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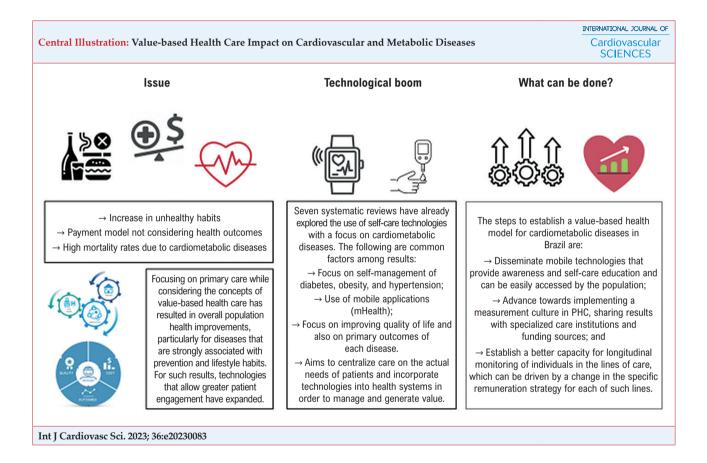
Value-based Health Care Impact on Cardiovascular and Metabolic Diseases

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Central Illustration: Value-based Health Care Impact on Cardiovascular and Metabolic Diseases

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Issue

→ Increase in unhealthy habits
→ Payment model not considering health outcomes
→ High mortality rates due to cardiometabolic diseases

Focusing on primary care while considering the concepts of value-based health care has resulted in overall population health improvements, particularly for diseases that are strongly associated with prevention and lifestyle habits. For such results, technologies that allow greater patient engagement have expanded.

Technological boom

Seven systematic reviews have already explored the use of self-care technologies with a focus on cardiometabolic diseases. The following are common factors among results:
→ Focus on self-management of diabetes, obesity, and hypertension;
→ Use of mobile applications (mHealth);
→ Focus on improving quality of life and also on primary outcomes of each disease.
→ Aims to centralize care on the actual needs of patients and incorporate technologies into health systems in order to manage and generate value.

What can be done?

The steps to establish a value-based health model for cardiometabolic diseases in Brazil are:

→ Disseminate mobile technologies that provide awareness and self-care education and can be easily accessed by the population;

→ Advance towards implementing a measurement culture in PHC, sharing results with specialized care institutions and funding sources; and

→ Establish a better capacity for longitudinal monitoring of individuals in the lines of care, which can be driven by a change in the specific remuneration strategy for each of such lines.

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Cardiometabolic diseases include conditions of metabolic changes starting with insulin resistance, dyslipidemia, hypertension, and obesity that affect the cardiovascular system. In Brazil, cardiovascular diseases were the leading cause of death in 2019, with coronary disease and stroke being on top, with a population prevalence of 6.1%.[1] It is estimated that more than 17 million Brazilians have diabetes, 46% of whom are unaware of the disease. Associated illnesses such as ischemic disease, stroke, and diabetes represent a high economic burden on health systems, justified by their high incidence, population aging, and increasing incorporation of more expensive technologies.

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Increased health spending without evidence of population health improvements has led to major changes in how health systems are defined and managed. In the search for strategies to contribute to the system's capacity to stimulate the generation of better results with existing resources, the concept of value-based health care has emerged. It consists of converting available investments into better healthcare results for the population.[2] The concept was introduced just over a decade ago,[3] in which primary health care (PHC) and education about population health and prevention are considered the pillars for the establishment of a value-based health system.[4,5]

PHC ensures cardiometabolic diseases are tracked, prevented and managed at a non-advanced stage or after an intervention in specialized care, and best practices for implementing specific programs have already been developed.[6] For PHC to perform its duty,

however, it is important to encourage prevention, self-care, and healthy habits, which can be done through remuneration models.[7] Remuneration strategies that include health outcome measures are required for implementing value-based healthcare[8] and, when it comes to PHC, it also refers to measuring whether prevention, tracking and education activities are being delivered to the assisted population in each unit.[9] However, the implementation of strategies and programs that reward the achievement of better health results and promote prevention and self-care initiatives require an accurate ability to organize measurement at the individual level.[10]

Technological advances facilitates measurement, especially of diseases that allow tracking and monitoring by the individuals themselves. As an example, the HEARTS application was implemented by Latin American countries to collaborate in the

Table 1 – Systematic reviews on the incorporation of self-care technologies with a focus on cardiometabolic diseases.

Title	Country	Disease	Technology employed	Impact and results generated by the digitization of data.
Considerations for the Development of Mobile Phone Apps to Support Diabetes Self-Management: Systematic Review[13]	USA	Diabetes	Mobile apps	Shared decision-making between diabetes patients, healthcare professionals, and application developers. Data security and privacy must be ensured, in addition to the integration of the main functions that support self-care as indicated by diabetes melitus guidelines. Therefore, the specific needs of diabetic patients can be addressed in the application, thus improving self-management and clinical outcomes.
Effectiveness of Mobile Health Interventions on Diabetes and Obesity Treatment and Management: Systematic Review of Systematic Reviews[14]	USA	Diabetes and obesity	Mobile apps, text messages, self-monitoring, and mHealth Program Management	mHealth interventions are promising, but evidence is limited about their effectiveness in glycemic control and weight reduction. In order to improve effectiveness, future studies are required to determine optimal formats and frequency, better adaptation of messages and improved usability, emphasizing maintenance of effectiveness over time.
The Use of DASH Mobile Apps for Supporting a Healthy Diet and Controlling Hypertension in Adults: Systematic Review[15]	USA	Hypertension	Mobile apps	There is weak emerging evidence of the positive effect of using DASH smartphone apps in supporting self-management to improve adherence to the DASH diet and consequently reduce BP.

A Systematic Review of Application and Effectiveness of mHealth Interventions for Obesity and Diabetes Treatment and Self-Management[16]	United States	Diabetes and Obesity	mHealth. Text messaging, wearable or handheld devices, and smartphone applications	Primary outcomes included weight loss or maintenance, in addition to glucose maintenance (mean decrease in glycated hemoglobin from -0.4% at 10 months to -1.9% at 12 months); secondary outcomes included changes in patient behavior and perceptions such as self-efficacy and program acceptability. Over 50% of studies reported positive effects of interventions based on primary outcomes. Most studies included small sample sizes, short intervention periods, and no rigorous data collection or analytical approaches. While some studies have suggested that mHealth interventions are effective and promising, most of them are pilot studies or have design limitations.
mHealth Interventions for Self-management of Hypertension: Framework and Systematic Review on Engagement, Interactivity, and Tailoring[17]	United States	Hypertension	Mobile app interventions for hypertension self-monitoring	mHealth app interventions for managing hypertension have implemented engagement, interactivity, and adaptation, as shown by the 21 studies in this review. A patient-centered engagement framework for hypertension self-management with mHealth technology was proposed, aiming to facilitate intervention design and disease self-management by using this technology in the future.
Mobile Apps to Support the Self-Management of Hypertension: Systematic Review of Effectiveness, Usability, and User Satisfaction[18]	United States	Hypertension	Mobile app interventions for hypertension self-monitoring	Twenty-one (21) studies with 3,112 participants were included in the review. Of the 14 studies that evaluated the effectiveness of mobile applications in lowering blood pressure, ten (71.4%) reported significant reductions in blood pressure and appeared to be effective in controlling hypertension. Of these ten, only two (20%) RCTs and three (30%) non-randomized studies had low to moderate risk of bias. Results were inconclusive and combinations of features would be more effective in lowering blood pressure due to variation in trial quality. Data suggests that apps that incorporate more comprehensive functionality will be more effective.
The Effectiveness of Self-Management of Hypertension in Adults Using Mobile Health: Systematic Review and Meta-Analysis[19]	United States	Hypertension	Mobile and wearable devices	Twenty-four (24) studies with 8,933 participants were included. Twenty-three (23) studies reported clinical BP outcome, 12 provided blood pressure data, and 16 focused on change in self-management behavior and medication adherence. A greater reduction in SBP and DBP was observed in the mHealth intervention groups compared with the control groups. Subgroup analyses showed consistent reductions in blood pressure levels across different reminder frequencies, interactive patterns, intervention functions, and study duration subgroups. Sixteen (16) studies reported better medication adherence and behavioral change in the intervention groups, while eight showed no significant change.

DAH: Dietary Approaches to Stop Hypertension; mHealth: mobile technologies and wearable devices; RCTs: random clinical trialS; SBP: systolic blood pressure; DBP: diastolic blood pressure.

identification of patients with cardiovascular risk in the PHC.[11] Based on variables answered by the patients when arriving at the PHC, the application suggests the level of cardiovascular risk, facilitating medical conduct within alternatives available in public and supplementary health. It collaborates with patient-centered care, particularly when established lines of care exist. They describe patient routines, including information on actions and activities towards promotion, prevention, treatment, and rehabilitation, to be developed in health care units, while defining the role of each member of the process and, therefore, reducing waste and increasing guidance assertiveness in the health care system.[12]

When considering the behavioral and self-care factors in the prevention and screening of cardiometabolic diseases, the establishment of value-based management models for this care pathway can achieve better results with the adoption of technologies used by patients. From educational solutions to self-monitoring of blood glucose levels, examples with positive results are widely known and summarized in systematic reviews of the literature on diabetes, obesity and post-infarction conditions. Table 1 describes the main contributions of these systematic reviews.

Consolidated evidence in systematic reviews indicates that the use of technologies by individuals favors the centralization of self-care, patient involvement in health-related decisions, early diagnosis and, consequently, greater adherence to the care pathway. These are the expected results of strategies aimed at generating value, as implemented in the context of PHC and cardiometabolic diseases. In the United States, the Centers of Medicare & Medicaid Services (CMS) launched a Bundled Payments Initiative, with a fixed portion for the delivery of a service and a variable portion for the outcome. Performance evaluation is based on measures of process results and assisted individuals related to monitoring cardiometabolic diseases, such as blood pressure and diabetes control, cancer screening, individual care planning, and patient experience.[5] In addition, the American Heart Association has also launched initiatives to better integrate primary and specialized care for diseases such as heart failure.[20]

In Brazil, existing projects incorporate these concepts, such as the Previne Brasil program, instituted by Ordinance No. 2979, of November 12, 2019.[9] The new funding model for PHC by SUS (Brazilian public health system) alters some forms of transferring funds to municipalities, which are now distributed based on four criteria: weighted capitation, payment for performance, incentives for strategic actions and financial incentives based on population criteria. For the pay-for-performance indicators, seven indicators are considered, two of which related to chronic conditions, such as the proportion of people with hypertension and blood pressure measured in the last semester and people with diabetes with glycated hemoglobin measured. This proposal is based on structuring a financing model focused on increasing people's access to PHC services and the link between population and HC team, based on mechanisms that induce managers and professionals to be responsible for the people assisted. An analysis of the Program in the State of Minas Gerais units showed an important increase in hypertension and diabetes indicators, from 2% in 2019 to 11% in 2021 and 5% to 23%, respectively.[21] This still preliminary and focal data corroborate the concepts of the importance of relating the care provided to chronic conditions with metrics and payment models leading to better results for both patients and overall population health in the future. Central illustration elucidates new technological alternatives to monitor/deal with cardiovascular diseases.

Final considerations

The development of a value-based health system that is centered around individual needs and scaled to deliver the best health outcomes within a budget constraint is possible and favored by structural changes to the system, such as payment methods and a technology base that enables real-life data-driven management. PHC centralization and the interconnection with data shared between the assisted population and specialized care systems seem to be a requirement for greater capacity for tracking, diagnosing, and managing cardiometabolic diseases in the health system. For Brazil's current scenario, the challenges start with the precarious measurement culture and remuneration strategies that are centered on payment for the service delivery rather than the impact they have on population health.

As primary steps to establish a value-based health model for cardiometabolic diseases in Brazil, seeking inspiration from existing evidence, the following are recommended: start by disseminating mobile technologies that provide education and self-care and can

be easily accessed by the population; advance towards implementing a measurement culture in PHC, sharing results with specialized care institutions and funding sources; and establish a better capacity for longitudinal monitoring of individuals in the care pathways, which can be driven by a change in the specific reimbursement strategy for each of care pathways.

Author Contributions

Conception and design of the research: Etges APBS, Polanczyk C; acquisition of data, analysis and interpretation of the data, writing of the manuscript, critical revision of the manuscript for intellectual content: Etges APBS, Ferreira AL, Comiran G, Polanczyk C.

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Ethics Approval and Consent to Participate

This article does not contain any studies with human participants or animals performed by any of the authors.

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