

# Cardiovascular Disease Risk Assessment and Prevention



## Current Guidelines and Limitations

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### KEYWORDS

- Atherosclerotic cardiovascular disease • Cardiovascular disease
- Peripheral arterial disease • Risk assessment • Clinical guideline(s)

### KEY POINTS

- Even with decades of progress in understanding atherosclerotic cardiovascular disease (ASCVD) and improved cardiovascular (CV) event prevention, the incidence, consequences, and cost of cardiovascular disease remain a significant public health issue.
- Observational studies have identified major ASCVD risk factors; however, a significant number of those at risk are not identified and most recurrent CV events still take place after aggressive prevention strategies are used.
- The statin era helped revolutionize clinical practice not only by effective outcome-driven low-density lipoprotein-cholesterol reduction but also by encouraging across-the-board aggressive prevention efforts.
- There are now numerous clinical guidelines for ASCVD risk stratification and treatment recommendations promulgated over the last 3 decades.
- Few patients are alike, and providing patient-centered care using all the tools available including, but not exclusively, evidence and clinical recommendations is paramount.

### INTRODUCTION

Atherosclerotic cardiovascular disease (ASCVD) affects more than one-third of the adult population, accounts for 35% of all US deaths, and is a leading cause of disability. ASCVD kills more women each year than the next 3 causes of death combined. More than 50% of ASCVD presents as coronary events, including sudden cardiac death, nonfatal myocardial infarction (MI), and revascularization, with the rest being stroke and claudication associated with peripheral arterial disease.<sup>1</sup> The last

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4 decades have witnessed unrelenting advances in the understanding of atherogenesis and development of clinically manifest ASCVD, including epidemiology, natural history, pathophysiology, risk assessment of, and treatments. Hallmarks of this disease process include:

- Begins decades before clinical manifestations,<sup>2,3</sup>
- Can involve a variety of different vascular beds with myriad presentations,
- Can be to a substantial degree prevented or modified.<sup>4</sup>

The atherosclerotic process is complex and appears to be initiated by the entrance and retention of atherogenic apolipoprotein B (apoB) particles (**Box 1**)<sup>5</sup> in the arterial subendothelial space. However, as noted in **Fig. 1**, the process clearly involves more than simply calculated low-density lipoprotein-cholesterol (LDL-C)<sup>6-8</sup>; further elucidation of other causative or involved factors and mechanisms may add to the ability to risk-stratify populations, and it is hoped, individual patients, and improve preventive treatment.

Observations regarding ischemic heart disease began centuries ago; however, modern appreciation of ASCVD's causes and disease risk began with the National Heart Act signed into law in 1948, which established the National Heart Institute and provided a \$500,000 grant for a 20-year epidemiologic study of cardiovascular (CV) disease, which became known as the Framingham Heart Study (FHS).<sup>9</sup> The first subject was enrolled 65 years ago when 44% of deaths in the United States were due to ASCVD. The FHS led to the identification of several major ASCVD risk factors, including cigarette smoking, hypertension, and elevated serum cholesterol; family history was added subsequently.

Presented is a brief review of the current state of ASCVD risk assessment and prevention treatment guidelines with attention to limitations that encourage improvement.

## ATHEROSCLEROTIC CARDIOVASCULAR DISEASE RISK FACTORS

The major, now termed traditional, risk factors (**Fig. 2**) are the foundation of all ASCVD risk assessment systems or scores and preventive treatment recommendations.<sup>10</sup> Starting with the Framingham Risk Score (FRS), most systems use, almost exclusively, these traditional risk factors. Because decreased high-density lipoprotein-cholesterol (HDL-C) is strongly associated with increased risk of CV events and elevated HDL-C is strongly associated with decreased risk,<sup>11</sup> some scores include it as a positive or negative factor, depending on levels. The INTERHEART Study<sup>12</sup> was a large, international (52 countries), standardized, case-control study evaluating the strength of association between a variety of risk factors and acute MI and whether this association varied by geographic region, ethnic origin, sex, or age. **Box 2** lists 9 risk, or protective factors, which identified almost 90% of those at risk of a first MI, clearly significantly

### Box 1

#### Apolipoprotein B particles

##### *Atherogenic (ApoB) lipoproteins*

- Very low-density lipoprotein (VLDL)
- Intermediate-density lipoprotein
- LDL
- LDL-P
- Lipoprotein (a)

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