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Disclosures

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Achieving Optimal Population Cardiovascular Health Requires an Interdisciplinary Team and a Learning Healthcare System:

A Scientific Statement From the American Heart Association

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Abstract

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*Modest.

Disclaimer: The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Population cardiovascular health, or improving cardiovascular health among patients and the population at large, requires a redoubling of primordial and primary prevention efforts as declines in cardiovascular disease mortality have decelerated over the past decade. Great potential exists for healthcare systems–based approaches to aid in reversing these trends. A learning healthcare system, in which population cardiovascular health metrics are measured, evaluated, intervened on, and re-evaluated, can serve as a model for developing the evidence base for developing, deploying, and disseminating interventions. This scientific statement on optimizing population cardiovascular health summarizes the current evidence for such an approach; reviews contemporary sources for relevant performance and clinical metrics; highlights the role of implementation science strategies; and advocates for an interdisciplinary team approach to enhance the impact of this work.

Keywords

AHA Scientific Statements; cardiovascular diseases; delivery of health care; disease management; interdisciplinary research; learning health system; population health

Worldwide, the population burden of chronic diseases is increasing, amplified by the aging of populations. Additionally, the progress toward improvements in population cardiovascular health (CVH) has been slow. Furthermore, and most important, recent mortality trends observed in the United States generate major concerns. In 2011, the rate of decline in cardiovascular disease (CVD) mortality began decelerating, and the downward trends in deaths attributed to heart disease and stroke reversed course in middle-aged Americans, even among those living in traditionally healthier geographies.[1,2] From 2011 to 2017, the magnitude of the decline in annual CVD mortality diminished to <1% per year, and 5-year CVD mortality declined by 4%.[3–5]

Responses to these concerning trends must involve a redoubling of efforts on primordial and primary prevention of CVD. To emphasize this prevention imperative, the Goals and Metric Committee of the Strategic Planning Task Force of the American Heart Association (AHA) developed the 2020 Impact Goal (Figure 1) “to improve the cardiovascular health of all Americans by 20% while reducing deaths from cardiovascular disease and stroke by 20%.”[6] There is a need to fully implement what is known and for innovative, integrated approaches to optimize CVH in populations and overcome adverse mortality trends.[9]

This scientific statement on optimizing population CVH summarizes the current evidence for such an approach; reviews contemporary sources for relevant performance and clinical metrics; highlights the role of implementation science strategies; and advocates for an interdisciplinary team approach to enhance the impact of this work. Although many of the initiatives reviewed in this statement support the enhancement of secondary prevention (eg, improving blood pressure control), they can provide a road map to expand efforts to impact primordial and primary prevention to optimize CVH.

A LEARNING HEALTHCARE SYSTEM APPROACH TO ACHIEVING OPTIMAL CVH

If population-level CVH interventions are deployed synergistically with health systems, they can benefit from the operationalization of the learning healthcare system model (Figure 2).[10–12] Learning healthcare systems are those in which knowledge is consistently generated and applied in the practice of medicine to yield continuous improvements in healthcare delivery. In realizing this vision, population-level interventions can leverage health information technology and associated data infrastructure to guide evidence-based healthcare delivery in a healthcare ecosystem that in turn promotes high-quality healthcare delivery and whose insights can be used to spur innovation.[11] Operationalizing this model calls for a synergistic, integrated, and complementary approach using health system–wide resources. Learning healthcare system models have been deployed and maintained in the Geisinger Health System and Kaiser Permanente, among others. To fully extend the impact of the innovative models in learning healthcare systems, they can be linked with complementary population-health efforts traditionally led by public health practitioners, as described by Auerbach's 3 buckets of prevention.[13]

Available data streams providing information on CVH metrics include the electronic health record, as well as data from mobile devices and wearables. Data streams require preprocessing and, once deemed valid and reliable, can be integrated into current data models using advanced data management techniques. Expertise with mobile device and wearable data is needed to complete this cycle. Findings can then be evaluated to determine the level of evidence to support the intervention, in which clinical contexts, and with which patient population. The aforementioned parts of the learning healthcare system model are shown in Figure 2; next, as also shown in Figure 2, the intervention is deployed and evaluated. A feature of this model is that it is iterative and serves as the foundation for cyclic assessments and clinical practice adaptation.

EVIDENCE-BASED CVH METRICS FOR POPULATION CVH

The data-centric steps (Figure 2) are best enabled by the selection of a prioritized set of performance measures, or clinical quality measures, for ongoing collection, analysis, and interpretation. With the breadth of interventions available to impact CVH, the selection of a prioritized set of performance measures may be a useful first step for health systems seeking to implement and evaluate performance related to CVH. We propose herein a number of evidence-based and actionable population CVH metrics for ongoing monitoring and evaluation of primordial and primary prevention, including maintenance of physical activity, a heart-healthy diet, ideal body mass index, and nonsmoking. Although we do not explicitly state which metrics a healthcare system should monitor, we aim to promote those most commonly measured and evaluated to streamline such efforts. We also acknowledge that there is a health–disease continuum that exists across the life course, and traditional health systems are frequently engaged when disease emerges.[14]

One example relevant to the evaluation of population-level CVH initiatives is Million Hearts 2022. This national initiative is co-led by the Centers for Disease Control and Prevention

and the Centers for Medicare & Medicaid Services in partnership with numerous public and private partners. The primary aim of the initiative is to prevent 1 million heart attacks and strokes within 5 years. Million Hearts 2022 seeks to align performance measures across federal and partner programs to reduce reporting burden, promote a common target, allow for comparisons across systems, and encourage the use of measures aligned with current guidelines.[15] Replication of these activities would be relevant to CVD prevention and management across healthcare settings. The Million Hearts 2022 initiative uses national guidelines to set targets and to link those targets to performance measures. Resources for performance measure alignment are provided by the program.[16] Since its inception in 2012, this initiative has focused on a set of common, high-burden risk factors. The 5-year initiative to prevent 1 million CVD events, now in its second cycle, identified the ABCS (aspirin when appropriate, blood pressure control, cholesterol management, and smoking cessation) as optimal areas of focus because of the significant evidence base for CVD primordial and primary prevention and high population burden.[17] It was recently reported that numerous clinical quality measures from the Million Hearts initiative are available for population health monitoring efforts from routinely collected electronic health record data elements.[18]

Acknowledging the need for resources to support the translation of guidelines into modern clinical practice, new guidelines released by the AHA and its partners have been accompanied by recommended performance measures for measuring and evaluating population-level blood pressure.[19] The AHA has partnered with industry leaders and other associations, such as the American Medical Association and the American Diabetes Association, to improve the diagnosis and management of blood pressure (Target:BP), cholesterol (Check.Change.Control.Cholesterol), and diabetes mellitus (Know Diabetes by Heart). These quality improvement programs are designed to help healthcare professionals and health systems treat important risk factors for the primary prevention of CVD.

Additionally, since 2015, Million Hearts has released 3 quality improvement change packages that provide evidence-based strategies for driving improvement on blood pressure control, tobacco cessation, and cardiac rehabilitation utilization. Using a quality improvement framework, these packages provide validated tools and resources from national organizations and healthcare provider organizations in the field who have demonstrated improvement. However, evidence-based interventions supporting enhanced CVH and CVD management are frequently underutilized because of the complexity of translating guidelines and recommendations into practice. Consistency in performance measures (developed according to guidelines) that are used by health systems proves useful for achieving the vision of a learning healthcare system, as well as reporting performance to health insurers and other key partners.

The prioritization of select clinical measures to drive performance improvement has already been effectively demonstrated across a variety of health systems in the United States. For example, the Kaiser Permanente Northern California hypertension program, although multidimensional in implementation, prioritized a hypertension control performance measure to demonstrate population health management and program effectiveness.[20] Lessons learned and common attributes from programs similar to Kaiser Permanente Northern California have been highlighted through the Million Hearts Hypertension

Control Challenge and are complementary to the World Health Organization's HEARTS technical package.[21] The HEARTS technical package serves as a comprehensive tool kit for improving CVH at the country level that includes pragmatic recommendations for the prioritization of performance measures for evaluating program effectiveness.[22] Additional core metrics that can be considered as performance measures for population-level CVH program development and evaluation of intervention effectiveness are listed in Table 1.

EVIDENCE-BASED METHODS FOR IMPLEMENTATION OF POPULATION CVH INTERVENTIONS

The methods-centric steps shown in Figure 2 comprise implementation and evaluation of strategies to improve CVH and to prevent chronic diseases. Although evidence-based medicine continues to be a cornerstone in modern medicine, some evidence-generation activities are more mature than others. Epidemiologists and other researchers have the skills to help define which outcomes of medical interventions are relevant and how to measure them effectively and efficiently. They can assist healthcare systems in designing, monitoring, and evaluating efforts to improve population CVH.

Healthcare systems often use quality improvement (QI) as an approach for furthering the field of healthcare delivery by evaluating care processes. QI projects allow for real-life variations in the environment and often rely on adaptive and rapid-cycle methodologies, such as the plan–do–study–act cycle[28] represented by the learning healthcare system model (Figure 2). QI projects rarely undergo rigorous evaluation or provide a systematic reporting of results; therefore, the reasons why they fail to achieve their anticipated outcomes often remain unknown. This is a missed opportunity for on-the-ground learning, and the inclusion of the evaluation and dissemination of lessons learned from QI projects in the planning phase could allow for new and innovative interventions.

Implementation science, on the other hand, offers rigorous metrics to design and evaluate clinical research questions. Implementation science research seeks to understand what is required, in terms of feasibility, time, and cost, to facilitate the adoption, uptake, and sustainability of an intervention in clinical settings. It can help us understand "for whom" and "under what conditions" an intervention works best so as to ensure equitable access to evidence-based care. Learning healthcare systems are informed by QI efforts and are implemented, or deimplemented, according to best practices in implementation science.

According to the Institute of Medicine, implementation science is central to addressing the "quality chasm and is a key component of learning healthcare systems designed to iteratively develop and evaluate innovations to deliver high-quality patient-centered care and to evaluate the effectiveness of this care."[29] Implementation science methods can be applied in synergy with QI methodologies. Clinical research questions can be first tested as QI interventions. This will aid the refinement of an idea and pilot testing of an intervention before a research study is designed, which would be a longer-term project with less flexibility in modifying data collection, primary outcomes, or elements of the intervention once the research was under way.

Epidemiologists and health services researchers are well positioned to work alongside implementation scientists and clinicians to support successful implementation of clinical interventions for several reasons. They are trained in the use of relevant theories, models, and frameworks and thereby are well poised to design and test strategies for deploying effective interventions and evidence-based practices into a variety of settings, including healthcare delivery systems.[30] Although training programs vary in their integration of program evaluation or QI, many include rigorous evaluation methods such as learning evaluation. Learning evaluation is a methodological approach that blends QI and implementation science research methods to study healthcare innovations.[31] In learning evaluation, qualitative and quantitative data are collected to conduct real-time assessments of implementation processes while also assessing changes in context, facilitating QI, and generating transportable lessons. This approach is designed to balance the flexibility needed for within-system innovation and the structure needed to support rigorous evaluation and cross-organization learning. The blending of these methodologies can help researchers define best practices for scaling population CVH interventions across healthcare delivery systems.

More recently, the implementation science field has championed the concept of deimplementation, or the discontinuation of practices known to be ineffective.[32] Deimplementation (reducing or stopping the use of ineffective, harmful, low-value, or unproven interventions, practices, and programs) is particularly important for population CVH interventions that may occur during already time-strapped clinical encounters. To advance population CVH management, the development and testing of frameworks, methods, measures, outcomes, and strategies that address issues specific to deimplementation is important.

ROLE OF AN INTERDISCIPLINARY TEAM

Expertise of diverse team members is needed in such efforts to ensure that population CVH interventions are acceptable to patients, healthcare professionals, health system administrators, and information technology staff before implementation. Researchers can adapt by working on interdisciplinary teams to enable unique insights into healthcare delivery, epidemiology, implementation science, health information technology, and informatics.[33] Examples of the expertise needed for improving population CVH in this context are shown in Table 2.

The experts listed in Table 2 can contribute significantly to CVH-promoting activities that occur in a learning healthcare system (Figure 2) at many stages of the effort. Researchers and healthcare professionals are essential components of a comprehensive strategy to improve CVH. Through their complementary expertise, they can provide direct patient care, implement new guidelines into management, track metrics and evaluate them over time, test novel strategies with the potential to improve CVH, and implement strategies to prevent the onset of chronic disease. Researchers in healthcare organizations and academic medical centers play an increasingly important role in systems-level approaches to preventing and managing CVD.

Developing, deploying, and evaluating interventions to improve population CVH requires a system-wide, interdisciplinary approach; however, researchers are rarely trained in how to work with stakeholder groups to successfully implement and evaluate healthcare delivery interventions. Healthcare professionals and researchers in training would benefit from participating on interdisciplinary teams to observe how interventions are designed, implemented, and evaluated within the constraints of busy healthcare workflows. Structured opportunities to shadow health service delivery, epidemiology, implementation science, and informatics researchers would provide invaluable experience in designing and implementing healthcare delivery interventions to improve population-level CVH.

Although the healthcare team does not typically include an epidemiologist, epidemiologists are uniquely positioned to contribute to health and the deployment of learning healthcare system models. Epidemiologists serve as experts in study design and in the measurement and interpretation of results, yet they can also serve as connectors to other fields of expertise. In addition, epidemiologists are well trained to help navigate the transformations that are taking place in modern medicine, from strengthening primary care to better managing chronic diseases to building integrated health systems, and from facilitating implementation of appropriate payment schemes that support value to enabling health information technology and data-driven programs to improve care.

At the same time, biostatisticians and data scientists play a key role in data management and analysis, given recent and ongoing expansion of data.[34] As data streams themselves become more vast and diverse, from electronic health records to wearable devices, there is also a considerable increase in data complexity. If the data are to be presented electronically as clinical decision support (CDS), informaticians and health information technology experts need to be consulted, not only to evaluate the extant information technology landscape in the healthcare ecosystem, but also to determine how best to present the information to the end user. Incorporating every recommendation and guideline into CDS prompts would likely overload the end user; thus, prioritization, staging, and a team-based approach are needed to disperse the demands and streamline implementation. End users themselves, whether patients, healthcare professionals, or caregivers, can be consulted with respect to acceptability and usability of a CVH intervention to ensure its feasibility and utility.

Healthcare professionals can help evaluate the research evidence for a particular intervention, serve as clinical champions for projects to encourage their uptake, and, alongside implementation scientists, provide insight into clinical workflows and how population CVH interventions can be integrated into usual care processes. It is also important to engage patients and their advocates early and throughout the process, because they can provide information on patient preferences for messaging and the delivery of the CVH intervention. It is important to keep in mind that institutional support for interventions from the broader healthcare system and data governance committees is often necessary before a project can proceed.

The aforementioned experts can also help prevent biases in algorithm development and deployment. Analytics conducted with data from the learning healthcare system may not result in internally valid CVH profiles given that not all patients are seen by healthcare

professionals regularly, nor do they all take the same tests or have the same laboratory values measured. Efforts to improve CVH can be deployed to enhance health outcomes for all, and the proposed interdisciplinary approach should include consideration of the equitable and ethical aspects of each project. Figure 3 shows a multilevel approach to preventing chronic disease, with consideration of affordable health care and public health policies that support healthy decisions. Careful consideration of these issues can protect against unintended consequences of population CVH interventions. Thus, we believe that early and frequent consultation between interdisciplinary teams and members of the healthcare ecosystem bode success for population CVH management strategies.

TOWARD OPTIMAL CVH: EXAMPLES OF A LEARNING HEALTHCARE SYSTEM APPROACH

Since the establishment of the AHA's 2020 Impact Goal and the development of CVH metrics, there have been various examples of successful CVH and prevention programs implemented in healthcare systems throughout the United States. Two examples of population-level CVH intervention programs include the SPHERE (Stroke Prevention in Healthcare Delivery Environments) study[35] and Priorities Wizard,[36] both of which are CDS tools. These examples were chosen because they use evidence-based metrics for CVH, including maintenance of physical activity, a heart-healthy diet, ideal body mass index, and nonsmoking, and can be easily evaluated and disseminated across healthcare delivery systems.

SPHERE Study

The SPHERE study aimed to enhance patient-healthcare professional communication around CVH and to improve the delivery of preventive cardiovascular care in the primary care setting.[35] SPHERE leveraged the functionality of the electronic health record to deliver a web application, embedded in the electronic health record interface, at the point of care so as to make the data an actionable part of the healthcare encounter. Its interactive interface enabled healthcare professionals to show patients how changes in their CVH behaviors and factors could result in improved CVH. SPHERE was developed in collaboration with clinic champions and informaticians so that it would be responsive to the workflow of usual care and would automatically populate with electronic health record data, to address traditional barriers to usability.

The SPHERE algorithm was programmed according to the AHA's 2020 Impact Goal with a focus on modifiable risk factors for CVD.[6] Five of the 7 risk factors were stored in the electronic health record for most patients, and the remaining 2 (diet and physical activity) were collected by a survey distributed via the personal health record. In this study, the use of the SPHERE tool resulted in 1-year improvements in body mass index and diabetes mellitus relative to the control clinic.[35] The tool was also deemed acceptable by healthcare professionals and did not take a significant amount of clinical time to administer at the point of care.

SPHERE investigators are currently implementing and studying this tool in the context of cancer survivorship care, with the ultimate goal of improving survivors' CVH and ameliorating cardiovascular events and cancer recurrence. Of note, there remains significant opportunity to address CVH, particularly in the areas of diet and physical activity, among children and adolescents, because interventions such as SPHERE can be easily adapted to established cut points relevant to these populations.[37,38]

Priorities Wizard

Another example of an effective electronic health record–embedded intervention is the Priorities Wizard.[36] Similar to SPHERE, it is a web-based CDS tool. The integration of Priorities Wizard in 3 large integrated health systems was associated with significant improvements in high-burden cardiometabolic metrics. Implemented at the patient visit in primary care clinics through the Health Care Systems Research Network, this tool (1) identifies patients who could substantially benefit from evidence-based actions; (2) presents prioritized evidence-based treatment options to both patient and clinician at the point of care; and (3) facilitates efficient ordering of recommended medications, referrals, or procedures. It allows for the rapid dissemination of new knowledge into clinical practice (updated AHA cholesterol, hypertension, or diabetes mellitus treatment guidelines, for example) while being cost-effective and having high clinician satisfaction.

Results from cluster-randomized trials showed that Priorities Wizard significantly improved glucose and blood pressure control in patients with diabetes mellitus, reduced 10-year CVD risk in high-risk adults without diabetes mellitus, improved management of smoking in dental patients, and improved high blood pressure identification and management in adolescents.[36] The CDS tool includes a button that allows clinicians to provide immediate feedback if the CDS recommendations seem incomplete or implausible, which has helped debug some algorithms in the initial design phase[36]; however, it is often the clinician who needs debugging, because clinicians are often unfamiliar with changes in evidence-based guidelines. Interdisciplinary researchers based in healthcare systems are critical for the design and success of these electronic health record–based CDS programs, as well as for ongoing monitoring and evaluation.

OPTIMIZING POPULATION CVH: LESSONS LEARNED AND FUTURE DIRECTIONS

Healthcare systems must continue to meet the growing demand for data-driven intervention strategies and risk algorithms to optimize population CVH. Interdisciplinary teams have the tools needed to effectively integrate population CVH interventions into the healthcare ecosystem and ensure that meaningful metrics and outcomes are being evaluated with the end goal of primordial and primary prevention of CVD, with an emphasis on CVH behaviors such as physical activity, heart-healthy diet, ideal body mass index, and nonsmoking. Researchers on the team who are trained in rigorous study design and evaluation methodologies are complemented by healthcare professionals, patients, and those with expert knowledge of healthcare data systems. Implementation science expertise can add

perspective to the team approach for developing and deploying interventions to ensure both their effectiveness and sustainability.[39]

To make the best use of the learning healthcare system model, interdisciplinary teams can develop a strategy for prioritizing a set of clinical measures to evaluate before, during, and after the intervention. This will ensure that relevant data are being used to evaluate the impact of the intervention, drive clinical and administrative decision making, and enable clinical benchmarking and performance metric reporting. Tracking a common set of metrics over time can also assist healthcare systems in identifying population CVH strategies that have become ineffective over time and could be either deimplemented or revised with updated evidence.

Consistent with the 2020 goals,[6] care must be taken to apply CVH interventions equitably across various settings and populations, so as not to skew the application of best practices toward communities and organizations with high capacity and the most resources.[40] Application of evidence-based implementation science tools and techniques can facilitate the uptake and effective use of evidence-based interventions to not only improve population CVH but also enhance and ultimately preserve health equity.[41,42] To achieve that end, a prioritized set of CVH performance measures, particularly those commonly collected in the electronic health record and consistent with other national initiatives such as Million Hearts, will facilitate dissemination of successful interventions across healthcare systems. Scaling evidence-based interventions across healthcare systems has the potential to maximize the population CVH impact of such approaches.

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Figure 1.
American Heart Association 2020 Goals—Life's Simple 7.

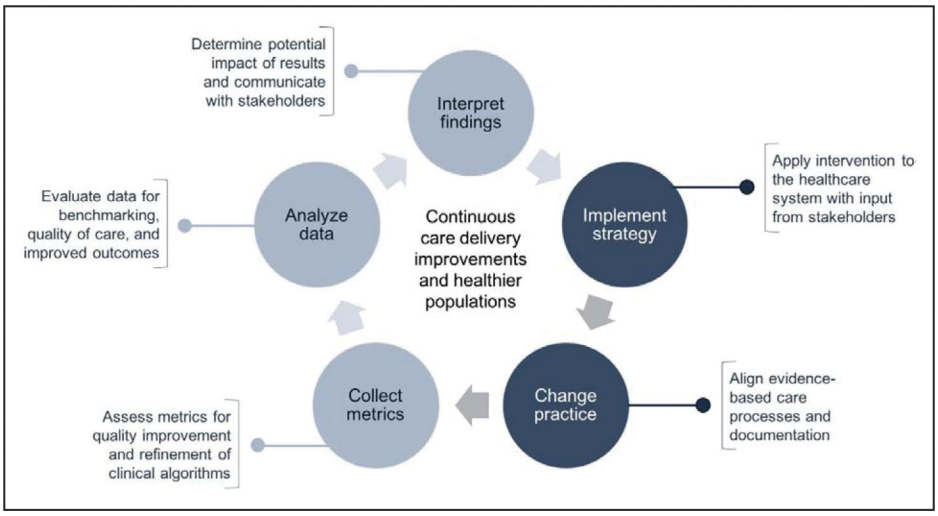

Figure 2.

A learning healthcare system context for cardiovascular disease prevention and management. Data-centric steps are shown in light gray; methods-centric steps are in dark gray. Data derived from Moloney et al,[10] Maddox et al,[11] and Institute of Medicine.[12]

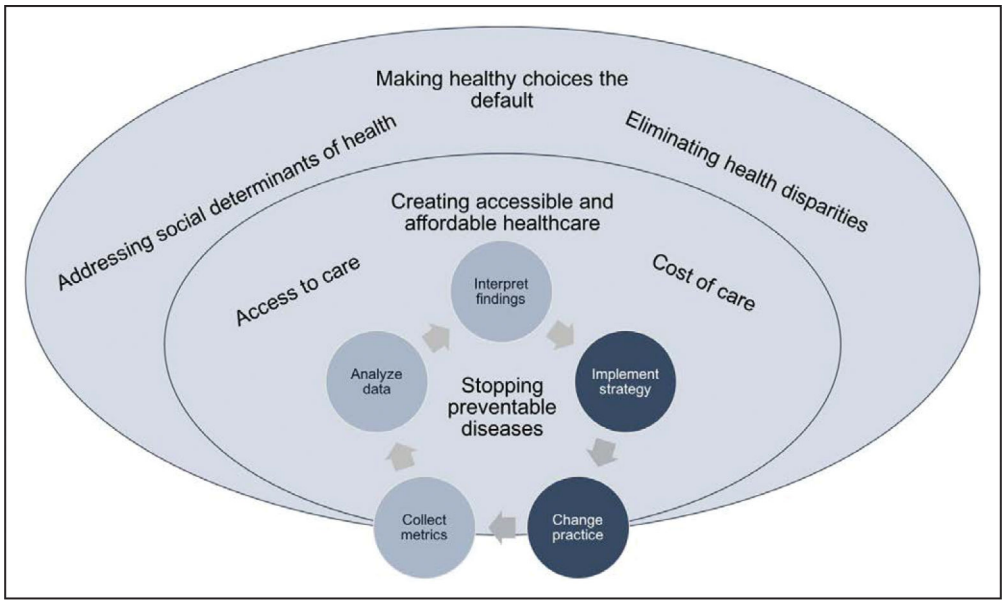

Figure 3.
Health equity–based approaches in the context of a learning healthcare system.

Table 1.

Selected Performance Measures for Evaluating CVH Intervention Effectiveness

2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease[23]
Minnesota Statewide Quality Reporting and Measurement System[24]
Robert Wood Johnson Foundation Culture of Health Framework[25]
Institute of Medicine Vital Signs: Core Metrics for Health and Health Care Progress[26]
Centers for Medicare & Medicaid Services Meaningful Measures[27]

ACC indicates American College of Cardiology; AHA, American Heart Association; and CVH, cardiovascular health.

Table 2.

Interdisciplinary Team Members and Their Relevance for the Study of Learning Healthcare System Interventions Designed to Improve Population-Level CVH

Team Member	Expertise
Epidemiologist	Study design
Biostatistician/data scientist	Statistical analysis and evaluation
Implementation scientist	Best practices for implementation and dissemination
Healthcare professionals	Healthcare context and workflow analysis
Informatician	Usability and workflow analysis
Information technology	Database resources and implementation considerations
Data abstractor	Reporting and monitoring outcomes
Systems scientist	Contextual approaches to problem solving
Marketing and communications	Communicate with stakeholders
Ethics	Patient safety and algorithmic bias detection
Individuals, families, and communities	Engagement with population health interventions