

Cost-Effectiveness of Screening for and Treating Masked Hypertension with out-of-Office Blood Pressure Monitoring

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 Matthew B. Green, MPH; Daichi Shimbo, MD; Joseph Schwartz, PhD; Adam P. Bress, PharmD, MS; Jordan B. King, PharmD, MS; Paul Muntner, PhD; James P. Sheppard, PhD, BSc(Hons), PGCert; Richard McManus, MA, PhD, MBBS, FRCP, FRCP; Andrew E. Moran, MD, MPH; Brandon K. Bellows, PharmD, MS

Background

- Masked hypertension (office blood pressure (BP) <130/80 mmHg, out-of-office BP ≥130/80 mmHg) increases cardiovascular disease (CVD) event risk nearly two-fold compared to sustained normotension (both office and out-of-office BP <130/80 mmHg).
- We compared the lifetime health and economic outcomes of screening for and treating masked hypertension by adding out-of-office blood pressure monitoring (OoOBPM) vs. usual care.

Methods

- The CVD Policy Model, a microsimulation health state-transition model, simulates the annual risk of fatal and non-fatal CVD events, treatment-related adverse events, and non-CVD deaths.
- We simulated screening of 500,000 US adults aged ≥30 years with suspected masked hypertension (office BP 120-129/80 mmHg, not taking antihypertensive medication, without CVD history).
- Based on published literature, we assumed ABPM had 100% sensitivity and 100% specificity (gold standard), and OoOBPM had 91.8% sensitivity and 91.4% specificity.
- We projected total direct health care costs (2020 USD), quality-adjusted life years (QALYs), and incremental cost-effectiveness ratios (ICERs).
- Future costs and QALYs were discounted 3% annually.

Main Findings

Screening Strategy	Cost (\$B, 95% CI)	Incremental QALYs (95% CI)	ICER (\$/QALY, 95% CI)	Incremental 2020 US\$ (95% CI)
Usual care	2.04 (2.03-2.05)	N/A	N/A	N/A
ABPM	3.07 (3.06-3.08)	0.004 (0.003-0.005)	\$6000	\$177,000,000
OoOBPM	3.14 (3.13-3.15)	0.004 (0.003-0.005)	\$6400	\$180,000,000

ABPM = ambulatory blood pressure monitoring; OoOBPM = out-of-office blood pressure monitoring; ICER = incremental cost-effectiveness ratio; 95% CI = 95% confidence interval.

- Screening for masked hypertension prevents more CVD events, but increases medication costs and risk for adverse events.
- There is an 82% probability that ABPM is at least immediately cost effective.

Results

- Cumulative incidence of CVD events (versus usual care)
 - ABPM: -3.3%
 - OoOBPM: -3.3%
- Proportion experiencing a serious adverse event (versus usual care)
 - ABPM: +6.8%
 - OoOBPM: +11.2%
- Cost (versus usual care)

Conclusion

Screening for masked hypertension with ABPM is an immediately cost-effective intervention that leads to modest health gains in US adults.

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ENTER NAMES OF AFFILIATED INSTITUTIONS

PRESENTED AT:



BACKGROUND

- Masked hypertension (office blood pressure [BP] <130/80 mmHg, out-of-office BP $\geq$ 130/80 mmHg) increases cardiovascular disease (CVD) event risk nearly two-fold compared to sustained normotension (both office and out-of-office BP <130/80 mmHg).
- We compared the lifetime health and economic outcomes of screening for and treating masked hypertension by adding ambulatory or home BP monitoring (i.e., ABPM or HBPM) to usual care (no screening) from a US healthcare sector perspective.

METHODS

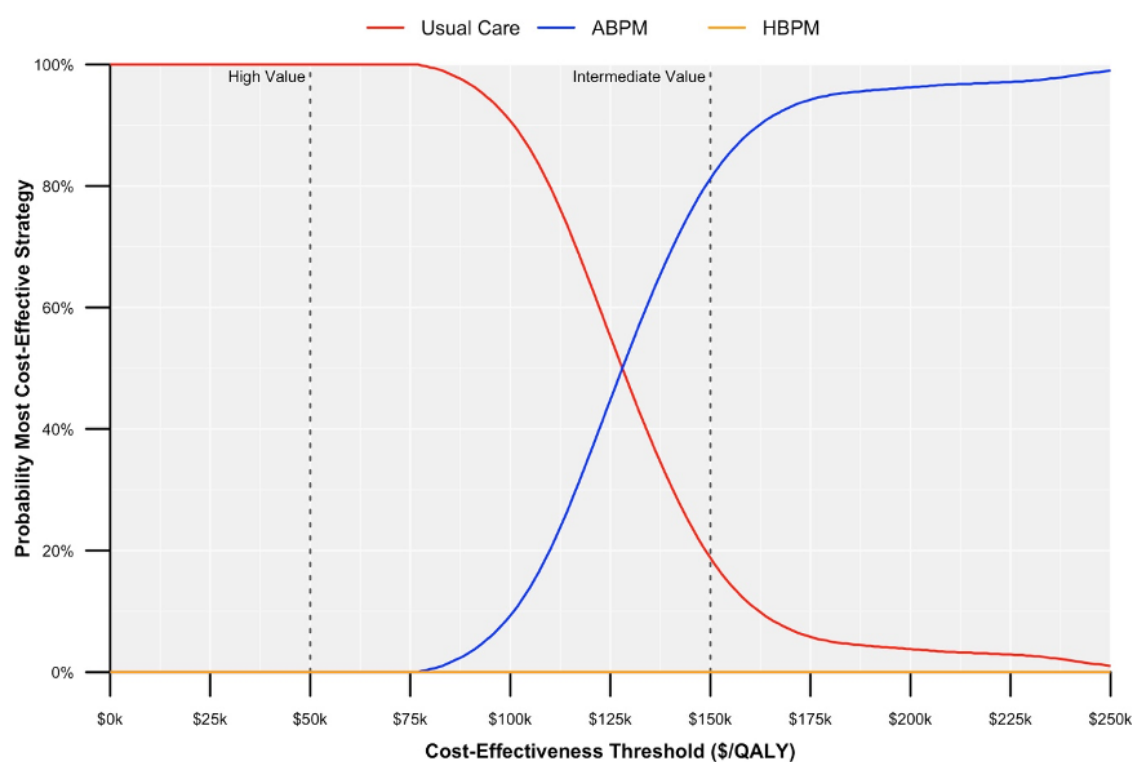
- The CVD Policy Model, a microsimulation health state transition model, simulates the annual risk of fatal and non-fatal CVD events, treatment-related adverse events, and non-CVD deaths.
- We simulated screening of 500,000 US adults aged ≥ 20 years with suspected masked hypertension (office BP 120-129/<80 mmHg, not taking antihypertensive medications, without CVD history).
- Based on published literature, we assumed ABPM had 100% sensitivity and 100% specificity (gold standard), and HBPM had 91.8% sensitivity and 41.4% specificity.
- We projected total direct health care costs (2020 USD), quality-adjusted life years (QALYs), and incremental cost-effectiveness ratios (ICERs).
- Future costs and QALYs were discounted 3% annually.
- Interventions with ICERs <\$50,000/QALY gained and <\$150,000/QALY gained were considered highly cost-effective and at least intermediately cost-effective, respectively.
- Primary analyses were performed using 100 probabilistic simulations.
- Parameter uncertainty was assessed using one- and two-way sensitivity analyses.

MAIN FINDINGS

Treatment Strategies	Costs (2020 USD)	Incremental Costs (95% UI)	QALYs	Incremental QALYs (95% UI)	ICER (\$/QALY gained)
Usual care	\$169,731	Ref	18.615	Ref	Ref
Usual care + ABPM	\$171,554	\$1,823 (\$1,810 - \$1,836)	18.630	0.015 (0.014-0.016)	\$121,533
Usual care + HBPM	\$173,441	\$3,711 (\$3,689 - \$3,734)	18.624	0.009 (0.008 - 0.010)	Dominated by ABPM

ABPM = ambulatory blood pressure monitoring, HBPM = home blood pressure monitoring, ICER = incremental cost-effectiveness ratio, QALYs = quality-adjusted life-years, UI = uncertainty interval

- Screening for masked hypertension prevents more CVD events, but increases medication costs and risk for adverse events
- There is an 82% probability that ABPM is at least intermediately cost effective



RESULTS

- Cumulative incidence of CVD Events (versus usual care)
 - HBPM: -3.3%
 - ABPM: -2.9%
- Proportion experiencing a serious adverse event (versus usual care)
 - ABPM: +6.8%
 - HBPM: +11.2%,
- Cost (versus usual care)
 - ABPM: +\$1,823 (95% CI: \$1,810-\$1,836)
 - HBPM: +\$3,711 (95% CI: \$3,689-\$3,734)
- QALYS (versus usual care)
 - ABPM: +0.015 (95% CI: 0.014-0.016)
 - HBPM: +0.009 (95% CI: 0.008-0.010)
- HBPM was dominated by ABPM as it was more costly and less effective.
- ICER of ABPM (versus standard care) was \$121,533 per QALY gained (82% probability of being at least intermediately cost-effective).
- The ICER with ABPM decreased to \$82,867 per QALY gained with exclusive use of generic drugs.

CONCLUSION

Screening for masked hypertension with ABPM is an intermediately cost-effective intervention that leads to modest health gains in U.S. adults.

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