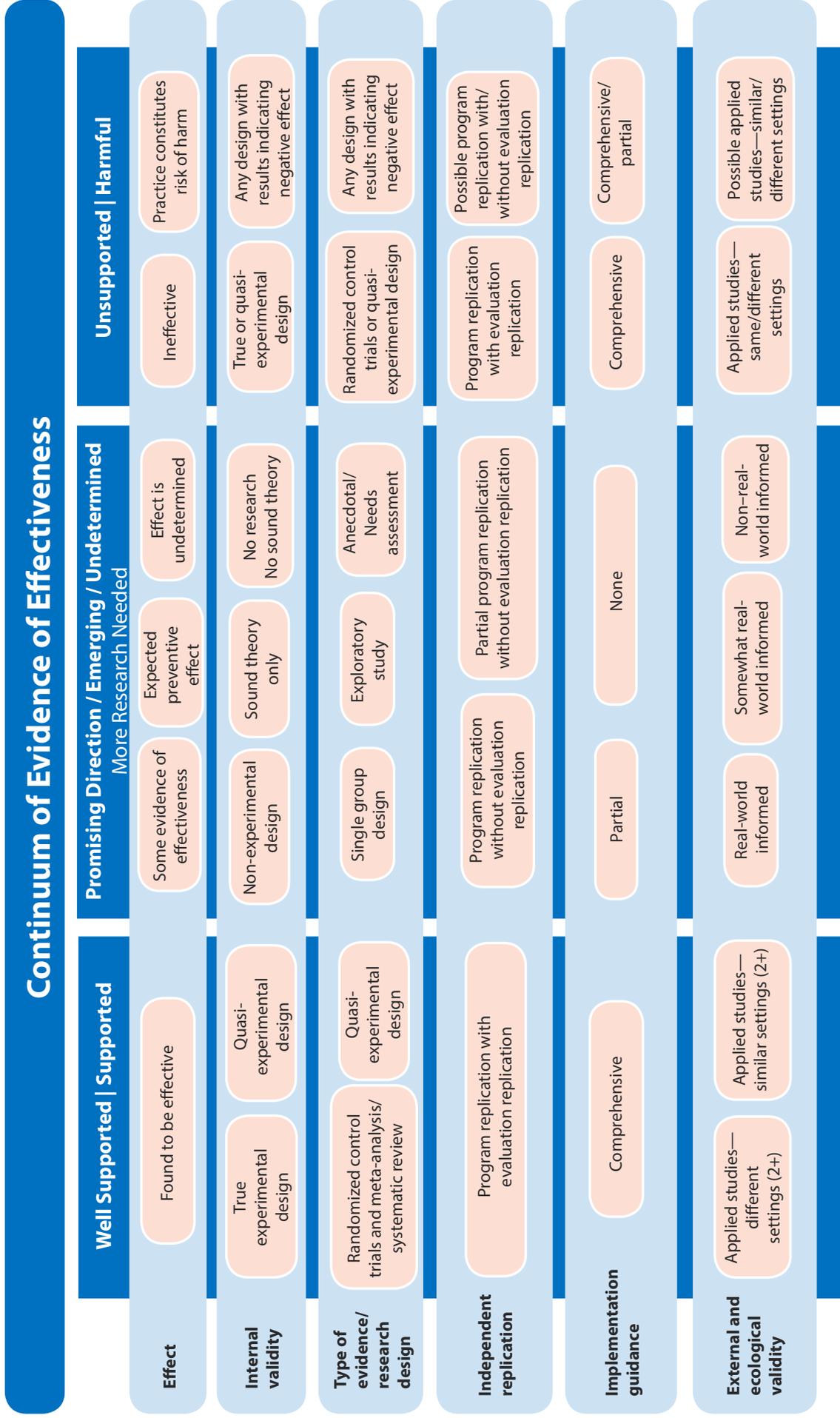
The Continuum of Evidence of Effectiveness (hereafter called the Continuum) tool clarifies and defines standards for assessing research evidence. Because of its ability to determine the strength of evidence on the basis of a clear and universal set of standards, the Continuum was chosen as the mechanism to rate the evidence behind the strategies included in the *Best Practices Guide for CVD Prevention*. This interactive, online tool was developed in 2007 by CDC's Division of Violence Prevention in the National Center for Injury Prevention and Control. The division needed a way to provide coherent and consistent language around the word "evidence" in programmatic activities. Division staff synthesized information about program effectiveness from the research literature, subject matter experts, and practitioners with experience implementing strategies in the field. This information guided the development of the Continuum, which assesses various components to determine the strength of the best available research evidence on a program, practice, or policy. The Continuum also illuminates the strengths and weaknesses of the research evidence and offers guidance on next steps for consideration.

Although this tool was developed to be applied specifically to the field of violence prevention, it can be used to guide evidence-based decision making in a wide range of health-related areas. In developing the *Best Practices Guide for CVD Prevention*, two knowledgeable reviewers used this tool to rate the evidence for each strategy considered for inclusion in this publication. Any discrepancies between the reviewers' results were resolved through discussion.

The structure and range of possible results from the Continuum tool are shown in [Figure 3](#). The Continuum has six evidence dimensions, which are listed vertically down the left side of the figure. It has three overarching categories of evidence strength, which are listed horizontally across the top of the figure. The Continuum uses the reviewer's input for a specific program or strategy to determine the strength of evidence for each dimension and assign a corresponding strength category for each dimension. The full range of responses for each dimension is shown in [Figure 3](#). Definitions and possible results for the six dimensions are provided in a [table](#) after the figure.

For more information about the Continuum of Evidence of Effectiveness, see CDC's 2011 publication, *Understanding Evidence Part 1: Best Available Research Evidence. A Guide to the Continuum of Evidence of Effectiveness*.

Figure 3. Continuum of Evidence of Effectiveness



Adapted figure from: Puddy, R. W. & Wilkins, N. (2011). *Understanding Evidence Part 1: Best Available Research Evidence. A Guide to the Continuum of Evidence of Effectiveness*. Atlanta, GA: Centers for Disease Control and Prevention.

Table 1. Possible Results and Definitions of the Six Dimensions of the Continuum of Evidence Effectiveness Tool

Dimensions and Possible Results	Definitions
Effect: The strategy's ability to reduce cardiovascular disease (CVD) or related risk factors or outcomes.	
Found to be effective 	Prevention strategies that are found to be effective are those that are based on sound theory, have been evaluated in at least two well-conducted studies, and have demonstrated significant, short-term or long-term preventive effects, depending on intent and design.
Some evidence of effectiveness 	Some programs may not have two or more rigorous evaluations to demonstrate short-term or long-term preventive effects, but they are based on sound theory and have been rigorously evaluated, and the results indicate that they may produce preventive outcomes.
Expected preventive effect 	Some programs may be grounded in theory and have been evaluated with a less rigorous design, or they may have been evaluated for short-term or long-term preventive effects that are different from the outcomes of interest.
Effect is undetermined 	Prevention programs that have not been evaluated or that have been evaluated poorly (with neither a true nor quasi-experimental design), whether or not they are based on sound theory, are considered to have undetermined effectiveness. It is not known whether these programs produce short-term or long-term preventive effects.
Ineffective 	Ineffective strategies are those that have been evaluated in at least two well-conducted studies and have demonstrated no significant short-term or long-term outcomes in these evaluation studies.
Practice constitutes risk of harm 	A prevention strategy is considered to be harmful if there is an indication that it causes harmful outcomes. This includes short-term outcomes, long-term outcomes, and/or unexpected outcomes. These harmful outcomes may be due to the inherent nature of the program, its implementation, an interaction with certain population-related factors, or an interaction with certain context/setting-related factors.
Internal Validity: The extent to which the short-term and long-term outcomes of a strategy can truly be attributed to the strategy itself.	
True experimental design 	True experiments are considered highest in internal validity because participants are randomly assigned to the treatment and control conditions. This helps assess whether the program, practice, or policy is likely responsible for changes in outcomes or if something else could be causing them. The strongest experimental designs also have multiple measurement points. These experiments are able to measure not only differences in outcomes between treatment and control groups, but also changes in outcomes over time. This helps to assess whether the demonstrated effects are sustained over time.
Quasi-experimental design 	<p>Quasi-experiments are also considered to have high internal validity, although less so than true experiments. Quasi-experiments are based on sound theory and typically have comparison groups (but no random assignment of participants to condition) and/or multiple measurement points.</p> <p>Some quasi-experimental designs are used to evaluate policy changes or naturally occurring experiments. These evaluations may not have a comparison group but include multiple waves of observation both before and after the introduction of a treatment.</p>

Dimensions and Possible Results	Definitions
Nonexperimental design 	<p>Relative to experimental and quasi-experimental designs, nonexperimental studies are the weakest of the three in terms of internal validity. Even though these designs are not as rigorous as true and quasi-experiments, they may still be based on sound theory and include some empirical aspects geared toward internal validity. Nonexperimental studies do not have a control or comparison group or multiple measurement points, making it difficult to attribute observed changes to the program.</p>
Sound theory only 	<p>Prevention programs based on sound theory only are also unable to establish or attribute observed changes to the program as those based on experimental or quasi-experimental studies. These programs are often exploratory in nature and are rooted in well-established research and subject matter expert opinion, suggesting that the program and/or its components may modify known risk or protective factors and produce preventive outcomes.</p>
No research, no sound theory 	<p>Programs not based on research or sound theory are considered weakest of all in terms of establishing an empirical link to a preventive outcome. In the absence of research or sound theory, there is no evidence to suggest that they are likely to modify known risk/protective factors or produce preventive outcomes.</p> <p>Some, however, may have face validity. This type of validity is concerned with how a measure or procedure appears and whether it seems reasonably well designed and reliable. Unlike other forms of validity, face validity does not depend on established theories for support.</p>
Research Design: The soundness of individual research method components.	
Randomized control trial and meta-analysis or systematic review 	<p>Randomized control trials are true experiments and considered a highly rigorous research design. They are the strongest research design for establishing a cause-effect relationship. Randomized control trials have a control group and randomly assign participants to the control or treatment condition.</p> <p>Systematic reviews collect information from a number of scientific studies on a specific topic for the purpose of summarizing, analyzing, and interpreting the overall scientific findings on that topic.</p> <p>A meta-analysis is a type of systematic review that uses statistical analyses to combine and analyze the data from single scientific studies on a specific topic and uses these combined findings to generate a single estimate or effect size to make more conclusive statements about the topic. The strongest reviews are conducted independently, consist of studies that were conducted independent from one another, consist of studies that are comparable, and include some form of empirical analysis to draw broader, general conclusions about the effectiveness of a strategy.</p>
Quasi-experimental design 	<p>If a design uses multiple groups without random assignment or includes multiple measurement points, it is considered quasi-experimental. Quasi-experimental designs are considered rigorous designs, although not as rigorous as randomized control trials because participants are not randomly assigned to treatment and control conditions and may not be equivalent from the start. In this respect, they are weaker in controlling threats to internal validity than randomized control trials.</p>
Single group design 	<p>The single group design is not considered as rigorous as the randomized control trial or quasi-experimental designs because it does not include a control or comparison group. Single group designs may also have just one post-measure or they may include pre- and post-measures.</p>

Dimensions and Possible Results	Definitions
Exploratory studies 	Exploratory studies are focused on learning about a program and the phenomena it addresses. Exploratory studies are based on sound theory derived from prior research and/or knowledge from subject matter experts. The information gleaned from an exploratory study may point to risk and protective factors that are potentially important to consider in developing or refining a prevention strategy or its components. Some descriptive and observational studies may also be considered exploratory studies.
Anecdotal or needs assessment 	Studies not based on empirical research or sound theory are the weakest with respect to research design. Studies that are based on anecdotal information, needs assessments, or windshield surveys are examples of this kind of research.
Independent Replication: Implementation and evaluation of a program by researchers or practitioners who were unaffiliated with the original program and who do not have any known conflicts of interest.	
Program replication with evaluation replication 	Programs that demonstrate the most reliability (ability to repeatedly produce the preventive effects) are those that have been replicated at least once by independent researchers or practitioners, in a similar setting to the original program, using a rigorous research design, and with high fidelity to the original program.
Program replication without evaluation replication 	Programs that demonstrate some reliability are those implemented with high fidelity to the original program and in settings that are similar to the setting of the original program. These replications may or may not be conducted by independent researchers/practitioners. Finally, these replications have not been evaluated in the same way as the original evaluation of the program.
Partial program replication without evaluation replication 	Programs that demonstrate weak reliability are those that are partially replicated and have not been evaluated. These replications may or may not be conducted by independent researchers/practitioners. Programs that are the weakest in reliability are those that are not replicated at all since there is no way to measure their reliability.
Possible program replication with or without evaluation replication 	If a program demonstrates harmful effects, it should not be replicated. In some cases, harmful effects may not have occurred during the original implementation of a prevention strategy but may occur in its replication. Evaluations may or may not have been conducted of this replication since a formal evaluation is not needed to prove harm. Once harmful effects have been associated with a program, either in the original or during a replication, no subsequent replications should be conducted.
Implementation Guidance: The availability of any and all services or materials that could help in the implementation of a strategy in different settings.	
Comprehensive 	Comprehensive guidance is the most effective way of ensuring that a program is carried out with fidelity in a different setting. This entails availability and accessibility of any products, services, or activities that facilitate proper implementation in a new setting. These products and services include training, coaching, technical assistance, support materials, organizational/systems change consultation, and manuals/guides, and may be offered by the program's developers or some other entity.
Partial 	For some programs, there may be some products, services, or activities to help researchers/practitioners implement them in different settings, but they may be limited in their availability and accessibility. It is important to note that since implementation support and guidance are limited for these programs, there is a chance that implementation issues may be influencing outcomes.
None 	Programs that do not have any products, services, or activities available to help researchers/practitioners implement them in a different setting run a high risk of experiencing implementation issues. This also means there is a significant chance that implementation issues may be influencing outcomes.

Dimensions and Possible Results	Definitions
External and Ecological Validity: Whether a program has been evaluated among diverse populations and in different contexts.	
Two or more applied studies: different settings 	Programs that demonstrate the highest external and ecological validity are those that have been implemented in two or more applied (“real-world”) settings that are distinct from both the original setting and each other in terms of their populations and physical/geographical locations.
Two or more applied studies: same settings 	Some programs have been implemented in two or more applied (“real-world”) settings that are similar to one another with similar populations. These prevention strategies demonstrate moderate external and ecological validity although not as much as those implemented in two or more settings that are different and that have different populations.
Real-world–informed 	Programs that have not been implemented in applied settings may still demonstrate some external and ecological validity if they are made up of components that are consistent with an applied setting. Likewise, programs may demonstrate external and ecological validity if they are implemented in ways that mirror conditions of the “real-world.”
Somewhat real-world–informed 	Some programs have not been implemented in applied settings and are not structured and implemented in ways that are completely consistent with an applied setting. These prevention strategies demonstrate some external and ecological validity if some of their components and implementation approximate conditions in the “real world.”
Not real-world–informed 	Programs that demonstrate the least amount of external and ecological validity are those whose basic components are not consistent with an applied setting and are not implemented in ways that mirror conditions of the “real world.” While it is not known whether these programs will be effective in applied settings, there is no way to measure which aspects work well across different settings and populations or which aspects are setting-specific.
Possible applied studies in similar or different settings 	Programs that demonstrate harm in any kind of a setting, applied or otherwise, are considered harmful. In other words, the program is considered harmful regardless of whether or not it has been conducted in an applied setting.

Appendix D. Glossary

Best practice: A practice supported by a rigorous process of peer review and evaluation indicating effectiveness in improving health outcomes, generally demonstrated through systematic reviews.

Best practices framework: A conceptual framework that includes important aspects of impact and quality to provide a common lexicon and criteria for assessing and strengthening public health practice.

Clinical decision support system (CDSS): A program that analyzes data entered into an electronic health record to trigger reminders, flags, and treatment protocols to help health care providers make clinical decisions.

Collaborative drug therapy management (CDTM): Qualified pharmacists are permitted to assume professional responsibility for performing a full scope of services (e.g., ordering drug-therapy laboratory tests; administering drugs; and selecting, initiating, monitoring, continuing, and adjusting drug regimens). Authority of CDTM is defined in the state's pharmacy practice within the scope of practice section.

Collaborative practice agreements (CPAs): A strategy to expand the pharmacist's role in team-based care with other providers and improving health outcomes. The range of services authorized under each state's practice act varies.

Community Guide (The Guide to Community Preventive Services): A resource with a collection of evidence-based findings from the Community Preventive Services Task Force (Task Force). This resource was created to help states, communities, community organizations, business, health care organizations, and schools select interventions to improve health and prevent disease.

Community health worker (CHW): The American Public Health Association defines a CHW as a "frontline public health worker who is a trusted member of and/or has an unusually close understanding of the community being served. This trusting relationship enables the CHW to serve as a liaison/link/intermediary between health/social services and the community to facilitate access to services and improve the quality and cultural competence of service delivery. In addition, a CHW builds individual and community capacity to improve health outcomes by increasing health knowledge and self-sufficiency through a range of activities such as outreach, community education, informal counseling, the provision of social support and advocacy."

Community Preventive Services Task Force (Task Force): An independent, nonfederal, unpaid panel of public health and prevention experts that provides evidence-based findings and recommendations about community preventive services, programs, and policies to improve health. Findings are summarized within the Guide to Community Preventive Services. The Task Force issues findings based on systematic reviews of effectiveness and economic evidence that are conducted with a methodology developed by the Community Guide Branch, which is based at CDC.

Community programs linked to clinical services: A term to describe connecting community programs with health care systems to improve disease prevention, care, and management.

Continuum of Evidence of Effectiveness: A tool to describe and assess various components in determining the strength of the best available research evidence on a program, practice, or policy's effectiveness. It illuminates the strengths and weaknesses of the research evidence and offers guidance on next steps for consideration. It consists of six dimensions, each of which addresses a specific aspect of the best available research evidence (e.g., effect, internal validity, research design, independent replication, implementation guidance, and external and ecological validity).

Effect: One of the six dimensions of CDC’s Continuum of Evidence of Effectiveness. Effectiveness is important because it tells us whether a prevention strategy is having an impact on the outcomes of interest. The most effective strategies produce preventive effects in the short term, long term, or both. The effectiveness of a strategy is based on its intent and design.

E-Prescribing: A prescriber’s ability to electronically send an accurate, error-free and understandable prescription directly to a pharmacy from the point-of-care. This is an important element in improving the quality of patient care.

External ecological validity: One of the six dimensions of CDC’s Continuum of Evidence of Effectiveness. External validity refers to whether a program, practice, or policy can demonstrate preventive effects among a wide range of populations and contexts. Ecological validity refers to whether the program components and procedures approximate the “real-life” conditions specific to a specific setting.

Health care system interventions: Effective delivery and use of quality care and preventive services in clinical settings.

Implementation guidance: One of the six dimensions of CDC’s Continuum of Evidence of Effectiveness. This includes any and all services and/or materials that aid in the implementation of a prevention strategy in a different setting, including but not limited to “training, coaching, technical assistance, support materials, organizational/systems change consultation, and manuals/guides.”

Independent replication: One of the six dimensions of CDC’s Continuum of Evidence of Effectiveness. This helps determine whether or not a prevention program can be replicated and implemented with other participants, and produce the same effects. Independent replications are not used to determine whether a program can be successfully generalized to a broad variety of settings or populations.

Internal validity: One of the six dimensions of CDC’s Continuum of Evidence of Effectiveness. This refers to the extent to which the short-term and/or long-term outcomes of a program, practice, or policy can truly be attributed to it or if these outcomes could have been caused by something else.

Medication therapy management (MTM): According to the American Pharmacists Association (APhA), “MTM is a service or group of services that optimize therapeutic outcomes for individual patients. Medication therapy management services include medication therapy reviews, pharmacotherapy consults, anticoagulation management, immunizations, health and wellness programs and many other clinical services. Pharmacists provide medication therapy management to help patients get the best benefits from their medications by actively managing drug therapy and by identifying, preventing and resolving medication-related problems.”

Public health domains of chronic disease prevention: Four key domains of CDC’s National Center for Chronic Disease Prevention and Health Promotion, which include (1) epidemiology and surveillance, (2) environmental approaches, (3) health care system interventions, and (4) community programs linked to clinical services.

Rapid Synthesis and Translation Process (RSTP) Framework: A six-step process developed by and for CDC’s Division of Violence Prevention in collaboration with partners in order to expedite the transfer of research knowledge to practitioners, specifically to prevent violence. The six-steps include the following: (1) topics suggested by end user(s); (2) scan findings; (3) sort for relevance; (4) synthesize results; (5) translate for end user(s); and (6) end user expert review.

Self-measured blood pressure monitoring (SMBP): The regular measurement of blood pressure by the patient outside the clinical setting, either at home or elsewhere. It is sometimes known as “home blood pressure monitoring.”

Team-based care: Team-based health care is the provision of health services to individuals, families, and/or their communities by at least two health providers who work collaboratively with patients and their caregivers—to the extent preferred by each patient—to accomplish shared goals within and across settings to achieve coordinated, high-quality care.

Type of evidence or research design: One of the six dimensions of CDC’s Continuum of Evidence of Effectiveness. The nature of the design of the research study determines whether and how to answer the research questions related to effectiveness. The more rigorous the research design, the higher its internal validity and the more likely outcomes can be attributed to the program, practice, or policy.

For more information, please contact Centers for Disease Control and Prevention
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