How technology is changing the shape of healthcare

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Global healthcare is facing a perfect storm as private and public health funding comes under increasing pressure, and consumers demand improved health outcomes. This funding pressure is being fuelled by an aging population that is living longer, with a rising incidence of chronic diseases, and multiple disorders. At the same time consumers are increasingly knowledgeable about illnesses with a greater expectation of care consequences. Together these issues create the potential for an industry in crisis.

The number of persons aged 80 or over is projected to rise almost 2.5 times by 2040 to 304 million, with per capita health spending highest amongst this cohort, demonstrating a six-fold difference between those aged +85 and those 55-59. Global health care expenditure is projected to reach US$18.3 trillion by 2040, rising from US$7 trillion in 2015.

Healthcare providers are seeking innovative strategies to offer improved health outcomes while maintaining a low cost base. To meet these challenges, the use of new and advanced technologies will need to be embraced and adopted. A variety of healthcare and technological innovations have appeared that offer solutions to many of these healthcare challenges.
Big Data and Internet of Things

Big data technology has emerged as one of the leading opportunities for healthcare advancement. At the forefront of this is the Internet of Things (IoT), the network of physical devices embedded with electronics, software, and sensors, that communicate between one another, enabling the collection and exchange of data, that can be accumulated and collated for healthcare research, development, and use.¹

In the healthcare space, IoT data is growing due to the rising popularity and use of wearable devices, biosensors, personal and electronic health records, along with information from clinical trials, research submissions, and human genetics projects. This information offers an unprecedented opportunity for analysis, manipulation, and application subsequently enabling and producing improved outcomes and experiences for patients and consumers.

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The Internet of Things and its application

A 2015 report from Dell EMC and the research firm IDC identified the volume of global healthcare data in 2013 at 153 exabytes with that figure swelling to 2,314 exabytes by 2020. To quantify this amount, if loaded onto laptops and stacked, the pile would be over 82,000 miles high and reach over 1/3 of the way to the Moon.\(^5\)

The effective use of this data and digital technologies, combined with advancements in areas such as artificial intelligence provides a powerful means to combat healthcare challenges. The application of this information offers an opportunity to dramatically improve patient outcomes through:\(^6\)

- Predictive modelling, producing a faster, more targeted R & D pipeline in drugs and devices;
- Statistical tools and algorithms improving clinical trial design and patient recruitment to better match treatments to individuals;
- The analysis of disease patterns and tracking disease outbreaks and transmission to improve public health surveillance and response, offering more accurately targeted vaccines; and,
- Advanced analysis of patient profiles, customer and patient segmentation, and predictive modelling to identify individuals who would benefit from proactive care or lifestyle changes. These include patients at risk or predisposed to developing specific diseases (e.g. diabetes, cancer, and cardiovascular disease).
In conjunction with these improvements and advancements the use of enhanced data and analytics show greatest opportunity to additionally reduce healthcare costs by:

- Identifying patients who are the greatest consumers of health resources or at the greatest risk for adverse outcomes, seeking early intervention with either preventative applications and lifestyle changes;
- Providing individuals with the information for them to make informed decisions and more effectively manage their own health as well as more easily adopt and track healthier behaviours;
- Reducing readmissions by identifying environmental or lifestyle choices that increase risk or trigger adverse events and adjusting treatment plans accordingly;
- Managing population health by detecting vulnerabilities within patient populations during disease outbreaks or disasters;
- Bringing clinical, financial, and operational data together to analyse resource utilisation productively and in real time; and,
- Identifying treatments, programs and processes that do not deliver demonstrable benefits or cost too much.

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Wearable Technologies and Biosensors

Mobile devices (both medical and general), apps, biosensors and remote patient monitoring products are offering ingenious ways to support better clinical decision-making and improved patient outcomes. These devices allowing medical teams and individuals to make more rapid decisions with a lower error rate, increasing the quality of data management and accessibility, and improving practice efficiency and knowledge.8

“Wearable technology may provide an integral part of the solution for providing health care to a growing world population that will be strained by a ballooning aging population” (Ajami and Teimouri).9

Mobile devices and sensors are playing an increasing role in improved self-monitoring and disease prevention, particularly in the evaluation of blood parameters like glucose, lactate, and urea,10 as well as; electrocardiogram monitoring, blood pressure monitoring, body temperature monitoring and medication management.11 Such self-monitoring applications allow for greater independence and accuracy while reducing the incidence of hospital and or health practice presentations.

Although the practical application of biosensors is still in its infancy, their immense potential in medical diagnostics, analysis and drug development offers considerable opportunity for rapid disease diagnosis (at a molecular level), treatment, cure, and potential disease prevention.

Mobile technology offers the opportunity and ability to connect patients and customers with doctors, researchers, and care givers, enabling timely health and disease monitoring, providing access to information and helping to lower costs and improve efficiencies within healthcare systems.

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