Empiric Support for Cardiovascular Health: the Case Gets Even Stronger

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Recently, the American Heart Association (AHA) adopted a new and ambitious strategic goal - “by 2020, to improve the cardiovascular health of all Americans by 20% while reducing deaths from cardiovascular disease by 20%

In the process, it defined a new concept, cardiovascular health, which is comprised of 7 components: 4 ideal health behaviors (nonsmoking, body mass index < 25 kg/m², physical activity at goal levels, and a diet consistent with current recommendations) together with 3 ideal health factors (untreated total cholesterol < 200mg/dL, untreated blood pressure <120/<80 mm Hg, and fasting blood glucose<100 mg/dL). This new approach emphasizes prevention with a focus on achieving and sustaining desirable behaviors.

At the time of the AHA report, the health benefits of each of the 7 individual components were well-supported by available literature. A few studies had also defined the relationship of clusters of ideal levels of risk factors and behaviors and had assessed their relationship with health outcomes, quality of life, and cost.

Specifically, Stamler defined low cardiovascular risk as a cluster of optimal levels of traditional cardiovascular risk factors, while Stampfer defined a cluster of ideal lifestyle behaviors. Yet, in 2010, when the AHA published its 2020 strategic goal, there was no available research on the new metric, cardiovascular health. In this issue of Circulation, two papers address this gap and provide complementary data related to cardiovascular health, or at least a forme fruste.

Liu et al assessed the relationship of adopting a healthy lifestyle during young adulthood on the prevalence of a low cardiovascular risk profile in middle age. The research was conducted in the Coronary Artery Risk Development in (Young) Adults (CARDIA) cohort study, which enrolled young adults, aged 18 to 30 years old. Participants were 3,154 black and white, men and women, with data collected at three time points – year 0 (baseline), year 7, and year 20. Healthy
risk factors (HLFs) were a) body mass index $< 25$ kg/m$^2$, 2) no or moderate alcohol intake, 3) higher healthy diet score, 4) higher physical activity score, and 5) never smoking. The primary outcome was a low cardiovascular disease (CVD) risk profile at year 20 defined as the absence of CVD and the presence of untreated total cholesterol $< 200$ mg/dL, untreated blood pressure $< 120/80$ mmHg, no diabetes, and never smoking. The HLFs were based on the average across values at baseline, year 7 and year 20. Very few persons had all 5 HRFs at baseline, just 6% of the cohort.

The principal finding of the Liu study was a graded, direct relationship – the more HLF in young adulthood, the greater the prevalence of low (desirable) CVD risk profile at middle age, 20 years later. Specifically, the prevalence of a low CVD risk profile increased progressively from only 0-3% in those with 0-1 HRF to 60.7% in those with 5+ HLFs. In the whole cohort, the overall prevalence of a low CVD risk profile dropped from 43.7% at the baseline examination to 24.5% at year 20. Some of their most interesting findings related to potential impact of adopting HRFs. Among those who had < 4 HLFs at all time points (years 0, 7, and 20), the prevalence of a low CVD profile was only 14.4% at year 20. Among adopters, namely those who initially had < 4 HLFs at baseline but who subsequently had 4+ HLF at year 7, year 20, or both years, the prevalence was strikingly higher (27.1%, 38.9% and 43.2%, respectively).

The study by Ford and colleagues addressed another issue, namely, the relationship of low, intermediate, and ideal levels of the 7 metrics that comprise the cardiovascular health metric with subsequent mortality from all causes and from diseases of the circulatory system. The setting was the National Health Examination Survey in which baseline data were collected between
1999 and 2002. Mortality was assessed via linkage with the National Death Index through 2006. Participants were 7,622 adults, aged ≥20 years. Median follow-up was 5.8 years, during which time there were 532 deaths, of which 186 were attributed to circulatory system diseases.

The main finding of the study by Ford and colleagues was the progressive, inverse relationship between the number of ideal health metrics and subsequent mortality, both all-cause mortality and mortality from diseases of the circulatory system. In fully adjusted models, there was a 78% reduced risk of all-cause mortality in those with 5+ ideal health metrics compared to those with no ideal health metric. For mortality from diseases of the circulatory system, the corresponding risk reduction was a striking 88%. In general, for each of the seven health metrics, there was a dose response relationship of mortality across the poor, intermediate and ideal levels of each health metric, albeit non-significant in several instances, possibly related to insufficient statistical power. Extremely few participants, just 1.1%, had ideal levels of all 7 health metrics.

Strengths of these studies were the large diverse study populations, their prospective designs, and high follow-up rates. Limitations of the CARDIA analyses were the use of year 20 data to define both exposure and outcome, and the approach to smoking, which was both an exposure and a component of the outcome. Limitations of the study by Ford were the relatively short duration of follow-up, median of just 5.8 years, and the low number of outcomes, only 186 deaths from diseases of the circulatory system. Nonetheless, these limitations are minor.

As a member of the Task Force that defined cardiovascular health, I recall several of our deliberations that are relevant to these papers. In defining cardiovascular health, the Task Force purposely selected components that are commonly available in national surveys and major cohort studies. The Task Force also debated the thresholds that defined ideal, intermediate and poor
levels of the 7 components. Ultimately, we selected stringent, evidence-based thresholds to define ideal levels. Interestingly, neither study used the explicit definition of cardiovascular health that the Task Force proposed. Each study modified aspects of the cardiovascular health metric, specifically, the definition of ideal diet, physical activity, as well as the definition of diabetes. Some of the variance might have resulted from the data collection tools used at the inception of these studies. With this in mind, I urge those who design our national surveys and major cohort studies to collect the requisite data to define cardiovascular health, as originally proposed, and to report their findings accordingly. Use of the recommended, albeit stringent thresholds, will facilitate comparisons across studies and progress over time. The bar is high, and appropriately so.

Achieving cardiovascular health is also extraordinarily relevant to two contemporary public health goals – eliminating health disparities and improving population health. While there is widespread recognition of racial and geographic disparities in health,9 there is emerging evidence that factors which comprise the cardiovascular health metric are likely responsible for these racial disparities. In a recent analysis, it was estimated that disparities in four factors (smoking, blood pressure, blood glucose, and adiposity) explained well over half of the racial differences in cardiovascular mortality in the United States.10

Lastly, cardiovascular health is closely related to population health, a popular concept among policy makers. The factors which determine cardiovascular health also appear to determine non-cardiovascular outcomes as well. Additional support comes from the analyses by Ford and colleagues, in which there was a strong dose-response relationship between the number of ideal
levels of the cardiovascular metrics with all-cause mortality, not just mortality from diseases of the circulatory system.\textsuperscript{8} Importantly, achieving population health is now viewed as a critical component of health care reform, not just for the sake of improving health but also as a means to control costs. As Daviglus and colleagues documented in the Chicago Heart Study, low cardiovascular risk at middle age is associated with reduced Medicare costs at older aged.\textsuperscript{2, 6} It will be important to replicate such analyses using the ideal cardiovascular health metric and to do so in broader samples and with other estimates of cost, potentially lifetime costs.

In summary, the studies by Liu and Ford provide strong empiric support for cardiovascular health as a valid construct. Efforts must now focus on interventions that assist individuals and populations in achieving and sustaining cardiovascular health, which hopefully will become the default, rather than the exception.

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