

Specialty preference for cardiovascular prevention practice in the Southeast US and role of a preventive cardiologist

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Abstract

Introduction: Cardiovascular disease (CVD) prevention is practiced concurrently by providers from several specialties. Our goal was to understand providers' preference of specialties in CVD prevention practice and the role of preventive cardiologists.

Materials and Methods: Between 11 October 2021 and 1 March 2022, we surveyed providers from internal medicine, family medicine, endocrinology, and cardiology specialties to examine their preference of specialties in managing various domains of CVD prevention. We examined categorical variables using Chi square test and continuous variables using t or analysis of variance test.

Results: Of 956 invitees, 263 from 21 health systems and 9 states responded. Majority of respondents were women (54.5%), practicing physicians (72.5%), specializing in cardiology (43.6%), and working at academic centers (51.3%). Respondents favored all specialties to prescribe statins (43.2%), ezetimibe (37.8%), sodium–glucose cotransporter-2 (SGLT2) inhibitors (30.5%), and aspirin in primary prevention (36.3%). Only 7.9% and 9.5% selected cardiologists and preventive cardiologists, respectively, to prescribe SGLT2 inhibitors. Most preferred specialists (i.e. cardiology and endocrinology) to manage advanced lipid disorders, refractory hypertension, and premature coronary heart disease. The most common conditions selected for preventive cardiologists to manage were genetic lipid disorders (17%), cardiovascular risk assessment (15%), dyslipidemia (13%), and refractory/resistant hypertension (12%).

Conclusions: For CVD prevention practice, providers favored all specialties to manage common conditions, specialists to manage complex conditions, and preventive cardiologists to manage advanced lipid disorders. Cardiologists were least preferred to prescribe SGLT2 inhibitor. Future research should explore reasons for selected CVD prevention practice preferences to optimize care coordination and for effective use of limited expertise.

Key Messages

What is already known on this topic

CVD continues to be a leading cause of mortality despite advancements in treatment. Health systems and clinicians from diverse specialties are invested in offering cardiovascular prevention practice addressing various domains such as in managing lipids, hypertension, premature CHD, diabetes, and others. Little is known about provider's preference about which specialties should manage various domains of cardiovascular prevention, including medication prescriptions which are increasingly more complex or provider's preference for the role of preventive cardiologists.

What this study adds

We found that respondents preferred most specialties to manage common cardiovascular prevention pertinent conditions and cardiology providers to manage complex conditions such as advanced lipid disorders. However, respondents less favored cardiology providers to prescribe GLP-1 agonists and SGLT2 inhibitors. Respondents preferred preventive cardiology providers to manage family history of premature CHD, familial hypercholesterolemia, elevated lipoprotein (a), and other genetic lipid disorders.

How this study might affect research, practice or policy

Efforts to reduce cardiovascular mortality continue to affect care across multiple specialties. Our study illuminates the gaps and opportunities that exist in cardiovascular prevention practice. Further research should explore clinicians' preferences for specific CVD prevention practice patterns management across multiple specialties to guide effective use of healthcare resources.

Research questions emerged from the current study:

- Identify appropriate strategies to incorporate training of internal and family medicine specialists in management of advanced lipid disorders.
- Understand the barriers for cardiologists to use SGLT2 inhibitors and GLP-1 receptor agonists.
- Understand patient and system level barriers in optimal coordination and practice of cardiovascular preventive care.
- Pilot optimal strategies in coordination of care in cardiovascular prevention among several specialties including preventive cardiologists.

Main messages from the current study:

- Coordination of cardiovascular preventive care, which is increasingly more complicated and practiced among several specialists, can improve the coordination and impact of cardiovascular prevention. This study adds to the literature by providing clinicians' preference about which specialty should practice which domain of cardiovascular prevention, and when to refer to specialists in the Southeast US.
- Clinicians preferred most specialties to manage common cardiovascular prevention pertinent conditions.
- Internal and family medicine specialists were less preferred but specialists, particularly cardiologists were more preferred to manage advanced lipid disorder.
- Clinicians identified preventive cardiologists' role in the management of family history of premature CHD, familial hypercholesterolemia, elevated lipoprotein (a), and other genetic lipid disorders.
- Cardiologists were less preferred to prescribe SGLT2 inhibitors and GLP-1 receptor agonists, which are medications with established cardiovascular benefits.

Keywords: cardiovascular prevention, preventive cardiology

Introduction

Despite increasing treatment options, the burden of cardiovascular disease (CVD) has not improved proportionately across many regions of the United States, particularly in the Southeast known as the "stroke belt" [1, 2]. Clinicians from various specialties, including family medicine, internal medicine, cardiology, and endocrinology provide CVD prevention addressing hypertension, diabetes, obesity, lipids, risk stratification, and premature coronary heart disease (CHD), among others [3–5]. Practice guidelines and consensus recommendations emphasize multi-disciplinary, team based, and a holistic approach for CVD prevention [3–7]. The scope of CVD prevention is expanding due to increasing availability of effective but complex pharmacotherapeutic options [8–13]. As such, some have even called for a unified and integrated practice of preventive cardiology as a subspecialty of cardiology dedicated to all aspects of CVD prevention [3–7]. Having multiple therapeutic options and expertise is an important initial step but by itself is not sufficient for optimal CVD prevention [4, 5]. Comprehending how best to use the available expertise is equally important and requires understanding of providers' preference of specialties to manage various domains of CVD prevention [14].

Understanding providers' preference toward CVD prevention practice can help develop and organize appropriate strategies for delivery of preventive care to align with the local needs and resources. For example, what should be and can be managed within the usual premise of primary care visits and when it is appropriate for a patient to see a specialist, or which specialty is preferred to manage a specific condition, are few examples of how understanding these issues can improve the coordination and impact of CVD preventive care. Studies to date on providers' preference in CVD prevention practice are limited and mostly reveal challenges in offering CVD prevention by general practitioners [15, 16]. We are not aware of any published studies assessing CVD preventive practice preferences of clinicians from multiple specialties, particularly with increasingly complicated CVD prevention practice.

Our goal for this study was to understand specialty preference of clinicians practicing CVD prevention from multiple specialties, including the role of preventive cardiologists. This study can help identify gaps and opportunities in CVD prevention practice that could be harnessed to improve population cardiovascular health. For example, this study will inform optimal care coordination for

CVD prevention practice among various disciplines commensurate with health system's resources. This study can also inform approaches to support primary care providers (PCPs) and specialists in CVD prevention practice. Accordingly, we examined family medicine, internal medicine, cardiology, and endocrinology clinicians' specialty preference for managing CVD preventive conditions including prescriptions of specific medications, and clinicians' opinion about the role of preventive cardiologists.

Materials and Methods

Questionnaire development

We used Cabana's framework, our clinical experience and existing literature to identify relevant constructs [15–18]. Cabana's framework posits that physicians' lack of adherence to guidelines stems from knowledge (lack of familiarity to the guidelines), attitude (lack of motivation, agreement, self-efficacy, and outcome expectancy of the guidelines), and behavior (barriers related to patients, guidelines, and environment). Our questionnaire was developed focusing on providers' knowledge about selected CVD prevention content and environmental barriers (e.g. inadequate resources and time, availability of relevant expertise), assessment of providers' attitude, and perception about CVD prevention practice [17].

We conducted literature search and identified relevant published constructs, such as adherence to risk assessment tools and cardiovascular practice guidelines [19–21], confidence and challenges pertinent to cardiovascular risk factors management [15, 16, 18], and putative role of a preventive cardiologist [14, 22–24]. Then we discussed these constructs among five clinicians comprising training physicians and board certified practicing physicians in internal medicine, family medicine, endocrinology, and cardiology about how they conceptualized the proposed constructs. These interviews helped us finalize the following constructs for the questionnaire: (i) availability of expertise, (ii) clinicians' confidence in management of CVD prevention-pertinent conditions, including prescribing related medications, and (iii) clinicians' specialty preference for managing conditions, including their opinion about the role of a preventive cardiologist. The current study is based on the third construct. After confirming the constructs, we developed an initial 21 item questionnaire following current best practice in survey design and using unambiguous vocabulary [25]. Subsequently, 10 practicing physicians and trainees, including cardiologists with practice focus on preventive cardiology and a cardiology physician assistant examined items for practical and clinical relevance and alignment with our constructs for face and content validity. During this process, we iteratively revised the questionnaire for representativeness, clarity, and relevance [25].

Subsequently, five practicing physicians and physicians in training, including two cardiologists with a focus on preventive cardiology, discussed the relevance and clarity of the items to the constructs of interest. They evaluated the survey construction process and assessed whether their interpretation of the items matched the intention [25]. This resulted in minor modifications mostly related to the presentation and flow of the items. Subsequently, we developed the questionnaire in the Research Electronic Data Capture (REDCap) software [26]. We pilot tested the online questionnaire among 10 clinicians (nurse practitioners, practicing and training physicians, pharmacists) from internal medicine, family medicine, endocrinology, and cardiology. The piloting resulted in three additional minor modifications of the questionnaire, mainly related to flow, clarity, presentation, and

user friendliness, before an 18-item questionnaire was finalized. We reduced the average completion time from 10–15 minutes to 7–8 minutes for the final version, and the responses could be entered using a smart phone. Questionnaire formation steps are summarized in [Supplemental Fig. 1](#).

Sampling of participants

The Atrium Wake Forest Baptist Medical Center Institutional Review Board exempted the requirement for full ethical review. Our target population comprised of physicians, nurse practitioners, physician assistants, and pharmacists working in internal medicine, family medicine, endocrinology, and cardiology specialties practicing predominantly in the Southeast US. We chose these specialties as they provide most of the CVD prevention-related care. We used convenience sampling of providers from several academic and private practices.

Questionnaire administration

We identified potential participants by contacting health system/practice leaders and The Consortium for Southeast Healthcare Quality, a non-profit consortium focusing on quality improvement of chronic illnesses. These health system/practices reach over multiple practices in the Southeast US. Using convenience sampling, we contacted nine administrative assistants from these health systems/practices and the consortium. The administrative assistants sent mass emails to help recruit participants with a brief information about the study and a link to the REDCap questionnaire. The emails targeted mostly clinical personnel within each department. We excluded participants who were not involved in outpatient clinical practice and non-clinical staff. A protocol for administration of the questionnaire was developed and communicated with the administrative assistants. Investigators sent a reminder email to each administrative assistant 1 day prior to the scheduled day to email the questionnaire. To improve response rates, each participant received four emails starting 10 November 2021 and was closed on 03 January 2022. For two sites, the distribution email list was slightly modified as we learned more about potential respondents' eligibility. Due to email fatigue, one site sent mass email twice and another site thrice only. During the open survey period, the total number of participant responses was viewed in REDCap. To preserve anonymity, unique participants could not be identified in REDCap. Therefore, participants received subsequent reminder emails even if they had already completed the survey but were told to disregard if they had already completed the survey. The administrative assistants' emailed investigators the total numbers of participants included in each mass email, and the total number of inactive email accounts or email addresses of non-clinical providers. We calculated the overall numbers of participants invited by one administrative assistant over total consecutive emails by averaging the total participants by the total number of emails sent per participant. A total of 956 participants received invitations to complete the questionnaire. Participants were able to enter into an optional raffle of 20 Amazon gift cards worth \$25 each.

Statistical analysis

We calculated the response rate by dividing the total number of respondents (numerator) by the total number of eligible questionnaire recipients (denominator = total number of participants in the mass emails minus inactive emails and emails of non-clinical person). Out-of-office or vacation auto-reply messages were not excluded when calculating response rate. For analysis, we first

grouped self-reported respondent specialty into four groups: cardiology, internal medicine, family medicine, and endocrinology. Respondents who reported their specialty as other options (item 4, $n = 13$) as pharmacists ($n = 5$), affiliated with both internal and family medicine ($n = 1$), primary care ($n = 1$), metabolic disorder ($n = 1$), ambulatory care ($n = 1$), pulmonology/critical care ($n = 1$), or missing ($n = 1$) were considered to have internal medicine and those indicating pediatrics ($n = 2$) as family medicine specialty.

We first described respondents' preference to manage a given condition or prescribe related medications by family medicine, internal medicine, endocrinology, preventive cardiology, general cardiology, or all listed specialties (Table 1). To create larger similar analytic groups, we subsequently merged the choices of internal and family medicine as PCP, merged endocrinology, preventive cardiology, and general cardiology as specialists, and did not change the option "all listed specialties" (Fig. 1).

We performed several prespecified subgroup analyses in exploratory analyses. Subgroups were predefined by age (\leq median vs. $>$ median age), sex (men vs. women), specialty (PCPs vs. specialists), occupation [physician vs. non-physicians (advanced practice providers and pharmacists; advanced practice providers included physician assistants and nurse practitioners)], duration of training or practice (\leq median vs. $>$ median), type of practice for those practicing [academic vs. others (private and private with academic affiliation)], and practice area (outpatient only vs. both outpatient and inpatient practice).

We examined categorical variables using Chi square test and continuous variables using t test or Analysis of Variance test to compare specialty preferences by respondent's characteristics. We did not adjust for multiple testing. We conducted analyses in R (4.0.2) using packages "finalfit" and "dplyr" and considered a two tailed $P < .05$ as significant.

Results

A total of 263 invitees from 21 health systems in 9 states (91% from North Carolina) participated in the survey (27.6% response rate, Table 1). The median age (25th, 75th percentile) was 39 (31, 52) years and 54.5% were women. About 43.6%, 32.3%, 19.8%, and 4.3% were from cardiology, internal medicine, family medicine, and endocrinology specialty, respectively; 72.5% were physicians, 10.3% nurse practitioners, 8.8% pharmacists, and 8.4% physician assistants; 73.8% were practicing and 26.2% were under training; 51.3% worked in academic institution, 24.9% in private with academic affiliation, and 23.8% in private institution; 65.5% practiced in both inpatient and outpatient setting, 29.5% in outpatient, and 5% in inpatient setting only.

Respondents selected preventive cardiology as the most preferred specialty to manage family history of premature CHD (33.1%), familial hypercholesterolemia (35.2%), elevated lipoprotein (a) (44%), other genetic lipid disorders (40%), chronically elevated triglycerides (30.6%), low high-density lipoprotein cholesterol (30.3%), and elevated high-sensitivity C-reactive protein (38.8%, Table 1, Supplemental Fig. 2). Respondents selected general cardiology as the most favored specialty to manage resistant/refractory hypertension (26.9%, nephrology was not an option), and both general and preventive cardiology as the most preferred specialty to manage patients with personal history of premature CHD or statin intolerance.

Respondents chose all listed specialties (i.e. family medicine, internal medicine, preventive cardiology, endocrinology, and general cardiology) as the most preferred choice to prescribe statins, ezetimibe, sodium-glucose cotransporter-2 (SGLT2)

inhibitors, metformin, and aspirin in primary prevention (Table 1). Respondents indicated both general and preventive cardiology as the most preferred specialties to prescribe proprotein convertase subtilisin/kexin type 9 inhibitors (PCSK9i) and icosapent ethyl, and preventive cardiology followed by general cardiology to prescribe bempedoic acid. Respondents selected both general and preventive cardiology as the least preferred specialties to prescribe SGLT2 inhibitors and glucagon-like peptide 1 (GLP-1) agonists.

When preferred specialties were grouped by PCP, specialists, and all listed specialties, results were broadly similar with some differences. Specialists (mainly general cardiologist/preventive cardiologist) were the most preferred to manage patient or family history of CHD, familial hypercholesterolemia, statin intolerance, chronically elevated triglycerides, elevated high-sensitivity C-reactive protein, management of advanced lipid disorders, such as elevated lipoprotein (a) and use of newer lipid-lowering therapies, but were less preferred to prescribe GLP-1 receptor agonists and SGLT2 inhibitors. Conversely, PCPs were slightly more preferred to manage resistant/refractory hypertension and to prescribe GLP-1 receptor agonists and SGLT2 inhibitors (Fig. 1). Both PCPs and specialists were equally preferred to prescribe aspirin for primary prevention.

When specifically asked what conditions should be managed by preventive cardiologists, respondents preferred genetic lipid disorders (17%), cardiovascular risk assessment (15%), dyslipidemia (13%), and refractory/resistant hypertension (12%). About 40% desired only one or a few consultation visits and 59% preferred longitudinal regular follow-up model of care with preventive cardiologist (1% no response).

Several themes were noted in subgroup analyses. For example, clinicians ≤ 39 years preferred PCPs to manage resistant/refractory hypertension compared to those > 39 years (58.9% vs. 40.6%, $P = .006$). One important finding was that clinicians preferred their own specialty to manage certain conditions [e.g. PCPs preferred PCPs to manage familial hypercholesterolemia over specialists (47.3% vs. 14.4%, $P < .0001$), while specialists preferred specialists to manage familial hypercholesterolemia over PCPs (84.7% vs. 68.7%, $P = .006$), Supplemental Tables 1 and 2].

Discussion

The aim of our study was to assess clinicians' specialty preference for managing CVD prevention pertinent conditions and prescribing related medications. Generally, clinicians preferred specialists to manage complex conditions such as advanced lipid disorders. They expressed preventive cardiologists' role in complex lipid management and cardiac risk assessments. These findings suggest a preferred shift to designate more complex patient management to specialists, such as general and preventive cardiologists. However, cardiologist was the least selected specialty to prescribe medications with established cardiovascular benefits like SGLT2 inhibitor and GLP1 agonist [11–13, 27]. Taken together, our study provides important insights into clinicians' specialty preference to deliver preference concordant care and shows some gaps and opportunities in CVD prevention practice in a region commonly referred as "stroke belt" [1, 2].

Some studies have explored general practitioners' perceptions of CVD prevention practices and understanding of guidelines, showing challenges in offering preventive services due to a lack of confidence or experience with certain medications [15, 16]. However, to our knowledge, there is no published study examining clinicians' perspective on which specialties are most preferred

Table 1. Heatmap of preferred specialty to manage conditions and prescribe medications.

Which specialty should manage the following conditions or prescribe the following medications? (N=264) ^a	Total responses	Family medicine, %	Internal medicine, %	Preventive cardiology, %	Endocrinology, %	General cardiology, %	All listed specialties, %
Resistant/refractory hypertension	476	15.7	24.6	21.4	3.2	26.9	8.2
Patient history of premature CHD	468	13.0	16.0	31.0	0.9	33.8	5.3
Family history of premature CHD	493	18.3	21.1	33.1	1.0	20.5	6.1
Familial hypercholesterolemia	474	11.4	15.4	35.2	11.8	18.8	7.4
Other genetic lipid disorders	450	8.2	11.6	40.0	17.3	18.2	4.7
Statin intolerance	470	15.5	18.9	29.6	3.2	23.4	9.4
Chronically elevated triglycerides (≥ 500 mg/dl)	468	11.8	15.0	30.6	14.1	19.4	9.2
Low high density lipoprotein cholesterol	439	16.4	20.5	30.3	7.1	16.2	9.6
Elevated high-sensitivity C-reactive protein	420	9.3	13.8	38.8	5.5	24.3	8.3
Elevated lipoprotein (a)	425	8.7	11.5	44.0	6.8	23.3	5.6
Statins	377	15.1	17.5	11.1	0.5	12.5	43.2
Ezetimibe	381	12.6	15.0	17.1	1.0	16.5	37.8
PCSK9i	457	5.3	8.1	31.9	8.1	30.6	16.0
Icosapent ethyl	417	4.8	7.9	34.1	8.6	28.1	16.5
Bempedoic acid	401	3.7	6.0	38.4	10.0	27.4	14.5
Metformin	447	21.9	25.1	5.1	18.3	2.9	26.6
GLP-1 agonist	464	20.3	23.3	8.6	19.4	4.5	23.9
SGLT2 inhibitors	443	16.3	19.6	9.5	16.3	7.9	30.5
Aspirin in primary prevention	411	14.8	17.3	14.8	2.4	14.4	36.3

^aOne participant can have >1 response.

0%	5%	10%	15%	20%	25%	30%	35%	40%	45%

in CVD prevention. CVD continues to be a leading cause of deaths despite availability of multiple therapies to lower CVD risk [1, 2]. Ideal CVD prevention requires an interdisciplinary approach involving healthcare administrators to the clinicians from multiple disciplines delivering the care [3–5]. Practice guidelines recommend referral to specialists after maximizing therapy by PCPs, such as with severe primary hypertriglyceridemia, resistant hypertension, or for cholesterol management

despite treatment with statins, ezetimibe, and PCSK9i [3–7]. Understandably, there is no single best approach to provide and coordinate CVD prevention care due to various reasons, including providers' preferences, self-efficacy, and their availability. Results from study like ours can inform better allocation of resources, organization in delivery of care, and identification of healthcare gaps. Having an understanding for which specialties are the most preferred to manage given conditions may

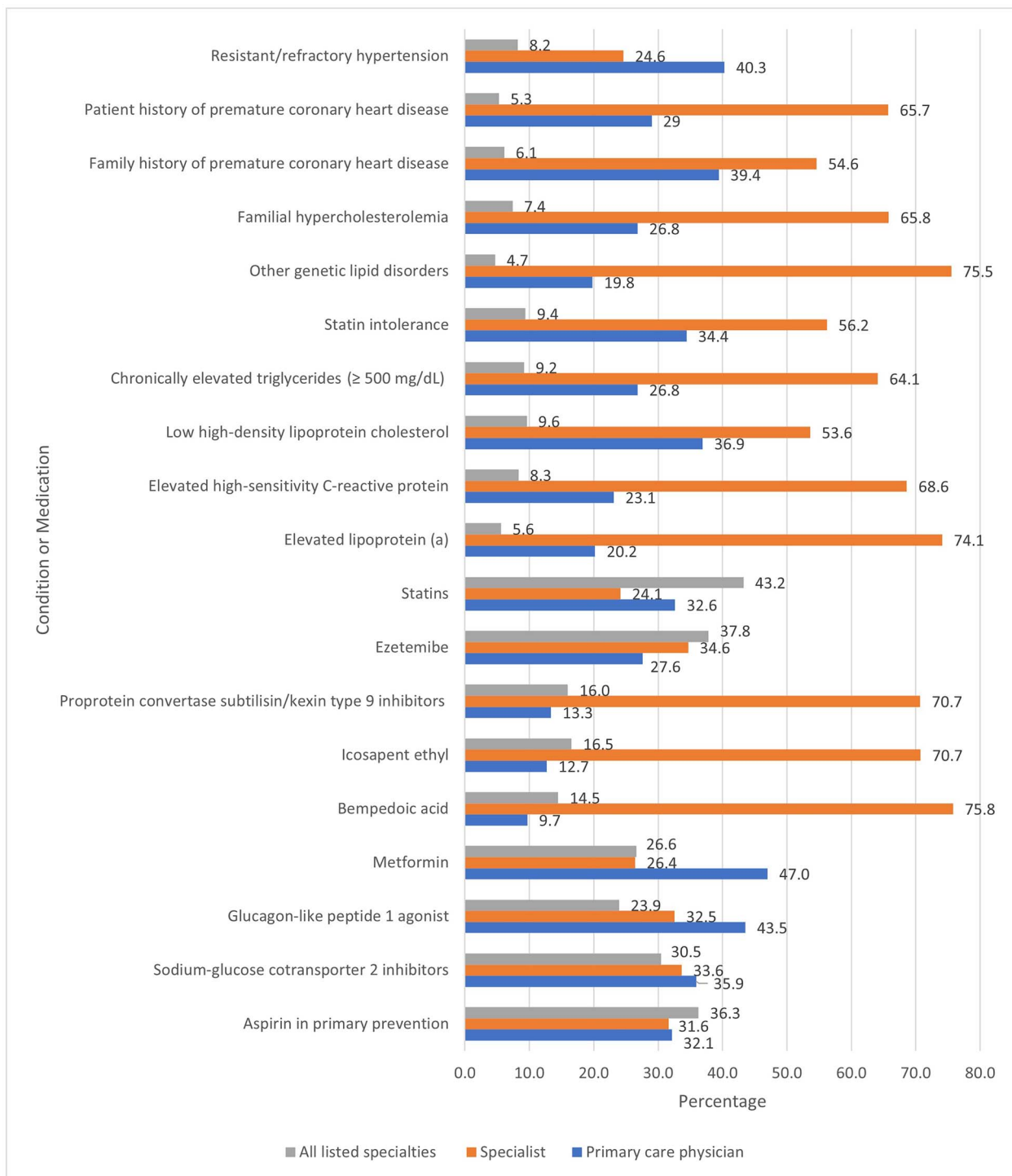


Figure 1. Preferred specialty to manage cardiovascular preventive conditions and prescribe pertinent medications

improve care coordination and reduce redundancies between providers.

Despite landmark studies demonstrating cardiovascular benefits with GLP-1 receptor agonists and SGLT2 inhibitors [27], their use in clinical practice is quite low [6]. Expert consensus in the US recommends using these medications by various providers, including PCPs, endocrinologists, and cardiologists with a team-based approach [6]. Reasons for hesitancy to use these agents in cardiology practices are not clear but may be attributed to unfamiliarity in using diabetes medications for cardiovascular

benefits, lack of personal and clinic's capacity to "deal" with diabetes or side effects of these medications. Furthermore, there may be appropriate reason for delay in using GLP-1 receptor agonists and SGLT2 inhibitors as providers could be using other guideline-recommended medications prior to GLP-1 receptor agonists and SGLT2 inhibitors [6, 7]. Nevertheless, etiology for low prescription of GLP-1 receptor agonists and SGLT2 by cardiologists warrants further investigation especially given their cardiovascular benefit and recommendation by cardiac professional society [6].

