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Current practices and Limitations in E Health Informatics

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Abstract

E-health is a field which as seen tremendous growth in the recent times especially after the covid-19 outbreak. E-health offers the potential to provide patients with high-quality care at a reasonable cost in the ease of their own homes. E-health has a wide range of application that includes rehabilitation, cognitive disorder, behavioural therapy, defence application and many more. E-health as a technology is changing tremendously and always been evolving to meet the demands of the current practices. But still, it has certain challenges in implementing such as ethical issues, patient contest etc. Artificial intelligence framework capable of using non-consultancy, reinforcement learning, and all three. Controlling the processes within the m-Health application, choosing the best processes that can be used to alter the user's existing conditions, or selecting the best diagnosis-solution from an array of choices are all supported by intelligent optimization algorithms that can offer faster feedback.

Keywords: E-health, Cognitive Disorder, Therapy, Healthcare.

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1. Introduction

E-health stands out the prospect of being an economical and effective technique of administering healthcare at a reasonable price to patients who would otherwise be underserved or excluded. The viability of E-health could be hampered if a number of ethical and legal issues are not resolved before it is implemented. Changes to the patient-healthcare professional connection, the need for informed consent, and responsibility allocation are among the issues that are raised.

In addition, their privacy issues, which affect both service providers and health informatics specialists' positions. It has never been easier to see how digital technologies are transforming the healthcare industry. Health care is moving further toward personalized and preventative paradigms by leveraging pervasive technologies that facilitate real-time self-care or monitoring with the introduction of wearable and other Internet of Things (IoT) devices [2].

2. Challenges in Health Informatics

2.1. Early detection of diseases

Early disease detection not only helps to lower the expense of medical care, but it also serves to save important lives of individuals. For instance, early cancer detection rather than disease discovery at a later stage may save a man's life. One critical challenge is that there is no framework accessible for discovery of illness at its early stage. Intuitively Health Communication Applications (IHCAs) can be used to get past this barrier. In creator talked about algorithm, which might be applied in early location of Parkinson's diseases [1].

The quality of services today and people's lifestyles have altered as a result of information systems and online technologies. Among these technology and systems, electronic health is a fresh and effective way to deliver medical and healthcare services to the public while also fostering relationships between doctors, patients, and all other users of the healthcare system. Unfortunately, despite the fact that E-health is not a new process and has been used in the majority of specialized medical fields, this technology is still not widely accepted as part of the standard delivery of healthcare. Particularly in the area of healthcare and medical services, developing nations face a number of challenges including a lack of physicians and other healthcare professionals as well as financial and resource constraints.

Capturing, Putting away and keeping up information and Getting to Data in productive way is additionally a huge challenge. Effectively keeping up EHR (Electronic Health record) a huge issue. They require of clear information of benchmarks to urge ideal esteem in actualizing health informatics Systems (WHO, National E-health methodology toolkit, 2012) [1].

Patient privacy is a challenge while creating online medical platforms. Enforcing privacy and maintaining confidentiality in public are two major privacy concerns that were mentioned. They also convinced that privacy is a key issue in GCC (Gulf Cooperation Council) Countries. To overcome this issue, lawful direction is required something else resistance will confront to embrace E-health system. We must make sure that the patient has faith in the system ability to safeguard their personal data.

2.2 Complexity of wellbeing care foundation

It is complex to manage healthcare infrastructure. For a variety of reasons, healthcare infrastructure can be complex. China, India, and other populated countries in developing nations need to build numerous hospitals and health care facilities. Similarly distributed geographic areas have very complicated health care infrastructure. E-health should be supported by such a complex infrastructure, but the current support is insufficient and poorly distributed. Such challenges are caused by a variety of circumstances.
For illustration in adequate support of power, destitute quality or not accessibility of Web access. These issues are more common in rustic ranges [1].

Be that as it may, versatile phone foundation is creating at an expanding rate gives openings to execute frameworks with fewer assets. Because of this, mobile health can be helpful when there is an inadequate framework in certain places. In any case these arrangements can lead to other issues such as divided data and troubles for venture adaptability.

2.3 Neighbourly government scheme

Nearby healthcare informatics strategies are not developed in most of the world. Since approach creators in Japan have limited exposure to internet medicine teaching and the potential advantages of this area, E-health appealing techniques are not being implemented. Moreover, in Jordan, government approaches are not appropriate for improvement of E-health. There is a need to require advancement of medical informatics Framework system for way better advancement as well as supportability of E-health Ventures. It is supported by legitimate worldwide organizations such as Joined United Countries (UN), World Health Organization (WHO).

2.4 Ethical challenges

There are several ethical concerns raised by the growing digitalization of healthcare and the development of portable and IoT devices as data collecting tools. One topic that is frequently brought up again and again is the precise makeup of the segment of consumer tech giants that have all joined the advanced prosperity field, including Amazon, Apple, Google, Facebook, and Samsung. These businesses provide methods for gathering and analysing economic data, which raises concerns about data security, data veracity, and informed permission.

As well as the issues said over of privacy, security, and consent, ethical concerns relating to data proprietorship are frequently talked approximately inside the composing. The development of apps and improvements made for a customer's display help to bridge the gap between therapeutic and non-medical devices and present moral dilemmas regarding how to regulate such advances. The rate of advancement and expanding globalisation of healthcare solutions increase this problem [2].

2.5 Patient consent

These ideas are relatively new in the patient-physician relationship, along with information disclosure and informed consent. They have a lot of positive practical benefits and are primarily founded on the autonomy principle. However, there are several barriers that must be overcome in order to carry out the moral duty of beneficence, some of which may hurt the patient or prevent the requirements from being put into practice. This is in particular true when physicians disclose facts and obtain informed consent in a defensive manner out of concern about malpractice claims. The method that adheres to the highest standards of ethics is to sensitively and empathically modify and direct the information in accordance with each patient's unique requirements and preferences. It is important that both parties take responsibility for the informed consent process.
There are various sorts of ask almost considers counting or not human subjects. No matter the sort of consider, any ask around tradition need to involvement a thorough ethical assessment. Concerning considers approximately counting human subjects, prior support by the committee embraced by the Prosperity benefit is required. For considers not counting human subjects, support by a Direction Overview Board is unequivocally endorsed. In development, any collection of person data ought to comply with the French

law on data security and opportunity of information as well as the European Common Data Security Heading [3].

The process of obtaining a patient's informed consent includes educating them of the advantages, disadvantages, and possible alternatives to a certain procedure or intervention. In order to voluntarily decide whether to undergo the operation or intervention, the patient must be competent. Informed consent, this is a moral and legal duty for medical personnel in the US and originates from the patient's right to determine what transpires to their body. Giving informed consent entails evaluating the patient's comprehension, making a real recommendation, and documenting the procedure. All aspects of informed consent must be documented, according to the Joint Commission. The nature of the procedure, its benefits and drawbacks, and viable alternatives are some of the elements that must be recorded during the informed consent process [4].

2.6 Confidentiality

It is essential for all healthcare professionals and institutions to ensure the security, privacy, and protection of patient's medical information. This is true more than ever in our fast-changing information technology era. In the past, healthcare professionals frequently gathered patient data for research purposes and typically just withheld the names of the patients. This is no longer allowed for access as before instead, protected health information (PHI) must be redacted before being used for research if it contains information that might be used to identify a patient or the patient's family, friends, employers, or household members. In order to maintain the confidentiality and security of patient medical documents, the federal government adopted the health insurance portability and accountability act, public law 104-191 [5].

The law is divided into two main parts: the privacy rule, which regulates how people's health information is used and disclosed, and the security rule, which establishes federal standards for safeguarding the privacy, integrity, and accessibility of electronically protected health information. The privacy rule lists 18 components that make up PHI (Protected Health Information). These identifiers comprise demographic data as well as additional details pertaining to a person's past, present, or future physical or mental health or condition, or the provision or payment of healthcare to a person [5].

Inadequate legal protections and a lack of rules have left management's ethical problems unresolved. There isn't just any regulation, but also no explanation of why secrecy isn't always guaranteed. All health care professionals can access patient information even though it is stored in electronic documents by using their own password; however, if they forget it, they can use the default password. Although maintaining patient confidentiality is not necessarily mandatory in clinical practise, there is no set policy or legislation that specifies when it is appropriate to violate patient confidentiality without their agreement or that names the individual who should be held accountable for disclosure. There are monitoring systems with fewer facilities to control who has access to patient information, but there are no rules defining the level of password protection [6].

2.7 Flexibility and Security

All healthcare facilities have access to a useful and adaptable framework for putting security measures in accordance to the HIPAA (Health Insurance portability and Accountability Act) security rule. Some of these requirements must be followed, but others are optional, giving the institution the freedom to implement security and privacy safeguards that are appropriate for its resources, infrastructure, and operation.

2.8 Hardware and software in medicine

The hardware and software solutions used in hospitals only address a narrow set of needs. They nevertheless produce sensitive patient data, necessitating the use of management healthcare solutions. Health portals are an alternative to medical database software for simplifying electronic prescriptions or supplying the medical personnel with the medical knowledge base when needed. These technologies not only improve employee collaboration but also ease operational and financial issues for the hospital.

There has recently been a buzz about the impact of AI, AR, and VR in the healthcare software sector. We also have software for medical researchers and scientists that were created specifically to help in the process of finding and analyzing of new drugs [7].

2.9. Provision faced

Patients can profit from the deployment of innovative technology by receiving high-quality care. All of your medical personnel must, however, be trained in the right use of these equipment. If not, people can be hesitant to use them or uncertain of how to make the most of their features. Offering ongoing training and instruction is one method to solve this difficulty. You can either do this internally or by employing a third-party trainer. This helps your staff to stay keep informed of all medical technology advancements.

Users of cloud-based applications can access data via a variety of devices. For instance, it could be challenging to pinpoint the source of changes if one of a user's two devices is compromised and both devices simultaneously modify the application data or service. The difficulties in obtaining such proof are still unknown, given the rise in potential for credential breach and identity theft in a cloud-based system. As we may mitigate this problem by putting in place a system that enables you to control the actions of all your medical staff from a single location. As a result, it will be simpler to determine the procedures that require automation and to keep track of your team's performance in real time [8].

2.10 Interoperability of medical data in Healthcare Informatics

Accessing and transferring safe health data has always been difficult. The nature of health data creates a paradox: It's challenging to share since it's delicate and needs a high level of privacy and security, but the inability to access it when necessary could result in serious injury. Interoperability and data transfer will become even more essential for providing good healthcare as the world's population's age and individuals live longer. Figure 1 shows the stages of interoperability.

Figure 1. Interoperability

Health data interoperability benefits businesses in the healthcare sector in addition to assisting doctors and other healthcare professionals in getting a fuller picture of their patients. Health plans would have a better knowledge of their utilization rates and demand for services if health information systems were more interconnected. Access to demographic data would allow government service providers to identify trends and address the needs of their constituents. Furthermore, life science firms would be able to use substantial datasets to facilitate quicker, more accurate research.

Healthcare organizations frequently encounter certain difficulties as they attempt to make their data and systems more interoperable, despite the fact that many experts and leaders in the field of healthcare agree that doing so would benefit healthcare as a whole.

Not many businesses are provided with the financial or technical resources necessary to purchase the technological components required to create a system that is genuinely interoperable. Organizations should determine their eligibility before updating their health record systems since there may be government grants available. Numerous cloud companies also provide pay-as-you-go payment options, which may lower and better anticipate technical costs.

Healthcare firms with older legacy systems must simultaneously meet interoperability requirements while also updating their systems. Healthcare businesses with older legacy systems confront the combined challenges of upgrading their systems while also satisfying interoperability requirements. Organizations can achieve both goals by extracting data from ancient systems and making it more available for current applications and programmes. Using a hybrid cloud strategy to extract data from ancient systems and make it more available for contemporary apps and programmes, organizations can achieve both objectives.

3. Recent trends in E-health

3.1 E-health in smart cities

Medical healthcare plays a crucial role in both people and planet. Despite the fact that our health systems are frequently created around the needs of individuals, the pandemic demonstrated how interrelated we are as people and how our personal health and wellbeing are influenced by the health and wellbeing of the communities in which people survive. The emergence of smart health communities re-imagine public health, and well-being into pro-active address the drivers of medical care in cities. When systems and data are integrated and interoperable across core health and other services, such as safety of public, environmental health, social and emergency services, are digitally connected "smart city" can make health care smarter. Cities can promote public health in a variety of ways, not just by integrating digital technologies or even by expanding access to conventional healthcare. Cities that are planned and built for people, with "green sidewalks" and public areas serve a healthy atmosphere. Smart cities necessity is increasing exponentially over the globe. Thus, they fulfill the requirements for public by the various application facilities like Internet of Things, Smart mobility, Smart grid and not the least as smart healthcare. Given that E-health is a subset of smart health, the specified smart city's ICT infrastructure and s-health are related. However, there are distinctions between s-health and m-health [9].

3.1.1 Mobile health Informatics

As a result of two NIH Big Data to Knowledge Centers, m-Health focus is on expediting the use of data obtained from mobile and wireless devices, such as wearable sensors, in clinical research and care, even though it covers a wide range of issues. Figure 2 shows the traits in m-health in which the largest new possibility is in using m-Health informatics is to directly measure and enhance patient health and health conditions outside the conventional constraints of the hospital and clinic due to the personal omnipresent nature of mobile devices. These informatics solutions have been developed for a range of demographics, but due to a

lack of advancements and user engagement, they may easily lose their novelty over time. The creation and implementation of technology can be problematic for a number of reasons, including high costs, continuously shifting schedules, and challenges creating compliant data storage systems [10].

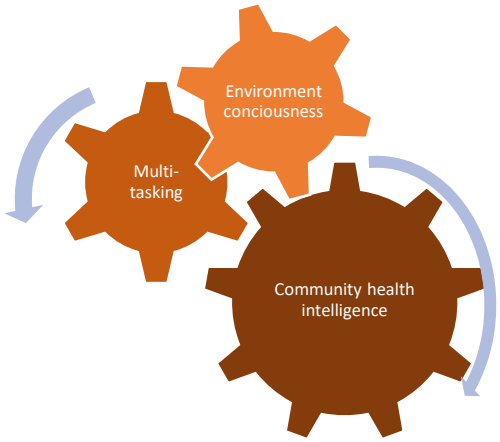

Figure 2. Traits in m-health

Artificial intelligence and machine learning algorithms have been widely used in the domains of autonomous driving, recommender systems in social media and online commerce, natural language understanding, and question-answering software. Additionally, the conduct of medical research is increasingly changing due to artificial intelligence. In areas including patient deterioration, readmissions, mortality, enhanced documentation, illness diagnosis, end-of-life care, patient transportation, and chronic care management, predictive modelling in healthcare has been driven by digital transformation. The emergence of cloud computing, big data, and the Internet of Things has made it possible to connect and exchange data using gadgets equipped with sensors, software, and other technologies. These advancements have also made it possible to perform large-scale computations, store shared resources, and compile data from a variety of sources [11].

3.2 E-health trend in Battlefield

To receive a virtual visit before recently a patient had to be present at the patient centered medical home. Veterans and those in the military have particular difficulties in accessing behavioral healthcare. It also includes barrier to receiving treatment due to concerns associated with the privacy and the stigma about behavioral healthcare. In addition to these military officials are subjected to frequent relocation and deployment cycle which basically leads to a life style where they are frequently separated from their families and irregular access to healthcare professional. E-health being one the unique technology which has the potential to support the general wellbeing, fitness status of the active-duty service members. These types of services in E-health can named as E-health behavior which refers to the use of internet (or) mobile devices for health related activities such as looking up health information online, virtual communication with clinical teams and use of health management tools like patient portals etc.-health behavior analysis is built upon the following factors such as

- Individual characteristics such as gender, age, race and marital status.
- Environment variable such as income and education and Socio economics.
- Military Branch
- Finally the health status of the person

These factors combined will be able to understand the behavioral model as shown in the figure 3.

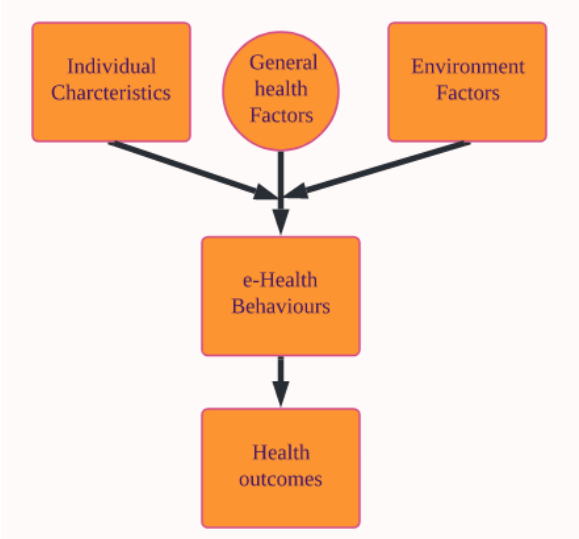

Figure 3. General health factors

Research has stated that incorporating these factors along with artificial intelligence and deep learning methodologies E-health will be able to meet the tremendous demands of the soldiers in the battlefield. It also states that virtual interaction is found to be very effective as that of the face to face interaction and will help in the behavioral improvement of the soldier. It will also reduce the major barrier such as transportation, distance between the battlefield and healthcare professional.

E-health has the capacity to provide continuous monitoring of the soldiers vital in the battlefield via proper telehealth infrastructures which is termed as virtual health. Virtual health involves the usage of medical device like glucose monitor, electrocardiogram etc. that can transmit information to the healthcare service providers via internet along with high resolution video for better diagnose of the

problem. The use of virtual healthcare reduces the need for evacuation of the soldiers because based on the consultant's suggestion, the practitioners are frequently able to treat or manage the medical problem at the deployed location. For an instance if a soldier is injured on a battlefield he or his fellow troops will able to communicate with a frontline medic to stabilize the injured solider with the help internet using some communication device until he can receive more advanced care. Another scenario is when a soldier to attached to various vital monitoring sensors which, when attached the soldier sends all his vitals to the healthcare professional screen. This will help in understanding that which soldier needs immediate care by comparing their vitals such as heart rate and blood pressure. These will also help us in identifying the exact geographical location of the soldier which helps in communication and also in identifying the causalities. Use of E-health in Army medicine enables the soldiers enables the patient to receive best healthcare service regardless of where they are stationed.

3.3 E-health trends in serious games

Gamification is always on trend since engages audience at a large scale by injecting fun and improving the cognitive skill of the user. In recent days many industries such as e-learning, marketing and many more has seen to use games for its advantage. Similarly, for its simplification and benefits healthcare is also evolving by incorporating games in its certain therapy, monitoring and diagnoses of diseases. The commonly accepted definition for gaming was proposed by Sebastian Deterding who stated as "Gamification is the use of game design element in non-game content". Serious games are nothing but games with purpose especially for non-recreational purpose with focus on areas like business, economics, industry, military and healthcare. Challenges, levels, badges and loops are some of the design structures of games which keep them engaged. By using the above mentioned structure serious games in healthcare can be designed with pleasant activities with long term engagement task that are otherwise thought to be demotivating. Depending on the objective of the E-health service to be provided they are classified as either patient based service or non-patient based service as shown in the figure 4.
Based on the patient service as shown, they are classified as follows

- Rehabilitation
- Treatment
- Detection
- Health monitoring
- Education/Training

Based on the non-patient service they are classified based on wellness as follows

- Exercise
- Sleep pattern
- maintaining a healthy body weight
- limiting alcohol use
- Training of healthcare professional

Figure 4. Classification of serious Game for E-health based on player

Some major serious E-health games are mainly aimed towards patient centered games especially cognitive disability. The development e-heath games towards cognitive disorder not requires software but also hardware interface with it such as smart phone and Virtual reality which may provide a better gaming experience. By using games such as Neuro-Orb research demonstrates that there is a significant improvement in the working memory of the patient with cognitive disorder such as alzheimer's disease.

Other most popular application of E-health in games is especially for rehabilitation. Video games are specially designed which requires the movement of physical body to interact with the game which can be used as a form of exercise in rehabilitation medicine. Through such games it is also possible to monitor the performance of the patient with functional impairment which may be caused due to stroke and paralysis. Some game involves peculiar movement of limb and body parts to perform action games such as dance games, step games, games balance training and games for hand training to improve the motor action of the patient. With right software and hardware setup for the serious game in E-health it is possible track the improvement of the patient from any location. With many advancements in technology e-games may be also used in training of healthcare professional in performing surgery, home based elderly patient monitoring etc. are some other areas of improvement

4. Conclusion

The development of tools that can significantly improve the lives of people struggling with physical and mental health disorders will be made possible through m-Health research [11]. Understanding the field strengths and shortcomings

through a map of its history can help guide future advancements. The requirement for a mobile application that boosts individual productivity and helps us in a crucial from this vantage point, it is possible to claim that the m-Health application provides a solution that satisfies the requirements. Although similar applications have been described in the literature, m-Health differs from these ones in that it makes use of technologies like expert systems, intelligent optimization, signal-image processing, and data mining. Framework in artificial intelligence that is competent of using reinforcement learning, non-consultancy, and all three. Intelligent optimization algorithms that can deliver faster feedback are also supported in processes like controlling the processes within the m-Health application, choosing the best processes that can be used to change the user's current status, or choosing the best diagnosis-solution among diverse alternatives [12].

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