Big Data in Cardiology

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Digital health means to use information and communication technologies effectively for diagnosing and treating patients, for investigation, for education and for analyzing the economic burden in healthcare. Digital health technologies carry extreme importance for improving the healthcare worldwide.

According to the World Health Organisation (WHO), cardiovascular(CV) diseases are the cause of nearly 18 million deaths per year, which means 31 percent of the global death (1). Since the symptoms occur slowly they are called as 'silent epidemic'. They are the most expensive conditions to treat and the increase in life expectancy is mainly due to the success of the CV healthcare.

Technological developments enable ever more detailed insights into the disease processes and enable a precise, multimodal diagnosis of even complex diseases using digital imaging, cardiac biomarkers and genomic information. The rapid availability of this data, often in real time, allows optimized planning and performing of tailored interventional, surgical or pharmacotherapies. However completely new challenges arise due to the growing flood of data, the integration of which can no longer be achieved by the individual health practitioner. The active involvement and participation of the patient also requires new digital concepts and should include decision-making, treatment planning, history and feedback on success and adverse drug reactions. By using artificial intelligence(AI), digital communication and decision support systems, economic benefits, quality improvements and acceleration of outpatient and inpatient treatment become possible.

The advent of digital technologies, including wearables, wireless mobile devices, AI, big data, electronic medical records and social media will prompt changes impacting many aspects of the doctor/patient relationship. The use of digital technology specific to the treatment of CV disease is already showing great promise for both patients and doctors (2).

Remote monitoring of devices such as pacemakers and defibrillators is now routine and allows earlier detection of many pathologies. AI interpretation of images also has begun to show benefit in identifying the abnormal scans earlier. And decision-support software provides doctors' and patients' access to the best current evidence and the relevant options. Cardiology often produces a lot of complex data, either physiological (ECG, blood pressure, lung water levels, patient activity) or imaging-based (echocardiogram, magnetic resonance imaging, etc). Interpretation of this complex data and identification of the abnormalities can often be improved or accelerated by the use of digital technologies. AI is increasingly being applied, and may provide benefits, particularly where access to local expertise is difficult (2). The next decade will see unprecedented changes in healthcare delivery and disease prevention using more digital technologies. Ultimately, cardiologists will use the technology for self-adjusting and monitoring, and those living with CV disease or those at risk of it, will use the technology for living a long life with high quality.

As for healthcare education portable diagnostic devices and mobile health (mHealth) are powerful technologies carrying importance. They have altered the paradigm in which students and healthcare providers train and acquire new competencies.They have a positive impact in education and practice, and are likely to become a dominant mode of clinical training very soon. One study in cardiology showed that digital online training improved the interpretation of the panoramic AF maps by inexperienced clinicians (3).

Big data

Currently, there is no definition of big data but it is generally characterized by the 5 "Vs"; volume, velocity, variety, veracity and value (4, 5).

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The level of care is determined by the quality of data .As mentioned before all of the technological instruments using digital health result in a bigdata which has the potential to improve healthcare quality in cardiology.

The data sources having an impact on decision making in CV medicine can be summarised as follows (4, 5):

1. Basic and preclinical data: Basic and preclinical CV data involve observations that are made from a small sample size but that hold great potential from the perspective of informing and advancing the understanding of disease mechanisms to improve the therapy.

2. Patient Information and Clinical Care: Prior to the 1980s, clinical researchers had to review individual patients' paper charts to gather data which resulted in small, single-institution case series studies. Currently the patients' clinical information are stored in electronic medical records (EMRs) in many hospitals. This digitization of patients' past histories, current complaints, treatments, and outcomes enable much successful clinical research. The remarkable growth and maturation of "big" clinical data resources during the past 30 years enable clinical researchers to turn the data into knowledge and into the routine clinical practice consequently.

3. My Personal Health Information: Patient-reported health information (eg, chief complaints) are generally isolated within the individual medical records. However the ecosystem of "my" personal health information is ever changing and pushing the boundaries of its place alongside the clinical data and within the Big Data as the world goes more digital.

4. Clinical Trial Data: The majority of clinical trials in CV medicine to date have been designed to assess the efficacy and safety of various therapies in patients together with some clinical trials evaluating the role of biomarker assays and imaging procedures.

5. Observational and Epidemiological Data

6. Big Data From the Real World

7. Genomic Data and Digital Health

With the evolution of cloud technology medical treatments are now within the reach of the healthcare ecosystem. Data derived from the point of care and from "wearables" combined with environmental data result in advances in healthcare delivery.

Since conventional statistical methods lack analytical power for big data machine learning algorithms are implemented to provide efficient data processing. Coupling Big Data with analytics and machine learning result in the foundation of a cloud-based ecosystem that can be utilised for better management of the patients. Technology and treatment elasticity constitute the main benefits of Big Data.

In Conclusion, Big data has the potential to drive medical innovation, reduce the medical costs and improve the health care quality. In the era of big data, a Cardiologist will sure be smarter if he knows how to get intelligent assistance from knowledge or big data-driven systems that are successfully operated.

Conflict of interest: None declared.

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