Chapter 15
Predictive Modeling for Improving Healthcare Using IoT: Role of Predictive Models in Healthcare Using IoT

Jayanthi Jagannathan
Sona College of Technology, India

Udaykumar U.
Sona College of Technology, India

ABSTRACT

The chapter covers the challenges faced in real-world healthcare services such as operating room bottlenecks, upcoming newborn medicines, managing datasets, and sources. It includes future directions that address practitioner difficulties. When IoT is merged with predictive techniques, it improves the medical service performance rate tremendously. Finally, the chapter covers the case studies and the tools that are in use to motivate the researchers to contribute to this domain.

INTRODUCTION

The usage of predictive analytics in healthcare can be achieved by merging different data repositories, which has the patient information that includes disease information, food & lifestyle habits. If we collect an information about individual, the task of prediction would be easier. The models can be customized based on the data points, to a specific patient or group of patients that ultimately leads to more precise and effective treatments that are bound to improve the overall efficacy of the healthcare system while at the same time reducing costs (Desikan et al., 2013). Healthcare organizations develop more sophisticated big data analytics capabilities, they are beginning to move from basic descriptive analytics towards the realm of predictive insights (Lindeman, 2018). Predictive analytics may only be the second of three steps along the journey to analytics maturity, but it actually represents a huge leap forward for many organizations. Instead of simply presenting information about past events to a user, predictive analytics

DOI: 10.4018/978-1-7998-1090-2.ch015

estimate the likelihood of a future outcome based on patterns in the historical data. This allows clinicians to receive alerts about potential events before they happen, and therefore make more informed choices about how to proceed with a decision. The importance of being one step ahead of events is most clearly seen in the realms of intensive care, surgery, or emergency care, where a patient's life might depend on a quick reaction time and a finely-tuned sense of when something is going wrong.

How and why are hospitals putting predictive analytics to work? The goal is often to improve operational efficiency or to proactively provide services that prevent greater problems and spending. Many hospitals have started with applications aimed at reducing readmissions and predicting which patients are at risk of developing sepsis. Other common use cases focus on optimizing staffing and resources. These following examples show how predictive analytics helps hospitals leverage their past data to learn what is likely to happen in the future, identify actionable insights, and intervene to reduce costs. These interventions often directly improve patient care and operational efficiencies

LITERATURE REVIEW

Operating Room Bottlenecks

The University of Chicago Medical Center (UCMC) (2017) used predictive analytics to tackle the problem of operating room delays. Such delays are aggravating for clinicians, patients, and families and they are wasteful since ORs are expensive to run. But delays are hard to prevent, with so many individuals and teams working on each surgical case. When one procedure ends, there is a sequence of certain tasks that must be completed before the next surgery can start.

UCMC combined real-time data with a complex-event processing algorithm to improve workflows, create notifications, and streamline the handoffs from one team to the next for each step of the OR process. The effort decreased turnover time 15% to 20% (four minutes per room), which was expected to save the hospital up to $600,000 annually. The new system also increased visibility into what was causing each delay and how to intervene in real time to get things back on track.

Newborn Antibiotics

Kaiser Permanente (2015) led the development of a risk calculator that has reduced the use of antibiotics in newborns. Antibiotics are necessary for a small percentage of newborns who are at risk for early onset neonatal sepsis, an infection that can lead to meningitis or death. Researchers developed a risk prediction model after drawing data from the EHRs of about 600,000 babies and their mothers. The approach better targets newborns who are at the highest risk for sepsis without exposing those at low risk to antibiotics. The effort safely reduced antibiotic use by nearly 50% in newborns delivered at Kaiser's Northern California birthing centers in 2015. It also allowed mothers and babies to stay together in the first few days. Kaiser makes the risk calculator available online.

Care Transitions After Knee and Hip Replacement

Cleveland Clinic (Gartner Research, 2017), feeling the pressures of fixed reimbursements and bundled payments, wanted to find ways to decrease the length of stay for patients receiving total hip and knee