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Original Articles

Provider understanding of the 2013 ACC/AHA cholesterol guideline

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BACKGROUND: Providers' understanding of the 2013 American College of Cardiology (ACC)/American Heart Association (AHA) cholesterol guideline in clinical practice is not known.

METHODS: We designed a questionnaire, which was administered to internal medicine, family practice, cardiology, and endocrinology providers at 21 venues across the United States. We compared responses between providers in training or practice and between specialists (cardiology and endocrinology) and nonspecialists (internal medicine and family practice).

RESULTS: Response rate was 72.1% (543 of 725). About 43% of the providers in training and 48% of those in practice indicated having read the guideline. Almost 50% in each group were unable to identify the 4 statin benefit groups and a large proportion (41% in training and 49% in practice) were not aware of the ≥7.5% 10-year risk threshold for discussion regarding statin therapy. Most (~85%) were unaware of the 4 outcomes assessed by the 10-year ASCVD risk equation. About 36% of the providers in training and 48% in practice could identify a patient with familial hypercholesterolemia and start a discussion regarding statin therapy. Only 27.6% of the providers in training and 40.4% in practice recommended repeating a lipid panel 6–8 weeks after starting statins in a patient with recent myocardial infarction. Similar gaps were noted when comparing specialists to nonspecialists.

The views expressed in this article are those of the authors and do not necessarily represent the views of the Department of Veterans Affairs.

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CONCLUSION: Most providers do not completely understand the 2013 ACC/AHA cholesterol guideline. As an unintended consequence, providers are moving away from lipid testing to document response and adherence to statin therapy. Efforts are needed to address these gaps.

The American College of Cardiology (ACC)/American Heart Association (AHA) cholesterol guideline to reduce atherosclerotic cardiovascular disease (ASCVD) risk was published in November 2013.[1] This guideline document, especially the new pooled cohort risk equation, generated controversy.[2–4] This new risk estimator has distinct differences compared with the Framingham 10-year coronary heart disease (CHD) risk estimator recommended by the prior Adult Treatment Panel (ATP) III guideline.[5] Apart from calculating risk separately for Caucasians and African Americans, this new risk estimator includes 10-year risk of fatal or nonfatal cardiovascular disease (CVD) (fatal CHD or nonfatal myocardial infarction [MI], fatal or nonfatal ischemic stroke) as opposed to the Framingham 10-year CHD risk estimator, which only included fatal CHD or nonfatal MI but not stroke, as the outcome assessed.[5]

A long lag time between publication of guidelines and their use in clinical practice is well recognized.[6–8] Several studies have also shown system-level gaps in care of patients identified to derive the most benefit from statins based on the 2013 ACC/AHA guideline.[9,10] It is currently not known whether there are gaps in providers' understanding of these new guidelines and especially the 10-year ASCVD risk estimator, which could be drivers of these system-level gaps.

Our aim was to determine gaps in providers' understanding of the 2013 ACC/AHA cholesterol management guidelines using a questionnaire survey.

Methods

Questionnaire development and pretesting

We developed a conceptual model (Fig. 1) to identify barriers to the implementation of the 2013 ACC/AHA cholesterol guideline in the 3 domains of provider knowledge, attitude, and behavior. The conceptual model was adapted from the model described by Cabana et al.[11] as used in our prior studies.[7,8] Knowledge gaps included provider's lack of familiarity with the guideline, what constitutes low, moderate, and high-intensity statins, lack of

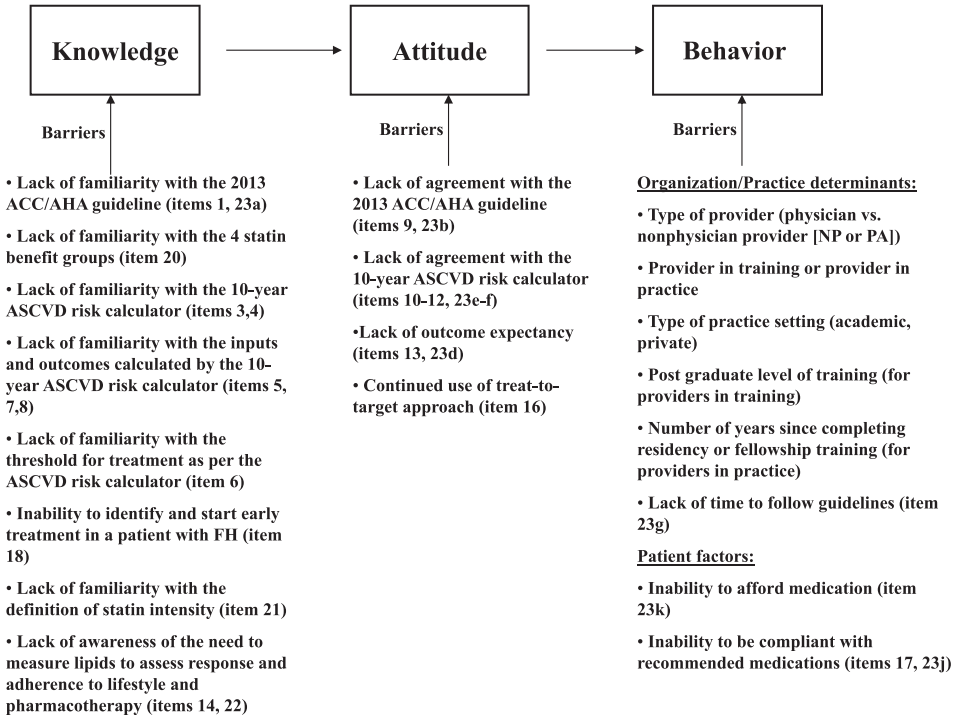

Figure 1 Conceptual model of why a provider may not be able to follow cholesterol management guideline (based on conceptual model by Cabana et al.[11]). ACC, American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; FH, familial hypercholesterolemia; NP, nurse practitioner; PA, physician assistant.

familiarity with 4 statin benefit groups (clinical ASCVD, LDL-C >190 mg/dL, diabetics aged 40–75 years, those with 10-year ASCVD risk ≥7.5%), a lack awareness of the outcomes calculated by the ACC/AHA 10-year ASCVD risk estimator, the differences between the ACC/AHA ASCVD and the Framingham CHD risk estimator, and a provider's lack of awareness that LDL-C ≥190 mg/dL could identify patients with genetic hyperlipidemia. In these patients with genetic hyperlipidemia, the guidelines recommend against the use of 10-year ASCVD risk given their extremely high short-term and long-term CVD risk,[1,5,12–15] and therefore, the discussion regarding the statin initiation should occur early.

Gaps in attitude included lack of agreement with guidelines, provider's belief that the use of the ACC/AHA ASCVD risk estimator will either under or overestimate the true 10-year CVD risk in their patients and lack of outcome expectancy (provider's belief that following the guideline will not improve cardiovascular outcomes in his or her patients). As a move away from treat-to-target to a statin dose-based approach could lead to providers thinking that lipid testing is not needed despite this being a class I recommendation in the guideline,[1] we presented a hypothetical case of a patient with recent MI started on a statin. Providers were asked whether they would repeat a lipid panel at 6–8 weeks of follow-up to document treatment response and adherence in this patient. We also assessed organizational/practice barriers (provider type [specialist or nonspecialist], provider in training or practice), academic vs private practice setting, number of years since completion of formal training, and barriers perceived by providers as secondary to patient factors (eg, adherence to lipid-lowering medication) as potential reasons for their inability to effectively follow the 2013 ACC/AHA cholesterol guideline.[1]

Based on the conceptual model,[11] we developed a questionnaire (Supplemental Fig. 1) with the help of a psychometrician. Figure 1 links each question to one of the conceptual model domains. We pilot tested the questionnaire with 11 providers, including a mix of internists, cardiologists, an endocrinologist, and a physician assistant to ensure good fidelity for testing across practice specialties and across provider types (physicians vs nonphysicians, providers in training or practice). Based on this pretesting, the questionnaire was further refined. Finally, the investigators and the psychometrician conducted a one-on-one session with an internist, in which questions were individually discussed to evaluate whether any question or responses were ambiguous or did not capture its intended purpose. The final questionnaire included 23 items.

Questionnaire administration

We administered the paper-based questionnaire to providers in training and in practice attending educational conferences at their local institutions or regional continuing medical education activities. We targeted providers in internal medicine and family practice and subspecialties (cardiology and endocrinology). The questionnaire included a cover sheet explaining to the participants that the survey assessed their cholesterol management practices and that their participation was voluntary. Providers were not remunerated for participation. Ten to fifteen minutes after handing out the survey, providers were instructed to return completed surveys. If a provider refused initially to accept the questionnaire or did not return it, then that provider was considered a nonresponder.

Outcomes and analyses

We calculated what proportion of providers was aware of the 4 patient groups identified in the recent guidelines to have a risk discussion regarding statin therapy, were aware of the outcomes calculated by the ASCVD risk estimator, the differences between the 10-year ASCVD and Framingham CHD risk estimator, and their ability to identify that in a patient with LDL-C of 210 mg/dL (likely heterozygous FH), a discussion regarding initiation of statin therapy should be pursued. We first compared the responses from providers in practice against providers in training. We then compared responses from providers in internal medicine and family practice (nonspecialists) against those of specialists (cardiologists and endocrinologists). Analyses were conducted with SAS, version 9.4 (SAS Inc, Cary, North Carolina). The P values described are two tailed and adjusted for multiple testing given the large numbers of questions compared for each analysis.[16] A $P < .05$ was considered statistically significant.

The protocol was approved by the Institutional Review Board at Baylor College of Medicine and the Michael E. DeBakey Veterans Affairs Research and Development Committee.

Results

We administered the survey to 725 participants across 21 venues (69.6% in South, 13.1% in Northeast, 12.5% in Midwest, and 4.8% in West) between September 2014 and April 2015. A total of 543 returned the surveys with an overall response rate of 72.1%. We excluded surveys from 30 medical students from among these 543. Therefore, our final analyses included 513 providers.

The mean age of the respondents (Table 1) was 36.3 years (SD = 12.12) with good representation from both genders. The study included 56.5% providers in training and 43.5% providers in practice. Providers in practice were on average about 13.8 years from the completion of their residency or fellowship training. Providers in training were on average 2.5 years into their training. Most of the sample included providers in internal medicine (49%) and family practice (11%) with a sizeable number from cardiology (27%) and a small number from endocrinology (2.1%).

Table 1 Characteristics of the overall study population

Characteristic	Participants (n = 513)
Male, n (%)	298 (58.1)
Age, mean (SD), y	36.3 (12.1)
Provider category	
Provider in practice	223 (43.5%)
Provider in training	290 (56.5%)
Time since completion of residency or fellowship training, mean (SD) for providers in practice, y	13.8 (12.8)
Post graduate training year for providers in training, mean (SD)	2.5 (1.6)
Primary practice specialty, n (%)	
Internal medicine	251 (48.9%)
Family practice	56 (10.9%)
Cardiology	139 (27.1%)
Endocrinology	11 (2.14%)
Other	40 (7.8%)
Missing	16 (3.1%)
Nonphysician provider (nurse practitioner or physician assistant)	34 (6.7%)
Practice type, n (%)	
Academic	277 (54%)
Private	43 (8.4%)
Private with academic affiliation	94 (18.3%)
Missing	99 (19.3%)

SD, standard deviation.

Table 2 provides a comparison of responses between providers in training and providers in practice. Several gaps were noted for both groups. Although 43% of the providers in training and 47.5% in practice indicated having read the 2013 guideline, 49% of the providers in training and 53% of those in practice were unable to correctly identify the 4 statin benefit groups, 41% and 49% of the providers in training and practice, respectively, were not aware of the ≥7.5% 10-year ASCVD risk threshold for initiating a risk discussion, most were unaware of the 4 outcomes assessed by the 10-year ASCVD risk estimator and the difference between the 2013 ASCVD and the Framingham CHD risk estimator. Only 36% of the providers in training and 48% of those in practice could identify a patient with FH and start a discussion regarding statin therapy. When asked about lipid testing in a patient with recent MI, only 27.6% of the providers in training and 40.4% of those in practice recommended a repeat lipid panel 6–8 weeks after starting a statin to document treatment adherence or response. Most providers in both categories still used LDL-C as the target of therapy. Most of these results were not significantly different between the two groups except that a higher proportion of providers in practice were able to identify and treat a patient with FH, and would recommend lipid testing 6–8 weeks after starting statin therapy in a patient with MI.

Table 3 describes the comparison of responses between nonspecialists and specialists. Although a higher proportion of specialists (67.3%) indicated having read the 2013 ACC/AHA cholesterol guideline compared with nonspecialists (39%) and were better able to identify and treat FH (57.3% and 34.2% for specialists and nonspecialists, respectively), major gaps were found for specialists as well. For example, 47.3% of the specialists were not able to correctly identify the 4 statin benefit groups, 38.7% were unaware of the ≥7.5% risk threshold to start risk discussion, 84% could not correctly identify all 4 outcomes calculated by the 2013 ASCVD risk estimator, 42.3% did not identify a patient with FH and start statin therapy, two-thirds were unaware of the definition of the intensity of statin therapy, and 60% would not repeat a lipid panel 6–8 weeks after starting statin therapy in a patient with recent MI.

We also evaluated the reasons identified by providers as barriers to the use of the 2013 ACC/AHA guideline[1] (Supplemental Table 1). Lack of familiarity with the guideline was identified as the major barrier (34.3%), followed by a lack of awareness of data supporting the guideline (17.2%) and patient's inability to afford medications (14.6%). Lack of agreement with the guideline (11.3%) and lack of confidence in the guideline (10.1%) were identified as barriers in a minority of providers.

In terms of the 10-year ASCVD risk estimator (Table 4), 61% of the providers stated that they used it in their practice; with 65.7% stating that they were comfortable using it. Only a minority (7.6%) stated that they did not agree with the risk estimator, with 35.7% stating that the use of the new 10-year risk estimator will overestimate and 16.4% stating that it will underestimate the true 10-year ASCVD risk in their patients.

Table 2 Comparison of responses of providers in training and providers in practice to questions in the knowledge and practice domain

Question*	Providers in training, n = 290 (56.5%)	Providers in practice, n = 223 (43.5%)	*P* value†
Provider has read either the summary or the full report of the 2013 ACC/AHA guideline (item 1)	124 (42.8%)	106 (47.5%)	.47
Provider able to identify the 4 major statin benefit groups (item 20)	147 (50.7%)	105 (47.1%)	.56
Provider aware of the threshold of ≥7.5% 10-year ASCVD risk to initiate discussion regarding risks and benefit of statin therapy (item 6)	170 (58.6%)	114 (51.1%)	.20
Provider understands the 4 outcomes captured by the pooled cohort ASCVD risk equation (item 7)	41(14.1%)	38 (17%)	.52
Providers know the differences between the ATP III guideline recommend Framingham 10-y CHD risk estimator, and the 2013 ACC/AHA guideline recommended 10-year ASCVD risk estimator (item 8)	31 (10.7%)	26 (11.7%)	.80
Provider able to identify a patient with LDL-C ≥190 mg/dL as possible FH and start a risk discussion regarding statin therapy (item 18)	104 (35.9%)	107 (48%)	.03
Provider understands the definition of low, moderate, and high-intensity statin therapy as per the 2013 guideline (item 21)	63 (21.7%)	64 (28.7%)	.20
Provider believes that a repeat lipid panel should be performed within 6–8 weeks in a patient with MI recently started on statin therapy (item 22)	80 (27.6%)	90 (40.4%)	.02
Provider uses LDL-C as target of therapy (item 16)	161 (55.5%)	136 (61%)	.39
Provider incorrectly identifies positive family history as one of the variables used in the 10-year ASCVD risk estimator (item 5)	128 (44.1%)	96 (43.1%)	.80

ACC, American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; ATP, adult treatment panel; CHD, coronary heart disease; LDL-C, low-density lipoprotein cholesterol; FH, familial hypercholesterolemia; MI, myocardial infarction.

*Please see questionnaire (Supplemental Fig. 1).

†Adjusted for multiple comparisons.

We also performed exploratory analyses comparing the responses between providers who stated that they had read the guideline vs those who did not (Supplemental Table 2). Providers who had read the guideline performed significantly better on most questions compared with those who had not read the guideline.

Discussion

Our analyses show that a large proportion of providers have not yet read the 2013 ACC/AHA cholesterol guideline 1, are unaware of the 4 major statin benefit groups, are unaware of the outcomes calculated by the 10-year ASCVD risk estimator and the risk threshold to initiate risk-benefit discussion regarding statin therapy, and are not able to identify and treat heterozygous FH. Most of them continue to use LDL-C as the target of therapy. As an unintended consequence, most of the providers are moving away from lipid testing to document response and adherence to statin therapy. These gaps are seen among providers in practice and providers in training and among specialists and nonspecialists.

Among the most controversial aspects of the 2013 ACC/AHA, cholesterol guideline is the threshold for risk discussion to consider statin therapy in primary prevention situations, which was set at a 10-year ASCVD risk of ≥7.5%.[1] Although one could argue that recent controversies in the medical literature could have led to providers questioning the utility of this risk estimator (and the actual 10-year CVD risk cutoff to be used) in their practice,[2–4] our results indicate a lack of providers' knowledge regarding what ASCVD outcomes are measured by the new risk estimator, and that the inclusion of stroke events differentiates it from the Framingham CHD risk estimator. Our results indicate that an emphasis on the fact that the 2013 ASCVD risk estimator focuses on total CVD (which includes fatal and nonfatal stroke in addition to fatal CHD or nonfatal MI) as opposed to CHD outcomes is important. This welcome change in the outcomes assessed by the 2013 risk estimator is important and should be emphasized to providers as much as the debate regarding what threshold to use for initiating a risk discussion.

Although these surveys were administered on average a year after the release of the 2013 ACC/AHA guidelines, most of the providers had still not read these guidelines. This could indicate the growing trend of providers accessing information related to guidelines either via medical news or online sources. This trend is disturbing as these online sources may not be comprehensive and may not allow the reader to appreciate the evidence behind these guidelines, which are explained in the main guideline document. Indeed, our analyses show that the providers who had read the actual text of the guideline performed better than those who had not read the guideline.

Despite the controversies associated with the 10-year ASCVD risk estimation, statin therapy for the other patient groups (those with established CVD, FH, and diabetes) is

Table 3 Comparison of responses of providers to questions in the knowledge and practice domain across practice specialties

Question*	Internal/Family medicine providers, n = 307 (67.18%)	Cardiology/Endocrinology providers, n = 150 (32.82%)	*P* value†
Provider has read either the summary or the full report of the 2013 ACC/AHA guideline (item 1)	120 (39.1%)	101(67.3%)	.001
Provider able to identify the 4 major statin benefit groups (item 20)	154 (50.2%)	79 (52.7%)	.73
Provider aware of the threshold of ≥7.5% 10-year ASCVD risk to initiate discussion regarding risks and benefit of statin therapy (item 6)	174 (56.7%)	92 (61.3%)	.53
Provider understands the 4 outcomes captured by the pooled cohort ASCVD risk equation (item 7)	46 (15%)	24 (16%)	.80
Providers knows the differences between the ATP III guideline recommend Framingham 10-year CHD risk estimator and the 2013 ACC/AHA guideline recommended 10-year ASCVD risk estimator (item 8)	32 (10.4%)	23 (15.3%)	.26
Provider able to identify a patient with LDL-C ≥190 mg/dL as possible FH and start a risk discussion regarding statin therapy (item 18)	105 (34.2%)	86 (57.3%)	.001
Provider understands the definition of low-, moderate- and high-intensity statin therapy as per the 2013 guideline (item 21)	68 (22.2%)	50 (33.3%)	.03
Provider believes that a repeat lipid panel should be performed within 6–8 wk in a patient with ACS recently started on statin therapy (item 22)	85 (27.7%)	60 (40%)	.03
Provider uses LDL-C as target of therapy (item 16)	177 (57.7%)	82 (54.7%)	.68
Provider incorrectly identifies positive family history as one of the variables used in the 10-year ASCVD risk estimator (item 5)	136 (44.3%)	54 (36%)	.20

ACC, American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; ATP, Adult Treatment Panel; CHD, coronary heart disease; LDL-C, low density lipoprotein cholesterol; FH, familial hypercholesterolemia; MI, myocardial infarction.

*Please see questionnaire (Supplemental Fig. 1).

†Adjusted for multiple comparisons.

not controversial and was also emphasized in the ATP III guideline.[5] Our results indicate that a significant gap persists in providers' understanding of what the guideline states about these noncontroversial areas. These results show a need to emphasize and focus on common evidence-based core elements emphasized in the 2013 guidelines and other major national and international guidelines and recommendation statements[12–15,17] as much as the differences (a move away from LDL-C targets, a lower threshold for risk discussion in primary prevention based on the new risk estimator) between them.[18,19]

The 2013 ACC/AHA guideline found no evidence to support a treat-to-target approach and focused on a statin dose-based approach.[1] With a treat-to-target approach, monitoring of LDL-C levels provided a mean to assess a patient's response and importantly, their adherence to statins. With a statin dose-based approach, monitoring LDL-C levels remains equally important to document adherence. Although the 2013 ACC/AHA guideline clearly states testing of lipids to document response and adherence to statin medications as a class I recommendation,[1] our results indicate that most providers now think that there is no need to follow lipids. This practice could be detrimental as studies have shown that up to 50% of the patients may not be adherent to their lipid-lowering regimen,[20,21] and this nonadherence is associated with poor CVD outcomes.[20] A lack of follow-up lipid panel may lead health care providers to miss out on identifying statin nonadherence. Repeat lipid testing after medication initiation has also been shown to be associated with an improvement in adherence to lipid-lowering therapy.[22] Therefore, this unintended consequence of the 2013 ACC/AHA cholesterol guideline[1] should targeted in future quality improvement initiatives.

An Institute of Medicine report suggested that, on average, it took 17 years for new knowledge to be incorporated into clinical practice.[6] Although we studied the 2013 ACC/AHA guidelines, it is important to note that providers have a large number of guidelines to read[23–25] and implement; and this cognitive load itself serves as a likely barrier. This is evident from our finding that more than half of the providers had not read the

Table 4 Attitude of providers toward ASCVD 10-year risk estimator and their use of 10-year ASCVD risk estimator in their practice

Question*	Response (%)
Provider uses 10-y ASCVD risk in his/her practice (routinely or sometimes) (item 2)	313 (61)
Provider aware of the web version of the 10-year ASCVD risk estimator (item 3)	361 (70.4)
Provider comfortable (very or somewhat) using the 10-y ASCVD risk estimator (item 4)	337 (65.7)
I have confidence in the 10-y ASCVD risk estimator (item 10)	Somewhat or strongly disagree: 44 (8.6)
The use of the ACC/AHA 10-y ASCVD risk estimator will overestimate the true 10-y CVD risk in my patients (item 11)	Somewhat or strongly agree: 183 (35.7)
The use of the ACC/AHA 10-year ASCVD risk estimator will underestimate the true 10-year CVD risk in my patients (item 12)	Somewhat or strongly agree: 84 (16.4)
Provider does not agree with the new 10-y ASCVD risk estimator (item 23e)	39 (7.6)
Provider has heard in the media that the use of new 10-y ASCVD risk estimator will lead to statin overuse (item 23f)	48 (9.36)
Provider does not know where to look for the 2013 ACC/AHA 10-y ASCVD risk estimator (item 23i)	17 (3.31)

ASCVD, atherosclerotic cardiovascular disease; ACC, American College of Cardiology; AHA, American Heart Association; CVD, cardiovascular disease.
*Please see questionnaire (Supplemental Fig. 1).

2013 guideline,[1] and a lack of familiarity with the guideline was identified as the major barrier. This issue is not specific to the 2013 ACC/AHA guidelines as our prior work showed similar gaps in providers' understanding of the ATP III guidelines almost 10 years after they were published.[7,8] Studies in provider behavior have shown that passive diffusion of guidelines from efforts including publication in professional journals or distribution of guidelines via online forums although effective, will likely not suffice.[23,26–28] These will need to be supplemented with more active efforts such as academic detailing,[29] audit and feedback,[30] and the use of decision support system,[31] as multifaceted interventions targeting various gaps are more likely to succeed than isolated interventions, such as guideline distribution or didactic educational lectures.[27,32,33] Indeed, rigorous evaluation is needed to assess the most effective manner to communicate the key messages of these guidelines to providers in a wide variety of settings.

Our study has limitations. Providers included in our analyses were motivated to attend educational sessions and thus are likely different from an average provider. These providers are likely better informed about guidelines than an average provider, given their motivation to update their knowledge base, and therefore, real-world results may show even larger gaps. Most of the providers in our survey represent those working at academic institutions, and therefore, gaps could be worse among providers practicing in nonacademic setting. The venues selected to administer the surveys were not random although, we administered surveys in most geographic regions of the United States potentially improving the external validity of our findings.

Conclusion

Major gaps remain in providers' understanding of the 2013 ACC/AHA cholesterol guideline. These gaps are noted among providers in practice and in training and among specialists and nonspecialists. A great majority of the providers are moving away from lipid testing to document response and adherence to statins. Efforts are needed to address these gaps.

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Supplemental Table 1 Reasons identified by providers as barriers to the use of the 2013 ACC/AHA ASCVD guideline in routine clinical practice

Reason*	Frequency (%)
Lack of familiarity with the guideline (item 23a)	176 (34.3)
Lack of awareness of data supporting the guideline (item 23c)	88 (17.2)
Patient's inability to afford medications (item 23j)	75 (14.6)
Lack of agreement with the 2013 ACC/AHA guideline treatment recommendations (item 23b)	58 (11.3)
Patient's inability to be compliant with medications (item 23k)	53 (10.3)
I have confidence in the new ACC/AHA cholesterol guideline (item 9)	Somewhat or strongly disagree: 52 (10.1)
Lack of outcome expectancy (item 23d)	18 (3.5)
Lack of time to follow current guidelines (item 23g)	21 (4.1)
Provider does not know where to look for guideline (item 23h)	17 (3.3)

ACC, American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease.
*Please see questionnaire (Supplemental Fig. 1).

Supplemental Table 2 Comparison of responses of providers who stated that they had read the guideline vs those who did not

Question*	Providers who stated having read the guideline (summary or the full report), n = 230	Providers who had not read the guideline, n = 283	*P* value†
Provider able to identify the 4 major statin benefit groups (item 20)	139 (60.4%)	113 (39.9%)	.0002
Provider aware of the threshold of ≥7.5% 10-y ASCVD risk to initiate discussion regarding risks and benefit of statin therapy (item 6)	168 (73%)	116 (41%)	.0002
Provider understands the 4 outcomes captured by the pooled cohort ASCVD risk equation (item 7)	42 (18.3%)	37 (13.1%)	.12
Providers know the differences between the ATP III guideline recommend Framingham 10-y CHD risk calculator, and the 2013 ACC/AHA guideline recommended 10-y ASCVD risk calculator (item 8)	38 (16.5%)	19 (6.7%)	.0007
Provider able to identify a patient with LDL-C ≥190 mg/dL as possible FH and start a risk discussion regarding statin therapy (item 18)	113 (49.1%)	98 (34.6%)	.001
Provider understands the definition of low, moderate and high intensity statin therapy as per the 2013 guideline (item 21)	87 (37.8%)	40 (14.1%)	.0002
Provider believes that a repeat lipid panel should be performed within 6–8 wk in a patient with MI recently started on statin therapy (item 22)	77 (33.5%)	93 (32.9%)	.88
Provider uses LDL-C as target of therapy (item 16)	116 (50.4%)	181 (64%)	.003
Provider incorrectly identifies positive family history as one of the variables used in the 10-y ASCVD risk calculation (item 5)	64 (27.8%)	160 (56.5%)	.0002

ACC, American College of Cardiology; AHA, American Heart Association; ASCVD, atherosclerotic cardiovascular disease; ATP, Adult Treatment Panel; CHD, coronary heart disease; LDL-C, low-density lipoprotein cholesterol; FH, familial hypercholesterolemia; MI, myocardial infarction.
*Please see questionnaire (Supplemental Fig. 1).
†Adjusted for multiple comparisons.

Clinical Practices for Cholesterol Management Questionnaire

We would like to know your views on the recently released American College of Cardiology (ACC)/ American Heart Association (AHA) Guidelines on the Treatment of Blood Cholesterol to Reduce Atherosclerotic Cardiovascular Risk in Adults. We greatly appreciate your taking 5-10 minutes to complete this questionnaire.

***Age*: _____ *Gender*: ❑ Male ❑ Female**

Your current position: ❑ Physician ❑ Nurse Practitioner ❑ Physician Assistant ❑ Physician in training ❑ Other (Please specify)_____

Specialty: ❑ Internal Medicine ❑ Family Practice ❑ Endocrinology ❑ Cardiology ❑ Other (please specify)_____

***If you are in training*: Year of residency if you are a resident: _____**
Year of fellowship if you are a fellow: _____
Type of residency or fellowship program: ❑ Private ❑ Academic ❑ Private with an academic affiliation

***If you are in practice*: Number of years since completing residency or fellowship: _____**
Practice area: ❑ Outpatient only ❑ Inpatient only ❑ Both inpatient and outpatient
Type of practice: ❑ Private ❑ Academic ❑ Private with an academic affiliation

1. Which of the following best describes your knowledge of the 2013 ACC/AHA cholesterol management guideline?
   - ❑ a. I am not aware of this guideline.
   - ❑ b. I am aware of its existence, but not aware of its contents.
   - ❑ c. I am aware of some of the content but have not read the summary or the full report.
   - ❑ d. I have read the summary.
   - ❑ e. I have read the full report.

Now, we would like to ask you questions regarding the 10-year atherosclerotic cardiovascular disease (ASCVD) Pooled Cohort Equation recommended by the recent cholesterol management guideline:

2. How often do you use the ASCVD 10-year risk calculator in your practice?

❑ a. Routinely ❑ b. Sometimes ❑ c. Rarely ❑d. I do not use it

3. Are you aware of the web version or the downloadable ASCVD 10-year risk calculator?

❑ a. Yes ❑ b. No

If yes, then how do you access it: ❑ Desktop ❑ Laptop ❑ Smartphone ❑ iPad ❑ Electronic health record

4. *If answer to question 3 is yes*, how comfortable are you in using the ASCVD 10-year risk calculator?

❑ a. Very comfortable ❑ b. Somewhat comfortable ❑ c. Not comfortable

5. Positive family history of premature cardiovascular disease is a factor used in the new ASCVD risk calculator

❑ a. Yes ❑ b. No

6. The current guideline recommends discussing the use of a statin with a patient at what 10-year ASCVD risk threshold?

❑ ≥4% ❑ ≥7.5% ❑ ≥10% ❑ ≥15% ❑ ≥20%

7. The 10-year ASCVD risk calculator provides an estimated risk of what outcome(s) (*please check all that apply)*?

❑ Fatal myocardial infarction (MI) ❑ Non-fatal MI ❑ Need for stenting or bypass surgery ❑ Fatal stroke
❑ Non-fatal stroke ❑ Death from any cause

Supplementary Figure 1

8. Are you aware of any differences between the new 10-year ASCVD risk calculator and the prior Adult Treatment Panel (ATP) III Framingham risk calculator (*please check all that apply*)?

❑ a. The new calculator is race specific, whereas, the prior risk calculator was not.

❑ b. The new risk calculator includes family history in calculation of 10-year risk, whereas the prior calculator did not.

❑ c. The 10-year adverse outcome(s) estimated by the new risk calculator differ from the prior calculator.

❑ d. They are the same except that the threshold for treatment consideration is lower for the new 10-year ASCVD risk calculator compared with the prior risk calculator.

Instructions: Please indicate how strongly you agree with each of the following statements by circling the appropriate number on the response scale.

	Strongly Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Strongly Agree
9. I have confidence in the new ACC/AHA cholesterol guidelines.	1	2	3	4	5
10. I have confidence in the new ACC/AHA ASCVD risk calculator.	1	2	3	4	5
11. The use of the ACC/AHA 10-year ASCVD risk calculator will overestimate the true 10-year CVD risk in my patients.	1	2	3	4	5
12. The use of the ACC/AHA 10-year ASCVD risk calculator will underestimate the true 10-year CVD risk in my patients.	1	2	3	4	5
13. Following the new ACC/AHA cholesterol guideline will lead to an improvement in cardiovascular outcomes in my patients.	1	2	3	4	5
14. With recent guidelines, I do not see a need to repeat a lipid panel once a patient is on a statin.	1	2	3	4	5

15. I usually titrate the statin dose on my patients rather than starting them on the highest recommended dose.

❑ a. Yes ❑ b. No

16. Do you currently use LDL cholesterol as the *target of therapy* for cholesterol management in your patients?

❑ a. Yes ❑ b. No

17. Approximately, what percent of your patients are not able to tolerate statins due to myalgias? _____

18. A 30 year old White male with no prior medical history presents to your office for a routine physical exam. His lipid panel shows a total cholesterol of 265 mg/dL, triglycerides of 80 mg/dL, LDL-C of 210 mg/dL, and HDL-C of 39 mg/dL. What would you recommend?

❑ a. Screening with carotid intima media thickness or coronary calcium score.

❑ b. Discuss the use of statin therapy with the patient.

❑ c. Perform a 10-year ASCVD risk calculation to determine if patient is a candidate for statin therapy.

❑ d. Discuss diet and life style recommendations and repeat 10-year ASCVD risk calculation in 5 years.

❑ e. Reassure the patient and repeat lipids and 10-year ASCVD risk calculation in 5 years.

19. A 63 year old African American male with history of hypertension (treated with hydrochlorothiazide) presents for a routine check-up. His fasting lipid panel shows total cholesterol 183 mg/dL, triglycerides of 85 mg/dL, HDL-C of 42 mg/dL, LDL-C 124 mg//dL. He is not a smoker or a diabetic. His blood pressure is 127/84 mm Hg. What is your guess about this person's 10-year risk of ASCVD?

❑ a. <5% ❑ b. 5-7.5% ❑ c. 10% ❑ d. 15% ❑ e. 20% ❑ f. >20%

Supplementary Figure 1 (continued)

20.The recent cholesterol management guideline recommends discussing statin use with which group of patients?

❑ a. Patient with established cardiovascular disease, diabetics age 40-75 years, patients with chronic kidney disease on hemodialysis, and patient with LDL cholesterol ≥ 190mg/dL

❑ b. Patients with established cardiovascular disease, diabetics age 40-75 years, patients with LDL cholesterol ≥ 190mg/dL, and patients with 10 years ASCVD risk ≥ 10%

❑ c. Patients with established cardiovascular disease, diabetics age 40-75 years, patients with LDL cholesterol ≥ 190mg/dL, and patients with chronic kidney disease not on dialysis

❑ d. Patients with established cardiovascular disease, diabetics age 40-75 years, patients with LDL cholesterol ≥ 190mg/dL, and patients with 10 years ASCVD risk ≥ 7.5%

21. What percent of LDL-C reduction would you expect from low, moderate or high intensity statin therapy according to the 2013 ACC/AHA cholesterol management guideline?

❑ (a) <20% for low, 20-<40% for moderate, and ≥ 40% for high-intensity statin therapy.

❑ (b) <30% for low, 30-<40% for moderate, and ≥ 40% for high-intensity statin therapy.

❑ (c) <20% for low, 20-<35% for moderate, and ≥ 35% for high-intensity statin therapy.

❑ (d) <30% for low, 30-<50% for moderate, and ≥ 50% for high-intensity statin therapy.

❑ (e) I do not know.

22. You are evaluating a 55 year old African American patient 4 weeks after admission for a ST segment elevation myocardial infarction. Patient received a stent. The patient was also started on aspirin 81 mg daily, clopidogrel 75 mg daily, metoprolol 25 mg twice daily, and atorvastatin 80 mg daily. At this point:

❑ (a) You will repeat a fasting lipid panel in the next 6-8 weeks.

❑ (b) You will repeat a fasting lipid panel in the next 12-15 months.

❑ (c) You will not repeat a lipid panel since the patient is already on high-intensity statin therapy.

23. What are the possible reasons that you may not be able to follow the cholesterol management guideline in your practice? Below we have listed many possible reasons. *Please check all that apply*.

❑ (a) I am not very familiar with the recent cholesterol management guideline.

❑ (b) I do not agree with the treatment recommendations made by the recent cholesterol guideline.

❑ (c) I am not aware of the data supporting the recent cholesterol management guidelines.

❑ (d) I am aware of the data but do not believe that cholesterol guideline is important to follow in my patients.

❑ (e) I do not agree with the new 10-year ASCVD risk calculator.

❑ (f) I have heard in the media that the use of new 10-year ASCVD risk calculator will lead to statin overuse.

❑ (g) I do not have time to follow guidelines in my practice.

❑ (h) I do not know where to look for the recent guidelines.

❑ (i) I do not know where to look for the recent 10-year ASCVD risk calculator.

❑ (j) My patients will not be compliant with statins due to side effects (e.g. myalgia).

❑ (k) The medication cost associated with statins in my patients will be prohibitive.

❑ (l) Other reasons (*please specify*): _____

Any comments or concerns about the questionnaire or the guideline? Please comment on the reverse side.

Thank you for participating in our study!

Supplementary Figure 1 (continued)