Drivers and scorecards to improve hypertension control in primary care practice: Recommendations from the HEARTS in the Americas Innovation Group

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Summary

Background Cardiovascular disease (CVD) is the leading cause of morbidity and mortality in the Americas, and hypertension is the most significant modifiable risk factor. However, hypertension control rates remain low, and CVD mortality is stagnant or rising after decades of continuing reduction. In 2016, the World Health Organization (WHO) launched the HEARTS technical package to improve hypertension control. The Pan American Health Organization (PAHO) designed the HEARTS in the Americas Initiative to improve CVD risk management, emphasizing hypertension control, to date implemented in 21 countries.

Methods To advance implementation, an interdisciplinary group of practitioners was engaged to select the key evidence-based drivers of hypertension control and to design a comprehensive scorecard to monitor their implementation at primary care health facilities (PHC). The group studied high-performing health systems that achieve high hypertension control through quality improvement programs focusing on specific process measures, with regular feedback to providers at health facilities.

Findings The final selected eight drivers were categorized into five main domains: (1) diagnosis (blood pressure measurement accuracy and CVD risk evaluation); (2) treatment (standardized treatment protocol and treatment intensification); (3) continuity of care and follow-up; (4) delivery system (team-based care, medication refill), and (5) system for performance evaluation. The drivers and recommendations were then translated into process measures, resulting in two interconnected scorecards integrated into the HEARTS in the Americas monitoring and evaluation system.

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Interpretation Focus on these key hypertension drivers and resulting scorecards, will guide the quality improvement process to achieve population control goals at the participating health centers in HEARTS implementing countries.

Keywords: Noncommunicable diseases; Cardiovascular disease; Hypertension; Latin America and the Caribbean; Quality improvement

Research in context

Evidence before this study

There is a major gap in diagnosis, treatment, and control of hypertension globally, particularly in low- and middle-income countries. However, a sustained improvement in hypertension control has been achieved in multiple settings in some high-income countries. Such progress has been rooted in quality improvement approaches where the operationalization of hypertension control drivers has a prominent place. The HEARTS in the Americas program, the regional version of the WHO Global Hearts Initiative, encourages the adoption of clinical and managerial changes based on health services strengthening and supported by a system for monitoring at every level of implementation. However, a significant challenge impedes a more rapid program scale-up: the lack of health system performance evaluation and quality improvement strategy to demonstrate progress and identify areas for potential improvement, particularly at the primary health care level (PHC).

Added value of this study

Understanding that innovative solutions are needed to shift hypertension programs from the highly specialized secondary level of care to PHC and based on an in-depth study of the most successful and innovative hypertension (HTN) programs globally, the HEARTS in the Americas innovation group (IG) selected eight evidence based HTN control key drivers. The IG also developed specific recommendations for implementation and designed two scorecards to translate the key drivers in process indicators. Translating key drivers into process measures with clearly established indicators is a pragmatic and innovative solution to operationalize the implementation of the HEARTS in the Americas.

Implications of all the available evidence

Implementing the key drivers for hypertension control and the resulting HEARTS Maturity and Performance indexes will allow primary health care facilities to guide the program implementation, enhance their culture of quality improvement and ultimately improve hypertension control while serving as a model for other non-communicable diseases management at the primary health care level in diverse settings throughout the world.

Introduction

Cardiovascular disease (CVD) is the leading cause of premature morbidity and mortality globally, and elevated systolic blood pressure (SBP) is the most significant modifiable risk factor.[1] According to the 2019 Global Burden of Disease Study, elevated SBP accounted for 10.8 million deaths in 2019 or 19.2% of total deaths. Likewise, CVD is the most prominent cause of disease burden in the Americas, with 2 million deaths annually and a substantial socioeconomic impact.[2]

Prevalence of hypertension is high in the Region of the Americas, with a significant gap in diagnosis and treatment. Hypertension control, despite some progress in the last decade, is still low. In 2019, in Latin America and the Caribbean, only 35% of women and 23% of men had hypertension controlled,[3] despite evidence that hypertension can be prevented and controlled. Indeed, a significant and sustained improvement in hypertension control has been achieved in multiple settings. For example, in Southern and Northern California Kaiser Permanente, in the United States (US), hypertension control improved from approximately 50% to 90% over ten years (2005–2015).[4,5] Similar improvements have been achieved nationally in Canada.[6] Most of these efforts have been rooted in quality improvement (QI) approaches. At their core is the definition of key (primary) drivers which are system components or factors that drive or directly contribute to the achievement of the program aim or quality goal.[7]

To reduce the growing CVD burden and tackle the suboptimal management of hypertension, the WHO launched the Global Hearts Initiative in 2016.[8] The Initiative comprises five technical packages. On the prevention side, the population-based packages are: the MPOWER for tobacco control, the ACTIVE for increasing physical activity, the SHAKE for salt reduction and the REPLACE to eliminate industrially-produced trans-fat. On the management side, the HEARTS technical package aims to improve clinical preventive services in primary health care (PHC) using highly effective, scalable, and proven interventions.[8] The WHO HEARTS technical package is a tool that encourages the adoption of clinical and managerial changes based on having a system for monitoring at every level of implementation. Hence, conceptually, HEARTS is an evolving,

continuous quality improvement (QI) program. As the Regional WHO Office, PAHO initiated the *HEARTS in the Americas Initiative*, a comprehensive CVD risk reduction program poised to become the Americas' CVD care management model by 2025. It is being implemented and expanded in 22 countries and 1045 primary health care centers (PHC). Countries where the HEARTS in the Americas Initiative is being implemented are: Argentina, The Bahamas, Barbados, Bolivia, Brazil, British Virgin Islands, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Mexico, Panama, Peru, Saint Lucia, Suriname, and Trinidad and Tobago. Implementation takes place in a stepwise phasic approach integrating into existing national programs.[9]

The key outcomes for this program are improvements in coverage and control of hypertension of the population served. Six technical pillars support the implementation of HEARTS in the Americas.[9] One of the strategic pillars of the program is innovation in the organization of the delivery of care, with an emphasis on team-based care at the primary health care (PHC) level and quality improvement.

This paper describes the process and rationale for selecting the key drivers to improve hypertension control and the resulting scorecards. These scorecards, integrated into the HEARTS monitoring and evaluation system, will guide the quality improvement process to achieve population control goals at the participating health center in HEARTS implementing countries. Lessons learned can be applied to the implementation and improvement of hypertension control programs globally.

Methods

The HEARTS in the Americas Innovation Group (IG)

The IG was constituted with representatives of the first 12 HEARTS implementing countries with in-depth knowledge of the ongoing HEARTS implementation and diverse professional backgrounds, including two nurses, six primary care physicians, two clinical specialists, a health education specialist, and a health technology specialist. It was co-led by an expert practitioner on hypertension quality improvement from Kaiser Permanente (JB), a HEARTS regional implementation expert (GG), and coordinated by the PAHO HEARTS technical advisor (PO). One central premise was that the work of this group should be fully aligned with the HEARTS technical package,[8] HEARTS in the Americas technical pillars,[9] and with the new 2021 WHO Guideline for the pharmacological treatment of hypertension in adults (WHO Hypertension Guideline).[10] To avoid any language issue, professional simultaneous interpretation was provided for all IG meetings, and was available for any questions regarding content of material reviewed.

The drivers for hypertension control

The IG used existing systematic reviews including the ACC/AHA 2017 Hypertension Guideline,[11] the 2019 AHA/ACC Clinical Performance and Quality Measures for Adults with High Blood Pressure report,[12] and the new 2021 WHO Hypertension Guideline[10] to assist with the identification of key hypertension control drivers. In addition to these systematic reviews, the IG also reviewed literature from known high performing systems and evidence-based best practices (Table 1). During the first three sessions, the IG received a package of readings from four primary sources: Kaiser Permanente Hypertension Model of Care,[4,5] CDC's Million Hearts Hypertension Control Package,[13] the Canadian Hypertension Education Program,[14] and additional relevant literature. Notably, the work of the IG was framed within a quality improvement approach. Subsequently, each of the six working sessions had a short lecture component where the preselected hypertension program case studies were reviewed, identifying hypertension control drivers, supporting evidence, and tools that have been used in successful programs. Sub-groups developed synthetic presentations that covered the practice of the specific hypertension control driver in the participants' health systems, a brief feasibility assessment of implementation, and recommendations on how to apply the driver in their country within ongoing HEARTS implementation.

At the end of this cycle, the IG agreed by consensus on the list of key drivers for improving the control of hypertension in the Americas. This selection was reached applying two main criteria: the strength of the specific intervention's evidence and the current feasibility for its local implementation.

Although the medication refill driver is not mentioned in the aforementioned systematic reviews, it has strong evidence support from multiple RCTs and has now become an accepted best practice.

Scorecard development

Subsequent sessions were dedicated to transform the selected hypertension control drivers into feasible process

Driver	ACC	WHO
BP measurement accuracy	✔	
CVD risk assessment	✔	✔
Standardized treatment protocol	✔	✔
Treatment intensification	✔	✔
Continuity of care and follow-up	✔	✔
Team-based care and task-shifting	✔	✔
Medication refill frequency*		
System for performance evaluation and feedback	✔	

***Table 1*: Sources of systematic review utilized.**

* Reference 37: King S, Miani C, Exley J, Larkin J, Kirtley A, Payne RA. Impact of issuing longer- versus shorter-duration prescriptions: a systematic review. Br J Gen Pract. 2018;68(669):e286-e92.

measures that could be captured in an easy-to-use format for implementation at the PHC level. The main criteria for the scorecard design were data availability and feasibility of implementation. First, the IG evaluated the hypertension control drivers and the corresponding process measures and rated these criteria using short questionnaires. Then, the group facilitator analyzed the responses and put forth a draft with eight selected process measures. An additional scorecard was designed to translate the HEARTS outcome indicators into performance measures. Finally, essential additions were made to make the scorecard consonant with the new 2021 WHO Hypertension Guideline.[10] Both scorecards - maturity and performance - were approved by the IG, resulting in the final hypertension drivers and scorecards.

Results

Key drivers for hypertension control

The following eight drivers represent the final selected list by the IG group. Each driver description includes the problem to be solved, solutions based on the available evidence, and specific recommendations for implementation.

Driver 1. Blood pressure measurement accuracy. *Problem*: BP measurement is often performed inaccurately. For instance, a systematic error of underestimating BP by 5 mm Hg would lead to 21 million people in the US not being identified for treatment. A systematic error of overestimating BP by 5 mm Hg would lead to 27 million people being unnecessarily treated.[15] These issues can occur due to incorrect measurement techniques or use of an inaccurate BP measurement device (BPMD).[16] Using accuracy validated BPMDs has been identified as a critical action to address the global burden of high blood pressure. This issue contributes to the widespread availability of clinic and home BPMD with limited or uncertain accuracy, potentially leading to inappropriate hypertension diagnosis, management, and drug treatment.[16]

Evidence-based solutions: Retraining for BP measurement proficiency at regular intervals, for example every six months, may help to maintain the competency of the BP measurement technique,[17] and has been recommended by the American Heart Association.[18] Moreover, repeat BP measurement for initially elevated readings is a well-established standard of care and may significantly impact control rates. A recent study demonstrated that 34% of initially elevated BPs normalized with recheck, and in 24% of patients, systolic BP (SBP) dropped more than 10 mm Hg.[19]

Recommendations:

1. Establish BP measurement training every six months, for all staff involved with BP measurement.
2. Institute standardized BP measurement protocols, including patient preparation and repeated BP measurement if the first reading is elevated.
3. Implement the exclusive use of validated automatic BPMD for clinical practice.

Driver 2. CVD risk assessment. *Problem*: Patients with hypertension and an elevated baseline cardiovascular risk derive greater absolute benefit from BP reduction. Many current hypertension guidelines, including the recently updated 2021 WHO Hypertension Guideline, recommend cardiovascular risk assessment with lower systolic goals in those at higher baseline risk.

Evidence-based solution: Guidelines based on total CVD risk assessment, which use risk scoring methods, are more cost effective than guidelines based on single risk factor levels to treat the same number of patients.[20] Indeed, most current hypertension guidelines now recommend assessing baseline CVD risk.[11,21] A recent meta-analysis of individual participant data from 11 trials and 47,872 participants showed that a CVD risk strategy avoided more CVD events than a BP strategy alone.[22] The SPRINT trial showed an advantage of an intensive systolic BP goal of < 120 mm Hg in a high-risk population.[23] Assessment of baseline CVD risk is essential in determining the BP treatment goal and management of other comorbidities and risks, including initiating statin therapy for primary prevention. Note that the WHO provides updated CVD risk assessment tools in the "Risk- based CVD Management" module of the HEARTS Technical Package.[8]

Recommendations:

1. Assess the CVD risk in all patients with hypertension to guide the BP goal and frequency of follow-up.
2. Use of combination BP medication, statin, aspirin (as needed) in high CVD risk patients, including those with diabetes and/or Chronic Kidney Disease (CKD), to reduce the risk of CVD events.

Driver 3. Standardized treatment protocol. *Problem*: The lack of standardized treatment protocols may contribute to the wide gap between guidelines recommendations for medication use and current practice resulting in poorly controlled patients. Most patients with hypertension require more than one antihypertensive medication for control,[11] and the majority of hypertension guidelines recommend using a fixed-dose combination (FDC) pill as initial treatment.[11,21] FDC pills improve adherence and control, and decrease length of time to achieve control.[24] However, in a recent analysis of NHANES data, the use of an FDC occurred in only 19% of patients in 2013–2016 in the US.[25]

Evidence-based solution: One pillar of HEARTS is implementation of a standardized hypertension treatment protocol supported by a small, but carefully selected formulary.[26] HEARTS in the Americas, and more recently, the 2021 WHO Hypertension Guideline,[24] calls for the rapid control of hypertension by using two antihypertensive medications, preferably in a single pill, FDC, for the initial treatment of hypertension.

Recommendations:

1. Use a standardized treatment protocol with specific medications and doses
2. Use an established protocol with FDC medication.

Driver 4. Treatment intensification. *Problem*: In a US study analysing over 41 million visits from 2005–2012 with an elevated BP (≥140/90 mmHg), treatment intensification occurred in only 16.8%.[27] Indeed, therapeutic inertia might be the most significant barrier to achieving hypertension control.[28] There are multiple factors for suboptimal intensification, including uncertainty over patient's accurate BP (especially when there is a discrepancy between home and office BP measurements), health care delivery constraints (including time pressure), lack of knowledge or comfort regarding dose escalation, potential side effects, medication adherence, and presence of comorbidities.[29]

Evidence-based solution: In the US, The Measure Accurately, Act Rapidly, and Partner with Patients (MAP) program employed provider education and feedback with a resultant decrease in treatment inertia and improvement in BP control.[30] Team-based care, especially with the use of pharmacists and nurses, increases medication titration.[31] The use of a standardized medication protocol, especially with FDC medication, allows for a more consistent approach to medication titration, in addition to facilitation of titration by non-physicians. In addition, the updated 2021 WHO guidelines now recommends initiation of pharmacological treatment of individuals with a confirmed diagnosis of hypertension and systolic blood pressure of ≥140 mmHg or diastolic blood pressure of ≥90 mmHg no later than four weeks after the diagnosis of hypertension.[10] Treatment should not be delayed if CVD risk assessment and/or laboratory tests are not available. Lastly, to be consistent with the updated WHO guidelines, treatment intensification should occur for the following thresholds: ≥ 140/90 mm Hg for average risk, or SBP ≥ 130 mm Hg for high-risk individuals.

Recommendations:

1. Initiate pharmacological treatment immediately after the diagnosis of HTN is confirmed.
2. Medication must be added or intensified as per standard protocol if BP ≥ 140/90 mmHg or SBP > 130 mmHg for high-risk patients.

Driver 5. Continuity of care and follow-up. *Problem*: Delays in follow-up care after a visit with elevated BP may lead to an increase in adverse outcomes. A retrospective cohort study from primary care practices in the UK showed that for SBP thresholds greater than 150 mm Hg, delays of greater than 1.4 months before medication intensification and delays of greater than 2.7 months before BP follow-up after antihypertensive medication intensification were associated with an increased risk of an acute CVD event or death.[32]

Evidence-based solution: Return intervals after visits where an elevated BP was identified are a significant driver of BP control. Shorter encounter intervals were associated with faster time to control, with the most significant benefit seen at intervals ≤ 2 weeks.[33,34] Faster control of BP has also been shown to improve CVD outcomes in several RCTs. Those patients achieving control within 3 months in the VALUE trial, six months in ALLHAT and ASCOT-BPLA, and 12 months in the SCOPE trial had improved outcomes compared to those who took longer to achieve control.[34] The ACC/AHA 2017 hypertension guideline recommends a one-month follow-up after an uncontrolled BP,[11] as does the recently updated WHO hypertension guideline.[32] The WHO 2021 Guideline found no evidence related to the question of the optimal follow-up time after a treated HTN patient achieves control. However, due to additional comorbidities, higher-risk patients generally require more frequent clinical and laboratory assessments.

Recommendations:

1. Follow-up of elevated BP within 2–4 weeks if not controlled.
2. BP visit within six months for all patients with hypertension stable and well-controlled.
3. BP visit within the last three months for all patients with hypertension and high CVD risk, including those with diabetes and/or CKD.

Driver 6. Team-based care and task-shifting. *Problem*: Physician-only dependent delivery of care exacerbates issues of timely access, inefficiency, inequity, and costs.[8] The majority of low- and middle-income countries have a significant shortage in the number of physicians needed to treat hypertension,[35] thus requiring a team-based approach to ensure adequate treatment and follow-up of patients.

Evidence-based solution: The HOPE 4 study showed that a comprehensive model of care led by non-physician healthcare workers (NPHW), involving primary care physicians and families, substantially improved hypertension control and reduced CVD risk compared with current strategies typically physician-centred.[36] Moreover, a systematic review showed that multi-level, multi-component strategies were most effective for

decreasing SBP. Of these, team-based care with an NPHW was most effective, with an average decrease of 7.1 mm Hg in BP.

Team-based care recommendations:

1. BP measurement by NPHW appropriately trained and certified.
2. Follow-up BP visits with NPHW under supervision and guided by protocol.
3. Medication titration by NPHW under supervision and guided by protocol.

Driver 7. Medication refill frequency. *Problem*: Several difficulties limit patient access to medicines in addition to cost. Low availability, frequent stockouts, and difficulties with transportation to pick up medications are all potential barriers. These difficulties have been exacerbated during the COVID-19 pandemic.

Evidence-based solution: 90-day prescription refills have been shown to improve adherence when compared to 30-day refills. A systematic review compared shorter and longer prescriptions and found moderate evidence that longer intervals are associated with increased adherence.[37] A similar study showed that after 540 days of follow-up, patients with a 90-day supply of medication were 7.1% to 9.9% more likely to adhere to treatment. In addition, nonadherence was 40% less likely to occur in those patients who received 90-day supplies of medication.[38]

Recommendation:

1. Implement standard 3-month refill intervals for all BP medication prescriptions.

Driver 8. Performance evaluation with feedback. *Problem*: There is a lack of consistent data collection and feedback regarding hypertension control processes and indicators throughout the Americas. Suboptimal recognition and development of critical process measures impair the ultimate goal of improving BP coverage and control.

Evidence-based solution: Effective quality improvement strategies (QIS) can be categorized into provider-focused (education, reminders, audit, and feedback), patient-focused (education, reminders, promotion of self-management), and system-focused (team change, financial incentives).[32] Standardized and regular reporting of hypertension quality performance metrics allows healthcare leadership, administrators, implementers, and care teams to understand their performance over time and correct gaps.[39] Observational findings show that regular performance feedback to clinics and providers is a critical feature of large, high-performing health systems. In Kaiser Permanente Southern California, where BP control increased from 54% to 86% from 2004–2010, extensive feedback was provided to overcome physician therapeutic inertia. Lower performing physicians received additional education, mentoring, and coaching.[4] In South Carolina, hypertension control rate increased from 49% to 66% between 2000 and 2005. Data reporting evolved from a manual to an electronic system with prompt and timely feedback given to providers as a quality improvement tool.[40]

Recommendation:

1. Implement a monthly performance evaluation and feedback program. Less frequent evaluation and feedback may be acceptable for smaller facilities, with every three months as the minimum acceptable frequency.

Scorecards

HEARTS in the Americas Maturity Index (MI). To guide the quality improvement process and assess the maturity of implementation at the PHC facility level, the IG designed the HEARTS *Maturity Index* (MI), which translates the key hypertension control drivers into a measurable scorecard. A detailed description of the indicators is included in the ***Supplementary material*** with definition, purpose, method of calculation, source of data, recommended target, key data elements, and reporting frequency.

The scorecard contains eight drivers and their recommendations. For each of the recommendations, the IG has set a goal and assigned a score accordingly. The sum of these scores, ranging from 1 to 21 define the state of maturity of the program implementation (from level 1 to 5) at a given PHC facility, shown in **Tables 2a** and **2b**.

HEARTS in the Americas performance index. Program coverage and hypertension control are key performance indicators of the HEARTS in the Americas. Coverage represents a health system's capacity to detect and treat all people with hypertension within a population and, also, hypertension control corresponds to a health system's quality in meeting the standard of care. Both indicators combined — coverage and control - synthesize the level of success or effectiveness of a given system of care in improving levels of hypertension control. Therefore, to complement the maturity index, the *Performance Index* was created. This scorecard comprises three outcome indicators: program coverage, control among all

Hypertension control drivers		Recommendations for implementation	Goals	Score (points) Total = 21
Diagnosis	1. BP measurement accuracy			3
		1.a Establish BP measurement training every six months for all staff involved with BP measurement.	≥ 90%	1
		2.a Institute standardized BP measurement protocols, including patient preparation and repeated BP measurement if the first BP reading is elevated.	≥ 90%	1
		3.a Implement the exclusive use of validated automatic BPMD for clinical practice.	≥ 90%	1
	2. CVD risk assessment			2
		2.a Assess the CVD risk in all patients with hypertension to guide BP goal and frequency of follow-up.	≥ 80%	1
		2.b Use of combination BP medication, statin, aspirin (as needed) in high CVD risk patients, including those with diabetes and CKD.	≥ 80%	1
Treatment	3. Standardized Treatment Protocol			2
		3.a Standardized treatment protocol with specific medications and doses	Implemented	1
		3.b Established protocol using FDC medication	Implemented	1
	4. Treatment intensification			2
		4.a Initiate pharmacological treatment immediately after the diagnosis of HTN is confirmed.	≥ 70%	1
		4.b Medication must be added or intensified as per standard protocol if BP ≥ 140/90 or SBP ≥130 mmHg for high-risk patients	≥ 80%	1
Continuity of care and follow-up	5. Continuity of care and follow-up			3
		5.a Follow-up of elevated BP within 2-4 weeks if not controlled	≥ 80%	1
		5.b BP visit within six months for all patients with hypertension stable and well- controlled.	≥ 80%	1
		5.c BP visit within 3 months for all patients with hypertension and high CVD risk, including diabetes and CKD	≥ 80%	1
Delivery System	6. Team-based care and task-shifting			3
		6.a BP measurement by NPHW appropriately trained and certified	≥ 90%	1
		6.b Follow-up BP visits with NPHW under supervision and guided by protocol	≥ 70%	1
		6.c Medication titration by a NPHW under supervision and guided by protocol.	≥ 70%	1
	7. Medication refill frequency			3
		7.a Implement standard 3-month refill intervals for all BP medication prescriptions for patients stable and controlled	Three months refill	3 (2 month refill = 2; monthly refill = 1)
System for performance evaluation	8. System for performance evaluation with feedback			3
		8.a Implement monthly performance evaluation with feedback to facilitate tracking, prevent substantial deviations and promote timely program corrections. (Bi-monthly evaluation and feedback can be acceptable for small facilities, and evaluation every three months is the minimum acceptable).	Monthly feedback	3 (Bi-monthly = 2; every three months = 1)

***Table 2a*: Hypertension control drivers, recommendations for implementation and scoring for Maturity index.**

Level 1	Level 2	Level 3	Level 4	Level 5
<7	7–10	11–14	15–18	19–21

***Table 2b*: HEARTS maturity index*.**
* The levels demonstrate implementation from lowest level (1), incipient to highest level (5) mature.

Indicators	Level of performance, goal, and scores				
	Poor (<50%)	Incipient (≥ 50%)	On Track (≥ 60%)	High (≥ 70%)	Excellent (≥ 80%)
Coverage*	0	1	2	3	4
Control (<140/90 mmHg) among all hypertensives treated	0	1	2	3	4
Control (<130 mmHg SBP) among all hypertensives-high CVD risk treated	0	1	2	3	4

***Table 3*: HEARTS performance index.**
HEARTS Performance Index: Poor: Below <0.8, Incipient: 0.9 – 1.6; On Track 1.7 – 2.4; High 2.5 – 3.2; Excellent 3.3 – 4.0
* **Coverage:** Proportion of people in the catchment area (clinical facility) who have been registered as hypertensive out of the best estimate of expected prevalence in the catchment area or larger geographical unit in a specific period of time.

hypertensives treated regardless of the CVD risk, and control among all hypertensives with high CVD risk treated. The average score of the three indicators constitutes the overall performance score (Table 3).

Discussion

HEARTS is a set of multi-level interventions designed to improve CVD management with a focus in hypertension control at the primary health care level.[6,41] In this complex scenario, the organization of care at the PHC facilities plays a central role. Effective local leadership ensures that PHC teams are trained on the clinical and managerial strategies and deliver interventions working with the community, patients, and caregivers. In this context, identifying and measuring the key drivers of hypertension control and progressively implementing a quality improvement program is especially relevant to support the PHC team in guiding the interventions and managing the program.

The selected eight hypertension control drivers are a set of interrelated critical health system interventions categorized into five domains that cover a comprehensive spectrum of processes, including: (1) diagnosis (BP measurement accuracy and CVD risk assessment); (2) treatment (standardized treatment protocol and treatment intensification); (3) continuity of care and follow-up; (4) delivery system (team-based care and medication refill), and (5) system for performance evaluation. The first two driver domains are provider-focused, and the other three are delivery and system-focused. Nonetheless, the selected hypertension control drivers were not designed to include all areas relevant to the control of hypertension. Indeed, social determinants of health are recognized as important drivers of hypertension control.[42] However, from the perspective of strength of impact and feasibility of measurement, these were deferred with consideration for possible inclusion in further iterations of this model. Also, population-based hypertension screening is an important determinant of BP control at the population level.[43] However, to the best of our knowledge, screening interventions have not been well identified as key drivers in the hypertension literature, as they would be difficult to implement and measure, and are often out of the control of the primary health care facility. Nevertheless, and due to the relevance of this indicator, the coverage indicator was introduced as a proxy for detection/diagnosis and awareness in the HEARTS *Performance Index*.

Likewise, lifestyle counseling is an important part of an integrated hypertension control program. Indeed, the HEARTS technical package includes the module H (Healthy-lifestyle counseling) as a fundamental intervention.[44] However, evidence for improved BP control with physician counseling of lifestyle factors is fairly scant and may also be more difficult to measure. In fact, a review by the USPSTF showed a mild benefit in reduction of SBP (1–3 mm SBP) only with high-intensity interventions with multiple touches over extended periods of time and generally outside of the primary care setting.[45]

In addition, availability and cost may be significant barriers to the use of FDC medication[46] and validated automatic BP devices,[47] but the evidence behind both of these drivers is strong enough (and now endorsed by the updated WHO guideline) to support their inclusion as key drivers that all health systems should aspire to implement. Note that health systems have the option of using combination BP medication in a non-FDC protocol, if FDCs are not readily available. Lastly, we include

diabetes as a high-risk category (as per the WHO guideline) but felt that inclusion of glycemic treatment was beyond the scope of this work.

The HEARTS scorecards, both the Maturity and the Performance Indexes, were created to facilitate the monitoring of the key drivers implementation. These tools are then integrated into the HEARTS monitoring and evaluation system to guide the quality improvement process to achieve the coverage and control goals focusing on the PHC facilities. In addition, a virtual course on how to implement the drivers targeting PHC personnel has been developed. Nonetheless, despite the *HEARTS in the Americas Initiative* rapid expansion among countries,[35] two significant challenges hamper a faster scaling up of the program: the lack of regular health system performance evaluation and quality improvement processes, and the lack of consistent data collection and reporting mechanism to demonstrate progress and identify areas for improvement, particularly at the PHC level. Although electronic health records and data systems for monitoring performance remain an important barrier to scale up the HEARTS program, the indicators reflected in the scorecards are considered feasible to measure in all systems by 2025. In addition, the IG was able to assess the balance of the burden of additional data gathering versus the benefit of clinical impact in a number of diverse primary health care systems. In the context of this practical implementation experience, the 8 described key drivers have been selected for their feasibility and greatest potential impact in improving BP control.

Our approach to defining the hypertension drivers has some limitations. While we did not perform a systematic review, the IG used existing systematic reviews in addition to extensive compilations of best practices from high-performing systems. The ultimate selection of drivers is well supported by systematic reviews. The second limitation is that a formal feasibility assessment was not conducted, but feasibility of drivers was extensively discussed in the context of HEARTS implementation, which depends on the level of organization and maturity of the countries' health systems. Another limitation is that all the recommendations have a similar weight in the maturity index scorecard, despite having potentially different clinical impact. However, as far as we know, there is no established rating scale or scorecard for differential valuation of key drivers of hypertension control. The IG, therefore, decided to initially start with equal weighting to reinforce the concept that only an integrated and coordinated set of interventions (process), systematically and methodically applied, have a chance to modify the outcomes and improve the hypertension control. Moving forward, as evidence accrues, the IG will consider changes to the relative weighting and the possibility of revising the Maturity Index scorecard. Additionally, formal cost analysis was not performed, but many of the recommendations were not cost-additive (e.g., changes in workflows and lengthening BP medication prescriptions). Nevertheless, cost-effectiveness will be relatively influenced by local PHC systems organization and maturity and will require country-level evaluations.

Conclusions

There is an urgent need to improve hypertension control in the Americas and the world. The new WHO hypertension guideline offers a unique opportunity to catalyze a long-awaited change. Identifying the key evidence-based drivers of better hypertension control will prompt the implementation of HEARTS at the primary health care level. In addition, translating key drivers into process measures with clearly established indicators will allow primary health care facilities to enhance their culture of quality improvement and ultimately improve hypertension control while potentially serving as a model for other non-communicable diseases management programs globally.

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Contributors

PO, JB, GPGA developed methodology, conducted formal analysis and writing of original draft. PO, JB, GPGA, TA, SC, MJDR, JV, CNO, MH, TM, VP, YVG, PWW & EZ all contributed to the conceptualization and methodology, reviewed and edited the article. NRC, MJ, AG, AR validated methodology and results and reviewed and edited the draft.

Declaration of interests

GG, MH, TM, VP and PO are staff members of the Pan American Health Organization. JB, AG, JM, GR, AR and EZ are consultants to PAHO/HEARTS in the Americas. NRCC reports personal fees from Resolve to Save Lives (RTSL), the Pan American Health Organization and the World Bank outside the submitted work; and an unpaid consultant on dietary sodium and hypertension control to numerous governmental and non-governmental organizations. MJD reports personal fees from the Ministry of Economy, Planning and Development of Dominican Republic outside the submitted work, and works as independent consultant on gender and public health to governmental and non-governmental organizations. Authors alone are responsible for the views expressed in this publication, and they do not necessarily represent those of the Pan American Health Organization.

Ethics approval was not required for this study as this qualitative study reviewed existing published documents, convened a group of practitioners who

participated in the Innovation Group voluntarily to select hypertension drivers and design the scorecards.

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Supplementary materials

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References

1 Institute-for-Health-Metrics-and-Evaluation. *GBD 2019 Cause and Risk Summaries: Cardiovascular-Diseases-Level-2-Causes*. University of Washington; 2019. [Available from; http://www.healthdata.org/results/gbd_summaries/2019/%20cardiovascular-diseases-level-2-cause.
2 Martinez R, Soliz P, Mujica OJ, et al. The slowdown in the reduction rate of premature mortality from cardiovascular diseases puts the Americas at risk of achieving SDG 3.4: A population trend analysis of 37 countries from 1990 to 2017. *J Clin Hypertens (Greenwich)*. 2020;22(8):1296–1309.
3 Collaboration NCDRF. Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: a pooled analysis of 1201 population-representative studies with 104 million participants. *Lancet*. 2021;398(10304):957–980.
4 Sim JJ, Handler J, Jacobsen SJ, Kanter MH. Systemic implementation strategies to improve hypertension: the Kaiser Permanente Southern California experience. *Can J Cardiol*. 2014;30(5):544–552.
5 Jaffe MG, Lee GA, Young JD, Sidney S, Go AS. Improved blood pressure control associated with a large-scale hypertension program. *JAMA*. 2013;310(7):699–705.
6 Campbell NRC, Ordunez P, Giraldo G, et al. WHO HEARTS: a global program to reduce cardiovascular disease burden: experience implementing in the Americas and opportunities in Canada. *Can J Cardiol*. 2021;37(5):744–755.
7 Institute-for-Healthcare-Improvement. Quality Improvement Essentials Toolkit 2021 Institute-for-Healthcare-Improvement [Available from: http://www.ihi.org/resources/Pages/Tools/Quality-Improvement-Essentials-Toolkit.aspx.
8 World-Health-Organization. HEARTS Technical Package 2020 World-Health-Organization [Available from: https://www.who.int/news/item/15-09-2016-global-hearts-initiative.
9 Pan-American-Health-Organization. HEARTS in the Americas 2020 Pan-American-Health-Organization [Available from: https://www.paho.org/en/hearts-americas.
10 World-Health-Organization. *Guideline for the Pharmacological Treatment of Hypertension in Adults. Web Annex A. Summary of Evidence*. Geneva: World Health Organization; 2021.
11 Whelton PK, Carey RM, Aronow WS, et al. ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: executive summary: a report of the American college of cardiology/American heart association task force on clinical practice guidelines. *J Am Coll Cardiol*. 2018;71(19):2199–2269.
12 Casey DE, Thomas RJ, Bhalla V, et al. 2019 AHA/ACC clinical performance and quality measures for adults with high blood pressure: a report of the American college of cardiology/American heart association task force on performance measures. *J Am Coll Cardiol*. 2019;74(21):2661–2706.
13 Million-Hearts. *Hypertension Control Change Package*. 2nd ed. Million-Hearts; 2020. [Available from: https://millionhearts.hhs.gov/tools-protocols/action-guides/htn-change-package/index.html.
14 Campbell N, Onysko J, Canadian Hypertension Education Program; Outcomes Research Task Force. The outcomes research task force and the Canadian hypertension education program. *Can J Cardiol*. 2006;22(7):556–558.
15 Jones DW, Appel LJ, Sheps SG, Roccella EJ, Lenfant C. Measuring blood pressure accurately: new and persistent challenges. *JAMA*. 2003;289(8):1027–1030.
16 Sharman JE, O'Brien E, Alpert B, et al. Lancet Commission on Hypertension group position statement on the global improvement of accuracy standards for devices that measure blood pressure. *J Hypertens*. 2020;38(1):21–29.
17 Bruce NG, Shaper AG, Walker M, Wannamethee G. Observer bias in blood pressure studies. *J Hypertens*. 1988;6(5):375–380.
18 Pickering TG, Hall JE, Appel LJ, et al. Recommendations for blood pressure measurement in humans and experimental animals: part 1: blood pressure measurement in humans: a statement for professionals from the subcommittee of professional and public education of the American heart association council on high blood pressure research. *Circulation*. 2005;111(5):697–716.
19 Burkard T, Mayr M, Winterhalder C, Leonardi L, Eckstein J, Vischer AS. Reliability of single office blood pressure measurements. *Heart*. 2018;104(14):1173–1179.
20 Gaziano TA, Steyn K, Cohen DJ, Weinstein MC, Opie LH. Cost-effectiveness analysis of hypertension guidelines in South Africa: absolute risk versus blood pressure level. *Circulation*. 2005;112(23):3569–3576.
21 Williams B, Mancia G, Spiering W, et al. 2018 ESC/ESH Guidelines for the management of arterial hypertension. *Eur Heart J*. 2018;39(33):3021–3104.
22 Karmali KN, Lloyd-Jones DM, van der Leeuw J, et al. Blood pressure-lowering treatment strategies based on cardiovascular risk versus blood pressure: a meta-analysis of individual participant data. *PLoS Med*. 2018;15:(3) e1002538.
23 Sprint-Research-GroupWright JT, Williamson JD, et al. A randomized trial of intensive versus standard blood-pressure control. *N Engl J Med*. 2015;373(22):2103–2116.
24 Derington CG, Cohen JB, Bress AP. Restoring the upward trend in blood pressure control rates in the United States: a focus on fixed-dose combinations. *J Hum Hypertens*. 2020;34(9):617–623.
25 Derington CG, King JB, Herrick JS, et al. Trends in antihypertensive medication monotherapy and combination use among US adults, national health and nutrition examination survey 2005–2016. *Hypertension*. 2020;75(4):973–981.
26 DiPette DJ, Goughnour K, Zuniga E, et al. Standardized treatment to improve hypertension control in primary health care: The HEARTS in the Americas initiative. *J Clin Hypertens (Greenwich)*. 2020;22(12):2285–2295.
27 Mu L, Mukamal KJ. Treatment intensification for hypertension in US ambulatory medical Care. *J Am Heart Assoc*. 2016;5(10).
28 Bellows BK, Ruiz-Negron N, Bibbins-Domingo K, et al. Clinic-based strategies to reach United States million hearts 2022 blood pressure control goals. *Circ Cardiovasc Qual Outcomes*. 2019;12:(6) e005624.
29 Josiah Willock R, Miller JB, Mohyi M, Abuzaanona A, Muminovic M, Levy PD. Therapeutic inertia and treatment intensification. *Curr Hypertens Rep*. 2018;20(1):4.
30 Hanlin RB, Asif IM, Wozniak G, et al. Measure accurately, act rapidly, and partner with patients (MAP) improves hypertension control in medically underserved patients: care coordination institute and American medical association hypertension control project pilot study results. *J Clin Hypertens (Greenwich)*. 2018;20(1):79–87.
31 Mills KT, Obst KM, Shen W, et al. Comparative effectiveness of implementation strategies for blood pressure control in hypertensive patients: a systematic review and meta-analysis. *Ann Intern Med*. 2018;168(2):110–120.
32 Xu W, Goldberg SI, Shubina M, Turchin A. Optimal systolic blood pressure target, time to intensification, and time to follow-up in treatment of hypertension: population based retrospective cohort study. *BMJ*. 2015;350:h158.
33 Turchin A, Goldberg SI, Shubina M, Einbinder JS, Conlin PR. Encounter frequency and blood pressure in hypertensive patients with diabetes mellitus. *Hypertension*. 2010;56(1):68–74.
34 Volpe M, Gallo G, Tocci G. Is early and fast blood pressure control important in hypertension management? *Int J Cardiol*. 2018;254:328–332.
35 Neupane D, Gao Y, Feng Y, Matsushita K, Appel LJ. Estimation of the global gap in clinic visits for hypertension care between patient need and physician capacity. *Hypertension*. 2021;78(3):779–786.
36 Schwalm JD, McCready T, Lopez-Jaramillo P, et al. A community-based comprehensive intervention to reduce cardiovascular risk in hypertension (HOPE 4): a cluster-randomised controlled trial. *Lancet*. 2019;394(10205):1231–1242.

37 King S, Miani C, Exley J, et al. Impact of issuing longer- versus shorter-duration prescriptions: a systematic review. *Br J Gen Pract*. 2018;68(669):e286–e292.
38 Hermes M, Gleason P, Starner C. Adherence to chronic medication therapy associated with 90-day supplies compared with 30-day supplies [abstract]. *J Manag Care Pharm*. 2010;16:141–142.
39 Campbell NRC, Ordunez P, DiPette DJ, et al. Monitoring and evaluation framework for hypertension programs. A collaboration between the Pan American health organization and world hypertension league. *J Clin Hypertens (Greenwich)*. 2018;20(6):984–990.
40 Egan BM, Laken MA, Shaun Wagner C, et al. Impacting population cardiovascular health through a community-based practice network: update on an ASH-supported collaborative. *J Clin Hypertens (Greenwich)*. 2011;13(8):543–550.
41 Giraldo GP, Joseph KT, Angell SY, et al. Mapping stages, barriers and facilitators to the implementation of HEARTS in the Americas initiative in 12 countries: a qualitative study. *J Clin Hypertens (Greenwich)*. 2021;23(4):755–765.
42 Fontil V, Pacca L, Bellows BK, et al. Association of differences in treatment intensification, missed visits, and scheduled follow-up interval with racial or ethnic disparities in blood pressure control. *JAMA Cardiol*. 2022;7(2):204–212.
43 US Preventive Services Task ForceKrist AH, Davidson KW, et al. Screening for hypertension in adults: US preventive services task force reaffirmation recommendation statement. *JAMA*. 2021;325(16):1650–1656.
44 World-Health-Organization. HEARTS technical package for cardiovascular disease management in primary health care. *Healthy-Lifestyle Counselling*. Geneva: World-Health-Organization; 2018.
45 LeFevre ML, US Preventive Services Task Force. Behavioral counseling to promote a healthful diet and physical activity for cardiovascular disease prevention in adults with cardiovascular risk factors: U.S. preventive services task force recommendation statement. *Ann Intern Med*. 2014;161(8):587–593.
46 Jeemon P, Severin T, Amodeo C, et al. World heart federation roadmap for hypertension-A 2021 update. *Glob Heart*. 2021;16(1):63.
47 Lombardi C, Sharman JE, Padwal R, et al. Weak and fragmented regulatory frameworks on the accuracy of blood pressure-measuring devices pose a major impediment for the implementation of HEARTS in the Americas. *J Clin Hypertens (Greenwich)*. 2020;22(12):2184–2191.