Cardiovascular disease

MEMBERS' BRIEFING – FEBRUARY 2019

Cardiovascular disease (CVD) is one of the most common causes of premature death in the UK, responsible for more than 150,000 deaths and costing the health system approximately £9bn each year. CVD includes a range of conditions that affect the heart or blood vessels, including stroke, heart attack, hypertension, and vascular dementia.

New technologies are opening the door for more personalised medicine for CVD which could help clinicians and patients manage conditions more effectively.

Personalising prevention, diagnosis and treatment

An individual's risk of CVD is now known to be influenced by many factors. Measuring and understanding the influence of these factors could lead to more personalised, targeted and better prevention and treatment, by identifying who might be at greatest risk, and which treatments are likely to be most effective. Preventing and responding more effectively to acute CVD events will reduce mortality rates and associated ill-health, and could reduce waste in the system overall. Faster, more precise diagnosis and treatment will optimise health outcomes for patients.

Enabling technologies

Today, **genetic testing** is used to determine starting doses of certain drugs such as warfarin and to find out whether a family is at risk for highly-heritable conditions such as life-threatening hypertrophic cardiomyopathy. There is also increasing interest in using **polygenic risk scores (PRS)** to evaluate the risk of CVD for early prevention [1].

Devices such as KardiaMobile (developed by AliveCor) are being deployed by the NHS as portable and easy-to-use heart **wearable monitors**, avoiding costly trips to hospital for an ECG. A personal smartwatch-compatible version (the Kardia Band) is also available for on-demand monitoring of atrial fibrillation by the wearer. Such devices could detect problems early, hopefully catching conditions before they become life-threatening and more costly to treat.

The NHS is also trialling HeartFlow software for non-invasive **image analysis** and 3D modelling of coronary arteries to diagnose blockages and plan treatments. **3D printing** technology is also being used to plan personalised surgical interventions, such as heart valve replacement and repair of heart defects.

In the future, **blood-based biomarkers** that provide an indication of inflammatory status could be used for treatment stratification in cases of heart attack, helping determine how effective certain treatments are likely to be for individual patients [2].

Gut microbiome research, though in its clinical infancy, has linked the composition of gut bacteria to atherosclerosis in the walls of blood vessels, which can lead to heart attacks and strokes. Methods for altering an individual's microbiome might in future contribute to prevention of this form of CVD.

References

[1] *Risk prediction of Coronary Artery Disease in 480,000 adults.* J Am Coll Cardiol. 2018;72(16):1883-1893.

[2] *Taking personalized medicine to heart.* Nat Med 2018; 24(2), 113.

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