Pathways Forward in Cardiovascular Disease Prevention One and a Half Years After Publication of the 2013 ACC/AHA Cardiovascular Disease Prevention Guidelines

Miguel Cainzos-Achirica, MD; Chintan S. Desai, MD, MSc; Libin Wang, MD; Michael J. Blaha, MD, MPH; Francisco Lopez-Jimenez, MD, MSc; Stephen L. Kopecky, MD; Roger S. Blumenthal, MD; and Seth S. Martin, MD, MHS

Abstract

The 2013 American College of Cardiology/American Heart Association cardiovascular disease prevention guidelines represent an important step forward in the risk assessment and management of atherosclerotic cardiovascular disease in clinical practice. Differentiated risk prediction equations for women and black individuals were developed, and convenient 10-year and lifetime risk assessment tools were provided, facilitating their implementation. Lifestyle modification was portrayed as the foundation of preventive therapy. In addition, based on high-quality evidence from randomized controlled trials, statins were prioritized as the first lipid-lowering pharmacologic treatment, and a shared decision-making model between the physician and the patient was emphasized as a key feature of personalized care. After publication of the guidelines, however, important limitations were also identified. This resulted in a constructive scientific debate yielding valuable insights into potential opportunities to refine recommendations, fill gaps in guidance, and better harmonize recommendations within and outside the United States. The latter point deserves emphasis because when guidelines are in disagreement, this may result in nonaction on the part of professional caregivers or nonadherence by patients. In this review, we discuss the key scientific literature relevant to the guidelines published in the year and a half after their release. We aim to provide cohesive, evidence-based views that may offer pathways forward in cardiovascular disease prevention toward greater consensus and benefit the practice of clinical medicine.
harmonized recommendations and the benefits they may offer.

APPROACH TO GLOBAL RISK ASSESSMENT: OLD PARADIGMS, MODERN PROBLEMS

Implementing the 2013 ACC/AHA risk assessment guideline, clinicians and patients have had the benefit of using the ACC/AHA Risk Estimator app. It is accessible via smartphone and Web interfaces, and it allows one to input risk factors and quickly obtain the patient’s risk estimates. The estimation equations have been integrated with electronic medical records in some health systems, thereby providing automatic risk estimation. This is a major improvement given concern with past guidelines that clinicians did not have sufficient time to calculate risk estimates.

However, the current estimator continues to rely on the traditional risk factor paradigm as the central approach to CVD risk assessment. In addition to the Framingham cohorts, 3 other prospective cohorts are included in the 2013 Pooled Cohort Equations used by the 10-year ASCVD risk estimator. Nevertheless, the risk factors included remain the same as those from the original Framingham Risk Score. Moreover, single-time measurements are still used, although it is a recognized limitation that this misses cumulative exposure during the time since diagnosis and pattern of exposure to each risk factor. Furthermore, using binomial variables, such as current smoking (yes/no), likely underestimates the risk in some individuals.

In addition to the limited risk discrimination that the traditional risk factor model had already shown with previous versions of the guidelines, shortly after its release the calibration of the 2013 risk estimator came into question, with evidence of risk overestimation of up to 150% when implemented in more modern cohorts (Table). The issue of risk overestimation had already been observed in more contemporary years of the pooled cohorts and in the validation study included in the guidelines using the Reasons for Geographic and Racial Differences in Stroke (REGARDS) and Multi-Ethnic Study of Atherosclerosis (MESA) cohorts. A subsequent, more comprehensive study of the 10-year calibration and discrimination performance of the risk estimator in MESA revealed persistent concerns about overestimation without evidence of substantially improved discrimination compared with previous risk scores. Differences in socioeconomic status and secular trends of CVD risk factors not captured in risk scores, along with changing incidence patterns of CVD and overall health between the cohorts used for developing the Pooled Cohort Equations and modern populations, may explain this phenomenon. Further research in this area will enhance our understanding regarding the reasons for such overestimation.

Following the recommendations of the 2013 ACC/AHA cholesterol guideline, clinicians and patients decide on lipid-lowering therapy according to absolute risk estimates. In this context, risk overestimation together with the reduction of the risk threshold for considering statin therapy means expanded consideration of statin therapy in the general population.

ARTICLE HIGHLIGHTS

- The 2013 American College of Cardiology/American Heart Association (ACC/AHA) cardiovascular disease prevention guidelines represent an important step forward in the risk assessment and management of atherosclerotic cardiovascular disease (ASCVD).
- The fundamental limitations of the traditional risk factor—based model underscore the need to explore alternative risk assessment approaches.
- Atherosclerosis imaging tools, such as coronary artery calcium, could be more strongly emphasized in future guidelines as powerful tools for refining risk assessment.
- Cholesterol treatment goals and nonstatin therapies shown to prevent ASCVD events should be reincorporated into future versions of the guidelines, with the critical notion that lowering should occur through safe, proven strategies.
- As highlighted by the 2013 ACC/AHA guidelines, a clinician-patient risk discussion is a critical element in the ongoing ASCVD risk assessment and management process, and further research in this area is warranted.
- Continuous scientific discussion together with standardized evaluation of clinical effectiveness will improve the development and implementation of future iterations of the guidelines.
TABLE. Selection of Notable Studies on ASCVD Risk Assessment Published After Release of the 2013 ACC/AHA Cardiovascular Disease Prevention Guidelines

<table>
<thead>
<tr>
<th>Reference, year</th>
<th>Design</th>
<th>Key findings</th>
<th>Implications for future guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ridker and Cook, 2013</td>
<td>Compared ASCVD risk predicted by the ACC/AHA 2013 Pooled Cohort Equations and observed event rates in the WHS, PHS, and WHI-OS.</td>
<td>The 2013 Pooled Cohort Equations systematically overestimated ASCVD risk by 75%-150%.</td>
<td>Risk estimators should be built on the most recent multiethnic cohorts available and should undergo extensive external validation.</td>
</tr>
<tr>
<td>Pencina et al, 2014</td>
<td>Estimated the number of US adults eligible for statin therapy according to the ACC/AHA 2013 treatment of blood cholesterol guideline using NHANES data from 2005-2010 and compared with the number after the ATP III guidelines.</td>
<td>The number of US adults eligible for statin therapy increased from 43 million to 56 million. Statin recommendation would increase in adults expected to have events and in those unlikely to have them.</td>
<td>Sensitivity and specificity should be carefully balanced when establishing risk thresholds for therapy allocation, particularly in elderly adults. Uncertainty of risk predictions should be discussed in a physician-patient discussion.</td>
</tr>
<tr>
<td>Muntner et al, 2014</td>
<td>18,498 REGARDS participants aged 45-79 y, a subset of 10,997 without DM not taking statins and with LDL-C levels &lt;190 mg/dL, and a subset of 3333 Medicare beneficiaries were followed for 5 y. Predicted risk using the Pooled Cohort Equations and observed events were compared.</td>
<td>There was moderate overestimation of risk by the Pooled Cohort Equations in the overall cohort. The performance improved in participants without DM, not taking statins, and with LDL-C levels &lt;190 mg/dL and when ASCVD events identified in Medicare claims data were added.</td>
<td>Clear guidance should be provided regarding the target populations in which the risk estimators are intended to be used.</td>
</tr>
<tr>
<td>Cook and Ridker, 2014</td>
<td>27,542 women aged 45-79 y from the WHS followed up for a median of 10 y. Predicted risk and observed event rates were compared after adjusting for effects of statins/ revascularization and indication bias.</td>
<td>Differences in statin use and revascularization procedures did not explain the discrepancy between risk predictions and observed event rates. Event underascertainment is unlikely to be the cause of risk overestimation.</td>
<td>Risk estimators should be built on the most recent cohorts available, approximating the secular patterns of risk factors and the overall health of the populations in which they are intended to be used.</td>
</tr>
<tr>
<td>DeFilippis et al, 2015</td>
<td>4227 MESA participants aged 50-74 y without DM at baseline. Expected event rates using the 2013 Pooled Cohort Equations and 4 older FRS-based risk scores were compared with observed rates after 10 y of follow-up.</td>
<td>Of the risk scores, 4 of 5 including ACC/AHA 2013 Pooled Cohort Equations overestimated risk by 37%-154% in men and 8%-67% in women. Use of pharmacotherapies and interim revascularization did not explain the risk overestimation.</td>
<td>Currently available risk prediction models have significant limitations when used in modern, multiethnic cohorts. Future guidelines should combine improved risk estimators with the information provided by other risk assessment tools.</td>
</tr>
<tr>
<td>Silverman et al, 2014</td>
<td>6698 MESA participants. CHD event rates after mean follow-up of 7.1 y were compared among traditional risk factor categories (0, 1, 2, or ≥3) and FRS categories after stratification by CAC score.</td>
<td>Individuals with no traditional risk factors and CAC scores &gt;300 had an event rate 3.5 times higher than individuals with ≥3 risk factors and CAC=0. Similar results were seen across categories of FRS.</td>
<td>CAC may have the potential to further stratify asymptomatic adults at the extremes of traditional risk factor burden, identifying those more likely to benefit from preventive interventions.</td>
</tr>
<tr>
<td>Martin et al, 2014</td>
<td>5534 MESA participants not receiving lipid-lowering therapy. CVD event rates after mean follow-up of 7.6 y were compared among categories of lipid abnormalities after stratification by CAC score.</td>
<td>55% of the total CVD events occurred in the 21% of participants with CAC scores &gt;100. Participants with CAC=0 and 3 lipid abnormalities had lower event rates than those with CAC scores &gt;100 and no abnormalities.</td>
<td>CAC may have the potential to match lipid-lowering therapy to ASCVD risk across the spectrum of dyslipidemia.</td>
</tr>
</tbody>
</table>

*ACC/AHA = American College of Cardiology/American Heart Association; ASCVD = atherosclerotic cardiovascular disease; ATP III = Adult Treatment Panel III; CAC = coronary artery calcium; CHD = coronary heart disease; CVD = cardiovascular disease; DM = diabetes mellitus; FRS = Framingham Risk Score; LDL-C = low-density lipoprotein cholesterol; MESA = Multi-Ethnic Study of Atherosclerosis; NHANES = National Health and Nutrition Examination Survey; PHS = Physicians’ Health Study; REGARDS = Reasons for Geographic and Racial Differences in Stroke; WHI-OS = Women’s Health Initiative Observational Study; WHS = Women’s Health Study.  
*1 conversion factor: To convert LDL-C values to mmol/L, multiply by 0.0259.
studies have found that this may result in the accurate assignment of a greater proportion of asymptomatic patients with subclinical atherosclerotic disease or significant coronary stenoses to statin therapy, there has been concern about it leading to the unnecessary treatment of more individuals unlikely to have events. Importantly, the risk estimator does not lead to automatic statin prescription, but rather the results must be considered in the context of a clinician-patient risk discussion.

Such discussion needs to be informed by the best possible data. Based on what we have learned during the past 18 months, it is a priority for future iterations of the guidelines to develop risk estimators incorporating the most recent cohorts available to mimic as much as possible the population in which they are intended to be used. Moreover, risk estimators could be updated and recalibrated on a regular basis, incorporating the insights from the latest, highest-quality demographic and epidemiologic evidence available. Nevertheless, the fundamental limitations of the traditional risk factor—based model underscore the need to explore alternative risk assessment approaches. Thus, the performance of nonlinear mathematical models departing from standard linear modeling should be assessed. Specifically, in the electronic medical record era, models including information on cumulative exposure to each risk factor may soon be feasible and will likely enhance risk assessment.

RISK PREDICTION: ONE SIZE DOES NOT FIT ALL

During the past year and a half, clinicians and patients have been able to use separate risk prediction equations for women and black patients. This is an important improvement because it accounts for effect modification by sex and race in the relationship between cardiovascular risk factors and the development of CVD. On the other hand, in clinical practice we are still applying, with caution, equations for non-Hispanic white patients in other nonwhite, nonblack racial/ethnic groups. There are currently more than 53 million Latinos living in the United States, and Asians are the second-fastest growing group. Studies have found that coronary heart disease (CHD) event and mortality rates in Latino and Chinese-American individuals living in the United States are lower than or similar to those of US non-Hispanic white individuals, whereas individuals of South Asian ancestry are known for their relatively high rates of ASCVD at early ages. Thus, equations from non-Hispanic white individuals may overestimate or underestimate risk in other groups.

It has been unclear how to best handle such issues in clinical practice. Future guidelines can make it a priority to further account for the multi-ethnic nature of the US population and provide more specific guidance. In particular, once sufficient evidence from prospective studies is available, risk estimators can incorporate specific equations for each group.

ADDITION OF STROKE AS PART OF THE ASCVD OUTCOME

The 2013 ACC/AHA guidelines are about ASCVD risk reduction, and, therefore, clinical practice this past year and a half has been focused on preventing strokes in addition to CHD. Clinicians are now more easily able to acknowledge the presence of shared risk factors and common upstream pathways between CHD and some types of stroke and the need for joint preventive efforts. Moreover, using a broader clinical end point is an area of agreement among guidelines, although there is still room to harmonize the specific components of the end point.

Nevertheless, there has been some uneasiness about expanding the end point because not all strokes may be atherosclerotic in nature. Accordingly, the use of an ASCVD risk estimate that includes risk of any stroke may result in the treatment of individuals at high risk for nonatherosclerotic strokes, such as patients with atrial fibrillation, who may not benefit from the same cholesterol-lowering interventions. In addition, incorporating stroke into the risk estimate has yielded an even greater sensitivity to chronological age compared with previous CHD risk scores. Consequently, many middle-aged men and almost every elderly individual with seemingly normal lipid profiles are exceeding the 7.5% risk threshold for considering statin therapy primarily on the basis of their chronological age.

Based on these observations, future iterations of the guidelines could consider separate CHD and ASCVD risk estimates as valuable complementary sources of information to be integrated by the clinician and patient in the context of a thoughtful discussion. In addition,
guidance on the discussion and accurate management of other concurrent risk factors that may be particularly relevant to an individual’s ASCVD risk, such as hypertension or tobacco use, could be expanded.31

KEY ROLE OF ADVANCED RISK ASSESSMENT TOOLS
Since November 2013, clinicians have had the opportunity to further adapt their individual practices for the use of advanced risk assessment tools. We are learning within the scope of each of our practices, as we have risk discussions with our patients, when treatment decisions are uncertain. When uncertainty arises, coronary artery calcium (CAC) is generally the most accurate tool for CVD risk assessment.1,32-37 In the National Heart, Lung, and Blood Institute-funded, multiethnic, population-based MESA study, CAC showed evidence of providing additional risk information over and above chronological age,38 traditional risk factor burden,20 and lipid abnormalities.21 Of note, a CAC score greater than 100 has been associated with high event rates in multiethnic cohorts,21 whereas a CAC score of 0 is associated with very low event rates.39 Moreover, down to a cost of less than $100 at many imaging centers, CAC may be a valuable, helpful tool for the cost-effective allocation of preventive therapies, particularly in intermediate-risk patients.30,42

On the other hand, previous studies on CAC have been limited by short to intermediate follow-up periods. However, recent retrospective cohort analyses suggest that the prognostic value of CAC extends to 10 years of follow-up, at least for all-cause mortality.43 Finally, CAC is associated with radiation exposure (1 mSv), and carotid ultrasound for plaque and intima-media thickness is an alternative to avoid radiation, particularly in young adults.

In view of these findings, future guidelines can consider an approach to risk assessment that combines the traditional risk factor–based paradigm with a more personalized atherosclerosis imaging model, actively incorporating the knowledge of the patient’s actual burden of atherosclerosis to the risk assessment process. It is clear that there are serious limitations to restricting “uncertainty” to patients with 5% to less than 7.5% ASCVD risk,44 and the target group in which advanced risk assessment tools such as CAC would be considered could be expanded, including individuals with a 10-year ASCVD predicted risk of 5% to 10% or 5% to 15%.13,45 This may include intermediate- and low-intermediate—risk individuals with uncommon risk factors.11 In these scenarios, early cardiovascular risk assessment should be considered,12 and clear guidance regarding the use of these tools in the context of a clinician-patient discussion should be provided.

Thus, the finding of a CAC score greater than 100 may trigger the discussion for starting statin therapy. Also, CAC may be used to motivate statin-reluctant patients, aid decision making in patients at risk for drug-drug interactions, and allocate nonstatin therapies.41,42 Finally, CAC testing may also be particularly valuable in middle-aged and elderly adults with optimal levels of risk factors in whom the high predicted risk is directly linked to their chronological age. In such patients, a CAC score of 0 could be used as a rationale to emphasize lifestyle interventions and defer statin therapy. In MESA (mean age, 62 years), 50% of participants had a CAC score of 0 at baseline.32

High-sensitivity C-reactive protein and the ankle-brachial index were also recommended as tools for further risk assessment by the 2013 ACC/AHA risk assessment guideline.1 However, recent studies have found that the measurement of high-sensitivity C-reactive protein as a tool for further risk assessment is modest, with multifactorial variability being one of its key limitations.46,47 Regarding the ankle-brachial index, currently available evidence suggests that its addition to traditional risk factors has limited value for predicting CVD, particularly in nonelderly adults.48 Finally, although the 2013 guidelines recommend against carotid intima-media thickness assessment,1 the combined assessment of carotid intima-media thickness and carotid plaque50 was not addressed by the guideline.

OTHER TOOLS FOR RISK ASSESSMENT AND MOTIVATION FOR LIFESTYLE CHANGE IN YOUNG ADULTS
In addition to a 10-year ASCVD risk estimate, the 2013 ACC/AHA risk estimator provides clinicians with lifetime risk estimation in adults 20 to 59 years of age. This initiative provides an appealing tool for further informing ASCVD risk and motivating health behaviors. Cumulative exposure is a critical factor for the eventual development of atherosclerosis,50 and preventive
interventions may be more effective when implemented at early ages. Specifically, lifestyle changes in young adults with low predicted 10-year risk (owing to their young age) but prevalent cardiovascular risk factors may result in large long-term health benefits. In such patients, lifetime risk estimation may be particularly helpful in forestalling false reassurance when the predicted 10-year risk is low or the CAC score is 0.

Nevertheless, the 2013 ACC/AHA lifetime risk tool has limitations that must be noted. First, lifetime risk predictions are built on a very limited set of traditional risk factors categorized as binary predictors. Second, despite being intended to be used mainly in young adults, the cohort used for developing the estimator was middle aged. Third, conclusive evidence is lacking regarding its performance in clinical practice, particularly motivating patients for lifestyle change or improving adherence to recommended pharmacotherapies. Finally, communicating lifetime risk can be at least as difficult as communicating 10-year risk. Further research is warranted to better understand the limitations of currently available tools and to aid the development of comprehensive, accurate, externally validated lifetime risk estimators that could be incorporated in future iterations of the guidelines.

Other risk assessment/motivational tools, such as relative risk and the “risk age,” are currently recommended by other scientific societies. Once more data are available regarding the performance of these tools, they could also be considered for incorporation into future ACC/AHA guidelines. We encourage patient-oriented research to understand how patients understand and respond to different forms of risk communication.

STATIN THERAPY AND OTHER LIPID-LOWERING TREATMENTS
A healthy lifestyle was portrayed in the 2013 ACC/AHA CVD prevention guidelines as the foundation of CVD prevention. Indeed, the Work Group of the Treatment of Blood Cholesterol Guideline noted that a healthy lifestyle was the background intervention in most of the studies considered. The central role of lifestyle in CVD prevention is one of the key agreements between the ACC/AHA and other scientific societies. Accordingly, healthy lifestyles and the best tools for their implementation in each individual patient should be thoroughly addressed in a clinician-patient discussion.

In addition, future iterations of the guidelines can consider providing detailed guidance regarding the potential role of lifestyle as a first-step therapy before pharmacologic interventions, as well as on the timing and methods for risk reassessment after lifestyle change. This may be particularly relevant when patients are motivated and their risk can be reasonably decreased to a level where no pharmacologic intervention would be needed.

Regarding pharmacologic treatments, accounting for the extensive high-quality evidence supporting their cardiovascular benefits, statins were prioritized by the 2013 ACC/AHA cholesterol guidelines as the first lipid-lowering pharmacologic treatment option. The Work Group of the guideline identified 4 statin benefit groups, and absolute risk was emphasized as the key criterion for therapy intensity and allocation. This has likely led to significant changes in some practices where statins were not being prioritized among drug therapy options.

Meanwhile, there has been considerable confusion about the continued role of nonstatin lipid-lowering agents in clinical practice. The 2013 ACC/AHA guidelines are often interpreted as mainly suggesting against the use of nonstatins. They can be considered in statin-intolerant individuals and in patients receiving maximally tolerated statin therapy with a less than anticipated response, although assessment of adherence to statin therapy and lifestyle changes is also to be considered in such a case.

Nevertheless, there are other clinical scenarios in which clinicians and patients may reasonably use nonstatin therapy. Regarding adding nonstatin therapy to background monotherapy, a landmark trial provided results after release of the guidelines. In the Improved Reduction of Outcomes: Vytorin Efficacy International Trial (IMPROVE-IT), 18,144 secondary prevention patients were randomly assigned to receive simvastatin plus ezetimibe or simvastatin plus placebo. After mean follow-up of 6 years, the mean low-density lipoprotein cholesterol (LDL-C) level in the ezetimibe group was 54 mg/dL (to convert to mmol/L, multiply by 0.0259) compared with 70 mg/dL in the placebo group, and there was a statistically significant 6% relative risk reduction in major adverse cardiovascular
and cerebrovascular events in the ezetimibe group. Furthermore, the number needed to treat was 50 over 6 years, overall on top of comprehensive secondary prevention therapy.

In the on-treatment analysis, the number needed to treat was 38. Considering these results, the use of ezetimibe would broadly fit into the treatment of blood cholesterol guideline framework for the use of proven and safe drugs reported in randomized controlled trials to reduce ASCVD. Nevertheless, therapeutic decisions must be individualized, and the pros, cons, cost-effectiveness, and benefit/harm balance of each alternative should be thoroughly addressed in a clinician-patient discussion.

The IMPROVE-IT trial yielded other relevant insights. First, the relative risk reduction in the simvastatin plus ezetimibe group per 1-mmol/L lowering of LDL-C was nearly the same as expected from statin monotherapy trials, suggesting that the “pleiotropic” effects of statins may be mediated by their lipid-lowering action. Second, the safety profile of the combination simvastatin–ezetimibe was excellent, providing a valuable example of a safe treatment strategy beyond statins alone offering net clinical benefit without being outweighed by adverse effects.

USE OF FIXED CHOLESTEROL TREATMENT GOALS

Based on randomized controlled trial data, the 2013 ACC/AHA cholesterol guideline panel found “insufficient evidence for or against” the use of LDL-C treatment goals as means for guiding therapy and for up-titrating statin treatment to further reduce cholesterol levels. Thus, unlike Adult Treatment Panel III and the European Society of Cardiology and Canadian Cardiovascular Society guidelines, the new ACC/AHA recommendations do not target fixed LDL-C or non–high-density lipoprotein cholesterol goals. Rather, they recommend lipid measurement at baseline, 1 to 3 months after statin initiation, and yearly thereafter to check for the expected percentage decrease in LDL-C levels.

However, there are several potential issues with the approach. First, it is in discord with other guidelines around the globe, which has led to confusion. Second, clinicians commonly are not able to determine the percentage reduction in LDL-C that a patient has achieved. Third, patients who begin treatment with a high LDL-C level may not attain a clinically optimal LDL-C level with statin monotherapy even if the expected percentage reduction is achieved. Fourth, the emphasis in the guideline on removing LDL-C goals led to the misperception among some clinicians during the past year and a half that lipid levels no longer need to be followed up.

In contrast, other organizations, such as the National Lipid Association, have published approaches that continue to emphasize fixed LDL-C treatment goals to aid in assessing the adequacy of treatment. Nevertheless, risk- and lipid-based paradigms are not mutually exclusive and can be complementary. At baseline, obtaining the most accurate assessment of risk is crucial in deciding who is most likely to have an event in the future, whereas in follow-up, lipid measurements can serve as a marker of therapeutic response, promote adherence, motivate lifestyle improvements, and guide discussions about add-on pharmacologic therapy for patients who are clearly established as high risk.

The IMPROVE-IT trial, combined with a reevaluation of all current best evidence, may enable the next ACC/AHA guideline panel to reassess the potential role of lipid goals using proven therapies. IMPROVE-IT further reinforces the central role of LDL-C and non–high-density lipoprotein cholesterol lowering in ASCVD risk management and shows that the effect is not specific to statins only. Moreover, on the basis of the totality of current best evidence, most expert groups in the United States and throughout the world recommend fixed on-treatment lipid goals.

The 2013 ACC/AHA guidelines recommend a focus on the percentage reduction and allow assessment for LDL-C levels less than 100 mg/dL when the percentage reduction cannot be determined. So, it would not be a major change to bring back guidance on on-treatment lipids, at least for specific patients in whom fixed goals can guide more aggressive management of high absolute risk. This may be particularly valuable in patients with LDL-C levels that remain high after a 30% to 50% relative reduction and in those with a high burden of subclinical disease.

A key issue that is often overlooked when guidelines are in disagreement, as is currently the case, is the resultant confusion that often contributes to either nonaction on the part of the professional caregiver or nonadherence by the patient. Ultimately, guidelines clearly agree on the central role of LDL-C and
atherogenic lipid lowering in therapy, the need to assess treatment adherence, and the need to evaluate the adequacy of the existing treatment plan. Current recommendations may give the impression of less fundamental agreement than truly exists, and harmonizing recommendations will likely benefit clinical care.

THE CLINICIAN-PATIENT RISK DISCUSSION AND THE SHARED DECISION-MAKING MODEL

A shared decision-making model between the clinician and the patient was emphasized in the 2013 ACC/AHA CVD prevention guidelines, particularly in the treatment of blood cholesterol document. Bringing more attention to shared decision making is one of the key achievements of the guidelines, and it is in agreement with the recommendations from other scientific societies and expert groups. Guideline recommendations provide a general framework for decision making, but they should not replace clinical judgment or disregard patients’ preferences. Accordingly, any algorithm should be critically evaluated in the context of the individual being assessed. Indeed, as the target of the intervention and the main health care provider on a daily basis, the patient is the center of the prevention process. Encouraging greater patient-provider dialogue may result in improved adherence to consensus lifestyle or pharmacologic interventions and, accordingly, yield better health outcomes. A clinician-patient discussion should not only guide treatment choices but should also be fully incorporated into the ongoing ASCVD risk assessment and management process. Accordingly, given the relevance of such discussion, practical guidance regarding the key elements may be useful to clinical practice. Considerations include patient preferences, precision of the risk estimate and opportunities for a more personalized assessment, willingness of the patient to participate in his or her ongoing care and to change lifestyle habits, the treatment and dose being proposed, potential benefits and harms of each treatment option, and price. Limited data are available regarding the effectiveness of different risk communication strategies, how to handle discussion of controversies in primary prevention, and more broadly, the effect of different risk discussion approaches on downstream clinical outcomes. Tools such as the Mayo Clinic statin decision aid are already available online, and in the next few years high-quality patient-oriented studies are critically needed to help determine the optimal methods for structuring clinician-patient risk discussions.

CONCLUSION

It has been an exciting and productive time in the year and a half since the landmark 2013 ACC/AHA CVD prevention guidelines were released. Continuous scientific discussion in the following years together with standardized evaluation of their clinical effectiveness will further improve future iterations of the guidelines and will likely result in more unified recommendations across various guideline committees throughout the world.

The CVD risk assessment tools should be built on the latest, highest-quality evidence to attain the most accurate absolute risk assessment. In addition, atherosclerosis imaging could be more strongly emphasized in future guidelines as a means to refine risk assessment built on the knowledge of the patient’s burden of atherosclerosis. Among such tools, CAC seems to be the best test for refinement of risk assessment. Regarding risk management, with data continuing to support the notion that a lower LDL-C level is better, cholesterol treatment goals and nonstatin therapies shown to prevent ASCVD events should be reincorporated in future versions of the guidelines, with the critical notion that lowering should occur through safe, proven strategies. Finally, a patient-physician discussion should address all these features to fully incorporate the patient’s expectations and preferences into the risk assessment and management process.

Abbreviations and Acronyms: ACC/AHA = American College of Cardiology/American Heart Association; ASCVD = atherosclerotic cardiovascular disease; ATP III = Adult Treatment Panel III; CAC = coronary artery calcium; CHD = coronary heart disease; CVD = cardiovascular disease; DM = diabetes mellitus; FRS = Framingham Risk Score; IMPROVE-IT = Improved Reduction of Outcomes: Vytorin Efficacy International Trial; LDL-C = low-density lipoprotein cholesterol; MESA = Multi-Ethnic Study of Atherosclerosis; NHANES = National Health and Nutrition Examination Survey; PHS = Physicians’ Health Study; REGARDS = Reasons for Geographic and Racial Differences in Stroke; WHI-OS = Women’s Health Initiative Observational Study; WHS = Women’s Health Study

Grant Support: Dr Cainzos-Achirica is funded by a research grant from the Spanish Society of Cardiology. Dr Martin was
supported by the Pollin Cardiovascular Prevention Fellowship, a Marie-Josee and Henry R. Kravis endowed fellowship, and a National Institutes of Health training grant (T32HL07024).

Potential Competing Interests: Dr Blaha has served on the advisory board for Pfizer and Luitpold Pharmaceuticals. Dr Martin is listed as co-inventor on a pending patent filed by Johns Hopkins University for a method of low-density lipoprotein cholesterol estimation.

Correspondence: Address to Seth S. Martin, MD, MHS, Johns Hopkins Ciccarone Center for the Prevention of Heart Disease, Carnegie 568A, The Johns Hopkins Hospital, 600 N Wolfe St, Baltimore, MD 21287 (smart100@jhu.edu).

REFERENCES


