Journal of **N**onlinear **A**nalysis and **O**ptimization
Vol. 14, Issue. 2 : 2023
ISSN : **1906-9685**

A Conceptual Study On Transforming Healthcare Through Big Data Analytics

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Abstract

The introduction of Big Data Analytics (BDA) in healthcare will allow to use new technologies both in treatment of patients and health management. The paper aims at analyzing the possibilities of using Big Data Analytics in healthcare. The research is based on a critical analysis of the literature, as well as the presentation of selected results of direct research on the use of Big Data Analytics in medical facilities. A survey was carried out on a sample of 100 medical facilities in Andhra Pradesh .. Literature studies have shown that the use of Big Data Analytics can bring many benefits to medical facilities, while direct research has shown that medical facilities in Andhra Pradesh are moving towards data-based healthcare because they use structured and unstructured data, reach for analytics in the administrative, business and clinical area. The research positively confirmed that medical facilities are working on both structural data and unstructured data. The following kinds and sources of data can be distinguished: from databases, transaction data, unstructured content of emails and documents, data from devices and sensors. However, the use of data from social media is lower as in their activity they reach for analytics, not only in the administrative and business but also in the clinical area. It clearly shows that the decisions made in medical facilities are highly data-driven. The results of the study confirm what has been analyzed in the literature that medical facilities are moving towards data-based healthcare, together with its benefits
KEY WORDS: Big Data, health care

Introduction

This paper makes a significant contribution by providing a comprehensive analysis of the utilization of structured and unstructured data, commonly referred to as Big Data, within medical facilities in Andhra Pradesh . These medical institutions make use of both structured and unstructured data in their operations. Structured data adheres to a predefined schema, is extensive, comes in diverse forms, and is highly organized. In contrast, unstructured data, known as Big Data (BD), doesn't conform to conventional data processing standards. Big Data represents an immense volume of data that cannot be effectively stored, processed, or analyzed using traditional tools, often remaining in storage without analysis. Due to its lack of a well-defined schema, searching and analyzing such data is challenging, necessitating specific technologies and methods to extract meaningful insights from it . The integration of both structured and unstructured data holds the potential to deliver significant value to organizations. Dealing with unstructured data requires a distinct approach, and this is where the promise of Big Data Analytics (BDA) comes into play. prognosis and responses to treatments; a deeper understanding of the complex factors and their interactions that influence health at the patient level, the health system and Analytics encompass a suite of techniques and tools used to dissect and extract valuable insights from Big Data. The outcomes of Big Data analysis hold the dual capacity to predict future trends and shed light on past occurrences. In the healthcare domain, this analytical power allows for the scrutiny of vast datasets from numerous patients, unveiling clusters and correlations within the data, and crafting predictive models through data mining techniques .Healthcare constitutes a multifaceted ecosystem with diverse stakeholders, including patients, physicians, hospitals, pharmaceutical companies, and healthcare policymakers. This sector operates under strict regulations and protocols. Nevertheless, there is a global shift away from the traditional doctor-patient paradigm, with doctors transitioning into collaborative partners and

patients actively engaging in the therapeutic process . Healthcare has evolved beyond merely treating patients; the foremost objective for decision-makers should be the promotion of healthy lifestyles and the prevention of avoidable diseases . This shift in focus was notably underscored during the Covid-19 pandemic .

The imminent challenges confronting the healthcare sector include the burgeoning elderly population and declining fertility rates. Fertility levels in many regions are plummeting below the minimum threshold required to maintain a stable population . The combined effect of an aging populace and reduced fertility rates has led to a rising demographic burden. Projections indicate that the current healthcare delivery model will become unsustainable within the next two decades.

This has become even more evident in the wake of the Covid-19 pandemic, which placed significant demands on healthcare systems, necessitating the analysis of vast datasets to identify trends and forecast the virus's spread. The pandemic emphasized the necessity for patients to have access to their health information, the ability to conduct digital health analyses, and access to reliable online medical support. Health monitoring and collaboration with healthcare providers to prevent diseases have the potential to revolutionize the healthcare system. One pivotal aspect of this necessary transformation is placing the patient at the core of the healthcare system. However, achieving these goals isn't solely contingent on technology. Therefore, changes should extend beyond technological innovation and encompass the redesign of comprehensive healthcare processes, ultimately impacting the business models of service providers. Although the adoption of Big Data Analytics is increasingly prevalent in various sectors , medical institutions have yet to meet the information needs of patients, healthcare professionals, administrators, and policy makers. Embracing a Big Data approach would enable the implementation of personalized and precision medicine grounded in individualized real-time data, delivered to patients on a personalized basis.

Society has seen significant advancements in the detection of safety issues related to drugs and medical devices, as well as more efficient methods for comparing prevention, diagnostics, and treatment options .

While the literature has extensively discussed the opportunities presented by big data analysis and the types of data that can be analyzed, there is a notable scarcity of research illustrating how data analysis is actually carried out in the healthcare sector, including the specific data used by medical facilities and the scope of their analytical activities. This paper seeks to bridge this gap by presenting the findings of research conducted within medical facilities in Andhra Pradesh . The primary objective is to scrutinize the potential applications of Big Data Analytics in healthcare, particularly in the context of Andhra Pradesh . Specifically, the paper aims to ascertain the types of data processed by medical facilities in Andhra Pradesh , the nature of their analyses, and the domains in which these analyses are applied. Additionally, it investigates how these facilities evaluate their analytical maturity. To achieve this goal, the paper combines a critical literature analysis with primary research involving a questionnaire administered to 217 medical facilities in Andhra Pradesh.The underlying hypothesis is that medical facilities in Andhra Pradesh are actively working with both structured and unstructured data and are progressively adopting data-driven healthcare practices, thereby reaping the associated benefits. Assessing the maturity of healthcare facilities in the realm of Big Data and Big Data Analytics is essential in understanding the prospective advantages that the healthcare sector can derive from the application of Big Data Analytics. Furthermore, it is crucial to anticipate whether the healthcare sector will be equipped to confront the imminent threats and challenges it faces.

Exploring the Application of Big Data and Big Data Analytics in Healthcare"

In recent years, there has been a growing demand for effective analytical tools, especially for handling vast datasets, often referred to as Big Data (BD). Organizations are increasingly seeking ways to leverage the power of Big Data to enhance decision-making, gain a competitive edge, and improve overall business performance While Big Data is perceived as holding potential for public and private organizations, there is still limited knowledge regarding the practical outcomes of its implementation across various sectors [As previously noted, healthcare management has undergone a transformation globally, shifting from a disease-centric model to a patient-centric model, even within value-based healthcare delivery systems. Adhering to this model's requirements and delivering effective patient-centered care necessitates the management and analysis of healthcare Big Data.One recurring concern in the healthcare sector regarding the utilization of data is the appropriate handling of Big Data. Healthcare has always generated substantial volumes of data, and now, there is a growing imperative to harness the potential of Big Data effectively.

The introduction of electronic medical records, as well as the huge amount of data sent by various types of sensors or generated by patients in social media causes data streams to constantly grow. Also, the medical industry generates significant amounts of data, including clinical records, medical images, genomic data and health behaviors. Proper use of the data will allow healthcare organizations to support clinical decision-making, disease surveillance, and public health management. The challenge posed by clinical data processing involves not only the quantity of data but also the difficulty in processing it. In the literature one can find many different definitions of Big Data. This concept has evolved in recent 0can be treated as a: large amount of digital data, large data sets, tool, technology or phenomenon (cultural or technological. Big Data can be considered as massive and continually generated digital datasets that are produced via interactions with online technologies . Big Data can be defined as datasets that are of such large sizes that they pose

challenges in traditional storage and analysis techniques . A similar opinion about Big Data was presented by Ohlhorst who sees BigData as extremely large data sets, possible neither to manage nor to analyze with traditional data processing tools . In his opinion, the bigger the data set, the more difficult it is to gain any value from it. In turn, Knapp perceived Big Data as tools, processes and procedures that allow an organization to create, manipulate and manage very large data sets and storage facilities . From this point of view, Big Data is identified as a tool to gather information from different databases and processes, allowing users to manage large amounts of data. Similar perception of the term 'Big Data' is shown by Carter. According to him, Big Data technologies refer to a new generation of technologies and architectures, designed to economically extract value from very large volumes of a wide variety of data by enabling high velocity capture, discovery and/or analysis . Jordan combines these two approaches by identifying Big Data as a complex system, as it needs data bases for data to be stored in, programs and tools to be managed, as well as expertise and personnel able to retrieve useful information and visualization to be understood . Following the definition of Laney for Big Data, it can be state that: it is large amount of data generated in very fast motion and it contains a lot of content . Such data comes from unstructured sources, such as stream of clicks on the web, social networks (Twitter, blogs, Facebook), video recordings from the shops, recording of calls in a call center, real time information from various kinds of sensors, RFID, GPS devices, mobile phones and other devices that identify and monitor something . Big Data is a powerful digital data silo, raw, collected with all sorts of sources, unstructured and difficult, or even impossible, to analyzeusing conventional techniques used so far to relational databases. While describing Big Data, it cannot be overlooked that the term refers more to a phenomenon than to specific technology. Therefore, instead of defining this phenomenon, trying to describe them, more authors are describing Big Data by giving them characteristics included a collection of V's related to its nature .

The integration of electronic medical records and the vast influx of data from various sensors and patient-generated content on social media have led to an ongoing expansion of data streams in the healthcare industry. This data encompasses clinical records, medical images, genomic information, and health behavior records. Harnessing this data effectively is crucial for healthcare organizations to enhance clinical decision-making, disease monitoring, and public health management. However, the challenge lies not only in the sheer quantity of data but also in the complexity of processing it.

The term "Big Data" has evolved in recent years and remains somewhat ambiguous, with numerous definitions existing in the literature. Nevertheless, it can generally be understood as encompassing several aspects:

1. **Large Amount of Digital Data:** Big Data represents massive and continuously growing digital datasets generated through interactions with online technologies.
2. **Challenges in Storage and Analysis:** It is characterized by datasets of such immense sizes that they pose difficulties for traditional storage and analysis methods.
3. **Tools and Technologies:** Big Data can also be viewed as a set of tools, processes, and procedures that enable organizations to create, manipulate, and manage extensive datasets and storage facilities.
4. **Extraction of Value:** Big Data technologies are designed to extract value from vast volumes of diverse data by enabling high-speed capture, discovery, and analysis.
5. **Complex System:** It involves not only data storage but also the integration of databases, management tools, expertise, and personnel to retrieve meaningful insights and provide visualization.
6. **Velocity and Content:** Big Data is characterized by the rapid generation of data and content from various unstructured sources, such as web clicks, social networks, video recordings, call center logs, sensor data, and mobile devices.
7. **Unstructured Nature:** It is a repository of raw data collected from a multitude of sources, often unstructured and challenging to analyze using traditional relational database techniques.

Rather than a precise definition, Big Data is more of a phenomenon, and many authors describe it based on its key characteristics, often referred to as the collection of "V's." These characteristics include "Volume" (referring to the vast amount of data, a significant challenge in Big Data analytics), among others. Big Data encompasses a multifaceted and ever-expanding domain that presents both opportunities and challenges in the field of data analysis and decision-making.

The concept of Big Data is in a state of constant evolution, with a current emphasis on extracting value from data rather than simply dealing with massive quantities of data . Big Data is sourced from various origins, each with unique data characteristics and managed by different organizational units, resulting in the creation of a Big Data chain . Organizations aim to effectively handle, process, and analyze Big Data, particularly in the healthcare sector, where Big Data streams comprise diverse data types, including:

1. **Clinical Data:** This includes data extracted from electronic medical records, information from hospital systems, records from imaging centers, laboratory results, pharmacy data, and various health service providers. It also encompasses patient-generated health data, physician's free-text notes, genomic data, and physiological monitoring data .
2. **Biometric Data:** These data types are gathered from various monitoring devices that track parameters like weight, blood pressure, glucose levels, and more.
3. **Financial Data:** This category encompasses comprehensive records of economic transactions, reflecting the

financial activities of the organization

Exploring the Challenges and Advantages of Implementing Big Data Analytics in Healthcare"

Modern analytics not only provides insights into historical data but also equips us with the information needed to gain insights into future possibilities, even in the prediction of evidence-based actions. The healthcare industry's drive for reform has led payers and providers to embrace data analysis as a means to reduce risk, uncover fraudulent activities, enhance operational efficiency, and ultimately save lives. All healthcare stakeholder including payers, providers, and even patients, are increasingly focused on achieving more with fewer resources. Consequently, there are several areas in which advanced data and analytics can bring about significant advantages for various healthcare participants

The use of analytics by healthcare providers Healthcare providers are the main recipients and users of analytical systems in healthcare. Thanks to the introduction of electronic medical records, medical facilities will have access to data and thepossibility of using analytical systems, enabling the compilation of health services, maximizing its usefulness, profitability, taking into account market demand, costs and without reducing the quality of services. They will be able to securely share patient data between themselves and other entities providing health services. The use of analytics will allow access to statistical forecasts and it will allow to estimate the likelihood of occurrence of specific diseases and, on this basis, to plan types of health services. Thanks to analytics, medical centers will have a complete picture of their activities, taking into account the clinical, management, financial and quality perspectives The use of analytics by the Payer The analytics will allow payers to develop plans for managing health and preventive programs, so it can be a factor in improving the quality of patients' health insurance and improving the health and quality of life of insured persons. It will be possible to carry out analyses allowing to determine the structure and cost-effectiveness of medical procedures for a given disease or the risk of its occurrence.Access to cross-sectional information about the consumers will enable payers to identify factors (genetic, demographic or environmental) affecting the emergence and development of specific diseases. It will allow to plan contracting services and implement information and preventive programs, as well as informing patients what diseases they might come across or what are the risks Analytics in the field of Life Sciences In pharmaceutical forms and companies producing medical equipment, analytics has been used for several years, as these industries evolve very quickly. Current analytical systems are slowly adapting to the challenges of personalized medicine, allowing the adaptation of treatments, prophylaxis to individual patient genomes, their proteomes and metabolic attributes. Effective solutions in this area have not yet been fully developed. Pharmaceutical companies also use drug sales data to plan marketing activities to achieve greater sales efficiency The use of analytics by patients Patients are the final recipients of healthcare, so they will also have to become. Analytics may be useful for finding the best medical facilities and doctors, checking the effectiveness of treatments and medicines ordered, as well as comparing the price and quality of offers of different providers and selecting the best one. The analytical capabilities in the patient area are of course related to the introduction of the Health 2.0 concept thanks to which patients have access to health information from the level of a web browser and can use analytical systems in the same way. Analytical reports will have to be simplified so that patients can understand them.

Healthcare organizations see the opportunity to grow through investments in Big Data Analytics. In recent years, by collecting medical data of patients, converting them into Big Data and applying appropriate algorithms, reliable information has been generated that helps patients, physicians and stakeholders in the health sector to identify values and opportunities . It is worth noting that there are many changes and challenges in the structure of the healthcare sector. Digitization and effective use of Big Data in healthcare can bring benefits to every stakeholder in this sector. A single doctor would benefit the same as the entire healthcare system. Potential opportunities to achieve benefits and effects from Big Data in healthcare can be divided into four groups : 1. Improving the quality of healthcare services: • assessment of diagnoses made by doctors and the manner of treatment of diseases indicated by them based on the decision support system working on Big Data collections, • detection of more effective, from a medical point of view, and more cost-effective ways to diagnose and treat patients, • analysis of large volumes of data to reach practical information useful for identifying needs, introducing new health services, preventing and overcoming crises, • prediction of the incidence of diseases, • detecting trends that lead to an improvement in health and lifestyle of the society, • analysis of the human genome for the introduction of personalized treatment. 2. Supporting the work of medical personnel • doctors' comparison of current medical cases to cases from the past for better diagnosis and treatment adjustment, • detection of diseases at earlier stages when they can be more easily and quickly cured, • detecting epidemiological risks and improving control of pathogenic spots and reaction rates, • identification of patients who are predicted to have the highest risk of specific, life-threatening diseases by collating data on the history of the most common diseases, in healing people with reports entering insurance companies, • health management of each patient individually (personalized medicine) and health management of the whole society, • capturing and analyzing large amounts of data from hospitals and homes in real time, life monitoring devices to monitor safety and predict adverse events, • analysis of patient profiles to identify people for whom prevention should be applied, lifestyle change or preventive care approach, • the ability to predict the occurrence of specific diseases or worsening of patients' results, • predicting disease progression and its determinants, estimating the risk of complications, • detecting drug interactions and their side effects

Healthcare organizations are recognizing the potential for growth through investments in Big Data Analytics. In recent years, the collection of patient medical data, conversion into Big Data, and the application of suitable algorithms have led to the generation of reliable information that benefits patients, physicians, and stakeholders within the healthcare sector . It's important to acknowledge that the healthcare landscape is undergoing significant changes and challenges. The digitization of healthcare and the effective utilization of Big Data can offer advantages to all stakeholders in this sector, ranging from individual doctors to the entire healthcare system. Potential opportunities and effects of harnessing Big Data in healthcare can be categorized into four key groups :

1. **Improving the Quality of Healthcare Services:**
    - Assessing diagnoses made by physicians and treatment methods based on decision support systems using Big Data collections.
    - Identifying more medically effective and cost-efficient ways to diagnose and treat patients.
    - Analyzing vast datasets to derive practical insights for identifying needs, introducing new health services, preventing and managing crises.
    - Predicting disease incidence.
    - Detecting trends that can lead to improved public health and lifestyle.
    - Analyzing the human genome for personalized treatment approaches.
2. **Supporting Medical Personnel:**
    - Enabling doctors to compare current medical cases with past cases for better diagnosis and treatment adjustments.
    - Early detection of diseases for more effective and timely treatment.
    - Identifying epidemiological risks and enhancing control of disease outbreaks and response times.
    - Identifying patients at the highest risk of specific life-threatening diseases by analyzing data on common disease histories, aiding in insurance reports.
    - Individual patient health management (personalized medicine) and population health management.
    - Capturing and analyzing large volumes of real-time data from hospitals and home-based monitoring devices to enhance safety and predict adverse events.
    - Analyzing patient profiles to identify individuals who should receive preventive measures, lifestyle changes, or proactive care.
    - Predicting the onset of specific diseases or deteriorations in patient health.
    - Predicting disease progression and its determinants, estimating the risk of complications.
    - Detecting drug interactions and potential side effects.By leveraging Big Data, healthcare stakeholders can not only improve the quality of healthcare services but also support the work of medical personnel, leading to more effective, efficient, and personalized healthcare delivery.
3. Supporting Scientific and Research Activities:

- Facilitating research on new drugs and clinical trials by analyzing all available data rather than selecting a limited sample.
- Identifying patients with specific biological features suitable for participation in specialized clinical trials.
- Selecting groups of patients likely to respond positively to the tested drug with minimal side effects.
- Utilizing modeling and predictive analysis to design improved drugs and medical devices.

4. Business and Management:

- Reducing costs and preventing abuse and fraudulent practices.
- Swiftly and effectively identifying incorrect or unauthorized financial transactions to prevent abuse and rectify errors.
- Increasing profitability by identifying high-cost patients and physicians whose practices result in significant costs, and providing solutions to reduce expenditures.
- Identifying unnecessary medical activities and procedures, such as redundant tests.

According to research by Wang, Kung, and Byrd, the benefits of Big Data Analytics can be categorized into five main groups:

1. **IT Infrastructure Benefits:** This includes reducing system redundancy, avoiding unnecessary IT costs, efficient data transfer among healthcare IT systems, standardizing data processing, and lowering IT maintenance costs related to data storage.
2. **Operational Benefits:** These encompass enhancing the quality and accuracy of clinical decisions, rapid processing of large volumes of health records, reducing patient travel times, immediate access to clinical data for analysis, shortened diagnostic test times, reduced surgical hospitalizations, and opening up new research possibilities.
3. **Organizational Benefits:** This involves swiftly detecting interoperability issues, improving cross-functional communication and collaboration among administrative, research, clinical, and IT staff, enabling data sharing with other institutions and expanding services, content sources, and research partnerships.
4. **Managerial Benefits:** These include providing quick insights into evolving healthcare market trends, offering decision-support information to board members and department heads for daily clinical operations, and

optimizing business growth-related decisions.

5. **Strategic Benefits:** These involve providing a comprehensive view of treatment delivery to meet future needs and create highly competitive healthcare services.

The possibilities of employing Big Data Analytics in healthcare are practically limitless. Advanced analytical tools enable the analysis of data from various sources and cross-analysis to yield deeper insights. For instance, cross-analysis may involve a combination of patient characteristics and their responses to treatments, allowing for more personalized and effective healthcare practices.

The utilization of healthcare Big Data offers a substantial potential for transforming the healthcare industry. It holds the promise of improving patient outcomes, predicting epidemic outbreaks, providing valuable insights, preventing avoidable diseases, reducing healthcare delivery costs, and enhancing overall quality of life . However, the implementation of Big Data in healthcare also presents numerous challenges, including difficulties in data capture, storage, analysis, and visualization .

Challenges of Big Data Analytics

The main challenges are associated with the following issues:

1. **Data Structure:** While Big Data should ideally be user-friendly, transparent, and menu-driven, it often exists in fragmented, dispersed, non-standardized, and difficult-to-aggregate formats.
2. **Security:** Ensuring data security, privacy, and safeguarding the sensitivity of healthcare data is of utmost concern, with significant worries about confidentiality.
3. **Data Standardization:** Data is often stored in formats that are incompatible with various applications and technologies, making integration and analysis a complex task.
4. **Storage and Transfers:** Particularly the costs associated with securing, storing, and transferring unstructured data pose significant challenges.
5. **Managerial Skills:** Proper data governance is crucial, and the healthcare sector often lacks the appropriate analytical skills and expertise needed for effective Big Data utilization.
6. **Real-Time Analytics:** Healthcare is increasingly required to harness Big Data in real-time to support immediate decision-making, which poses additional technological and infrastructural challenges.
7. This research is founded on a critical analysis of existing literature and the presentation of specific findings derived from direct research on the implementation of Big Data Analytics in medical facilities in Andhra Pradesh
8. The research findings presented here are part of a broader questionnaire-based investigation into Big Data Analytics. The direct research involved an interview questionnaire comprising 100 questions with a 5-point Likert scale (ranging from 1—strongly disagree to 5—I definitely agree), along with four metrics questions. This study was conducted in December 2018, involving a sample of 217 medical facilities, which included 110 private and 107 public institutions. The research was carried out by a specialized market research agency, the Center for Research and Expertise of the University of Economics in Katowice.
9. Regarding the direct research, the selected entities encompassed those financed through public sources, such as the National Health Fund (23.5%), and those operating on a commercial basis (11.5%). A majority of the surveyed entities (64.9%) operated on a hybrid financial model, receiving funding from both public and commercial sources. The research sample's diversity also extended to the size of these entities, categorized by the number of employees. Notably, medium-sized entities (10–50 employees) constituted 34% of the sample, followed by large entities (51–250 employees) at 27%. The research covered the entirety of Andhra Pradesh , with entities from all voivodeships participating. The largest representation came from Łódzkie (32%), Śląskie (18%), and Mazowieckie (18%) voivodeships, which host a significant number of medical institutions. Other regions of the country were represented by individual units. The research sample was randomly selected in a layered approach. The data analysis was conducted using the GNU PSPP 0.10.2 software.
10. The primary goal of this study was to ascertain whether medical facilities in Andhra Pradesh employ Big Data Analytics and, if so, in what specific areas. The characteristics of the research sample are presented in Table 2.
11. It's important to note that the research is not exhaustive due to the incomplete and uneven regional distribution of the samples, with an overrepresentation of entities from three voivodeships (Łódzkie, Mazowieckie, and Śląskie). Nevertheless, the substantial size of the research sample, consisting of 217 entities, permits the authors of the study to formulate concrete conclusions regarding the utilization of Big Data in healthcare management processes.

Results and Findings

1. Based on the analysis of the literature and the findings from our research study and as per the responses received from the participants, nearly half of the medical institutions (47.58%) indicated that they somewhat favor the collection and utilization of structured data, such as databases, data warehouses, and reports to external entities. Additionally, 10.57% strongly agreed with this statement. Another 23.35% of representatives from medical institutions expressed a neutral stance, indicating "I agree or disagree."

2. The survey results indicate that medical facilities in Andhra Pradesh utilize a variety of data sources, including

both structured and unstructured data

3. The analysis further examined whether the size and ownership form of a medical facility have any impact on the analysisof unstructured data Correlation coefficients were computed to assess this.

4. Medical facilities collect and utilize data. The survey demonstrate that medical facilities primarily use information published in databases, reports submitted to external units, and transaction data. Additionally, they utilize unstructured data from sources like emails, medical devices, sensors, phone calls, and audio and video data. Data from social media, RFID, and geolocation sources are used to a lesser extent. These findings align with existing literature studies. Furthermore, more than half of the medical facilities have integrated hospital systems (HIS) implemented. Specifically, 43.61% use integrated hospital systems, while 16.30% use them extensively .Conversely, 19.38% of the examinedfacilities do not use HIS at all

5. Medical facilities (34.80% use it, 32.16% use extensively) conduct medical documentation in an electronic form, which gives an opportunity to use data analytics. Only 4.85% of medical facilities don't use it at all. Other problems that needed to be investigated were: whether medical facilities in Andhra Pradesh use data analytics? If so, in what form and in what areas?

In summary, analysis of the literature that the benefits that medical facilities can get using Big Data Analytics in their activities relate primarily to patients, physicians and medical facilities. It can be confirmed that: patients will be better informed, will receive treatments that will work for them, will have prescribed medications that work for them and not be given unnecessary medications . Physician roles will likely change to more of a consult-ant than decision maker. They will advise, warn, and help individual patients and have more time to form positive and lasting relationships with their patients in order to help people. Medical facilities will see changes as well, for example in fewer unnecessary hospitalizations, resulting initially in less revenue, but after the market adjusts, also the accomplishment . The use of Big Data Analytics can literally revolutionize the way healthcare is practiced for better health and disease reduction. We can conclude that the analysis of the latest data reveals that data analytics increase the accuracy of diagnoses. Physicians can use predictive algorithms to help them make more accurate diagnoses. Moreover, it could be helpful in preventive medicine and public health because with early intervention, many diseases can be prevented or ameliorated . Predictive analytics also allows to identify risk factors for a given patient, and with this knowledge patients will be able to change their lives what, in turn, may contribute to the fact that population dis- ease patterns may dramatically change, resulting in savings in medical costs. Moreover, personalized medicine is the best solution for an individual patient seeking treatment. It can help doctors decide the exact treatments for those individuals. Better diagnoses and more targeted treatments will naturally lead to increases in good outcomes and fewer resources used, including doctors' time.

Practical implications

This work sought to narrow the gap that exists in analyzing the possibility of using Big Data Analytics in healthcare. Showing how medical facilities in Andhra Pradesh are doing in this respect is an element that is part of global research carried out in this area, including .

Conclusion

The present study carried out and presented in this article made it possible to determine whether medical facilities in Andhra Pradesh use Big Data Analytics and if so, in which areas. Medical facilities are working on both structured and unstructured data, which comes from databases, transactions, unstructured content of emails and documents, devices and sensors. According to analytics, they reach for analytics in the administrative and business, as well as in the clinical area. It clearly showed that the decisions made are largely data-driven. The results of the study confirm what has been analyzed in the literature. Medical facilities are moving towards data-based healthcare and its benefits. In conclusion, Big Data Analytics has the potential for positive impact and global implications in healthcare. Future research on the use of Big Data in medical facilities will concern the definition of strategies adopted by medical facilities to promote and implement such solutions, as well as the benefits they gain from the use of Big Data analysis and how the perspectives in this area are seen.

References

[1] Abouelmehdi K, Beni-Hessane A, Khaloufi H. Big healthcare data: preserving security and privacy. J Big Data. 2018.https://doi.org/10.1186/s40537-017-0110-7.

[2] Agrawal A, Choudhary A. Health services data: big data analytics for deriving predictive healthcare insights. HealthServ Eval. 2019. https://doi.org/10.1007/978-1-4899-7673-4_2-1.

[3] Al Mayahi S, Al-Badi A, Tarhini A. Exploring the potential benefits of big data analytics in providing smart healthcare. In: Miraz MH, Excell P, Ware A, Ali M, Soomro S, editors. Emerging technologies in computing— first international conference, iCETiC 2018, proceedings (Lecture Notes of the Institute for Computer Sciences, Social- Informatics and Telecommunications Engineering, LNICST). Cham: Springe r; 2018. p. 247 –58. https://doi.org/10.1007/978-3-319-95450-9_21.

[4] Bainbridge M. Big data challenges for clinical and precision medicine. In: Househ M, Kushniruk A, Borycki E, editors. Big data, big challenges: a healthcare perspective: background, issues, solutions and research directions. Cham: Springe r; 2019. p. 17–31.

[5] Bartuś K, Batko K, Lorek P. Business intelligence systems: barriers during implementation. In: Jabłoński M, editor. Strategic performance management new concept and contemporary trends. New York: Nova Science Publishers; 2017. p. 299–327. ISBN: 978-1-53612-681-5.

[6] Bartuś K, Batko K, Lorek P. Diagnoza wykorzystania big data w organizacjach-wybrane wyniki badań. Informatyka Ekonomiczna. 2017;3(45):9–20.

[7] Bartuś K, Batko K, Lorek P. Wykorzystanie rozwiązań business intelligence, competitive intelligence i big data wprzedsiębiorstwach województwa śląskiego. Przegląd Organizacji. 2018;2:33–9.

[8] Batko K. Możliwości wykorzystania Big Data w ochronie zdrowia. Roczniki Kolegium Analiz Ekonomicznych.2016;42:267–82.

[9] Bi Z, Cochran D. Big data analytics with applications. J Manag Anal. 2014;1(4):249–65. https://doi.org/10.1080/23270 012.2014.992985.

[10] Boerma T, Requejo J, Victora CG, Amouzou A, Asha G, Agyepong I, Borghi J. Countdown to 2030: track- ing progress towards universal coverage for reproductive, maternal, ne wborn, and child health. Lancet. 2018;391(10129):1538–48.

[11] Bollier D, Firestone CM. The promise and peril of big data. Washington, D.C: Aspen Institute, Com munications and Socie ty Program; 2010. p. 1–66.

[12] Bose R. Competitive intelligence process and tools for intelligence analysis. Ind Manag Data Syst.2008;108(4):510–28.

[13] Carter P. Big data analytics: future architectures, skills and roadmaps for the CIO: in white paper, IDC sponsored bySAS. 2011. p. 1–16.

[14] thmore N. Deriving business intelligence from unstructured data. Int J Inf Comput Technol.2013;3(9):971–6.

[15] Gupta V, Singh VK, Ghose U, Mukhija P. A quantitative and text-based characterization of big data research. J Intell Fuzzy Syst. 2019;36:4659–75.

[16] Hampel HOBS, O'Bryant SE, Castrillo JI, Ritchie C, Rojkova K, Broich K, Escott-Price V. PRECISION MEDICINE-the golden gate for detection, treatment and prevention of Alzheimer's disease. J Prev Alzheimer's Dis. 2016;3(4):243.

[17] Harerimana GB, Jang J, Kim W, Park HK. Health big data analytics: a technology survey. IEEE Access. 2018;6:65661–78. https://doi.org/10.1109/ACCESS.2018.2878254.

[18] Hu H, Wen Y, Chua TS, Li X. Toward scalable systems for big data analytics: a technology tutorial. IEEE Access. 2014;2:652–87.

[19] Hussain S, Hussain M, Afzal M, Hussain J, Bang J, Seung H, Lee S. Semantic preservation of standardized healthcare documents in big data. Int J Med Inform. 2019;129:133–45. https://doi.org/10.1016/j.ijmedinf.2019.05.024.

[20] Islam MS, Hasan MM, Wang X, Germack H. A systematic review on healthcare analytics: application and theoretical perspe ctive of data mining. In: Healthcare. Basel: Multidisciplinary Digital Publishing Institute; 2018. p. 54.

[21] Ismail A, Shehab A, El-Henawy IM. Healthcare analysis in smart big data analytics: reviews, challenges and recommendations. In: Security in smart cities: models, applications, and challenges. Cham: Springer; 2019. p. 27–45.

[22] Jain N, Gupta V, Shubham S, et al. Understanding cartoon emotion using integrated deep neural network on large dataset. Neural Comput Appl. 2021. https://doi.org/10.1007/s00521-021-06003-9.

[23] Janssen M, van der Voort H, Wahyudi A. Factors influencing big data decision-making quality. J Bus Res.2017;70:338–45.

[24] Jordan SR. Beneficence and the expert bureaucracy. Public Integr. 2014;16(4):375–94. https://doi.org/10.2753/PIN10 99-9922160404.

[25] Knapp MM. Big data. J Electron Resourc Med Libr. 2013;10(4):215–22.

[26] Koti MS, Alamma BH. Predictive analytics techniques using big data for healthcare databases. In: Smart intelligent computing and applications. New York: Springer; 2019. p. 679–86.

[27] Krumholz HM. Big data and ne w knowledge in medicine: the thinking, training, and tools needed for a learning health system. Health Aff. 2014;33(7):1163–70.

[28] Kruse CS, Goswamy R, Raval YJ, Marawi S. Challenges and opportunities of big data in healthcare: a systematic revie w. JMIR Me d Inform. 2016;4(4):e38.

[29] Kyoungyoung J, Gang HK. Potentiality of big data in the medical sector: focus on how to reshape the healthcaresystem. Healthc Inform Res. 2013;19(2):79–85.

[30] Laney D. Application delivery strategies 2011. http://blogs.gartner.com/doug-laney/files/2012/01/ad949-3D-Data- Management-Controlling-Data-Volume -Velocity-and-Variety.pdf.
[31] Lee IK, Wang CC, Lin MC, Kung CT, Lan KC, Lee CT. Effective strategies to prevent coronavirus disease-2019 (COVID- 19) outbreak in hospital. J Hosp Infect. 2020;105(1):102.
[32] Lerner I, Veil R, Nguyen DP, Luu VP, Jantzen R. Revolution in health care: how will data science impact doctor-patient relationships? Front Public Health. 2018;6:99.
[33] Lytras MD, Papadopoulou P, editors. Applying big data analytics in bioinformatics and medicine. IGI Global: Hershey; 2017.
[34] Ma K, et al. Big data in multiple sclerosis: development of a web -based longitudinal study viewer in an imaging informatics-based eFolder system for complex data analysis and management. In: Proceedings volume 9418, medi- cal imaging 2015: PACS and imaging informatics: next generation and innovations. 2015. p. 941809. https://doi.org/10.1117/12.2082650.
[35] Mach-Król M. Analiza i strategia big data w organizacjach. In: Studia i Materiały Polskiego StowarzyszeniaZarządzania Wiedzą. 2015;74:43–55