The impact of big data on healthcare and medical practice
Big data is the term typically used for very large amounts of information that can be interpreted by analytics to provide useful, actionable information (usually in the form of trends or patterns). Businesses and organizations leverage big data in a number of ways, such as to improve the development of the next generation of products and services. For instance, manufacturers are using data obtained from sensors embedded in products to create innovative after-sales service offerings such as proactive maintenance — preventive measures that take place before a failure occurs or is even noticed.¹

The potential care, system, and societal gains of big data analytics in healthcare are well recognized. However, only now as patient information repositories are being populated, are gains being realized. For example, at the patient level, we are seeing enhanced approaches to mammography screenings, easier glucose monitoring among diabetic patients, and enhanced clinical decision-making support to determine the likelihood of pneumonia or hospital readmission based on patient variables. The analysis of big data can also improve outcomes. By pursuing specific patient groups, increased rates of immunization can be realized. Identifying and then caring for patients with chronic diseases in community settings can result in decreased emergency department visits. In addition, the use of big data

Should big data be spelled with a V?

Physicians will understand how big data’s primary attributes are volume, variety, velocity, and veracity. Lots of data is needed, and normally from a variety of sources. Velocity is also necessary, in that decision-makers need timely insights, whether it’s for real-time remote patient monitoring, to predict when an infant is at risk for sepsis, or to monitor the potential spread of a pandemic, for example. Data must also be accurate and precise.²

The collection and use of large data sets, also known as “big data,” is receiving considerable attention in healthcare. Repositories of health-related data — both clinical and administrative — are becoming increasingly attractive for analysis by healthcare providers, researchers, ministries of health and system managers, and commercial interests. While each party has presented arguments for its legitimate use, issues of governance, appropriate use, privacy, and the role of healthcare providers are at the fore of big data.

CMPA members will want to be, if not already, familiar with the concept and utility of big data, and attentive to the related opportunities and risks.
can help improve patient safety, for example through predictive alerting for venous thromboembolism or targeted infection control resulting in decreased healthcare-associated infections.

The secondary or system-level use of big data is also growing. System-level uses for big data include capitalizing on all data for health system management, such as resource allocation decisions; population and public health, including health surveillance; and health research. The value of big data analysis can be seen in the visual representation of wait times in provincial hospitals, or in detailed reports of medication incidents in small hospitals.

The use of big data by third parties, such as pharmaceutical or insurance companies, is also on the rise and creating both benefits and risks.

**BIG DATA ENABLERS**

There are a number of important elements to the successful use of big data. One of the most important is good quality data. As more healthcare providers use electronic records and more discrete data is created, the potential of big data grows. However, just because data is captured electronically doesn’t mean it’s ready to use. Since data is sometimes described as the “fuel” for analytics, it must be of good quality and must meet acceptable standards.

Data governance is, therefore, essential. This begins with an organization’s plan for how it will collect, maintain, protect, and analyze data, and present results. Sufficient resources, information management capabilities, technical infrastructure, and analytics know-how are also part of the foundation.

Capacity and culture are additional factors in the success of big data in healthcare. Big data and healthcare analytics will thrive when healthcare leaders, physicians, and other providers believe in the value of big data, and facilitate data capture while also leveraging its decision-making power. Moreover, adequate knowledge, expertise, and tools to accurately analyze, interpret, and use large data sets for their intended purposes are essential if the healthcare sector is to truly benefit from big data.

**PRIVACY AND SECURITY**

Regardless of its intended use, the assurance of privacy is needed for patients and healthcare providers to support big data analytics. There is general agreement that data repositories and data analysis tools should be designed to protect privacy. By default, large repositories should contain anonymized data, which would minimize many privacy concerns. As well, expertise is required to help prevent data breaches and to react swiftly if these occur. As Canadians become more comfortable with the notion of healthcare data analytics, the focus on privacy is not expected to diminish. This applies to the use of patient information for individual healthcare purposes; for secondary use such as health system planning, management, or research; and certainly for use by third parties such as commercial interests.
Physicians have an ethical and professional duty to maintain the confidentiality of patient information, and privacy legislation imposes specific obligations on how doctors must manage and protect patient information.

Health information privacy concerns are legitimate, but not unsurmountable. Privacy is key to maintaining public confidence in electronic records, big data, and healthcare analytics.\(^4\)

**THE ROLE OF PHYSICIANS IN BIG DATA**

Initiatives in big data and healthcare analytics have the potential to greatly affect healthcare, however this will not be fully possible without the support and involvement of physicians. Doctors capture patient information and increasingly rely on the information in electronic health records. Physicians are also central to the appropriate sharing of personal health information within the circle of care, as data repositories are ultimately populated by such information.

Given some of the promising benefits of big data analytics, physicians will want to be familiar with these initiatives and consider how they can contribute to legitimate, value-added use. Physicians recognize the use of anonymized data minimizes most privacy concerns, and re-identification issues are generally limited. Doctors should assess the patterns, findings, or evidence that is derived from big data analytics. Using the results of big data analysis may help to improve healthcare outcomes and safety.\(^5\)

Physicians need to discuss and resolve questions regarding appropriate use. Doctors are central to finding the right balance between leveraging the advantages of big data (enhanced care, service delivery, resource management, commercial opportunities) with legitimate privacy issues. This is essential for the benefit of the entire healthcare system and society.

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5. Ibid., p.10