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ANALYSIS OF POTENTIAL FOR LEARNING FOR MEDICAL PHYSICIANS FROM BIG DATA RESEARCH IN HEALTHCARE

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ABSTRACT

Large amounts of patient health data files and sensor data are being generated in today's era of smart phones and wearable devices. In the healthcare industry, big data analytics is crucial to resolving problems and overcoming obstacles. The healthcare industry is experiencing a data explosion that can be managed by using big data. Petabytes of data are generated every day from a wide variety of sources, and if analysed, they could provide actionable insights and solutions for improving patient care. This article aims to address what appears to be a significant problem in the field of continuous medical education and learning by identifying the main dimensions of a model proposal for increasing the potential of big data research in Healthcare for the education of medical doctors (MDs). In order to complete this research, we must first understand the advantages and disadvantages that clinical physicians face when conducting or writing a medical report. Using this research, the difficulty of digital disruption in healthcare big data analysis is assessed. The healthcare industry is crucial, making this research crucial. After all, it's about making sure people are healthy. As new technologies and methods of doing things become widely available, digital disruption becomes an increasingly important factor in today's world.

Key words: Potential, medical physicians, big data, healthcare.

1. INTRODUCTION

1.1 What Is Big Data in Healthcare?

Electronic health records (EHRs), medical imaging, genetic sequencing, payor records, pharmaceutical research, wearables, and medical gadgets are just a few examples of where large amounts of health data are being collected and analysed. Traditional electronic medical and human health data used for decision-making are different from it in three ways: It's accessible in vast quantities, information travels quickly throughout the vast digital landscape of the health sector, and, as it comes from so many different places, its structure and nature are wildly diverse. The 3Vs of Big Data refer to these aspects.

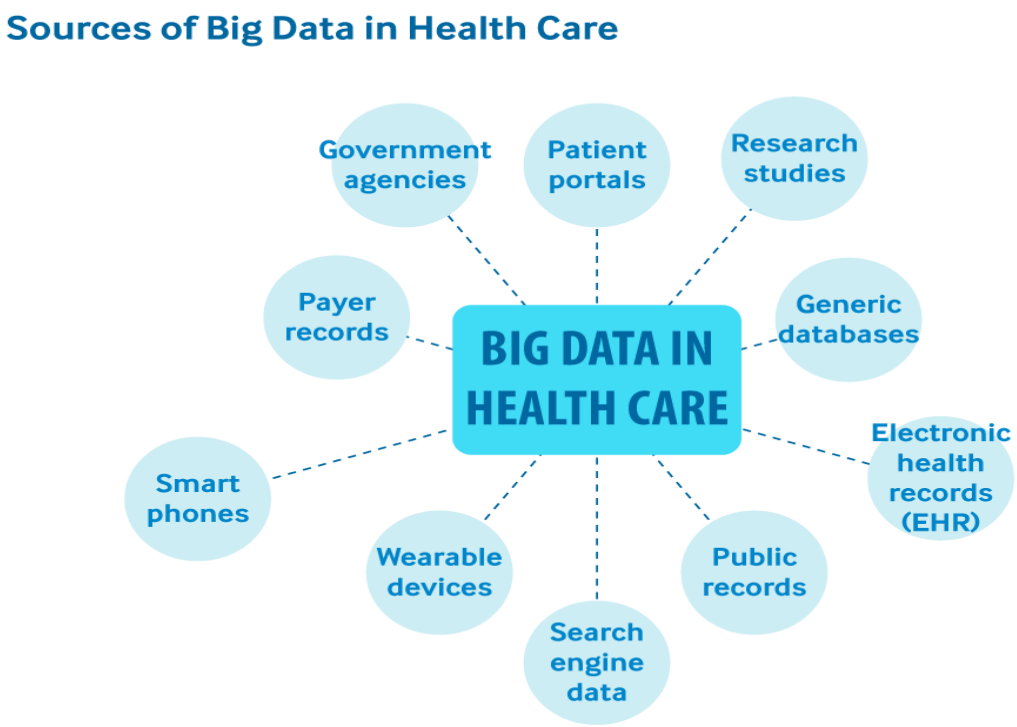

Figure 1.Sources of Big Data in Healthcare include EHRs, Payer Records, Smart Devices, Genetic Databases, the Government.

2. LITERATURE REVIEW

A. Shubham Mehla, 2021 Currently, a huge amount of sensor data and patient health data files are being produced thanks to smartphones and other wearable technology. The healthcare industry has several problems and challenges that can be resolved with big data analytics. Big data can manage the enormous influx of data that exists in the healthcare business. Through a variety of devices, petabytes of data are generated every day. If these data are examined, they can provide useful data-driven solutions and insights for patient treatment. This article provides an overview of the various applications of big data analytics in healthcare, as well as the difficulties and potential tools and technologies for cloud-based healthcare.Big data has the potential to transform the healthcare sector and enhance operational effectiveness and the standard of clinical trial monitoring. Manuel Au-Yong-Oliveira, 2021 said that in order to build and visualise bibliometric networks related to the subject, this article used VOSviewer software. Therefore, more research can adopt various software tools like CiteSpace, BibExcel, Eigenfactor Score, and R package, among others, which are popular and effective tools used to gather quantitative and visual data and map out a certain topic. Additionally, this study concentrated on peer-reviewed articles found in the digital databases of PubMed and Google Scholar, emphasising more clinically-related journals or publications.Future research may focus on more sources that have been published in databases like Elsevier's Scopus and/or Web of Science (SCIE, SSCI, and/or ESCI), as these datasets contain journals, reviews, and books from other scientific fields that could create synergies on the subject, such as the social sciences, business and management, engineering, or education.

In order to gauge doctors' satisfaction with the EMR system, a research by Mounir El Khatib was carried out in the Abu Dhabi emirate in 2022. The study found that although doctors were happy with it, they had conflicting views on how useful it was for patients. Clinicians found that viewing was the EMR's main feature that gave them the most satisfaction since it improved the doctor-patient relationship and the correctness and dependability of the records. As the wait time lengthens, it has a detrimental impact on the patient-physician interaction. Aside from this, there was a loss of eye contact throughout the earliest stages of adoption. However, the study found that some doctors used the screen to reassure patients by displaying graphics and addressing their concerns.

According to Hu et al., applying the control theory can help healthcare workers in a substantial way to quickly and accurately interpret and evaluate vast amounts of medical data. They claim that this could aid in the speedy analysis of medical data by medical practitioners. Such a need has grown exponentially in recent years due to a rise in the number of people who want healthcare services.

According to Luo et al., a double-reading or entering system can greatly aid healthcare practitioners in extracting and then analysing substantial amounts of organised and unstructured medical data in a brief period of time. They predict that this will drastically alter the nature of the healthcare industry.

3. APPLICATIONS FOR BIG DATA IN HEALTHCARE

Maintaining a patient's health and protecting them from infection should be at the top of any list. Activity trackers like the Fitbit and the Apple Watch can monitor their users' workout routines and provide detailed reports on their health. This information is already being uploaded to the cloud, where doctors may use it as part of a patient's comprehensive health and wellness plan.

United Healthcare is one of Fitbit's existing partnerships, and through it, the company offers its insureds annual rewards of up to $1500. Using the One Drop app from Informed Data Systems, users of Android and Apple devices are seeing significant reductions in their A1c levels. Meanwhile, Apple's HealthKit, CareKit, and ResearchKit use the technologies built into Apple's mobile devices to aid patients in managing their ailments and to aid researchers in collecting data from hundreds of millions of people across the world.

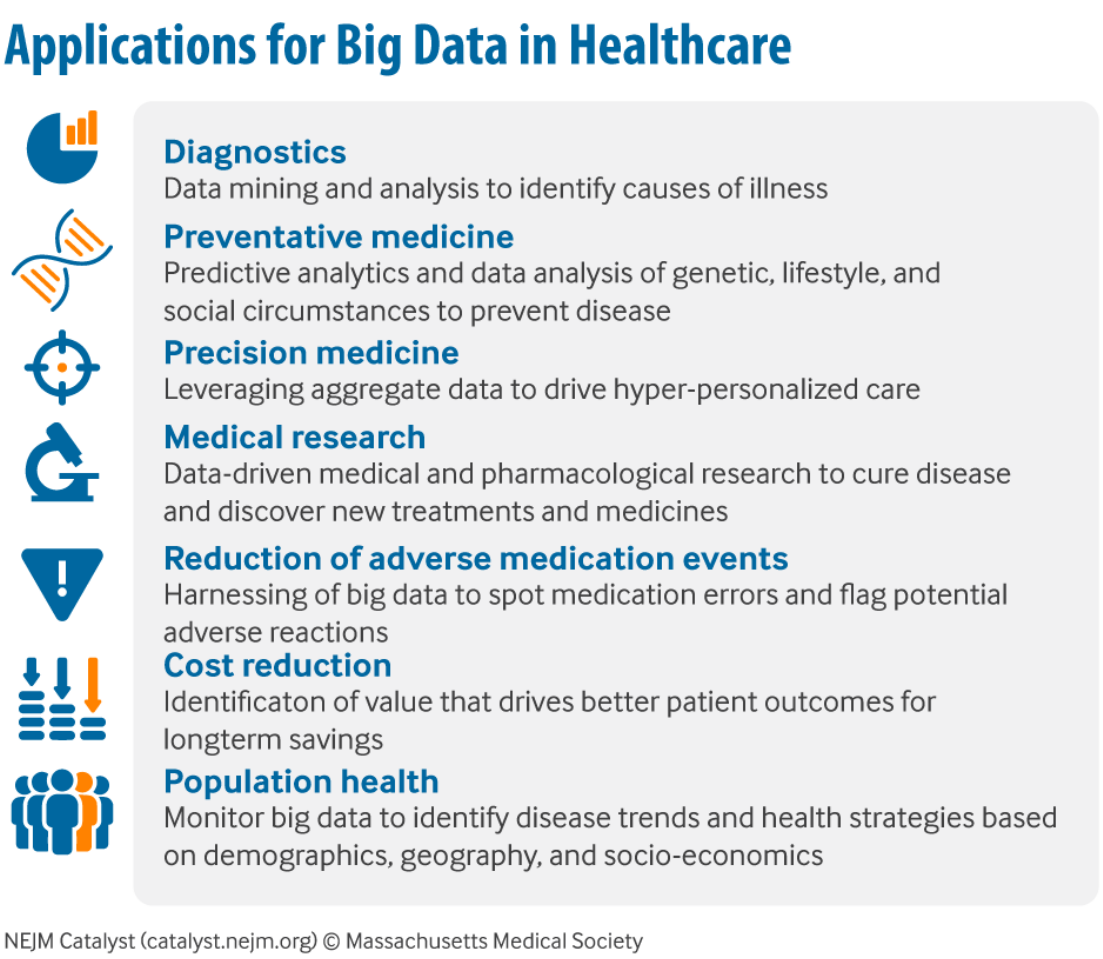

Figure 2.Big Data in Healthcare Applications--Diagnostics, Prevention, Precision Med, Research, Reduced Costs

Improvements in diagnostic capabilities improve people' access to health care. Mobile apps like Aetna's Triage use pooled data to provide users advice on their health and whether or not they should see a doctor depending on their responses.

- Apple has teamed up with Stanford University researchers on another healthcare data project to examine the possibility of using the Apple Watch's built-in heart sensor to detect atrial fibrillation, a condition responsible for the deaths of about 130,000 Americans every year. If the gadget is able to detect the illness, Apple could send alerts to its customers advising them to see a doctor.
- Individuals with asthma or COPD can take advantage of Propeller Health's Bluetooth-enabled sensor by attaching it to their inhaler or spirometer. The organisation monitors environmental conditions at sensor locations and reports the data to patients' mobile devices so they can figure out what's triggering their symptoms and take preventative measures. The company also provides medication reminders. To date, Propeller has published 34 articles in reputable scientific journals documenting a decrease in asthma attacks by 79% and an increase in days without symptoms by 50%.
- Prescription error reduction is a lifesaving and quality of life enhancing endeavour. More than 7 million people in the United States are affected by prescription errors each year, and 7,000 people lose their lives as a result, as reported by the Network for Excellence in Health Innovation. Israeli firm MedAware is working with hospitals and other healthcare facilities to roll out a decision support tool that leverages big data to detect and prevent prescription mistakes.

Reducing costs. Better patient care, shorter hospital stays, and fewer admissions and re-admissions are all results of the increased understanding that medical data affords doctors.

- In order to reduce the number of unnecessary trips to the emergency room, the Mayo Clinic uses big data analytics to determine which patients with multiple chronic conditions (comorbidity) would benefit most from early interventions at care homes.
- Big data analysis provides healthcare providers with knowledge that would not be possible without the data collected. It improves both the quality of care provided to patients and the efficiency with which medical professionals are able to prescribe medications and otherwise make clinical decisions.
- Patient cohorts with the highest risk for illness can be identified through analysis of healthcare big data, allowing for preventative measures to be taken. In a nutshell, patients with abnormally high health service utilisation can be identified through analysis of healthcare big data. It can identify procedures and practises that are inefficient or costly without providing sufficient return on investment. It can be used to help people become more health-aware and self-reliant. It can show how cost-effective and efficient treatment plans are by combining financial and clinical data.

3.1 Healthcare Big Data Lakes Become "Oceans"

Big data samples with more information are preferable for the same reason that researchers prefer to work with samples containing millions of values rather than hundreds. The term "data lake" is commonly used to represent a collection of raw large data, but there are a number of events currently taking place that promise to create what can be dubbed "data oceans" teeming with study and analytical possibilities.

Integration and exchange of clinical research data is valued by researchers and funding organisations for its ability to fill these "oceans." The UK Biobank is made available through the University of Oxford's Li Ka Shing Centre for Health Information and Discovery, which also intends to expand its database to include 50 million electronic patient records. In addition:

- The European Medical Information Framework (EMIF) is an initiative to increase research community access to cohort datasets and health data obtained from the electronic health records of around 50 million Europeans.
- Open PHACTS is a database that provides easy access to pharmacological information for researchers and other users. It was developed with the help of both academic and commercial entities, and its functionality lies on its ability to help users extract information and resolve intricate pharmacologic issues. More than 15 petabytes of information from 390 million patient records, inputs, and imaging studies have been collected by a division of the Dutch multinational company N.V. Philips. Using this huge

repository, medical professionals can access vital information that can aid in making educated treatment decisions.

- Bringing biomedical big data to researchers, clinicians, and others is a goal of the Big Data to Knowledge (BD2K) programme at the National Institutes of Health in the United States. Health care providers will have more agency to enhance care for patients and slow the unsustainable growth of healthcare costs as a result of initiatives like these. They will also make a wealth of data and information for the prevention and treatment of disease available to scientists.

4. METHODOLOGY

In academia, a systematic study is conducted to determine the current state of knowledge on a given topic or research question, including what has been discovered (trends, patterns, lines of inquiry, novel theoretical frameworks, and eminent researchers) and what still needs to be discovered (including gaps in the literature). We utilised VOSviewer, a programme designed for "visualising scientific landscapes," for this task. VOSviewer is an example of an evidence-based approach, as it employs a dependable and systematic methodology to locate, evaluate, and understand several academic publications that are pertinent to a certain issue. This article focuses on the use of Big Data studies to improve medical education and training.

To build and display bibliometric networks, use VOSviewer, a piece of software. Citation, bibliographic coupling, co-citation, and co-authorship relations can be used to build such networks, which may consist of journals, researchers, or individual articles. In addition to its usual array of features, VOSviewer now boasts text mining capabilities that may be put to use in building and visualising co-occurrence networks of key terms culled from a corpus of scientific study.

4.1 Study Design

The many aspects that boost big data analytics in the healthcare sector have been derived after an examination of various data works. This investigation uses a qualitative research approach based on interviews with representatives from two multinational corporations. The utilisation of both primary and secondary sources indicates that this study is grounded in qualitative research methodology.

4.2 Data Collection Method

4.2.1 Primary Data Collection

The method for analysing the data is a qualitative one. Twenty-five interviews were performed, with representatives from the Department of Health, the Abu Dhabi Health Services Authority (SEHA), and the Dubai Health Authority (DHA), as well as two international organisations, Johns Hopkins and Joint Commission International (JCI). Ten doctors, five EMR administrators, and five HIS experts were also interviewed. In order to get a more complete picture, we met ten doctors, four of whom specialised in different areas of medicine. Doctors are the link between the electronic medical record and the people who use it. All interviewees were contacted through the appropriate channels.

4.2.2 Secondary Data Collection

Literature and previous studies on the subject serve as the primary sources of secondary data used in this investigation.

4.3 Analysis

The Physicians

- Rapidly analysing massive amounts of medical data has been shown to significantly improve the likelihood of a positive outcome for patients.
- The majority of the analysis of medical data is still done by humans, but it is now recorded in computerised databases.
- They should look into introducing full automation into their procedures for storing and analysing medical data, especially in emergency situations where every second counts yet it takes time to sift through multiple pages of medical language and data to reach a conclusion.
- We need better data-driven decisions and more time spent with patients.
- Doctors can use digital data to better understand the relationships between different patient instances and tailor their care accordingly.
- As it stands, the healthcare system has some holes in its infrastructure.

5. BIG DATA RESEARCH IN HEALTHCARE

Big Data is the term used to describe the massive amounts of data, both organised and unstructured, that are created every day around the world. This includes anything from EMRs to medical wearables and augmented reality diagnostic gadgets that connect to the internet (loT) to improve patient care.

Across four dimensions, sometimes referred to as the "4 V's," Big Data is considered to operate in general notions and the broader literature. Volume, Veracity, Velocity, and Variety are the 4 V's.

HCOs are increasingly relying on data and analytics for a variety of purposes, including but not limited to: maintaining a competitive and profitable edge in the face of new regulations and governmental pressures to maximise costs and results; and meeting the increasing demands to boost performance, cut down on medical errors, and find novel ways to achieve better health outcomes.

Complexity and variety characterise today's medical technologies and clinical procedures. As the number of patient-facing wearables, data sources, and mobile apps continues to grow exponentially, the difficulty of developing effective Big Data algorithms and data gathering models will only increase. This explosion in data will help doctors better understand their patients' conditions, leading to more accurate diagnoses and more effective treatments. If Big Data continues to show promising results in healthcare, it will force a rethinking of healthcare delivery models around the world. Health care costs are still up for debate, but it appears that today's data distribution can be understood only by human intelligence.

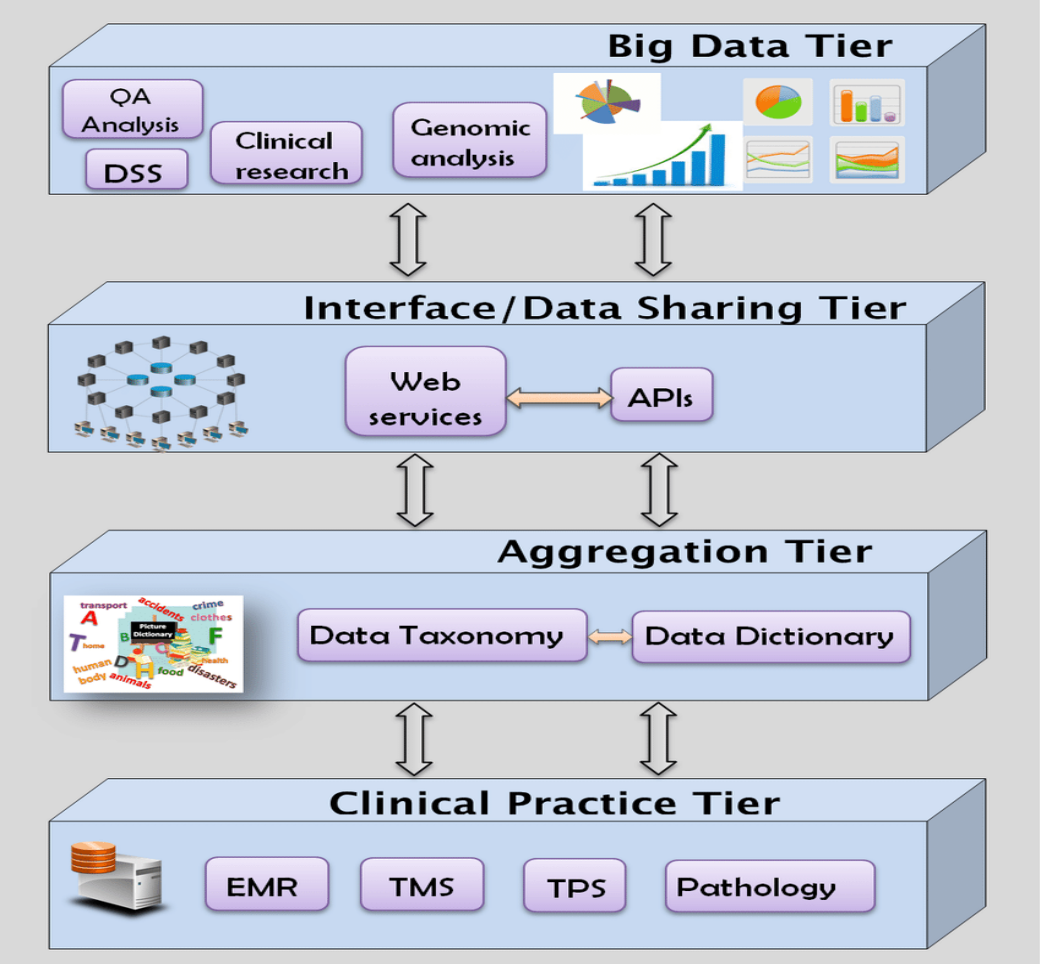

Figure 3: Smart tools for Big Data research in Healthcare.

Figure 3 displays a high-level architecture that reflects the fundamental structure of the suggested system.

5.1 Big Data Characteristic

Like with any large objects, characterising them will help us to organise our understanding and control them. Big data is noted for having the three Vs (volume, velocity, and variety) as its primary qualities. Knowing how to measure big data requires an awareness of these characteristics. The amount and extent of the data are indicated by its volume. While the velocity refers to the pace of change or frequency of creation of data. The variety also includes various data forms and types, as well as various uses and approaches to data analysis. The characteristics are listed in Fig. 4 below.

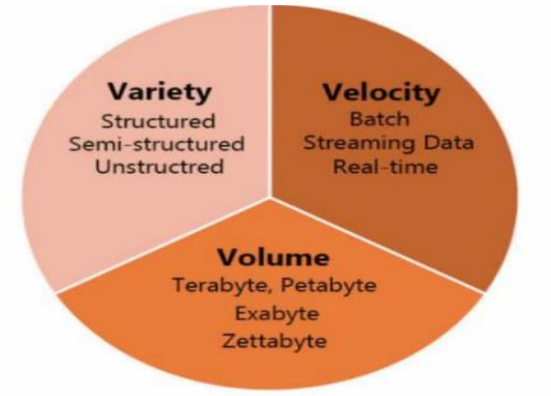

Figure 4. The Big Data Characteristic.

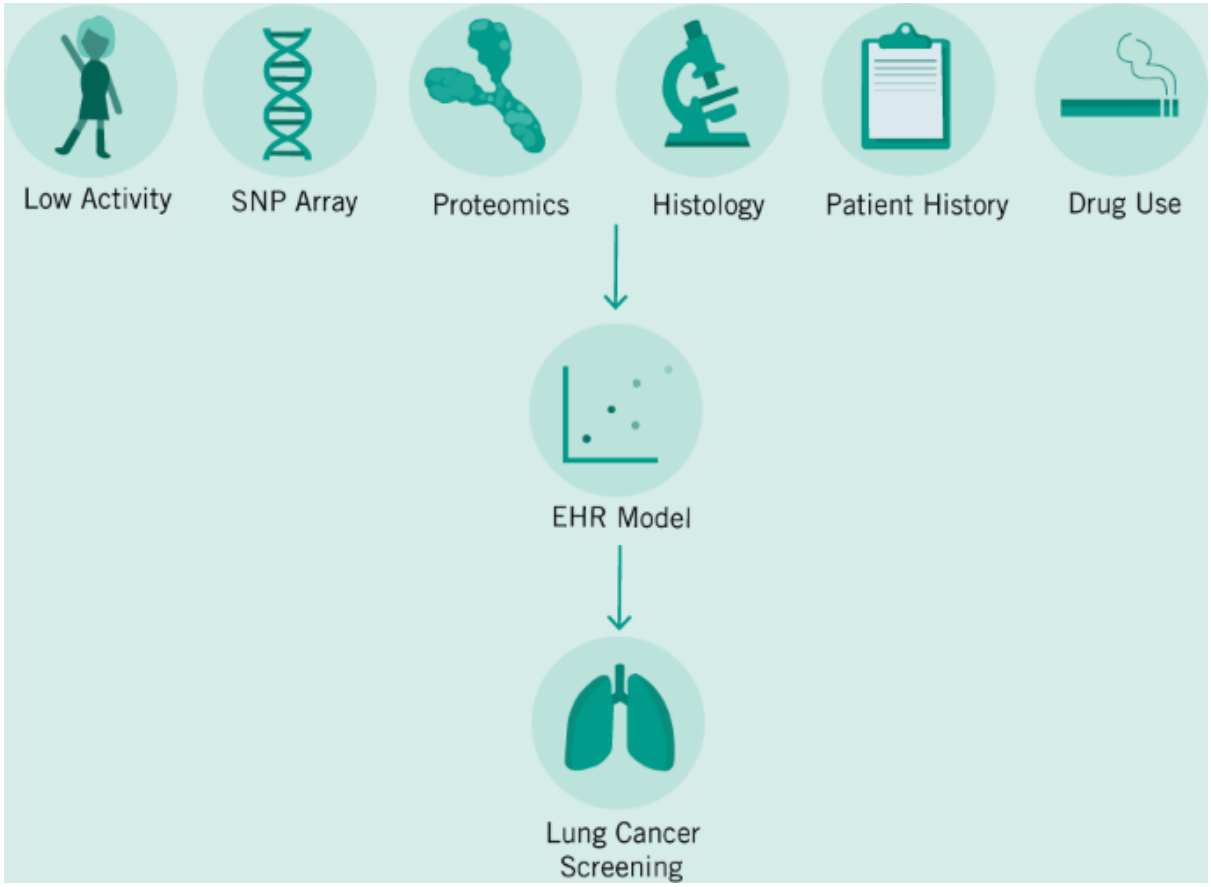

Fig. 5: The promise of Big Data is in its ability to prevent disease not just help doctors diagnose them.

Patients who have been regularly monitoring their heart rate, blood sugar, and a number of other factors for years may soon bring terabytes of data to doctors' offices. It is absurd to expect medical professionals to make clinical judgments based on such a massive amount of information. In order to solve the issue of the exponential expansion in the number of tests, assays, and outcomes, EHRs will need to be expanded from being records of patient-physician interactions and digital folders to being diagnostic tools (Fig. 5).

5.2Continuous medical education and learning

These days, doctors are also expected to help healthcare organisations learn and quickly distil new information from vast amounts of data in order to inform decisions about how to cut costs, expand treatment options, improve diagnostic pathways, and address other issues that have a financial or human resource impact. The ability to extract these insights will be a differentiator for firms and organisations, allowing them to grow and remain ahead of emerging competitors while also empowering the future of health. In order to better care for and diagnose patients in today's complex, high-tech, interdisciplinary healthcare system, medical doctors must participate in ongoing education programmes that expand their knowledge and skillsets.

Hospitals and HCOs often implement online modules, hire external third-party vendors, or sponsor specific academic courses in an effort to better equip MDs with the Big Data knowledge and technical expertise to operate with different data sets, databases, and insight query in an efficient and cost-effective manner. Most doctors have some level of comfort with diagnostic tools and EHRs, but there is room for growth in the area of sophisticated systems that employ AI or data science techniques, for example. Doctors are often too busy or too exhausted to actively read through the material and remember information needed to address these actual demands. In addition, doctors do not have as much time to focus on education because of the scarcity of clinical professionals.

6. RESULTS AND DISCUSSION

The use of big data analytics in healthcare has been extensively studied. Analysis of large amounts of medical data reveals previously unknown opportunities and spotlights existing problems. The quality, privacy, and security of an organization's data are crucial to the success of any information-gathering efforts. In addition, modern technologies like in-memory databases, artificial intelligence, and cloud computing have made "smart healthcare services" available, which can significantly enhance the efficiency of the healthcare system as a whole. In this article, we will go deeper into the numerous health analytics options made possible by big data.

1. Clinical diagnosis and research

Simply said, a clinical diagnosis is made by analysing a patient's symptoms and indicators to determine the disease's origin and nature. A physical examination and review of the patient's medical records are the main methods of diagnosis.

The process of disease diagnosis is the focal point of healthcare administration. In order to better inform their clinical judgement, medical professionals will benefit from analysing the massive amounts of data being collected about patients' symptoms, diagnoses, medications, and treatment plans. Hadoop and spark are two examples of the types of big data technologies used to process and analyse the massive amounts of raw data that are collected and to create useful prediction models for use in decision-making.

When it comes to determining the efficacy and safety of medications for human consumption, clinical research is another important area of the healthcare industry. Capturing large amounts of information from clinical databases could help us advance clinical research into a variety of diseases, including sleep disorders, etc. Potentially fruitful areas of healthcare include personalised medicine and preventative care.

2. Health Insurance – It pays for someone's medical bills in the event that they have them. A person's requirement for health insurance can be predicted with the help of predictive analytics. This aids institutions in comprehending the health insurance gap that exists in our society. As a result of the transparency and auditability it provides, blockchain technology could play a crucial role in the health insurance industry.

3. Service delivery system – The inputs of various health workers are what ultimately determine the quality of services provided by the health system. They make sure that the bar for quality is set low enough that the system actually has to meet it. It is critical to select the best quality indicator and track healthcare performance.

CONCLUSION

According to the results of the research, BDA is crucial for boosting the efficiency of healthcare organisations' inner workings. The use of big data analytics to improve healthcare outcomes and cut costs is a growing field with great potential. Accurate disease diagnosis, reduced costs and fewer mistakes, and appropriate Medicare treatment would all result from the widespread adoption of healthcare analytics, which could be greatly aided by efficient organisational structures, the streamlining of

processes, and the analysis of large data sets. However, data privacy and security concerns present a significant obstacle to the widespread adoption of big data in healthcare. BDA needs to anticipate closing these gaps with cutting-edge resources and technologies. The primary objective of this paper is to talk about how healthcare organisations can benefit from using big data tools and technologies. The data-driven services that can be offered to the public, as well as the insights that can be gleaned from analysing large amounts of data using Hadoop and Spark. Big data's necessary tools and technologies will hasten development in the healthcare sector and yield insights from massive data sets.

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