Research Article

An Adoption Of Artifical Intelligence(Ai) Technology For Patient- Centric Healthcare Solutions

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ARTICLE INFO	ABSTRACT
	The adoption of artificial intelligence (AI) in healthcare is still in its early stages. AI-powered diagnosis, decision support systems, predictive analytic tools, and remote patient monitoring devices can improve treatment plans, reduce costs, and enhance the patient's experience. **Objective:** To analyze AI technology adoption and how healthcare professionals create personalized treatment journeys based on unique patient profiles by utilizing AI for more effective and specialized intervention. **Method**: The research obtained 399 peer-reviewed papers from the Scopus& Web of Science database further SLR, Bibliometric analysis through VoS viewer is used to analyze. **Findings:** The research states that artificial intelligence (AI), especially in machine learning and natural language processing, holds promise for improving predictive analytics and diagnostic accuracy. These results highlight AI's capacity to interpret enormous volumes of medical data. It identifies AI in patient-centric solutions will improve healthcare outcomes, lower costs, and improve the entire patient experience, bringing in an innovative era of healthcare delivery. However, challenges identified in AI adoption are data accuracy, Patient privacy, trust, consistency, and relevance. **Conclusion:** AI technology adoption in healthcare highlights its revolutionary potential for patient-centric solutions. The research highlights how transformational AI may be in empowering people and influencing the direction of personalized, high-quality healthcare in the future. Through the identification and resolution of recognized difficulties, as well as the use of AI-driven insights will move toward a healthcare ecosystem that is patient-centric and improves everyone's quality of life. **KEYWORDS:** Artificial-Intelligence, Adoption, Healthcare, Patient data, Outcome measures, and patient safety

INTRODUCTION:

Artificial intelligence (AI) means machine-made thinking (machine learning). The integration of AI technologies is undergoing a radical transformation in healthcare. With the adoption of AI technologies, the healthcare sector is experiencing a significant shift toward patient-centric care. By moving toward AI-powered patient-centric healthcare, medical diagnosis, treatment planning, remote monitoring, and patient involvement could all be significantly enhanced [Mary H. Stanfill, (2019)]. It is crucial to examine AI's consequences, both in terms of benefits and problems, as it continues to develop and permeate all parts of healthcare [Barett et al., (2019)]. In addition to promising to improve patient outcomes, this dynamic partnership between AI and healthcare aims to meet the urgent demand for more effective and initiative-taking medical treatments [Sri Sunarti, (2021)]. It is

crucial to explore the complex web of advantages, drawbacks, and ethical issues that underpin the use of AI technology in patient-centric healthcare solutions as we travel along this transformative journey [Julian Varghese, (2020)]. ''Artificial intelligence in the healthcare industry' can help doctors make better decisions, have more time available, and maintain patient records effectively [Jin Ho Yun, (2021)]. Patients will receive treatment more quickly, precisely, and with higher-quality care [Fig 1]. The quick development of Artificial intelligence (AI) technology has made this change in basic assumptions possible [Dhruvkhullar, (2022)]. AI, which includes computer vision, machine learning, natural language processing, and predictive analytics, has emerged as a computer in changing healthcare management and delivery [Topol, E.J. (2019)]. With early breakthroughs involving chatbots, diagnostic tools, and radical image processing. Interest in using AI in healthcare has only grown [Jordan Richardson, (2021)]. With the use of AI, it is possible to analyze huge patient data to develop personalized treatment regimens based on each patient's medical history, Way of life, and preferences [Sandeep Reddy, (2019)]. Artificial intelligence (AI) algorithms could identify small patterns and indicators in medical data, assisting in the early diagnosis of illnesses and ailments, and improving prognosis and treatment outcomes [Thomas Davenport, (2019)]. AI-powered gadgets and
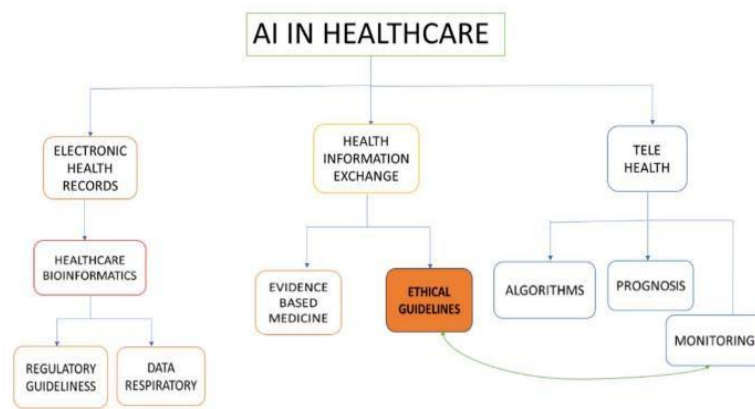
wearables make it possible to continuously monitor patients from a distance while sending real-time data to healthcare professionals for prompt intervention and individualized care adjustments [Viet-ThiTran, (2019)]. In the words of Forbes, '' AI in healthcare is expected to enhance patient outcomes and streamline operations, making healthcare more accessible and effective' [Thomas L. Forbes, (2022)]. Healthcare businesses may be able to provide care services to millions of people worldwide faster, Smarter, and more effectively by applying artificial intelligence (AI) in hospital and clinical settings.

Source: AI in healthcare process

## 1.1 : PURPOSE AND SCOPE OF ADOPTION OF AI TECHNOLOGY FOR PATIENT-CENTRIC HEALTHCARE SOLUTIONS:

Adopting artificial intelligence (AI) technology for patient-centric healthcare solutions has a range of uses and involves tackling several opportunities and problems in medicine. Adopting AI technology in patient-centric healthcare is primarily done to improve the efficacy, efficiency, and quality of healthcare delivery. AI can help medical personnel identify diseases more precisely and provide individualized treatment strategies [Deans et al., (2019)]. Patient participation can be continuously facilitated by AI-driven applications like virtual health assistants and patient portals, empowering people to take charge of their health [J.P. Richardson, (2021)]. AI makes it possible to provide telehealth services and remote patient monitoring, both of which are essential, particularly during pandemics like Covid-19 [Smith, A.C., (2020)]. AI can streamline administrative work and improve hospital operations by cutting wait times [Miotto, (2018)]. AI may examine patient records, genomic data, and medical imaging to assist in the early diagnosis and prognosis of diseases [Esteva, A., (2019)]. A patient's particular medical history, genetics, and preferences can be considered by AI

algorithms to offer customized treatment approaches

[Obermeyer, Z., (2016)]. Apps and wearables driven by AI can continuously track patient's health and deliver feedback and alerts in real-time [Mukherjee, A. (2020)]. Virtual assistants and chatbots powered by NLP can converse with patients in natural language while providing support, addressing their questions, and setting up appointments [Razavian, N., (2019)]. To ensure that patient data is secure and compatible with legislation, the scope also includes addressing data privacy and security problems [Majeed, R. (2019)]. The implementation of AI must consider ethical considerations, such as algorithm transparency and fair access to AI-driven healthcare [Char, D.S, (2018)]. To ensure safe and efficient use, the deployment of AI in patient-centered healthcare requires a clear regulatory framework and policy guidelines [Price, W.N., (2018)].

1.2 : AN OVERVIEW OF AI TECHNOLOGY IN HEALTHCARE

AI technology for patient-centric healthcare solutions will improve patient care and results. Predictive analytics for individualized treatment regimens are made possible by machine learning models like deep neural networks and accurate disease detection [Esteva, A., (2019)]. Chatbots and virtual health assistants are powered by NLP technology, enabling natural language communication between patients and the healthcare system [Obermeyer, z., (2016)]. NLP technology enables natural language communication between patients and healthcare systems through chatbots and virtual health assistants [Razavian, N., (2019)]. Predictive analytics powered by AI can assist in identifying patient health risks and managing chronic diseases in a preventative manner [Esteva, A. (2019)]. Artificial intelligence (AI)-enhanced wearable technology can continually track vital signs, enabling remote patient monitoring and prompting action.
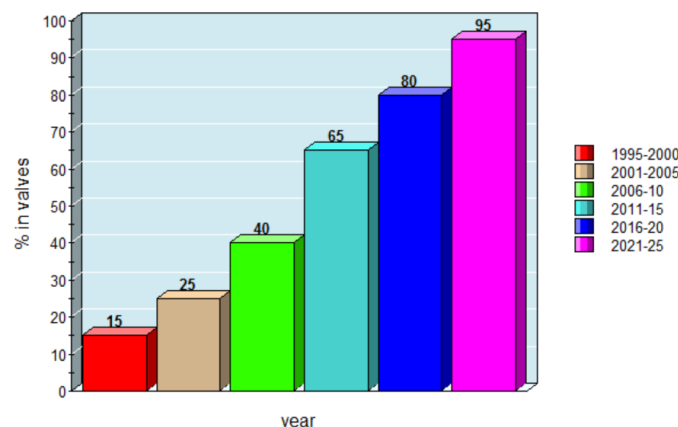
Source: AI in healthcare: year-wise analysis

In the above diagram [Fig2], artificial intelligence (AI) in healthcare is gradually increasing (i.e., an increasing trend).

❖   1995-2000: Initial research and development

❖   2001-2005: For the first time, clinical decisions have greater prominence in electronic health records (EHR).

❖   2006-2010: develop healthcare apps, including cancer diagnostics, etc.

❖   2011-2015: Innovative diagnostic techniques using AI, big data, and medical images.

❖   2016-2020: Drug discovery for the COVID-19 pandemic, virtual health meetings, and vaccine development

❖   2021-2025: More challenges, robotic surgical devices, ethical concerns, data privacy

REVIEW OF PREVIOUS RESEARCH:

2.1 AI TECHNOLOGY APPLICATION IN PATIENT-CENTERED HEALTHCARE

The healthcare sector is transformed by the application of artificial intelligence (AI) technologies. Through the study of medical imaging, including X-rays, MRIs, and CT scans. Artificial intelligence (AI) systems can spot anomalies and detect diseases early, allowing for prompt therapies [Mukherjee, A. (2020)]. To develop individualized treatment regimens, AI makes use of patient data, including genetic data and medical history. These strategies accommodate the unique characteristics of each patient, resulting in more precise and successful interventions [Esteva, A., (2019)]. This makes it possible for medical professionals to monitor patient progress online and function as appropriate, resulting in greater care coordination [Obermeyer, Z., (2016)]. Telehealth services provide easy access to healthcare, which is especially helpful in isolated or underdeveloped locations [Smith, A.C., (2020)]. AI-driven predictive algorithms examine patient data to find health concerns and forecast the development of diseases. AI streamlines administrative processes, manages resources, and decreases wait times to enhance hospital and clinical operations, improving patient experience [J.P. Richardson, (2021)].

2.2: IMPLEMENTATION OF AI FOR EARLY IDENTIFY DISEASE

Artificial intelligence (AI) offers significant potential for transforming disease detection and diagnosis in the healthcare industry. Healthcare professionals can improve early disease detection by utilizing AI, which will result in more timely interventions and better patient outcomes. A key

lement in enhancing healthcare outcomes is early disease detection. Early detection enables quick treatment, which may stop the spread of the disease and its effects. Traditional illness detection techniques, however, may have drawbacks due to the possibility of human mistakes and the time-consuming nature of manual analysis. Medical imaging is one of the most visible fields where AI is advancing early disease detection. Numerous medical pictures, including X-rays, MRIs, and CT scans, may be accurately analyzed by AI systems [Miotto, (2018)]. To predict risk of diseases, AI can also use patient data and electronic health records (EHRs). Healthcare providers may not immediately notice patterns and risk factors, but machine learning algorithms can. Prediction of infection in hospitalized patients using EHR analysis is one significant example, as shown in the study [Nemati, S., Holder (2018)].

2.3: APPLICATION OF AI FOR PREVENTIVE MAINTENANCE

To find and fix equipment problems before they lead to expensive failures. One of the most important uses of AI is predictive maintenance, in which machine learning algorithms foresee equipment faults by analyzing past and current data [Zhang, J., (2017)]. AI systems use sensors and IOT devices to continuously check the state of machinery like pumps, turbines, and automobiles. AI can notify maintenance personnel of potential problems by evaluating data trends and anomalies [Tamaddoni, M., (2019)]. AI-driven building management systems analyze data from sensor systems to reduce energy use and find building infrastructure issues. Energy savings and maintenance expenses are both lowered by these systems [Lin, Y., (2020) & Deldar, H., (2019)].

2.4. USE OF AI AND ITS IMPACT ON OVERALL PATIENT DATA PERFORMANCE

In the essential field of patient data management in the healthcare business, data such as electronic health records (EHRs), medical imaging, patient histories, and other data are all covered. By automatically extracting, cleaning, and validating patient data, AI systems can reduce errors brought on by manual data entry [Rajkomar, A., (2018)]. AI enables predictive analytics on patient data, which aids in the early diagnosis of diseases and preventive therapy. Machine learning models use and analyze patient data to look for trends and risk factors [Kooi, T., (2017)].

It does so through encryption, anomaly detection, and access limits. AI-powered chatbots and virtual assistants make it simpler to schedule appointments, effectively engage with patients, and reply to frequently asked inquiries.

❖   Systematic literature review (SLR) Protocol and results obtained from Scopus. (Fig: 3)

S.NO	STAGE	DESCRIPTION	FILTERS	RESULTS
1	Initial Search	Platforms & Search terms	Scopus& Web of Science	1536 documents
2	Theme & Period Filter	Focus on AI healthcare & Implementation	Research Themes – Publication dates (For example 2020 – 2023)	223 documents
3	Rigorous Selection	Refining the final set	Peer-reviewed Articles (Scopus -Specific inclusion / exclusion criteria For ex: Methodology)	399 documents

Source: Prisma tool

❖   For patient-centered healthcare solutions, artificial intelligence (AI) technology uses bibliometric analysis and Vos viewer's keyword analysis. We examine the relationship between the adoption [Fig: 4] of AI and several nodes, including patient perception, trust, healthcare delivery, AI-based tools like machine learning and deep learning, applications like diagnostics, telecare, monitoring devices, medical imaging, healthcare delivery systems, etc.

Source: VoS viewer [Fig: 4]

Materials and Methods:

In addition to covering the period (up to September 2023) and the databases (Scopus and Web of Science) in the systematic literature review process, the section offers a well-defined search technique. The use of AI in healthcare is the main topic of the section. Research addressing AI-powered diagnosis, decision-support tools, predictive analytics, remote patient monitoring, and their effects on medical outcomes were all considered for inclusion. A Total of 399 peer-reviewed papers were selected for in-depth analysis, providing a diverse data set of insights into adoption in healthcare. Bibliometric analyses are visually presented to illustrate the relationship between various aspects of AI adoption, Perception of the patient, healthcare delivery, and AI-based integration tools. The Systematic literature review technique using the Prisma tool ensures a standardized approach to the review process.

INTEGRATING AI IN PATIENT-CENTERED HEALTHCARE:

2.1 : AI FOR DIAGNOSIS:

Medical imaging has been the topic of AI study, including X-rays, CT scans, and MRIs [Ehteshami Bejnordi, (2017)]. Using photo analysis, AI has shown tremendous potential for detecting skin cancer [Rajpurkar, P., (2017)]. Pathologists have used AI to assist disease diagnosis from histology images [Noesi, (2016)]. AI can examine electrocardiograms (ECG) to look for signs of heart issues [Choy, G, (2018)]. AI analysis of patient data can be used to anticipate infectious disease outbreaks [Dua, S., (2018)]. Artificial intelligence-powered clinical decision assistance technologies are becoming more common. These technologies assist medical personnel in diagnosing patients more speedily and accurately by looking at patient data and academic research [Bashshur, R., (2015)].

3.2: AI FOR TREATMENT PLANNING:

❖ **Planning a radiation therapy course of action:** AI is used in radiation oncology to optimize radiation dose distribution by evaluating patient data from CT scans and MRI pictures. AI algorithms can assist in more accurately contouring target volumes and organs at risk, enhancing treatment outcomes [Dua, S., (2018)].
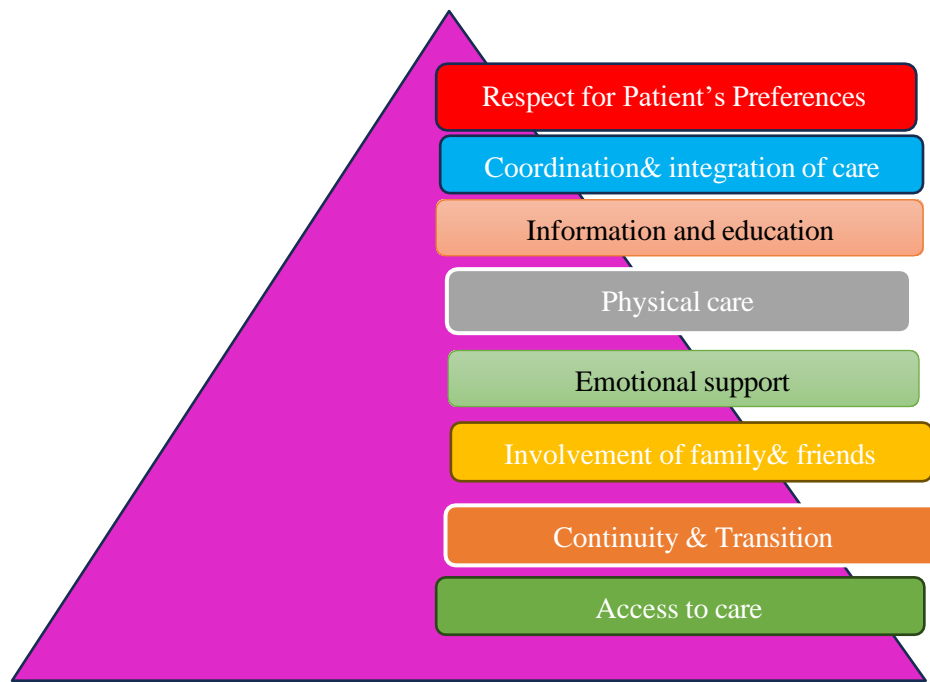
❖ **Drug prescription and individualized healthcare:** AI-driven algorithms can examine the genetics, medical history, and lifestyle aspects of a patient [Bashshur, R., (2015)]. This is especially important for pharmacogenomic research and cancer treatment.

❖ **Planning for surgical treatment:** By assessing preoperative photos, assisting in anatomical mapping, and identifying the best surgical approaches, AI helps surgeons plan complex surgeries [Ammenwerth, E., (2012)].

❖ **Management of Chronic Disease:** The management of chronic diseases including diabetes and hypertension uses AI-based predictive models.
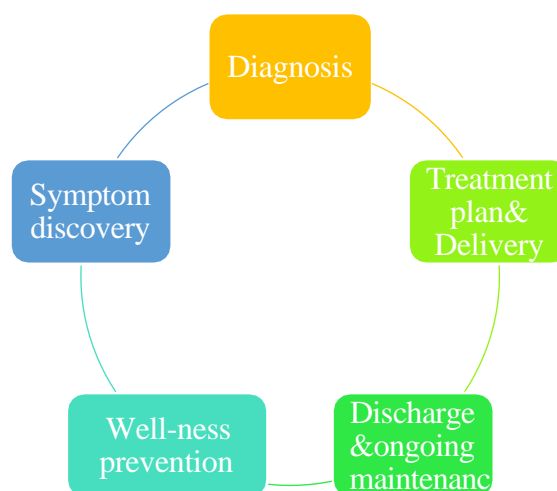
3.3 : AI FOR REMOTE MONITORING:

Artificial intelligence (AI) is used extensively in a variety of industries, including infrastructure management, manufacturing, and healthcare. In healthcare, remote monitoring wearables and remote sensors can continually gather data, identify errors, and issue early warnings, improving healthcare delivery, and AI is used to remotely monitor patients' health problems [Topol, E.J. (2019)]. Picker's Eight Principles [Fig 5] of Patient-Centered Care are a set of principles that place a strong emphasis on the value of including patients in healthcare decision-making and providing care that is suited to their unique needs and preferences.

Respect for Patient's Preferences

Coordination& integration of care

Information and education

Physical care

Emotional support

Involvement of family& friends

Continuity & Transition

Access to care

Source: Picker's Eight Principles of Patient-centered Care [Fig 5]

3. IMPROVING PATIENT ENGAGEMENT:

Patient engagement describes the active participation of patients in their treatment plans, general health and well-being, and healthcare decisions (i.e., interactions, behavior, and methods). Cognitive, behavioral, and affective are components of patient engagement, and transparency, Engagement, and collaboration are key factors of successful patient engagement [Lakshmipriya BACHINA, Anusha KANAGALA, (2023)]

Diagnosis

Symptom discovery

Treatment plan& Delivery

Well-ness prevention

Discharge &ongoing maintenanc

Source: Patient-engagement process [Fig 6]

Enhancing patient experience and providing better healthcare results depends on increasing patient engagement. Patients can access care more easily thanks to telehealth and telemedicine technologies

that allow for remote consultations and follow-ups. According to studies, telemedicine has a higher impact on patient engagement [Fig 6]. Patients have their medical records, appointment scheduling, and educational tools through patient portals and health apps. According to research, patients who use these tools are more interested in their care.

5. DATA SECRUITY& ETHICAL CONSIDERATION:

In the past, patient information in manual medical records by the healthcare industry. Thus, there were several faults, and data theft was quite simple. Reducing errors and recovering lost data are challenging tasks for artificial intelligence (AI), now incredibly simple, precise, and time-saving because errors are detected. Artificial intelligence (AI) is increasingly in healthcare. The growth

in patient satisfaction and recovery rates is slow. In healthcare, AI technology is robotic surgeries, medical imaging, diagnosis centers, telecare, virtual health assistants, and other remote monitoring systems.

❖   In AI technology we adopt various sectors like healthcare, pharma, transport, and various organizations to implement AI to give valuable insights and outcomes shown in given below.

❖   Figure 7 Categories of work deliberated with various sectors and displayed concerns with respect to AI-powered patient-centric healthcare solutions.
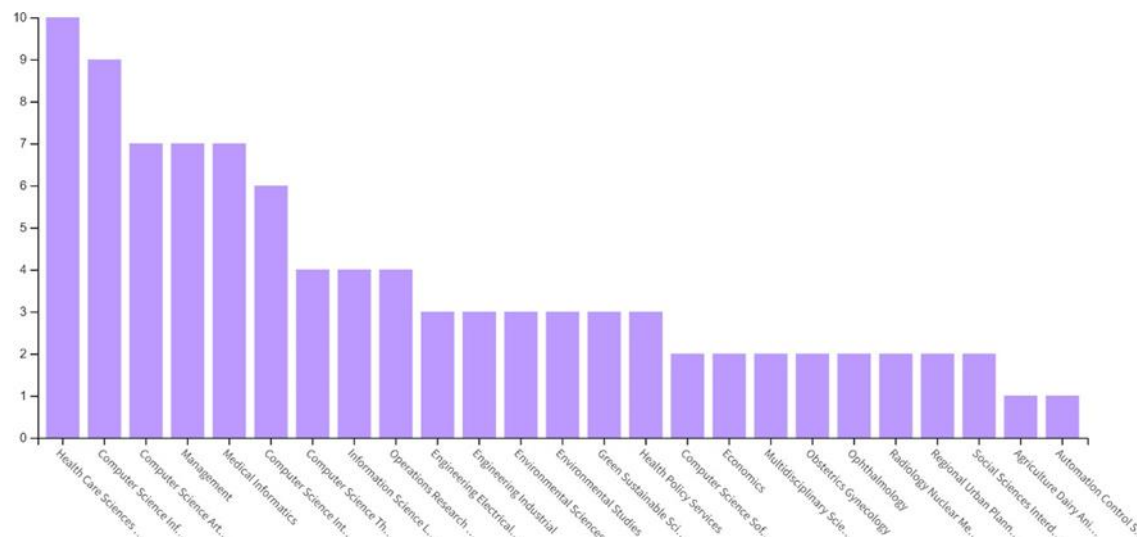
Source: Wos Results for Keyword AI in Patient-centric healthcare6. **CHALLENGES:**

Adopting AI technology for patient-centric healthcare solutions is an achievable way to improve the standard of care, enhance patient experiences, and optimize systemwide efficiency. Numerous difficulties in the healthcare system arise from the use of AI technology for patient-centric solutions. Given the sensitivity of healthcare information, maintaining the highest level of data privacy and security is one of the top issues. The need to achieve a delicate balance between AI- driven decision-making and ethical criteria like informed consent and unbiased care raises ethical issues.

7. DISCUSSION:

The study highlights how AI individualized therapy pathways on unique patient profiles by combining insights from a systematic literature review. The study builds on earlier research to enhance treatment efficacy and healthcare experiences. The difficulties noted, such as data security and moral issues, highlight the careful execution needed for successful AI integration.

8. CONCLUSION:

In summary, Artificial intelligence (AI) technology in patient-centric healthcare solutions produces insights into the technology's revolutionary potential in the healthcare industry. Our research has shown

that artificial intelligence (AI), especially in machine learning and natural language processing, holds promise for improving predictive analytics and diagnostic accuracy. These results highlight AI's capacity to effectively interpret enormous volumes of medical data, resulting in more precise diagnoses and customized treatment plans. The potential for AI in patient-centric solutions to improve healthcare outcomes, lower costs, and improve the entire patient experience, bringing in an innovative era of healthcare delivery, remains bright as we work through these barriers. Until AI becomes related to healthcare imaging of patient diseases, there are several approaches that many hospitals, professional organizations, and individual trusts can take to help ease the growing pressure on AI technologies in healthcare.

9. FUTURE SCOPE:

Healthcare has the potential for significant growth and transformation in AI technology for patient-centric solutions. We can anticipate a healthcare environment focused on personalized and initiative-taking patient care as AI algorithms advance and healthcare datasets grow. AI will enable early interventions and individualized treatment regimens by enabling healthcare practitioners to anticipate patient demands. AI-supported telemedicine, which provides simple access to high- quality care regardless of geographic barriers, will become a crucial healthcare delivery.

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