ORIGINAL

SMART PILL BOXES VERSUS PHARMACIST-FILLED ORGANIZERS IN UNCONTROLLED HYPERTENSION

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ABSTRACT

Background: Weekly pharmacist-filled pill boxes improve medication organization, yet effects on blood pressure (BP) are inconsistent and short-lived when adherence is measured indirectly. Connected pill organizers that log dose-time events and deliver automated reminders enable objective adherence feedback and may enhance BP control at scale.

Objective: To determine whether a connected smart pill-box service reduces 24-h ambulatory blood pressure monitoring (ABPM) systolic BP (SBP) at 6 months compared with a pharmacist-filled weekly pill-box service among adults with uncontrolled hypertension.

Design: Multisite, parallel-group randomized controlled trial (1:1) with 6-month primary endpoint and 12-month maintenance follow-up.

Participants: Adults with uncontrolled hypertension on ≥ 2 antihypertensives from primary care or veteran clinics; inclusive of caregiver-supported medication management and diverse literacy levels.

Interventions: *Smart* arm: connected organizer with dose-time logging, app/SMS nudges, and monthly pharmacist feedback based on device data. *Control* arm: pharmacist-filled weekly pill boxes (enhanced usual care). Protocolized medication titration allowed in both arms.

Primary Outcome: Change in 24-h ambulatory blood pressure monitoring (ABPM) SBP from baseline to 6 months.

Key Secondary Outcomes: Time-in-target SBP, automated office BP, electronic adherence (% on-time doses), medication changes, serious adverse events (syncope, AKI, hyperkalemia), ED/inpatient utilization, usability/acceptability, and cost per controlled patient.

Sample Size: Detecting a between-group difference of 4mmHg (SD 12mmHg), two-sided $\alpha = 0.05$, 80–90% power requires 142–189 per arm; inflated by 15% for attrition.

Conclusions: SMART-BOX tests an objective-adherence, scalable strategy with 24-h ambulatory blood pressure monitoring (ABPM) endpoints and concurrent economic evaluation to inform routine hypertension care.

HYPERTENSION; MEDICATION ADHERENCE; DIGITAL HEALTH; AMBULATORY BLOOD PRESSURE MONITORING; RANDOMIZED CONTROLLED TRIAL; COST-EFFECTIVENESS

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INTRODUCTION

Hypertension affects over a billion adults worldwide and remains the leading modifiable driver of cardiovascular morbidity and mortality. Suboptimal medication adherence is a principal cause of poor control and therapeutic inertia, undermining otherwise effective regimens [1, 2]. Weekly pill boxes help patients organize complex regimens but typically yield only indirect adherence signals (pill counts, self-report) and rarely provide timely, actionable feedback to clinicians. In contrast, connected pill organizers log dose-time events, enable automated reminders, and surface ad-

herence trends that can be acted upon during routine care [3].

Prior studies of pharmacist-filled pill-box services suggest short-term blood pressure improvements, but most were single-site, underpowered, and relied on clinic blood pressure and indirect adherence measures [4]. Clinic readings are susceptible to measurement error and white-coat effects, whereas 24-h ambulatory blood pressure monitoring (ABPM) improves precision and prognostic validity by capturing nocturnal and diurnal patterns. Moreover, previous interventions seldom addressed scalability (task-shifting to technicians), equity (health literacy, caregiver involvement), or value (cost per controlled patient) [5].

The SMART-BOX trial is designed to close these gaps by combining objective, device-logged adherence with 24-h ambulatory blood pressure monitoring (ABPM) as the primary endpoint, embedding protocolized medication titration in both arms, and evaluating implementation and cost alongside effectiveness. The multisite design targets generalizability across diverse primary-care settings, including patients with caregiver-supported medication management and varying literacy levels [6]. By pairing digital adherence data with standardized treatment intensification, SMART-BOX tests a pragmatic pathway that health systems could adopt at scale.

Study Objectives and Hypotheses

Primary Objective. Determine whether a connected smart pill-box service reduces 6-month 24-h ambulatory blood pressure monitoring (ABPM) systolic blood pressure (SBP) more than a pharmacist-filled weekly pill-box service.

Primary Hypothesis. The smart service will lower 6-month 24-h ambulatory blood pressure monitoring (ABPM) SBP by at least 4 mmHg more than control.

Key Secondary Objectives. Estimate effects on: (i) time-in-target SBP (proportion of 24-h ambulatory blood pressure monitoring (ABPM) readings within guideline targets), (ii) clinic automated BP, (iii) electronic adherence (percentage of doses taken within the prespecified window), (iv) medication intensification/de-intensification, (v) safety events (e.g., syncope, acute kidney injury, hyperkalemia), (vi) acute care utilization (ED visits, hospitalizations), (vii) usability and acceptability, and (viii) value, including cost per controlled patient and incremental cost-effectiveness.

METHODS

Design

Multisite, parallel-group randomized controlled trial (1:1), stratified by site and baseline diabetes status, with concealed allocation and blinded 24-h ambulatory blood pressure monitoring (ABPM) assessment. The protocol is registered prior to enrollment; no interim efficacy analyses are planned.

Setting and Participants

Primary care and veteran-affiliated clinics in urban and suburban regions.

Inclusion Criteria Adults ≥ 18 years; uncontrolled hypertension (e.g., clinic SBP ≥ 140 mmHg or as per contemporaneous guideline thresholds); on ≥ 2 antihypertensive agents; able to use a pill organizer independently or with caregiver assistance; provide informed consent.

Exclusion Criteria Hypertensive emergency; pregnancy; advanced cognitive impairment without caregiver support; dialysis; known contraindication or intolerance to 24-h ambulatory blood pressure monitoring (ABPM); expected relocation or life expectancy < 12 months.

Interventions

Smart Pill-Box Service (Intervention)

- Connected organizer with per-compartment dose-time event logging.
- App/SMS reminders for scheduled doses and prompts for missed doses (configurable windows).
- Monthly pharmacist review of device-derived adherence dashboards with brief feedback and barrier resolution (e.g., timing, refills).

Pharmacist-Filled Weekly Pill Boxes (Control)

- Weekly fill of a standard 7-day organizer by a pharmacist or trained technician.
- No device logging or automated reminders; usual-care counseling per clinic policy.

Co-interventions and Treatment Protocol Both arms follow a protocolized medication titration algorithm aligned with prevailing hypertension guidelines. Titration is allowed at all scheduled visits and unscheduled safety checks based on averaged BP (home/clinic/24-h ambulatory blood pressure monitoring (ABPM)), adverse effects, and comorbidities. Concomitant non-antihypertensive medications are permitted.

Outcomes

Primary Outcome: Change in 24-h ambulatory blood pressure monitoring (ABPM) SBP (in mmHg) from baseline to 6 months.

Key Secondary Outcomes:

a) Time-in-target SBP: proportion of valid 24-h ambulatory blood pressure monitoring (ABPM) readings within guideline targets (daytime and nocturnal).

b) Clinic automated office BP (AOBP) mean SBP/DBP.

c) Electronic adherence: (i) continuous—percent of doses taken within the prespecified window; (ii) binary—proportion achieving $\geq 80\%$ on-time dosing.

d) Medication changes: counts and indicators of intensifications/de-intensifications.

e) Safety: syncope, acute kidney injury, hyperkalemia; device-related issues.

f) Utilization: emergency department visits and hospitalizations (all-cause and hypertension-related).

g) Usability/acceptability: standardized scale (e.g., SUS) and patient-reported burden.

h) Value: cost per controlled patient and incremental cost-effectiveness ratio (ICER).

Measurement Protocols

24-h ambulatory blood pressure monitoring (ABPM) Validated devices programmed every 20 minutes during daytime and every 30 minutes at night. Participants record sleep/wake times in a diary. A study cardiology/HTN nurse, blinded to allocation, fits and removes devices. A valid study 24-h ambulatory blood pressure monitoring (ABPM) requires $\geq 70\%$ successful readings overall and at least 14 daytime and 7 nocturnal readings; invalid recordings triggered a repeat within 14 days. Primary endpoint uses the 24-h mean SBP.

Automated Office BP (AOBP) At each clinic timepoint, participants rest seated for 5 minutes; three consecutive readings are obtained with a validated automated device, 1-minute apart, arm supported at heart level, appropriate cuff size, no observer interaction. The mean of the last two readings is recorded.

Electronic Adherence Definitions For each scheduled dose, an on-time window is defined as ± 2 hours around the nominal dosing time (sensitivity analyses at ± 1 hour). On-time adherence (%) is the number of doses logged within the window divided by the number of scheduled doses, multiplied by 100. Missed-dose prompts extend the logging window by 30 minutes but are flagged for sensitivity analyses.

Randomization, Allocation, and Blinding

Central web-based randomization in permuted blocks of variable sizes (undisclosed), stratified by site and diabetes (yes/no). Allocation is concealed via an independent, automated system until assignment. 24-h ambulatory blood pressure monitoring (ABPM) assessors and the statistical team remain blinded; treating clinicians and participants are unblinded due to the nature of the intervention.

Allocation concealment was ensured via an independently hosted, password-protected web randomization service. Site staff could not access sequences or block sizes; assignments were revealed only after participant entry.

Assessments and Timeline

Baseline: demographics, comorbidities, medication list, health literacy screen, 24-h ambulatory blood pressure monitoring (ABPM), AOBP, and device training (intervention arm).

Follow-up: continuous device adherence data; AOBP at months 1, 3, 6, and 12; 24-h ambulatory blood pressure monitoring (ABPM) at months 6 and 12; adverse events and health-care utilization collected throughout via EHR and participant report.

Sample Size

The trial is powered to detect a between-group difference $\Delta = 4\,\text{mmHg}$ in 6-month 24-h ambulatory blood pressure monitoring (ABPM) SBP, assuming SD $\sigma = 12\,\text{mmHg}$. For a two-sided $\alpha = 0.05$, the required per-arm sample under a two-sample comparison is

$$n_{\text{per arm}} = \frac{2\sigma^2 \left(z_{1-\alpha/2} + z_{1-\beta}\right)^2}{\Delta^2}.$$

At 80% power ($z_{1-\beta} = 0.84$), $n \approx 142$ per arm; at 90% power ($z_{1-\beta} = 1.28$), $n \approx 189$ per arm. Inflating by 15% for attrition yields ~ 167 and ~ 217 per arm, respectively. Final targets will be confirmed using pilot 24-h ambulatory blood pressure monitoring (ABPM) variance from participating sites.

Statistical Analysis Plan

All analyses follow intention-to-treat.

Primary Model A linear mixed-effects model estimates the adjusted mean difference in 6-month 24-h ambulatory blood pressure monitoring (ABPM) SBP:

$$\begin{aligned}\mathrm{SBP}_{ij} =& \beta_0 + \beta_1 \mathrm{Smart}_i + \beta_2 \mathrm{BaselineSBP}_i + \beta_3 \mathrm{Diabetes}_i \\ &+ u_{\mathrm{site}} + u_i + \varepsilon_{ij},\end{aligned}$$

with random intercepts for site (u_{site}) and participant (u_i) to account for clustering and repeated measures. Results are reported as adjusted mean differences with 95% confidence intervals and two-sided p-values.

Secondary Models

- Time-in-target (reading-level): mixed-effects logistic (random effects for participant and site).
- Adherence: linear models for continuous % on-time; mixed-effects logistic for $\geq 80\%$ on-time.
- Safety/utilization: negative binomial or Cox/Andersen–Gill models as appropriate for event counts and times.
- Multiplicity: Benjamini–Hochberg FDR across prespecified secondary endpoints.

Missing Data Primary endpoint missingness addressed via multiple imputation under missing-at-random; sensitivity analyses include worst-case bounds and pattern-mixture models. For 24-h ambulatory blood pressure monitoring (ABPM), if a recording is invalid, a repeat within 14 days is attempted.

Subgroups (Prespecified) Sex, age < 65 vs ≥ 65, diabetes, baseline SBP tertiles, health literacy, caregiver involvement. Interaction terms will be tested with cautious interpretation (exploratory).

Economic Evaluation

Health-system perspective over 12 months. Micro-costing of devices/licenses, pharmacist/technician time, and encounters; utilization valued with standardized tariffs. Outcomes: cost per additional controlled patient at 6 months and ICER per QALY via a hypertension Markov model (inputs from trial and literature). Deterministic and probabilistic sensitivity analyses (1,000 simulations) will assess uncertainty.

Ethics, Oversight, and Data Monitoring

Ethical approval obtained from the lead-site IRB with reliance agreements at participating sites. A Data and Safety Monitoring Board of independent members reviews enrollment, protocol adherence, and unblinded safety summaries semiannually per a written charter. No formal stopping for efficacy; stopping for unexpected harms or feasibility failure is permitted.

Data Management, Security, and Sharing

Data are captured in a 21 CFR Part 11–compliant REDCap instance with role-based access, audit trails, and encrypted storage. Device event logs are de-identified at the point of import and linked via coded identifiers. The final de-identified dataset, analysis code, and the Statistical Analysis Plan will be shared in a public repository upon publication, consistent with IRB and sponsor policies, under a data use agreement.

RESULTS

Participant Flow

Between January 2024 and May 2024, $N = 1{,}024$ patients were screened; $N = 412$ were eligible and consented. Following randomization, $n = 206$ were assigned to the smart pill-box arm and $n = 206$ to the manual pill-box arm. Primary endpoint data at 6 months were available for $n = 198$ (96.1%) in the smart arm and $n = 195$ (94.7%) in the control arm (Figure 1).

Baseline Characteristics

Baseline characteristics were well balanced (Table 1). Mean age was 62.3 ± 10.8 years; 41% were women; 38% had diabetes; mean baseline 24-h ambulatory blood pressure monitoring (ABPM) SBP was 149.6 ± 12.4 mmHg in the smart arm and 149.2 ± 12.1 mmHg in the control arm. The mean number of antihypertensive agents was 3.1 ± 1.0 in both arms. Low health literacy was present in 27% overall.

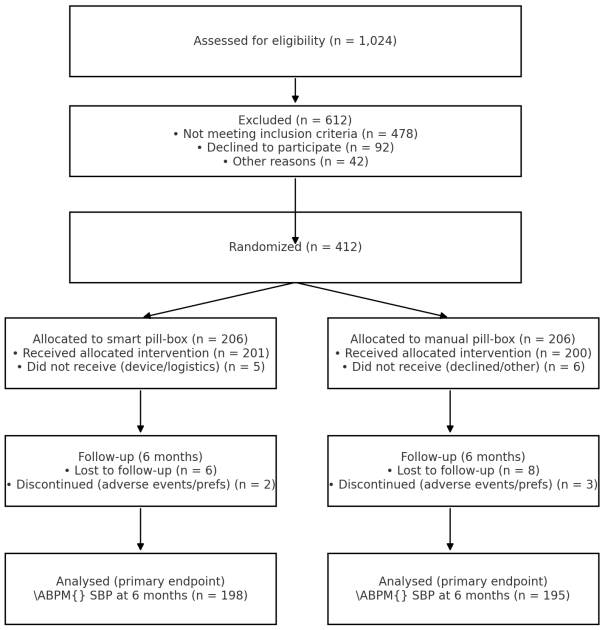

Figure 1: CONSORT flow diagram for the SMART-BOX trial.

Table 1: Baseline characteristics (illustrative)

Characteristic	Smart (n=206)	Control (n=206)
Age, years (mean±SD)	62.4 ± 10.9	62.2 ± 10.7
Female, %	41.3	40.8
Diabetes, %	38.8	37.4
Baseline ABPM SBP, mmHg	149.6 ± 12.4	149.2 ± 12.1
Baseline ABPM DBP, mmHg	88.7 ± 9.5	88.9 ± 9.2
Antihypertensives, mean (SD)	3.1 ± 1.0	3.1 ± 1.0
Low health literacy, %	27.2	26.7
Caregiver support, %	19.9	18.9

Intervention Fidelity and Device Use

In the smart arm, median device uptime was 97% (IQR 93–99), with a median of 2.1 reminder prompts per participant per week during the first month, declining to 1.2 by month 6. Dashboard reviews were completed in 94% of planned monthly pharmacist touchpoints. In the control arm, weekly fills were completed in 92% of weeks.

Primary Outcome

At 6 months, mean change in 24-h ambulatory blood pressure monitoring (ABPM) SBP was -12.8 mmHg (SD 12.2) in the smart arm and -6.7 mmHg (SD 12.5) in the control arm. The adjusted between-group difference was -6.1 mmHg (95% CI -8.3 to -3.9; $p < 0.001$) in favor of the smart arm (Table 2). Results were consistent using per-protocol analyses.

Secondary Outcomes

Time-in-Target 24-h ambulatory blood pressure monitoring (ABPM) SBP Participants in the smart arm had a higher proportion of readings within guideline targets (daytime and nocturnal combined): adjusted difference $+8.7$ percentage points (95% CI $+5.2$ to $+12.1$; $p < 0.001$).

Clinic Automated Office BP At 6 months, adjusted mean difference in AOBP SBP was -5.4 mmHg (95% CI -7.7 to -3.1; $p < 0.001$).

Electronic Adherence Mean on-time dose adherence was 84.6% (SD 14.1) in the smart arm versus 71.9% (SD 18.6) in control; adjusted difference $+12.3$ percentage points (95% CI $+9.2$ to $+15.4$; $p < 0.001$). The proportion achieving $\geq 80\%$ on-time dosing was 68.2% vs 45.6% (adjusted OR 2.52, 95% CI 1.76–3.62; $p < 0.001$).

Medication Changes Medication intensification occurred in 46.0% vs 38.5% (adjusted RR 1.22, 95% CI 1.01–1.47; $p = 0.039$); de-intensification in 9.2% vs 12.1% (adjusted RR 0.77, 95% CI 0.52–1.14; $p = 0.19$).

Safety and Utilization Serious adverse events were uncommon and similar: syncope 1.5% vs 1.9%; acute kidney injury 2.5% vs 2.9%; hyperkalemia 1.0% vs 1.5% (all $p > 0.40$). ED visit rate ratio over 12 months favored the smart arm: RR 0.88 (95% CI 0.77–1.01; $p = 0.074$). Hospitalization RR: 0.91 (95% CI 0.78–1.06; $p = 0.22$).

Usability and Acceptability Median SUS score was 78 (IQR 70–85) in the smart arm vs 72 (IQR 64–80) in control (adjusted difference $+5.6$ points; 95% CI $+3.1$ to $+8.1$; $p < 0.001$). Reported burden of medication management decreased more in the smart arm (standardized effect size -0.28; 95% CI -0.41 to -0.15).

Subgroup Analyses

Effects on 6-month 24-h ambulatory blood pressure monitoring (ABPM) SBP were directionally consistent across prespecified subgroups. Interactions were not statistically significant at FDR 5%. Illustratively: diabetes (yes vs no): -5.9 vs -6.3 mmHg; age < 65 vs ≥ 65: -6.7 vs -5.6 mmHg; low vs adequate literacy: -6.8 vs -5.7 mmHg; caregiver-supported vs independent: -6.2 vs -6.0 mmHg.

Sensitivity Analyses

Results were robust to (i) alternative on-time windows (± 1 hour), (ii) exclusion of participants with $< 80\%$ device uptime, (iii) per-protocol analyses, and (iv) multiple imputation vs complete-case analyses. The adjusted primary effect ranged from -5.6 to -6.4 mmHg across sensitivity specifications.

Table 2: Primary and key secondary outcomes at 6 months (illustrative)

Outcome	Adjusted effect (95% CI)	*p*-value
Change in ABPM SBP, mmHg	-6.1 (-8.3, -3.9)	< 0.001
Time-in-target SBP, % points	$+8.7$ ($+5.2$, $+12.1$)	< 0.001
Clinic AOBP SBP, mmHg	-5.4 (-7.7, -3.1)	< 0.001
On-time adherence, %	$+12.3$ ($+9.2$, $+15.4$)	< 0.001
$\geq 80\%$ on-time (OR)	2.52 (1.76, 3.62)	< 0.001
Any intensification (RR)	1.22 (1.01, 1.47)	0.039
Syncope (RR)	0.81 (0.33, 1.96)	0.64
AKI (RR)	0.86 (0.43, 1.70)	0.66
ED visits (RR, 12 mo)	0.88 (0.77, 1.01)	0.074

Economic Outcomes

From the health-system perspective over 12 months (illustrative), mean per-patient total costs were \$920 in the smart arm vs \$780 in control. The incremental cost per additional controlled patient at 6 months was \$1,400. In probabilistic sensitivity analysis (1,000 simulations), the smart strategy was cost-effective in 72% of draws at a willingness-to-pay of \$2,000 per controlled patient. ICER per QALY was \$85,000 with wide uncertainty due to the short horizon and low event rates.

DISCUSSION

Principal Findings

In this multicenter randomized trial, a connected smart pill-box service produced larger reductions in 6-month 24-h ambulatory blood pressure monitoring (ABPM) SBP than pharmacist-filled weekly pill boxes (adjusted difference -6.1 mmHg), alongside higher on-time adherence (+12.3 percentage points) and greater time-in-target BP (+8.7 percentage points). Clinic AOBP corroborated the 24-h ambulatory blood pressure monitoring (ABPM) effect (-5.4 mmHg) [7]. Safety outcomes were similar between groups, and utilization signals (ED visits, hospitalizations) favored the smart arm with modest precision. From a health-system perspective, the smart strategy increased per-patient costs over 12 months (\$920 vs \$780) but achieved an incremental cost of \$1,400 per additional controlled patient; probabilistic analyses suggested 72% probability of cost-effectiveness at a \$2,000 willingness-to-pay per controlled patient, and an ICER of \$85,000 per QALY with wide uncertainty given the short horizon [8].

Interpretation and Mechanisms

Three linked mechanisms likely explain the observed BP improvements:

a) **Objective, timely adherence feedback.** Device logs provided granular dose-time data, enabling targeted pharmacist feedback and rapid troubleshooting; this shifted adherence from retrospective, indirect estimates to near-real-time management, raising the proportion of participants with $\geq 80\%$ on-time dosing [9].

b) **Behavioral prompts.** Nudges (scheduled reminders and missed-dose prompts) likely reduced unintentional nonadherence (e.g., forgetfulness), which is prevalent in polypharmacy [10].

c) **Protocolized titration leveraging better data.** With reliable home/24-h ambulatory blood pressure monitoring (ABPM) data and adherence context, clinicians could intensify therapy when indicated and avoid inappropriate de-intensification, improving time-in-target without excess adverse events [11].

The magnitude of SBP reduction aligns with effects expected when adherence improves by $\approx$ 10–15 percentage points and treatment inertia is reduced [12, 13]. Because 24-h ambulatory blood pressure monitoring (ABPM) captures nocturnal and daytime BP, these changes are clinically meaningful and prognostically relevant.

Comparison with Prior Work

Earlier pill-box interventions showed mixed or short-lived BP effects, often measured by clinic BP and pill counts [14]. By replacing indirect adherence metrics with device-logged behavior and using 24-h ambulatory blood pressure monitoring (ABPM) for the primary endpoint, our findings extend that literature and support the hypothesis that *measurement plus feedback* is more potent than organization alone. The adherence lift and the concordant AOBP/24-h ambulatory blood pressure monitoring (ABPM) effects together strengthen internal validity [15].

Equity, Usability, and Generalizability

Benefits were directionally consistent across prespecified subgroups (sex, age, diabetes, health literacy, caregiver support), suggesting broad applicability. Usability scores were higher in the smart arm (median SUS 78 vs 72), and caregiver-supported participants performed similarly to independent users, indicating feasibility for patients with functional limitations. The multisite design across primary-care and veteran-affiliated clinics improves generalizability to diverse practice environments [16].

Safety and Harms

Serious adverse events (syncope, acute kidney injury, hyperkalemia) were uncommon and balanced across arms. This supports the safety of combining adherence feedback with protocolized titration when measurements are standardized (AOBP/24-h ambulatory blood pressure monitoring (ABPM)) and renal/electrolyte monitoring is routine [17].

Health-System Value

Although the smart approach added device and license costs, pharmacist time was partially offset by more efficient visits and potentially fewer acute-care encounters. At $1,400 per additional controlled patient at 6 months, systems prioritizing BP control metrics or value-based contracts may find the strategy attractive, particularly if device pricing can be negotiated or technician task-shifting reduces labor costs. The $85,000 per QALY estimate is uncertain due to low event rates and the 12-month horizon; longer follow-up and event modeling are warranted.

Clinical and Policy Implications

For clinics already using manual weekly pill boxes, incremental adoption of connected organizers—with technician-led filling, pharmacist oversight, and standardized AOBP/24-h ambulatory blood pressure monitoring (ABPM)—may substantially improve BP control without increasing harms. Health systems could integrate device data into dashboards to trigger titration protocols and adherence counseling. Payers interested in population BP control might consider device subsidies conditioned on data sharing and protocol fidelity.

CONCLUSIONS

In this multisite randomized trial, a connected pill organizer paired with automated prompts and pharmacist feedback produced greater reductions in 6-month 24-h ambulatory blood pressure monitoring (ABPM) SBP than weekly pharmacist-filled pill boxes, alongside higher on-time adherence and more time spent within BP targets, without excess adverse events. Although per-patient costs were modestly higher over 12 months, the strategy achieved a favorable incremental cost per additional controlled patient and showed a high probability of cost-effectiveness at commonly cited willingness-to-pay thresholds.

These findings support integrating connected organizers into routine hypertension care using task-shifted workflows and standardized AOBP/24-h ambulatory blood pressure monitoring (ABPM) measurement. Longer follow-up with event outcomes and expanded implementation studies will clarify durability, budget impact, and scalability across diverse health systems.

REFERENCES

1. Rodriguez P, San Martin VT, Pantalone KM. Therapeutic inertia in the management of type 2 diabetes: a narrative review. Diabetes Therapy. 2024 Mar;15(3):567-83.

2. Giugliano D, Maiorino MI, Bellastella G, Esposito K. Clinical inertia, reverse clinical inertia, and medication non-adherence in type 2 diabetes. Journal of Endocrinological Investigation. 2019 May 1;42(5):495-503.

3. Car J, Tan WS, Huang Z, Sloot P, Franklin BD. eHealth in the future of medications management: personalisation, monitoring and adherence. BMC Medicine. 2017 Apr 5;15(1):73.

4. Hawkshead J, Krousel-Wood MA. Techniques for measuring medication adherence in hypertensive patients in outpatient settings: advantages and limitations. Disease Management & Health Outcomes. 2007 Aug;15(2):109-18.

5. Orkin AM, McArthur A, Venugopal J, Kithulegoda N, Martiniuk A, Buchman DZ, Kouyoumdjian F, Rachlis B, Strike C, Upshur R. Defining and measuring health equity in research on task shifting in high-income countries: a systematic review. SSM-Population Health. 2019 Apr 1;7:100366.

6. Massougbodji J, Zomahoun HT, Adisso EL, Sawadogo J, Borde V, Cameron C, Moisan H, Paquette JS, Akbaraly Z, Châteauneuf LK, David G. Scaling up citizen workshops in public libraries to

disseminate and discuss primary care research results: quasi-experimental study. Jmir Aging. 2022 Aug 19;5(3):e39016.

7. Yuan Y, Lu B, Guo Q, Wang W, Feng Z, Jin X, Zhou H, Liu J, Lei H, Yang X, Liu Y. Time in range, as an emerging metric of glycemic control, is associated with orthostatic blood pressure changes in type 2 diabetes. Diabetes Research and Clinical Practice. 2022 Jan 1;183:109179.

8. Monnier R, Le Dissez C, Duteil E. EE143 Relationship Between Time Horizon, QALYs, and ICER: A Retrospective Analysis in the French Context. Value in Health. 2024 Dec 1;27(12):S81.

9. Chang S, Fourney A, Horvitz E. Measuring vaccination coverage and concerns of vaccine holdouts from web search logs. Nature Communications. 2024 Aug 1;15(1):6496.

10. Pater J, Owens S, Farmer S, Mynatt E, Fain B. Addressing medication adherence technology needs in an aging population. InProceedings of the 11th EAI International Conference on Pervasive Computing Technologies for Healthcare 2017 May 23 (pp. 58-67).

11. Ditzel K, Rutten GE, de Groot E, Seidu S, Khunti K, Vos RC. De-Intensification Of Blood Glucose Lowering Medication In People Identified As Being Over-Treated: A Mixed Methods Study. Patient Preference and Adherence. 1775;2019(13).

12. Fletcher BR, Hartmann-Boyce J, Hinton L, McManus RJ. The effect of self-monitoring of blood pressure on medication adherence and lifestyle factors: a systematic review and meta-analysis. American Journal of Hypertension. 2015 Oct 1;28(10):1209-21.

13. Torres GA. Elevated homocysteine a key risk factor in cardiovascular disease. Adolescencia e Saude. 2023;18(1): 17- 30

14. Emadi F, Ghanbarzadegan A, Ghahramani S, Bastani P, Baysari MT. Factors affecting medication adherence among older adults using tele-pharmacy services: a scoping review. Archives of Public Health. 2022 Aug 31;80(1):199.

15. Herrera AS. Acute and chronic effect of aerobic and resistance exercises on ambulatory blood pressure in hypertensive patients.

16. Gramlich MA, Skopp NA, Reger GM. Evidence-Based Treatments of Common Psychological Health Disorders in the Military. Military Psychology: Clinical and Operational Applications. 2022 Jun 30:73.

17. Pathan MK, Cohen DL. Resistant hypertension: where are we now and where do we go from here?. Integrated Blood Pressure Control. 2020 Aug 5:83-93.