2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease

Web Supplement

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Preamble (full version)

Since 1980, the American College of Cardiology (ACC) and American Heart Association (AHA) have translated scientific evidence into clinical practice guidelines with recommendations to improve cardiovascular health. These guidelines, which are based on systematic methods to evaluate and classify evidence, provide a foundation for the delivery of quality cardiovascular care. The ACC and AHA sponsor the development and publication of clinical practice guidelines without commercial support, and members volunteer their time to the writing and review efforts. Guidelines are official policy of the ACC and AHA. For some guidelines, the ACC and AHA partner with other organizations.

Intended Use

Clinical practice guidelines provide recommendations applicable to patients with or at risk of developing cardiovascular disease. The focus is on medical practice in the United States, but these guidelines are relevant to patients throughout the world. Although guidelines may be used to inform regulatory or payer decisions, the intent is to improve quality of care and align with patients' interests. Guidelines are intended to define practices meeting the needs of patients in most, but not all, circumstances, and should not replace clinical judgment.

Clinical Implementation

Management, in accordance with guideline recommendations, is effective only when followed by both practitioners and patients. Adherence to recommendations can be enhanced by shared decision-making between clinicians and patients, with patient engagement in selecting interventions on the basis of individual values, preferences, and associated conditions and comorbidities.

Methodology and Modernization

The ACC/AHA Task Force on Clinical Practice Guidelines (Task Force) continuously reviews, updates, and modifies guideline methodology on the basis of published standards from organizations, including the Institute of Medicine (1, 2), and on the basis of internal reevaluation. Similarly, presentation and delivery of guidelines are reevaluated and modified in response to evolving technologies and other factors to optimally facilitate dissemination of information to healthcare professionals at the point of care.

Beginning in 2017, numerous modifications to the guidelines have been and continue to be implemented to make guidelines shorter and enhance "user friendliness." Guidelines are written and presented in a modular knowledge chunk format, in which each chunk includes a table of recommendations, a brief synopsis, recommendation-specific supportive text and, when appropriate, flow diagrams or additional tables. Hyperlinked references are provided for each modular knowledge chunk to facilitate quick access and review. More structured guidelines—including word limits ("targets") and a web guideline supplement for useful but noncritical tables and figures—are 2 such changes. Also, to promote conciseness, the Preamble is presented in abbreviated form in the executive summary and full-text guideline documents.

In recognition of the importance of cost–value considerations in certain guidelines, when appropriate and feasible, an analysis of value for a drug, device, or intervention may be performed in accordance with the ACC/AHA methodology (3).

To ensure that guideline recommendations remain current, new data are reviewed on an ongoing basis, with full guideline revisions commissioned ideally in approximate 6-year cycles. Publication of potentially practice-changing new study results relevant to an existing or new drug, device, or management strategy prompts evaluation by the Task Force, in consultation with the relevant guideline writing committee, to determine whether a focused update should be commissioned. For additional information and policies on guideline development, we encourage readers to consult the ACC/AHA guideline methodology manual (4) and other methodology articles (5-8).

Selection of Writing Committee Members

The Task Force strives to ensure that the guideline writing committee both contains requisite expertise and is representative of the broader medical community by selecting experts from a broad array of backgrounds, representing different geographic regions, sexes, races, ethnicities, intellectual perspectives/biases, and scopes of clinical practice, and by inviting organizations and professional societies with related interests and expertise to participate as partners or collaborators.

Relationships With Industry and Other Entities

The ACC and AHA have rigorous policies and methods to ensure that documents are developed without bias or improper influence. The complete policy on relationships with industry and other entities (RWI) can be found at http://www.acc.org/guidelines/about-guidelines-and-clinical-documents/relationships-with-industry-policy. Appendix 2 of the guideline lists writing committee members' relevant RWI; for the purposes of full transparency, their comprehensive disclosure information is available online (https://www.ahajournals.org/doi/suppl/10.1161/CIR.0000000000000678). Comprehensive disclosure information for the Task Force is also available at http://www.acc.org/guidelines/about-guidelines-and-clinical-documents/guidelines-and-documents-task-forces.

Guideline-Directed Management and Therapy

The term *guideline-directed management and therapy* encompasses clinical evaluation, diagnostic testing, and both pharmacological and procedural treatments. For these and all recommended drug treatment regimens, the reader should confirm dosage with product insert material and evaluate for contraindications and interactions. Recommendations are limited to drugs, devices, and treatments approved for clinical use in the United States.

Class of Recommendation and Level of Evidence

The Class of Recommendation (COR) indicates the strength of recommendation, encompassing the estimated magnitude and certainty of benefit in proportion to risk. The Level of Evidence (LOE) rates the quality of scientific evidence supporting the intervention on the basis of the type, quantity, and consistency of data from clinical trials and other sources (see Table 1 in the guideline) (5).

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Supplemental Tables

Table S1. Associated Guidelines and Statements

Title	Organization	Publication Year (Reference)
Guidelines		
Guideline on the Management of Blood Cholesterol	ACC/AHA/AACVPR/AAPA/ABC/ACPM/ ADA/AGS/APhA/ASPC/NLA/PCNA	2018 (9)
Use of Risk Assessment Tools to Guide Decision-Making in the Primary Prevention of Atherosclerotic Cardiovascular Disease	AHA/ACC	2018 (10)
2018 Physical Activity Guidelines for Americans	U.S. HHS	2018 (11)
Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults	ACC/AHA/AAPA/ABC/ACPM/AGS/ APhA/ASH/ASPC/NMA/PCNA	2017 (12)
Healthful Diet and Physical Activity for Cardiovascular Disease Prevention in Adults Without Known Risk Factors: Behavioral Counseling	U.S. Preventive Services Task Force	2017 (13)
Guideline on the Management of Patients With Lower-Extremity Peripheral Artery Disease	ACC/AHA	2016 (14)
Focused Update of the Guideline for the Diagnosis and Management of Patients With Stable Ischemic Heart Disease	ACC/AHA/AATS/PCNA/SCAI/STS	2014 (15)

Title	Organization	Publication Year (Reference)
Behavioral Counseling to Promote a Healthful Diet and Physical Activity for Cardiovascular Disease Prevention in Adults With Cardiovascular Risk Factors: U.S. Preventive Services Task Force Recommendation Statement	U.S. Preventive Services Task Force	2014 (16)
Guideline for the Management of Overweight and Obesity in Adults	AHA/ACC/TOS	2013 (17)
Guideline on Lifestyle Management to Reduce Cardiovascular Risk	AHA/ACC	2013 (18)
Guideline on the Assessment of Cardiovascular Risk	ACC/AHA	2013 (19)
Secondary Prevention and Risk Reduction Therapy for Patients With Coronary and Other Atherosclerotic Vascular Disease: 2011 Update	AHA/ACCF	2011 (20)
Guidelines for Primary Prevention of Cardiovascular Disease and Stroke: 2002 Update: Consensus Panel Guide to Comprehensive Risk Reduction for Adult Patients Without Coronary or Other Atherosclerotic Vascular Diseases	AHA	2002 (21)
Statements		
Spontaneous Coronary Artery Dissection: Current State of the Science	AHA	2018 (22)
Health Policy Statement on Cardiovascular Team-Based Care and the Role of Advanced Practice Providers	ACC	2015 (23)

Title	Organization	Publication Year (Reference)
Eligibility and Disqualification Recommendations for Competitive Athletes With Cardiovascular Abnormalities: Preamble, Principles, and General Considerations	ACC/AHA	2015 (24)
Update on Prevention of Cardiovascular Disease in Adults With Type 2 Diabetes Mellitus in Light of Recent Evidence	AHA/ADA	2015 (25)
The Agenda for Familial Hypercholesterolemia	AHA	2015 (26)
Social Determinants of Risk and Outcomes for Cardiovascular Disease	AHA	2015 (27)
Electronic Cigarettes	AHA	2014 (28)
Statement on Cost/Value Methodology in Clinical Practice Guidelines and Performance Measures	ACC/AHA	2014 (3)
Primary Prevention of Cardiovascular Diseases in People With Diabetes Mellitus	AHA/ADA	2007 (29)

AACVPR indicates American Association of Cardiovascular and Pulmonary Rehabilitation; AAPA, American Academy of Physician Assistants; AATS, American Association for Thoracic Surgery; ABC, Association of Black Cardiologists; ACC, American College of Cardiology; ACCF, American College of Cardiology Foundation; ACPM, American College of Preventive Medicine; ADA, American Diabetes Association; AGS, American Geriatrics Society; AHA, American Heart Association; APhA, American Pharmacists Association; ASH, American Society of Hematology; ASPC, Association of Surgeons in Primary Care; HHS, U.S. Department of Health and Human Services; NLA, National Lipid Association; NMA, National Medical Association; PCNA, Preventive Cardiovascular Nurses Association; SCAI, Society for Cardiovascular Angiography and Interventions; STS, Society of Thoracic Surgeons; and TOS, The Obesity Society.

Table S2. Relative Risk Association Between Risk-Enhancing Factors and ASCVD

Risk-Modifying Factor	Risks for ASCVD—Illustrative Examples	References
Parental CVD	Multivariable adjustment gave ORs for premature CVD: – Men: 2.0 (95% CI: 1.2–3.1) – Women: 1.7 (95% CI: 0.9–3.1) Comments: In the Framingham Offspring Study, participants with no parental CVD were compared with those with at least 1 parent with premature CVD with onset at <55 y of age in father and <65 y of age in mother.	(30)
Family history of stroke	Comments: For family history of stroke, multivariable adjustment gave ORs of: – All stroke: OR: 2.79 (95% CI: 1.68–4.66; *P*<0.001) – Ischemic stroke: HR: 3.15 (95% CI: 1.69–5.88; *P*<0.001) This was true for both maternal and paternal stroke.	(31)
Metabolic syndrome with and without DM	RR for patients with metabolic syndrome, including DM: RR for CVD: 2.35 (95% CI: 2.02–2.73) – Men: 2.14 (95% CI: 1.62–2.83) – Women: 2.87 (95% CI: 2.40–3.43) – CVD mortality: 2.40 (95% CI: 1.87–3.08) RR for patients with metabolic syndrome but not with DM: – CVD mortality: 1.75 (95% CI: 1.19–2.58) RR for cardiovascular events and death: 1.78 RR for patients including DM versus those without DM: 1.51 versus 1.69 RR for patients with CHD versus those without CHD: 2.68 versus 1.94	(32, 33)

CKD	HR for cardiovascular mortality (if dipstick proteinuria ≥ ++) – eGFR 45-59: 1.38 (2.67) – eGFR 30-44: 2.42 (3.06) – eGFR 15-29: 3.29	(34)
Inflammatory disorders	RR of cardiometabolic diseases (CHD, stroke, T2DM, venous thromboembolism, and peripheral artery disease) Comment: Magnitude of association with inflammatory disease and cardiometabolic disease was higher among those prescribed nonsteroidal anti-inflammatory or corticosteroid drugs. RR by specific inflammatory conditions	(35)
Rheumatoid arthritis	1.70 (95% CI: 1.59–1.83)	
Ankylosing spondylitis	1.28 (95% CI: 1.09–1.52)	
Psoriasis (most common)	1.25 (95% CI: 1.16–1.35)	
Systematic lupus erythematosus (least common)	6.36 (95% CI: 4.37–9.25)	
Vasculitis	1.64 (95% CI: 1.42–1.90)	
HIV HCV HIV/HCV coinfection	MI rates per 1,000 person-years: – Black men: 6.9 – Black women: 7.2 – White men: 4.4 – White women: 3.3 HR: 2.91 (95% CI: 1.19–7.12) Comments: Note higher RR in black versus white patients and in black women especially. Also, HIV/HCV-coinfected patients had a higher incidence of CVD events and/or death than did HIV-monoinfected adults (36, 37)(4% versus 1.2%, *P*=0.004).	(36, 38)

Conditions specific to women: early menopause and preeclampsia	Early age at menopause (age <40 y versus age 50 to <55 y) associated with higher multivariable-adjusted CVD risk: 1.32 (95% CI: 1.16–1.51), *P* trend <0.0001, with excess risk for both natural and surgical menopause In women with a history of preeclampsia or eclampsia, the following were demonstrated: – An increased risk of CVD (leading to either a clinical diagnosis or a fatal outcome) (HR: 2.28; 95% CI: 1.87–2.78), – cerebrovascular disease (HR: 1.76; 95% CI: 1.43–2.21) – developing hypertension (HR: 3.13; 95% CI: 2.51–3.89) Comments: 1. Prospective cohort study data from Nurses' Health Study. Furthermore, a shorter reproductive life span was associated with higher risk of incident CVD after multivariable adjustment (RR: 1.32 [95% CI: 1.16–1.49] comparing duration in years <30 with ≥42; *P* trend <0.0001). 2. Outcomes for menopausal women <45 y of age relative to women >45 y of age. For overall CHD, relative risks were 1.50 (95% CI: 1.28–1.76). – 1.11 (95% CI: 1.03–1.20) for fatal CHD – 1.23 (95% CI: 0.98–1.53) for overall stroke – 0.99 (95% CI: 0.92–1.07) for stroke mortality – 1.19 (95% CI: 1.08–1.31) for CVD mortality – 1.12 (95% CI: 1.03–1.21) for all-cause mortality 3. A meta-analysis of 43 studies of women with a history of preeclampsia or eclampsia demonstrated increased risk of CVD (leading to either a clinical diagnosis or a fatal outcome). (HR: 2.28; 95% CI: 1.87–2.78), cerebrovascular disease (HR: 1.76; 95% CI: 1.43–2.21), and of developing hypertension (HR: 3.13; 95% CI: 2.51–3.89).	(39-42)

High-risk races/ethnicities (e.g., South Asian)	Proportionate mortality ratios are highest in Asian Indian men (1.43) and women (1.12), followed by Filipino men (1.15). Comments: Examined 10,442,034 U.S. records from 2003 to 2010 using U.S. Census and death records from the National Center for Health Statistics by Asian subgroup. Although non-Hispanic men and women had the highest overall mortality rates, Asian Indian men and women and Filipino men had greater proportionate mortality burden from ischemic heart disease. The proportionate mortality burden of hypertensive heart disease and cerebrovascular disease, especially hemorrhagic stroke, was higher in every Asian-American subgroup than in non-Hispanic whites.	(43, 44)
ABI	ABI <0.9 supports revising risk assessment by PCE upward. Comments: The ABI is to be used when risk-based decisions about initiation of LDL-C–lowering therapy remain uncertain after quantitative risk assessment by PCE. Same analysis also noted this to be true of family history of premature ASCVD and hsCRP (see above).	(19)

Biomarkers		
Hypertriglyceridemia	HR: 1.37 (95% CI: 0.99) Comments: HRs were at least as strong in those who did not fast as in those who were fasting. HR for CHD after adjustment for nonlipid risk factors was 1.37, but HR was only 0.99 (95% CI: 0.91–1.03) after further adjustment for HDL-C and non–HDL-C. For incident fatal and nonfatal cardiovascular relative risks: Men: Univariate RR for TG: 1.32 (95% CI: 1.26–1.39; *P*<0.05) Adjustment for HDL-C: 1.14 (95% CI: 1.05–1.28; *P*<0.05) Women: Univariate RR for TG: 1.76 (95% CI: 1.50–2.07; *P*<0.05) Adjustment for HDL-C: Univariate RR for TG: 1.37 (95% CI: 1.13–1.66; *P*<0.05)	(45, 46)
hsCRP	HR: 1.63 (95% CI: 1.37) Comments: When adjusted for age and sex, HR was 1.63, but HR was only 1.37 when adjusted further for CHD risk factors.	(47)

Lipoprotein(a)	1. Lp(a) and CHD relationships. In 24 cohort studies: – RR: 1.16 (95% CI: 1.11–1.22) adjusted for age and sex only – RR: 1.13 (95% CI: 1.09–1.18) further adjustment for lipids and conventional risk factors – RR: 1.10 for ischemic stroke (95% CI: 0.98–1.05) 2. Individuals with Lp(a) ≥80th percentile show increased CVD risk with higher LDL-C values than those with LDL-C <96.8 mg/dL (2.5 mmol/L). 3. Quintile analyses showed that risk for incident CVD was graded but statistically significant only for the highest compared with the lowest quintile for Lp(a): – HR: 1.35 (95% CI: 1.06–1.74) for blacks; – HR: 1.27 (95% CI: 1.10–1.47) for whites 4. In Women's Health Study, a curvilinear association with increased CVD risk was reported if Lp(a) was >50 mg/dL, but only among women with total cholesterol >220 mg/dL. In contrast, authors reported a strong association of Lp(a) with CHD among men with low total cholesterol levels in the JUPITER RCT.	(48-51)

Apolipoprotein B	In large multicenter prospective follow-up of patients without CVD: a) TC /HDL-C ratio or apoprotein ratios illustrated no improved risk prediction over TC and HDL-C. b) Adding apoB to TC and HDL-C was associated with slight improvement in CVD risk prediction. Meta-analysis prospective observational studies show apoB > non–HDL-C > LDL-C: – ApoB: RRR 1.43 (95% CI: 1.35–1.51) – Non–HDL-C: RRR 1.34 (95% CI: 1.24–1.44) – LDL-C: RRR 1.25 (95% CI: 1.18–1.33) In frequentist meta-analyses, the mean CHD risk reduction (95% CI) per standard deviation decrease in LDL-C, non–HDL-C and apoB across 7 placebo-controlled statin trials were: – LDL-C: 20.1% (95% CI: 15.6%–24.3%) – Non–HDL-C: 20.0% (95% CI: 15.2%–24.7%) – Apo B: 24.4% (95% CI: 19.2%–29.2%)	(52-54)

*Family history age-adjusted ORs for CVD: 2.6 for men and 2.3 for women. Multivariable-adjusted OR: 2.0 for men and 1.7 for women. Family history of premature CVD was defined as cardiovascular event in first-degree relative <55 y of age in men and <65 y of age in women (4, 30).

ABI indicates ankle-brachial index; apoB, apolipoprotein B; ASCVD, atherosclerotic cardiovascular disease; CHD, coronary heart disease; CI, confidence interval; CKD, chronic kidney disease; CVD, cardiovascular disease; DM, diabetes mellitus; eGFR, estimated glomerular filtration rate; HCV, hepatitis C virus; HDL-C, high-density lipoprotein cholesterol; HIV, human immunodeficiency virus; HR, hazard ratio; hsCRP, high-sensitivity C-reactive protein; JUPITER, Justification for the Use of Statins in Prevention: an Intervention Trial Evaluating Rosuvastatin; LDL-C, low-density lipoprotein cholesterol; Lp(a), lipoprotein (a); MI, myocardial infarction; OR, odds ratio; PCE, pooled cohort equations; RR, risk ratio; RRR, relative risk reduction; TC, total cholesterol; T2DM, type 2 diabetes mellitus; and TG, triglyceride.

Table S3. Strategies to Improve Guideline Implementation by Setting and Target Audience (19, 55-57)

Patient	Clinician	Office/Health System	Health Plan	Retail Pharmacy
• Simplify medication regimens • Provide clear instructions (what the medications is for, how to take it, what to expect) • Encourage the use of telephone alarms, prompts, and other tools to help patient remember to take medication • Encourage support of family and peers • Lower barriers to getting medication (cost, delivery method) • Provide consistent messaging • Remind patients about appointments and follow up on missed appointments • Ask patients to bring	• Initiate clinician–patient risk discussions • Provide brief, simple messages • Assess adherence at every encounter • Maintain contact with patient (follow-up laboratory tests and follow-up visits) • Use shared decision-making aids, motivational interviewing, decision coaching, and question prompt lists (60) • Incorporate discussion about lifestyle into every encounter • Provide prescriptions for diet and exercise recommendations • Teach clinicians to implement ASCVD risk reduction guidelines (61, 62) • Use apps (e.g., ASCVD Risk Estimator Plus (63), CardioSmart Explorer (64), LDL-C Manager	• Leverage decision-support tools imbedded in electronic medical records to promote formulary-based prescribing, minimal out-of-pocket expenses, and implementation of guidelines (72) • Use technology to identify high-risk patients who are not receiving GDMT • Collaborate with other team members to provide patient care (pharmacists, including retail-based; nurses; NP; PA) (23, 73, 74) • Structure care by developing standard treatment plans and pathways • Use peer-to-peer feedback from past performance with guideline implementation	• Reduce the out-of-pocket cost of GDMT/prescriptions (72, 75-77) • Provide greater transparency to allow the patient and clinician determine which medications are included in the patient's drug formulary, the tier level, and the out-of-pocket cost to the patient • Increase access to care • Promote and reimburse for team-based collaborative care (pharmacists, including retail based; nurses, NP, PA) (23, 73, 74)	• Encourage enrollment in automatic refill programs (78) • Encourage 90-d refills versus 30-d refills (79, 80) • Encourage packaging that promotes adherence (81-83) • Encourage use of medication synchronization programs (84, 85)

prescription and nonprescription medication bottles to each office visit • Provide education with behavior support, case management, or telehealth counseling • Increase empowerment through peer-to-peer and social support moderated by clinician • Consider clinician–patient shared accountability for performance measures (58, 59)	(65), Statin Intolerance (66), Mayo Clinic Statin Choice Decision Aid) (67) and other resources (American Heart Association Life's Simple 7 (68), National Lipid Association Patient Tear Sheets (69), Clinicians' Lifestyle Modification Toolbox (70), Preventive Cardiovascular Nurses Association Heart Healthy Toolbox (71), cholesterol tear sheets, and patient education booklets)	to promote change in future care • Participate in registries to improve care • Use academic detailing (61, 62) • Identify stakeholders and make use of audit and feedback on clinical performance (61, 62)		

ASCVD indicates atherosclerotic cardiovascular disease; GDMT, guideline-directed medical therapy; LDL-C, low-density lipoprotein cholesterol; NP, nurse practitioner; and PA, physician assistant.

Table S4. Clinician–Patient Risk Discussion: Useful Checklist

Individualize decision for patient with regard to prevention of ASCVD
1. Importance of addressing other risk factors • Cigarette smoking • Hypertension • DM • Metabolic syndrome, obesity, sedentary behaviors • Other risk-modifying factors (9) **2. Importance of adherence to optimal lifestyle** • Lifestyle improves all metabolic risk factors • Lifestyle still important even in presence of genetic disease or if patient is on statin therapy **3. Understand current risk status with PCE risk estimation** • If age 20–39 y, estimate lifetime ASCVD risk • If age 40–75 y, use 10-y ASCVD risk estimator (63) o Risk estimator estimates to age 79 y if of interest o Reliability of PCEs; need to adjust for ethnic and other factors (use ACC/AHA risk estimator) (9, 86); see Section 7 (9) • Understand that risk estimates are not precise; they start the risk discussion **4. Resolving uncertainty about risk estimation** • If uncertain, consider benefit of CAC scoring (see Section 6 (9)), as a CAC score of zero may indicate that benefits of statin therapy do not outweigh risks. • Understand that, especially in younger patients, a CAC score of zero does not provide information on noncalcified plaques **5. Potential benefit of statin therapy** • Multiple meta-analyses show statins to be effective and safe. In those at risk, statins have been shown to reduce all-cause and cardiovascular mortality rate in primary and as well as in secondary prevention. • Concept of reversal of unstable plaques for high risk • Concept of “the lower, the better” for LDL-C, especially in those at highest risk (favors higher intensity) • Expected risk reduction from prescribed dose (see section on pharmacotherapy (9)) **6. Potential for adverse effects of statins (See Section 5 (9))** • Lack of specificity of common musculoskeletal symptoms and other symptoms falsely attributed to statin therapy. • Consider genetic reasons (SLC01B1) for side effects on simvastatin • Dose versus side effect relationship (See Section 5 (9)) • Potential for drug–drug interaction (see section on pharmacotherapy (9)) • Guidelines encourage pharmacist input to check for drug–drug interactions • In those with DM risk factors, progression to DM more likely with statins, but this is not seen in those with 0–1 DM risk factors. Another reason to stick with heart-healthy lifestyle if placed on a statin. **7. Potential adherence issues of lifetime statin therapy (See Section 6 (9))** • Studies show increased risk in those assigned to statin therapy who did not persist in finding a tolerated statin or dose

- Discuss that benefits from statin therapy are greater in year 3 than in year 1; benefits increase with duration of therapy
- Discuss several studies with long-term follow-up showing benefit

8. **Patient preference and expectations**
   - Patients values, goals, and attitudes toward using medication should be shared so a joint decision can be made
   - Important to inquire about prior experiences with drugs and/or statins
   - Communicate the essential nature of a risk decision involving the evidence, patient characteristics, clinician judgment and after hearing about benefits, risks, and options, the inclusion of patient preference in shared decision-making
   - Use best practices for discussing numeric risk, including teaching aides
   - Ongoing reassessment of patient status and measurements of adherence and percent lowering of LDL-C on statin therapy, along with patient preference, which may change
   - Special considerations for women, various racial/ethnic groups, and those >75 y of age, including cessation of statin therapy in the elderly (see Section 4.4.4.1, 4.4.5.1, and 4.4.5.4 (9))
9. **Consider knowledgeable staff and consider materials for patients who wish to think about this decision (see Section 6 (9)). The decision may, in some cases, require a repeat visit to review issues important to the patient.**

ACC indicates American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; CAC, coronary artery calcium; DM, diabetes mellitus; LDL-C, low-density lipoprotein cholesterol; and PCE, pooled cohort equations.

Table S5. High Blood Pressure or Hypertension: 2017 and 2019 Guideline Recommendations

2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease

Recommendations from the 2017 Hypertension Clinical Practice Guidelines (12) are adapted below.

Section 4.4. Recommendations for Lowering High Blood Pressure Referenced studies that support recommendations are summarized in Online Data Supplements 13 and 14.		
COR	**LOE**	**Recommendations**
I	**A**	**1. In adults with elevated blood pressure (BP) or hypertension, including those requiring antihypertensive medications, nonpharmacological interventions are recommended to reduce BP. These include:** • **weight loss (87-90);** • **a heart-healthy dietary pattern (91-93);** • **sodium reduction (94-98);** • **dietary potassium supplementation (99-103);** • **increased physical activity with a structured exercise program (88, 90, 96, 104-108); and** • **limited alcohol (109-114).** Adapted from recommendations in the 2017 Hypertension Clinical Practice Guidelines (12).
I	**SBP: A** **DBP: C-EO**	**2. In adults with an estimated 10-year ASCVD risk* of 10% or higher and an average systolic BP (SBP) of 130 mm Hg or higher or an average diastolic BP (DBP) of 80 mm Hg or higher, use of BP-lowering medications is recommended for primary prevention of CVD (115-123).** Adapted from recommendations in the 2017 Hypertension Clinical Practice Guidelines (12).
I	**SBP: B-R^{SR}** **DBP: C-EO**	**3. In adults with confirmed hypertension and 10-year ASCVD event risk of 10% or higher, a BP target of less than 130/80 mm Hg is recommended (118, 124-127).** Adapted from recommendations in the 2017 Hypertension Clinical Practice Guidelines (12).
I	**SBP: B-R^{SR}** **DBP: C-EO**	**4. In adults with hypertension and chronic kidney disease, treatment to a BP goal of less than 130/80 mm Hg is recommended (128-133).** Adapted from recommendations in the 2017 Hypertension Clinical Practice Guidelines (12).

I	SBP: B-R[SR] DBP: C-EO	**5. In adults with T2DM and hypertension, antihypertensive drug treatment should be initiated at a BP of 130/80 mm Hg or higher with a treatment goal of less than 130/80 mm Hg (118, 132, 134-139).** Adapted from recommendations in the 2017 Hypertension Clinical Practice Guidelines (12).
I	C-LD	**6. In adults with an estimated 10-year ASCVD risk <10% and an SBP of 140 mm Hg or higher or a DBP of 90 mm Hg or higher, initiation and use of BP-lowering medication is recommended (121, 140-143).** Adapted from recommendations in the 2017 Hypertension Clinical Practice Guidelines (12).
IIb	SBP: B-NR DBP: C-EO	**7. In adults with confirmed hypertension without additional markers of increased ASCVD risk, a BP target of less than 130/80 mm Hg may be reasonable (144-147).** Adapted from recommendations in the 2017 Hypertension Clinical Practice Guidelines (12).

2017 Hypertension Clinical Practice Guidelines (12).

Recommendations for Nonpharmacological Interventions References that support recommendations are summarized in Online Data Supplements 9 through 21.		
COR	**LOE**	**Recommendations**
I	**A**	**1. Weight loss is recommended to reduce BP in adults with elevated BP or hypertension who are overweight or obese (87-90).**
I	**A**	**2. A heart-healthy diet, such as the DASH (Dietary Approaches to Stop Hypertension) diet, that facilitates achieving a desirable weight is recommended for adults with elevated BP or hypertension (91-93).**
I	**A**	**3. Sodium reduction is recommended for adults with elevated BP or hypertension (94-98).**
I	**A**	**4. Potassium supplementation, preferably in dietary modification, is recommended for adults with elevated BP or hypertension, unless contraindicated by the presence of CKD or use of drugs that reduce potassium excretion (99-103).**
I	**A**	**5. Increased physical activity with a structured exercise program is recommended for adults with elevated BP or hypertension (88, 90, 96, 104-108).**
I	**A**	**6. Adult men and women with elevated BP or hypertension who currently consume alcohol should be advised to drink no more than 2 and 1 standard drinks* per day, respectively (109-114).**
I	**SBP: A**	**7. Use of BP-lowering medications is recommended ~~for secondary prevention of recurrent CVD events in patients with clinical CVD and an average SBP of 130 mm Hg or higher or an average DBP of 80 mm Hg or higher, and~~ for primary prevention in adults with an estimated 10-year atherosclerotic cardiovascular disease (ASCVD) risk of 10% or higher and an average SBP 130 mm Hg or higher or an average DBP 80 mm Hg or higher (115-123).**
I	**SBP: B-R^{SR}** **DBP: C-EO**	**8. For adults with confirmed hypertension and known CVD or 10-year ASCVD event risk of 10% or higher (see Section 8.1.2), a BP target of less than 130/80 mm Hg is recommended (118, 124-127).**

I	SBP: B-R[SR] DBP: C-EO	9. Adults with hypertension and CKD should be treated to a BP goal of less than 130/80 mm Hg (128-133).
I	SBP: B-R[SR] DBP: C-EO	10. In adults with DM and hypertension, antihypertensive drug treatment should be initiated at a BP of 130/80 mm Hg or higher with a treatment goal of less than 130/80 mm Hg (118, 132, 134-139).
I	C-LD	11. Use of BP-lowering medication is recommended for primary prevention of CVD in adults with no history of CVD and with an estimated 10-year ASCVD risk <10% and an SBP of 140 mm Hg or higher or a DBP of 90 mm Hg or higher (121, 140-143).
IIb	SBP: B-NR	12. For adults with confirmed hypertension, without additional markers of increased CVD risk, a BP target of less than 130/80 mm Hg may be reasonable (144-147).

Table S6. Cholesterol: 2018 and 2019 Guideline Recommendations

2019 ACC/AHA Guideline on the Primary Prevention of Cardiovascular Disease

Recommendations from the 2018 Cholesterol Clinical Practice Guideline (9) are adapted below.

Section 4.3. Recommendations for Lowering High Blood Cholesterol Referenced studies that support recommendations are summarized in Online Data Supplements 11 and 12.		
COR	**LOE**	**Recommendations**
I	**A**	**1. In adults at intermediate-risk (≥7.5% to <20% 10-year ASCVD risk), statin therapy reduces risk of ASCVD, and in the context of a risk discussion, if a decision is made for statin therapy, a moderate-intensity statin should be recommended (148-155).** Adapted from recommendations in the 2018 Cholesterol Clinical Practice Guideline (9).
I	**A**	**2. In intermediate risk (≥7.5% to <20% 10-year ASCVD risk) patients, LDL-C levels should be reduced by 30% or more, and for optimal ASCVD risk reduction, especially in patients at high-risk (≥20% 10-year ASCVD risk), levels should be reduced by 50% or more (148, 151-156).** Adapted from recommendations in the 2018 Cholesterol Clinical Practice Guideline (9).
I	**A**	**3. In adults 40 to 75 years of age with diabetes, regardless of estimated 10-year ASCVD risk, moderate-intensity statin therapy is indicated (157-165).** Included from recommendations in the 2018 Cholesterol Clinical Practice Guideline (9).
I	**B-R**	**4. In patients 20 to 75 years of age with an LDL-C level of 190 mg/dL (≥4.9 mmol/L) or higher, maximally tolerated statin therapy is recommended (148, 166-171).** Included from recommendations in the 2018 Cholesterol Clinical Practice Guideline (9).
IIa	**B-R**	**5. In adults with diabetes mellitus who have multiple ASCVD risk factors, it is reasonable to prescribe high-intensity statin therapy with the aim to reduce LDL-C levels by 50% or more (148, 153).** Included from recommendations in the 2018 Cholesterol Clinical Practice Guideline (9).

IIa	**B-R**	**6. In intermediate-risk (≥7.5 to <20% 10-year ASCVD risk) adults, risk-enhancing factors favor initiation or intensification of statin therapy (53, 153, 172-178).** Adapted from recommendations in the 2018 Cholesterol Clinical Practice Guideline (9).
IIa	**B-NR**	**7. In intermediate-risk (≥7.5% to <20% 10-year ASCVD risk) adults or selected borderline-risk (5% to <7.5% 10-year ASCVD risk) adults in whom a coronary artery calcium score is measured for the purpose of making a treatment decision, AND** • **If the coronary calcium score is zero, it is reasonable to withhold statin therapy and reassess in 5 to 10 years, as long as higher risk conditions are absent (e.g., diabetes, family history of premature CHD, cigarette smoking);** • **If coronary artery calcium score is 1 to 99, it is reasonable to initiate statin therapy for patients ≥ 55 years of age;** • **If coronary artery calcium score is 100 or higher or in the 75th percentile or higher, it is reasonable to initiate statin therapy (174, 179).** Adapted from recommendations in the 2018 Cholesterol Clinical Practice Guideline (9).
IIb	**B-R**	**8. In patients at borderline risk (5% to <7.5% 10-year ASCVD risk), in risk discussion, the presence of risk-enhancing factors may justify initiation of moderate-intensity statin therapy (174, 180).** Adapted from recommendations in the 2018 Cholesterol Clinical Practice Guideline (9).

2018 Cholesterol Clinical Practice Guideline (9)

Primary Prevention Recommendations for Adults 40 to 75 Years of Age With LDL Levels 70 to 189 mg/dL (1.7 to 4.8 mmol/L) Referenced studies that support recommendations are summarized in Online Data Supplement 16.		
COR	**LOE**	**Recommendations**
I	**A**	**1. In adults at intermediate-risk, statin therapy reduces risk of ASCVD, and in the context of a risk discussion, if a decision is made for statin therapy, a moderate-intensity statin should be recommended (S4.4.2-1–S4.4.2-8).**
I	**A**	**2. In intermediate-risk patients, LDL-C levels should be reduced by 30% or more, and for optimal ASCVD risk reduction, especially in high-risk patients, levels should be reduced by 50% or more (S4.4.2-1, S4.4.2-4–S4.4.2-9).**
I	**B-NR**	**3. For the primary prevention of clinical ASCVD* in adults 40 to 75 years of age without diabetes mellitus and with an LDL-C level of 70 to 189 mg/dL (1.7 to 4.8 mmol/L), the 10-year ASCVD risk of a first "hard" ASCVD event (fatal and nonfatal MI or stroke) should be estimated by using the race- and sex-specific PCE, and adults should be categorized as being at low risk (<5%), borderline risk (5% to <7.5%), intermediate-risk (≥7.5% to <20%), and high-risk (≥20%) (S4.4.2-10, S4.4.2-11).**
I	**B-NR**	**4. Clinicians and patients should engage in a risk discussion that considers risk factors, adherence to healthy lifestyle, the potential for ASCVD risk-reduction benefits, and the potential for adverse effects and drug–drug interactions, as well as patient preferences, for an individualized treatment decision (S4.4.2-12-S4.4.2-14).**
IIa	**B-R**	**5. In intermediate-risk adults, risk-enhancing factors favor initiation or intensification of statin therapy (S4.4.2-6, S4.4.2-15–S4.4.2-22).**
IIa	**B-NR**	**6. In intermediate-risk or selected borderline-risk adults, if the decision about statin use remains uncertain, it is reasonable to use a CAC score in the decision to withhold, postpone or initiate statin therapy (S4.4.2-15, S4.4.2-17, S4.4.2-23).**
IIa	**B-NR**	**7. In intermediate-risk adults or selected borderline-risk adults in whom a CAC score is measured for the purpose of making a treatment decision, AND** • **If the coronary calcium score is zero, it is reasonable to withhold statin therapy and reassess in 5 to 10 years, as long as higher risk conditions are absent (diabetes mellitus, family history of premature CHD, cigarette smoking);** • **If CAC score is 1 to 99, it is reasonable to initiate statin therapy for patients ≥55 years of age;** • **If CAC score is 100 or higher or in the 75th percentile or higher, it is reasonable to initiate statin therapy (S4.4.2-17, S4.4.2-23).**

IIb	**B-R**	**8. In intermediate-risk adults who would benefit from more aggressive LDL-C lowering and in whom high-intensity statins are advisable but not acceptable or tolerated, it may be reasonable to add a nonstatin drug (ezetimibe or bile acid sequestrant) to a moderate-intensity statin (S4.4.2-9).**
IIb	**B-R**	**9. In patients at borderline risk, in risk discussion, the presence of risk-enhancing factors may justify initiation of moderate-intensity statin therapy (S4.4.2-17, S4.4.2-24).**

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