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Improving BP Control Through Electronic Communications: An Economic Evaluation

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Abstract

Background—Web-based collaborative approaches to managing chronic illness show promise for both improving health outcomes and increasing the efficiency of the healthcare system.

Objective—Analyze the cost-effectiveness of the Electronic Communications and Home Blood Pressure Monitoring to Improve Blood Pressure Control (e-BP) study, a randomized controlled trial that used a patient-shared electronic medical record, home blood pressure (BP) monitoring, and web-based pharmacist care to improve BP control (<140/90 mm Hg).

Study Design—Incremental cost-effectiveness analysis conducted from a health plan perspective.

Methods—Cost-effectiveness of home BP monitoring and web-based pharmacist care estimated for percent change in patients with controlled BP and cost per mm Hg in diastolic and systolic BP relative to usual care and home BP monitoring alone.

Results—A 1% improvement in number of patients with controlled BP using home BP monitoring and web-based pharmacist care—the e-BP program—costs $16.65 (95% confidence interval: 15.37- 17.94) relative to home BP monitoring and web training alone. Each mm HG reduction in systolic and diastolic BP achieved through the e-BP program costs $65.29 (59.91-70.67) relative to home BP monitoring and web tools only. Life expectancy was increased at an incremental cost of $1850 (1635-2064) and $2220 (1745-2694) per year of life saved for men and women, respectively.

Conclusions—Web-based collaborative care can be used to achieve BP control at a relatively low cost. Future research should examine the cost impact of potential long-term clinical improvements.

The Institute of Medicine reports[1] that approximately 73 million Americans have hypertension, defined as sustained blood pressure (BP) of >140/90 mm Hg,[1,2] and hypertension care increases national healthcare costs by $73 billion a year. Randomized

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trials have provided clear evidence that lowering BP with antihypertensive medications decreases mortality and major disability; however, hypertension remains inadequately treated in those most affected.[2]

Medical care's focus on one-on-one doctor/patient interactions in clinics misses opportunities to influence patient outcomes. Electronic communications offer patients new opportunities to be involved in their own care, and patient websites support these efforts to connect care between home and the clinic. We previously demonstrated that a new model of care that leverages patient home BP monitoring, electronic medical records (EMRs), and patient access to a secure patient website with collaborative pharmacist care can be successfully used to improve BP control.[3,4] We now report the cost-effectiveness from a health plan perspective of the Electronic Communications and Home Blood Pressure Monitoring to Improve Blood Pressure Control (e-BP) Trial, a randomized controlled trial to improve hypertension control.

Setting and Context

e-BP was a 3-arm randomized controlled trial conducted within Group Health Cooperative, which provides comprehensive health services to over 600,000 residents of Washington State and Idaho. Most enrollees receive care through a closed group practice, which has a commercially available EMR integrated with a patient website. The patient website allows patients to refill medications, make appointments, view portions of the EMR, and use secure messaging to communicate with healthcare team members.[5] The trial was conducted at 10 primary care medical centers within Group Health's Western Washington group practice. All study protocols were reviewed and approved by the Group Health Institutional Review Board and all participants provided written, informed consent before randomization.

Adults aged 25 to 75 years diagnosed with hypertension and taking antihypertensive medications, with no diagnoses of diabetes, cardiovascular, or other serious conditions, were eligible for the study, and invited to 2 screening visits at their primary care clinic, where a research assistant measured BP using the validated Omron Hem-705-CP automated monitor.[6] Individuals with mean diastolic BP between 90 and 109 mm Hg or mean systolic BP between 140 and 199 mm Hg at both visits were invited to join the study. A single-blind block independent randomization design ensured balance within medical centers and baseline systolic BP measurements. The primary outcomes of the e-BP study were change in systolic and diastolic BP and the percentage of patients with controlled BP (<140 mm Hg systolic and <90 mm Hg diastolic) at 12 months following randomization. Complete descriptions of the trial design[3] and results[4] have been published elsewhere.

Eligible individuals that met study inclusion criteria and provided informed written consent were randomized into 1 of 3 arms:

The Usual Care (UC), care provided to Group Health patients with hypertension, which includes patient information materials including a wallet card with their BP numbers; a pamphlet on hypertension control, including information on medications, adherence, and lifestyle behaviors to lower BP; and "The No-Waiting Room" pamphlet, which describes the My-GroupHealth website and utilities available to registered users. The MyGroupHealth website allows members to communicate with their providers through secured messaging, schedule appointments, refill prescriptions that are then mailed, and view most of the medical record including lab results. A detailed review of the services available through the website may be found at http://www.ghc.org/mygrouphealthpromos/onlinesvcs.jhtml. Patients were told their BP was not in control and were encouraged to work with their physician to improve it.

Home BP Monitoring (BPM) patients received UC as well as a home BP monitor and training in its proper use. They were instructed to use this monitor to check their BP at least twice a week with a goal for home BP of less than 135 mm Hg systolic and 85 mm Hg diastolic.[7] Patients received training on use of the MyGroupHealth website, were told their hypertension was not controlled, and were encouraged to work with their physician and use their BP monitor and MyGroupHealth tools to manage their BP.

BPM Plus Pharmacist Care (e-BP) patients received all BPM features and direct care supervision from a clinical pharmacist trained in hypertension evidence-based care, stepped medication protocols based on the Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure,[8] and patient-centered techniques for addressing behavioral issues related to medication adherence and lifestyle change. Pharmacists sent an introductory secure message to e-BP patients and made 1 telephone call to obtain a detailed medication history and review allergies, intolerances, and cardiovascular risk factors. The pharmacist detailed the patient's action plan for improving BP control, including instructions for home BP monitoring, a list of current medications, and at least 1 patient-selected lifestyle goal; any recommended medication changes based on the stepped medication protocols; and the follow-up plan. This plan was sent to the patient and their physician and planned communications then occurred over the web every 2 weeks until BP was controlled, and less often thereafter. Patients were asked to provide BP measurements, concerns about medications, and progress related to their lifestyle goals. Pharmacists made specific recommendations (including medication changes) and patients were encouraged to provide feedback and collaboratively change the action plan. All clinical concerns were referred back to the patient's physician.

The extant literature includes multiple studies documenting the valuable role clinical pharmacists play in treating hypertension.[9-15] Pharmacists may be more aware of the benefits of alternative medication regimens and have greater time and opportunities to evaluate a patient's experience with particular drugs and provide patients specific tailored regimens. The additional time patients may spend with pharmacists allows for the development of a relationship that can lead to greater trust and greater adherence to recommendations.

Table 1 provides descriptive information on the 778 patients that participated in the trial. One year following randomization, BP control had improved among e-BP patients to 56% compared with 31% in UC and 36% in BPM. e-BP patients had a greater decrease in systolic BP (net change −6.0 mm Hg; $P<.001$) and diastolic BP (net change −2.6 mm Hg; $P<.001$) compared with BPM and an even greater decrease in systolic BP (net change −8.9 mm Hg; $P<.001$) and diastolic BP (net change −3.6 mm Hg; $P<.001$) compared with UC. Patients receiving BPM only had a modest, but significantly greater, decrease in systolic BP (net change −2.6 mm Hg; $P=.02$)[12] compared with UC. However, BP control and change in mean diastolic BP among BPM patients was not significantly different from UC.

The mean (standard deviation [SD]) number of message threads (secure message and subsequent responses) was 22.3 (10.2) in the e-BP group compared with 2.4 (4.6) in the UC and 3.3 (7.4) in the BPM group. Excluding the 1 planned call, telephone encounters at 12 months were higher in the e-BP group with a mean of 7.5 (9.3) compared with 3.8 (5.0) in the BPM group ($P<.001$) and 4.0 (4.8) in the UC group ($P<.001$). There were no significant differences in primary care visits, inpatient visits, or urgent care or emergency use at 12 months among patients across arms. There was a modest but significant decrease in the percentage of patients with office visits to a specialist in the e-BP group ($P=.04$) relative to baseline and to patients in the other groups.

METHODS

We calculate incremental cost-effectiveness ratios (ICERs) for the e-BP program for 4 specific outcomes: improved BP control, reduced mm HG systolic and diastolic BP, and change in life expectancy achieved through greater control of hypertension. ICER measures the change in costs relative to the improvement in outcomes for 2 programs or interventions and is estimated through the formula given by equation 1:

$$\mathrm{ICER}=[\Delta \mathrm{Costs_i}/\Delta \mathrm{Outcomes_i}]$$

where Δ Costs is the difference in costs and Δ Outcomes is the difference in outcomes for the more intensive intervention relative to the less intensive intervention.

The base, or reference case,[16,17] for our estimates of ICER is UC, which reflects the standard of care provided to all Group Health patients with uncontrolled hypertension. We then estimate the ICER for each outcome for the BPM arm relative to UC and e-BP relative to the BPM to provide estimates of the additional costs incurred in these stepped interventions to improve BP control, reduce systolic and diastolic BP, and increase life expectancy. For outcomes between groups that are not statistically significant we report that the intervention is dominated and do not calculate an ICER since additional costs associated with the intervention do not yield an improved outcome.

Changes in systolic and diastolic BP and improved hypertension control used to calculate the ICER for these outcomes are from the trial results as reported in Green et al.[4] The change in life expectancy is measured as the increased number of years an individual with controlled BP is expected to live relative to someone whose BP is not in control. To estimate the additional years of life attributable to each intervention arm we calculate the formula given by equation 2:

$$\Delta\ \mathrm{Hypertension\ Attributable\ LYS}_i=\sum_{t=50}^{T} x \; [\mathrm{Prob\ of\ Controlled\ BP}_{it}\ x\ \Delta\ \mathrm{LE}_{it}]/(1+\mathrm{r})^t$$

where LYS is the change in years of life lived (life-years saved), Prob of Controlled BP is the probability that an individual’s BP is controlled, and ΔLE is the change in life expectancy attributable to improved BP control.

We estimate the change in life-years for each intervention arm (identified by the subscript *i*) by summing across time periods (identified by the subscript *t*) from the point an individual enrolled in the program for the remainder of their expected life. The probability of improved blood pressure control is derived from the trial results reported in Green et al[4] and the change in life expectancy is derived from 2 sources: average life expectancy for adults in the United States as reported by the US Social Security Administration[18] and evidence from the scientific literature on the impact that uncontrolled hypertension has on life expectancy.[19-23] Our estimates of changes in life expectancy attributable to controlled hypertension is based on the experience of a cohort of 50-year-old men and women in order to reconcile evidence from the published literature and data available from Social Security. To estimate the present value of the impact that the current investment in BP control has on life-years saved we discount the stream of increased life expectancy using alternative values for the social rate of discount between 3% and 7% (represented as r in equation 2) as recommended by several leading guides to the economic evaluation of health programs.[16,17] Life expectancy and the impact that uncontrolled BP has on life expectancy differ by gender and we therefore present separate ICER results for controlled BP–attributable life-years saved for men and women.

Cost assignment for each intervention arm is based on the project team's report of resources used to deliver each intervention arm and an activity accounting model method[24] for allocating costs incurred in delivering the interventions. Activity accounting uses micro-costing to assign unit costs to every physical and human resource required to deliver an intervention. To micro-cost the intervention, we identified each resource used to deliver each component of each intervention, whether this was staff time, office space, supplies, or travel time. Unit costs relevant to each resource, for example hourly wage, rent per square foot of office space, or cost per sheet of paper, were multiplied by the total units of each resource used to deliver the intervention. The sum of these amounts was the total costs for each intervention. We assume that a health plan would incur all of the expenditures required to deliver the intervention except for building and maintaining the health plan's information systems. Dollar values used were 2009 local market costs for personnel, office space, and furnishings, to avoid idiosyncrasies in Group Health's purchasing or human resource policies. We estimate the range of intervention costs by examining possible and plausible variation in both the unit costs and the amount of each resource used to deliver each intervention.

Costs associated with UC include identifying patients with uncontrolled BP and informing them of their clinical status and distributing Group Health pamphlets. Additional BPM costs incurred include a face-to-face session in which patients were instructed on the resources available on the MyGroupHealth website including the secure messaging feature and medication refills, and training on the home BP monitor, which project records indicate took about 1 hour. The cost of the monitor was based on the negotiated rate that would likely be available to any purchaser ordering the devices in bulk.

Most of the incremental cost for e-BP patients is the effort spent by clinical pharmacists being trained in evidence-based management of hypertension and in direct patient contact. Pharmacists also met with a senior clinical pharmacist and physicians to review patient progress and medication regimens and to monitor potential adverse events and treatment programs. Three clinical pharmacists that evenly divided the 261 randomized patients into equally sized patient panels of 87 individuals each spent an average of 4 hours per week—with this weekly average based on project logs maintained by each pharmacist—answering patient secure messages and reviewing medical records, and an additional 2 hours per month on average assessing patient progress with a senior clinical pharmacist.

We assess incremental cost-effectiveness based on mean point estimates and test the sensitivity of our findings by estimating 95% confidence intervals though a bootstrap method for each ICER.[25]

RESULTS

The parameters used to estimate ICER in the model are reported in Table 2, with details on the estimation of per patient costs reported in Table 3. Mean UC costs of $10.56 (range: 8.48-12.64) were driven by the time spent by project staff identifying and contacting health plan members and measuring their BP. Mean costs for the BPM arm of $67.36 (53.88-80.83) include the 1 hour spent training each patient on the website and the home BP monitor and the cost of the monitor. The e-BP program includes all of these costs plus training and supervising the pharmacists, with time spent by pharmacists managing patients' medication regimens being the primary factor in the $400.36 (263.41-565.77) per patient cost. Data on mm HG systolic and diastolic BP and BP control reported in Table 2 were discussed above and are obtained directly from trial results.

Mean life expectancy for 50-year-old men and women in the United States in 2009 was 28.9 and 32.7 years for men and women respectively. Published evidence from randomized trials reported that controlled BP results in an increased life expectancy ranging from 3.4 to 6.2 years for men and 1.6 to 4.9 years for women. By applying equation 2 to the actuarial data on life expectancy, the range of values for the impact that controlled BP has on life expectancy, the range of values for BP control, and the alternative social rates of discount, we generate estimates of the discounted change in life-years saved attributable to each intervention arm. As reported in Table 2, the present discounted change in life-years saved attributable to each intervention arm ranges from 0.25 years (95% CI: 0.18-0.32) for women receiving UC to 0.53 years (0.37-0.69) for men receiving the e-BP program. The relative increase in life expectancy for both men and women achieved through the BPM arm was not statistically different from the UC arm, a result driven by the fact that the BPM arm did not result in improved BP control relative to UC. The increase in life expectancy for the e-BP arm relative to BPM is on average 0.18 years for men and 0.15 years for women (P <.10).

ICER estimates for each outcome are reported in Table 4. Because there was no statistically significant improvement in BP control or for the change in diastolic BP for the BPM arm relative to UC, these ICERs are dominated, which means that the additional costs associated with BPM do not yield an improved outcome on these measures. The BPM arm did achieve significant improvements in systolic BP with an ICER of $29.63 (27.23-32.03) per mm HG systolic BP.

The ICERs for e-BP relative to BPM reported in Table 4 are $16.65 (95% CI 15.37-17.94) for each percent increase in the percent of patients with BP control, $65.29 (59.91-70.67) and $114.82 (111.90-117.74) per mm HG for each decrease in systolic and diastolic BP respectively, and $1850 (1635.76-2064.24) and $2220 (1745.09-2694.91) per year for life-years saved for men and women, respectively.

DISCUSSION

In a healthcare system with an existing patient-shared EMR and secure messaging, the addition of home BP monitoring and web-based pharmacist care improved BP control by 25% at a mean per patient cost of $400 and an incremental cost of $16.65 per 1% increase in number of patients with BP control. The pharmacist-led program achieved lower systolic and diastolic BP at a cost of $65.29 and $114.82 per 1 mm HG and resulted in increased life expectancy at a cost of $1850 and $2220 per year of life saved for men and women, respectively. The 31% improvement in hypertension control among UC patients suggests that uncontrolled hypertension may be addressed in the short run with a brief intervention that identifies the issue for patients and provides them with minimal self-management tools. However, some of the improvements in the UC group might have been related to regression to the mean,[15] the normal variation in blood pressure measurement, or the Hawthorne effects of volunteering to participate in a study.[16]

Few studies have evaluated the effectiveness and cost-effectiveness of web-based quality of care interventions. In a recent comprehensive assessment of interactive information technology interventions for patients with chronic health conditions, those that included monitoring patient status to inform treatment decisions along with communications back to the patient were most likely to have a positive effect on health outcomes.[26] We are unaware of any studies that examined the cost-effectiveness of using an existing EMR with a patient web portal to improve treatment outcomes.

Our research contributes to a small number of studies that have examined the cost-effectiveness of collaborative approaches to hypertension control. Soghikian et al[27] report that patients provided a BP monitor had lower total healthcare costs resulting in a net program cost of $28 (in 1992 dollars) in the initial year and lower healthcare costs despite a lack of significant differences between home BP and UC and smaller reductions in systolic and diastolic BP than our study. Carter and colleagues'[13] review of team-based interventions for hypertension care found only 1 economic analysis,[28] which found that patients in a pharmacist-managed hypertension clinic group had significantly (P <.001) lower mean BP at 1 year than patients in UC. Although the costs of managing the 2 approaches were similar (approximately $240 per patient in 1998 dollars), cost per outcome was lower in the pharmacist-managed group ($27 vs $193/mm Hg systolic BP, and $48 vs $151/mm Hg diastolic BP). Reed et al[29] evaluated a multi-component telephonic behavioral lifestyle intervention and patient self-monitoring to improve hypertension control, which resulted in significantly lower systolic BP relative to UC at a cost of $416 (SD $93) in 2008 US dollars. The authors do not report a cost-effectiveness analysis, but our analysis of the published data yields an ICER of the joint intervention of $31 per mm Hg reduced systolic BP.

We note several limitations with our study. First, the trial was conducted within an integrated healthcare system that had already invested in the necessary information technology infrastructure. In addition to leveraging investments in health information technology, integrated systems facilitate the interaction within and among clinical care teams on which the e-BP program relied. Most Americans must still bundle their healthcare from providers that practice independently from one another, making it difficult to achieve the level of care coordination possible within integrated systems. The incentives for providers to create and join accountable care organizations may facilitate the translation of programs such as the e-BP to community settings that do not have the organization advantages of integrated systems such as Group Health.

The majority of our study population was white and had a college degree, and web access was required, limiting the generalizability of our findings. Study participants might have been more responsive to the interventions offered and in particular have greater access to and facility with web-based health services than a group that is more representative of the entire United States. Thus the success of extending programs such as the e-BP to more diverse populations may depend on adapting the manner in which patients can access their health records and care teams to include the full range of technological solutions available in the marketplace.

Second, our analysis was conducted from a health plan perspective and we did not calculate any costs incurred by patients. Third, the e-BP trial did not directly compare web-based care to planned physician or pharmacist in-person office visits for the purposes of improving BP control. Future studies should compare the costs of in-person, telephone, and web-based delivery modes and determine the optimal "dose" of collaborative care for improving BP control long term. Finally, we could not examine the full set of potential long-term benefits of our intervention, as results were based on 1-year follow-up. However, it is possible that patients receiving training in self-management might have more sustained BP control over time.

CONCLUSION

Our analyses suggest that the clinical success of the e-BP trial can be achieved with a relatively low short- and long-term ICER relative to UC approach to hypertension management. We demonstrated that it is possible to significantly improve hypertension control with a program that is relatively low cost and future research should examine the cost impact of potential long-term clinical improvements.

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Take-Away Points

- Hypertension care that includes patients monitoring their blood pressure at home and using secure web-based tools to collaboratively manage their care with clinical pharmacists is both a clinically effective and cost-effective way to improve blood pressure control.
- Providing patients with the skills and tools to identify and manage their own medical needs with support from pharmacists while using the latest advances in health information technology demonstrates the potential for increasing access to care through cost-effective means.

Table 1

Sample Descriptive Information

Demographics	UC (n = 258)	BPM (n = 259)	e-BP (n = 261)
Sex, n (%)			
Female[a]	141 (54.7)	119 (45.9)	146 (55.9)
Age, n (%)			
25-54 y	79 (30.6)	76 (29.3)	72 (27.6)
55-64 y	113 (43.8)	107 (41.3)	114 (43.7)
65-75 y	66 (25.6)	76 (29.3)	75 (28.7)
Race, n (%)			
Caucasian	214 (82.9)	223 (86.1)	207 (79.3)
African American	22 (8.5)	18 (6.9)	21 (8.0)
Asian	8 (3.1)	9 (3.5)	12 (4.6)
Other/refused to say	14 (5.4)	9 (3.5)	21 (8.0)
Education, n (%)			
≤12 years or GED	22 (8.5)	19 (7.3)	21 (8.0)
Some post high school	117 (45.3)	110 (42.5)	97 (37.2)
4-year college degree	48 (18.6)	72 (27.8)	75 (28.7)
Post 4-year college degree	71 (27.5)	58 (22.4)	68 (26.1)
Employment, n (%)			
Full-time	158 (61.2)	130 (50.2)	147 (56.3)
Retired	75 (29.1)	103 (39.8)	92 (35.2)
Part-time	16 (6.2)	21 (8.1)	14 (5.4)
Other/refused to say	9 (3.5)	5 (1.9)	8 (3.1)
Body mass index, n (%)			
Normal (18.5-24.9)	16 (6.5)	14 (5.6)	24 (9.5)
Overweight (25-29.9)	72 (29.4)	84 (33.3)	81 (32.1)
Obese I (30-34.9)	84 (34.3)	78 (31.0)	77 (30.6)
Obese II (35-39.9)	42 (17.1)	34 (13.5)	43 (17.1)
Obese III (≥40)	31 (12.7)	42 (16.7)	27 (10.7)
Missing	—	—	—
Blood pressure			
Systolic BP, mean (SD), mm Hg	151.3 (10.6)	152.2 (10.0)	152.2 (10.4)
Diastolic BP, mean (SD), mm Hg	89.4 (8.0)	89.0 (7.9)	88.9 (8.1)

BPM indicates blood pressure monitoring; eBP, Electronic Communications and Home Blood Pressure Monitoring to Improve Blood Pressure Control; SD, standard deviation; UC, usual care.

[a]Difference significant at $P < .05$.

Table 2

Model Parameters and Data Sources

Variable	Value	Source(s)
Per patient cost (range) of hypertension control program (detail provided in Table 3)	UC: $10.56 (8, 12) BPM: $67.36 (54, 80) e-BP: $400.36 (263, 565)	Estimated (see Table 3)
Percent of population with controlled hypertension at 1 year follow-up (95% CI)	UC: 31% (25, 37) BPM: 36% (30, 42) e-BP: 56% (49, 62)	4
Adjusted change in systolic BP at follow-up (95% CI)	UC: :146.6 (144.8, 148.4) BPM: 146.8 (141.9, 145.5) e-BP: 137.7 (135.9, 139.5)	
Adjusted diastolic BP at follow-up (95% CI)	85.7 (84.5, 86.9) 84.5 (83.3, 85.7) 81.6 (80.4, 82.8)	
Life expectancy among American adults aged 50 years	Men: 28.9 Women: 32.7	11
Change in life expectancy (in years) attributable to controlled hypertension	Men: 3.4-6.2 Women: 1.6-4.9	12, 13, 14, 15, 16
Discounted change in life expectancy (in years) at age 50 years with controlled hypertension		
Usual care (95% CI)	Men: 0.31 (.23-.39) Women: 0.25 (.18-.32)	
BPM (95% CI)	Men: 0.35 (.26-.44) Women: 0.29 (.21-.37)	
e-BP (95% CI)	Men: 0.53 (.37-.69) Women: 0.44 (.31-.57)	
Social rate of time preference—discount rate	3%, 5%, 7%	9, 10

BP indicates blood pressure; BPM, blood pressure monitoring; CI, confidence interval; eBP, Electronic Communications and Home Blood Pressure Monitoring to Improve Blood Pressure Control; UC, usual care.

Table 3

Mean per Patient Costs (Range) for Program Elements

	Program		
	UC	**BPM**	**e-BP**
Identify enrollees and produce self-management materials	$3.40 (2.75-4.05)	$5.62 (4.49-6.74)	$4.76 (3.08-6.81)
Patient training	$6.17 (4.94-7.41)	$25.00 (20.00-30.00)	$25.00 (16.00-36.00)
Protocol development and training for pharmacists			$15.33 (9.81-22.07)
Pharmacist services			$310.63 (198.80-447.31)
Home BP monitor		$35.00 (28.00-42.00)	$35.00 (28.00-42.00)
Overhead/fixed costs	$0.99 (0.79-1.18)	$1.74 (1.39-2.08)	$9.65 (7.72-11.57)
Total	**$10.56 (8.48-12.64)**	**$67.36 (53.88-80.83)**	**$400.36 (263.41-565.77)**

BP indicates blood pressure; BPM, blood pressure monitoring; eBP, Electronic Communications and Home Blood Pressure Monitoring to Improve Blood Pressure Control; UC, usual care.

Table 4

Incremental Cost-Effectiveness Ratios (95% CI)

Measure	Comparison	
	BPM-UC	e-BP-BPM
Percent improvement in hypertension control[a]	Dominated	$16.65 (15.37, 17.94)
Decrease in mm HG systolic BP[a,b]	$23.76 (21.32, 26.19)	$65.29 (59.91, 70.67)
Decrease in mm HG diastolic BP[a]	Dominated	$114.82 (111.90, 117.74)
Cost per life-years saved		
Men (95% CI)[a]	Dominated	$1850 (1635.76, 2064.24)
Women (95% CI)	Dominated	$2220 (1745.09, 2694.91)

Dominated is defined as no significant difference in outcomes between interventions for the intervention to be defined as cost-effective.

BP indicates blood pressure; BPM, blood pressure monitoring; CI, confidence interval; e-BP, Electronic Communications and Home Blood Pressure Monitoring to Improve Blood Pressure Control; UC, usual care.

[a]Difference in cost and outcomes between e-BP and BPM arms significant at $P<.05$.

[b]Difference in cost and outcomes between and BPM and UC arms significant at $P<.05$.