

Review Article

A clinician's guide to addressing cardiovascular health based on a revised AHA framework

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Abstract: The American Heart Association recently published updates to its definition of cardiovascular health (CVH) in its Presidential Advisory called Life's Essential 8. In particular, the update from Life's Simple 7 added a new component of sleep duration and refined definitions of prior components, including measurement of diet, nicotine exposure, blood lipids, and blood glucose. Physical activity, BMI, and blood pressure were unchanged. Together, these eight components create a composite CVH score that clinicians, policy-makers, patients, communities, and businesses can utilize to communicate in a consistent way. Life's Essential 8 also emphasizes the critical role of addressing social determinants of health to improve these individual CVH components, which strongly correlate with future cardiovascular outcomes. This framework should be used across the life spectrum including during pregnancy and childhood to allow improvements in and prevention of CVH at critical time-points. Clinicians can use this framework to advocate for digital health technologies and societal policies that help address and more seamlessly measure the 8 components of CVH with the goal of increasing quality and quantity of life.

Keywords: Cardiovascular health, prevention, lifestyle, guidelines, digital health

Cardiovascular health and a summary of Life's Essential 8

The American Heart Association (AHA) defines cardiovascular health (CVH) as a concept that goes beyond the absence of cardiovascular disease (CVD) and instead more broadly incorporates longevity and quality of life as important goals [1]. In 2010, the AHA released its original "Life's Simple 7" framework to define and prioritize the seven behaviors and health factors associated with CVH. By measuring these healthy behaviors and factors, the AHA aimed to shift the focus of CVH from disease treatment to the promotion of positive health throughout one's lifetime. Effectively measuring CVH in a standardized way is the first step to improve CVH on a population level.

The AHA recently released Life's Essential 8-an update to its original "Life's Simple 7" framework from 2010 [1]. The following manuscript

aims to highlight the practical components of the new Presidential Advisory that are most relevant for clinicians to address CVH.

Life's Essential 8 includes four health behaviors and four health factors-diet, physical activity, nicotine exposure, sleep health, body mass index, blood lipids, blood glucose, and blood pressure (**Table 1**). Sleep duration (self-reported average duration of sleep per night) was a new metric of CVH introduced in Life's Essential 8 [1]. Sleeping <7 hours or >10 hours per night was associated with a 1.14 and 1.10 increased risk of CVD in an analysis of the Swedish Twin Registry, which followed 12,268 CVD-free twin elderly individuals over 18 years for development of CVD [2].

Life's Essential 8 also modified its scoring criteria of each component from a categorization of "poor, intermediate, and ideal" to a numerical score from 0 to 100. The scores of each of the

Clinician's guide to Life's Essential 8

Table 1. The updated version of AHA's construct of cardiovascular health: Life's Essential Eight (LE8)

Component ^a	Life's Simple 7	Life's Essential 8	Summary of scoring for adults		Changes from Simple 7
Health Behaviors					
Diet	Intake evaluated on 5 components: fruits/vegetable, fish, fiber-rich whole grains, sodium, sugar-sweetened beverages	Evaluation based on self-reported DASH, HEI, or MEPA scores	Cut-offs based on survey used		More standardized proposed surveys to capture heart-healthy diets
Physical Activity	Self-reported minutes of activity per week	Self-reported minutes of activity per week	Points	Minutes	Unchanged
			100	≥150	
			90	120-149	
			80	90-119	
			60	60-89	
			40	30-59	
			20	1-29	
			0	0	
Nicotine Exposure	Self-reported smoking history and quit date	Self-report smoking history, quit date, and nicotine exposure	Points	Status	Nicotine instead of smoking exposure, including vaping and e-cigarettes
			100	Never smoker	
			75	Former smoker, quit ≥5 y	
			50	Former smoker, quit 1-<5 y	
			25	Former smoker, quit <1 y	
			0	Current smoker	
Sleep Health	N/A	Average sleep duration	Points	Level	New component
			100	7-<9	
			90	9-<10	
			70	6-<7	
			40	5-<6 or ≥10	
			20	4-<5	
			0	<4	
Health Factors					
BMI	Height/kg ²	Height/kg ²	Points	Level	Unchanged
			100	<25	
			70	25.0-29.9	
			30	30.0-34.9	
			15	35.0-39.9	
			0	≥40.0	
Blood Lipids	Total cholesterol	Calculation of non-HDL cholesterol	Points	Level	Changed definition to non-HDL which can be measured during non-fasting state
			100	<130	
			60	130-159	
			40	160-189	
			20	190-219	
			0	≥220	
Blood Glucose	Ideal fasting blood glucose	HbA1c	Points	Level	Changed metric to hemoglobin A1c
			100	No diabetes + FBG <100 (or HbA1c <5.7)	
			60	No diabetes + FBG 100-125 (or HbA1c 5.7-6.4) (prediabetes)	
			40	Diabetes + HbA1c <7.0	
			30	Diabetes + HbA1c 7.0-7.9	
			20	Diabetes + HbA1c 8.0-8.9	
			10	Diabetes + Hb A1c 9.0-9.9	
			0	Diabetes + HbA1c ≥10.0	
Blood Pressure	Systolic over diastolic	Systolic over diastolic	Points	Level	Unchanged
			100	<120/<80 (optimal)	
			75	120-129/<80 (elevated)	
			50	130-139 or 80-89 (stage 1)	
			25	140-159 or 90-99	
			0	≥160 or ≥100	

^aAll 8 Components were averaged to create a total score: Total score 80-100 = HIGH, 50-79 = MODERATE, 0-49 = LOW.



Figure 1. American Heart Association Life's Essential 8: a holistic approach to cardiovascular health.

8 components can be averaged to determine an overall CVH score from 0 to 100. Other refinements to the original components include:

- utilizing the Mediterranean Eating Pattern for Americans (MEPA) to assess diet quality for individuals (16-point scale that assesses a "Mediterranean-like diet pattern" among American diets) and the DASH and Healthy Eating Index (HEI) for population level dietary assessment.
- expanding nicotine exposure to include e-cigarettes, vaping, and second-hand smoke.
- measuring lipids using non-high-density lipoprotein cholesterol (which can be done in the non-fasting state).

- modifying the blood glucose metric to include fasting blood glucose and hemoglobin A1c.

Life's Essential 8 emphasizes the role of psychological health and social determinants of health in promoting CVH but acknowledges that these concepts are difficult to measure and will require additional research and validation (**Figure 1**) [1].

Importance and validity of CVH on long-term health

Higher measured CVH is associated with a significant reduction in CVD (relative risk 0.20, 95% CI 0.11-0.37), cardiovascular mortality (RR 0.25, 95% CI 0.10-0.63), and all-cause mortality (RR 0.55, 95% CI 0.37-0.80) [3] across age, race, sex, and socioeconomic status. CVH in aggregate may predict long-term outcomes better than its individual components and as a result help identify those at risk of poor outcomes that may otherwise be missed using traditional measures [4, 5]. Additionally, CVH is correlated with lower rates of non-cardiovascular outcomes including cancer, dementia, end-stage renal disease, and chronic obstructive pulmonary disease [6, 7].

Current CVH status in the US

Per Life's Essential 8, only 20% of adults had high CVH (score ≥ 80) while 63% had moderate CVH (score 50-79) using NHANES data [8, 9]. The greatest opportunities based on the lowest median scores were diet, physical activity, and BMI. Additionally, among those with CVD, individual components of CVH worsened from 1999 to 2018 according to a recent analysis of NHANES data [9].

For example, the percentage of Americans with optimal hemoglobin A1c declined from 58.7% to 52.4%. The percentage of Americans with

BMI <25 kg/m² also declined from 23.9% to 18.2%. From 2007-2010 to 2015-2018, optimal blood pressured (<130/80) declined from 52.1% to 48.6% of adults. Smoking, diet, and physical activity levels were unchanged over this time period, although only 22% and 1% of adults had optimal physical activity and diets, respectively, per AHA definitions. One metric that improved was non-HDL cholesterol levels <100 mg/dL, which increased from 7.3% to 30.3% of adults [9].

Implementation opportunities for clinicians

Accordingly, there is a large opportunity to increase CVH in the United States, and clinicians will be essential to operationalize this work with patients. We provide suggestions on how clinicians and health systems can leverage health data to assess, track, and improve CVH of their patients and communities.

1. Create a standardized framework to develop evidence-based data collection and visualization tools.
2. Utilize health technologies including wearables and sensors that integrate with electronic health records (EHRs) to a) better predict CVH and adverse outcomes (especially using machine learning technology) [10]; and b) promote a patient-centered approach and extend access to preventative services that may be limited by traditional in-person approaches (e.g., cardiac rehabilitation) [11].
3. Screen for and optimize CVH at critical time points in people's lives with consideration of social determinants of health (e.g., pregnancy and post-partum) [12, 13].
4. Routinely incorporate Life's Essential 8 in both primary and secondary prevention for patients.

Using Life's Essential 8 as a standardized framework, key influencers of population health including policy makers, public health programs, community institutions, businesses, and clinicians can unite to prevent adverse cardiac events and enhance quality of life for millions of Americans.

EHRs and digital health technologies (smartphone applications, wearables, and sensors)

can enhance measurement of CVH for individuals over time. For example, a digital health program, Corrie, was clinically validated in the Myocardial infarction, Combined-device, Recovery Enhancement Trial (MiCORE) [14]. This multi-center study provided patients who were hospitalized with an acute myocardial infarction the opportunity to use the Corrie program to facilitate recovery while in the hospital and at home. The program included a smartphone application ("app"), an Apple watch, and a blood pressure monitor to provide a daily guideline-based cardiovascular care plan, educational videos, medication tracking, blood pressure management, physical activity tracking, mood assessment, and a connection to follow-up appointments. The Corrie program aimed to empower and engage patients, enhance guideline-directed management, and decrease preventable re-hospitalizations.

The MiCORE study found Corrie participants had a 52% lower risk of all-cause unplanned 30-day readmissions compared with patients in the historical control group who received standard of care [14]. A financial analysis based on reduction of 30-day readmissions estimated that using Corrie produced savings of approximately \$10,000 per patient. Financial barriers for patient enrollment were mitigated by providing those without smartphones free loaner phones and smartwatches [15]. The MiCORE trial supports the promise of digital health to enhance patient engagement, reach diverse and underserved patients, and foster guideline-directed care to improve outcomes.

Health technologies and EHRs can enhance clinical decision-making and prevention practices by providing clinicians with relevant longitudinal health metrics and trends. Wearable technologies will make these decision-support tools more robust and more customized for individual patients. Life's Essential 8 provides a standardized and validated set of core metrics that digital health platforms can use. Clinicians should be at the heart of creating quality improvement metrics and interactive dashboards.

With more data, quality improvement metrics and dashboards can be tailored to develop strategies for sub-populations like pregnant women. Life's Essential 8 recognizes critical

time windows and places, including pregnancy, menopause, schools, and workplaces, in addressing CVH. For example, pregnancy and peripregnancy time periods (preconception, postpartum) set the stage for the offspring's CVH potential and represent an important transition period and physiologic stressor for mothers.

Multidisciplinary approaches with Obstetricians and Maternal Fetal Medicine specialists can help engage women during and surrounding pregnancy to adhere to CVH metrics that would lead to better CVH long-term. Care delivery models looking at integration of preventive cardiology in the inter-pregnancy timeframe—from immediate post-partum to pre-pregnancy counseling—would also help drive AHA-based CVH recommendations to pregnancy-capable individuals.

Social determinants of health and psychological health are important considerations in the new guidelines and will be priorities to improve national CVH. Clinicians can use the Accountable Health Communities Health-Related Social Needs Screening Tool to complement the 8 components outlined in Life's Essential 8 with an assessment of a patient's social determinants of health. This screening tool evaluates someone's living situation, food, transportation, utilities, safety, financial strain, employment, family and community support, education, physical activity, mental health, substance use, and disabilities [16].

Better measurement of CVH and outcomes over time can refine Life's Essential 8 in important ways. For example, appropriately weighting individual components of the aggregate CVH score can enhance the current use of an unweighted average. Lastly, dashboards both at the clinic and county level (e.g., county-healthrankings.org) can incorporate CVH for more active and dynamic monitoring of community progress.

In conclusion, clinicians will be essential in implementing AHA's revised Life's Essential 8 framework with the goal of improving CVH for Americans. Digital health and wearable technologies can help health systems more seamlessly measure the eight components of CVH among patients. These data can feed into decision-support tools and system-wide quality metrics that improve patient outcomes and

facilitate greater adoption of Life's Essential 8 framework. Life's Essential 8 along with increasing use of digital health technologies can empower patients to take greater ownership of their health beyond healthcare environments. Integrated EHRs that link with wearable technologies and broader adoption of policies that address social determinants of health and lifestyle will be critical in supplementing the work of clinicians in the office.

Disclosure of conflict of interest

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