

Challenges of eHealth and Current Developments in eHealth Applications: An Overview

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Abstract

Healthcare sector is moving towards digitalization in every aspect including e-consultations, surveillance of health, and all other services in healthcare industry. eHealth ends in the remodel of conventional methods of imparting specialist healthcare offerings digitally through the use of technology aimed toward both fee-effectiveness and patient satisfaction who are the customers of health offerings. Electronic health records has been maintained by developed countries which makes evaluating patient outcome easier. which makes evaluation of patient outcomes much easier. In the health sector, a variety of new ICTs are implemented to improve the efficiency of all levels of healthcare. eHealth—or digital health—is the use of ICT to improve the ability to treat patients, facilitate behaviour change, and improve health. Advances in information and communication technology (ICT) and the dissemination of network data processing created a new environment of universal access to information and globalization of communications, businesses, and services eHealth applications were analysed to determine the brand new developments in E-health programs. In this paper, the stakeholders are identified who're accountable for contributing to a selected eHealth challenge. By analysing the current scenario of E-health, we identified the challenges faced by eHealth technologies. The factors influencing the challenges were identified and classified. The emerging trends in the field of e-Health was studied and the applications and its benefits towards the patients was also analysed. The paper also elaborates on the role of mHealth in eHealth.

Keywords: eHealth, Health Informatics, Management, eHealth programs, eHealth utility categories, Smart City, Artificial Intelligence, mHealth.

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1. Introduction

e-Health refers to the use of facts and verbal exchange technology to enhance or decorate fitness care. E-Health is also referred to as health informatics. The development of e-health systems has expanded many folds over the past decade. Over the beyond few years, the eHealth area has grown worldwide. Furthermore, some emerging technologies have an immense capacity to transform certain areas of health and social care service. It is to be noted that technology plays a vital role in improving

healthcare prices, affected person safety and excellent in medical care. e-Health can play a critical function in facing the challenges within the field of Health Care. The use of fitness facts generation dates lower back to the mid-90s. Areas supposed for eHealth

- Electronic health facts control;
- Networks and communication infrastructure
- Suspension of patient records;
- Data Privacy and security
- Countrywide research and international cooperation.

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Some of the important benefits of eHealth applications are:

- Health Care Programs - enhance useful resource usage (high-quality - value effectiveness)
- Promoting better selection-making.
- Information and data: Additional get right of entry to, availability, Speed
- Professional Impact: enhance performance (accuracy, records generation)
- Useful for evaluating crucial affected person identity data and scientific records.

There are many eHealth programs evolved however many guarantees of eHealth research and development have not yet been fulfilled. The effective and green improvement of the eHealth gadget faces many challenges. The most crucial problems are a lack of commitment from fitness care authorities and a lack of interplay between exclusive health data systems. Over the beyond decade, researchers have raised numerous challenges dealing with eHealth. It is vital to review those demanding situations and divide them into unique categories. The motive of this paper is to differentiate the eHealth demanding situations into broader classes via a complete review of articles posted on this location [1][2][3].

2. Smart Cities and e-Health

The current population growth and urbanization have ignited a desire to create smart cities by integrating technology into the design of city services". This renewed desire has resulted in the use of information and communication technologies (ICT) to increase critical urban support for larger communities like crime sourcing, emergency response and transportation.[4]

The general parameters like traffic conditions, pollution level, temperature, humidity, allergens, pollution and power grid status are perceived using the sensors in smart cities. The values of these different parameters provide information and context that helps the system to monitor and understand the state of a citizen at any given time. Responding strategically to the sensed data makes health care smarter. By gaining real-time access to this information, Smart city services can respond immediately to urgent health needs and take critical decisions to avoid unhealthy situations by gaining real time access to the sensor data information [5].

Electronic health records and personal health records were introduced in the early 2000 and even played a major role by influencing various decisions of the government regarding investments in healthcare fund. Historical data like e-health data, data mining helps the doctors to understand the health condition of the entire population and also to understand the recent health trends. It is estimated that nearly 55% of doctors now make use of Electronic Health Record. and Personal health Record sources

Different types of sources provide information to the smart cities. Sensor data from the mobile sources and ambient sensor data are some of the sources. These include the information sources listed in the previous section such as mobile device sensor data and ambient sensor data. Added to this, data like transportation grid status. vehicular networks, locations of emergency service providers, size of the population can be tapped from city wide sites throughout the region [6].

3. Current Challenges in eHealth

3.1. Detection of sickness at early stage

Detection of ailment at early level helps no longer most effective to reduce value of clinical treatment however it is also useful in saving precious lives of humans. For example, detection of cancer at early stage might also rescue man's lifestyles as opposed to detection of disorder at later degree. The technologies related to E-Health falter at identifying the sickness at an earlier stage [7].

3.2. Management of Patient's facts in an efficient manner

Capturing, Storing and maintaining information and Accessing Information in green manner is likewise a massive venture. Efficiently keeping EHR (Electronic Health report) is a large problem .There is need of clear information requirements to get greatest value in implementing eHealth Systems and also reducing Cost of Health Care through the usage of eHealth System. Reducing Cost of Health care with assist of eHealth is a huge Challenge. Health Care Systems contain a module called Health Information Exchange. This module aims to get 360 degree view of the treatment plans of the patients and the sufferers [7].

3.3. Effective usage of Skills of HSR and IT

eHealth solutions are developed by Expert Health Service Researchers. The challenge lies in saving the time of the expert health service researcher and minimising his involvement in improvement of eHealth. So, combining abilities of each HSR and IT Expert in an effective way to achieve maximum gain is a highly challenging task [7].

3.4. Establish agreement with between HSR and IT Expert

Health Service Researchers are people who are actively involved in the improvement of the eHealth solutions and work in parallel with the IT professionals So, there must be mutual admiration and co-operation among both the teams but troubles arise whilst both HSR and IT professional are

interacting with each other. Therefore, organising a mutual agreement among each Health Service Researcher and IT professional crew is a huge task [8].

3.5. Data Privacy

In SCH programs, a large quantity of information is continuously gathered from and about patients. These data can be modified duplicated, accessed with ease via unauthorized parties through malicious assaults like tag cloning, radio frequency jamming, and cloud polling and spoofing. RFID tags which do not include password and also not protected by encryption over the air can be duplicated and cloned. A Radio frequency jammer is a tool used for saving the received radio transmissions using a receiver applicable to its characteristic. This type of assault can interrupt the functionalities of existence-monitoring structures, now and again leading to loss of lives. In cloud polling, traffic is redirected, allowing unauthorized command infusions at once right into a device through a man-in-the-middle assault [7][9].

3.6. Exchange of data amongst different Healthcare Places

Patient's facts interoperability among exclusive Health care Places like Hospitals, private clinics is a key trouble. Due to loss of interoperability, statistics stay fragmented, remoted and information analysis cannot be achieved. Due to this problem, replacing statistics among exceptional structures is not feasible that's problem to perform fundamental goals of healthcare. WHO also advocated its members to adopt requirements for powerful exchange of statistics among eHealth implementations and fitness care practitioners. Solution to this hassle is making records in a well-known form [8].

3.7. Health Care Infrastructure

It is an uphill task to develop and maintain the Healthcare infrastructure. Healthcare infrastructure may be complicated because of distinct reasons. Populated countries take active steps to increase the number of hospitals and also to provide better healthcare facilities. Similarly, geographically dispersed regions have a well-developed Health Care infrastructure. Such developed infrastructure should assist eHealth however the infrastructure provides insufficient support to eHealth. There are many factors for such problems to occur. Factors ranging from lack of electricity to lack of internet connection. These troubles are extra not unusual in rural regions. However, mobile smartphone infrastructure is growing at a growing price provides opportunities to put into effect structures with much less assets). Hence mHealth (part of broader telemedicine discipline) can be useful in presence of insufficient infrastructure. There are also other problems consisting of fragmented records and

problems for project scalability. eHealth System infrastructure consists of both hardware and software. It is our fortune that now Hardware fee is comparatively low than previous year. Due to low fee of Hardware developing and beneath growing international locations are in function to make initiative of distributing low cost Computers. Open Source motion is helping constrained useful resource international locations in terms of Software. PostgreSQL (an open Source DBMS) and Open MRS (Helps to design custom designed EHRs) are two correct examples of Open Source Software [10].

3.8. Shortage of eHealth experts

Professionals are fewer in this interdisciplinary region and there is also shortage of such experts in the E-health sector. This association laboured in growing countries like Singapore and Argentina to create a worldwide model tailored to cater to the eHealth requirements. Another technique to counter this trouble is to use cellular and telemedicine devices to attach educated assets with population. It is especially useful in rural areas. Such initiative is taken in India where in cell tools are being used to screen in retinopathy [10].

4. Recent Trends in eHealth programs

4.1. Artificial Intelligence

AI and Machine Learning are used in this area as solutions to gather, examine and exploit facts to be able to automate sure recurring responsibilities in order that docs can focus on different tasks with higher brought value. These technologies will attain maturity within the e-health area by means of 2030. The uses may be very numerous, inclusive of triage and orientation of sufferers, acceleration of drug improvement, diagnostic help through digital assistants, computer-assisted surgery or epidemiological prevention [11].

4.1.1. Applications of Artificial Intelligence

a) Support for Clinical Decision Making

It is highly essential for the health professionals to take each and every piece of information into consideration during diagnosis of the patients. If there's a mistake in keeping track of even a single relevant fact, the life of a patient could be put at risk. With the help of Natural Language Processing doctors find it convenient to chart down all relevant information from patient reports. Large sets of data could be stored and processed using Artificial Intelligence and it is useful in creating databases of the patients and enhance individual patient clinical support.

b) Primary Care through Chatbots

People in general have the tendency to visit a nearby hospital or doctor immediately at the slightest medical issue which at times could be self treated or can be a false alarm. Through Artificial Intelligence doctors can concentrate on more critical and deadly cases as artificial intelligence enables smooth flow of primary treatment and also automation of primary care. Medical Chatbots is based on AI and is incorporated with smart algorithms that provide instant answers to all the health-based queries and concerns of the patients. and also, chatbots guide them on how to deal with any potential problems. The availability of chat box is 24/7 and they can also handle multiple patients at the same time.

c) Virtual nursing assistants

Virtual nursing assistants are facilitated by artificial intelligence systems, and they can perform a variety of tasks like striking a conversation with the patients and guiding the patients to the effective care unit. The Virtual nursing assistants can answer the queries of the patients' and also examine them and provide instant solutions. The availability of virtual nurses is 24/7. Nowadays using many AI powered applications virtual nursing assistants has enabled more frequent interactions between patients and care takers in between office visits to overcome any unnecessary visit to the hospital. The world's first virtual nurse assistant Care Angel, can facilitate wellness checks through AI and also voice [12].

d) Machine vision for diagnosis and surgery

Computer vision usually interprets the images and videos by machines at par or above human-level capabilities which involves recognising object and scene. Image-based diagnosis and image-guided surgery are areas where computer vision is making a strong impact.

4.2. Remote fitness

Remote health has experienced a first-rate increase in the course of the Covid-19 health disaster. According to a McKinsey record, telehealth use has extended 38X from the pre-COVID-19 baseline. In 2022, it's miles fairly possibly that the telemedicine and faraway fitness services advanced during the pandemic to control sufferers in the context of number one care may be extended to many different specialties and care paths, including intellectual health, tracking of chronic diseases or monitoring of sufferers recuperating from surgical treatment or serious infection.

4.3. Internet of Things

The Internet of Things, allows an expansion of medical gadgets to be connected to the Internet. Thanks to those connected items, patients can end up increasingly involved of their fitness. They can use or wear these devices to check their body temperature, blood strain or coronary heart price, and transmit them to a medical doctor who can be able to remotely reveal the affected person's fitness repute. This type of tool can help patients with chronic sicknesses better control their health and contribute to better care. With the information transmitted, healthcare professionals can, as an example, deliver recommendation to the patient or better prepare for an emergency management [12][13].

4.4. Applications for Employee Wellness

As lifestyles amid a plague prolonged, it had a strong negative impact on the mental health. Mindfulness applications like, Liberate, Headspace and Calm weren't only for the niche target market, as mainstream adoption drove download numbers within the wellbeing application market. Employers are more and more spotting that wellness applications might be useful for their personnel. Company had taken initiatives like corporate wellbeing retreats, place of job yoga, and crew-building events for many years, but the corporation-furnished wellbeing app is a fantastically new idea [14].

4.5. Virtual Reality and Augmented Reality

Few years ago, virtual reality seemed like a novelty idea exceptional acceptable to video games. Now, virtual reality and Augmented Reality generation offers a huge variety of sensible uses past gaming and leisure. In healthcare, Virtual Reality facilitates with surgical education and making plans, allowing both doctors and sufferers to get extra comfortable with procedures. There also are multiple reviews about the efficacy of Virtual Reality for supporting with chronic pain control and mental strength. Markets and Markets performed a study on the anticipated boom of AR and VR in healthcare, projecting a 30.7% annual boom charge between 2017 and 2025 [15].

4.6. Mobile health (m-health)

One among the subsets of e-Health is the usage of handheld devices like mobile phones, which is known as mobile Health (m-Health). The mobile phones prove to be the handiest tool nowadays, as it has become into a personal object that the most of the people use frequently and does not part with. Mobile phones can be used for e-Health in a different way: notification of the patient about the about their medication timings through messages that are automatically sent, their appointments that has been scheduled or reminding the pregnant women in detail about

different stages of pregnancy and advice on how to deal with unusual conditions [16].

4.7. Deep learning and medical image recognition

“Deep” relates to the multi-layered nature of machine learning amidst all Deep Learning techniques, Convolutional Neural Networks has been the most promising in the field of image recognition. Many features of an image are identified through image recognition. Additionally Convolutional Neural Networks requires a significant amount of training data that is in the form of medical images along with labels for what the image is supposed to be. Convolutional Neural Networks can adjust the applied weights and filters at each hidden layer of training to improve the performance on the given training data [16][17].

5. SWOT Analysis on eHealth

Strength

- The data can be collected at ease automatically.
- Personalised Medicine could be given to the patients based on the ailment of the patients.
- The patients can be monitored closely through the use of artificial intelligence and other eHealth applications.
- The data collected is standardised and can be used as benchmark for further data collection.

Weakness

- The infrastructure required for eHealth is highly underdeveloped
- There are high chances of data privacy to be compromised
- Exchange of data could lead to data duplication and also other complications
- The data available on active diseases is highly limited

Opportunity

- The workload of the doctors, could be reduced
- Emergence of eHealth tools for drug development
- The emergence of Artificial Intelligence also plays a vital role in eHealth
- Internet of Things and usage of convoluted neural networks

Threat

- Widespread implementation of unvalidated eHealth tools

- eHealth could lead to negative impact on the psychology of the patients
- Overinterpretation of the role of the patients

6. Conclusion

eHealth is a research area that is on the rise and has gained the interest of research people, industries, and also the governments throughout the world as it has the potential to transform the healthcare field into an ecosystem that is efficient and effective. The power of data obtained from multiple medical equipment, mobile devices, miniature sensors, and other sources can be harnessed by SCH. Secondary research was carried out for this study and it has been understood that e-health is facing lot of challenges like data privacy, management of patient’s data, lack of trained professionals, usability and accessibility and also lack of a connected and central patient database. It has been understood from the review of literature that artificial intelligence would play a vital role in eHealth with technologies like chatbot and virtual nursing assistants. Through SWOT analysis some of the strengths of eHealth was found to be ease of data collection, and also close monitoring of the patient and personalised medication. It is suggested that more IT professionals could be involved in e-health and proper training about e-health be given to them. Despite challenges and weakness, it is incurred from the study that eHealth would play a major role in transforming healthcare industry in the future through the use of technology.

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