DATA MINING DIRECTED HEALTHCARE THEORY, APPROACH AND APPLICATIONS

A.S.Shanthakumari[1]
*Research Scholar, Department of Computer Science, Vels institute of Science Technology
and Advanced Studies, Chennai, Tamilnadu, India.*
shanthakumarias79@gmail.com
Dr. R. Jayakarthik[2]
*Assistant Professor, Department of Computer Science, Vels institute of Science Technology
and Advanced Studies, Chennai, Tamilnadu, India.*
drrjayakarthik@gmail.com

Abstract—**Due to the rapid increase in the number of electronic health records, data mining holds enormous promise for healthcare services. Doctors and physicians historically held patient records in the document where it was very difficult to keep the details. Digitalization and ingenuity of modern approaches minimize human efforts and make data easily evaluable. Data mining tools allow you to identify trends and to use those trends to predict future patterns or the probability of future events. Data mining is usually applied to structured data. Some efficient early warning systems and other numerous healthcare-related systems have emerged from clinical and diagnostic data from both the data mining and healthcare industries. With regard to this advent, in terms of process and implementations, we have checked data mining guided healthcare.**

Keywords: **Big data, Data mining, Digitization, Healthcare, Knowledge discovery, Medical science.**

I. INTRODUCTION

Data mining has tremendous potential for the healthcare industry to allow health systems to routinely use data and analytics to acknowledge inefficiencies and best practices that improve treatment and reduce costs. Some researchers predict that up to 30 percent of total spending on healthcare can be offset at the same time by opportunities to increase treatment and decrease costs. This could be a complete win / win. But because of the complexity of healthcare and a slower rate of technological adoption, our industry lags behind these others in the implementation of successful data mining and analytical methods. The medical sector collects a dazzling array of data, much of which is electronic health records (EHRs) obtained by healthcare facilities. In healthcare, data mining is becoming increasingly commonif not increasingly necessary, according to a survey by PubMed Ahmad et al.[2015]; Sen et al.[2018].

Data mining provides the methodology and technology for healthcare organizations for:

- Effective treatment,
- Predicting medicine to save lives of patients,
- Managing healthcare at different levels,
- Managing customer relationship,

Detecting waste, fraud and abuse.

Data mining is used as part of the Information Discovery in Databases (KDD) process to sift through the accumulated medical data and to retrieve the valuable knowledge contained there. Data mining is best described as the act of using automated tools to discover trends within large datasets, instead of referring exclusively to the initial data collection. These patterns can then be used to frame questions that delve deeper into why and how such patterns emerge, what they mean in relation to a specific use case or need for decision-making. Mining, in this case, in an otherwise uninteresting data landscape, refers to the process of searching for seams of significance, not precious metals Dennison et al.[2005];Jothi et al.[2015].

The healthcare industry is rife with examples of how mathematical and machine data mining is required to solve pressing business cases in clinical, financial and organizational environments. Tayade [2013].

- Identification of excessive usage of high-cost facilities such as imaging tests or the use of emergency departments

- Understanding the flow of patients to an after-hours nursing hotline from a clinic or call volume

- Tracking by provider of the prescribing levels of a certain opioid

- Tallying the number of patients with a diabetes diagnosis in a given population

- Measuring the performance of providers on a given process metric, such as the distribution of colonoscopies or vaccinations against influenza.
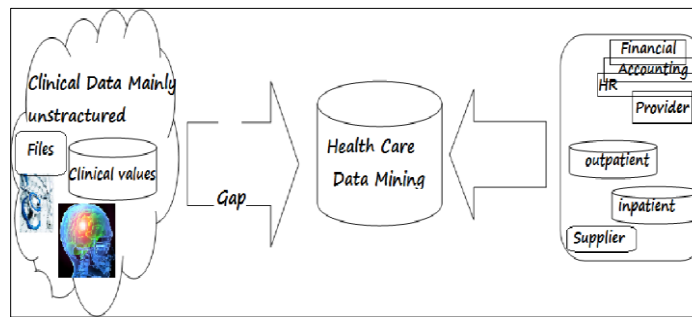

Figure 1. Health care data mining

- Figure 1 depicts the data mining process in healthcare industry. Nowadays, with machine learning, data mining is becoming more closely known, as both emphasize the detection of trends within complex data sets. Machine learning is one tool used to perform data mining. Healthcare data mining is mostly used, along with machine learning, to predict various disorders, assist with diagnosis, and guide doctors to make clinical decisions. It can provide question-based answers, anomaly-based findings, more informed decisions, probability measures, predictive modeling, and support for decisions, but the data mining potential is far greater. Yoo et al.[2011]. With this introduction, Chapter 2 discusses the systematic approach and Chapter 3 reviews the applications followed by conclusion in Section 4.

2. DATAMINING IN HEALTH CARE STUDY

2.1 Systematic Approach

The three-framework methodology is the most successful way to put data mining beyond the reach of academic analysis. The integration of all three frameworks is the key to driving real-world progress in any healthcare analytics project. Sadly, only a few healthcare facilities use all three of these services.
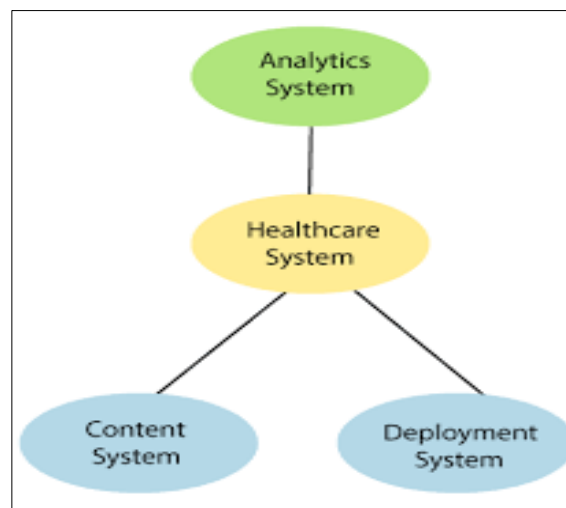

Figure 2. Systematic approach

A. Analytics system

Analytics system requires the technology and expertise to capture, make sense of and standardize measurements of information. The fundamental piece of this framework is the collection of health, financial, patient satisfaction, and other data into an enterprise data warehouse (EDW).

B. Content system

The content method requires the standardization of the knowledge function, systematically applying evidence-based best practices to the delivery of care. Researchers make major findings on clinical best practices each year but it takes years for these findings to be adopted into clinical practice. A good best practice structure allows organizations to put current medical science into practice quickly.

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C. Deployment system

Via modern organizational systems, this framework includes guiding change management. In particular, it includes the introduction of team frameworks that will allow best practices to be continuously applied across the enterprise. By no way is this scheme simple to execute. In order to accelerate the implementation of best practices within an organization, real organizational change is required.

If a data mining project does not involve all three of these structures, the chances are high that it will remain a purely academic practice and never leave the laboratory for published articles. The introduction of all three enables a healthcare organization to pragmatically apply data mining to routine clinical practice. Koh et al.[2005];Elezabeth et al.[2018].

2.2 Data mining in predicting patient population risk

In the healthcare initiative, data mining involves the use of predictive algorithms to predict risk within some populations. This process of stratifying patients into groups of high-, medium- or low-risk is important to the success of every community health management program. Interestingly, certain patients are so at risk that sending a doctor out preemptively to make a house call instead of waiting for that patient to come in for a crisis visit would be simpler. It was crucial for the clinic to be able to identify these high-risk patients in advance and focus the appropriate resources on their care. To help stratify the patient populations for risk, a sophisticated predictive algorithm is applied to the data. Using the data, it is more likely that the clinical and demographic parameters for that specific population predict a treatment event.

A regression is then performed on the clinic's historical data in order to determine the weight that should be assigned to and parameter in the predictive model. By applying such a personalized algorithm to the details, the clinic has been able to identify that patients require the most treatment long before the crisis. Importantly, the clinic has integrated this information into its workflow with a consistent ranking of prioritized patients. This has provided for the establishment of improved systems for handling the care of patients at risk. The doctors and care coordinators discuss the risk level of each patient every week for instance, with an appointment set for the week. In preparation, during the meeting with the patient, they would then create a care management plan to address. This leads to collaborative doctor-patient decision-making, as some patients who are at higher risk of non-compliance can be determined in advance by the doctor. Tomor [2013].

2.3 Data mining to improve primary care reporting

In order to allow primary care providers (PCPs) to comply with community health regulatory initiatives, the data mining project mines historical data. The PCPs of this clinic must demonstrate to regulatory bodies that they are providing these patient groups the necessary screenings and care. The analytics applications have allowed PCPs to control their compliance rate and to take steps to ensure that the appropriate screenings are received by patients. This has provided for the establishment of improved systems for handling the care of patients at risk. The doctors and care coordinators discuss the risk level of each patient every week for instance, with an appointment set for the week. In preparation, during the meeting with the patient, they would then create a care management plan to address. This leads to collaborative doctor-patient decision-making, as some patients who are at higher risk of non-compliance can be determined in advance by the doctor. This method encourages doctors to see more patients and to devote more time to those patients' urgent needs. And it helps any member of staff to work at the top of their license and training. Beulah et al.[2016].

2.4 Monitoring and predicting Fee-for-service volumes

A significant portion of revenue comes from out-of-state referrals to its top-rated facilities. The team has to ensure that these contracts remain in place and provide a consistent stream of revenue. In order to monitor this process, an enterprise data warehouse (EDW) and advanced analytics tools are used. The EDW incorporates various data sets, such as payer, financial and cost data, and then presents information dashboards such as the case mix index (CMI), per payer's referral patterns, per payer amounts, and those payers' associated margins. In terms of volume and margin, this scheme allows the team to mine data viewing habits from each payer. At this point in the implementation, the team is able to see the referrals slow down within a fifth, rather than after a year or two from a certain source. They can then respond quickly through outreach, ads, and other approaches. Raghupathi [2010].

3. APPLICATIONS

Data mining has been used in many industries to enhance customer service and satisfaction, and improve product security and usability. In fields such as predictive medicine, customer experience management, detection of fraud and violence, hospital management and testing the effectiveness of some treatments, data mining has proven useful in healthcare. Pandey [2016].

3.1 Pragmatic application of data mining

One client is a health system that aims to thrive, while still performing well in risk-based arrangements under the fee-for-service payment model. The transition to value based shopping is a gradual one. Until the flip is turned all the way, health systems have to create structures that allow them to straddle both models. This client uses data mining in order to minimize its census for patients under risk contracts while keeping its patient volume steady for patients not included in these contracts. In order to predict what the amounts will be, healthcare mines the data for each patient category. The health system then creates procedures to ensure that all patients receive the best treatment in the best location and at the right time. This will include care management outreach for high-risk patients.

3.2 Calibrating treatment efficiency

In order to achieve the most reliable approach for a specific illness or disorder, this use of medical data mining includes analyzing and contrasting factors, triggers and treatment programs. For example, it is possible to compare patient groups who are healed with different drug therapies and find out which solutions have good results and save the good amount of money. In addition, the continuous use of this program will help standardize a treatment method for various illnesses, thus making the protocol for analysis and treatment easier and simpler.

3.3 Detecting fraud and misuse

This includes setting up regular patterns by clinics, physicians, laboratories, or even some others, eventually deciding irregular patterns of medical claims. For the determination of conflicting referrals or signs and insurance scams and bogus medical claims, this application may also be helpful.

3.4 The Future of Data Mining

The transition from written to digital health records has played a major role in the drive to use patient information to enhance aspects of the healthcare system. In every healthcare segment, the advent of electronic health records has encouraged healthcare professionals to exchange information, also helping to reduce medical discrepancies, present detailed data, and enhance patient care and satisfaction. Data mining from healthcare is also expected to help reduce costs. The medical future is more likely to concentrate on the use of data mining to reduce healthcare costs, assess cures and best practices, determine efficacy, define fraud benefits and health claims, and eventually increase the quality of patient service.

4. CONCLUSION

The method of analyzing existing databases to derive new information from them is data mining. It's reshaping many markets, including the medical industry. Preclinical trials and drug adverse reaction reports help doctors evaluate whether prescribing a patient with a new medication can mean making another change to the care of the person to stop dangerous side effects. Leaders in hospital administration are actively searching for ways to improve efficiency, minimize costs and enhance efficiencies. In order to achieve those goals, many of them turn to data mining, often by relying on business consultants to strengthen current practices through data-driven insights. No single element in a hospital signifies excellent results.

REFERENCES

1. Ahmad, Parvez & Qamar, Saqib & Rizvi, Syed. (2015). Techniques of Data Mining In Healthcare: A Review. International Journal of Computer Applications. 120. 38-50. 10.5120/21307-4126.
2. Beulah, Mercy & Nirmala Sugirtha Rajini, Selvaraj & Selvaraj, Nirmala Sugirtha Rajini & Narayanan, Dr. Rajkumar. (2016). Application of Data mining in healthcare: A survey. Asian Journal of Microbiology, Biotechnology and Environmental Sciences. 18. 2016-999.
3. Dennison, Thomas & Qazi, Farhan. (2005). Data Mining in Health Care.. 89-96.
4. Elezabeth, Laura & Mishra, Ved P & Dsouza, Joanita. (2018). The Role of Big Data Mining in Healthcare Applications. 256-260. 10.1109/ICRITO.2018.8748434.

5. Jothi, Neesha & Abdul Rashid, Nur'Aini & Husain, Wahidah. (2015). Data Mining in Healthcare – A Review. Procedia Computer Science. 72. 306-313. 10.1016/j.procs.2015.12.145.

6. Koh, Hian & Tan, Gerald. (2005). Data Mining Applications in Healthcare. Journal of healthcare information management : JHIM. 19. 64-72.

7. Pandey, Dr. Subhash. (2016). Data Mining Techniques for Medical Data: A Review. 10.1109/SCOPES.2016.7955586.

8. Raghupathi, Wullianallur. (2010). Data Mining in Healthcare. 10.1201/9781439809792-c11.

9. Sen, Indrajit & Khandelwal, Krati. (2018). DATA MINING IN HEALTHCARE. 10.13140/RG.2.2.22189.38887.

10. Tayade, Motilal. (2013). Role of Data Mining Techniques in Healthcare sector in India. Sch. J. App. Med. Sci.. 01. 158-160.

11. Tomar, Divya. (2013). A survey on Data Mining approaches for Healthcare. International Journal of Bio - Science and Bio - Technology. 5. 241-266. 10.14257/ijbsbt.2013.5.5.25.

12. Yoo, Illhoi & Alafaireet, Patricia & Marinov, Miroslav & Pena-Hernandez, Keila & Gopidi, Rajitha & Chang, Jia-Fu & Hua, Lei. (2011). Data Mining in Healthcare and Biomedicine: A Survey of the Literature. Journal of medical systems. 36. 2431-48. 10.1007/s10916-011-9710-5.