

Global health and data science: future needs for tomorrow's cardiologist

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Compared with other diseases, cardiovascular diseases (CVD) are responsible for the greatest burden of disease both globally¹ and in the UK.² Drugs for CVD and its risk factors have always been represented in the list of international blockbuster drugs. Important research innovations, such as 'learning health systems', 'precision medicine' and electronic health record (EHR)-based trials, have been led by professionals in the field of cardiology. Cardiovascular scientists from the UK have a long and strong history of research contributions with international impact. Training in cardiology is critical, not only in preparing and mentoring the clinical and academic cardiologists of the future, but also in shaping how the specialty is perceived from inside and outside. Global health and data science are overarching themes that offer new lenses through which to view CVD and cardiology. However, cardiology training in the UK barely pays lip service to either of these issues, when their implications have never been greater or more acute on our specialty.

Opportunity for global health

Over 40% of UK medical students gain experience in a developing country during their elective rotation, broadening perspective on disease and healthcare, as well as personal development by experiencing different cultures.³ Experience in low- and middle-income countries (LMICs) during postgraduate training offers similar benefits, but the number of trainees who embark on such rotations is comparatively small and restricted to particular specialties in the UK.

According to the 2012 British Junior Cardiologists Association trainee survey, 66% of trainees had completed or planned to undertake a clinical fellowship, with the majority planning to go overseas, but rarely to a LMIC.⁴ A similar pattern is seen in the research domain, with the vast majority of trainees taking time out of their programme for research, but very few undertaking work in CVD prevention, implementation research or CVD in LMICs. Specialties such as infectious diseases and obstetrics have a

tradition of encouraging training in LMICs and have a greater global outlook in their research priorities, which better positions trainees to adapt to changing disease epidemiology worldwide.⁵

CVD is the biggest cause of disability and death internationally,¹ and while rheumatic heart disease and conditions such as Chagas' cardiomyopathy are more prevalent in certain regions of the world than the UK, the vast majority of CVD burden is myocardial infarction, heart failure or stroke. Contrary to the impression held by many, the risk factors for CVD in LMICs are largely the same as those in high-income countries.⁶ There is a certain irony in the lack of a global perspective within cardiology given that clinical and research knowledge and skills in cardiology are genuinely transferable between more developed and less developed regions of the world. This is in contrast with the field of infectious diseases, for example, where the aetiology and presentation of disease varies greatly across different regions worldwide. The World Health Organisation, the World Heart Federation, international policy makers and UK research funding bodies such as the Medical Research Council have made reducing the global burden of CVD a priority, and the cardiology community in countries, such as the UK, have a great deal to contribute to achieving this goal.^{7,8}

Medical training in North America has been quicker to embrace the opportunities of taking a greater global perspective. Funding initiatives such as the National Institute of Health's Fogarty International Fellows Programme supports trainees, including those in cardiology, to develop skills to be independent researchers in the field of global health.⁹ A number of residency programmes have established global health-themed programmes, allowing trainees to gain experience at international centres, usually in LMICs, in a clinical and/or research capacity.¹⁰ Such programmes facilitate two-way transfer of knowledge and skills between clinicians and researchers in both countries and can establish strong collaborative networks for ongoing research. Establishing, maintaining and capitalising on such networks is

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vital to reduce the burden of CVD worldwide. Examples of institutions that have embedded and integrated clinicians with global health and/or data science expertise are the Population Health Research Institute, McMaster University in Canada and the Institute for Health Metrics and Evaluation, University of Washington in the US. The value of perspective from practising cardiologists, with their in-depth knowledge of disease and the underpinning science, should not be underestimated, and, indeed, the number of cardiologists undertaking research in this space is increasing, albeit slowly.

Using data science to break down silos

Concerns for a speciality, which has embraced subspecialisation, but not cross-cutting themes, are not new or specific to cardiology. UK cardiologists have been instrumental in developing and evaluating many of the treatments that are now standard of care for patients with, or at risk of, CVD. However, a failure to adequately emphasise the most pressing issues in cardiovascular science in the core training curriculum will have consequences on the readiness of cardiologists to research and practise in the health system of tomorrow.

Data science embraces epidemiology, 'big data science', health informatics, e-health and m-health. Use of large clinical datasets, increased technology and devices, expansion in mobile healthcare and an exponential rise in publications are already shaping the field of cardiovascular research and integrating into routine clinical practice. The age of 'omics-based', 'personalised medicine' and 'learning health systems' demands knowledge of data science from clinicians and academics alike, and cuts across the subspecialties, whether electrophysiology, intervention or imaging. There is currently little training in these areas as part of the UK core cardiology curriculum. Lack of

knowledge or awareness of these areas is against trends in other countries, such as the US, where opportunities in big data science are recognised. For example, organisations such as the American Heart Association, are engaging trainees to optimise the environment for acquisition, sharing, and governance of large-scale healthcare data.¹¹

Benefits to UK cardiology

Some of the most influential work affecting prevention and treatment of CVD, and other diseases more broadly, in the last 50 years, originates from non-clinical research, including social determinants of health, health and treatment inequalities and the global burden of disease. Epidemiology and prevention still occupy a relatively small part of cardiology training, yet these areas have contributed to the UK being a world leader in epidemiological research and clinical trials, with many seminal trials led by cardiologists in the UK.

To not incorporate data science and global health into the training curriculum has two negative implications. First, cardiologists will not be engaged in global health and data science agendas, leaving other disciplines, such as public health, to lead, as has historically been the case for epidemiology and prevention in the UK. Second, both clinical and academic cardiologists will fail to capitalise on the potential for research and implementation in the UK and beyond. In order to be competitive, data science and a global perspective are crucial to training cardiologists.

Call for action

The cardiology community in the UK needs to adapt to the changing landscape of research and clinical practice. Training must evolve to address global and national trends in CVD epidemiology, as well as grounding in data science. Interested trainees undertaking a higher degree should consider further training in data science, placing

them in a strong position to be at the forefront of a new, but essential, part of future cardiovascular research. Basic knowledge of big data is relevant to all cardiologists, not just researchers, in order to interpret and contextualise the research of tomorrow. It is encouraging that the theme of the British Cardiovascular Society Annual Meeting in 2016 was 'Prediction and prevention' with a keynote speech entitled 'Big data: a big deal for cardiology'.

Cardiologists with interest in global cardiovascular health should provide mentorship to interested trainees. Opportunities for trainees to gain clinical or research experience in LMICs and collaboration with physicians and scientists in LMICs should be viewed as a valuable two-way relationship, whether 'within' or 'out of' programme.

In an already crowded curriculum, e-learning modules may represent the most feasible and relevant way to introduce data science and global health to trainees. Bespoke training days are another possibility. Just as leadership/management and basic science are part of the core curriculum, which can be further developed as out-of-programme or post-certificate of completion of training (CCT) experiences, data science and global health can be considered in the same way. More than other aspects of the curriculum, these two new areas are cross-cutting and must not be considered in isolation, which allows them to contribute to other training and competencies. Both trainees and their mentors will need to be creative, but their efforts alone are unlikely to prompt culture change. Engagement from multiple stakeholders across the NHS, universities, Royal Colleges, General Medical Council and other medical specialties is required, but cardiology has the chance to lead the way ●

Conflict of interest

None declared.

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