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Modeled Health and Economic Impact of Team-Based Care for Hypertension

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Abstract

Introduction: Team-based interventions for hypertension care have been widely studied and shown effective in improving hypertension outcomes. Few studies have evaluated long-term effects of these interventions; none have assessed broad-scale implementation. This study estimates the prospective health, economic, and budgetary impact of universal adoption of a team-based care intervention model that targets people with treated but uncontrolled hypertension in the U.S.

Methods: Analysis was conducted in 2014–2015 using a microsimulation model, constructed with various data sources from 1948 to 2014, designed to evaluate prospective cardiovascular disease (CVD)–related interventions in the U.S. population. Ten-year primary outcomes included prevalence of uncontrolled hypertension; incident myocardial infarction, stroke, CVD events, and CVD-related mortality; intervention and net medical costs by payer; productivity; and quality-adjusted life years.

Results: About 4.7 million (13%) fewer people with uncontrolled hypertension and 638,000 prevented cardiovascular events would be expected over 10 years. Assuming $525 per enrollee, implementation would cost payers $22.9 billion, but $25.3 billion would be saved in averted medical costs. Estimated net cost savings for Medicare approached $5.8 billion. Net costs were especially sensitive to intervention costs, with break-even thresholds of $300 (private), $450 (Medicaid), and $750 (Medicare).

Conclusions: Nationwide adoption of team-based care for uncontrolled hypertension could have sizable effects in reducing CVD burden. Based on the study's assumptions, the policy would

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Appendix
Supplementary data
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be cost saving from the perspective of Medicare and may prove to be cost effective from other payers' perspectives. Expected net cost savings for Medicare would more than offset expected net costs for all other insurers.

Introduction

Since 1921, cardiovascular disease (CVD) has been the leading cause of mortality in the U.S., and hypertension is a major contributing risk factor for CVD.[1–3] Hypertension affects approximately one in three Americans and contributes to more than $42.9 billion in medical costs annually.[4,5] Many effective and well-tolerated drug therapy options exist, with low-cost generics available in most therapeutic classes. Despite this, almost half of the population with hypertension does not meet recommended blood pressure (BP) goals.[4]

One promising policy to help those with uncontrolled hypertension is managing the disease with a coordinated care team. Team-based hypertension care involves the inclusion of adjunct or allied health professionals—including nurses, pharmacists, dietitians, social workers, and community health workers—in an existing relationship between a patient and primary care provider. Team member responsibilities may include medication management, patient follow-up, self-management support, and attention to adherence. System-level support for team-based care may include integrated use of electronic health records, home BP monitors, and emerging information technologies. An extensive body of research indicates that team-based care improves hypertension control and lowers BP through changes to prescribed medications, improved medication adherence, and improved lifestyle habits, and the care model has been recommended by the U.S. Community Preventive Services Task Force (Community Guide).[6]

Despite compelling evidence for the effectiveness of team-based hypertension care, prior studies have not addressed important dissemination and implementation questions involved with scaling up the intervention model to a broader sample of the U.S. population. This study seeks to bridge the research to practice gap by using a microsimulation model to estimate the potential health, economic, and budgetary impacts over 10 years for a scenario in which team-based hypertension care interventions targeting actively treated but uncontrolled BP patients are hypothetically implemented across the U.S.

Methods

Model Design and Analytic Approach

Analyses were conducted using the HealthPartners Institute ModelHealth™: Cardiovascular disease (ModelHealth: CVD) microsimulation model. ModelHealth: CVD is an annual-cycle microsimulation model, parameterized to estimate the lifetime incidence of CVD events and associated costs in a cross-section of individuals representative of the U.S. population. Appendix B (available online) provides a detailed description of the model.

Disease outcomes in ModelHealth: CVD include incidence of myocardial infarction, stroke, congestive heart failure, angina pectoris, intermittent claudication, and CVD-related death. Events are predicted by 1-year risk equations estimated specifically for the model from

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Framingham Heart Study data.[7,8] Event risk is based on a person's age, sex, BMI, systolic BP (SBP), cholesterol levels, smoking status, and history of CVD.

Annual progression of BMI is derived from recall data reported in the Behavioral Risk Factor Surveillance System,[9] and the natural history of SBP and cholesterol is estimated using Framingham Heart Study data.[7,8] Tobacco initiation and cessation probabilities are derived from National Health Interview Survey data[10] and published estimates from longitudinal studies.[11,12] Screening and treatment for hypertension and dyslipidemia in the model follow national clinical guidelines,[3,13] and identification and treatment adherence patterns are consistent with rates observed within the National Health and Nutrition Examination Survey.[14–18] Use of antihypertensive and lipid-acting medications is modeled as an exogenous treatment effect on SBP and cholesterol, respectively, and alters disease risk accordingly.

Disease costs in ModelHealth: CVD are estimated from the Medical Expenditure Panel Survey,[19] with first-year and ongoing disease costs distinguished. Costs are apportioned by payer using an insurance submodel that assigns each simulated individual to a primary payer: private insurance, Medicaid, Medicare (including Medicare/Medicaid dual-eligibles), uninsured, or other/multiple insurance. Initial insurance status is derived from Current Population Survey data,[20] and year to year transitions are derived from Survey of Income and Program Participation data.[21] Productivity measures in the model capture lost market and house-hold productivity due to premature death, absenteeism, and presenteeism.[22,23] All monetary measures are presented in 2012 U.S. dollars.

All analyses compare outcomes for a simulated population with nationwide access to a team-based care intervention for uncontrolled hypertension to the same population, all else held equal, without wide-scale access to this intervention. The intervention affects outcomes by lowering SBP in eligible people. Alternative parameter assumptions are assessed with sensitivity analysis. Results are representative of and scaled to the U.S. population aged ≥35 years, based on a simulated sample of 1 million people and with those aged 25–34 years aging into the cross-section over 10 years. Initial demographic characteristics for the modeled population are presented in Table 1.

Literature Search and Abstraction

Along with evidence reviews conducted by the Community Guide,[24,25] a number of other systematic reviews and meta-analyses on team-based hypertension care interventions were identified.[26–30] These sources identified 160 study arms related to team-based care for hypertension interventions. To incorporate more recent literature, PubMed was searched from the end of the search period of the most recent review (June 1, 2012) to July 25, 2013 for the terms *hypertension* AND (*trial* OR *RCT*) AND (*team* OR *nurse* OR *pharmacist*). This search yielded 56 articles, from which two studies[31,32] were deemed relevant and included for a total of 162 study arms combined.

Sixteen study arms met the inclusion and exclusion criteria as described in Appendix A (available online).[31–45] Among these studies, an average weighted intervention effect of reducing SBP by 8.1 mmHg was found. Most interventions were implemented in

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a primary care setting, but two studies were conducted in a Veteran's Administration medical center[35,38] and one involved community pharmacies.[45] Thirteen of the study arms included a pharmacist in the intervention team,[31–34,36–39,41–45] and others included registered nurses,[35,37,38] nurse practitioners,[40] health educators,[38] and community health workers.[40] All interventions included a medication management component, and for half of the study arms, team care providers were authorized to independently make changes to the patient's treatment regimen.[31,32,38–42,44] Eleven interventions also included patient education or behavioral counseling components,[31–33,35,38–43,45] and five included home BP monitoring/telemonitoring.[31,32,37,39,42]

Because hypertension management rarely occurs in isolation, evidence was reviewed for secondary benefits to lipid management resulting from team-based hypertension care. Among the seven studies that met the inclusion and exclusion criteria described in Appendix A (available online),[46–52] the weighted average intervention effect was an 11.9 mg/dL reduction in low-density lipoprotein and a 1.0 mg/dL increase in high-density lipoprotein. These findings were incorporated into the sensitivity analysis.

Intervention Design

For this study, a hypothetical team-based hypertension intervention was designed—evidence-informed and adaptable to a wide variety of care settings—to involve referral by an existing care team to an adjunct hypertension management program involving a pharmacist or nurse with prescribing authority (either autonomously or under arrangement with a physician). All individuals newly diagnosed with hypertension were assumed to pursue usual care for the first year; thereafter, individuals actively taking BP medications but not under control (SBP≥140 mmHg) were eligible for referral to the intensive 1-year team-based intervention. It was assumed that 90% of referred people would accept, and that the persisting treatment effect in each subsequent year would be 80% of the prior year (such that the residual effect drops to about 10% by Year 10). It was also assumed that individuals with uncontrolled BP may re-enroll in the intervention once every 5 years.

A microcosting approach was used to estimate the resources required to deliver this team-based intervention. Specifically, the composite design assumed four in-person visits and eight phone visits over 1 year. The first in-person visit was assumed to involve new patient intake and require a comprehensive 60-minute visit. Each additional in-person visit and all phone visits were assumed to be 15 minutes. All in-person and over-the-phone clinical costs were based on CPT 99211, an "incident-to-physician" billing procedure code used for charging medication therapy management pharmacy services.[53] The estimated typical market provision cost for a 15-minute team care visit was $35, based on analysis of payments for this procedure code by private insurers and patient out-of-pocket costs (assumed to be covered by the payer) reported in the 2012 Truven Health MarketScan® Commercial Claims and Encounters Database. For patient time, it was assumed the intake visit would require 3 hours, subsequent in-person visits would require 2 hours on average, including travel and waiting time, and phone visits would require 20 minutes of total patient time to account for any coordination required. Average hourly earnings plus benefits in 2012 ($31 per hour) were used to estimate the value of patient time.[54] Combined, the total estimated per-person cost of the year-long intervention was $887 ($525 in costs to the health system and $362 in patient time costs). Alternative cost scenarios to the health system were considered in the sensitivity analysis. Intervention characteristics are summarized in Table 1.

Results

Ten years after implementation, widespread adoption of the team-based care model would be expected to reduce the number of people with uncontrolled hypertension by 4.7 million—a reduction of about 13% (Table 2). Over 10 years, the team-based approach could be expected to prevent (or postpone) about 48 million person years of uncontrolled hypertension, 130,000 myocardial infarctions, 204,000 strokes, and 638,000 cardiovascular events in those aged ≥35 years. In addition, about 165,000 CVD-related fatalities would be averted over this period. The number of reduced person years with uncontrolled hypertension was similar between those aged 35–64 years and ≥65 years, but most of the prevented disease burden over 10 years was found among people aged ≥65 years.

Over 10 years, costs to the healthcare system would be expected to total $22.9 billion, but would be offset by almost $25.3 billion in averted disease costs (Tables 2 and 3). Patient time costs would be expected to total approximately $15.8 billion over 10 years; however, these would be expected to be largely offset by productivity gains, which would total just above $11 billion. The policy would be expected to be cost saving for Medicare, with a net savings of $5.8 billion over 10 years.

Sensitivity Analysis

Predicted health outcomes were especially sensitive to three sources of uncertainty: the rate at which patients would accept and participate in the team-based intervention, the expected effect of that intervention on improving BP, and the long-term persisting effect of the intervention. Across each of these parameters, the effect on net outcomes was found to be approximately proportional with the relative change from the base case assumptions. For example, increasing the acceptance rate from 90% to 100% translated to a roughly 10% increase in net benefits (Table 4). Reducing the mean treatment effect from 8.1 to 4.1 mmHg SBP corresponded with an approximate 50% reduction in net benefits. Changing the frequency at which people can re-enroll in a team-based program had only a modest effect on health outcomes. For example, allowing annual re-enrollment added about 8% to the person years of avoided uncontrolled BP; never allowing re-enrollment (i.e., a limit of one lifetime referral) dropped this figure by 15%. The former would increase implementation costs by 130%, and the latter would lead to cost savings of 26%.

Net costs were particularly sensitive to per-enrollee intervention costs. If the intervention cost the health system $200 per person, total implementation costs over 10 years would drop to $9 billion (−$16 billion net), but would increase to $52 billion ($27 billion net) if those costs were $1,200 per person. Break-even points for 1-year intervention costs relative to averted disease costs over 10 years are about $300 for private insurers, $450 for Medicaid, and $750 for Medicare.

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The effect of including a concomitant intervention benefit of improved lipid management among individuals with uncontrolled hypertension who also are being treated for dyslipidemia was also considered (Table 4). Allowing for a team care member to manage lipids along with BP—either through medications or lifestyle—would be expected to reduce incident myocardial infarctions by almost another 50%. Disease costs across the population would also be expected to drop an additional 25%. The inclusion of a lipid management benefit had little effect on incident stroke, in part because of the limited direct effect of lipids on stroke and the increased competing risk for stroke attributable to reduced coronary heart disease burden.

Discussion

This analysis shows that nationwide adoption of a team-based referral program for people with treated but uncontrolled hypertension would have sizeable health impacts and can be expected to reduce the number of individuals with uncontrolled hypertension by 4.7 million and prevent approximately 640,000 cardiovascular events and 165,000 CVD-related deaths in a 10-year period. Improving BP control rates for the reduction of CVD is a goal of the Million Hearts® initiative,[55] the National Prevention Strategy,[56] and national quality improvement measures, such as the Healthcare Effectiveness Data and Information Set.[57] Opportunities for preventing CVD are greater for populations with higher disease prevalence (i.e., among people aged ≥65 years). Although the intervention would be cost saving for Medicare only, the net social savings to the healthcare system ($2.4 billion) leave room for a possible Kaldor–Hicks welfare-improving arrangement in which payers coordinate to ensure full benefits are realized.[58,59] Moreover, if intervention costs are a barrier and other approaches are not effective in lowering them, approximately 85% of the benefits can be achieved by offering enrollment in a team-based hypertension program only once for each person, with a corresponding cost savings of about 25%.

From a policy implementation perspective, team-based care is an integral component of the patient-centered medical home payment and care delivery model that is being widely implemented, tested, and validated by both public and private insurers. With growing evidence from patient-centered medical home demonstration projects, the commitment to advance team-based, coordinated, and accessible care to transform primary care at the practice level has gained momentum and broad support from both the private and public sectors.[60,61] The new evidence provided in this paper may therefore be useful and relevant in informing decision makers in these efforts.

Limitations

Model results are always limited by data inputs. Literature reviews reveal a wide variety of intervention and study designs, eligible populations, and healthcare settings.[24–30] This makes the evaluation of an intervention that can be universally adopted difficult, and it is unlikely that a single program design will work effectively and identically across all care settings. As such, important limitations of this analysis include assumptions regarding intervention design, long-term effects, and intervention costs.

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The design of the team-based intervention for this study involved several choices. For example, this study required that a patient be actively using BP medications, but remain uncontrolled in their hypertension, to be eligible for the intervention. The definition of active medication use corresponds with the self-reported "currently taking" hypertension medications question in the National Health and Nutrition Examination Survey, which has been just above 60% among hypertensive patients in the U.S. in recent years.[62] This adherence stipulation was not required by any of the 16 studies from which treatment effects were derived, but uncontrolled hypertension was requisite and medication adherence at baseline in these studies was generally high (ranging from 60% to 90%, varyingly defined). These study populations demonstrated a high degree of engagement by self-selecting enrollment in a clinical trial, and the adherence requirement identifies a translational equivalent population within the general hypertensive populace. Finally, although team-based approaches to hypertension care may also be effective for people with controlled hypertension, this analysis focuses on a large, uncontrolled population for which the marginal value and organizational willingness to adopt a new approach to hypertension care is likely highest.

Long-term follow-up data on team-based care interventions are lacking. Among the few studies with outcomes reported at multiple time points, no clear trend is revealed. For example, Hill et al.[40] found continued BP improvement over time, Carter and colleagues[63] recently found BP improvements holding well 15 months after a 9-month intervention, and Margolis et al.[32] found long-term incremental impact on BP diminishing over time. The latter finding was deemed most plausible; therefore, the base case results assume that BP improvements attenuate by 80% each year after the initial intervention. Because hypertension management can evolve over one's lifespan, the analysis also incorporated repeated opportunities for intervention enrollment, as may be warranted and practical within the clinical setting. Table 4 shows that findings are relatively insensitive to re-enrollment opportunities but better data on long-term durability of team-based care interventions would improve precision of model results.

Predicted intervention effects depend on baseline event rates in the model. Disease risk is not adjusted by race/ethnicity in ModelHealth: CVD, but model validation to National Health and Nutrition Examination Survey data suggests that differences in observable risk factors are generally sufficient to explain differences in observed disease rates, and this conclusion is supported by other recent evidence.[64] Appendix B, Table B18 (available online) shows that ModelHealth: CVD event rates compare well with national prevalence data.

An economic analysis by the Community Preventive Services Task Force[65] found a mean team-based intervention cost of $284 per enrollee with an interquartile range ($153–$670) that encompasses this study's estimated annual intervention cost of $525 per enrollee. Among the 16 study arms used to derive the base case effect, eight reported annualized intervention costs ranging from $35 to $1,350, with a mean of $618 and a median of $428.[32,35,38,45,66,67] If design efficiencies or patient cost sharing could lower the health system intervention cost to $200 per enrollee, net savings are predicted for all payers ($16 billion over 10 years, combined).

Only one study that assessed direct cost savings from averted cardiovascular events for a team-based hypertension intervention was identified.[68] In this quasi-experimental pre–post study, they found approximately $730 per person per year in event cost savings. Five studies that assessed broader healthcare utilization were also found (e.g., out-patient visits, hospitalizations, or emergency encounters[35,67,69–71]) but none found statistically significant differences in these costs between intervention and control groups.

Conclusions

Despite numerous challenges and limitations, this analysis shows that wide-scale adoption of team-based programs to lower BP among people with uncontrolled hypertension shows good potential in improving hypertension control rates, reducing CVD, and stemming disease costs. No other study has considered the health and economic impacts of a nationwide adoption of team-based programs for hypertension care. These findings indicate that such programs could potentially accomplish at least two objectives of the Triple Aim[72]—improved outcomes and lower costs—and support their broader dissemination and implementation.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1.

Baseline Characteristics of Intervention and Simulated U.S. Population Cross-Section (Aged 35+ Years)

Characteristic	Baseline value	Source
Population characteristics		
Population size (millions)	162.8	ACS[73]
Mean SBP, mmHg	126.1	NHANES[14–18]
% Over goal	20.6	NHANES[14–18]
% Treated	22.0	NHANES[14–18]
Treated, mean SBP, mmHg	142.0	NHANES[14–18]
% Treated over goal	45.7	NHANES[14–18]
Age, %		NHANES[14–18]
35–44 y	25.3	ACS[73]
45–54 y	27.5	ACS[73]
55–64 y	22.6	ACS[73]
65–74 y	13.4	ACS[73]
75 y+	11.2	ACS[73]
% Female	52.4	ACS[73]
Insurance status, %		
Private	53.2	CPS[20]
Medicaid	3.9	CPS[20]
Medicare	24.9	CPS[20]
Uninsured	15.1	CPS[20]
Other/multi	2.8	CPS[20]
Mean BMI	29.0	NHANES[14–18]
% Overweight	72.4	NHANES[14–18]
% Obese	40.9	NHANES[14–18]
Mean LDL, mg/dL	120.3	NHANES[14–18]
% Over goal	28.3	NHANES[14–18]
% Treated	22.5	NHANES[14–18]
% Smokers	17.4	NHIS[10]
% With diabetes	18.7	NHANES[14–18]
% With previous CVD	12.8	NHANES[14–18]
Intervention characteristics		
Acceptance of TBC intervention, %	90	Assumption
Effect of TBC on SBP, mmHg ↓.	8.1	31–45
TBC SBP effect persistence rate, %	80	Assumption
TBC re-enroll period, y	5	Assumption
TBC program costs, US$	525	Assumption
TBC patient costs, US$	362	Assumption
With included lipid effects (sensitivity analysis)		
Effect of TBC on LDL, mg/dL ↓	11.9	[46–52]

Characteristic	Baseline value	Source
Effect of TBC on HDL, mg/dL ↑	1.0	[46–52]
TBC lipid effect persistence rate, %	80	Assumption

ACS, American Community Survey; CPS, Current Population Survey; CVD, cardiovascular disease; HDL, high-density lipoprotein; LDL, low-density lipoprotein; NHANES, National Health and Nutrition Examination Survey; NHIS, National Health Interview Survey; SBP, systolic blood pressure; TBC, team-based care for hypertension.

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Table 2.

Health and Economic Outcomes from Broad-Scale TBC Adoption Across the U.S. Population

Variables	Standard care	Standard care with TBC	10-Year difference	95% CI
All ages (35+ years)				
At 10 years				
Mean SBP, mmHg, treated persons	138.7	136.4	−2.25	−2.27, −2.23
% Treated above goal	42.3	32.0	−10.3	−10.5, −10.1
Persons above goal (millions)	35.2	30.5	−4.72	−4.82, −4.62
Over 10 years				
Person-years above goal (millions)	325.1	277.3	−47.8	−48.4, −47.3
Incident MI (thousands)	7,602	7,471	−131.2	−147.2, −115.2
Incident stroke (thousands)	5,391	5,187	−203.9	−223.0, −184.9
Incident CVD events (thousands)	30,128	29,490	−638.0	−674.4, −601.6
Incident CVD death (thousands)	7,789	7,624	−164.7	−180.7, −148.6
Total QALYs (thousands)	1,664,056	1,664,979	922.6	858.7, 986.5
Total CVD costs, (billions US$)	2,650	2,624	−25.29	−27.08, −23.51
Private insurance CVD costs (billions US$)	800	795	−4.28	−5.21, −3.35
Medicare CVD costs (billions US$)	1,423	1,404	−19.38	−20.79, −17.98
Medicaid CVD costs (billions US$)	263	262	−0.82	−1.10, −0.55
Uninsured CVD costs (billions US$)	94	94	−0.54	−0.68, −0.40
Other insurer CVD costs (billions US$)	70	70	−0.27	−0.41, −0.13
Total productivity (billions US$)	93,232	93,243	11.05	9.70, 12.39
Aged 35–64 years				
At 10 years				
Mean SBP, treated persons, mmHg	136.7	134.9	−1.86	−1.89, −1.83
% Treated above goal	35.0	25.3	−9.8	−10.1, −9.4
Persons above goal (millions)	14.4	12.6	−1.81	−1.87, −1.75
Over 10 years				
Person-years above goal (millions)	150.9	129.8	−21.2	−21.6, −20.8
Incident MI (thousands)	3,103	3,069	−34.8	−44.6, −25.0
Incident stroke (thousands)	1,261	1,237	−24.4	−32.5, −16.4

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Variables	Standard care	Standard care with TBC	10-Year difference	95% CI
Incident CVD events (thousands)	10,919	10,807	−111.3	−129.3, −93.3
Incident CVD death (thousands)	2,016	1,995	−21.0	−28.3, −13.7
Total QALYs (thousands)	1,231,672	1,231,772	100.2	77.3, 123.0
Total CVD costs (billions US$)	1,250	1,245	−5.36	−6.38, −4.34
Private insurance CVD costs (billions US$)	741	737	−3.48	−4.37, −2.58
Medicare CVD costs (billions US$)	113	112	−0.64	−0.85, −0.43
Medicaid CVD costs (billions US$)	258	257	−0.78	−1.05, −0.51
Uninsured CVD costs (billions US$)	74	74	−0.25	−0.34, −0.15
Other insurer CVD costs (billions US$)	65	65	−0.21	−0.33, −0.09
Total productivity (billions US$)	82,824	82,825	1.66	0.96, 42.36
Aged 65+ years				
At 10 years				
Mean SBP, treated persons, mmHg	140.0	137.4	−2.52	−2.54, −2.50
% Treated above goal	47.1	36.5	−10.6	−10.9, −10.3
Persons above goal (millions)	20.8	17.9	−2.91	−2.99, −2.84
Over 10 years				
Person-years above goal (millions)	174.2	147.5	−26.7	−27.0, −26.3
Incident MI (thousands)	4,499	4,403	−96.4	− 109.0, −83.8
Incident stroke (thousands)	4,130	3,950	−179.5	−196.8, −162.3
Incident CVD events (thousands)	19,210	18,683	−526.7	−558.3, −495.1
Incident CVD death (thousands)	5,773	5,630	−143.7	−158.1, −129.3
Total QALYs (thousands)	432,385	433,207	822.4	763.5, 881.3
Total CVD costs (billions US$)	1,400	1,380	−19.93	−21.35, −18.51
Private insurance CVD costs (billions US$)	59	58	−0.80	−1.05, −0.56
Medicare CVD costs (billions US$)	1,310	1,291	−18.74	−20.13, −17.36
Medicaid CVD costs (billions US$)	5	5	−0.04	−0.07, −0.01
Uninsured CVD costs (billions US$)	20	20	−0.29	−0.40, −0.19
Other Insurer CVD costs (billions US$)	5	5	−0.05	−0.12, 0.01
Total productivity (billions US$)	10,409	10,418	9.39	8.26, 10.52

Note: The incident CVD events rows combine incident MI, incident stroke, incident hospitalization for congestive heart failure, onset of angina pectoris, and onset of intermittent claudication. The 95% CI is based on a simulation of 1 million persons. All costs are presented in undiscounted 2012 U.S. dollars.

CVD, cardiovascular disease; MI, myocardial infarction; SBP, systolic blood pressure; Stroke, ischemic and hemorrhagic stroke; QALYs, quality-adjusted life years; TBC, team-based care for hypertension.

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Table 3.

Summary of Intervention Costs Due to Broad-Scale Adoption of Team-Based Care for Hypertension

Variable	Intervention referrals (millions)	Direct intervention costs (billions US$)	Intervention patient time costs (billions US$)
Private insurance	11.85	6.23	4.29
Medicare	25.89	13.60	9.36
Medicaid	2.80	1.47	1.01
Uninsured	2.23	1.17	0.81
Other	0.86	0.45	0.31
All payers	43.63	22.92	15.78

Note: All costs are presented in undiscounted 2012 U.S. dollars. Direct intervention costs include all clinical costs borne by the healthcare system in adopting team-based care for hypertension. Intervention patient time costs correspond to the estimated personal time costs required for individual to participate in a team-based care program for hypertension.

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Table 4.

Sensitivity to Parameter Changes in TBC Adoption Analysis for U.S. Population

	10-Year cumulative difference between groups						
Variable	Person-years above goal (millions)	Incident MI (thousands)	Incident stroke (thousands)	Incident CVD death (thousands)	QALYs (thousands)	Disease costs (billions US$)	Intervention costs (billions US$)
Base case	−48	−131	−204	−165	923	−25	23
Acceptance rate							
50%	−27	−72	−109	−93	522	−14	10
100%	−53	−146	−231	−178	1,020	−28	25
SBP effect							
4.1 mmHg	−25	−63	−109	−90	503	−13	23
12.1 mmHg	−67	−193	−288	−231	1,356	−37	22
SBP effect persistence rate							
50%	−32	−75	−119	−94	600	−16	24
100%	−68	−217	−316	−250	1,338	−40	21
Re-enrollment window							
Never	−41	−108	−162	−126	826	−22	17
1 year	−52	−158	−243	−195	1,084	−31	53
Intervention costs							
$200 per person	−48	−131	−204	−165	923	−25	9
$1,200 per person	−48	−131	−204	−165	923	−25	52
Inclusion of lipid effects	−48	−192	−210	−206	1,116	−31	23
LDL effect							
6.9 mmHg	−48	−171	−212	−190	1,054	−30	23
16.9 mmHg	−48	−216	−210	−225	1,199	−33	23
HDL effect							
0.0 mmHg (no effect)	−48	−182	−202	−200	1,064	−30	23
2.0 mmHg	−48	−201	−215	−211	1,145	−33	23
Lipid effect persistence rate							
50%	−48	−163	−209	−189	1,046	−29	23
100%	−48	−226	−213	−233	1,222	−34	23

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Note: Table data reflect the difference in outcomes between standard care and standard care with TBC. The SBP and lipid effect persistence rates indicate the percentage of the original treatment effect assumed for each subsequent year after the intensive intervention period. The TBC re-enrollment period refers to the length of time before a person may be eligible to be referred again to a TBC intervention. Intervention costs in this table refer to only the costs borne by the healthcare system in delivering the team-based hypertension care intervention. All costs are presented in undiscounted 2012 U.S. dollars.

CVD, cardiovascular disease; HDL, high-density lipoprotein; LDL, low-density lipoprotein; MI, myocardial infarction; QALYs, quality-adjusted life years; SBP, systolic blood pressure; Stroke, ischemic and hemorrhagic stroke; TBC, team-based care for hypertension