New handheld scanner to give instant heart disease diagnosis

With worldwide cardiovascular deaths at an all-time high, European scientists have developed a new handheld scanner that can read your heart's vital signs like a supermarket barcode reader can scan items at the checkout, allowing a GP to diagnose even preclinical patients for the early onset of a disease.

According to the World Health Organization, cardiovascular disease is the leading cause of death in the world today. In 2015 over 17.3 million people, roughly 30% of all global deaths, died as a result of cardiovascular conditions, such as coronary heart disease, heart attacks or strokes.

CVDs can be identified using a number of medical tools, including cardiac biomarkers, cardiac catheterization, chest x-ray, electrocardiogram (ECG), Holter monitoring, and cardiac MRI.

However, because they are complicated or expensive, routine early forecasting of CVD is impossible in large populations at present.

This new diagnostic tool developed by the EU's Horizon 2020 collaboration 'CARDIS', (or 'CARdiovascular disease Detection with Integrated Silicon Photonics'), can read your heart's vital signs with one click of a button, similar to the way a handheld supermarket scanner can scan barcodes at the checkout.

Heart Vibration Mapping

Employing 'Laser Doppler Vibrometry', a technique using photonics technology, the device can pick up vital information about the status of the heart using light, in a fast and inexpensive way.

It works by harnessing the 'Doppler Effect', the phenomenon used to observe changes in pitch of light or sound from a fixed point, and commonly experienced when an ambulance siren passes and changes in tone.

Using the 'Doppler shift' of the reflected light, the scanner builds up a 'vibration map' of the chest and heart area, which can highlight the telltale signs of CVD, such as plaque build-up, arterial stiffness, arterial stenosis or heart dyssyncrony. Project coordinator Dr. Mirko de Melis explains:

"Our device employs the latest photonics technology, allowing a user to make measurements of the vibration characteristics of the heart without even touching it."

"A stiff artery creates a faster pulse pressure from the patient's beating heart. By measuring the 'pulse wave velocity', we can assess the stiffness of the arteries using light and make informed judgements, long before the onset of cardiovascular disease."

Although there are a number of vibration sensors that exist for this purpose, LDV is non-invasive and provides a much higher degree of accuracy in a fraction of the time.

"At present, millions considered to be low or moderate risk are walking around undiagnosed.

It is our long term goal to place such a device in the hands of the GP, the first point of contact for the mass population, as part of a routine health examination."

Delay, Halt or Reverse

"The screening of potential sufferers, who are in their early 40s, would delay the onset of the condition by 5-10 years. Assuming a sufferer would comply with the health advice given and adopted a change in lifestyle, this device allows the medical professional to halt or even reverse CVD," De Melis said.

The CARDIS team believe the key to the success of a mass screening programme at the GP-patient level are the inexpensive and portable nature of the new laser scanner:

"Our device would be cheap, easy to use and extremely effective. With cost of an Echocardiographer anything above €100k, and an arterial tonometer at €5000-€6000, the CARDIS scanner would be reasonably priced at around €1500. However it is the potential savings on our health services caused by the early diagnosis and prevention of CVD that will be the most rewarding," De Melis explained.

While the EU consortium is happy with their demonstration model, CARDIS will be ready to unravel their prototype in the summer of next year.

Administrated in Belgium at the Interuniversitair Micro-Elecronica Centrum, with Medtronic being the Technical coordinator, the CARDIS project received a grant of €3,629,207.51 from Horizon 2020 via the Photonics Public Private Partnership.

Participants from six European countries include: (Netherlands) Medtronic Bakken Research Centre BV, Universiteit Maastricht; (Germany) SIOS Messtechnik; (Belgium) Universiteit Gent, Fundicio BVBA; (United Kingdom) Queen Mary University, (University of London); (Ireland) University College Cork, National University of Ireland; (France) Institut National de la Sante et de la Recherche Medicale.

About CARDIS

http://www.cardis-h2020.eu

About Photonics21

Photonics21 is the European Technology Platform (ETP) for photonics, a technology encompassing all of the products and processes around the emission, manipulation and detection of light. Photonics is integral to a wide range of industries that include the medical, healthcare, transport, manufacturing, and telecommunications sectors.

"Photonics21" was set up in December 2005 to bring the community of photonics researchers and industries together. The European Commission defined photonics as one of five European Key Enabling Technologies (KET's) in September 2009. Shortly after, the European Research & Innovation Program "Horizon 2020" invited Photonics21 to become a "Public Private Partnership" (PPP). The "Photonics 21 Association", a legal entity under Belgium law, became the private contract partner in November 2013 in a Public Private Partnership (PPP) in conjunction with the EU Commission.

Today Photonics21 represents more than 3000 personal members from across Europe and abroad. Our members are experts in the photonics industry, research organisations and universities who actively engage with us to develop a joint photonics strategy for future

research and innovation in Europe.

With the global photonics market growing from €350 Billion in 2011 to €447 Billion in 2015, Photonics remains a strong industry. The European photonics industry, estimated to be worth €70 billion, has considerable global leadership positions and employs over 300,000 people directly.

With positive growth forecast, current industry trends like digitalisation, resource efficiency, individual and zero failure production will drive the photonics industry further.

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