

Heart Disease and Stroke Prevention: Team-based Care to Improve Blood Pressure Control

Community Preventive Services Task Force Finding and Rationale Statement Ratified December 2020

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CPSTF Finding and Rationale Statement

Intervention Definition

Team-based care to improve blood pressure control is a health systems-level, organizational intervention that uses a multidisciplinary team to improve the quality of care. Team-based care is established by adding new staff or changing the roles of existing staff who work with a primary care provider.

Each team includes the patient, the patient's primary care provider, and other professionals such as nurses, pharmacists, dietitians, social workers, and community health workers. Team members provide process support and share responsibilities of blood pressure control to complement the activities of the primary care provider. Responsibilities include medication management, patient follow-up, and adherence and self-management support.

Team-based care interventions typically include activities to do the following:

- Facilitate communication and coordination of care support among various team members
- Enhance the use of evidence-based guidelines by team members
- Establish regular, structured follow-up mechanisms to monitor patients' progress and schedule additional visits as needed
- Actively engage patients in their own care by providing them with education about blood pressure (hypertension) medication, adherence support (for medication and other treatments), and tools and resources for self-management (including self-measured blood pressure monitoring and health behavior change)

CPSTF Finding (December 2020)

The Community Preventive Services Task Force (CPSTF) recommends team-based care to improve blood pressure control based on strong evidence of effectiveness in improving the proportion of patients with controlled blood pressure and in reducing systolic and diastolic blood pressure (SBP and DBP). Findings provide strong evidence of effectiveness for team-based care organized primarily with nurses and pharmacists working in collaboration with primary care providers, patients, and other professionals. Evidence shows meaningful improvements in blood pressure control for Black or African American and Hispanic or Latino patients. When implemented by health care providers to serve patients from racial and ethnic minority groups, interventions are likely to advance health equity.

The CPSTF finds team-based care to improve blood pressure control cost-effective. Systematic review evidence shows the median cost per quality adjusted life year (QALY) gained for team-based care is \$15,202, which is below a conservative threshold of \$50,000.

Rationale

Basis of Finding

The CPSTF recommendation is based on evidence from a review of 54 studies (search period January 2012 - June 2020). The CPSTF assessed evidence to be strong based on the magnitude of effect estimates, number of studies, and consistency of effects. This recommendation updates and replaces the 2012 finding of strong evidence of effectiveness for team-based care to improve blood pressure control. The update focuses on evidence from studies published since the 2012 finding.

Evidence from the 54 included studies showed interventions lead to improvements in blood pressure outcomes (Table 1). Studies also showed team-based care improved lipid and diabetes-related outcomes, especially total cholesterol, and low-density lipoprotein (LDL) cholesterol (Table 2).

Table 1. Intervention Effects on Blood Pressure Outcomes

Outcome	Number of Studies	Effect Estimate	Direction of Effect
Improvement in the proportion of patients with controlled blood pressure*	39	Median increase of 8.5 percentage points (IQI: 2.8 to 17.8 percentage points)	Favors the intervention
Mean systolic blood pressure (SBP)	44	Median decrease of 3.5 mmHg (IQI: -6.8 to 0.1 mmHg)	Favors the intervention
Mean diastolic blood pressure (DBP)	35	Median decrease of 2.1 mmHg (IQI: -4.7 to -0.4 mmHg)	Favors the intervention

*Absolute percentage point difference in proportion of patients achieving blood pressure control. Blood pressure control was based on guidelines used by the study for controlled systolic and diastolic blood pressure (<140/90 mmHg or <130/80 mmHg).

IQI: Interquartile Interval

mmHg: Millimeters of mercury

Table 2. Intervention Effects on Lipid and Diabetes-related Outcomes[^]

Outcome	Number of Studies	Median Study Effect Estimate	Direction of Effect
Mean total cholesterol	8	Median decrease of 3.8 mg/dL (IQI: -7.7 to -3.2 mg/dL)	Favors the intervention
Mean low-density lipoprotein (LDL)	13	Median decrease of 3.9 mg/dL (IQI: -8.6 to -0.4 mg/dL)	Favors the intervention
Mean high-density lipoprotein (HDL)	7	Median increase of 0.7 mg/dL (IQI: -1.5 to 2.2 mg/dL)	No effect
Mean triglycerides	5*	Median decrease of 4.4 mg/dL (IQI: -14.2 to -0.4 mg/dL)	Favors the intervention
Hemoglobin A1C levels	10**	Median decrease of 0.10% (IQI: -0.31% to 0.02%)	Favors the intervention

[^]All study designs included in median effect estimates

* One additional study reported no change in HDL levels overall (p=0.2)

**One additional study reported a favorable, but not statistically significant change in A1C control (Odds ratio: 1.2 [95%CI -0.4, 3.6 p=0.79])

IQI: Interquartile Interval

mg/dL: Milligrams per deciliter

Seven studies examined intervention effect on overall risk for cardiovascular disease. Four studies that used a version of the Framingham 10-year risk score reported results that were favorable and statistically significant (2 studies), favorable (1 study), or showed no change (1 study). The remaining three studies evaluated cardiovascular disease risk using other measures and reported results that were favorable and statistically significant (1 study), and favorable (2 studies). Reductions in cardiovascular disease risk were generally meaningful.

Team-based care members who worked with patients and primary care providers were predominantly nurses (22 studies), pharmacists (13 studies), or both (7 studies). Clinical pharmacists delivered interventions in 11 studies. Additional team members included community health workers or lay health workers (9 studies), dietitians (6 studies), medical assistants (6 studies), clinicians providing consultations on hypertension management (3 studies), physician's assistants (2 studies), pharmacy technicians (2 studies), occupational therapists (2 studies), and social workers (2 studies).

When pharmacists were added to teams, median improvements in blood pressure control and systolic blood pressure were greater than the overall median effect estimates for these outcomes. When nurses were added to teams, median improvements in blood pressure control and systolic blood pressure were similar to the overall median effect estimates. When both pharmacists and nurses were added to teams, median improvements were greater for blood pressure control and systolic blood pressure than the overall median effect estimates. The included studies added one (24 studies), two (17 studies), or three or more team members (12 studies). Patients experienced greater improvements in blood pressure control and systolic blood pressure when two or more people were added to the team (e.g., pharmacist or nurse).

Most of the included studies described team members' roles in managing patient blood pressure medications. Team members were able to change blood pressure (hypertension) medications independent of the primary care provider (16 studies); made changes with primary care provider approval or consultation (16 studies); or had no role in medication changes (15 studies). Teams that allowed members to change medications with or without primary care approval or consultation achieved larger improvements in blood pressure outcomes when compared with teams that did not.

Additional team member roles included support and management for patients' self-measured blood pressure (SMBP) monitoring (21 studies) and follow-up checks for blood pressure (30 studies). Overall, studies that included SMBP showed greater improvements in blood pressure outcomes (e.g., blood pressure at goal) than studies that did not, especially when a team member or provider interacted with patients (15 studies). Similarly, interventions that had team members manage patients' follow up checks showed greater improvements in blood pressure outcomes when compared with interventions that did not.

Team members commonly provided health behavior counseling, coaching, or education to support blood pressure management (18 studies), medication adherence (19 studies), or lifestyle activities (31 studies). When interventions included lifestyle counseling, coaching, or education, median improvements in blood pressure control and systolic blood pressure were greater than the overall median effect estimates.

Studies reported that primary care providers most often communicated with one or more team members through electronic medical records (27 studies) or direct team communication (22 studies). Less common communication

channels included email (4 studies), telephone (4 studies), other digital formats (6 studies), and referral for consultation (7 studies).

Team-based care interventions were similarly effective for patients identified or referred for care with blood pressure not under control (16 studies), and patients recruited or referred with a diagnosis of hypertension regardless of baseline control status (37 studies).

Applicability and Generalizability Issues

Included studies were conducted in the United States (38 studies), Australia (3 studies), Germany (2 studies), Hong Kong, China (2 studies), and the United Kingdom (2 studies); one each was done in Canada, Denmark, Italy, Netherlands, South Korea, Sweden, and Switzerland.

The median age of patients was 61.6 years. Findings from this systematic review are applicable to adults and likely, older adults. Included studies reported an even distribution of females (50.5%) and males (49.5%) with findings applicable to both.

Patients were recruited primarily from health care systems (47 studies), including the U.S. Armed Forces and Veteran's Health Administration (6 studies), and federally qualified health centers (2 studies). In six studies, teams provided care to patients in community settings, ranging from barber shops to senior centers. Findings are applicable for health care and community-based settings.

Studies had fewer than 100 patients (2 studies), 100 to 499 patients (26 studies), or 500 or more patients (25 studies). Small-scale studies (500 patients or less) reported slightly larger median effect estimates than large-scale studies (more than 500 patients). Studies were conducted for 6 to 12 months (22 studies), 12 to 18 months (20 studies), or 18 months or longer (11 studies), defined by the last time point after baseline assessment.

Thirty-four of the studies from the United States reported on racial and ethnic distributions or socioeconomic factors. Patients who were White (median 48%; 30 studies), Black or African American (median 23%; 28 studies), or Hispanic or Latino (median 11.7%; 19 studies) were well-represented across studies, indicating applicability of findings to these groups. While none of the included studies provided stratified assessments of effectiveness by race or ethnicity, results from studies in which more than 50% of the participants identified as Black or African American (9 studies) and studies in which more than 35% of participants identified as Hispanic or Latino (4 studies) showed improvements in blood pressure control greater than the overall median effect estimates.

Included studies provided limited information about socioeconomic or insurance status and analysis by these variables. Six studies examined intervention effectiveness for patients whose annual household income was less than \$35,000. In four of these studies, more than 50% of the patients fell into this category. Among this population, favorable changes in systolic blood pressure and blood pressure control were smaller in magnitude, compared to the overall median effect estimates. Fourteen studies reported patients' education levels. In two of these studies, more than half of the patients had less than a high school education and results were mixed. Overall, thirty-three studies reported on insurance status. Twelve studies reported on public health insurance (Medicare or Medicaid) with six studies showing results in line with the overall median effect estimates when more than half of the patients received Medicare or Medicaid.

Team-based care interventions included a variety of digital health components. Patients used digital devices for SMBP (21 studies), had access to a web portal or website for self-monitoring and communication with other team members (6 studies), and used electronic communication systems such email (8 studies). Team members used a software program or

digital device (14 studies) and tracked patient progress in a registry system (6 studies). Although no studies directly compared intervention effectiveness by type and use of digital health component, findings are likely applicable to interventions that employ digital health components for patient self-management, monitoring, and patient-team communications.

Data Quality Issues

Study designs included randomized controlled trials (27 studies), non-randomized trials (2 studies), other designs with a concurrent comparison group (1 study), retrospective and other cohorts (9 studies), time series (4 studies), and before-after without control (11 studies). The most common limitations assigned, according to Community Guide quality scoring methods, were for sampling issues (45 studies), intervention and study description (37 studies), and data analysis (25 studies).

Other Benefits and Harms

None of the included studies reported or examined additional benefits of team-based care interventions. CPSTF did not postulate any additional benefits of these interventions.

None of the included studies reported or examined potential harms of team-based care interventions. CPSTF did not postulate any harms of these interventions. Team-based care commonly includes proactive monitoring and follow-up which provides opportunities to identify and address potential adverse effects from blood pressure (hypertension) medications.

Economic Evidence

Economic evidence shows team-based care interventions to improve blood pressure control are cost-effective. The economic review included 35 studies (search period January 2011 through January 2021). All monetary values are reported in 2020 U.S. dollars.

Studies were based in the United States (23 studies), the United Kingdom (4 studies), China – Hong Kong (2 studies), Argentina (2 studies), Canada (2 studies), Australia (1 study), and Singapore (1 study). Studies were set in primary care clinics (26 studies), hospitals (2 studies), a hypertension clinic (1 study), a community pharmacy (1 study), and other settings (5 studies). The majority of studies (22 studies) were implemented in urban areas.

The median sample size was 252. The median age of patients was 59 years, and the median percentage of female participants was 54%. In the 35 studies, primary care providers were supported by other team members involved in medication management and other medication roles (e.g., medication changes with primary care provider approval, medication review; 20 studies), monitoring patients' blood pressure (22 studies), and education, counseling, or coaching (27 studies). Blood pressure control was the focus of the intervention (17 studies) or part of chronic disease management, which included management of type 2 diabetes (18 studies).

The economic review team assessed the quality of evidence by considering how well each estimate captured the components considered to be drivers of magnitude and the appropriateness of measurement and valuation; the lower of the two assessments was used to determine overall quality. The most frequently reported limitation for intervention cost estimates (16 good quality, 15 fair quality) were missing cost of training or cost of information system enhancements. The most frequently reported limitations for health care cost estimates (6 good quality, 10 fair quality) were missing emergency department visits, short follow-up periods, all-cause rather than cardiovascular disease-related health care utilization, and failure to adjust for baseline covariates. The most frequently reported limitations for return

on investment estimates (5 good quality, 9 fair quality) and cost per QALY estimates (11 good quality, 4 fair quality) were missing worksite productivity, time horizons shorter than 10 years, and lack of fade-out for intervention effect.

Intervention Cost

- The median intervention cost per patient per year was \$299 (\$168 to \$518), based on 31 estimates from 29 studies.

Health care Cost

- The median change in health care cost per patient per year was -\$140 (IQI: -\$386 to \$30), based on 16 estimates from 16 studies.

Net Cost

Net cost is measured as the sum of the change in health care cost due to intervention and the cost of intervention. A negative value indicates the averted health care cost is greater than the intervention cost.

- The median net cost per patient per year was \$133 (IQI: \$-\$16 to \$495), based on 19 estimates from 17 studies. Five estimates were negative and 14 were positive.

Return on Investment (ROI)

ROI, from the health system perspective, is the ratio of the difference in averted health care cost and intervention cost to intervention cost. ROI is favorable if the estimate is greater than zero.

- The median ROI was -80% (IQI: -130% to 20%), based on 14 estimates from 14 studies. Ten ROI estimates were negative and four were positive.

Cost-benefit

There were no studies that reported cost-benefit estimates.

Cost-effectiveness

- The median cost per QALY gained was \$15,202 (IQI: \$3,569 to \$34,509), based on 15 estimates from 14 studies. Fourteen of the 15 estimates were below \$50,000.

The median time horizon for included studies was 12 months. This likely was not enough time to capture effects of reduced blood pressure on cost of health care utilization. This is one plausible explanation for the mixed results for net cost and ROI.

The systematic economic review finds team-based care interventions for hypertension control are cost-effective based on a median estimate of \$15,202 per QALY gained, which is below a conservative \$50,000 per QALY threshold.

Considerations for Implementation

The following considerations for implementation are drawn from studies included in the existing evidence review, the broader literature, and expert opinion, as noted below.

Several resources offer guidance on the use and translation of team-based care interventions to control blood pressure.

- The [Surgeon General's Call to Action to Control Hypertension](https://www.hhs.gov/sites/default/files/call-to-action-to-control-hypertension.pdf) [https://www.hhs.gov/sites/default/files/call-to-action-to-control-hypertension.pdf] (2020) provides team-based care strategies to promote and optimize care for blood pressure control.
- The [Best Practices Guide for Cardiovascular Disease Prevention](https://www.cdc.gov/dhdsp/pubs/guides/best-practices/index.htm) [https://www.cdc.gov/dhdsp/pubs/guides/best-practices/index.htm] from CDC's Division of Heart Disease and Stroke Prevention describes and summarizes scientific evidence behind eight effective strategies health care systems can implement with communities to help patients lower blood pressure and cholesterol. The guide is a resource for state and local health departments, decision makers, public health professionals, and others interested in using proven strategies to improve cardiovascular health. Specific information is available on [team-based care](https://www.cdc.gov/dhdsp/pubs/guides/best-practices/team-based-care.htm) [https://www.cdc.gov/dhdsp/pubs/guides/best-practices/team-based-care.htm], its effectiveness, and strategies for implementation.
- The [Hypertension Control Change Package](https://millionhearts.hhs.gov/files/HTN_Change_Package.pdf) [https://millionhearts.hhs.gov/files/HTN_Change_Package.pdf] from Million Hearts® presents a list of process improvements that outpatient clinical settings can implement to promote blood pressure control. It is composed of change concepts, change ideas, and evidence- or practice-based tools and resources.

CPSTF also recommends [team-based care to improve diabetes management for patients with type 2 diabetes](https://www.thecommunityguide.org/findings/diabetes-management-team-based-care-patients-type-2-diabetes) [https://www.thecommunityguide.org/findings/diabetes-management-team-based-care-patients-type-2-diabetes]. Results from that review and meta-analysis of 35 studies found meaningful and significant improvements in both blood glucose control and blood pressure control. While the two team-based care interventions share similar components, a comparison of the summary outcomes suggests patients with both type 2 diabetes and high blood pressure may get more benefit from team-based care organized around diabetes management.

Expanded use of digital health devices and technology could increase patient access to components such as counseling or coaching and improve communication between patients and team members. Programmers using technology-supported communications (e.g., web portals, mobile devices) need to be aware of requirements to protect patient confidentiality (Zamani et al., 2009; Mallen et al., 2005).

Evidence Gaps

CPSTF identified several areas that have limited information. Additional research and evaluation could help answer the following questions and fill remaining gaps in the evidence base.

- Which factors affect sustainability and intensity of team-based care interventions?
- How should these interventions be used by systems of care?
 - Are there differences in the effectiveness and economic efficiency of these interventions when they include all patients with high blood pressure rather than limiting participation to those with uncontrolled blood pressure?
 - How does intervention effectiveness vary based on patients' baseline rates of blood pressure control? At what baseline rate does team-based care become an inefficient intervention for improving blood pressure control in a patient population?
- What are the effects of adding digital interventions and innovative technology-enabled resources to team-based care? Specifically, what are the benefits associated with patients' use of web portals and mobile technology?
- How do costs and reimbursement mechanisms impact the effectiveness of team-based care?

- What are the long-term effects of team-based care on morbidity and mortality outcomes? More studies of longer duration are needed to capture effects.
- Is the intervention cost-effective over 5- to 10-year time horizons?
- What are the economic outcomes for interventions implemented in rural areas?
- How do interventions affect productivity of patients at their worksites?
- What are the development, implementation, and training costs associated with the intervention?

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Disclaimer

The findings and conclusions on this page are those of the Community Preventive Services Task Force and do not necessarily represent those of CDC. CPSTF evidence-based recommendations are not mandates for compliance or spending. Instead, they provide information and options for decision makers and stakeholders to consider when determining which programs, services, and policies best meet the needs, preferences, available resources, and constraints of their constituents.

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