

ATHEROSCLEROSIS: THE 21ST CENTURY EPIDEMIC CONCLUDING STATEMENT

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Arterial disease affects most of the world's population causing Heart and Brain infarctions. Cardiac and Cerebrovascular Diseases are the leading causes of death worldwide. Prevention of arterial disease is possible yet largely unaccomplished. Paradoxically, the last decade has witnessed major scientific advances in the prevention and treatment of Vascular Disease. These positive achievements, however, have mostly increased the gap between knowledge and expected results. Effective implementation is most important to reach objectives.

Science is succeeding in the battle of research against Vascular Disease but losing the field of successful patient treatment as reflected by an increasing death toll. In current times, most things change rapidly and in science specially so. Often, even before there is time to test a new hypothesis, drug or device, a more recent one has to be evaluated instead.

Knowledge sharing is the key to scientific progress in any given field. Vascular Disease is unique in that specialists from different medical areas participate in the treatment of the same patient. However, the knowledge from these different vascular experts is not fully integrated since they work in different hospital departments, do research in different laboratories and attend different scientific meetings.

One first step to effectively potentiate the discoveries that will benefit arterial disease is to integrate the efforts from physicians and other experts that specialize in epidemiology, genetics, cardiology, diabetes, vascular neurology, lipids, cognitive impairment and related specialties.

In turn, the aforementioned scientists should present their work in easily understood terms to Governments and other non-medical agencies that have a leading role in the distribution of new resources and knowledge.

At the Vatican Meeting "Atherosclerosis: The 21st Century Epidemic" we contributed by stimulating an inter-specialty collaboration with world opinion leaders.

The following is a Statement based on two days of meetings. After each participant had presented salient issues in their vascular fields, open discussions lead to this statement. We created a short document with a concise and attainable message that identifies the key success factors that must be urgently addressed.

I. Atherosclerosis

1. Atherosclerosis (Vascular Disease) is a *rising epidemic* with severe health and economic consequences for all world regions, affecting men and women in developed and developing countries. Vascular Disease is the leading cause of death worldwide resulting in 17 million deaths per year.
2. Atherosclerosis *begins early in life*, and is a chronically progressive disorder that is initiated and progressively advanced by specific lifestyle conditions and genetic factors.
3. Atherosclerosis is a *systemic disorder* responsible for acute conditions such as MI (heart), stroke (brain) as well as chronic conditions such as cognitive decline and dementia, heart failure, renal failure, peripheral vascular disease.
4. Atherosclerotic disease *worsens exponentially with increasing age* and the burden of atherosclerotic disease is expected to double by 2030 as the population ages.
5. The incidence of *premature atherosclerotic disease is rising* in some parts of the world and threatens to do so globally with the growing epidemic of obesity/diabetes.
6. *New knowledge* from epidemiology, therapeutic trials and technological advances, support the recognition, diagnosis and a new basis for action to fight this atherosclerosis epidemic.

II. Prevention

1. Prevention is the major hope for controlling atherosclerotic Vascular Disease. However, many public campaigns and medical publications focus on acute treatment missing the most effective target: prevention. Prevention provides the opportunity to generate a much clearer, effective and large-scale audience message. Resources are limited and thus must be allocated where there are greater chances for success. Prevention offers this unique opportunity.
2. Risk factor assessment and modification should begin early in life (childhood).
3. Most risk factors that lead to atherosclerosis can be modified by lifestyle changes as opposed to drug or device treatment.

4. Behavioral risk factors include: smoking, unhealthy diet and physical inactivity. Unhealthy diet encompasses excessive salt intake, excessive alcohol intake, excessive carbohydrate intake and trans-fat consumption. Obesity is a result of unhealthy diet and physical inactivity among other factors.
5. Most important risk factors include: hypertension, cholesterol, diabetes and the metabolic syndrome.
6. With the exception of age, gender and family Vascular Disease history, all risk factors are modifiable through behavioral and/or pharmacologic strategies.
7. Primary prevention can reduce the burden of illness through a culture of healthy lifestyle: reducing the prevalence of obesity, smoking, high salt diet, reducing trans-fat intake, replacing some saturated with polyunsaturated fats and avoiding a sedentary lifestyle. Solidarity in primary prevention efforts will benefit both the individual and the society as a whole. Such measures are extremely cost effective.
8. Primary and Secondary Prevention is achieved with control of the medical risk factors: hypertension, high cholesterol, and insulin resistance. Effective treatment reduces the first clinical manifestations of atherosclerosis and subsequent events in those who have already suffered a consequence of atherosclerosis (stroke, MI).
9. Hypertension accounts for approximately 50% of Vascular Disease mortality and thus is the most important modifiable risk factor yet it is largely ignored or undertreated by physicians and patients. White coat hypertension is not a benign entity and should thus be treated as hypertension.
10. In order to achieve the behavioral changes that will reduce atherosclerotic disease, policies and environment must be conducive to (promote) healthy choices. The role of Governments in these areas is crucial. The best approach should be based on a strong intersectorial Government-Health collaboration.
11. Aggregate risk factor reduction can decrease cardiovascular events by as much as 70%. Adequate Secondary prevention measures can reduce vascular event recurrence by 75%.

III. Treatment

1. Acute and chronic treatment strategies for acute coronary events and stroke are proven to reduce disability/death but access to care is often lacking.
2. Effective strategies and medications are generally underutilized even when available and not limited by cost.

3. Interventions to consider: the polypill approach for primary and secondary prevention is a cost-effective, evidence-based approach to prevention. Percutaneous interventions with stenting and surgeries (by-pass and endarterectomy) are effective measures for certain scenarios of coronary and cerebral artery stenosis and occlusions. Recent data shows that pharmacological treatment is an acceptable alternative to invasive revascularization in certain patients with coronary and carotid artery disease.
4. The most cost-effective management of Vascular Disease is one of an integrated atherosclerosis treatment based on a Total Vascular Risk approach. Individuals should be stratified according to their Vascular Risk of developing a vascular event depending on their risk factor profile and objective measurement of arterial atherosclerosis (and not managed solely on the basis of individual vascular risk factor treatment).

IV. Education

1. There is a major shortage of “vascular neurologists” in both high- and low-income countries. There should be a change in focus in the education of all physicians to more strongly emphasize evidence-based primary prevention of Vascular Disease.
2. Education focused on school children, especially targeted to create sustainable healthy behavior and sustainable control of risk factors. Both in Elementary and High School levels subjects covering Health Promotion and Disease Prevention should be part of the mandatory curriculum or could even replace subjects such as anatomy, biology or similar.
3. Telemedicine has been proven effective in selected world regions. This experience should be extrapolated and proven as a reliable alternative for treatment of Vascular Disease patients in most world areas without direct access to physicians with expertise in Vascular Disease.
4. There is significant asymmetry between the medical and general population knowledge in the different vascular fields. Knowledge in stroke lags significantly behind that about coronary heart disease. This limitation in knowledge worsens the fact that stroke incidence has increased 100% in low- and middle-income countries over the last 40 years. This and other gaps should be reduced via effective medical and population education.
5. Engage the media to promote education on Vascular Disease knowledge for a healthy lifestyle, Vascular Disease Prevention, and the need for rapid access to treatment.

6. Produce easily accessible (through multiple medical journals and internet) and understandable guidelines for management of Vascular Disease. Present guidelines are redundant, complex and not geographically, economically and culturally sensitive. If not understandable and applicable by physicians worldwide, they are not serving their natural purpose.

V. Research

1. Studies are essential to understand the pathobiology of the disease (atherogenesis, related thrombosis, lipid biology, vascular inflammation), and for the development of more potent anti-atherogenic medications.
2. Implementation (Translational Type 2) research is necessary to understand how to achieve most effective health/clinical outcomes in the wide variety of populations, to optimize the treatment of individual patients (personalized medicine). Monitoring and evaluation of cardiovascular health programs is essential to improve health outcomes.
3. Further research is necessary to discover the yet unknown risk factors that contribute to atherosclerosis and the occurrence of vascular events in persons with atherosclerosis. In the same line, knowledge is lacking to explain the occurrence of events in people without vascular risk factors and the absence of events in elderly people with multiple risk factors (i.e. outliers).
4. Greater coordination between the industry and academia would lead to a larger spectrum of the research needed for knowledge progression.
5. Many different and complex mechanisms are involved in the genesis of arterial disease: oxidative stress, cellular apoptosis, ion channels, cell migration, and inflammation are all pieces with a role in the vascular damaging process. An isolated approach to research by the different vascular specialties delays discoveries. Basic science researchers, epidemiologists, genetic experts, lipid and glucose specialists, cardiologists and vascular neurologists should work closely together and ensure that information exchange is sufficient to advance their mutual learning process.

VI. Health care policies

1. Policy development is essential as well as multidisciplinary and multi sector research.
2. Special efforts should be devoted to low- and middle-income countries where 85% of vascular events occur.
3. Developed, high-income regions should coordinate efforts to promote effective action in developing, low-income countries. This could be achieved politically at Government level, through financial support with

- research grants and identifying scientists and physicians that could function as representatives and valid translators of each country's necessities.
4. Develop an overarching Policy Framework with key components; Protection/Promotion/Prevention, Health care, Monitoring of risk factors and determinants which provides a life course approach to cardiovascular health.
 5. Advocate to place Cardiovascular/Non-communicable diseases in the development agenda and give due recognition to health in all public policies. A coordinated call to action should engage governments, church, food distributors, media, education, non-governmental organizations, and health professionals.
 6. Invest adequately on prevention focusing lobbies on tobacco control policies, reduction of salt, and high content carbohydrate and trans-fat in processed foods, replacing some saturated fats with polyunsaturated ones, providing opportunities for healthy choices and empowering people, particularly children.
 7. Medical societies related to Vascular Disease should join forces and mandate that Governments worldwide include Vascular Disease Prevention as a priority in their agendas. Public Health campaigns should include validated Vascular Disease Prevention information. Public Hospitals should have Multispecialty Vascular Prevention Clinics and Stroke Units organized following particular geographic needs and possibilities.
 8. Provide fair financing for health care moving towards universal coverage and address equity gaps so that services are based on need rather than ability to pay. Strengthen primary care for early diagnosis and reorient health systems.
 9. There is a unique opportunity for the Church, through its schools, ministry, and care of the sick to make a major contribution in fighting the epidemic of atherosclerosis in high- and low-income countries.

Conclusions

The present generation of physicians has the duty and responsibility to make Vascular Disease Prevention the number one priority in the World's health agenda. Scientists with the active collaboration of Governments, NGOs, the Church and other religious orders should ensure that Vascular Disease Prevention translates from wishful thinking to reality. The next generation should see this endeavor accomplished and focus efforts on genetics, biotechnology, nanorobotics and other novel approaches for the treatment of selected patients in whom prevention is not effective.