


Coronary Heart Disease: Have We Reached a Plateau in Primary Prevention?

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The burden of coronary heart disease (CHD) has declined consistently over the past few decades.¹ The decline between 1980 and 2000 was attributed to improvements in primary and secondary prevention strategies.² Studies over this time period demonstrated a decline in the use of diagnostic coronary angiography and subsequent coronary revascularization.³ However, since 2000, trends in the use of angiography and revascularization in CHD are unknown. In this issue of the *Journal of the American Heart Association (JAHA)*, Gerber et al⁴ sought to address this gap in knowledge by examining contemporary use of coronary diagnostics (invasive angiography and noninvasive computed tomography angiography [CTA]) and interventional procedures (percutaneous coronary intervention [PCI] and coronary artery bypass grafting [CABG]) in a geographically defined community between 2000 and 2018. Their primary findings demonstrate that previous favorable trends in the prevalence of CHD have ceased, and they question whether healthcare providers are losing ground in the fight against coronary atherosclerosis. However, the question is whether these findings are real and can be generalized to the overall United States population.

Gerber et al evaluated patients who resided in Olmsted County, Minnesota, a population that is predominately white, middle class, insured,⁵ and has easy and affordable access to 2 nearby major medical centers with 1 unified medical record system.⁶ The investigators' analysis of 12 981 invasive angiograms among 9049 individuals demonstrated that the

age- and sex-standardized utilization rates of invasive angiography have declined, with the greatest use being between 2005 and 2009, but the introduction of CTA in 2010 altered this trend, resulting in an increase in the use of any diagnostic angiographic procedures and a resultant decrease in the prevalence of any anatomic coronary artery disease (CAD). More importantly, the severity of angiographic CAD declined initially between 2000 and 2005 and leveled off between 2005 and 2009, with no further changes between 2010 and 2018. The use of revascularization followed the same pattern. The age- and sex-standardized rates of revascularization procedures declined markedly during the earlier period (2000–2009) and leveled off in more recent years (2010–2018), with most receiving PCI (77%) as opposed to CABG (23%).

The investigators should be praised for their work and for providing a spotlight on the trends of CHD over the past 18 years. Their easy access to data provided them with the ability to analyze the severity of CAD and revascularization rates, which is important, as previous epidemiological studies had difficulty capturing this information. Although the investigators raise concerns on the cessation of decline in the severity of the disease from 2010 and 2018, they should recognize that these findings could be biased by the limitations of the study and other considerations.

Among the limitations is the unique study population from 1 region (Upper Midwest of the United States). This population was predominantly white, male, middle-class patients with insurance and in close, easy proximity to healthcare resources. The clinical practice patterns at these sites may differ from other institutions in the United States. Therefore, the results of this analysis cannot be generalized to the entire US population.

In addition, the authors should have provided trends in the smoking rate, obesity prevalence, diabetes mellitus, hypertension, and hyperlipidemia in this county, as these may support their findings and claims. Trends in smoking cessation, hypertension, and dyslipidemia control can explain trends in the reduction of CHD. In contrast, increase in obesity and diabetes mellitus may level off this reduction and be the cause of the plateau of the prevalence of CAD. Without knowing what happened in this county with regard to these

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risks, one cannot fully conclude that indeed this plateau is the trend in CHD nationwide.

Furthermore, the introduction of appropriate use criteria and access to the healthcare system may have a direct effect on the use of different diagnostic tools and may falsify the trends of actual CHD burden. The implementation of appropriate use criteria⁷ is likely to affect the decline in the use of diagnostic angiography and subsequent intervention between 2000 and 2018. In addition, changes in healthcare programs, such as the Affordable Care Act of 2010, may also have influenced access to care, as well as allowing subsequent diagnoses of CAD and a greater number of procedures. The increased access to health care may have led to an increased number of diagnostic studies and procedures and might be the cause for the plateau seen after 2009, irrespective of the traditional risk factors for CHD.

Also, the investigators in the present study used CTA to determine CAD starting in 2010. Previous epidemiological studies on the prevalence of CHD reported severely abnormal cases of stress test as an indicator of CAD; however, this is flawed, as the prevalence of false positives is high for cardiac stress tests.⁸ The introduction of CTA provided clinicians with the opportunity to visualize the coronary anatomy directly and noninvasively, making it feasible to assess the prevalence and severity of anatomic CAD. Furthermore, there has been a shift in clinical practice for the evaluation of CAD from classic functional testing to more of an anatomic evaluation,⁹ specifically in patients with low or intermediate pretest probability of CAD. The change in the use of anatomic evaluation, which in this study was reflected in 2010, was seen in this analysis, as the inclusion of CTA utilization rates substantially offsets the declining use of invasive angiography. However, the study population's easy access to health care could have inflated the use of CTA in this analysis, as the use of this imaging modality gained momentum during the past 8 years (from 2010 to 2018) following the results of the ROMICAT (Rule Out Myocardial Infarction using Computer Assisted Tomography) study¹⁰ and other reports favoring CT as a screening tool in comparison with CAD.¹¹

Finally, the plateau in severity of CAD, along with rates of revascularization, is concerning given recent data from 2011 demonstrating that the number of deaths from all cardiovascular causes, heart disease, and stroke has been increasing, and the rates of decline of mortality have also slowed down.¹² Based on this analysis, it is difficult to ascertain that changes in rates of CABG or PCI are directly impacted by CHD burden. Many catheterization programs are transitioning severe CAD patients from revascularization with CABG to more complex PCI cases. The concept of complex higher-risk indicated patients (CHIP) programs has allowed more patients to undergo PCI instead of CABG. This change of practice might have impacted revascularization trends over the study time period.

Despite these limitations in the analysis, healthcare providers should take these results of the present study as a cause for concern and questions as to whether healthcare providers are losing ground in the fight against coronary atherosclerosis. The increasing rates of obesity and diabetes mellitus,¹³ along with the findings in this analysis, emphasize the ongoing importance of strategies for the treatment of CAD. In 2020, primary prevention should be focused on these 2 epidemics (obesity and diabetes mellitus).

In addition, ongoing novel therapies need to be evaluated and considered in order to continue to tackle this highly prevalent disease process. The use of PCSK9 (proprotein convertase subtilisin/kexin type 9) inhibitors¹⁴ and icosapent ethyl¹⁵ need to be further investigated, as these therapies might further impact efforts to lower lipids. The role of inflammation-modifying agents on CAD will continue to be evaluated in the next decade. The role of monoclonal antibodies as an anti-inflammatory therapy for altering the burden of CHD,¹⁶ along with other agents,¹⁷ needs to be examined closely. These changes, along with focusing on the epidemics of obesity and diabetes mellitus, will allow us to manage and treat CHD in the next decade as a chronic disease that is influenced by an array of systemic factors.

Disclosures

Waksman reports the following: Advisory Board: Amgen, Boston Scientific, Cardioset, Cardiovascular Systems Inc., Medtronic, Philips, Pi-Cardia Ltd.; Consultant: Amgen, Biotronik, Boston Scientific, Cardioset, Cardiovascular Systems Inc., Medtronic, Philips, Pi-Cardia Ltd.; Grant Support: AstraZeneca, Biotronik, Boston Scientific, Chiesi; Speakers Bureau: AstraZeneca, Chiesi; Investor: MedAlliance. Case has no disclosures to report.

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