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Project Report

On

e-Health and Telemedicine: The paradigm shift in the health industry

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Abstract

eHealth and telemedicine are giving easy access to healthcare even in remote places. Over the years ehealth and telemedicine evolved. More and more countries implemented these methods for better healthcare. In this paper different journals, paper, web articles are covered to show that how eHealth and Telemedicine is providing with up to date healthcare. We have recognized the advantages and future of these approach and also the previous success of eHealth and Telemedicine. Also, in covid-19 pandemic eHealth and Telemedicine is proven a great helper. This paper gives compact yet handful of information for eHealth and Telemedicine

Introduction

eHealth refers to the use of medical data and modern communication technology or ICT for providing healthcare according to the WHO. eHealth sector works together around the world to ensure the proper use of ICT in healthcare system. In 2018 the advantages of modern technology were appreciated at The World Health Assembly. The representatives there all gave the new digital health aspiration a green signal. This aspiration wishes that the world will give importance to Worldwide Health Coverage and advancing the Viable Development Goals. [1] eHealth is a much bigger and a collective term but what it generally means is that using modern technology and information to provide healthcare services. [2] The world has seen escalating expansion in the information and communication (ICT) sector. This has made the whole world to implement different approach in providing healthcare using the ICT. Different government of the world is encouraged by the WHO to use ICT for better eHealth. Many countries including Bangladesh uses eHealth as national health plans. [3]

eHealth focuses on providing health care with new and unique way including healthcare with mobile devices, EMR, telemedicine, eLearning. Different types of healthcare system have already been adopted by various country and organization. [4]

e-Health has a vague interpretation but everyone knows it means to provide healthcare with the help of ICT. eHealth empowers the patient to take control of their treatment and it gives them the opportunity to efficiently manage the situation of their health. There are 10 e's that is included in eHealth to ensure healthcare. These are: Efficiency, Enhancing Quality, Evidence Based, Empowerment, Encouragement, Education, Enabling, Extending, Ethics, and Equity. [5]

Telemedicine is a sector which falls under eHealth. Providing the patient with healthcare without them coming to clinic through the use of technology and other necessary software is referred as Telemedicine. [6]

Telemedicine is also popular around the world. GFMP has a goal to provide healthcare breaking the geological wall to all the people that is needed medical attention at Gezira state. [3]

Telemedicine is a unique approach to provide health-care using the modern ICT. Telemedicine uses the transfer of medical data to help provide health-care to every place. Brismar refers telemedicine as hospitals that have no border. [7]

Telemedicine is also recognized as delivering health-care services to far off hospitals or

patient with the help of electronic audio-video devices. [8]

Telemedicine started not more than forty years ago and since its birth it is growing. Today hospital-clinic, private clinic, house health care and work place all has implemented telemedicine for at least primary health-care. Telemedicine is not a unique feature of a health service providing center. It is a way to provide the already available services of the health center to distant places even remote places. [9]

Telemedicine has made the healthcare more attainable, budget-friendly and it has also made the healthcare system more patients friendly. Since 1950 telemedicine has grown and more and more staff are engaging in telemedicine which has made it possible for people living in the remote village to get healthcare services. [10]

To improve the health care a new approach was always been searched. Telemedicine using the modern technology made that easier. [11]

World welcomed telemedicine as a blessing. It is helping the doctor and other staff to asses, distinguish and manage patient at a far distance place efficiently using the telecommunications mechanism. [6]

Both eHealth and Telemedicine is working like a charm in the healthcare system. So many countries have adopted these in last few years. Even in this covid-19 pandemic eHealth and telemedicine is proven advantageous. It is seen that at the beginning in china covid-19 affected people was helped with eHealth tools. [12]

Background Studies

In the year 2017, a hurricane named IRMA attacked Florida and the impact that it had on Florida was very bad as many people were injured. At this time, an organization called the NCC provide the citizens with free e-Health services. They provided the citizens with free audio-video telemedicine services through many social-networking sites such as Facebook, Instagram, etc. They also had their own application that any citizen can use it on their laptops, computers, mobile phones, etc. These e-health services were mainly provided for children. A parent has to provide the information about their children and after they are selected, they are told to wait in a virtual waiting room. Then the doctors will evaluate the information and will decide whether the patient is suitable for telemedicine. If the case is serious, then the patient is sent to the nearby hospital or clinic. Among the 369 families who used these e-Health services provided by NCC, 262 families were successfully given the treatments for their diseases and most of them were treated free of cost. This organization helped the citizens with their e-health services at all three phases of the hurricane: pre-disaster, in the time of disaster and post-disaster.

CHIEF COMPLAINTS	NUMBER OF CALLS (*N*=262), *n* (%)
Upper respiratory symptoms	88 (33.6)
Skin-related symptoms	50 (19.1)
Fever as the primary concern	44 (16.8)
GI-related symptoms	17 (6.5)
Hospital/ER follow-ups	3 (1.1)
Eye-related symptoms	11 (4.2)
Ear-related symptoms	13 (5.0)
Injury-related issues	4 (1.5)
Asthma and breathing concerns	7 (2.7)
Other[a]	25 (9.5)

[a]Includes all other chief complaints that do not fall into the categories just cited.

ER, Emergency Room; GI, Gastrointestinal.

Figure 1: Chief complaints of patients seen by Nemours CareConnect during the Hurricane Irma.

Figure1: shows the type of cases that NCC helped the families with and from the figure it can be seen that most of the patients suffered from upper respiratory symptoms, skin related problems and fever.

Even though NCC is providing good e-health and telemedicine services but the organization still faces many problems. Their analysis was limited to only one platform and needed to understand how to overcome the challenges to provide a better service via telemedicine on emergency cases. They also had financial problems, poor infrastructure, bad technical support, etc. They needed a better technical team with proper knowledges, good internet connection for the transmission of patient's data. [13]

In 1999, Sub-Saharan Africa introduced equipment for videoconferencing that would help the doctors in providing treatments for teleophthalmology and antenatal tele-ultrasonography projects. That also took initiatives to train the doctors and staffs of the rural areas by introducing programs like HIV Management, etc. These programs helped the doctors and staff of the Sub-Saharan Africa to have better knowledge in how to provide better telemedicine services. But the country was lacking in health workers as it required around 820000 workers for 23 health professionals per 100000 people. This shortage of workers puts a barrier in the implementation of telemedicine services. [14]

In North America, e-Health services are very popular in the at medical sectors like radiology and cardiology. They are currently dominating the e-Health services. There are around 200 telemedicine networks with around 3500 e-Health service sites that are connected to most of the hospital of the United States that helps them to check on their patients. Europe is also not falling behind. 83% countries of Europe already have telemedicine services and are also very popular in the radiology section. It is estimated that the values of telemedicine market are around 38 billion USD in the year 2018 and it could be around 104 billion USD in the year 2024. Because of these e-Health services, doctors are able to reach patients who are living in rural areas and are able to give them a high-quality medical treatment.

These countries also sometimes face difficulties in giving these e-Health services. Lack of proper infrastructure, costly services, privacy and legal matters, etc. sometimes become the barriers for them. To develop the telemedicine industry, huge investment in infrastructure, investment in technologies, etc. is required. [15]

Orissa Trust of Technical Education and Training (OTTET) in India is currently leading the usage of ICT to provide a better

e-Health and telemedicine services. They have delivered these services to around 51000 villages of their state. The government of Gujarat is also improving their telemedicine services through PPP mode. National Institute of Mental Health and Neurosciences (NIMHANS) and Mysore based K.R. Hospital have collaborated with Larsen and Toubro (L&T) Ltd to give an amount of INR 600,000 to the medical centers that are under Corporate Social Responsibility (CSR). This amount helped them to improve their telemedicine services. Also in April 2006, the CSR program of Gas Authority of India Limited (GAIL) tried to improve these services by starting a new project with optical fiber cable network. In the year 2010, GAIL also made improvements to their technologies for having better video conference with their patients. [16]

In July 2010, the government of Ghana started their e-Health services. With the usage of ICT, Ghana have removed the gap in providing a better and efficient telemedicine services. They have implemented many projects such as Mobile technology for community health (MOTECH), Ghana Consultation Network, Moorfield's/Korle Bu Eye Center, One Touch Medicare Line, etc. These projects were implemented with the goal of giving the citizens of Ghana a better healthcare services over the internet. These helped the doctors of Ghana to reach patients who had trouble coming to the hospital or clinic. [17]

In Spain, a research group have developed a simulator that is used to predict the Emergency Department behavior and performances. The research group collaborated with Parc Tauli hospital to make this simulator. This simulator helped group by letting them predict how telemedicine is changing the emergency department visits. The research group thinks that telemedicine and e-Health services are very efficient and saves a lot of time for both the patients and the doctors and is also not costly. [18]

Sudan have successfully implemented the e-Health services along with the telemedicine services. The GFMP in Sudan have given computers and laptops with webcam to 207 trainees for giving telemedicine services to their patients. They were also given free internets all of which was paid by the government of Gezira state. The government has established two telemedicine studios and have installed many computers, webcams, microphones, telephone lines, etc. so that their patients can be benefitted with the e-Health services. They have also made software programs named ooVoo that connects all the doctors of the medical centers from all over the Gezira state. They also made scheduled programs that consists of specialized doctors to provide an even better e-Health services to their citizens. [3]

The telemedicine services have become very successful in Ukraine at the time of global pandemic of coronavirus. Because of these telemedicine services, specialized doctors and physicians could give consultations through video-conferencing to the people of both urban areas and rural areas. The telemedicine services have shown rapid development against coronavirus and have expanded throughout the whole country. [19] Not only Ukraine, other countries were also benefited from telemedicine services during COVID-19. These services helped to treat patients who have allergic diseases because at the time of COVID-19, allergic patients were at risk of travelling. They were given treatments through video conferencing which

was a very safe, reliable and efficient way to treat these types of patients. [20]

Many countries have built many healthcare centers for providing telemedicine and e-Health services so that patients can get treatments from home rather than coming to the hospital. These services benefited the patients a lot as these services ensured proper safety for them. But there were some countries who were having trouble in giving these services as they did not have enough knowledge about technologies and because of this they could not perfectly implement the telemedicine services. They also did not have enough trained employees and many patients did not preferred the video consultation for their treatments and wanted to visit the hospital or clinic in person. [21]

The Moroccan society started their telemedicine journey in June 2018. These services benefited both the citizens of rural and urban areas. They wanted to fully utilize the use of ICT in telemedicine services and made different studies with objectives such as whether every citizen is able to use these e-Health services, whether doctors are able to give proper treatments through the online platform, etc. In one of their study, they found out that 100% of the users uses the web as a platform for their knowledge and 87.5% of the users were successful in making the doctors understand about their diseases and 58.3% user agreed to share their information with the doctors. But the Moroccan society saw that around 45.8% did not take part in this study and have not tried the teleconsultation and around 52.2% doctors could not provide treatments to their patients as those doctors did not have the proper training for giving telemedicine services. [22]

In 1993, a royal decree started the e-Health center in the King Faisal Specialist Hospital and Research Center (KFSH&RC) in Riyadh. The eHealth center makes sure that every citizen of Saudi Arabia gets the best quality of telemedicine services and the best quality care. The e-Health center uses fiber optics for their connection and videoconferencing to give consultation to their patients and educational training to their employees. They have increased their telemedicine services from 5 centers to 22 centers and 5 more centers are currently under implementation. [23]

In 2005, Pakistan was attacked by earthquake and many people were affected by that. In 2007, the US Military decided to help Pakistan by giving them all kinds of telemedicine services. They built an army surgery hospital, Medical command and medical command control center, online remote consultation program, etc. In 2008, they also used telemedicine services and paraplegic rehabilitation in a hospital at Rawalpindi which was in Pakistan. Around 194 patients were benefited from these e-Health services. [24]

Countries like Africa and Egypt are also innovating their telemedicine and e-Health services. In Africa, a Spanish NGDO Recover Foundation started an African cardiac patient program the included all the telemedicine services connecting all the doctors and physicians of Africa with the doctors and physicians of Spain for the diagnosis of the patients. In Egypt, Fouad and Abdullah established a telemedicine portal that benefited the citizens with e-Health services. This telemedicine portal was considered to be an innovative solution for the healthcare centers of Egypt as the citizens can access numerous information about any

hospitals and can have consultations about their diseases. But these countries face many challenges and drawbacks for providing these services. Infrastructure of Africa is very poor and only 6.7% people have access to internet. Connectivity cost is very high and because of this it is difficult for many people to have access on these e-Health services. Egypt also faces the same problem like Africa. The citizens of Egypt are not aware of the services and also, they do not know how the service works. They also lack in having professional employees for their services. [25]

Around $18.99 billion dollar has been spent on telemedicine services according to the National Hospice and Palliative Care. 50% people were benefited by these telemedicine services. 40% people are taking these services for more than 180 days. Services are continuously given to the patient in need and the rate of people recovering was increasing day by day. [26] Another survey by the Russian federation showed that more than 3000 people are taking the e-Health and telemedicine services and are getting benefited from them. Patients are coming with different health conditions and different types of diseases. To make these services even better, United Kingdom created a new electronic system to monitor their patients so that the telemedicine services and e-Health services are more effective. This system shows the patients symptoms and is fitted with a pulse oximetry so that they can see their oxygen saturation. This system also shows their pulse rate in a wave form. [27]

Telemedicine services are now also available in plastic surgery. In 2014, an application named as eFace was created that was validated by the Banks er al. This application shows a visual scale about the facial function. This application uses 3 parameters that consists of 5 static, 4 synkinesis and 7 dynamic items. This application can be used on pc, laptop or on any mobile devices. If the scale given by it not good then it explains that the patient needs a treatment for their face. The main problem of this application arises when the employees are using free applications like Facetime, Zoom, Meet, Skype, etc. for their video calls because these application does not have any control over privacy. Also, not all the countries are advanced in telemedicine services as the services are internet based and needs internet connection with good video resolution. Rural areas of a country mainly face these problems as it becomes costly for them to afford good internet connections. [28]

In Denmark, 91 patients have used video conferencing for the diagnosis of psychiatric disorders in asylum, refugees and migrants. 75 patients were satisfied with the service and are willing to use it again. In United Kingdom, telemedicine service was very useful in fetal echocardiograms for the diagnosis of patients with heart diseases. In Netherlands, 214 patients were given telemedicine services through the TV to guide them for their chronic heart failure. Patients affected with familial hypercholesterolemia were checked continuously and they were assigned to personal video counseling or into a new web-based lifestyle. These patients continued these services for around 12 months. In Switzerland, 191 children out of 194 received treatments for their cardiovascular disease by a professional sonographer who was from a remote hospital. In the year 2008, the US Army Medical Department started to give e-Health and telemedicine services to the remote countries like Iraq, Afghanistan, etc. who did not have good healthcare facilities. [29]

All of these countries are taking the telemedicine services to another level by making the interaction between human and ICT more effective. The proper usage of ICT by these countries helped them to implement a better eHealth service. Researchers of all the countries are finding more effective ways to deliver these services to patients are more benefited. They are using cloud architecture to make a connection between the doctor and the patient. This cloud architecture directly sends the patient's information to the doctors who then gives the treatment using the telemedicine system used by the facilities. [30]

Future of e-Health and Telemedicine

As the medical care industry accepts different innovation drifts and changes quickly, suppliers, specialists, and patients will appreciate a wide scope of new advantages. Quite possibly the most encouraging developments in this space is telemedicine. By conveying clinical benefits distantly, telemedicine is relied upon to assume a significant part in the advancement of medical services frameworks during the forthcoming years. It's mechanically problematic, however it additionally vows to tackle difficulties like the maturing of the populace, the need to oversee a lot of data, and the developing interest for healthcare services. [31]

The vital component of the framework is electronic healthcare record to be shaped by the secluded methodology as essential and satellite electronic clinical records. Individual focused healthcare is proposed as an establishment for e-wellbeing. Such a methodology gives an expected chance to every one of the clinical specialists to acquire fundamental data about their patients whenever by means of the teleconsultations specifically. Change to e-wellbeing is related with the formation of new freedoms for settling on symptomatic and helpful choices dependent on the utilization of work in choice help modules. The PC helped programming plan or hybrid frameworks are considered as the fourth era clinical data frameworks. [32] Our health frameworks are confronting extraordinary difficulties. This is because of segment changes, progress in medication innovation and local issues in giving healthcare to low thickness populaces. The term 'telemedicine' has a wide definition and is viewed as the act of medication a good way off and compares to a wide scope of telemedicine applications. Telemedicine communications are of two kinds, either occurring progressively, for example, in videoconferences, or non-concurrently, for example, away and forward transmission of information from observing of locally situated estimations of body weight, blood glucose, blood pressure and other essential signs or actual qualities. [33]

Mobile applications might be either automatic (e.g. latent observing of movement utilizing room sensors) or require the patient to make a move (for example communicating home-estimation esteems utilizing customary phones or progressively, and specifically, cell phones). [34]

Almost 66% of healthcare suppliers across 14 worldwide business sectors are presently putting vigorously in advanced health. In non-industrial nations, computerized healthcare is likewise helping, with far off admittance to trained professionals. Senior healthcare pioneers from 14 countries say reinforcing flexibility and planning for future emergencies is a main concern, as indicated by another report appointed by Royal Philips.

Medical administrations pioneers in nations including the US, Germany and India were gotten some information about their arrangements for digitalization over the course of the following three years. The pandemic has seen numerous nations shift from face-to-face medical meetings to telemedicine, utilizing applications, telephone and video arrangements. Industry investigator IDC predicts that by 2023 almost 66% of patients will have gotten to healthcare through an advanced front end. Improving strength and getting ready for future emergencies is the main concern for more than 66% of senior medical care pioneers overviewed, with France, the Netherlands and Germany scoring the most elevated. Second in line is the proceeded with shift to far off and virtual consideration (42%), drove by India, the Netherlands and the US. While healthcare pioneers are obviously mindful of the worth of their advanced speculations, there are as yet numerous boundaries to the area's computerized change. [35]

Telemedicine has been consuming increasingly more space in the consideration cycle. At present, it is beginning to be utilized for far off persistent checking and follow-up, with the presence of various applications for this reason. Among them, we feature:

Teleconsultation:

It empowers distant patient observing, conclusion or treatment. The trading of clinical data is vital for this. A few models are the transmission of x-beams or comparable pictures (teleradiology), research center or electronic wellbeing record (telepathology), just as its application in fortes like dermatology, psychiatry or cardiology, among others.

Telemonitoring:

It empowers the development of patients – customarily persistent patients – joining natural, physiological and biometric boundaries. Telemonitoring assumes a major part in the strengthening of patients concerning their wellbeing. Consequently, it permits them to play a functioning part in their consideration, while decreasing their visit in the medical clinic.

Tele-surgery:

Without a doubt, this is one of the extraordinary unrests in Telemedicine that will keep on progressing throughout the next few years. The utilization of mechanical technology and computer-generated reality has helped the developing number of tests telesurgeries. [36]

That telehealth is occurring by any means, and that its vertical enunciation has been so articulated in the course of the most recent 14 months, is perhaps the greatest sign of changes to come. It flags an irrefutable inspiration with respect to wellbeing frameworks to accept better approaches for dealing with the actual center of their administrations: the collaboration of a patient with a medical services supplier. This is the "wedge in the entryway" that will take into account the reception of so numerous other tech-empowered efficiencies. [37]

The way toward embracing eHealth drives isn't without its center difficulties. These incorporate deficient correspondence of eHealth objectives, concerns in regards to framework normalization, and a current absence of administration and subsidizing. WHO has additionally attached the execution of eHealth to an objective of accomplishing widespread wellbeing inclusion in distant and

underserved networks? Nonetheless, this takes a ton of work. Eventually, the way to beating challenges is to regard eHealth as a vital piece of health arranging, and not similarly as an extra. All things considered, a prepared labor force capable in eHealth frameworks can give appropriate authority and oversight to other people. [33]

The pandemic has sped up shifts that were at that point in progress in medical services; the advanced change that may have required 10 years to achieve could now take just three years.12 However, a few changes, especially in the legitimate and administrative climate, are as yet important to guarantee society can receive the most extreme reward from these movements. [38]

It is difficult to foster confidence in a specialist long haul if the patient is just seen practically. Once the interface has been set up it is simpler to progress into telemedicine." according to the investigation done by BJGP, "vis-à-vis counseling was as yet seen as the best quality level for genuinely charged or additional difficult conferences." A patient who took part in the examination likewise said that the "underlying relationship" that they had framed with the specialist prior to doing a subsequent video interview made the collaboration much more "agreeable." Therefore, the response for the future will be a crossover model: a blend of both telemedicine and conventional medication wherein a couple of gatherings will occur face to face while the lion's share would be over video meetings since human associate is the one thing distance can't address, particularly with regards to wellbeing and medical care. [39]

Conclusion

This fast review summarizes the current job of eHealth, telemedicine, as well as telehealth in the progression of conveying medical care administrations to patients with persistent sicknesses or conditions during the time of the COVID-19 emergency. The writing needs concentrates on the impacts of eHealth, telemedicine, or potentially telehealth on conveying wellbeing administrations, for example, clinical interviews to ongoing sickness patients during this emergency. Notwithstanding, specialists agree that the utilization of such innovations is probably going to offer a chance to warrant the congruity of conveying the required medical care administrations to patients living with constant wellbeing sicknesses or conditions during and after this pandemic. These stresses the direness of leading further exploration during this pandemic to survey the job of these innovations in improving admittance to support for those living with constant sicknesses. [40]

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