Chapter 10
Data Analysis and Integration in Healthcare

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ABSTRACT

Healthcare providers treat a plethora of conditions associated with the human body for a patient to achieve optimal healthiness. However, aspects of a patients' entire wellbeing can often be overlooked, which leads to issues such as drug interactions, missed diagnoses, and other gaps in care. Healthcare can benefit from implementing better data management and integration to improve data analysis, which could bridge gaps in care. This chapter will explain data analysis and data integration, why they are pertinent in the healthcare system, and their associated rewards and challenges. After analyzing these healthcare facets, this chapter will conclude with a proposal for healthcare providers to leverage technology for patients' general wellbeing and a healthier population.

INTRODUCTION

There has been ample research about the influence and role of information technology in medical systems. Technology is increasingly used in pertinent roles, such as acquiring data, processing data, communicating collaborative data to caregivers, as in nurses and doctors, and administering treatment to patients. The increase in the use of technology is accounted for by various reasons, as Payne et.al. states, "The reported benefits of Health Information Technology (HIT) include improved healthcare quality and safety, decreased costs, and an enhanced ability to conduct research" (Payne, 2016). These rewards have motivated hospital systems to increase their technological prowess. However, while the available technological aspects of healthcare advance in some hospital systems, others have been left in an antiquated state, which could be detrimental as information technology continues its rapid improvements. Many medical systems continue using relational databases for both patient information and general business information, while higher end medical systems are migrating to much more fluid forms of data manage-

ment. However, both types of systems need to continue or begin to apply data analysis and data integration to truly make the most of the vast amounts of data collected by medical practitioners. As Brumen states, "Medical data stored in online systems are true goldmines. However, if they are not analyzed, they are useless" (Brumen, 2013). Herein will serve as an encouragement for healthcare providers to continue their pursuit of new technologies for both caregivers and patients, primarily by recognizing the importance of data analysis and integration in modern medical systems. As Payne et.al. aptly explains, "technology assumes a primary role in delivering high quality, safe, and cost effective clinical care and wellness promotion, and is thus worthy of further pursuit, energy, and effort" (Payne, 2016).

Herein, the current uses and possibilities of data integration will be explored in medical fields, specifically with federal initiatives to incorporate data analysis in the healthcare system. The chapter will divulge several benefits and challenges associated with incorporating data analysis and integration in healthcare systems. Benefits include: improved diagnosis, preventative diagnoses, accurate records of prior and current treatment, protection from drug interactions, overdoses, and allergies, real time diagnoses and treatment, a more cost effective system, and enhanced research for future improvements. Some challenges include: data security, patients' privacy concerns, the learning curve for clinicians, incentives for data integration, analysis, and sharing, implementing a standard for integration and sharing, and maintaining a patient-centric practice. This chapter will end with a proposal for healthcare providers to collaborate on medical analysis and integration across health professions, and the associated risks and rewards with an application on that scale.

BACKGROUND

Without practices that involve data analysis and integration, healthcare providers fall into possible mishaps with fatal drug interactions, missed diagnoses, and other deadly accidents that could happen without the preemption of information technology and analytics. Also, analytics preempts issues like later cancer stages and heart problems in at risk patients, which would be left out if no data analysis or data integration was used in hospital systems. Additionally, without Electronic Medical Records (EMRs) or other networked sharing of patient data, doctors in the same hospital systems could find inconsistencies or mistakes within a patient's Personal Health Record (PHR). In traditional databases, only one person or computer can access a patient's data to change it to avoid race conditions. A race condition happens when two different people or processes are accessing a piece of data to change it and something gets left out by accident. There would be no inclusive way to share patients' data with all of his or her caregivers, especially in large healthcare systems. Using different analysis systems could allow different caregivers to simultaneously access data and change it, or even allow machines to automatically put data into the patient's record.

As well, currently, patients are primarily responsible for their own information, which can lead to issues with misremembrance and confusion, especially with older patients or patients experiencing trauma. To elaborate, a patient must tell their physician every medication they are taking, with no possible way to accurately verify all their medications. Or, a patient who had an emergency and was admitted into another hospital may not remember what treatment was given to them, which could cause issues for the primary care physician. In addition, data analysis and integration is imperative when considering research. Without data analysis and integration, research cannot be comprehensive, encompassing all possible patients across spans of age, race, socioeconomic backgrounds, and genetic profiles. Especially

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