Consumer wearables to disrupt medical device market

April 17, 2019 News Centre Features 0

Image credit: Milles Vector Studio | shutterstock.com

With consumer wearables such as FitBits and the Apple Watch established in the market and consumers who have bought these devices now accustomed to seeing their own personalised health data such as heart rate displayed on their wrists (although not to standards of accuracy required by the medical profession), is the time now right for major disruption in the medical device market?

As evidenced by devices like the Apple Watch, all top tier smartphone companies have identified healthcare as the next major driver for the slowing handset market and have active healthcare groups. Researchers and analysts have also been showing a keen interest in the potential that consumer health wearables could bring to medical care, and multiple reports and papers have been published. The Rise of Consumer Health Wearables: Promises and Barriers (Piwek L, Ellis DA, Andrews S, Joinson A (2016), offered conclusions others have also arrived at: “Consumer wearables can provide patients with personalized health data, which could assist with self-diagnosis and behaviour change interventions.” And, crucially, that same report posed the question: “Will consumer wearable technology ever be adopted or accepted by the medical community?”

The answer to the latter is almost certainly yes – but a qualified yes. Medicine is a science, and only consumer devices that are able to deliver medically-accurate vital signs measurements will be trusted sufficiently by clinicians to be of use as a means of diagnosis and monitoring .

In addition, it's important to note that the term "consumer wearable technology" when looking at the potential of devices for personalised medical self-monitoring by individuals encompasses more than just smart watches – the playing field contains smart clothing (sensors built into clothing) and smartphones, so more accurately is Mobile Diagnostic Technology.

So what will drive the case for serious adoption of Mobile Diagnostic Technology (MDT), both by consumers themselves and the medical profession? As may be expected, it's about the benefits these devices can bring to healthcare:

- for consumers, the convenience and reassurance of easily monitoring their own health and of those that they care about – detecting unknown conditions and more easily managing those that have already been diagnosed
- for the medical profession, MDTs would provide a low-cost method of providing data to assist diagnosis and management of chronic conditions, and also enable such 21st century innovations as telehealth consultations, if, and only if, vital signs (blood pressure, respiration rate, temperature, heart rate, blood oxygen levels) can be measured with the same accuracy as current equipment used by the medical profession.

Let's not forget the importance of health economics. MDTs could deliver a paradigm shift not only to consumers and the medical profession but quantifiable benefits measured by these exacting and precise economic standards. Again, the essential criterion has to be the accuracy of mobile devices – measurements of vital signs to the standards of comparable legacy standalone devices used by medical professionals is the market driver.

Take the example of blood pressure measurements. Hypertension is one of the leading risk factors for cardiovascular disease, which leads to the top two causes of death in both high and low income countries. The World Health Organisation views it as the most important risk factor to be controlled and treated to lower mortality and morbidity. Awareness of the disease is greater in high income countries than middle and low income countries but there are considerable differences even in first-world countries.

High blood pressure is so important because around forty percent of the global adult population has this condition and a very significant proportion of these individuals are unaware of it. High blood pressure is one of the biggest risk factors for cardiovascular disease and stroke, but can be treated and managed reasonably simply once diagnosed. However at present, symptomless hypertensive individuals are only going to be picked up by opportunistic monitoring when they visit a doctor, population-wide programmes having been found impractical or too expensive.

The advent of MDT and particularly simple-to-use devices which enable self-measurement of the vital signs (blood pressure, blood oxygen, heart rate and others) will enable individuals to self-screen, detecting problems before symptoms appear and the condition becomes acute, or worse, causes a heart attack or stroke.

A report on a study carried out at the University of Lausanne, Switzerland (Evaluation of Potential Health Benefits and the Economic Impact of Mobile Diagnostic Technology: Case of Hypertension Screening in England. Wiesner, R. July 2015) sought to estimate the expected health benefits and costs of introducing MDT to screen a large population for high blood pressure and evaluate the economic implications and therefore cost effectiveness of this approach.

The main questions it posed were:

- How does the introduction of the MDT device in the general population affect early detection and treatment of hypertension?
- How does detection of hypertension in turn affect quantitative health outcomes (primarily for cardiovascular disease (CVD), CV-mortality and non-CV mortality) and costs on

average for the whole health care system compared with the current common practice of detection at the primary care physician practice?

Fig 1 – A Medical Diagnostic Technology-equipped smartphone
Source: Leman Micro Devices SA

What is the potential impact of the introduction of MDT smartphones on long-term health outcomes (coronary heart disease (CHD) and stroke risk) and costs, with and without early detection of hypertension?

The study devised a screening model for hypertension to assess potential health benefits and costs of introducing MDT smartphones into a larger population that is unaware of its blood pressure values. It is of course essential that the MDT is certified as medically-accurate and makes an absolutemeasure of blood pressure. Devices that track blood pressure after being calibrated by a conventional cuff do nothing to detect hypertension because the user will learn that from the cuff.

The study compares self-screening using MDT with opportunistic base case screening by a GP and applied the model to the English population over two years from data taken from a representative sample of the Heath Survey for England (England was chosen because the integrated health service provides a large database).

The results were measured in two ways:

- The number Quality Adjusted Life Days (QALDs) that are gained (one QALD equals a day in perfect health, one day when suffering may be weighted to less than one QALD)
- The net cost of the treatment to achieve those benefits, including confirmation of the diagnosis, the treatment and the savings due to decreased cardiovascular risk.

Health economists often express the benefits and costs in discounted values because the majority of healthcare interventions cost money and produce outcomes over a period of years. Discounting is a method of taking the impact of time into account when valuing these costs and outcomes, whereby a future benefit or cost is considered to be less significant than an immediate one. This study computed both discounted and undiscounted values; for simplicity we have presented only the undiscounted values here.

The study found that using an MDT device (medically-accurate smartphone) was a cost-effective method of screening a large population for hypertension and improving health outcomes across both genders and in all age and gender subgroups (30, 40, 50, 60 and 70 years).

In terms of pure health benefits, the most QALDs were gained by male subgroups. Females also benefited, again more markedly in the younger age groups. The gender discrepancy is accounted for by differences in the incidence of hypertension and the differences in CHD and stroke risks between the two sexes, plus the differences in mortality (cardiovascular and non-

cardiovascular): females have lower risks and consequently have lower benefits from hypertension screening and treatment).

MDT intervention is cost-effective when compared with conventional screening for males and females in all age groups, especially for males. The model showed an average gain of 104 QALDs for men and 68 QALDs for women, with an average cost per QALD of £0.32 ($0.42) and £1.53 ($2.00) respectively. This average cost per QALD gained was very significantly below the cost-effectiveness threshold of around £55 ($72) recommended in the UK, and significantly cheaper than current practice.

This masks the most striking effect, which is that the greatest benefit occurs to younger users, up to 178 QALD for males and 118 for females. In other words, the average young man who buys and uses an MDT will live at least 6 months longer. That is on average, for some there will be little gain but for others it will be much greater. If discounting is considered, the greatest benefit and most cost-effective treatment is for men on their 30s and 40s, because the benefits generally occur later in life so are more heavily discounted for younger people.

The study showed clear health benefits and the cost effectiveness of Medical Diagnostic Technology used to screen for hypertensive individuals in a population, as opposed to random and opportunistic screenings during a primary care visit. In terms of subgroups, there were significantly higher benefits and lower costs for males, while the highest health benefits were to be gained by younger individuals.

The Lausanne study found that screening with MDTs could significantly improve detection and treatment rates and concluded that MDT was cost-effective for all age and gender groups. The study also concluded that there is a large potential for a private-public partnership, where screening is provided through MDT-enabled smartphones and the healthcare system provides medical treatment. The same intervention transposed to different populations (other than the predominantly Caucasian, high income one studied) to one with a known and greater prevalence of hypertension (such as an Asian or African population) for example, would likely yield results showing an even greater incentive for the introduction of MDT.

If MDT devices to measure vital signs to medical accuracy are accessible, affordable to the majority, and widely adopted, they present a hitherto unavailable opportunity to tackle one of the world’s leading causes of mortality and morbidity.

Looking at the future for MDTs, it is clear that the potential impact is huge and market disruption is inevitable. In the case of, for example, smartphones able to measure blood pressure and other vital signs to medical accuracy, the data gained from measurements on this scale is of great interest to many organisations in the healthcare eco system (telehealth providers, pharmaceutical companies, health insurers, healthcare research and others). Not only that – the ability to obtain such data from a smartphone will provide the smartphone companies incorporating this technology into next-gen handsets with the next compelling smartphone feature – after all, who can now imagine a smartphone without a camera?