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Big Data: Opportunities for Healthcare Organisations

Healthcare organisations need to make much better use of the health data that they hold and to share that use with other organisations in order to scale up their learning opportunities and improve the quality and efficiency of the healthcare they provide.

At the level of the individual patient, guideline and decision support systems, notification and alerting components and analytic tools need to process integrated health data drawn from multiple electronic health record (EHR) systems in a consistent manner. Health services, insurers and public health bodies also need fine-grained activity and outcome data to inform service planning, commissioning and prevention/wellness programmes. However, health data is captured today at a variable quality, is not collected or stored consistently and the adoption of interoperability standards is far from ideal. Healthcare organisations therefore need to invest more in their capability to capture high-quality structured and coded health data from every clinical encounter, and from patients themselves using an increasing repertoire of wearable and portable devices and sensors.

Integrated Data Key

Typical patient journeys span multiple healthcare organisations, who all have their own IT systems. It is therefore critical that patient information is able to flow seamlessly between these IT systems to support and enhance the patient journey, ensuring that clinicians always have the right information in the right place at the right time to make clinical decisions, and to support new integrated care models.

Integrated data are needed for cross organisational care coordination and to increase adherence to evidence of best practice such as clinical guidelines. The ability to integrate data themselves, or to accurately combine and compare analyses of data, is vital in order to calculate more accurate clinically-relevant benchmarks of performance, to detect areas of poorly effective or unsafe practice and thereby to optimise care pathways, reduce clinical risk, improve clinical outcomes and maximise cost-effectiveness.

This is not just promised, but reality: Kaiser Permanente is able to track outcomes and develop data-driven algorithms using the connected and interoperable EHRs of its 9 million patients. As a consequence it has demonstrated:

- an HIV death rate half of U.S. national average;
- a decrease in coronary heart disease death rate by a third;
- a decrease in pressure ulcers by two-thirds;
- death due to sepsis reduced by > 50 percent;

European hospitals cannot individually reach that patient number, but if their health data are structurally and semantically consistent, and capable of being connected, they can still gain important decision-influencing insights internally and collaborate at regional, national and EU levels in research. Large healthcare organisations, especially hospitals, increasingly implement a clinical data warehouse as a repository, sometimes fully de-identified but often pseudonymised, to enable in-house analytics and research.

Digital Research Potential

Healthcare organisations greatly benefit from participating in research, for example through clinical trials. These are increasingly being undertaken in small as well as large healthcare organisations, hospitals and general practices and there are some critical bottlenecks to reusing health data for research that are now being unblocked, such as semantic interoperability and privacy protection.

A European public-private research partnership has recently established a trustworthy platform that can connect EHR data warehouses in individual hospitals to enable them to collaborate in pharmaceutical research, by helping them to discover the patients most suitable for enrolment in a new clinical trial. The Electronic Health Records for Clinical Research (EHR4CR) platform (2015) is now being scaled up across Europe, and is growing a network of connected hospitals (and later general practitioner (GP) practices).

Given that over half of clinical trials experience recruitment delays, reusing EHRs to help accelerate recruitment will improve trial efficiency and enable more healthcare organisations to become trial centres. Healthcare providers will have the opportunity to increase research revenues, grow scientific reputation, be more attractive to high calibre clinicians and enhance their standing with patients. Using health data and research platforms can enrich the business intelligence available to a healthcare organisation itself, to improve its efficiency and outcomes. A culture of research can improve staff attitudes to data quality, which in turn enriches the ability to use that data to improve care and conduct research.

Concerns about protection of privacy when health data are integrated or shared, for direct patient care as well as for aggregated data purposes, limit the extent to which even the data we have today are combined, aggregated and analysed appropriately. Several recent European initiatives have specifically addressed this, developing codes of practice for the use of 'big' health data, establishing governance policies and state-of-the-art information security and audit measures such as EHR4CR, Electronic Medical Information Framework (EMIF) (2015) and Translational Research and Patient Safety in Europe (TRANSFoRM) (2015). Such approaches can now provide society with a greater assurance of privacy protection. We are therefore very well placed to scale up the trustworthy re-use of health data for research.

Big Data in Health

So what do we mean by 'Big Data'? The term was historically used to refer to data volumes and a complexity of processing that exceeded conventional computing capability, but it is increasingly used more broadly to refer to very large networks of data that comprise high data volumes, diversity of data types and constantly evolving content. Health data certainly qualifies! As an example of where large scale data are needed, many of our current clinical guidelines are for single diseases, but patients rarely have only one. The most realistic way of building up an understanding of how diseases and treatments interact and the optimal ways to manage multiple conditions, is to analyse large-scale EHR repositories.

Apart from data traditionally captured by healthcare professionals, health data potentially includes genomic data, data about social needs and care, environmental factors such as atmospheric pollution, and an increasing volume of data generated by patients and healthy citizens. Forty-four million health related smartphone apps were downloaded worldwide in 2011 and monitoring services will account for 65% of the global mHealth market by 2017. (Ernst and Young 2012). Disease self management and prevention/wellness information are therefore predicted to be our next big contribution to the big health data ocean, offering us greater opportunities to personalise care, target therapies more precisely and to partner patients in managing their health.

Increasing sophistication of care, with an ageing population and more and more illnesses becoming longterm conditions (such as HIV), requires greater cooperation between professionals of different disciplines working in different locations, knowing each others' care goals, progress made and any difficulties encountered. This needs more than sharing the record of what has been done (EHRs), but sharing each other's clinical care strategy, options and logistic constraints, to determine optimal ways of aligning efforts.

The rapid pace of bio-science discovery, the advent of personalised therapies, and the overwhelming volume of new clinical evidence, combined with demands for evidence-based, safe, high-quality and equitable standards of care, now makes big data a vital resource to healthcare organisations - for local intelligence, service optimisation and for collaboration in research.

Key Points

- Healthcare organisations need to make much better use of the health data that they hold in order to improve quality and efficiency of care.
- If an organisation's health data are structurally and semantically consistent, and capable of being connected, they can gain important decision-influencing insights internally and collaborate at regional, national and EU levels in research.
- Healthcare providers should participate more in research, to increase revenues, grow scientific reputation, be more attractive to high calibre clinicians and enhance their standing with patients.
- State of the art governance policies, information security and audit measures can now provide society with a greater assurance of privacy protection when health data repositories are

combined and analysed to optimise health services and for research.

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