

A Review of AI-Driven Medical Assistant System and Intelligent Chatbots Platforms for Modern Healthcare

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Abstract: Healthcare is not made to work in a world where people look for help online before they talk to a doctor. It used to be simple with hospital websites and places to make appointments. Now it is complex with artificial intelligence helping to figure out what is wrong with people patients wanting to get information right away and healthcare providers having to manage appointments and keep patient information safe. As these systems get bigger it becomes a deal to make sure, they are reliable give the right medical information keep data private and are secure. In the ten years people have made many ideas for medical assistants that use artificial intelligence, systems that can figure out what is wrong with people and platforms that can schedule appointments. These systems can look at symptoms give people some idea of what might be wrong and help them figure out what condition they might have. At the time systems that let people make doctor appointments online have made healthcare better by reducing wait times letting people make appointments online and making it easier for patients and doctors to talk.

This review looks at assistant systems that use artificial intelligence and are connected to platforms that let people make doctor appointments. It looks at how these systems work what they are made of and how they keep data safe. By looking at what people have done and what technology is available this study shows what these systems can do now what they cannot do and where they are going to improve how patients are helped and how healthcare is made available, to people.

Keywords: AI Medical Assistant; Intelligent Healthcare Systems; Medical Decision Support Systems; Medical Chatbots; Healthcare Data Privacy; AI-Driven Healthcare Services

I. INTRODUCTION

Healthcare system around the world faces many problems like Population, rising medical costs, and shortage of doctors for patients. In many Places, mainly in rural or remote areas where people face difficulty in getting medical advice on time. Because of this, diseases may be diagnosed late and health conditions can become worse. Traditional healthcare systems also depend mostly on doctors and manual processes, which can make healthcare services slower and less accessible. AI has become as an important technology in healthcare industry. AI techniques like Machine learning (ML), Deep learning (DL) and Natural Language Processing (NLP) used in healthcare for predicting diseases, analyse the medical images, Monitoring patients, and Automating healthcare services. These are used to analyse large amounts of medical data and find patterns that may be difficult for humans to notice. These are the things which are used to help doctors diagnose diseases faster and make better decisions[1], [2]. Healthcare is dealing with a problem and that is handling and studying a lot of medical data. Hospitals and other healthcare places make an amount of data every day from things like patient records, lab reports, pictures from medical tests and systems that watch patients. It is hard. Takes a long time for healthcare workers to look at all this information by hand[1], [2]. Artificial Intelligence is a help in going through and studying this data quickly. Artificial Intelligence systems can look at records fast find patterns and give useful ideas that help doctors make good decisions. This makes diagnosis more accurate. Helps doctors give better care to patients[3], [4].

Artificial Intelligence is also used in looking at pictures and finding diseases. Things like learning can look at X-ray pictures, MRI scans and CT scans to find problems like tumour infections or damaged organs. These systems help doctors by pointing out health issues that need to be looked at more closely. Artificial Intelligence tools do not replace doctors. They work with doctors to make medical analysis faster and more reliable. When Artificial Intelligence and healthcare workers team up it makes healthcare better overall[5], [6].

Another big use of Artificial Intelligence in healthcare is watching patients from away. With the help of things people wear phone apps and Internet of Things sensors we can keep an eye on health data like heart rate, blood pressure, sugar levels and how active they are. Artificial Intelligence looks at this data in time and tells healthcare workers if it finds anything unusual. This helps doctors step in early[7], [8]. Prevents serious health problems. Watching patients from away is especially helpful for older patients and people who live in rural areas and cannot visit hospitals often[9], [10].

Artificial Intelligence healthcare systems make healthcare more available. Get patients more involved. A lot of people do not go to hospitals for symptoms because it takes time costs money or they do not know much about it. Artificial Intelligence healthcare platforms give users medical help and information about their symptoms. These systems can also teach people about health give lifestyle advice and tell them how to prevent health problems. By giving people easy access, to information Artificial Intelligence encourages people to take care of their health early on. One of the most important systems of AI in healthcare is development of AI based healthcare assistants and medical chatbots[11], [12]. These systems used to allow the patients to interact with AI applications which can analyse their symptoms, give basic health advice, and guide them right healthcare services. The recent research has explored different AI healthcare services such as symptom analysis, disease prediction models, medical assistant, digital health monitoring systems[11], [13]. These technologies are used to help in improving patient engagement and support doctors or professionals in making medical decisions. For example, AI chatbots can assist patients by checking symptoms, scheduling appointments, medication reminders and etc[14], [15]..

However, after these advancements also there are also some challenges still exist. The challenges are related to data privacy, ethical concerns, reliability of AI models and difficulty in integrating AI systems with existing healthcare system that can combine all services of AI into one platform. This study reviews existing AI technologies in healthcare and proposes Care+ an intelligent healthcare system designed to analyse patient symptoms and provide Personalized medical recommendations[16], [17].

Table 1: Challenges in Traditional Healthcare Systems

Challenge	Description
Population Growth[18]	Increasing number of patients needing healthcare services
Shortage of Doctors[19]	Limited number of medical professionals
Late Diagnosis[20]	Delay in detecting diseases
High Medical Costs[21]	Expensive treatments and hospital services
Limited Accessibility[22]	Rural areas have difficulty accessing healthcare

II. METHODOLOGY

A. Research Design

This research studies many previously published research papers about how Artificial Intelligence is used in healthcare. Instead of building a new system immediately, the study first collects and analysis existing research papers to understand what technologies and methods are already being used. AI has become an important technology in healthcare because it can help improve diagnosis accuracy, patient interaction, and clinical decision making. Many researchers have explored the use of Machine learning, deep learning, and natural language processing techniques in healthcare. The purpose of this literature review is to examine the technologies, research trends, system designs, and limitations of existing AI healthcare systems. Previous studies show that AI can support early disease detection, improve healthcare accessibility, and provide intelligent patient assistance through digital healthcare platforms. By analysing the selected research papers, this study aims to identify the strengths and limitations of current AI healthcare systems and determine the existing research gaps.

B. Search Strategy

To collect relevant research for this study, papers were gathered from well-known scientific databases. These databases are used by researchers and contain reviewed studies which is related to AI, healthcare technologies, and digital health systems. The databases used for the literature search are IEEE Xplore, SpringerLink, ScienceDirect, PubMed Central, ResearchGate. During the search Process, different keywords were used to find relevant papers. These keywords were selected to match the main topics of this study. The main search keywords Included are “Artificial Intelligence in Healthcare”, “AI in Healthcare Diagnosis Systems”, “Machine learning in disease Prediction”, “AI symptom Checker Systems”, “Conversational AI in Healthcare”, “Digital Healthcare Assistants”. These keywords were used both

individually and in different combinations while searching in databases). The search resulted in many research Papers, and from these, the most relevant studies were selected based on the defined inclusion and exclusion criteria.

C. Inclusion Criteria

To make sure that the selected research papers are relevant and of good quality, these criteria were used while choosing the studies for this literature review. Only papers that satisfied these conditions were included in the analysis. The selected papers meet the following requirements: The papers are reviewed publications, that means they have been reviewed and approved by experts in the field. The studies focus on Artificial intelligence applications in healthcare systems. The research discusses topics such as AI based disease prediction, healthcare chatbots, symptom analysis systems, or digital healthcare assistants. The papers were published within the last 10-15 to ensure that the review includes recent developments in AI technologies. The studies provide clear information about the methods used, datasets, system design, or experimental results related to healthcare AI. Based on these criteria, papers were selected and analysed in detail for this study.

D. Exclusion Criteria

During the literature review process, some types of publications were excluded to ensure that only relevant and quality research papers were included in the study. The following types of sources were excluded: Blog articles and online posts that are not reviewed. Opinion based articles that do not contain research results. Studies that are not related to Artificial intelligence in healthcare. Duplicate research papers found in more than one database. Papers which do not provide enough information about their methods or results. By applying these exclusion criteria, only relevant research studies were selected for review.

E. Data Extraction and Analysis

After selecting the relevant research papers, important information from each study was collected and organized for analysis. This process was helped in understanding and comparing the different AI healthcare systems discussed in the selected papers. The following information was recorded from each research paper: Author names and publication year. Artificial intelligence techniques used, such as machine learning, deep learning or natural learning processing. Application area, for example disease prediction, healthcare chatbots, or patient monitoring systems. Dataset or healthcare sources used in the research. Key results, system performance, and research contributions. The collected information was then analysed to identify important research gaps, such as lack of system integration, limited patient interaction, and insufficient personalized healthcare recommendations.

F. Limitations of the methodology

This study looks at how Artificial Intelligence's used in healthcare. There are some problems with the way the study was done. The study is based on what other people have found out about Artificial Intelligence. The results are only as good as the studies that were used. Some important studies about Artificial Intelligence may have been missed if they were not, in the databases that were looked at. One more limitation is that this review is mostly studies on using Artificial intelligence to predict Artificial intelligence to predict diseases, healthcare chatbots and systems that analyse symptoms. Other AI applications in healthcare, such as robotic surgery or advanced medical imaging systems, were not included in detail. In addition, differences in datasets, research methods, and evaluation technique used in studies may affect the comparison of results. Other than these limitations, the review provides useful insights into current trends, technologies, and research gaps in AI healthcare systems.

G. Summary

This study used a literature review methodology to analyse the research which is existed on Artificial intelligence applications in healthcare systems. Research papers was collected from scientific databases such as IEEE Xplore, SpringerLink, ScienceDirect, PubMed Central, and ResearchGate. After collecting the papers, inclusion and exclusion criteria was applied to select the most relevant studies. The information from each paper the information from each paper which is important such as the AI techniques used, datasets, application areas and research findings was extracted and analysed. The analysis helps to identify key technologies, research trends, and limitations in existing AI healthcare systems.

III. ARTIFICIAL INTELLIGENCE IN HEALTHCARE

A. Artificial Intelligences Function in Disease Prognosis

Artificial Intelligence is really changing the way we find out if someone is sick. Artificial Intelligence is helping doctors figure out what is wrong with people sooner. Usually, doctors look at test results use their experience and wait for symptoms to appear before they can say what is wrong with someone. The problem is that a lot of people do not

find out they are sick until it is too late. This makes it harder to get better and more expensive to get treatment. Artificial Intelligence helps with this by looking at a lot of information and finding patterns that people might not see[25], [26]. Artificial Intelligence systems can look at information from lots of places like what is in peoples medical records, pictures from scans, genetic information and data from fitness trackers. Artificial Intelligence does this because of something called machine learning and deep learning. This means Artificial Intelligence can look at all this information and help doctors find out what is wrong, with people sooner. Artificial Intelligence is getting better at doing this because it can look at much information and find patterns that people might miss[27], [29].

B. Technologies Used in AI-Based Disease Prediction

advanced AI technologies are used to predict diseases. Machine Learning algorithms like Decision Trees, Random Forest and Support Vector Machines are used. These algorithms analyse data and find patterns related to diseases. Deep Learning models are also effective. They include Convolutional Neural Networks and Recurrent Neural Networks. These models are great at analysing images and patient data over time .Natural Language Processing helps AI systems[26], [28].It extracts information, from clinical notes and medical reports. Big Data Analytics is also important. It combines information from healthcare databases. These technologies help healthcare systems. They make disease prediction more accurate. They provide treatment recommendations using Machine Learning and Deep Learning models. Machine Learning and Deep Learning improve disease prediction. They help doctors make decisions[20], [30], [31], [32].

C. Applications of Artificial Intelligence in Healthcare Diagnosis

Artificial Intelligence is used a lot in medical fields to predict diseases. For cancer treatment Artificial Intelligence looks at pictures from machines like CT scanners and MRI scanners to find cancer on. In heart care Artificial Intelligence checks the signals from heart tests and devices that people wear to see if they have heart problems or if their heart is beating funny[33]. Artificial Intelligence also helps doctors who treat the brain figure out if someone has a disease like Alzheimer's by looking at pictures of their brain and their medical history. Artificial Intelligence also helps doctors prevent people from getting sick in the place. People wear things, like smartwatches that track their heart rate how much they move around and how well they sleep. Artificial Intelligence looks at all this information. Can tell if someone is getting sick before they even know it. Then it can warn both the person and their doctor so they can do something about it before it gets really bad[34], [35].

D. Challenges and Future Scope of Artificial Intelligence in Healthcare

Artificial Intelligence in healthcare is really useful for predicting diseases. However, there are still some problems that need to be solved. One big problem is keeping information private. Artificial Intelligence systems need to look at patient data. Healthcare organizations have to be very careful and follow a lot of rules to keep data safe. Another problem is that Artificial Intelligence models can be unfair. This happens when they are trained with data that's not complete or not balanced. With these problems the future of Artificial Intelligence in healthcare looks good. New technologies like learning and explainable Artificial Intelligence and using blockchain can make medical Artificial Intelligence systems more transparent and secure and reliable. Artificial Intelligence can also work with devices and Internet of Things technology. This will help doctors keep an eye on patients all the time and give them the treatment. This will make patients healthier. Reduce the cost of healthcare[23], [36], [37]. Artificial Intelligence, in healthcare is going to be very important[34], [38].

Table 2. AI Models Used in Disease Prediction

AI Model	Type	Main Application	Example Disease Prediction
Decision Tree[2]	Machine Learning	Patient data classification	Diabetes, Hypertension
Random Forest[16]	Machine Learning	Risk prediction using clinical data	Diabetes prediction
Support Vector Machine (SVM)[39]	Machine Learning	Pattern recognition in medical datasets	Lung cancer detection
Convolutional Neural Network (CNN)[9]	Deep Learning	Medical image analysis	Tumour detection in CT/MRI scans
Recurrent Neural Network (RNN / LSTM)[22]	Deep Learning	Time-series health data analysis	Disease progression prediction
Natural Language Processing (NLP)[40]	AI Technique	Clinical text and medical records analysis	Early sepsis detection

IV. CHATBOTS IN HEALTHCARE**A. Background and Emergence of Chatbots**

These days people need help with their tasks because everyone has smartphones, smart devices and internet access. This is also true for healthcare, where patients often need answers to their health questions. Artificial Intelligence has become important here because it can do some thinking and decision-making[41], [42]. A good example of Artificial Intelligence is chatbots. These systems talk to users understand their questions and give automated answers.

The idea of chatbots started in 1966 with ELIZA, one of the programs that could have a conversation like a human. Over time chatbot technology has improved a lot. Now chatbots are used in industries, like customer support, education, finance, marketing, entertainment and healthcare. Modern chatbots use Machine Learning and Natural Language Processing to understand language and give responses[43], [44]. As a result, chatbots have become a way for humans and computers to interact letting users talk to machines naturally and efficiently. The thing about chatbots is that they are changing how we interact with technology and chatbot technology is advancing rapidly. People are using chatbots in areas and chatbots are helping people in many ways. The fact is that chatbots are becoming very useful and people are using chatbots more and more. Chatbots are really making a difference. The use of chatbots is, on the rise[42], [45].

B. Concepts, Types and Working Mechanism of Chatbots

A chatbot is a computer program that has a conversation with people through text or speech. It comes up with answers by itself without needing any help from people. In the healthcare field medical chatbots are created to assist patients. They answer questions provide health information and help users figure out what is wrong with them[46], [47], [48]. These systems use Artificial Intelligence to understand what people are saying and give answers based on what they know about chatbots. There are three kinds of chatbots: chatbots, smart chatbots and hybrid chatbots. Simple chatbots work based on rules. Can only answer certain questions about chatbots. Smart chatbots are more advanced. Use Natural Language Processing to understand what people mean and how they are feeling when they talk to chatbots. They can give answers because of this[49], [50], [51]. Hybrid chatbots use both rules and Artificial Intelligence to be more accurate and flexible when people interact with chatbots[52], [53], [54], [55], [56].

So how does a chatbot work? Well first the user says something or types something to the chatbot. Then the system looks at what the user said and compares it to what it knows about chatbots. After that the chatbot comes up with an answer. Tells it to the user. The chatbot uses things like pattern matching and neural networks to do all this with chatbots. Neural networks are special because they help chatbots learn from what they have been told and get better at answering questions over time about chatbots. Medical chatbots, which are designed to help patients with their health questions and concerns, about their symptoms can really help people when they use chatbots[6], [42], [45].

C. Applications and Benefits of Chatbots in Healthcare

I think chatbots in healthcare are really useful because they make it easy for people to get the help they need. Chatbots in healthcare can make getting medical help easier and faster. With chatbots in healthcare patients can find out what is wrong with them. Get some advice without having to go see a doctor right away. These chatbots in healthcare are available all the time to help people, twenty-four hours a day using their phones or other devices. This makes it easy for people to get the healthcare information they need no matter what time it is or where they are. Chatbots in healthcare can do a lot of things to help people[12], [43], [57]. They can help people make doctor appointments remind them to take their medicine collect information and help make records. Chatbots in healthcare can also keep an eye on people who're sick and help them make healthy choices by giving them personalized suggestions[58], [59]. When there are health problems, like pandemics chatbots in healthcare have helped people get the right information and not believe wrong things. Some organizations have used chatbot systems on messaging platforms to give help to a lot of people. Chatbots in healthcare are really helpful because they make things easier for patients[6], [12].

Chatbots in healthcare also help the people who work in healthcare by giving them work to do. Things like making appointments, billing and collecting data can be done by chatbots in healthcare. This means that doctors and other healthcare workers can focus on taking care of people and spend time with them. Chatbots in healthcare can also help figure out if someone's sick early on and send them to the right healthcare services. Chatbots in healthcare can make healthcare better for everyone. They can help save money and make patients happier, with chatbots in healthcare[60], [61].

D. Challenges, Security Risks and Future Potential

Healthcare chatbots have some problems. One of the issues with healthcare chatbots is that they give advice. Healthcare chatbots do not know everything about a patient condition. They are not like doctors. Doctors have

experience. Can understand how patients are feeling. This is important when making decisions about patient care. Healthcare chatbots should help healthcare professionals not replace healthcare professionals. Another big problem is keeping information safe. Healthcare chatbots deal with health information, which makes them a target for cyberattacks. There are threats like data theft or people pretending to be someone they're not. Healthcare chatbots can also be affected by denial-of-service attacks, which can stop healthcare chatbots from working. There are also problems with access to information. These problems happen because the system is not designed well or the code is not written properly. There are also attacks, like injection attacks that can make healthcare chatbots give advice. To make healthcare chatbots safer we need to add security measures. We need to make sure only the right people can use the healthcare chatbot. We need to keep the information, between the patient and the healthcare chatbot private. We need to use protocols and make sure only the right people can get to the information. We can also use anonymization to keep identities safe [62], [63]. If we do all these things and are careful we can make sure healthcare chatbots are safe to use[12], [64].

Overall healthcare chatbots can help healthcare systems a lot. Healthcare chatbots can give patients help when they need it. Healthcare chatbots can also help patients get the information they need. Healthcare chatbots can even help healthcare professionals do their jobs better which can lead to patient care. We need to be careful and make sure healthcare chatbots are accurate keep information safe and work well with doctors. We need to think about all these things when we use healthcare chatbots. Healthcare chatbots have a lot of potential to help people and healthcare chatbots can make a difference in the future[65], [66].

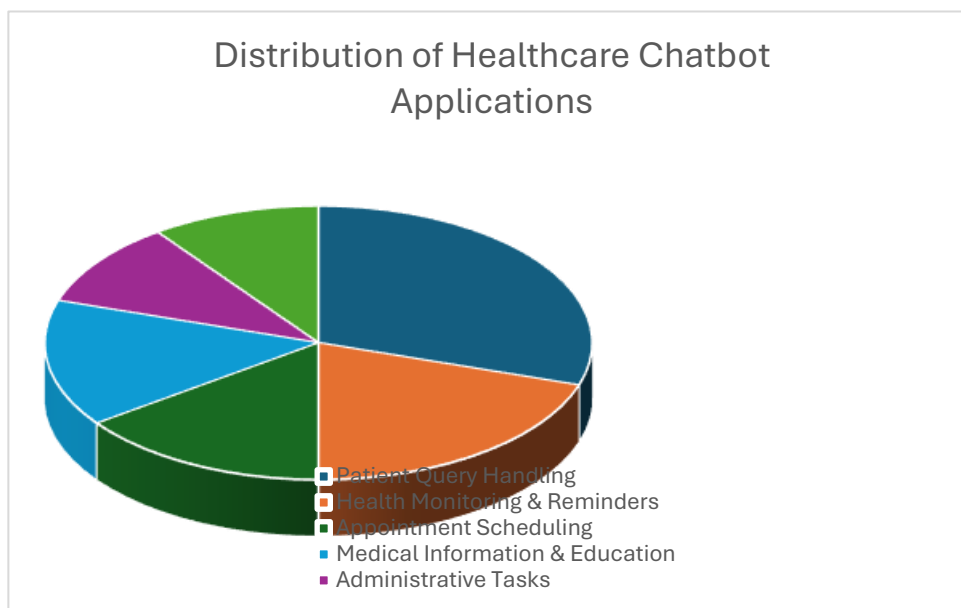


Fig. 1. Distribution of Healthcare Chatbot Applications[45]

V. DATA SECURITY IN MEDICAL SYSTEMS

A. Introduction to Data Security in Healthcare Systems

Healthcare systems are used to store and manage large amount of sensitive data of patients. like medical history, personal details, diagnosis reports, and treatment records. Protecting this data is very important because if it is accessed or misused by unauthorized people, it can cause privacy problems and reduce trust in healthcare systems. As of now Artificial intelligence and digital healthcare platforms are used more in healthcare, medical data is stored and processed in electronic systems such as HER (electronic health records), cloud databases, and healthcare applications. These technologies are used to improve healthcare and more accessible[67], [68], [69]. However, they also increase the risk of cyber threats like data breaches, unauthorized access, and identity theft. One of the main challenges in healthcare data security is protecting the patient privacy while still allowing the doctors to access the information they need for treatment. Healthcare systems are used to keep patient data safe by using secure storage, controlled access, and strong authentication methods[18], [46], [70]. Common techniques used to protect medical data are encryption, secure communication protocol and role-based access control. Not only technical security measures, healthcare systems should follow strict rules and regulations for protecting patient data. Standards like HIPPA and GDPR give rules to keep health information safe and protect privacy. Good data security is key. It helps keep patients trusting us. It stops

cyber threats. It makes sure AI, in healthcare is used safely. Secure healthcare systems are a must. They protect data[36], [37], [51]. They help us use healthcare tech in a reliable and ethical way[19], [53].

B. Authentication and Role-Based Access Control in Medical Data Security

Medical data security is an important thing to think about. Healthcare systems have to make sure that only the right people can get in like doctors and nurses and administrators can see the information. They use things like passwords and verification steps and fingerprint scanning and special cards to make sure that the users are really who they say they are the medical data security people. These methods help check if a user is really a doctor or a nurse or an administrator before they can see the records the medical data security records[71], [72]. Strong verification systems make it less likely that someone who should not be there can get in and protect the medical data security information. Role-based access control is also very important in healthcare data protection the medical data security protection. It makes sure that users can only see the information they need for their job like doctors and nurses and administrators the medical data security jobs. For example doctors might be able to see everything about a patients diagnosis and treatment the data security diagnosis and treatment[73], [74], [75]. Office staff might only be able to see appointment or billing details the medical data security details. By limiting what people can see based on their job healthcare systems can reduce the risk of medical data security data being misused the medical data security risk[39], [76].

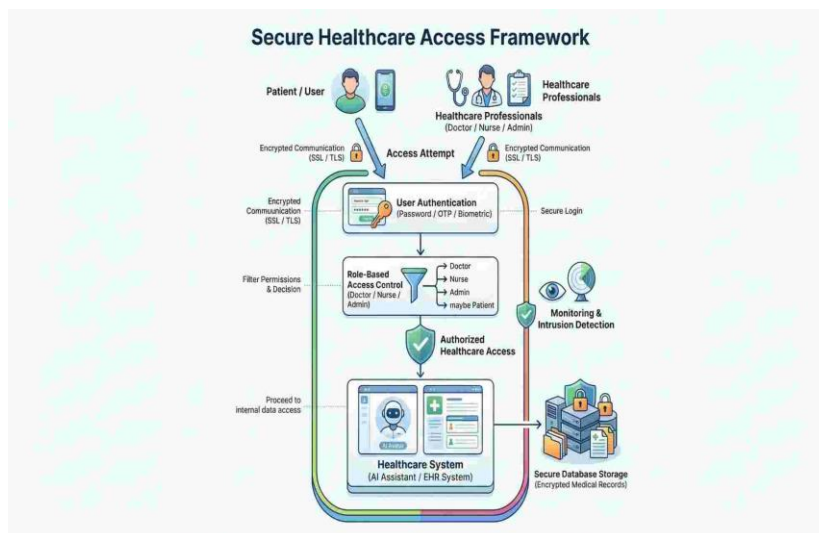


Fig 2. Secure health access framework[43]

C. Encryption and Network Security Techniques in Healthcare

Data encryption is another technique used in healthcare security the medical data security technique. Encryption turns data into coded information that can only be read by systems or users with the right decryption key the medical data security key. This protects information when it is stored in databases and when it is sent across networks the medical data security networks. Secure communication protocols like SSL/TLS are often used to protect data during communication the medical data security communication. Healthcare organizations also do monitor and secure database management to detect security threats the medical data security threats. They use intrusion detection systems and firewalls and security monitoring tools to identify activity within their networks the medical data security networks. Regular software updates and security patches are also crucial to prevent vulnerabilities that attackers might exploit the medical data security vulnerabilities. By monitoring healthcare systems organizations can detect threats early the medical data security threats early[77], [78], [79], [80].

D. Cloud Security and Cybersecurity Awareness in Healthcare

The security of cloud-based platforms is a growing concern, the medical data security concern. Many healthcare institutions store data in the cloud because it is scalable and offers access the medical data security access. However, cloud storage must be carefully managed to ensure data remains protected the medical data security protected. Healthcare organizations use encrypted storage and secure API communication and access logging and strong identity management systems the medical data security systems. Healthcare staff need security awareness and training the medical data security training[81], [82]. With technical protections human errors like weak passwords or phishing attacks can lead to security breaches the medical data security breaches. Training healthcare professionals about cybersecurity practices helps them understand how to handle information the medical data security information safely.

A combination of technology and trained personnel is essential, for maintaining a healthcare data security framework the medical data security framework[17], [41], [83].

Table 3: Common Security Threats in Medical Systems

Security Threat	Description
Data Breaches[52]	Unauthorized access to patient medical records
Unauthorized Access[22]	Access to healthcare systems without proper permission
Identity Theft[48]	Misuse of patient personal information
Cyber Attacks[62]	Attacks on hospital databases or healthcare networks
Data Manipulation[69]	Unauthorized modification of medical records

VI. CONCLUSION

Artificial Intelligence is becoming really important for making healthcare better. This study looked at ways Artificial Intelligence is used, such as predicting diseases, medical chatbots, smart healthcare assistants and secure healthcare platforms. Looking at research shows that Artificial Intelligence technologies like Machine Learning and Natural Language Processing can handle a lot of medical data and help healthcare professionals make decisions faster and more accurately. Artificial Intelligence systems can look at symptoms, medical pictures and health records to help find diseases early and make treatment plans better[18], [70], [84], [85]. These systems let patients get medical help check their symptoms, schedule doctor appointments and get health information anytime. These digital healthcare platforms can reduce the work of professionals and help patients get medical help on time especially in areas where healthcare is not easily available[8]. Even with all the good things Artificial Intelligence can do for healthcare there are still some problems. We need to be careful about keeping information private making sure systems are secure and making sure Artificial Intelligence predictions are reliable. Healthcare systems need to have security measures like passwords, encryption and access control to protect patient information and prevent cyber attacks[86], [87], [88], [89].

Overall Artificial Intelligence can make a difference in healthcare by helping predict diseases making patients more involved and making healthcare more accessible. Future healthcare systems will probably use Artificial Intelligence with technologies like cloud computing, wearable devices and Internet of Things. If we do it right and keep information safe Artificial Intelligence can help make healthcare better and more accessible like the Care+ system. Artificial Intelligence can help make healthcare more efficient and personalized which is really important, for patients and healthcare professionals.

ACKNOWLEDGMENT

The authors would like to express their sincere gratitude to **Dr. Ashwini Kumar Jha** for his continuous guidance, insightful feedback, and unwavering support throughout the development of this review paper. His expertise in research and his constructive suggestions significantly strengthened the conceptual clarity and analytical depth of this work. We are deeply thankful for his mentorship, encouragement, and valuable academic direction.

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