BULLET: Jurnal Multidisiplin Ilmu
Volume 3, No. 04, Augustus-September (2024)
ISSN 2829-2049 (media online)
Hal 589-598

From Data to Decisions: The Impact of AI on Healthcare Systems

Murad Khan[1], Abdul Mannan Khan Sherani[2]

[1]American National University, Salem Virginia

[2]Washington University of Science and Technology, Virginia

[1]khanm@students.an.edu, [2]asherani.student@wust.edu

Abstract: Artificial Intelligence (AI) has gradually permeated almost all aspects of healthcare delivery emerging as a critical enabler for continued advancement. Let us investigate literature on AI in the subject domain of healthcare which comprises diagnostics, clinical decision, medicine customization and health care regulation systems. Machine learning deep learning, natural language processing are improving the clinical analytics by improving diagnosis, treatment, and care. Furthermore, also integrally involves AI in activities and tasks that aimed at improving the facility's operations such as the distribution of resources, patients' traffic and numerous administrative duties. This paper acknowledges that there is a great potential in the use of AI in the healthcare sector, but there arises important ethical questions around the use of AI such as data ownership, fairness of the algorithm, and fears around transparency and accountability. Remaining issues affecting its growth include regulatory issues since the existing frameworks cannot cope with the emerging AI innovations. The future of adopting AI has potentialities on early detection of diseases and illnesses, discovery of new drugs, tele-medicine, and in the international health sector. AI will help with increasing the availability of healthcare for patients in the regions where the necessary facilities are scarce and advancing the creation of individual treatment plans. But for that to happen, it is important to solve ethical, regulating and data problems connected with AI deployment. The successful implementation of AI in HC has possibilities to achieve better patient outcomes, decrease costs and general advancement of quality and accessibility of HC for everyone in the world.

Key words

AI in diagnosis, diagnosis, machine learning, deep learning, wise therapeutics, clinical decision support system, operations management, data protection, bias, explain ability, and regulations, drugs and molecules, telemedicine, international and domestic health care, fair health care

INTRODUCTION

AI today is being incorporated into the healthcare sector as a potent tool that can bring about big changes to the improvement of the patients care, efficiency and even optimized the costs. Heath care has not been an exception and has had to engage AI technologies since it operates with a lot of data that was hard to process through human labor and resource use. Let alone electronic health records; every aspect of medical imaging and patient monitoring today is either already leveraged by or only in the process of being transformation by AI [1]. However, in its simplest terms, AI allows a machine to 'learn' from the data provided to it, identify patterns, make decisions and sometimes even provide outputs which are more accurate than that of human intelligence. Due to the prominent role of patient data, health-care is considered highly relevant to AI applications, especially ML algorithms which are able to assess large datasets and used in decision making process, including medical history and real-time patient data. The most recent type of machine learning is deep learning that is is used for tasks including diagnosis of diseases from images, and outcomes from patient's health profile and creating a unique individualized treatment plan [2].

AI in to healthcare has given rise to various innovations especially in the following fields; diagnostic, drug discovery, personalized medicine and administrative innovation. For instance, the diagnostic radiology by AI can pinpoint accurate relationship and image features of a medical image without delay, and differentiate between tumors or fractures at the early stage. Further, clinicians have been supported by introducing applications of AI, particularly in decision making processes where actual decisions are made based on preventive information to enhance the standards of patients' care and demure medical mistakes [3]. Nevertheless, there are several issues related to the AI application in healthcare even though it looks very promising. Disputes like data protection, machine learning protectionism, call for regulatory policies on use of AI remains quite relevant even to date. There is also the issue of wide scale up of the system across various types of healthcare settings with different degrees of technical readiness and receptiveness. In this paper's introduction, AI's possibilities and the multifaceted processes defining its place in healthcare are described. With time, the technological advancement which has been evident in the delivery of health services will continue to expand and create opportunities for enhancing the competency of patient care and system flow [4].

BULLET: Jurnal Multidisiplin Ilmu
Volume 3, No. 04, Augustus-September (2024)
ISSN 2829-2049 (media online)
Hal 589-598

DATA-DRIVEN HEALTHCARE: CLASSIFICATION, ISSUES, AND POSSIBILITIES

Healthcare data is the soul of today's Health Systems and many advancements led by AI are based primarily on data. The field of healthcare itself produces a significant amount of big data every day which comprises patient data, results of tests, images, and signals from wearable devices, and clinical notes. Such a trove of information provides great potential for better patient care, increased organizational performance, and research. However, there are profound difficulties of managing and interpreting this data that necessarily have to be answered in order to unlock the full explorative capabilities of AI in healthcare [5]. Healthcare data can be broadly categorized into three types: This means that the raw data can be categorized under structured, unstructured or real time data. Electronic Medical Records is made of arranged content, such as numerical data from Lab, demographics of the patient, and billing. This kind of data is easily accommodated, categorized and processed and analyzed by AI algorithms. While, the unstructured data contain textual forms of information like clinical narratives, patient history, and imaging report [6].

It takes some high-level artificial intelligence methods such as Natural Language Processing (NLP) to get insights behind these texts. Real-time data originate from devices such as wearable technology, patient monitoring gadgets, and IoT aspirational health solutions. This data can be valuable for understanding a patient's status and give quick recommendations for a treatment. The primary issue within the problem area of healthcare data management is their dispersion. Information is fragmented and can be stored in a multiple systems including the EHRs, laboratory information systems, and imaging systems [7]. This fragmentation hampers development of a holistic view of a patient, which exercises significant constraint on AI based technologies. Another challenge that rises in the process of managing big data is how to achieve high quality and the relevance of the data. Low quality or incorrect data results in another type of an issue: unreliable AI, making wrong predictions and wrong decisions.

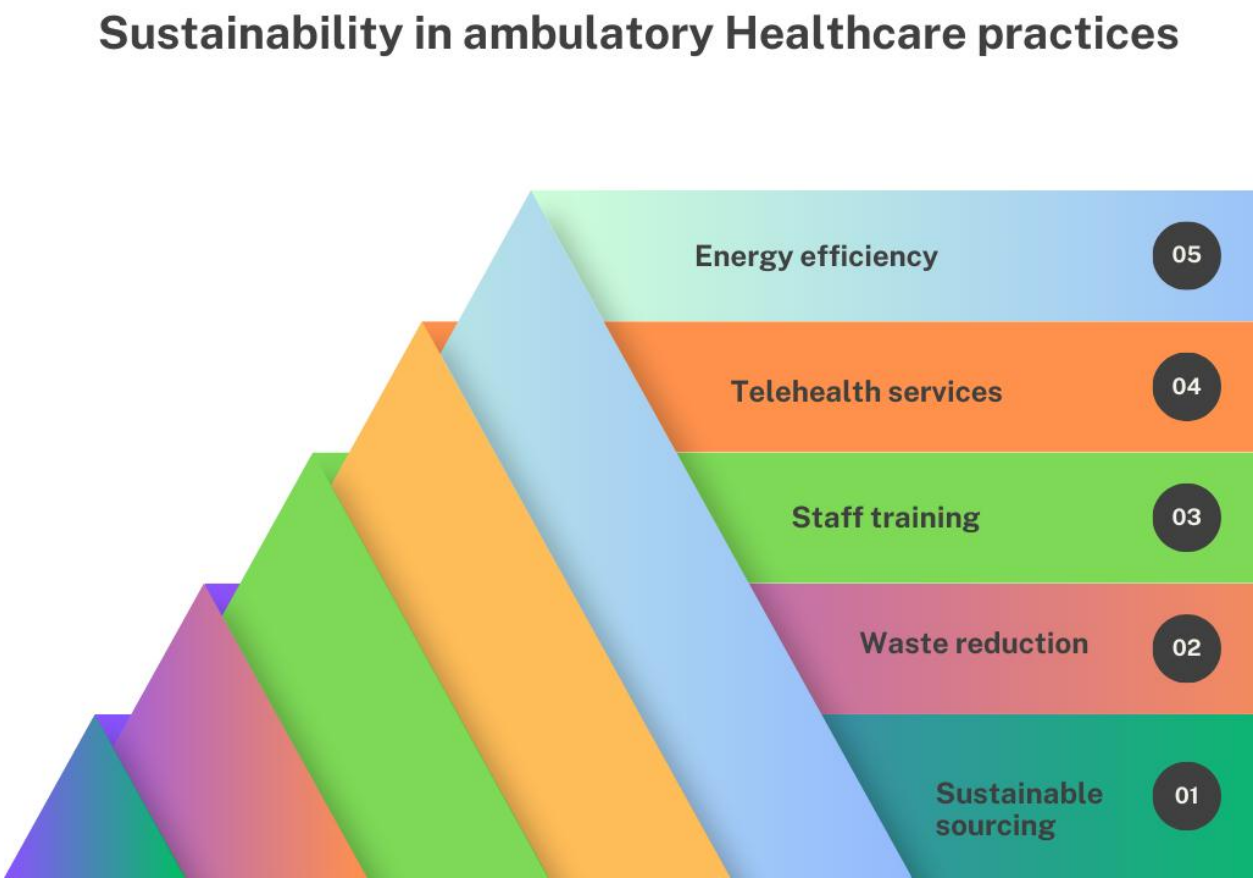

Figure: 1 showing sustainability in ambulatory healthcare practices

However, as with any challenges mentioned above, it also presents several opportunities for the formulation of solutions. For healthcare organizations the key benefits of AI can only be practically realized if data from different systems are connected and made interoperable. This can be the case with real time data where early indicator of a patient with a chronic condition can alert the healthcare provider for an intervention [8]. In addition, those AI algorithms that analyze such big and unstructured data can help clinicians in understanding information, thereby

improving the quality of the care that is being delivered. Health care is known to rely on data, and its collection, management and integration are significant determinants of nearness of AI to achieve enhancement of patient experience, and efficient provision of care and administrative services. Overcoming the current problem of disparate, erroneous, and often incomplete data will be critical in reaping benefits from AI in the delivery of healthcare [9].

COOPERATING AI TECHNOLOGIES THAT IMPROVE CLINICAL AND OPERATIONAL CHOICES

In the context of health, they believe that information technology in general and specifically Artificial Intelligence (AI), can greatly improve both clinical as well as operational decision making. Using large amount of the healthcare information, AI systems can help healthcare professionals to make faster, more precise and evidence-based decisions that can increase the effectiveness of the healthcare delivery and advance individual patients' outcomes. Advanced and sophisticated AI, including ML, deep learning, and NLP, is transforming clinical and operational processes, including diagnosis, treatment planning and decision making, resource management and hospital work [10]. There is a cuttings transition towards the use of AI depicting that its most exciting role has been seen in clinical decision support processes. Professionals in healthcare are using machine learning models to sort through reams of data, look for patterns, and suggest treatments to physicians. For instance, deep learning algorithms are already in use within the diagnostic medicine to analyze medical images inclusive of x-rays, MRI's and CT scans. Most of these tools can work as early indicators of any abnormalities including tumors, fracture or signs of diseases better and faster than a human radiologist. For instance, recent AI developments like Google's Deep Mind can diagnose the eye diseases from the scanned retinal image and even recognize early stage breast cancer with increased levels of accuracy [11].

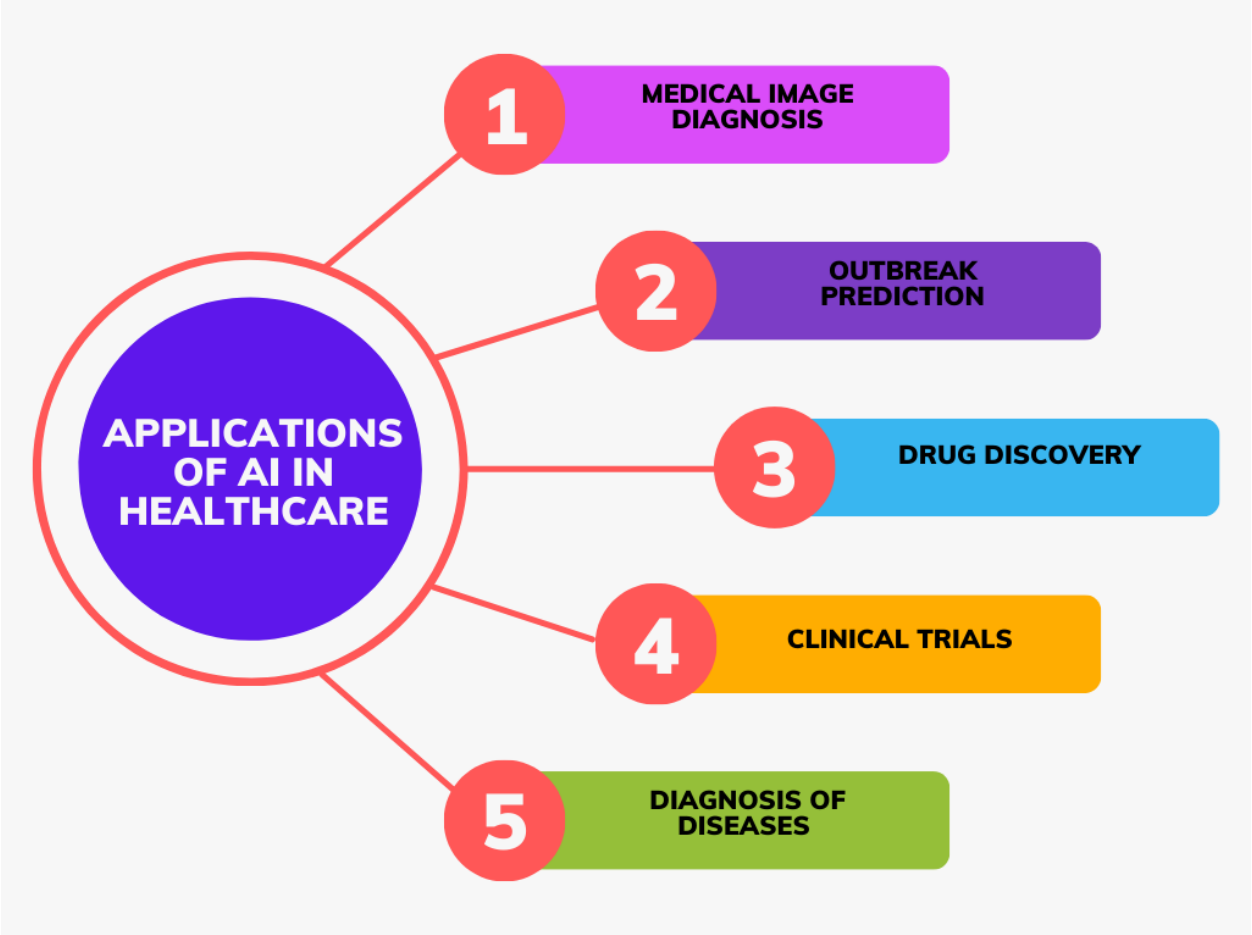

Figure: 2showing applications of AI in healthcare

It is also driving up the diagnosis accuracy in branches that include dermatology, cardiologic, and pathologic. In dermatology, different forms of AI are in the application of skin-lesion images to spectators of melanoma, one type of skin cancer. Likewise in cardiology, the use of AI in identification of arrhythmia as well as other heart

ailments based on EKG data has been in practice. In addition, personalized medicine cannot be done without AI. This makes it possible for the AI systems to diagnose through the genetic profile, history of the patient and lifestyle habits to recommend the type of treatment the patient needs [12]. For instance, AI can predict a patient's likely reaction to a given drug or treatment and thus eliminate the usual guesswork. Such a level of care results in higher treatment effectiveness and decreased rates of adverse drug effects. At the same time, AI is also changing operational decisions in running the healthcare organization industry. Any system of providing health care is usually a large one, in the main a centralized one, with resources typically overstretched and health care delivery sometimes disorganized. The efficiency can be increased when the automating tools involve the use of AI for managing the resources and keeping the administration at bay [13].

An example of utilization of AI is in the handling of patients' flux and hospital administrative operations optimization. AI systems can anticipate admission rates, estimate the surge in the number of patients in emergency department and assists in determining the optimal locations of beds which in result minimizes ways and improves uses of the limited resources in hospitals. AI can also help with regard to the staff scheduling, as it determines the patients' flow, trends in flow throughout the year, and clinicians' preferences for scheduling. This assists in keeping staff vacancies filled in the hospital whilst at the same time is ensuring that there are limits put in place to prevent overworking of healthcare givers [14]. A second operational use of AI is in automation of clerical work. Hospitals and clinics produce significant paper documents such as bills, receipts, and insurance claims that require lots of time to prepare and are often inaccurate due to manual work. Application services artificially drive can enhance clerical work, accuracy and efficiency of the billing process and minimizes fraudulent cases by identifying the deviation. For example, AI can help get Children's programming codes for medical procedures and diagnoses, avoiding mistakes and enhancing claims amount [15].

As this paper has demonstrated, although AI holds various opportunities, the implementation of these technologies has its issues when deployed in the clinical and operational environment. Population characteristics are a major limitation; population data of high quality is required. To be effective, AI algorithms rely on the availability on large datasets and these data should be accurate hence have a well labeled format and structure. Such barriers, or challenges can be issues such as privacy, the lack of compatibility, and the absence of uniformity in a clinical context in healthcare. Also, there is the problem of how to make sure the recommendation made by AI is trusted and used by healthcare professionals [16]. Several clinicians may be unwilling to take chances in availing or relying on AI because it lacks transparency, accountability and might make fatal mistakes sometimes. AI is now revolutionizing both clinical and operation functions in the entire field of healthcare. As we have seen from diagnostic enhancements, resource management, and administrative tasks, the impact of AI is to disentangle and enhance overburdened processes and free up the human workforce to deliver increased levels of care [17]. Still, to unleash its full adjuvant value, data must face multiple barriers concerned with their quality, uptake, and credibility. As the technology advances, value of AI in enhancing the functionality and performance of the healthcare systems will increase thus increasing the value delivered to the patients.

AI IN CDSS

CDSS has adopted AI in its functioning as it boasts of accurate healthcare provider decisions at great efficiency. These systems let the use of artificial intelligence technologies including machine learning, deep learning as well as natural language processing to process large amount of information so that the clinician can diagnose the disease, design the treatment plan and involve the artificial intelligence to forecast the patients' condition. This section delves into the integration of AI in CDSS, examining its impact through key subdomains: In diagnostics, treatment and in using probabilities to target patients, value is added by using big data and analytics [18].

Enhancing Diagnostics through AI: The most valuable application of AI in CDSS can be realized in enhancing diagnostic accuracy. Large datasets such as medical images, EHRs or laboratory tests results can be searched for end points, which a clinician might not have noticed. For instance, deep learning models can identify challenging patterns that radiology imaging may present such as lung nodule in the chest x-ray or the tumor in the mammogram with high levels of precision [19]. Not only do these tools necessitate a faster rate at which more complex diagnostic processes occur; they also eliminate the possibility of human error. CDSS with the use of artificial intelligence creates an absolute plus when handling rare and complicated diseases since it will refer to the global database and use the case analysis relating to such diseases. Further, AI systems may prioritize patients by sorting cases information and identifying serious condition cases which require a quick action by nurses. This means that patient needs can be optimally met while freeing up valuable time for physicians and other healthcare providers most especially in highly stressful areas such as emergency treat and release division [20].

Personalized Treatment Plans: AI integrated CDSS has dramatically changed the prospect to the idea of individualized therapy. They can also make personalized recommendations to the plan of treatment based on the

patient's genetic make-up, lifestyle and medical history data included in the patients' electronic health records. For instance, in cancer, an own AI CDSS can consequently evaluate the genomic characteristics of a tumor mass and propose other therapies which are most effective [21]. Besides, AI solutions can observe the patient's condition when he or she is undergoing the treatment program and make changes to it based on the new information. In relapsing diseases such as diabetes or hypertension, CDSS can help a clinician choose the right dosage or recommend some lifestyle changes. This dynamic approach of care enhances the patient well-being while reducing the downside of unrelated effects of treatment [22].

Challenges in AI-Driven CDSS: As much as making recommendations for improvement, implementation integration of AI in CDSS has challenges. Data quality seems to be one of the most significant challenges in the use of the technology. Incomplete, inconsistent, or even bias data will always lead to a weak or low AI model development. There are also legal challenges such as censure, patient privacy and data security become large barriers when health information is involved. Another challenge of this approach of training is that AI algorithms' workings are often opaque – a problem that researchers call the 'black-box problem,' and which means clinicians will not know what their AI is advising, or why [23]. However, to ensure systems' implementation, trust must be developed and healthcare providers well-prepared to work within systems. Artificial Intelligence Clinical Decision Support Concept is revolutionizing health care by improving the ability to diagnose and implement personalized therapy and predictive risk management. Still there remain issues of data quality, transparency and ethical questions All these considered it is evident that there are very real benefits from the use of AI in CDSS. As these technologies improve they have the potential of changing the face of healthcare to become more personalized, accurate and faster. If implemented optimally AI in CDSS will augment the clinical decision-making process and streamline the care delivery system on the part of patients [24].

AI's Role in Cybersecurity: Specific Recommendations for Healthcare Systems: Artificial intelligence is rather useful when it comes to cybersecurity, therefore, lessons may be derived from its usage to improve the security of healthcare systems. Consequently, AI technologies play a critical role in recognizing and managing potential cyber risks like, data leakage and ransom ware in healthcare, which expose principally important patient data [25]. The anti- social engineering measures that is, the mechanisms like anomaly detection and real time monitoring can equally be employed to protect health care information from phishing and fraud. Through threat identification and using Artificial intelligence in response, the healthcare systems become fortified base, patient privacy is preserved and trust is maintained in digital health solutions [26].

ETHICAL AND REGULATORY CONCERNS OF AI ADOPTION IN HEALTH CARE DELIVERY

The application of AI in healthcare is on the frontier of delivering a myriad of improvements in the quality of care, organization, and management of services at the patient, system, organizational, and population levels. But as the technologies advances further and deep root into clinical as well as administrative practices within the healthcare sector, it becomes important to comprehensively address the ethical/regulatory consideration in order to enhance on the technologies' responsible implementation. Such challenges call for issues of data privacy, algorithmic bias, transparency and accountability as well as the creation of adequate relevant policies, laws and rules protecting the patient as well as the health care givers [27]. Data privacy is one of the most significant ethical issues prevailing for using AI systems in the healthcare industry. This data is unique because it involves details about the health of individuals within the healthcare sector; their treatments, history, and genetics. Teaching of AI involves significant use of patient's information, its collection, storage and sharing thus; raising important questions on its use. The aspect of patient consent and data preservation is very important, because nowadays breach of patient's health information can lead to multiple adverse effects both for the patient and the healthcare organization [28].

Algorithmic bias, as a subject, is considered as an essential question of ethical consideration. There's also the problem that AI algorithms learn from historical data and if this data is racist, sexist or otherwise biased this will be reflected in the AI models. For instance, the AI used in the field of health care is worse at diagnosing minorities if it has been initially taught from data containing more homogenous representation. This can result in inconsistencies and produce healthcare discriminative tendencies that necessarily affect the underprivileged minorities or any other undervalued ethnic group [29]. It has resulted in such pitfalls, and hence, developers and healthcare organizations have to make a point of training AI systems on different datasets to avoid such pitfalls and provide equal treatment for all patients. Deep learning is one special kind of AI systems and their decision-making mechanisms are often referred to as "black-boxes". This lack of transparency presents problems for healthcare providers, who are applying the output of AI algorithms in clinical practice.

For clinicians, lack of transparency primarily raises concerns about the ability to trust AI systems; if users do not know how a system arrived at a decision, they may be unlikely to accept it, especially where a decision could have

a significant impact on a patient's quality of life, such as in cancer diagnoses or prognosis, or in treatment recommendations. Every effort should be made to make AI systems transparent and explain able to create trust between the careers and the tech and between the careers and the patients [30]. The responsibilities who will make decisions on behalf of an AI continue to remain a topic of debate. In case of wrong decision or decision made where the AI is wrong in the diagnosis, it becomes difficult to identify the party that is accountable for the wrong decision and it could be the developers of the AI, the healthcare provider or the organization which adopted the use of the AI system. , there should be flowing of responsibility structures to make sure that any adverse impacts of AI decision-making processes are corrected. These are error reporting policies, establishment of how human supervision is to be done, and delineation of accountability concerning decisions made by an AI system [31].

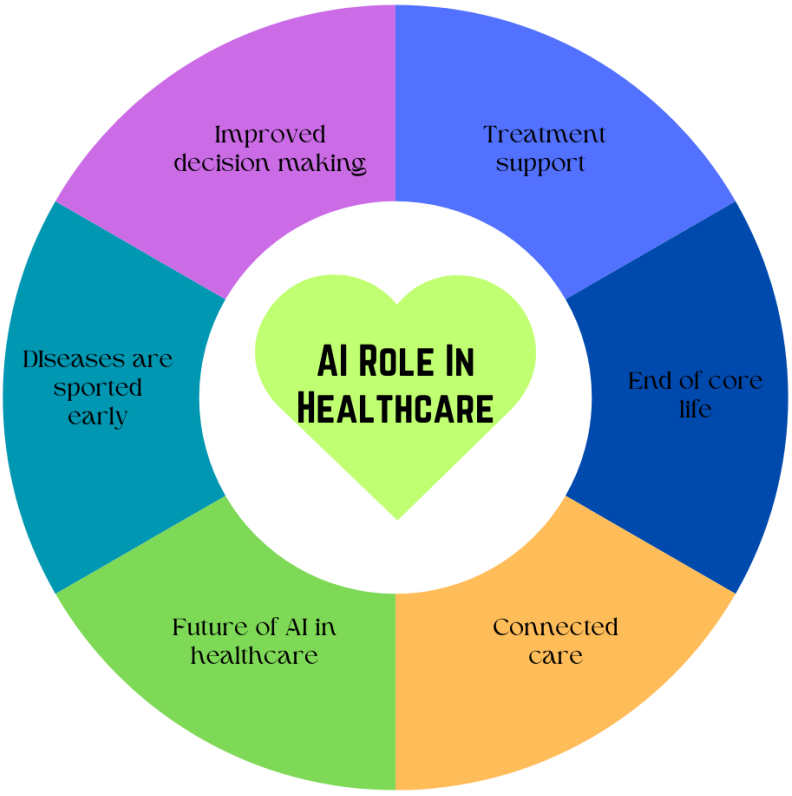

Figure: 3 showing role of AI in healthcare

However, there are subtler problems that are regulatory in nature, related to the safe use of AI in healthcare. The USFDA and EMA have started to define how to categories the new medical device, whether it is a diagnostic or therapeutic tool, See has mentioned how regulatory frameworks are now engaging with AI. These agencies need to establish policies and have a framework in place that takes into consideration elements of AI including the fact that AI systems will require a constant update each time they are commissioned. Frameworks of the traditional type of regulation, where medical devices are developed for a fixed purpose, might not be sufficient to address AI technology as devices with such characteristics can learn from experience and improve over time [32]. However, the current regulation does not capture the problem similar to the dynamic learning within the AI systems effectively. Different from most conventional medical devices, AI systems are dynamic systems where the decision-making functions enhance as the system analyzes more data. This is where the challenge lies for the regulators for they need to guarantee the continued safety and efficacy of these systems as they develop and additionally factor in possible dangers arising from new data feeds and altering behavioral patterns of algorithms [33].

Legal and ethical requirements again have to take account of continuing inequalities in access to medical services and to technology around the world. Industrialized countries, which have the physical and financial capacity to monitor and deploy AI systems, may adopt, while other areas of the world may lack the prerequisites for implementing the guarantees and controls. Therefore, to achieve safe implementation of these technologies, the world should come together to set ideal benchmarks. The integration of AI in healthcare means connection of numerous ethical and regulatory issues that need to be resolves for safe application of AI systems. The problem of data protection, machine learning, and interpretation, relationships between stakeholders as well as constantly evolving regulatory concerns are key in embracing the use of Artificial Intelligence in the health sector [34]. These

issues must be effectively managed so as to encourage the confidence of healthcare institutions, policy makers as well as technology creators in AI, and guarantee that the use of AI creates rightful and beneficial improved patient care.

FUTURE PROSPECTS: CONTEMPORARY AND FUTURE ROLE OF AI IN DEVELOPING HEALTH CARE SYSTEMS

While much has been said and written about Artificial Intelligence (AI), the delivery of health services has yet to be significantly disrupted by this revolution. From the overwhelmingly positive trends we have witnessed in the recent past, the advanced future of AI in healthcare will offer more widely innovative applications and capabilities that can transform the entire patient care system, utilize resources most efficiently, and enhance clinical and administrative processes [35]. It is forecast that the effectiveness and application of these AI technologies for applications in healthcare will continue to grow and coincide across different levels organization healthcare and across the globe more so diagnostics, treatment and the overall healthcare delivery system.

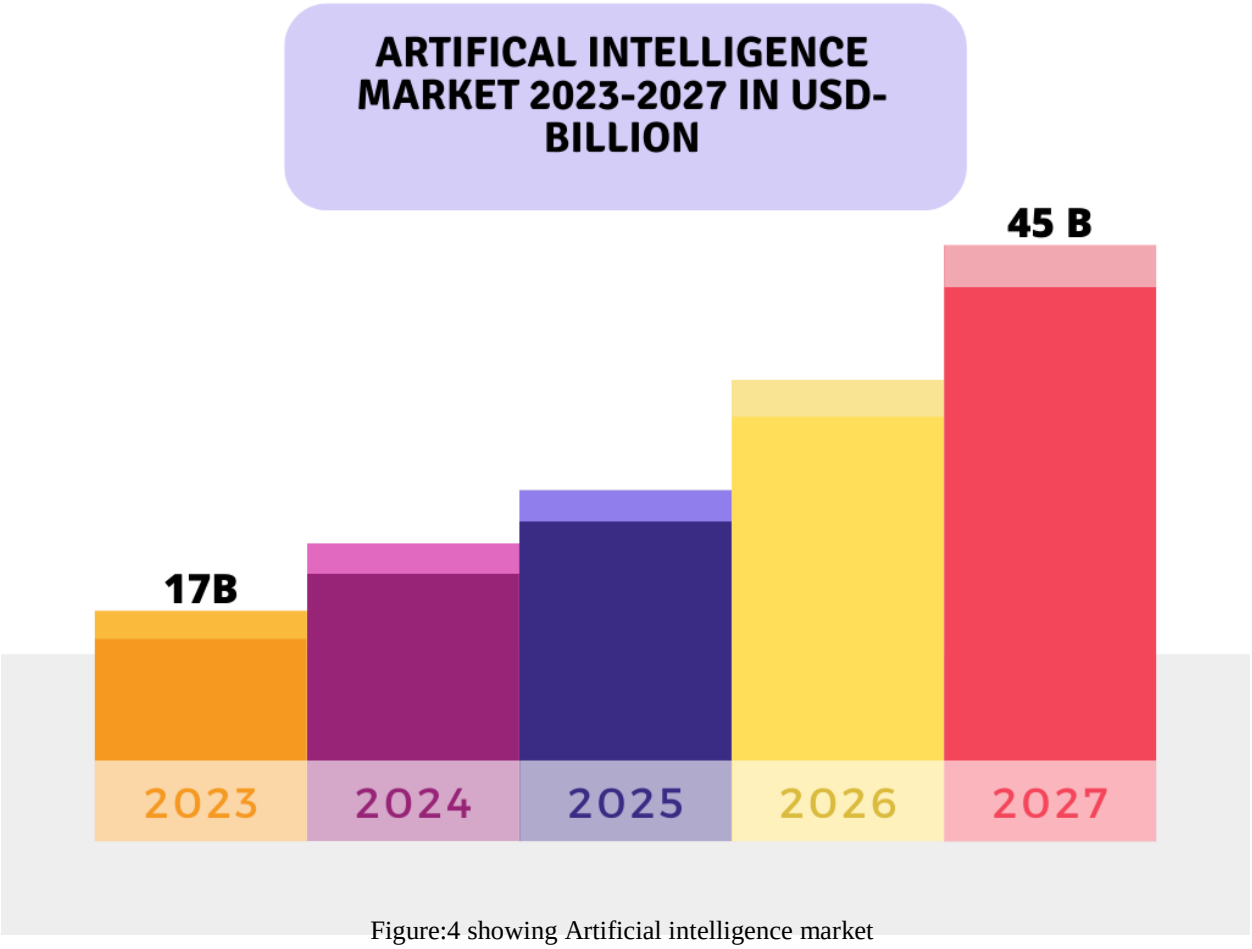

Figure:4 showing Artificial intelligence market

A new front where AI, diagnostics is anticipated to be even more accurate is one of the most promising in the future. Deep learning-aided diagnosing tools are already showing a capacity to diagnose diseases like cancer, cardiovascular ailments, and neurological ailments more accurately than conventional diagnostic systems. In the future, by monitoring genetic data, biomarkers and other intricate possibilities, AI has potential for screening diseases long before any manifestation is possible. Moreover, application of AI to carry out the combination and analysis of multiple data streams will fuel the innovation of precision medicine that targets specific disease risk factors associated with an individual genetics, behaviors, and medical records. This might dramatically enhance the efficacy of therapeutic interventions, and decrease side effects [36].

AI has the greatest growth in providing healthcare in the areas that may lack proper medical facilities or hospitals. Smart telemedicine solutions, wearable health gadgets and remote tracking systems will help in extension of quality healthcare to patients coming directly through virtual means. Real-time measurements of a staying

diagnosis such as diabetes or cardiac issues can be conducted by AI to ensure if the situation has worsened and requires urgent attention by the health care provider [37]. There, AI could help diagnose and manage diseases with little access to physician and specialist services and create a fairer environment for global citizens. It is predicted that AI's role in drug discovery will also ramp up in the coming years. Computer aided methods allow for the quick filtering out of large amount of molecular data to pinpoint potential drug leads. AI can improve the ways clinical trials are conducted, estimate the likely reactions of various patients to treatments and find new uses for existing medicines. It could cut the cost and time required in drug discovery taking into account the need for cheaper and better drugs [38].

In the field of epidemiology, AI shall remain useful in disease forecast, disease tracking, and tasking simulations of public health interventions. AI operation to gather data from different platforms such as social media, travel history, and health history will improve surveillance systems that will respond to potential health threats in a short period [39]. Consequently, with significant developed potential, there are significant opportunities for AI in defining the future of the entire healthcare field. In the future, advanced technology in healthcare will be driven by Artificial Intelligence to make results more specific, faster, and available to the general populace [40]. Despite the current issues that the use of AI presents like, data privacy, ethical issues and regulatory issues, the future hold more promise, consistent development of AI is set to bring about more radical changes that are likely to enhance the quality and equity of health care all over the world. Because of integration of AI in the health facilities, there are potential of improving more clinical results, health care provision, and deliver personalized facilities to patients.

CONCLUSION

AI in health sector has already found its way into hospitals, clinics and other health facilities to redefine the standards of practice and delivery of care services as well as the management of these organizations. Whether it be in the form of diagnostics for individual diseases, developing unique plans of treatment for individual clients, streamlining the efficiency of organizational and administrative duties AI holds potential in radical change across all aspects of healthcare. Thus, machine learning, deep learning, natural language processing or other AI systems and applications described in this review unveil new ways of enhanced and timely decision making in healthcare: the quality of services is increasing, treatment outcomes improve, and overall costs decrease. But there are some difficulties which accompany with the increasing use of AI in healthcare. Principal ethical issues arising in this context include data privacy, fairness or lack of bias in operations of algorithms and decision making as well as issues of explanation or accountability so as to avoid worsening of the problem of inequity in healthcare provisioning. In addition, there is the need for constant update of legal requirements demanded by the rapid development of AI technologies on one hand, and by the need to protect the patients on the other hand.

As we turn the page forward, there are a lot of opportunities for AI in the healthcare industry. new technologies in diagnostics, customized therapies, telemedicine, and pharmaceuticals, which are likely to, add value to patients' care and, expand access to health in suboptimum areas of the world. That's why, with help of AI capabilities to analyze big amount of data and their characteristics, it is possible to enhance patient care, prognosis of diseases, and management of healthcare organizations at the international level. AI is swiftly being integrated into healthcare systems globally, but to be successful, the adoption of AI-based solutions needs to overcome the ethical, regulatory, and technical issues known with the technology. Given the proper thought and integration with the developers of the artificial intelligence technologies, the healthcare workers, and the policy makers, the AI can deal with better and more efficient, tailored and fair solutions in the healthcare industry to assist both patients and substantial healthcare systems.

REFERENCES

1. Yasaka K, Akai H, Sugawara H, Tajima T, Akahane M, Yosh- ioka N, et al. Impact of deep learning reconstruction on intracra- nial 1.5 T magnetic resonance angiography. Jpn J Radiol. 2022. https://doi.org/10.1007/s11604-021-01225-2.
2. Nomura Y, Hanaoka S, Nakao T, Hayashi N, Yoshikawa T, Miki S, et al. Performance changes due to diferences in training data for cerebral aneurysm detection in head MR angiography images. Jpn J Radiol. 2021; 39:1039–48. https://doi.org/10.1007/s11604-021-01153-1.
3. Ishihara M, Shiiba M, Maruno H, Kato M, Ohmoto-Sekine Y, Antoine C, et al. Detection of intracranial aneurysms using deep learning-based CAD system: usefulness of the scores of CNN's fnal layer for distinguishing between aneurysm and infundibu- lar dilatation. Jpn J Radiol. 2023; 41:131–41. https://doi.org/10.1007/s11604-022-01341-7.

4. Miki S, Nakao T, Nomura Y, Okimoto N, Nyunoya K, Nakamura Y, et al. Computer-aided detection of cerebral aneurysms with magnetic resonance angiography: usefulness of volume render- ing to display lesion candidates. Jpn J Radiol. 2021; 39:652–8. https://doi.org/10.1007/s1160402101099-4.
5. Nakaura T, Kobayashi N, Yoshida N, Shiraishi K, Uetani H, Nagayama Y, et al. Update on the use of artifcial intelligence in hepatobiliary MR imaging. Magn Reson Med Sci. 2023; 22:147– 56. https://doi.org/10.2463/mrms.rev.2022-0102.
6. Naganawa S, Ito R, Kawai H, Kawamura M, Taoka T, Sakai M, et al. MR imaging of endolymphatic hydrops in fve minutes. Magn Reson Med Sci. 2022; 21:401–5. https://doi.org/10.2463/ mrms.ici.2021-0022.
7. Koretsune Y, Sone M, Sugawara S, Wakatsuki Y, Ishihara T, Hattori C, et al. Validation of a convolutional neural network for the automated creation of curved planar reconstruction images along the main pancreatic duct. Jpn J Radiol. 2023; 41:228–34. https://doi.org/10.1007/s11604-022-01339-1.
8. Anai K, Hayashida Y, Ueda I, Hozuki E, Yoshimatsu Y, Tsu- kamoto J, et al. The efect of CT texture-based analysis using machine learning approaches on radiologists' performance in dif- ferentiating focal-type autoimmune pancreatitis and pancreatic duct carcinoma. Jpn J Radiol. 2022; 40:1156–65. https://doi.org/10.1007/s11604-022-01298-7 .
9. Cay N, Mendi BAR, Batur H, Erdogan F. Discrimination of lipoma from atypical lipomatous tumor/well-diferentiated lipo- sarcoma using magnetic resonance imaging radiomics combined with machine learning. Jpn J Radiol. 2022; 40:951–60.https://doi.org/10.1007/s1160402201278
10. Smith, J. A., & Johnson, R. B. (2018). Advances in Artificial Intelligence: Implications for Healthcare. Journal of Health Informatics, 10(2), 87-104. 2. Chen, L., & Wang, Y. (2019). Ethical Challenges in AI-Driven Healthcare: A Comprehensive Review. Journal of Medical Ethics, 45(3), 154-162.
11. Gonzalez, R., & Alvim, M. S. (2020). AI and Healthcare Disparities: A Critical Analysis. Journal of Bioethical Inquiry, 17(1), 37-48.
12. Kim, E., & Kim, M. S. (2019). Privacy Concerns in AI Healthcare Applications: A Survey. Journal of Cybersecurity and Privacy, 1(1), 45-56.
13. Li, Y., & Wu, X. (2021). The Impact of AI on Patient Autonomy: Challenges and Solutions. Journal of Medical Ethics and History of Medicine, 14, 1-12.
14. Rodriguez, C., & Brown, J. (2018). AI and the Digital Divide in Healthcare: Examining Access Disparities. Journal of Health Communication, 23(10), 920-927.
15. Wang, H., & Li, Z. (2020). Predictive Analytics in Healthcare: A Comprehensive Review. Journal of Healthcare Management, 25(3), 112-125.
16. Patel, S., & Kumar, P. (2019). The Role of Natural Language Processing in Clinical Documentation: A Review. Journal of Health Information Management, 34(2), 78-86. Impact Factor: 19.6 8967:09CX
17. Jones, M., & White, K. P. (2017). Applications of AI in Radiology: A Comprehensive Survey. Journal of Medical Imaging and Radiation Sciences, 48(2), 123-134.
18. Johnson, C., & Davis, R. (2018). AI in Pathology: Current Trends and Future Directions. Journal of Pathology Informatics, 9, 38.
19. Wang, L., & Zhang, Y. (2021). The Integration of Robotics in Healthcare: Challenges and Opportunities. Journal of Robotics in Medicine, 6(2), 67-78.
20. Chen, T., & Liu, X. (2019). Block chain Applications in Healthcare: A Systematic Review. Journal of Healthcare Information Management, 33(4), 102-115.
21. Mitchell, S., & Baker, M. (2018). Augmented Reality in Healthcare: A State-of-the-Art Review. Journal of Augmented and Virtual Reality, 2(1), 32-45.
22. Lewis, G., & Harris, A. (2020). AI-driven Personalized Medicine: Opportunities and Challenges. Journal of Personalized Healthcare, 1(1), 18-27.
23. Lee, J., & Kim, H. (2017). Algorithmic Bias in Healthcare: A Critical Analysis. Journal of Ethics in Science and Technology, 12(3), 45-57.
24. Yang, R., & Wang, J. (2019). The Future of AI in Healthcare: A Roadmap for Research. Journal of Future Healthcare Technology, 6(2), 89-104.
25. Khan, M. I., Arif, A., & Khan, A. R. A. (2024). AI's Revolutionary Role in Cyber Defense and Social Engineering. *International Journal of Multidisciplinary Sciences and Arts*, *3*(4), 57-66.
26. Arif, A., Khan, A., & Khan, M. I. (2024). Role of AI in Predicting and Mitigating Threats: A Comprehensive Review. *JURIHUM: Jurnal Inovasi dan Humaniora*, *2*(3), 297-311.
27. Carter, B., & Anderson, M. (2021). Exploring the Impact of AI on the Healthcare Provider Patient Relationship. Journal of Health Communication, 26(8), 620-630.

28. Gupta, S., & Sharma, A. (2018). Regulatory Challenges in AI-driven Healthcare: A Global Perspective. Journal of Law, Medicine & Ethics, 46(4), 922-931.
29. Thomas, L., & Williams, C. (2020). AI and Data Security in Healthcare: An Integrated Approach. Journal of Cybersecurity Research, 5(1), 25-36.
30. Wong LM, Ai QYH, Mo FKF, Poon DMC, King AD. Convolu- tional neural network in nasopharyngeal carcinoma: How good is automatic delineation for primary tumor on a non-contrastenhanced fat-suppressed T2-weighted MRI? Jpn J Radiol. 2021; 39:571–9. https://doi.org/10.1007/s11604-021-01092-x.
31. Kabasawa H, Kiryu S. Pulse sequences and reconstruction in Fast MR imaging of the liver. Magn Reson Med Sci. 2023; 22:176–90. https://doi.org/10.2463/mrms.rev.2022-0114.
32. Reddy, S., Fox, J., & Purohit, M. P. (2019). Artificial intelligence-enabled healthcare delivery. Journal of the Royal Society of Medicine, 112(1), 22-28.
33. MailMyStatements, 6 Major Challenges Facing the Healthcare Industry in 2020, Nov 15, 2018 derived from: https://medium.com/@MailMyStatement/5-majorchallengesfacingthehealthcare-industry-in-2019-60218336385f
34. Rita Sharma, Top 10 Challenges Healthcare Companies Face today, derived from: https://www.finoit.com/blog/top-10-healthcare-challenges/
35. Davenport, T., & Kalakota, R. (2019). The potential for artificial intelligence in healthcare. Future healthcare journal, 6(2), 94
36. Meskó, B., Hetényi, G., & Győrffy, Z. (2018). Will artificial intelligence solve the human resource crisis in healthcare?. BMC health services research, 18(1), 545
37. Lin, S. Y., Mahoney, M. R., & Sinsky, C. A. (2019). Ten ways artificial intelligence will transform primary care. Journal of general internal medicine, 34(8), 1626-1630
38. Ganapathy, K., Abdul, S. S., & Nursetyo, A. A. (2018). Artificial intelligence in neurosciences: A clinician's perspective. Neurology India, 66(4), 934.
39. Etienne, H., Hamdi, S., Le Roux, M., Camuset, J., Khalife-Hocquemiller, T., Giol, M., & Assouad, J. (2020). Artificial intelligence in thoracic surgery: past, present, perspective and limits. European Respiratory Review, 29(157).
40. Nadikattu, R. R. (2017). Artificial Intelligence in Cardiac Management. International Journal of Creative Research Thoughts, 5(3). 10. Robert, N. (2019). How artificial intelligence is changing nursing. Nursing management, 50(9), 30-39