ACC/AHA lipid guidelines: Personalized care to prevent cardiovascular disease

ABSTRACT

The 2018 and 2019 guidelines from the American College of Cardiology and American Heart Association reflect the complexity of individualized cholesterol management. The documents address more detailed risk assessment, newer nonstatin cholesterol-lowering drugs, special attention to patient subgroups, and consideration of the value of therapy, all with the aim of creating personalized treatment plans for each patient. Overall, the guidelines recommend shared decision-making to meet the individual needs of each patient.

KEY POINTS

Emphasize a heart-healthy lifestyle for all patients across their life span.

A discussion with the patient is the cornerstone of shared decision-making and should include the patient’s 10-year risk of atherosclerotic cardiovascular disease according to the Pooled Cohort Equations, as well as risk-enhancing factors.

Statins are the foundation of pharmacologic therapy, to which ezetimibe and, if necessary, a proprotein convertase subtilisin/kexin type 9 inhibitor can be added to achieve lipid goals.

Special treatment algorithms are outlined for certain patient subgroups, such as certain ethnic groups, adults with chronic kidney disease, those with human immunodeficiency virus infection, and women.

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Here, we review the recent guidelines and discuss the most important changes for clinical practice.1–3

**CLASSES OF RECOMMENDATION, LEVELS OF EVIDENCE**

The guidelines award classes of recommendations, signifying the certainty of benefit compared with the estimated risk and the strength of the recommendation.
- **Class I (strong)**—benefit greatly exceeds risk; treatment is recommended
- **Class IIa (moderate)**—benefit exceeds risk; treatment is reasonable
- **Class IIb (weak)**—benefit equals or exceeds risk; treatment might be reasonable
- **Class III: No benefit (moderate)**—benefit equals risk; treatment is not recommended
- **Class III: Harm (strong)**—risk exceeds benefit.

The guidelines also award levels of evidence to their recommendations:
- **Level A**—high-quality evidence
- **Level B-R**—moderate-quality evidence from randomized controlled trials
- **Level B-NR**—moderate-quality evidence from nonrandomized trials
- **Level C-LD**—limited data
- **Level C-EO**—expert opinion.

**STATINS AND OTHER OPTIONS**

In addition to a heart-healthy lifestyle (which should be encouraged for all patients across their life course), statins are the foundation of lipid management. Statin therapy is divided into 3 categories of intensity:

- **High-intensity**, aiming for at least a 50% reduction in LDL-C. Examples:
  - Atorvastatin 40–80 mg daily
  - Rosuvastatin 20–40 mg daily

- **Moderate-intensity**, aiming at a 30% to 49% reduction in LDL-C. Examples:
  - Atorvastatin 10–20 mg
  - Fluvastatin 80 mg daily
  - Lovastatin 40–80 mg
  - Pitavastatin 1–4 mg daily
  - Pravastatin 40–80 mg daily
  - Rosuvastatin 5–10 mg
  - Simvastatin 20–40 mg daily

- **Low-intensity**, aiming at a LDL-C reduction of less than 30%. Examples:
  - Fluvastatin 20–40 mg daily
  - Lovastatin 20 mg daily
  - Pravastatin 10–20 mg daily
  - Simvastatin 10 mg daily

**Nonstatin drugs**

The nonstatin LDL-lowering drugs such as ezetimibe and proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitors can be added to statin therapy, as recent randomized clinical trials found them to improve cardiovascular outcomes in patients with atherosclerotic cardiovascular disease.4–7

**Ezetimibe** decreases cholesterol absorption and consequently lowers LDL-C levels by about 20%. A large randomized trial in patients who recently had acute coronary syndromes showed that ezetimibe modestly reduced cardiovascular risk over 7 years of follow-up when added to their regimen of moderate-intensity statin therapy.4,5

**PCSK9 inhibitors** lower LDL-C by 50% to 60% by binding to PCSK9, inhibiting labeling of LDL receptors for degradation, thus prolonging LDL receptor activity at the cell membrane. Several trials showed that PCSK9 inhibitors reduce cardiovascular risk in patients with stable atherosclerotic cardiovascular disease or recent acute coronary syndromes who are already on moderate- or high-intensity statin therapy.4,6,7

**PRIMARY PREVENTION**

The new guidelines advocate a multifaceted approach to primary prevention of atherosclerotic cardiovascular disease through cholesterol management. As the risk due to high cholesterol levels is cumulative over the life span, the guidelines encourage lifestyle therapy for primary prevention at all ages and in all patient categories. Additionally, they outline decision algorithms to create a therapy that suits the individual needs of each patient (Table 1).

**Statin benefit groups**

The new guidelines keep the same statin benefit groups defined in the previous (2013) ACC/AHA guidelines.8 Statin therapy recommendations are specifically given for the following groups:

- **Adults with severe hypercholesterolemia**
  If a patient age 20 to 75 has LDL-C levels of 190 mg/dL or higher, you do not need to cal-

In addition to a heart-healthy lifestyle, statins are the foundation of lipid management.
REITER-BRENNAN AND COLLEAGUES

TABLE 1

<table>
<thead>
<tr>
<th>Primary preventive therapy in different patient subgroups</th>
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<tbody>
<tr>
<td><strong>Severe hypercholesterolemia</strong></td>
</tr>
<tr>
<td>Initiate high-intensity statin therapy immediately, irrespective of 10-year risk of atherosclerotic cardiovascular disease (ASCVD)</td>
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<tr>
<td>Adding ezetimibe is reasonable if low-density lipoprotein cholesterol (LDL-C) is ≥ 190 mg/dL or there is less than 50% reduction in LDL-C levels with maximal tolerated statins</td>
</tr>
<tr>
<td>Consider adding a proprotein convertase subtilisin/kexin type 9 (PCSK9) inhibitor in patients with heterozygous familial hypercholesterolemia or with LDL-C ≥ 220 mg/dL with maximally tolerated statins and ezetimibe</td>
</tr>
<tr>
<td><strong>Diabetes mellitus in adults</strong></td>
</tr>
<tr>
<td>Irrespective of 10-year ASCVD risk, initiate moderate-intensity statin therapy immediately</td>
</tr>
<tr>
<td>Aim for reduction of LDL-C by at least 50%</td>
</tr>
<tr>
<td><strong>Adults age 40–75 with LDL-C levels 70–189 mg/dL</strong></td>
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<tr>
<td>Before starting statins, engage in clinician-patient risk discussion, evaluating risk factors, 10-year ASCVD risk, risk enhancers (Table 2), patient’s preference, costs, and adverse effects of statins</td>
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<tr>
<td>Use coronary artery calcium score to guide decision if risk is still unclear</td>
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<tr>
<td><strong>Children and young adults</strong></td>
</tr>
<tr>
<td>Assess risk factors in children age 0–19 years</td>
</tr>
<tr>
<td>Initiate statin therapy if patients have severely abnormal lipid profiles or clinical presentation of familial hypercholesterolemia and cannot be treated by 3 months lifestyle therapy</td>
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<tr>
<td><strong>Ethnicity</strong></td>
</tr>
<tr>
<td>Review racial and ethnic features that can influence ASCVD risk and intensity of treatment (Table 3)</td>
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<tr>
<td><strong>Adults with chronic kidney disease</strong></td>
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<tr>
<td>Starting moderate-intensity statin alone or in combination with ezetimibe can be useful</td>
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<tr>
<td><strong>Adults with chronic inflammatory disorders and HIV</strong></td>
</tr>
<tr>
<td>In adults age 40–75 with LDL-C 70–189 mg/dL with a 10-year ASCVD risk of over 5%, discuss moderate- or high-intensity statin therapy</td>
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<tr>
<td><strong>Women</strong></td>
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<td>History of premature menopause (before age 40) or history of pregnancy-related disorders (hypertension, pre-eclampsia, gestational diabetes, small-for-gestational-age infants, and preterm deliveries) are risk-enhancing factors and should influence lifestyle and pharmacologic therapy decisions</td>
</tr>
</tbody>
</table>

If the patient has a risk factor for atherosclerotic cardiovascular disease and his or her LDL-C level remains higher than 100 mg/dL even after adding ezetimibe to the statin, a PCSK9 inhibitor may be considered.

**Adults with diabetes mellitus**

Moderate-intensity statin therapy is indicated in adults with diabetes, regardless of their 10-year risk. Rather, high-intensity statin therapy should be started right away to lower LDL-C by at least 50%.

If a patient age 20 to 75 has LDL-C ≥ 190 mg/dL, start high-intensity statin therapy right away.
LIPID GUIDELINES

year risk. However, it is reasonable to start high-intensity statin treatment if the patient also has multiple risk factors. Similarly, the 2019 guidelines of the American Diabetes Association advocate high-intensity statin therapy in patients who have additional risk factors or a 10-year risk of an atherosclerotic cardiovascular disease event higher than 20%.9

Adults age 40–75, without diabetes, with LDL-C levels 70–189 mg/dL
In this group, the guidelines say to use a risk calculator to determine if the patient needs lipid-lowering medication.

Use the Pooled Cohort Equations, which are based on age, sex, race, total cholesterol, high-density lipoprotein cholesterol, systolic blood pressure, and whether the patient is receiving treatment for high blood pressure, has diabetes, or smokes (class I recommendation). This tool gives an estimate of the patient’s risk of a cardiovascular event within the next 10 years, which the guidelines categorize as follows:

- Low risk: < 5%
- Borderline risk: 5%–7.5%
- Intermediate risk: 7.5%–20%
- High risk: > 20%

The addition of the “borderline” group (only the 2018 guidelines specifically mention and explain primary preventive treatment in the “borderline” risk category) reflects the uncertainty of treatment strategies for patients at intermediate risk, while treatment recommendations for high- and low-risk groups are well established.10

The US Preventive Services Task Force11 recommends statins as primary preventive therapy for adults age 40 to 75 with no history of cardiovascular disease, 1 or more risk factors, and a calculated 10-year risk of 10% or greater (grade A recommendation—there is high certainty that the net benefit is moderate, or there is moderate certainty that the net benefit is moderate to substantial). However, it gives a lower recommendation for low-intensity statin therapy for people with a lower 10-year risk, ie, between 7.5% and 10% (grade C—they recommend selectively offering or providing it to individual patients based on professional judgment and patient preferences; there is at least moderate certainty that the net benefit is moderate to substantial). 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For patients at borderline or intermediate risk, risk-enhancing factors are particularly useful to review during the risk discussion, and the guidelines give especially detailed instructions in the decision algorithm for patients in these groups. This acknowledges the criticisms of the previous 2013 guidelines that they led to overprescription of statins due to many patients fitting the intermediate-risk category, and called for additional risk stratification tools.12

By evaluating risk-enhancing factors, patients’ risk can be revised and preventive treatment prescribed only to those at higher risk, while avoiding overprescription for those at low risk. The guidelines give a class II A recommendation to starting or intensifying statin therapy if risk-enhancing factors are present in borderline- and intermediate-risk adults.

In unclear cases, consider coronary artery calcium measurement. If, in view of this evidence, the patient and clinician favor statin therapy, statins should be initiated at a moderate intensity to lower LDL-C by 30% to 49%. However, if the risk decision is still unclear even after reviewing the Pooled Cohort Equations and risk enhancers, the coronary artery calcium score can be added to guide decisions.

A great body of research indicates that the coronary artery calcium score is an effective tool to stratify risk and improve risk estimation.13 If the score is 1 to 99, statin therapy is suggested, especially in patients older than 55. If the score is 100 or higher or patients are in the 75th percentile or higher for coronary artery calcium, statin therapy is clearly indicated. If the score is 0, statin therapy may be safely withheld unless the patient smokes or has premature cardiovascular disease.

Therapy recommendations for patients on either extreme of 10-year risk are more straightforward.

For patients at low risk (< 5%), clinicians should still emphasize lifestyle changes to reduce risk modifiable factors.

For patients at high risk (> 20%), clinicians should clearly recommend statin therapy aimed at lowering LDL-C by at least 50%.

Primary prevention in children and young adults
The guidelines pay special attention to cholesterol management in subgroups. The most important updates are specific recommenda-

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### TABLE 3

<table>
<thead>
<tr>
<th>ASCVD risk</th>
<th>CAC score</th>
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| Asian                                          | South Asian men have similar CAC burden to non-Hispanic white men, but higher CAC compared with blacks and Latinos
greater risk than East Asians*                  | South Asian women have similar CAC scores compared with other ethnic and racial groups
greater risk than East Asians*                  |
| Hispanic and Latino                            | Individuals from Puerto Rico have the highest ASCVD risk
CVD mortality is higher in Hispanics than whites | Lower CAC burden compared with Asian-Americans and non-Hispanic whites
Lower CAC scores compared with whites and Hispanics|
| Black, Native American, and Alaskan            | Increased ASCVD risk
Greater rates of CHD events compared with non-Hispanic white populations|

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*Individuals from Bangladesh, India, Nepal, Pakistan, and Sri Lanka make up most of the South Asian group.

*Individuals from Japan, Korea, and China make up most of the East Asian group.

ASCVD = atherosclerotic cardiovascular disease; CAC = coronary artery calcium; CHD = coronary heart disease; CVD = cardiovascular disease.
Black populations have higher rates of coronary heart disease even though they have lower coronary artery calcium scores.
can be used to guide statin therapy. Before and 4 to 12 weeks after starting anti-inflammatory or antiretroviral therapy, fasting lipid profiles and atherosclerotic cardiovascular disease risk factors can be used to monitor lipid-lowering medications.

**Primary prevention issues specific to women**

The new guidelines identify the following conditions specific to women as risk-enhancing factors:

- Premature menopause (before age 40)
- Pregnancy-associated disorders such as hypertension, preeclampsia, gestational diabetes, and diabetes mellitus
- Infants small for gestational age
- Preterm deliveries.

The guidelines give a class I recommendation to intensively discussing lifestyle intervention and potential benefit of statin therapy in case of these conditions.

Women with these conditions could also benefit from additional risk-stratification tools like coronary artery calcium scoring to guide decisions about statin therapy. A cross-sectional study in 446 women suggest that earlier cardiovascular risk screening including coronary artery calcium scoring might benefit women with preterm deliveries. Other studies showed that women with hypertensive disorders of pregnancy could benefit from earlier risk stratification through the coronary artery calcium score.

**Pregnant women should not take statins,** however, even if they have severe hypercholesterolemia. This recommendation is based on animal data, in which teratogenic effects of statins in high doses and disruption of the cholesterol synthesis in the fetus were observed. However, recent evidence has not confirmed the teratogenic potential of statins. Nevertheless, while new safety data are reassuring, suspension of statins is still advisable.

The guidelines also give specific recommendations regarding statin therapy when planning or during pregnancy. Sexually active women on statin therapy are advised to use effective forms of contraception (class I recommendation). Women planning to become pregnant should stop statin therapy 1 to 2 months before pregnancy is attempted. If women become pregnant while using a statin, they should stop taking it as soon as pregnancy is discovered.

### SECONDARY PREVENTION: Atherosclerotic Disease

High-intensity statin therapy is recommended for all patients with atherosclerotic cardiovascular disease, including acute coronary syndromes, myocardial infarction, stable or unstable angina, arterial revascularization, stroke, transient ischemic attack, or peripheral artery disease.

The new guidelines recognize 2 phenotypes in secondary prevention: high risk and very high risk (Table 4). Very high risk in-

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**TABLE 4**

<table>
<thead>
<tr>
<th>Patient subgroup</th>
<th>Guideline recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>At very high risk</strong>&lt;sup&gt;a&lt;/sup&gt;</td>
<td>If low-density lipoprotein cholesterol (LDL-C) levels are ≥ 70 mg/dL with the maximal tolerated statin therapy, it is reasonable to add ezetimibe</td>
</tr>
<tr>
<td>If LDL-C level is ≥ 70 mg/dL on maximal tolerated statin and ezetimibe, it is reasonable to add a PCSK9 inhibitor</td>
<td></td>
</tr>
<tr>
<td><strong>Not at very high risk</strong></td>
<td>Goal is LDL-C reduction by 50%</td>
</tr>
<tr>
<td>Age ≤ 75</td>
<td>Use moderate-intensity statins if high-intensity statins are not tolerated</td>
</tr>
<tr>
<td>If LDL-C ≥ 70 mg/dL on high-intensity statins, it is reasonable to add ezetimibe</td>
<td></td>
</tr>
<tr>
<td>Age &gt; 75</td>
<td>Starting or continuing either moderate- or high-intensity statins is reasonable</td>
</tr>
</tbody>
</table>

<sup>a</sup>Secondary prevention refers to patients with clinical atherosclerotic cardiovascular disease (ASCVD), ie, those with a history of acute coronary syndrome, myocardial infarction, stable or unstable angina, arterial revascularization, stroke, transient ischemic attack, or peripheral artery disease.

<sup>b</sup>Very high risk includes a history of multiple major ASCVD events or 1 major ASCVD event and multiple high-risk conditions (age ≥ 65, heterozygous familial hypercholesterolemia, history of coronary artery bypass surgery or percutaneous coronary intervention, diabetes mellitus, hypertension, chronic kidney disease, current smoking, persistently elevated LDL-C, or history of heart failure).

Based on information in reference 1.
cludes a history of multiple major atherosclerotic cardiovascular disease events or 1 major event and multiple high-risk conditions.

The reduction in risk is proportional to the decrease of LDL-C levels. The authors also provide instructions on the use of nonstatin medications as part of secondary prevention. In patients with a very high risk and LDL-C levels higher than 70 mg/dL on maximal tolerated statin therapy, it is reasonable to add ezetimibe. Further, in patients at very high risk whose LDL-C level remains higher than 70 mg/dL on maximally tolerated statin and ezetimibe therapy, adding a PCSK9 inhibitor is reasonable.

■ **MONITORING RESPONSE TO LDL-C-LOWERING THERAPY**

As in the last guidelines, the current ones suggest assessing adherence and percentage response after initiating or changing the dose of LDL-C-lowering medications and lifestyle changes, with repeat lipid measurements 4 to 12 weeks after therapy is started. This can be repeated every 3 to 12 months as needed.

■ **COST AND VALUE CONSIDERATIONS**

The 2018 guidelines comment on the importance of considering the value of treatment in therapy decisions.1

The authors reviewed the cost-effectiveness of PCSK9 inhibitors using simulation models. These revealed that, to be cost-effective, the prices of PCSK9 inhibitors will have to be reduced by at least 70% in the United States from 2018 levels. However, since PCSK9 inhibitors have an incremental cost-effective ratio of $141,800 to $450,000 per quality-adjusted life-year added, the cost-effectiveness of these drugs improves only if used for very high-risk patients. This is reflected in the current guidelines, which suggest adding PCSK9 inhibitors only after maximal tolerated doses of statins and ezetimibe have not improved LDL-C levels significantly in very high-risk atherosclerotic cardiovascular disease patients or those with a family history of premature atherosclerotic cardiovascular disease. However, in mid-2018, when the 2018 guidelines were written, the US list prices of PCSK9 inhibitors were roughly $14,000 a year; now (in 2019) costs have been reduced to a little more than $6,000 a year.

■ **STATIN ADVERSE EFFECTS**

The new guidelines additionally address patients’ and clinicians’ fears of adverse effects of statins. They specifically recommend that the clinician-patient risk discussion also review possible adverse events and how these can be managed.

The guidelines advocate reviewing the net clinical benefit of statins and comparing the potential for reduction in risk of atherosclerotic cardiovascular disease with the risk of statin-associated side effects and drug interactions (class I recommendation, level of evidence A). Observed adverse effects include myalgias, elevation of creatine kinase, and transaminitis.8

When adverse effects occur, clinicians should lower the dose or dosing frequency, prescribe an alternate statin, or combine statin with nonstatin therapy. If symptoms persist despite these measures, nonstatin therapies with proven efficacy in randomized controlled trials are recommended. In recent clinical trials, evolocumab27 as well as alirocumab28 performed well in lowering LDL-C in statin-intolerant patients.

Muscle symptoms are the most common statin-related adverse effects. Subjective myalgia occurred in 1% to 15% of participants in randomized controlled trials but in 5% to 20% of patients in observational studies. In a class I recommendation, the authors write that patients with statin-associated muscle symptoms should undergo a detailed assessment of symptoms, and nonstatin causes and predisposing factors should be taken into consideration.

Further, statins slightly increase the risk of diabetes mellitus in patients with prediabetes. However, the guidelines clearly state that therapy should not be discontinued because of this, as the advantages of statins are much greater than the risk of diabetes mellitus.29,30