



OVERVIEW OF AI BASED E- HEALTHCARE SYSTEM

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ABSTRACT

E healthcare is a new and emerging concept that uses the internet and Internet related services to improve the efficiency of healthcare. It involves use of tools like Artificial Intelligence (AI), Big Data etc. to improve the quality of healthcare. Hence being a developing concept, it has dragged the attention of academic scholars, that's the reason for choosing E- Healthcare systems for this review. The main aim of this review paper is to summarize the literature on benefits and challenges for E healthcare. This paper also emphasizes on the relevance, need and features of E healthcare systems. It has provided a special emphasis on the benefits of E healthcare for developing nations and how the developing countries prove themselves as opportunities for E- healthcare.

The paper describes the potential advantages of E healthcare, organizational benefits, social benefits etc. Along with the benefits this paper also covers the various drawbacks of E healthcare systems, the need for improvement. It has also focused on relevance of use of Artificial Intelligence in the improvement of health care services. The paper will cover almost every detail about E- healthcare systems in a brief and summarized form. It also contains the introduction, Emergence and historical Background of E healthcare.

Hence this paper will be critically evaluating the term E health, E healthcare, Manual Healthcare, E healthcare systems and all the related terms like big data etc. The main headings to be covered under this paper are Introduction, Features, Scope, Benefits and limitations/ Challenges.

INTRODUCTION

E-health care is an emerging concept used to monitor various health conditions by using the technologies and helps the health organizations in formulating and analyzing their strategies and policies. The concept was first brought into consideration in 1999 when the electronic communication and technological achievements were combined in a single thread for the very first time.[1] The concept has been improved a lot with passing time and emergence of new upgraded technologies. Although E-healthcare is a relatively older concept but its significance is improved only with the latest technological developments like introduction of big data, artificial intelligence (AI), sensors, drones, block chains, Internet of Medical Things (IoMT) etc. By using the above-mentioned technologies one can track a patient's current and past status and inform the doctors prior to any mi's happenings.[2]

According to a Canadian Researcher Eisenach, "e-health is a field emerging at the nexus of medical IT, public health, and business,

enabling improving conditions for providing public health services over the Internet and related Internet technologies".[3]

WHO (World Health Organization) has defined E- health care as use of the information communication technologies to monitor and manage the treatments of the healthcare service users.

Various Artificial Intelligence tools are used in healthcare systems in order to ensure the efficient functioning of health services and make them less time consuming and more reliable.

Various conceptual definitions are available in order to define E healthcare but the major similarity in all the concepts is all of them has emphasized the importance of Internet and internet technologies in order to provide a user oriented and user-demanded health care system and services.[4] Hence one can conclude that the term E- health is surrounded by various innovations and technologies based on internet and internet's potential. These innovative technologies have helped to develop the concept of big data which has enabled the digital transformation of the healthcare system by collection of data and



information about the patients. These health care systems increase efficiency of the healthcare organizations as well as provide them with financial benefits.[5]

Some of the benefits associated to E-healthcare systems:

- a) Safety in terms of making a decision regarding how a medical procedure will be implemented.
- b) Provide easy access to the information all healthcare institutions.
- c) Increases efficiency
- d) Increases quality of work etc.
- e)

Artificial intelligence refers to the problem solving and decision making capability of a machine/ computer systems similar to that of a human being. It involves expert systems, natural language processing, speech recognition, machine vision etc. The application of Artificial Intelligence in hospitals, clinics and other healthcare facilities helps the healthcare system to become faster, smarter and more efficient to help the people worldwide.

Features of E- Healthcare systems

The term e health care is not restricted to a limited extent but has a wide area to be covered, based on the above scope some of the characteristics of e healthcare system are as follows: -

a) Efficient

Efficiency refers to the ability of doing a work in a cost-effective manner. The main aim kept forward to development e- healthcare system was to reduce the cost of management of various functions related to the manual health care services. Hence it definitely leads to a cost-effective management of the healthcare services. Efficiency can be achieved by avoiding unnecessary diagnostics, cut in the overhead costs and better involvement of patients by improved communication.[6]

b) Enhanced Care quality

E healthcare systems provide a wide variety of information about the patients, it tells about their past record as well their present status along with all the diagnosed reports and their recovering history. All these information help to improve the quality of health care. It allows comparison between diverse care providers, focus on quality assurance, and aims that the patient receives the best quality suppliers.

c) Based on Evidences

The healthcare services are very crucial in nature hence the services related to it need to be handled really carefully. The E- healthcare systems should be designed as per value and competence-based models not only

presumed but proven by scientific assessment. Although it seems to be an easy task but a lot is needed to be done in this sector.[7]

d) Empower consumers and patients

E healthcare system empowers the consumers and the patients by enabling them to expand their knowledge and access their records online. It provides with new opportunities for the patients by providing them with various facilities like patient centered medicine facility, personal access to one's data, availability of multiple supplier choices etc.

e) Encourage patient participation

E healthcare systems provide with a well facilitated proactive care. It also provides the consumers with other benefits like one click services, available even at home, secure services, available at convenience of the patients etc. all these things encourage a link and mutual consent between the doctors and patient.[8]

f) Expansion of Knowledge

As E health is an emerging concept based on various technological developments and keeps on changing as per the new innovations and need of the era, it enables the physicians and consumers to educate about the recent technological developments through online sources, by using the systems etc. It also provides the patients and the providers with the latest researches and healthcare information.

g) Enables Exchange of Information

E healthcare system creates an environment which enables easier exchange of information as well as easy communication between the consumers and service providers.

It also ensures discussions and communication among various health care institutions on regular and frequent occasions.[9]

h) Extends opportunities

E healthcare system has extended the health care opportunities beyond the conservative boundaries of the manual healthcare systems. E healthcare has facilitated the consumers to achieve health services from international service providers without much paperwork. The facilities provided can be from a small advice / suggestion to a more complex and compound medication.

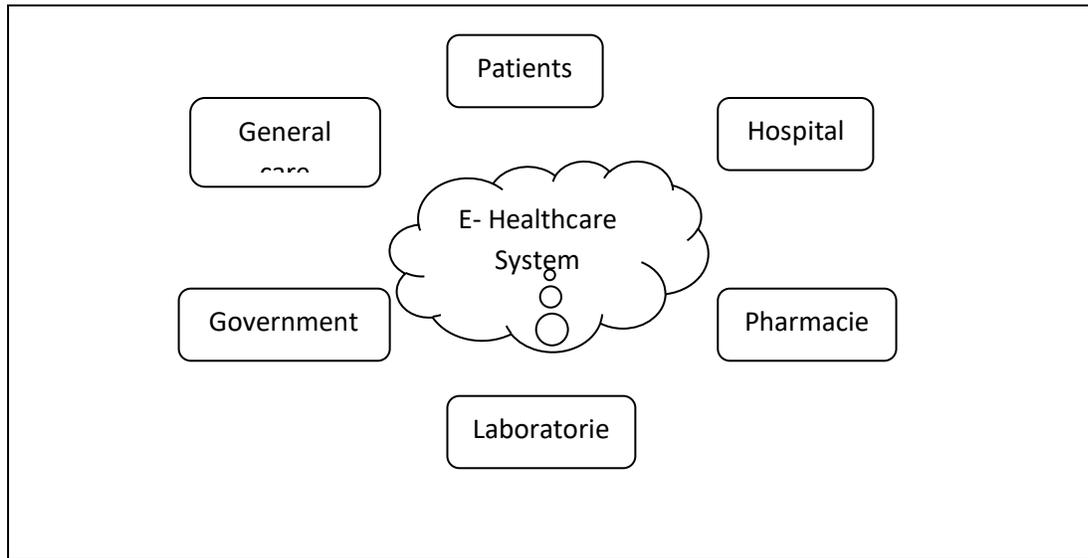


Figure 1 fig of E-Healthcare System

i) Ethical functioning

Ethics is a concept that is needed to be thoroughly studied before implementing any system, policy, strategy or any action performed by anyone. Similarly Ethical code of conduct is applied to E- healthcare system as well. It ensures moral norms to be followed while using a e healthcare system. For example: Privacy, Informed consent etc.

c) For Taking Care of the Patient

- **Maternal Care:** AI technologies can help in reducing the maternal mortality rate and after childbirth problems. It can predict the expected risk at the time of delivery by diagnosis of the mother prior to the childbirth. It also ensures more frequent and sophisticated care throughout the pregnancy period. Hence use of AI helps to reduce the Maternal Morbidity and problems during and after the pregnancy period.

- **Assistance by Robotics:** Adding to the medical staff personells certain robots are designed to assist the patients throughout their treatment journey. Some of these robots involves Exoskeleton robots used to assist the paralysed patients in walking again. There are artificial limbs, arms and other body parts available as well that are based upon AI technologies that ensures better assistance to the patients.

These are a few of the implementations of Artificial Intelligence in the healthcare systems.

Application of Artificial Intelligence in E- healthcare system:

a) Discovery and development of medicines

The use of Artificial Intelligence has paced up the process of discovery of new drugs and medicines in the pharmaceutical industries. Some of the examples are Pfizer is using a machine learning based system named as IBM Watson to find Immuno- oncology treatments, Sanofi is using Exscientia's Artificial Intelligence to find metabolic disease medication etc.

If Artificial Intelligence is utilized in to their best use it will bring results that can result in making the drugs development faster and cheaper.

b) Used for clinical Trials

Clinical trials refers to the testing of the newly manufactured drugs and medications on humans and animals for the first time. Artificial Intelligence has the potential to shorten the time of the trial cycle by providing the required data at the right time and right place without consuming much of time. The data can be saved in the forms of graphs and diagrams which make it easy to understand and reach to a conclusion. By keeping track of the trial information one can easily decide on the efficacy and success rate of the trial.

Benefits of E healthcare System:

E healthcare systems keeps into account cost effective and secured use of facts and Internet Communication Technologies (ICT) for the sake of health, healthcare services and other health related fields.[10]

- I. It ensures quick access to the records and information of the patients that helps in efficient management of the healthcare.
- II. By using E healthcare system one can save costs of duplication, paperwork etc. making it a cost-efficient means to manage health and health related fields.



- III. As E healthcare system is based on automated process and AI technologies the chances of medical errors reduce to almost nil and better clinical decisions can be made.
- IV. These systems facilitate better communications which acts as a bridge for the gap between the patient and the service provider.[11]
- V. By using the healthcare systems, the patient's condition can be monitored and recorded on real time.
- VI. It is a time saving means to improve the quality of care.
- VII. Through e health systems the patients are provided with the decision to manage their health on their own which facilitates better health decisions.
- VIII. Life becomes really convenient by using these systems as these can keep track of the daily activities of the consumers like heart rate, eating habits etc.
- IX. Development of e healthcare systems brought E-commerce to health care.
- X. These systems provide the consumer with better health care as it improves all the aspects of patient care like patient centric, on time actions etc.[12]
- XI. These systems also provide with healthcare guidelines and how to develop a healthy environment which again proves to be beneficial for the consumers as by these systems healthier lifestyle is encouraged.
- XII. These systems can also be used as a distance learning tool as these keep the basics about the common health problems etc.[13]

- Sometimes the basic software required are not available or sometimes the software used is not responding in the same manner.

Scope of AI based E healthcare systems in Developing Nations

- E health care system has a great opportunity to improve public sector i.e government owned healthcare institutions in developing nations.
- E- Healthcare system contribute to the overall growth and development of the nation as developing and underdeveloped countries confront many health-related problems and late access to the healthcare services.[15]
- E healthcare systems has strategic benefits as usually in developing nations there is a lack of proper healthcare management and the access is limited to some extent.
- The E healthcare system can provide improved quality and efficiency of the healthcare services, this thing also makes it preferable.
- In developing nations government also provides assistance for the development of E healthcare systems in order to attain improved quality, accessibility and capability of health sector.
- E healthcare system also provide improved facilities to the patients and the consumers which lead to boosting up the morale of the consumers to avail the benefits of E healthcare system.
- E healthcare system reduces the costs that can be proven beneficial in case of any emergency.

Limitations of E healthcare system

- Due to digital divide, it is really difficult to get access to the electronic health information.
- Not every system is designed in an ethical manner, which leads to the issues related to privacy, security etc.
- Sometimes due to misinterpretation of the data, these systems can lead to distrust and unwanted interference in the doctor-patient relationship.
- The information provided by these systems are based on medical researchers which means there is a lot more use of medical study-based words which are not easy to be understood by the commoners.[14]
- As the building block for these systems is Internet as well as they have a continuous need for Internet access hence the cost for the internet services is increased.
- In order to operate these systems, one should be well trained and equipped to their technology, due to it the need for skilled staff and new technology is increased
- It is really time consuming to keep the health records up to date and modify them almost every day.
- The access of these systems is limited to a certain boundary due to lack of basic infrastructure like internet connection in remote rural area.
- It is must be responsibility of all the systems that they should be systematically managed from time to time as and when required.

CONCLUSION

This paper is based on the study of the benefits and challenges of E healthcare systems. During the study one can easily draw a conclusion that E healthcare systems are providing most of the benefits to society and patients. Along with it the study helps to drag the attention of the researchers toward the various limitations that are needed to be observed as soon as possible in order to ensure efficient functioning of E healthcare systems.

There are various technological and logistical issues that are needed to be addressed. It is also observed that e healthcare system is more like a boon for the developing nations but still there is a long way to go now as well. Along with the introduction to new and innovative technologies the E healthcare also needs to be updated. As India is one of the fastest growing economies of the world, it is also a developing nation hence it also faces some similar issues in management of Healthcare services. These issues are addressed in an effective manner with the introduction of E healthcare and E governance concepts by the government, Hence from here we can easily get an idea that how developing an E healthcare system has become the need of the hour in order to compete with other nations as well as for the development and welfare of one's own nation.



The various AI technologies used in Healthcare system helps one to understand the emerging need and requirement of development of AI tools to improve the Healthcare services.

The need for e health systems is increasing day in day out due to the emerging need of improvements in healthcare services, need for timely availability of healthcare services like early diagnosis, quick response to fatal diseases, early awareness about severe problems etc. as from the point of view of the providers development of e healthcare systems is necessary to save time, reduce complexity of work, easy and timely availability of patients data etc. all these requirements make the concept of E health more crucial and development of e healthcare systems has provided with the need fulfillment of both consumers and providers.

After critically examining the scope, need, benefits and limitations in the paper we can conclude that E health is a concept that cannot be ignored at any cost, it can be termed as the integral part of any healthcare institution including hospitals, clinics, chemists etc. that can never be studied separately. The growth and expansion of this concept has also led to expansion of terms like “M health”, “Big Data” etc. Implementation of AI strategies and techniques in E healthcare systems has led to improvement of healthcare services contributing to the improvement in the quality of life of the people. But it has many a limitations as well which are in a need for a quick response and critical focus. Development of more efficient AI tools can be considered as a solution to most of the prevalent health care problems. Hence, E healthcare systems are in a great need for new innovations and acceptability.

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