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COVID-19 PANDEMIC ACCELERATES THE GROWTH OF HEALTHCARE 4.0

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Abstract

The impact of the COVID-19 outbreak, earlier witnessed by the citizens of China alone, later has become a matter of serious concern for almost every country in the world. The scarcity of resources to continue the COVID-19 outbreak combined with the fear of overburdened healthcare systems has forced a majority of the countries into a state of partial or complete lockdown. The healthcare extension of Industry 4.0 is known as Healthcare 4.0. The scope of healthcare 4.0 is broad and is characterized by a combination of technologies across physical, digital, and biological domains. This paper discusses the potential impact of COVID-19 on the adoption of Internet of Technology in different aspects of healthcare services such as tele-health, robotics, IoT and wearable medical devices, mobile health systems and applications. It aims to identify the necessary to implement practical procedures in the industry to obtain feedback from patients and healthcare participants to encourage the adoption of new Healthcare 4.0 technologies.

Keywords: Healthcare 4.0, COVID-19 Pandemic and Healthcare 4.0 technologies.

Introduction

The extent of Healthcare 4.0 is extensive and is characterized by a combination of technologies across physical, digital, and biological domains. In December 2019, the ongoing COVID-19, also known as corona virus, started to outbreak in Wuhan city of China. In January 2020, the World Health Organization (WHO) declared this outbreak as a public health emergency of international concern and then considered it as a global pandemic in March 2020. This pandemic has caused confusion and disruption at the economic and social levels globally, forcing many governments to lockdown in the world. Evolution of COVID-19 (corona virus) pandemic has also resulted in strengthening the utilization of massive technologies, especially, those associated with Industry 4.0. This pandemic increases the trust on ICT technologies as a tool that has the needed capabilities to support the community health and to provide quick solutions to many governments, organizations, and inhabitants during the time of crisis.

The healthcare 4.0 would promote greater opportunities and offers which will be able to compete in the near future demand of digital age and drive down manufacturing costs. The digital

revolution is arriving at a hospital or clinic. Clinical applications of e-Health include Electronic Health Records, Tele-Consultations, Clinical Decision Making Support Systems, essential Signs Monitoring Services, Tele-Homecare, Ambulatory E-Health, E-Prescribing, E-Nursing, E-dissemination of personalised healthcare services, health information systems, health records, pharmacy information systems, electronic claims systems, laboratory information systems, interfacing with diagnostic equipment, ICT in health administration, and identification and tracking solutions.

The sensors are used to collect the data required to observe and manage traffic, noise, and air quality, health among others to improve and support future decisions of authorities, enterprises, and people. It provides a digital integrated platform to generate information and knowledge network which can be used, during the pandemic time, to scrutinize infected people while warning others. The technologies have been radically used to diminish the spread of this disease to larger areas, guarantee the continuity of work and educational systems, provide a hand in supporting the healthcare system, develop a vaccine, and reduce the quarantine impact on citizens.

Although many countries in the mid of this pandemic were not able to provide a hand to others because of their internal pressure, they must harness their potentials in the future together in discovery of vaccine for this unanticipated disease and learning from the experiences of each other. The corona virus pandemic has proved that advancing industry 4.0 technologies have the potential for improving and protecting many of lives.

Industry 4.0 in the medical field

Industry 4.0 generates new services and technical devices to the patients through analysing the data of the patient with the help of sensors and IoT. It provides exact information with impending medical techniques and helps to perform precise surgery. It can manage various intricate cases with the help of a digitally controlled service among the patients. This revolution will readily undertake new research and development within the medical field.

Industry 4.0 performs a variety of functions and proceeds among all the previous revolution because it solves many medical problems with the interdisciplinary approach. It is a suitable industrial revolution for patient data analysis, sensors to sense diseases, complicated cases handled by robots, digitally controlled service and innovative service to a patient. It enables flexibility in design and developed by digitally controlled system. It introduces the customised tools and various other support devices in lesser time with optimised cost and recycling of medical waste in the hospital that saves our environment. During COVID-19 pandemic, many of these technologies were used to ensure that the COVID-19 does not spread to larger areas and save the people.

The major technologies of healthcare 4.0:

a) The Internet of Medical Things (IoMT):

It is an incorporation of medical devices and applications which will connect with the health care information technology systems by using networking technologies. It leads to the next generation of associated healthcare, with the ability to store and process scalable sensor data (big data) for health care applications. The Internet of Services (IoS) model can connect gadgets smartly.

b) Artificial Intelligence (AI):

AI-based technology has the potential to aid physicians in diagnosing diseases more accurately, make predictions about patients' future health, and recommend better treatments. It can create the opportunity to join in the transformation of modern medicine. It can find certain diseases with medical images such as MRIs, x-rays, and CT scans.

c) Cyber security:

Healthcare is one of the predominantly targeted industries when it involves to cyber attacks. This may put patients in threat. Patient records, such as EHRs, are required by hackers. It is up to suppliers and the hospitals effort together to provide security to the patient's identity.

d) Big Data and Predictive Analytics:

Big data is that the enormous quantities of information collected by the digitization about everything, which gets consolidated and analyzed by specific technologies. It is the process of learning from historical data in order to construct predictions regarding the potential. For health care, data analytics will facilitate the proper decisions to be made, allowing to personalized services to the individual. The purpose of big data and predictive analytics in healthcare has a lot of optimistic and also life-saving outcomes. In healthcare, the exploitation of electronic medical records (EMRs) and electronic health records (EHRs) has been increasing

e) Block chain Technology for Healthcare:

It is a technology that makes absolute and distributable data records which are shared peer to peer between networked database systems. The technology records digital events in a means that does not permit for the data to be altered or recognized until it reaches the beneficiary. Block chain technology might just be the key to the privacy and security issues hindering the digital transformation of healthcare. The management of patient records-compiling episodes, disease registries, lab results, treatments and also these data be able to achieved through block chain, including inpatient, ambulatory and wearable data- assisting providers with better ways of delivering healthcare.

f) Robotics

Robots are utilised to perform surgery and afford a better performance, movement and control. Now a day, surgeries can be performed through computer control. It can reduce or remove the tissue trauma in open heart surgery case. It can also perform in an environment that is felt very dangerous for surgeons.

g) Other technologies:

It include genetic engineering, synthetic biology, nanotechnology, data science, bioinformatics, the healthcare informatics, the cyber-physical systems, the Internet of things (IoT), robotics, drones, block chain, cloud computing, 3D printing (additive manufacturing), and the information security. These technologies are shaping the way to treat patients.

The corona virus pandemic accelerates the growth of healthcare 4.0

The modern technologies have been exerting a remarkable impact on COVID-19 management with industry 4.0 technologies. During the global pandemic of COVID-19, virtual reality has been a stupendous tool enabling communication and comfort. People or patients can have counseling sessions from their own homes with complete privacy as smart phones and tablets replace traditional monitoring and recording devices. Innovations are making household gazettes like smart phones or tablets more

accessible and user friendly from the point of view of both the health care industry and patients. The technical advancements are providing the options to the people or patients according to their preference. Remote areas benefit with telemedicine with the same facilities as metropolitan cities. The infrastructures of hospitals are effectively equipped for rapid communication during any emergency using technologies during the COVID-19 pandemic.

Big data is employed to collect a huge quantity of data and information of patient's personalised treatment. The collected information can be analysed from various sources. The innovative drug can quickly develop to enhance the standard of healthcare. Robots change the way of healthcare treatment. This has excellent potential to help the surgeon while performing surgery. It helps to implement physical therapy and other vital treatment process. This leads to predict the treatment outcomes of the COVID-19 patient.

IoT's sensor-based equipment enhances an outstanding potential to reduce the threat of surgery during complicated cases and helpful for COVID-19 type pandemic. With the assistance of this technology, doctors can easily detect changes in critical parameters of the COVID-19 patient. The AI approaches leads to succeed the battle against the COVID-19 pandemic through the effective roles in infection tracking, vaccine development, population screening, quarantine development, effective exploitation of resources, and designing targeted responses.

The most exclusive AI programs, autonomous robots have offered an outstanding contribution at not only medical and healthcare platform but also in many other areas, as a revolutionary technology. The growth of autonomic police robots to make certain social distancing can prove to be quite appreciable, with a greater extent of detection and accuracy by the machines, this technology can provide medical aid to healthcare workers, overcoming the limited number of medical professional and saving time.

Cloud computing is a digital platform that enable people to manage their professional and social lives through slack, loom, Netflix, Amazon, Google cloud, etc., even during the present times of social distancing.

The AI programs in maintaining patient reports, keeping track of infected patients, transportations, surveillance, social interactions, diagnostic, treatment and therefore the approaches and the applications to acquire a key role in healthcare services, thus replacing man power in every aspect, consequent unemployment problems and false utilization of technology. This can be prevented by introducing an innovative approach of human within the loop by near future.

The characteristics of block chain technology, like decentralization, transparency, and immutability, can help control this pandemic by early detection of outbreaks, fast-tracking drug delivery, and protecting user privacy during treatment.

This technology is accommodating for continuous monitoring of patients during the COVID-19 pandemic for the enhanced treatment. It provides an appropriate indication and detects the prevalence of abnormalities about the disease rapidly. This feature of the multi-agent system makes it very useful during the treatment of COVID-19.

Healthcare system for patients during the Covid-19 Pandemic:

The technologies which are involved in healthcare services driven by Industry 4.0 are being adopted to cure the emerging pandemic. These services opens up new healthcare opportunities as it

moves towards the best way of an information system to adapt world-class results as it enables improvement of treatment systems in the hospital.

- ♣ Decision support system for patients
- ♣ Emergency management of patients
- ♣ Patient scheduling for treatment
- ♣ Medical data management of patients
- ♣ Planning and resource allocation for patients
- ♣ Remote care of patients
- ♣ Composite systems for patients
- ♣ E-medicine for patients

Benefits and challenges

Healthcare 4.0 is about capturing the massive amounts of data and putting it to applications. It also offers more benefits to medical device manufacturers. It may be a key enabler for comfortable with cost effective healthcare services. Pharmaceutical industries are tends to shift from being just medications manufacturers to being healthcare service providers

Healthcare 4.0 has to face significant challenges including the reliability and latency problems with high speed data networks, the acceptance of robotics in clinical practice, the human safety issue during human-robot interaction, and the related legal issues. The field of healthcare is burdened with regulatory compliance and stringent regulation.

Healthcare organizations, governmental agencies, and healthcare professionals need to discuss the challenges involved in implementing healthcare 4.0.

Conclusion

The COVID-19 pandemic has significantly changed people lives all around the globe. Governments have taken many quick actions as a response to fight with this virus. During this pandemic, healthcare 4.0 technologies are having a remarkable role in fighting this disease. It could produces high-quality of medical equipments and components by using advanced manufacturing techniques to satisfy the demand of each patient. Healthcare 4.0 can lead to enhance the general performance by providing a digitally controlled management system to the patients. It would effectively adopt mass customisation which fulfils the most important requirements. This revolutionary feature has a greater impact on the environment by reducing wastage of material and human efforts with the help of various advanced manufacturing facilities. It provides precise surgery to the patient by the applications of preservative manufacturing, sensors, holography, robots, AI, big data and IoT devices. The modern era methods are reducing the workload, time consumption, and human efforts, as well as provide efficient and reliable results, not only in healthcare but all the other areas, influencing the life of human race.

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