Chapter 6
Healthcare Big Data:
A Comprehensive Overview

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ABSTRACT

Big data has unlocked a new opening in healthcare. Thanks to the considerable benefits and opportunities, it has attracted the momentous attention of all the stakeholders in the healthcare industry. This chapter aims to provide an overall but thorough understanding of healthcare big data. The chapter covers the 10 'V's of healthcare big data as well as different healthcare data analytics including predictive and prescriptive analytics. The obvious advantages of implementing big data technologies in healthcare are meticulously described. The application areas and a good number of practical use cases are also discussed. Handling big data always remains a big challenge. The chapter identifies all the possible challenges in realizing the benefits of healthcare big data. The chapter also presents a brief survey of the tools and platforms, architectures, and commercial infrastructures for healthcare big data.

1. INTRODUCTION

Healthcare industry is going through a trailblazing makeover. Due to the significant advancement in digitised and open and pervasive healthcare systems, it is generating a massive amount of data. This healthcare data is truly comparable to the Big Data both in size and nature, hence termed as healthcare Big Data. Though compared to other industries, the healthcare industry has been lagging behind in the

adoption of Big Data technologies, the changed medical and clinical landscape has forced the stake-holders to delve into the development quickly. Suddenly, Big Data has become crucial for almost every operational, clinical, and management task (Bresnick, 2017). The healthcare people are now convinced of the benefits of Big Data and persuading themselves to analyse the data for extracting new insights that have given them the access to promising new threads of knowledge which are being transformed into innovative and purposeful actions (Groves et al., 2013).

Several healthcare use cases are well-suited for incorporating Big Data technologies. The healthcare Big Data analytics has opened up many exciting avenues in different healthcare operations including diagnosis and medical care, clinical decision support, population health management etc. (Bresnick, 2017). The success of healthcare Big Data is mostly dependent on the efficient collection and storage of massive quantities of disparate data acquired from diverse sources and also running it through an in-depth analysis (McDonald, 2017). The effective utilization of healthcare Big Data and obtained knowledge through analytical processes has the potential to save a significant amount of money and most importantly, people's lives (Lebied, 2017).

This chapter provides a preliminary and overall understanding of healthcare Big Data. The rest of the chapter is organised as follows. Section 2 discusses the 'big' aspect of the healthcare data including the ten 'V's of healthcare Big Data. It also covers the basics of healthcare Big Data analytics as well as the present healthcare Big Data market. Section 3 identifies several advantages of Big Data in healthcare. Section 4 mentions some application areas while Section 5 lists some specific examples of healthcare Big Data. The associated challenges are discussed in Section 6. Section 7 provides a brief survey of the different platforms and tools, architectures, and practical infrastructure for healthcare Big Data. Section 8 concludes the chapter.

2. BIG HEALTH DATA

2.1. The Data Overload

Back in 2012, a study estimated that healthcare data boast the largest share (30%) in occupying the overall electronic data storage in the world (Brown, 2015). To make the things graver, healthcare data is growing at a rapid pace, in fact seriously rapid. Among the growing digital universe healthcare is one of the fastest growing sectors. A report from the EMC Corporation along with the research firm IDC suggests that the digital healthcare data is growing at 48% per year whereas the growth rate of the overall digital universe 40% per year for the (IDC, 2014). The report estimates that the size of healthcare data will swell to 2,314 Exabytes by 2020 from a figure of 153 Exabytes in 2013 with an annual growth rate of 48%. The report elaborates that if all the digital healthcare data are stored on a stack of tablet computers, the height of the tower, by the year 2020, would cross 82,000 miles scaling from 5,500 miles in 2013 (Leventhal, 2014). The above statistics are sufficient to get a picture of the growth rate of the healthcare data and if this rate is continued, the healthcare data volume will soon reach the zettabyte and yottabyte scale.

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