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REVIEW ARTICLE

AUTOMATION IN HEALTHCARE THROUGH IMPLEMENTING THE ARTIFICIAL INTELLIGENCE TECHNOLOGY

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ABSTRACT

For decades artificial intelligence had been implemented in sectors like banking and financial industry, but it has now been used in healthcare field also. Artificial indicates human made object rather than taking place naturally, and intelligence is called an ability to form tactic to accomplish goals by interacting with information-rich surroundings. Artificial Intelligence simply represent the intelligence of machines and the separation of computer science that targets to create it. The healthcare system of developing countries has high disease burden, inadequate infrastructure, and insufficient skilled health care professionals, further there are also numerous challenges in the safety of patients. In such a situation Artificial Intelligence has a vital role in improving healthcare by early disease detection and diagnosis, improving the efficiency of existing healthcare services, decrease medical expenditure and prolonging patient lives with safety. There are many automation tools utilizing in this filed for digital consultation, disease diagnosis, healthcare treatment, robotic assisted surgery, and medical data management. Hence, Artificial Intelligence can play an important role in helping the doctors and patients deliver healthcare much more professionally in the 21st century.

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INTRODUCTION

Since the 1950s, sectors like banking and financial industries have been implemented the Artificial Intelligence (AI) platform. In the last decade, it has had substantial innovations within many other domains like pharmaceuticals, healthcare, insurance industries. In healthcare of developing countries has high disease burden, inadequate infrastructure, and insufficient skilled health care professionals (HCPs), there are also numerous challenges in the safety of patients (1). So, it is in such a situation that AI technology has a huge role in reducing health imbalance by early disease detection and diagnosis, improving the efficiency of existing healthcare services, decrease medical expenditure and prolonging patient lives with safety (1,2). However, considerable challenges, not least ethical and regulatory concerns, could present a barrier to the entry and use of AI in healthcare (3). Besides, healthcare practice will be digitalized and regionalized that will have improved connectivity, accessibility, and convenience for future medical consultation (1).

In Artificial Intelligence, Artificial signifies human made object rather than taking place naturally and Intelligence is called an ability to form tactic to accomplish goals by interacting with information-rich surroundings. Hence, AI simply represent the intelligence of machines and the separation of computer science that targets to create it (4). AI can categorize patient routes or treatment tactics better and deliver all the information to physicians that they need to make an appropriate judgment in clinical practice (5). AI may allow for better prevention, detection, diagnosis, and treatment of disease (6). Hence, this review will focus on automation in healthcare by implementation of AI technology and it can save lives by helping individual patients.

METHODS

The information for this review article were recovered by using electronic database such as "PubMed", "Google Scholar", and "Google". The articles were searched till 2022 and the key words used in literature search were limited to AI and ML technology applies in healthcare industry. In this review, we emphasize on automation in several conventional aspects of healthcare sector and improvement in faster and appropriate disease diagnosis and management. surgerv. and

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Application of AI technology in healthcare Sector

Digital Consultation: Healthcare bots are first and important technology for patient engagement digitally. It is found in mobile messaging apps that can facilitate patients promptly and in actual time simply by sending a message (7) and bots can reply to health-associated questions and even support patients manage medications by providing data on variety of medications and suggested doses (8). Currently, AI is extensively utilized by healthcare monitoring gadgets which can be used remotely patients monitoring for health indicators and interpret this information to provide better access to their physical condition. There is emerging tool called electronic consultation that primary care clinicians can use to communicate with specialists about patients at different times that are convenient for each physician. So, electronic consultation offers opportunities to improve health care quality and reduce specialty care costs (9).

Disease Detection & Diagnosis: AI has ability for rapid and more accurate identification of signs and symptoms of disease in medical scan images like MRI, CT scans, ultrasound, and x-rays. Hence, it allows faster diagnostics and reducing patients waiting time from weeks to hours and expeditiously the initiation of treatment (10). In diagnostic and interventional radiology, deep learning algorithms are applied in mammography to detect breast cancer, in computed tomography (CT) to detect gastrointestinal malignancies, in chest X-ray to detect pulmonary pathology like lung nodules (11). According to a study conducted at the Catholic University of Leuven, Belgium, regarding the effectiveness of AI in the diagnosis of respiratory diseases showed that AI is approximately two times as accurate as pulmonologists (82% vs. 45%) in interpreting the results of respiratory diseases. AI can extract features from images that provides much more details than the human eye could determine (12). Imaging can capture macro differences among tumors with dimension, shape, and exterior features, if these features can be connected to specific mutations, then that data may be exploited to verify diagnosis or forecast results (13). The technology development in recent times established an AI powered Autism experiment which permits providers to apply eye tracking technology to recognize early stage of ASD (autism spectrum disorder) in kids ranging from 12 to 40 months (14). During COVID pandemic time, AI may have an important role in diagnosis, screening, contact tracing, and management (15). There is a technology called Telediagnos is a process of remote evaluation of diagnostic tests to provide access to specialized care reducing time to diagnosis and intervention and, hence avoiding known complications (16).

Healthcare Treatment: Technology like AI is succeeding development in healthcare treatments, such as upgrading the organization of treatment tactics, analyzing data to provide superior treatment strategy, and monitoring treatments (17). Physicians can search information like modernizing medicine, a medical assistant used to gather patient information, record diagnosis, mandate tests and prescriptions and arrange billing details (5). Furthermore, the ability to explore public databases with information from thousands of doctors and patient cases can support physicians to manage better personalized treatments or discover similar cases (18). AI will encourage physicians adopt a more appropriate treatment, better facilitate care designs, and help patients with their long

treatment programs (19). The computer assisted diagnosis, decision support systems, specialist systems and execution of technology may help physicians to reduce the intra and inter-observer variability. AI implementation enhances interpretation of outcomes with high precision and maximum speed (20). There is tool called digital therapeutics (DTx) which is a part of the digital health, and it represents a collection of technologies, products and services across healthcare and wellness sector (21) delivering evidence-based therapeutic interventions to patients that are driven by software to prevent, manage, or treat disease. They are used independently or in concert with medications, devices, or other therapies to optimize patient care and health outcomes (22). DTx products not only has to be software-driven and backed by evidence but it also be able to prevent and manage a disease (23). It is also showing promising results in medication adherence by helping people optimize the benefits of conventional pharmaceutical therapies (24). These products are reviewed and approved by regulators to supplement the product claims regarding risk, efficacy, and intended use. The value of the global DTx market is estimated at USD 1.8 billion in 2018, which is expected to reach USD 7.1 billion by 2025 (25). Latest report estimates the biggest applications of DTx are diabetes and weight loss shortly, with other use in medical conditions like chronic obstructive pulmonary disorder (COPD), developmental disorders (with the use of computer games), and post-traumatic stress disorder (with the use of virtual reality) (26). So, DTx has major advantage that offers the physicians an option to provide treatment anywhere and anytime, excelling the physical borders of a clinic or a hospital.

Robotic Assistance in Surgery: Technological improvements like robotic surgery, computer-assisted surgery, and robotically assisted surgery that utilizes the robotic systems to aid in surgical procedures (27). Robotically assisted surgery has created to overcome the limitations of preexisting minimally invasive surgical procedures and to improve the capacity of surgeons performing open surgery (28). Surgical robots are initially approved by the United States of America in the year 2000. Now, it is extensively used by the surgeons for performing surgeries by small incisions with more accuracy and avoiding tremors. Robotic process automation (RPA) is computer program that does administrative work (29). In robotically assisted minimally invasive surgery, instead of straightly moving the instruments, the surgeon uses one of two methods to control the instruments either a direct telemanipulator or through computer control (30). A telemanipulator is a remote controller that allows the surgeon to execute the ordinary activities related with the surgery. During meantime the robotic arms complete those movements using end-effectors and manipulators to do the real surgery on the patient (31,32). In computer-controlled systems the surgeon utilizes a computer to deal with the robotic arms and its end-effectors, however these systems still utilize telemanipulators for their information (33). Benefit of computerized technique is that the surgeon does not need to be available during the surgery, but rather can be anywhere in the world, top to the likelihood for remote surgery (34). The most familiar surgical robot is the da Vinci Surgical System (35). Recently, Google has reported that it commenced working with the pharmaceutical giant Johnson & Johnson in designing a new surgical robot system (36).

Data Digitalization and Consolidation: Electronic healthcare records (EHR) have been widely used in clinical practice. The most apparent use of artificial intelligence in healthcare is data management i.e., gathering it, storing it, normalizing it, and tracing its ancestry (37). The primary goal of EHR is facilitate the management of daily clinical practice, many researchers found that the EHR can provide high-quality and real-world data for doing clinical research. There are several potential advantages of utilizing EHR such as, convenient, cheap, time saving, real-world evidence for the effectiveness of an intervention or diagnostic tests (38). Although, the disadvantage of EHR is healthcare processes vary substantially across different medical centers and such a variability may be responsible for discrepancy of results and conclusions for studies conducted in different places (39,40). Healthcare Information and Management Systems Society (HIMSS) advocates several standards that impact the EHR. These standards require that all certified EHR products maintain data confidentiality, ensure interoperability to share information, and can execute a series of well-defined functions. Once an EHR is certified, clinicians and organizations can feel confident that their system is effective and efficient in supporting information technology (41). In healthcare industry data such as, patient information, diagnosis information, new research findings are generated in massive volumes every day (42). The data analytics tool is used for massive data collection and analysis. It provides essential insights to healthcare organization to achieve and take excellent decisions for patient's treatments and empowering remote patient monitoring (43).

Future of AI in Healthcare: The complexity and rise of data in healthcare means that artificial intelligence (AI) will increasingly be applied within this field (44). AI is developing in healthcare sectors and have enormous positive impact for doctors and patients in hospitals. AI can yield faster and accurate diagnoses because its capability to collect and analyze a huge amount of various patient's data. Individuals without access to extremely specialized healthcare might achieve the advantage of that experience through AI (45). Hence, huge healthcare expenses could potentially reduce due to previous and more accurate diagnoses (46). Still, AI technologies are developing and will transform the way doctors look at their patients, broaden the possibilities to predict and treat diseases, save healthcare expenses, and progress medical care in regions where access to healthcare is limited. Finally, imagining a future of medicine based on data and analytics gives explanation for hope but needs constant research to understand its full potential (47). It also seems increasingly clear that AI systems will not replace human clinicians on a large scale, but rather will augment their efforts to care for patients. Perhaps the only healthcare providers who will lose their jobs over time may be those who refuse to work alongside artificial intelligence (44).

Limitations of AI in Healthcare: The word "artificial intelligence" could be misleading in many cases as it involves a far more developed technology than it stands now (48). At finest, current technology – meaning a variety of machine learning methods can achieve artificial narrow intelligence (ANI) in various fields. Yet, it is emerging at an implausible speed (49). These narrowly intelligent programs beat humans in particular tasks. To avoid over-hyping the technology, the medical restrictions of present-day ANI also must be

acknowledged (50). Streamlining and standardizing medical records in such a way that algorithms can make sense of them mean another huge limitation in introducing ANI to hospital departments for doing administrative task.

CONCLUSION

Artificial Intelligence is a growing advanced technology which has wide variety of applications in healthcare field such as digital consultation, disease diagnosis and treatment, robotic assisted surgery, and data digitalization, etc. There are some proven evidence reveals AI can play an important role in helping the doctors and patients to deliver healthcare much more professionally in the 21st century.

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