Setting the Agenda for Preventive Cardiology

Michael D. Shapiro, Sergio Fazio

Preventive cardiology is a spontaneously emerging subspecialty with a broad base of support from multiple disciplines but no obvious consensus on its logistical, educational, and disciplines boundaries. Here, we examine the origins and current status of the field and provide a roadmap for its future success as a subspecialty.

What Is Preventive Cardiology?

To some, it is a general concept encompassing a range of interests so wide to include basic research, population studies, community medicine, and public policy work. To others, it is a philosophy that informs and defines an aspect of a more general clinical practice stance, be it general cardiology, endocrinology, or internal medicine. To us, practitioners of this clinical art, it is a discipline in its own right and worthy of attaining subspecialty status. Atherosclerotic cardiovascular disease (ASCVD) remains the leading killer in the world, and yet we all know it is largely preventable. The notion of disease (ASCVD) remains the leading killer in the world, and yet we all know it is largely preventable. The notion of dedicating significant resources to ASCVD prevention in the clinical setting, although of intuitive value, poses challenges of political and logistical nature. Yet, these challenges must be overcome as the threat we face is colossal. All of us after a certain age are at measurable risk of heart attack or stroke. This brief perspective will examine the origins of what is currently known as preventive cardiology, review the current status of this discipline in its myriad forms, and provide a call to action for its future if it is to evolve as a defined subspecialty.

Scientists from diverse backgrounds have been interested in the link between cholesterol and ASCVD for over a century. In 1913, Nikolai Anitschkow fed pure cholesterol to rabbits and demonstrated the development of hypercholesterolemia. Ten more years and Akira Endo discovered compactin, the forbearer to the first statin, from a blue-green mold. Shortly thereafter, in 1973, Michael Brown and Joseph Goldstein made their seminal discovery of the low-density lipoprotein receptor and its feedback regulation, their work largely inspired by a young child with homozygous familial hypercholesterolemia who had a heart attack. Around this time, sufficient interest mounted to test the impact of cholesterol lowering on rates of cardiovascular disease (CVD). The Lipid Research Clinics—Coronary Primary Prevention Trial with cholestyramine and the Coronary Drug Project with niacin ushered in the era of lipid modulation for prevention of heart disease. Beyond those already mentioned, there are many other important forefathers of preventive cardiology. Remarkably, they emerged from strikingly disparate backgrounds, encompassing basic science, nuclear physics, internal medicine, public health, cardiovascular medicine, clinical research, surgery, endocrinology and metabolism, pediatrics, and medical genetics. So, to which medical specialty do preventive cardiology belong? And why is there an unspoken assumption that a preventive cardiology service is mostly an embellished lipid clinic and therefore an endocrine enterprise at its root?

Although the fragmented history of the discipline does not reveal a rightful owner, the first real home for such activities can be traced to the Lipid Clinic. These specialized centers spawned mostly within the realm of endocrine enterprises within academic medical centers and maintained a 2-fold focus, executing research and catering to rare medical curiosities. Though important, their impact on the health of local populations was minimal. The introduction of the statins into the market changed the mom-and-pop poise of most lipid clinics and triggered an adjustment of scale if not of approach. Starting with the landmark publication of the 4S trial in 1994, a seemingly unending litany of prospective randomized controlled trials tested and proved the effectiveness of these drugs in virtually all clinically relevant patient groups. Because of the success of early studies, trial design progressed from placebo-controlled to statin-controlled (high-intensity versus low or moderate-intensity) randomizations. The clinical outcomes from these studies suggested that there was no low-density lipoprotein cholesterol below which patients did not receive further benefit, thus setting the stage for the current standard of statin allocation for all above a certain risk threshold. The results of these trials were stunningly consistent and revolutionized the way clinicians approach dyslipidemia, both in terms of risk assessment and treatment. As the understanding that low-density lipoprotein cholesterol lowering is safe, simple, and effective at...
mitigating atherosclerotic risk in broad populations became widely appreciated, several agency guidelines adopted low-density lipoprotein cholesterol lowering as a top priority for risk management. At the same time, proper risk assessment became a key driver of interventions that are always chronic, often expensive, and usually accompanied by inconvenient or intolerable side effects. As the need to identify preventive opportunities in larger populations emerged, the value of the narrow Lipid Clinic model diminished.

The transition from Lipid Clinic to Preventive Cardiology Center takes many factors into account. First, and perhaps foremost, is the fact that while dyslipidemia plays a prominent and even central role in ASCVD risk assessment and management, we now have a greater understanding of the importance of multiple influences on this common condition and place more emphasis on determining whether the patient has the seeds of the disease that kills so many. All major risk factors cluster in a metabolic corral. Obesity is the fence around the corral and the leading cause of preventable death. Personalized dietary interventions should have a central role in the practice of ASCVD risk mitigation. Likewise, diabetes mellitus is now seen as a cardiometabolic disorder, as opposed to one of solely disordered glucose metabolism, whose associated ASCVD risk derives from its many accompanying risk factors. Benign essential hypertension is neither benign nor essential although it is common and commonly undertreated. Despite progress, cigarette smoking continues to be an epidemic exposure, particularly among the youth. High-risk families, where heart attacks cluster in the absence of obvious risk factors, are more prevalent than previously thought. So, if the ambitious goal is to prevent CVD, why do we limit ourselves by addressing mostly lipid metabolism?

The numerous available global risk assessment tools generally qualify patients into discrete risk categories based on estimates of ASCVD events for a 10-year horizon. However, ≈50% of individuals who go on to sustain a cardiovascular event are not identified as high-risk candidates with these calculators. New tools that refine risk estimation on top of conventional clinical scoring systems include novel biomarkers, genetic testing, and noninvasive measures of atherosclerosis that can detect the presence of subclinical disease. The evidence base has clearly established atherosclerosis imaging, particularly the coronary artery calcium score, as the single most effective risk stratification tool in primary prevention. Practice models are changing to accommodate this fact. The contemporary preventive cardiology program leverages these understandings to provide a comprehensive, integrated practice. Although a bona fide preventive cardiology program requires the expertise to evaluate and treat common and rare lipid phenotypes, it must encompass far more than that. The new model must be wide ranging and multidisciplinary in its scope and makeup and incorporate comprehensive risk assessment and treatment algorithms (see Table).

Who Owns Preventive Cardiology?
It is our belief that preventive cardiology is a natural subspeciality of Cardiovascular Medicine because it principally aims to evaluate and treat risk factors for prevention and management of CVD. Cardiology fellowship training provides the didactic and practical knowledge of vascular disease and its consequences, far more so than any other specialty. From a practical standpoint, a preventive cardiologist with general cardiology training will have the ability to manage all facets of primary and secondary prevention. Of course, advanced knowledge in lipid metabolism, hypertension, obesity, nutrition, drug therapy, and atherosclerosis imaging should all be provided in the preventive cardiology fellowship program of the future. Today’s challenge relates to the fact that endocrine fellowship programs may provide some training in lipid metabolism but none in CVD risk management, whereas cardiology fellowship programs devote time to risk evaluation and treatment but consider metabolism a foreign language. In the broader domain of practice, this trajectory is already obvious. A 2016 review of the top 15 academic hospitals by the US News and World Report reveals that 14 of 15 programs offer preventive cardiology services while only 5 of these also offer endocrine-based lipid clinics. The National Lipid Association holds the largest membership of preventive-minded providers and has influenced the creation of the only related certification board in existence today, the American Board of Clinical Lipidology, which is an independent organization not affiliated with the American Board of Internal Medicine. It is interesting to note that the largest segment (two thirds of total) of American Board of Clinical Lipidology graduates is made up of internists. The remaining one third of diplomates includes more cardiologists than endocrinologists (in a 3:1 ratio). Other societies, such as the American Heart Association, the American College of Cardiology, and the American Society for Preventive Cardiology, have the potential to consolidate efforts around this growing subspecialty but have yet to take up the reins. Nonetheless, it is essential that one of these organizations takes ownership of the entire subspecialty to provide a home for practitioners, set standards and practice guidelines, establish a certifying body and board certification process, and work toward establishment of preventive cardiology fellowship training programs, as detailed below.

What Should a Preventive Cardiology Fellowship and Accreditation Look Like?
We conceive of this subspecialty fellowship as a dedicated 1- or 2-year training program that follows completion of a general cardiology fellowship. The 1-year fellowship is purely clinical and suited for the trainee who is preparing for a career dedicated to patient care. The 2-year fellowship will include a research component (whether basic science, translational, outcomes, health services, etc) that will prepare the trainee for an academic career to include clinical responsibilities but with emphasis on research.

The issue of subspecialty accreditation and board certification is of utmost importance because preventive cardiology will not be a real subspecialty until it is structured in training methods and in validation of training. Although the American Board of Clinical Lipidology oversees an examination representing the pinnacle of expertise endorsement in the field of clinical lipidology, the name of this board conveys a focus that fails to encompass the wider knowledge spectrum...
required for a provider to call herself a preventive cardiologist. An evolved American Board of Clinical Lipidology will have to find a way to be granted status within the American Board of Internal Medicine. Although we think that any practitioner with passion and commitment can become skilled at providing excellent cardiovascular preventive care, a pragmatic read of the American Board of Internal Medicine position is that there are no subspecialty board certifications directly under the umbrella of Internal Medicine, whereas the specialty CVD has already been granted 4: Advanced Heart Failure, Adult Congenital Heart Disease, Cardiac Electrophysiology, and Interventional Cardiology. It is time for a fifth.

Conclusions
The fundamental concept that atherogenic lipoproteins cause ASCVD is now widely held as proven and not only for individuals with high cholesterol, CVD risk exposure is universal and pervasive, and ASCVD is common, multifactorial, treatable, and preventable. Thus, the new era demands a more efficient and comprehensive approach to risk assessment and treatment with the mandate to detect and treat disease well before it becomes clinically apparent. The concept of the lipid clinic as an entity with limited focus is no longer viable and must become a component of the larger preventive cardiology concept. With advances in basic science, epidemiology, genetics, clinical trials, therapeutics, risk assessment, and cardiovascular imaging, the preventive provider of the future will require training and expertise beyond what is currently delivered in standard fellowship training programs. Creating the specialists to implement such programs is not a pipedream or fantasy but rather an obligation. And it is within reach.

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Table. Structure of the Ideal Preventive Cardiology Service

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<tr>
<th>Staffing</th>
<th>Clinical Services</th>
<th>Diagnostic Testing</th>
<th>Education</th>
<th>Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physicians</td>
<td>Daily operation of outpatient services</td>
<td>In-house diagnostic laboratory for state-of-the-art CVD risk assessment</td>
<td>Cardiology fellows, medicine residents, medical students</td>
<td>Basic and translational science studies</td>
</tr>
<tr>
<td>Advanced practice providers</td>
<td>In-house cardiac rehabilitation</td>
<td>Atherosclerosis imaging</td>
<td>Visiting providers</td>
<td>Family studies and N-of-1 clinical studies</td>
</tr>
<tr>
<td>Clinical pharmacist</td>
<td>PCSK9 inhibitor clinic</td>
<td>Genetic testing</td>
<td>Outreach visits and audits</td>
<td>Development of diagnostics</td>
</tr>
<tr>
<td>Genetic counselor</td>
<td>LDL apheresis</td>
<td>Echocardiography exercise testing stress imaging</td>
<td>CME courses, symposia, and lectures</td>
<td>Trials of novel therapies</td>
</tr>
<tr>
<td>Dietitian</td>
<td>Lifestyle counseling and natural therapies</td>
<td></td>
<td>Cooking classes, recipe books</td>
<td>Patient registry</td>
</tr>
<tr>
<td>Registered nurse</td>
<td>Outreach clinics</td>
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<td>Biorepository</td>
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References

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