OPINION

HIGHLIGHTS

Precision Cardiology is the emerging paradigm to treat cardiovascular diseases in agreement with a personalized approach to clinical practice. Here we discuss that, in the particular case of heart-related infirmities taking into account the social factors determinant for health and disease is mandatory. We also present some challenges and perspectives on the incorporation of social information into the precision cardiology scheme.

ABSTRACT

Precision Medicine is an upcoming paradigm to face the clinical practice of medicine by taking into account the multitude of data that can be gathered for a given diseased condition; both from population based studies at the epidemiological and genetic levels, and from individual information derived from the health records of patients. In the context of cardiovascular diseases, Precision Cardiology has been developing along similar lines. However, in view of the important roles that social determinant factors have in shaping the onset and outcomes of heart diseases we discuss that proper precision cardiology is incomplete without the consideration of these issues. We also provide some hints as to how to incorporate social aspects in the context of information-based personalized medicine and point out some challenges that may be presented.

KEY WORDS
Cardiovascular diseases; precision cardiology; social determinants of health

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EXPERT OPINION

Cardiovascular diseases (CVDs) are still leading causes of death worldwide. Even if a wide variety of health policies have been implemented to diminish the impact of CVDs, the burden they impose both our societies and at the individual level is still quite large. Indeed, the rise in both, the incidence and prevalence rates and the association with high levels of morbidity and mortality, and with strong economic and social consequences keep on pressing public health systems worldwide [1].

CVDs often result from the complex interplay of a number of genetic, environmental, social and individual factors that entangle the identification of compound phenotypes, delaying appropriate treatment. These same combinations of factors present important challenges not only to diagnostic of CVDs, but also to their prognosis and therapeutics and further complicate both primary and secondary prevention strategies.

The heterogeneous nature of complex phenotypes in cardiovascular and metabolic diseases make mandatory the use of the tools of high-throughput molecular medicine, genomics and imaging techniques on the one hand but also the consideration the social and epidemiological aspects that delineate the quality of life of both, healthy and diseased populations [2].

However, the integration of information coming from large datasets of molecular and imaging data, plus the medium-sized personal electronic records and laboratory tests with epidemiological and social information seems to be a challenging, even daunting task, in particular within the clinical setting. Under these conditions there is a need for a more personalized tailor-made cardiovascular medicine that engulfs prevention, diagnose and treatment of CVDs under a united approach. This is precisely the goal of Precision Cardiology which is the branch of Precision Medicine dealing with CVDs [3, 4].

Precision medicine envisions a hybrid medical practice that incorporates elements from basic and biomedical research into the traditional clinical setting to harvest benefits towards a personalized medicine. Precision medicine approaches are often strongly reliant on continuous updating on the data and hypothesis in what has come to be called a learning system that is heavily supported by current information technologies [3]. To date most promised developments on Precision Medicine have been made within the oncology area. Targeted and tailor-made therapies for CVDs are less developed than those in oncology. It is likely that one of the aspects that have delayed the transition to personalized medicine in cardiology is the fact that CVDs present an even stronger environmental and societal component than cancer. In particular, the so-called social determinants of disease play important roles in both the onset and the outcome of CVDs [5, 6].

An example of the complexities that CVDs represent for the establishment of Precision Cardiology but at the same time are highly dependent on its implementation is hypertension. Commonly patients with hypertension receive therapies that are developed and customized based on treatment algorithms that were designed within large cohort studies in broad populations. However, it is well known that due to pharmacogenomic reasons (pharmacokinetics and pharmacodynamics -PK/PD- specificities of anti-hypertensive drugs led to marked differences in the metabolic response to them and then to its therapeutic effects) but also to social determinants such as those involved in the variable adherence to therapy [3].

It is noticeable that whereas anti-cancer drugs are often administered in well controlled hospital facilities, most anti-hypertensive drugs are given on a regular basis to patients that need to be aware of their treatments in home environments. It is precisely in these domestic domains that social and lifestyle determinants inside more. Aside from PK/PD differences and lifestyles, CVDs are strongly affected by individual metabolism which calls for a tailored, personalized therapeutic design.

Precision cardiology must develop following the tenets of precision medicine that have been successful, say in oncology but needs to incorporate also the collective determinants of health that arise from the social environment of individuals. In the case of CVDs, unlike cancer, there is a good deal of preventive action that can be taken since the association of lifestyle factors with CVDs is (with a few exceptions like smoking and lung tumors) more established than those of cancer. In the case of heart diseases prevention may be taken at the primordial (in the absence of risk), primary (for population under risky conditions) and secondary (for those individuals that already had a CVD event) settings. In this regard, the precision medicine approach to cardiology may set the standard not only for treatment but also for preventive interventions and this in turn should enhance the effectiveness of this approach [5].

In agreement with the guidelines of the World Health Organization regarding the social determinants of health, the development of personalized cardiovascular medicine should include (likely as additional
entries in the Electronic Health Records) information regarding social, economical and lifestyle conditions that may affect both the state of health of unaffected individuals (with view to primordial and primary prevention) and the outcomes of those patients with CVDs (having prognostics and therapeutics, but also secondary prevention, in mind) [3, 5].

In this regard, Precision Cardiology must consider, aside from the molecular and physiological factors that shape the state of health or disease of an individual, the set of social constrains that spans from dietary and customary habits, to domestic environment – not only at the pollution or chemical agents level but also taking into account stressful or violent neighbourhoud conditions and home-associated risk factors –, education and access to information and so forth. Doing so requires an enormous collective effort, since on top of the wealth of information derived from the molecular and imaging studies at the individual level, from the genomic and metabolomic studies in large cohorts as well as the comprehensive review of the hereditary and risk-associated information from the electronic medical records, we must provide social information (likely coming from the interaction with social workers, caregivers and nurses) and aside from the already difficult to manage team of clinical and research physicians, biologists and bioinformaticians, now the presence – and collaboration – of social science researchers is required [5].

In view that one of the pillars of personalized medicine is the patient’s involvement with his/her own treatment – a fact that may determinant in relation with therapeutic adherence and secondary prevention, the development of a truly effective Precision Cardiology pro-gram may provide some elements of feedback from the patients in the design of the individualized medical strategy. The experience developed by the so-called Evidence-Based focus groups and dynamic interviews can form the basis for an additional layer of information to be added to the analysis. It is likely that with the advent of cloud-based solutions and the patients right to access his/her medical records, a door may be opened to update the data from the patient’s experience (both in the form of questionnaires and physiologic data as recorded in portable devices such as cell phones) in real time [6].

Of course, managing detailed personal information and combine it with collective information in (likely) public databases presents important challenges related to the confidentiality of said information. This is already the case with personal medical records and family health histories, but may be all the more drastic when including social and even intimate features. While we recognize that this is indeed a challenge, current information technologies have shown to be generally effective when managing encrypted information in an efficient way as day-to-day electronic financial transactions attest.

Having all this in mind, we are confident that the Precision Cardiology paradigm will in time, prove to be an effective approach to the analysis and treatment of cardiovascular diseases, contributing to the current efforts to control these extremely important public health issues, while at the same time may contribute towards the construction of a more human (socially-aware) approach to medical practice.

CONFLICT OF INTEREST
The author has no conflicts of interest to declare.

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REFERENCES