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Perspectives of cardiovascular research in Central and Eastern Europe (*letter*)

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The principal question is whether perspectives for cardiovascular research should be regional

When considering the perspectives of cardiovascular research, the first question to ask is whether it is justified to focus specifically on cardiovascular research in Central and Eastern Europe, i.e. whether different socio-economic circumstances should influence the direction of cardiovascular research.

Epidemiology as a background for regionalization of research

Over the past four decades, age-adjusted cardiovascular disease (CVD) mortality in Europe has declined and is currently following a steady trend; nonetheless, CVDs are still a major cause of death and accounts for 46% of all deaths.[1]

Large inequalities exist across Europe with CVD-related mortality generally higher in Central and Eastern Europe. In Central and East European countries, coronary heart disease and stroke are responsible for 49% and 32% of all CVD deaths, respectively.[2] It is noteworthy that Eastern European countries have some of the highest rates of CVD mortality in the world. Additionally, in most middle-income countries, the overall burden of CVD, which includes morbidity, is greater than in high-income countries. This growing burden of disease is one of the triggers for the growth in cardiovascular research.

Cardiovascular disease research plays a key role in improving patient outcomes as well as bolstering the sustainability of healthcare systems. The epidemiology of CVD suggests that one direction for research should focus on identifying the root causes of this condition, a substantial number of which cannot be adequately accounted for using conventional CVD risk factors. The risk of CVD is heavily influenced by environmental conditions as well as psychosocial and socio-economic variables. No doubt, the high burden of CVDs in middle-income countries reflects increased rates of hypertension, diabetes, and smoking compared with high-income countries. An important determinant of life expectancy is, of course, the availability and quality of healthcare that is often economically demanding; this includes the availability of medical care in general, as well as specialized care and procedures, and the implementation of evidence-based medicine recommendations. Risk factors associated with unhealthy lifestyle choices are potentially reversible; as such, they provide an excellent opportunity to address some of the health inequalities that exist across Europe.[3] However, this is a problem that needs to be solved using new approaches. Identifying the causes, risk factors, and differences in CV mortality needs to be a major topic for research. For instance, the high rates of cardiovascular mortality seen in Russia remain largely unexplained.[4]

Trends in cardiovascular research

The European Society of Cardiology initiated and coordinated 'A Survey of the European cardiovascular research landscape and recommendations for future research strategy (CardioScape)'.[5] The survey was converted into an online database that now provides an extensive overview of research activities at national and European levels and the respective sources of financial funding. CardioScape shows that cardiovascular research funding varies widely between nations in the European Union. CardioScape II continues the work of the first study and is funded by the European Research Area Network on Cardiovascular Diseases, through Horizon 2020.

The breadth of cardiovascular research is extensive. The work of Gal *et al.*,[6] from Leuven (Belgium), analysed

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478 000 scientific publications and identified 175 cardiovascular topics. They found that trends in research were impacted by opportunity-driven scientific interest, as well as by strategic funding policies. Therefore, regionality is likely to be extremely important in influencing trends in cardiovascular research.

In general, evidence-based guidance for treatment, research on outcomes, prognosis, and risk factors were identified as rapidly growing topics in clinical and population sciences. Hot topics include novel treatments for valve disease, coronary artery disease, and imaging. Basic research is undergoing substantial growth in research on stem cells and tissue engineering, as well as in translational research. Inflammation, biomarkers, metabolic syndrome, obesity, and lipids are hot topics across population, clinical, and basic research, which support integration across the field of cardiovascular medicine.[6]

Big data
The big data approach is a new form of CV research that can analyse and share large amounts of information. It combines millions of patient records and provides a new methodology for expanding data collection in three directions: high volume, wide variety, and extreme acquisition speed.[7] Electronic health records are now considered the main source of big data for biomedical research. The nation-wide collection of data[8] provides a unique opportunity to compare the care system performance of different countries and evaluate the effects of patient characteristics on outcomes. Big data may play a role in an actionable understanding of and reductions in inequalities in health and healthcare between 'rich' and 'poor' countries.[9] Furthermore, big data can be used to evaluate the impact of healthcare and public health interventions on the population.

Resources (funding)
Quality research requires funding. When evaluating cardiovascular research, the best results are seen in economically strong countries with historically established mechanisms of subsidies and grants, which create an environment for quality research, of course, not only for CVDs. The European Union spends heavily in support of research programmes; nevertheless, this support remains (largely) untouched by Eastern European countries. The level of CVD research funding is inversely proportional to CVD mortality rates; as such, Eastern European countries draw little to no funding for cardiovascular research. For instance, in Bulgaria, Croatia, Estonia, and Lithuania, no funding $\geq$ €100 000 per project was made available by funding bodies between 2010 and 2012.[5] Participation in consortia with West European countries is an attractive approach for increasing the involvement of Eastern European countries in drawing grant support for research projects.

Collaboration
There are wide variations in cardiovascular research activity, communication, and collaboration between countries.[10] Successful collaborations generate opportunities to build on each partner's strengths and to share resources leading to research with a higher impact. European Union framework programmes underlie the growth of collaborative publication output in Europe. The 4EU initiative is a noteworthy example in which four strong European research universities—Charles University (Czech Republic), Heidelberg University (Germany), Sorbonne University (France), and the University of Warsaw (Poland) joined together in a European strategic partnership that was built on existing academic collaborations. This alliance will help increase cooperation and strengthen the creative environment for teaching, learning, research, and innovation.

Cardiovascular research in Central and Eastern Europe will build on projects with exceptional benefits. Estonia's contribution to digital health is certainly a good example.[11] Estonia is determined to contribute significantly to the development of digital cardiovascular health. Digital health innovations support contemporary cardiovascular healthcare delivery. Soon, these methods will help facilitate more personalized healthcare and improve quality and participant experience. Estonia has been on the frontline of digital development. The PRAGUE studies, to which a special article in this issue of the *EHJ Supplement* is dedicated to, have contributed, through purely academic research, to several important achievements in CV outcome research. Another example involves the Institute of Heart and Vessels of the Almazov National Medical Center, in Saint Petersburg, which joined the international community of more than 800 WHO collaborating centres. The collaboration between WHO and the Centre has the potential to impact research and innovation and contribute to efforts aimed at reducing premature mortality from noncommunicable diseases in Russia. Currently, research on CVDs in Central and Eastern Europe face major challenges.

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