The healthcare sector and its emerging technologies

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ABSTRACT

Technology drives the healthcare sector these days. Different types of technology used in healthcare keep changing at a fast pace from cutting edge to ubiquity. Some of these technologies will change the practice of healthcare and transform our whole approach to illness and health. Although emerging healthcare technologies will not fix all healthcare problems, they can improve the practice, decision-making, and management of healthcare.

INTRODUCTION TO TECHNOLOGY-DRIVEN HEALTHCARE

The digital age provides a common ground for technology-driven feel and connectivity. This is why technology is getting better, smaller, and faster. It is becoming more and more in demand in every sector of the economy, particularly in healthcare. The pace of change in healthcare technology is unprecedented, but human nature does not change at these technological timescales. The main stakeholders in healthcare include insurance companies, big pharma, doctors, managers, suppliers, builders, and governments. There have been dramatic technological changes in healthcare. Health technologies comprise all the devices, medicines, vaccines, processes, procedures, and systems designed to streamline healthcare operations, lower costs, and enhance the quality of care [1]. Technology drives healthcare more than any other force. It is drastically changing and improving healthcare, from anesthetics and antibiotics to MRI scanners and radiotherapy. This technology-driven progress in healthcare is often called Health 2.0. It is well known that hospitals adopt new technologies that enhance their service capabilities and enable them to attract and retain physicians who use the technologies [1].

Technology is still emerging if it is not yet a "must-have" [2]. Emerging technology is the one that holds the promise of creating a new economic engine and is trans-industrial. Emerging healthcare technologies cannot be fully exploited without a clinical team to shape the therapeutic response, something hospitals have been able to do over the years with their multidisciplinary clinical workforce. How hospitals and policymakers respond to these emerging technologies will help determine whether hospitals remain at the center of the US healthcare system.

EMERGING TECHNOLOGIES IN HEALTHCARE

Technologies emerging in the healthcare sector include information technology, nanotechnology/nanomedicine, biotechnology, cloud computing, Internet of things, augmented/virtual reality, GPS, RFID, voice search, chatbots, social media, blockchain, personalized medicine, biometrics, electronic health records, wearable computing devices, drones, robotics, and artificial intelligence. Of the several emerging technologies, the following examples stand out [1,3]:

Artificial intelligence (AI): is a field of computer science that is concerned with designing systems to do things that would require the intelligence of humans. Today, artificial intelligence is shorthand for any task a machine can perform just as well as, if not better than, humans. AI technologies are now increasingly being been adopted in many areas of the public sector such as education, social interventions, and healthcare.

AI in healthcare refers to the application of AI technology in the diagnosis and treatment of patients. AI is being applied in healthcare to review mammograms, monitor early-stage heart disease, and enable accurate decision-making among medical practitioners. Today, AI is already being used in medicine in several other areas such as decision support systems, laboratory information systems, robotic surgical systems, therapy, and reducing human error [4].

3D Printing: 3D printing (also known as additive manufacturing (AM) or rapid prototyping (RP) was invented by Charles Hull in the early 1980s. Since then, it has been used in manufacturing, automotive, electronics, aviation, aerospace, consumer products, education, entertainment, medicine, space missions, the military, and chemical and jewelry industries. It is a technology perfectly tailored for the healthcare industry. It offers a range of precision healthcare solutions, including tissue and organ fabrication, creation of customized prosthetics, implants, and anatomical models, drug delivery, and testing, as well as in clinical practice. Benefits of 3DP in healthcare include the customization and personalization of medical products, drugs, and equipment; cost-effectiveness; increased productivity; the democratization of design and manufacturing; and enhanced collaboration. Hospitals could potentially create items on demand, and this would significantly alter the healthcare supply chain [5].

Augmented/Virtual Reality: is a highly interactive, computer-based multimedia environment in which the user becomes the participant in a computer-generated world. For example, surgical students can use virtual overlays of the circulatory system to help direct them during procedures. Billing agents can use "smart glasses" to see patient insurance and billing information when they are away from their computers. It can help reduce the amount of anxiety a patient is feeling before and after surgery. It can be used to train surgeons in a realistic and low risk simulated environment. It offers therapeutic potential and rehabilitation for acute pain and anxiety disorders [6].

Nanomedicine: simply connects nanotechnology with medicine in the fight against diseases. Nanotechnology is the science of small things or the manipulation of matter on an atomic or molecular scale. Nanomedicine is essentially the medical application of nanotechnology to the diagnosis, management, and treatment of disease. It is regarded as one of the most promising technologies of the 21st century. It seeks to manufacture drugs and other products that are packaged into nanoscale systems for improved delivery. The most prominent area of nanomedical research and drug approvals is cancer treatment. The application of nanomedicine, particularly in cancer treatment, promises to have a profound impact on health care. Medications can be more efficiently delivered to the site of action using nanotechnology [7].

Robotics: deals with the design, construction, operation, and application of robots. Robots are becoming an integral part of the healthcare toolkit. For example, imagine a robot that can draw a patient's blood with no mistakes and no pain. Robots play an important role in healthcare as they can improve diagnosis, lower the number of medical errors, and improve the overall quality and effectiveness of healthcare delivery. They hold the promise of addressing major healthcare issues in surgery, diagnostics, prosthetics, physical and mental therapy, monitoring, and support. Robots have the potential to provide assistance to healthcare providers in daily caregiving tasks. Transport, telemedicine, and service robots in healthcare promise to create a new level of quality healthcare by providing experts to patients. A wide range of robots is developed to serve different purposes within the healthcare environment. This results in various kinds of healthcare robots such as surgical robots, logistics robots, disinfectant robots, cleaning robots, pill robots, laboratory robots, rehabilitation robots, nursing robots, telepresence robots, therapy robots, assistive robots, robotic prosthetic limbs, diagnostics robots, and many other types [8].

Cloud Computing: is an on-demand and self-service Internet infrastructure that offers large scalable computing and storage, data sharing, on-demand anytime and anywhere access to resources. The healthcare industry has been hesitant in embracing cloud computing because of the concern of data privacy and integrity. Cloud computing is changing the way healthcare providers (doctors, clinics, and hospitals) deliver services to their patients. Healthcare providers are increasingly facing keen competition and are compelled to do more for less. They are rapidly turning to the cloud to address business and patient needs. On the patient side, people are accustomed to managing their own healthcare needs. Application areas include emergency healthcare, home healthcare, assistive healthcare, telemedicine, storage, sharing, and processing of large medical resources [9].

Internet of Things (IoT): allows all entities to be connected to each other through wired or wireless communication means. IoT has been gaining popularity rapidly since its inception into the IT world and is being used in healthcare, education, gaming, finance, transportation, and several more. The healthcare industry is among the fastest to adopt the Internet of things. Applications of IoT in healthcare are numerous, ranging from remote monitoring to smart sensors and medical device integration. The applications benefit patients, families, nurses, and physicians. IoT healthcare is applicable in many medical instruments such as ECG monitors, glucose level sensing, and oxygen concentration detection. It has been long predicted that IoT healthcare will revolutionize the healthcare sector in terms of social benefits, penetration, accessible care, and cost-efficiency [10, 11].

Blockchain: consists of a shared or distributed database used to maintain a growing list of transactions, called blocks. With blockchain, transaction records are stored and distributed across all network participants rather than at a central location. Blockchain in health care will be in clinical trial records, regulatory compliance, and medical records. The technology can help medical practitioners make better and more accurate diagnoses and prescribe more effective treatments. The goal of BC is to give patients and their providers one-stop access to their entire medical history across all providers. Blockchain is able to securely, privately, and comprehensively track patient health records. It makes electronic medical records more efficient, disintermediated, and secure. It also makes health information exchanges more secure, efficient, and interoperable [12].

Social media: internet-based and mobile-based tools that allow individuals to communicate with things. This is king in healthcare marketing. The Internet has empowered individuals to share health information and interact using social media. Social media are basically web-based tools used for computer-mediated communication. It is a powerful tool that healthcare professionals can use to communicate and interact with patients. It has become an undeniable force that the healthcare industry must reckon with. Although social media is still evolving, it has made a profound impact on the healthcare industry [13, 14]. Besides these, there are also many other different technological inventions being made to help in difficult situations.

APPLICATIONS OF EMERGING HEALTHCARE TECHNOLOGIES
Emerging technologies are usually more accessible, less expensive, and easier to learn than their predecessors. The technologies can be used for the prevention of diseases, diagnostics, effective healthcare delivery, rehabilitation, improving quality of life for patients, reducing morbidity and fatality rates, and enhancing healthcare access [15]. Emerging technologies have been noted as potential mechanisms for reducing medication errors. An amalgamation of these technologies will be needed to have an end-to-end solution for emerging healthcare applications. The emerging technologies presented above can be applied to every aspect of healthcare. Some popular areas include the following [16]:

Regenerative Medicine: the art of culturing and grafting human tissues. Remarkable advances have already been made in culturing and grafting human cells to repair burn damage. Regenerative medicine has the potential to heal or replace tissues and organs due to age, disease, damage, trauma, or congenital defects. This field tends to regenerate damaged tissues and organs in the body by stimulating previously irreparable organs to heal themselves [17].

Remote patient Monitoring: involves placing small sensors on the patient's body to monitor various health parameters like blood pressure, heartbeat, temperature, and prolonged electrocardiogram. The potential advantages of remote monitoring of implantable devices could include timely monitoring of clinical events and symptoms. The time spent by medical staff be saved [18].

Personalized Healthcare: is healthcare tailored to suit individual patients. It is one of the areas that benefit from IoT. Emerging technologies that provide personalized healthcare services to patients include [19]: Pattern recognition methods for prediction and diagnosis of diseases; Body sensor networks; Algorithms for the analysis of patient-specific physiological signals; Ontologies and context-based electronic health records; Modelling of physiological systems; Monitoring and treatment support tools for chronic diseases; Patient-specific multiscale modeling; and Integrated e-health solutions. Personalized healthcare offers numerous benefits to medical professionals and patients, especially elderly people. It makes it possible for doctors and medical staff to monitor patients remotely and for patients to receive instant treatment [20].

Electronic Health Records (EHR): is a digital record of a patient's health history. EHR may be made up of records from many sources such as hospitals, providers, clinics, and public health agencies. Health records continue to evolve as a result of technology. Any changes in the documentation of care have a significant impact on nursing practice. EHR is available 24/7 and has built-in safeguards to assure patient health information confidentiality and security [21]. Emerging technologies have been recommended as potential mechanisms for reducing medication errors. Other applications include surgery, cancer treatment, healthcare education, and wearable devices.

CONCLUSION
The healthcare sector is not in want of challenges as every individual wants and expects better care, costs are rising, and performance is declining, among other issues. Futuristic technological innovations such as novel drugs, devices, and treatments will keep transforming healthcare. Since technology drives healthcare, the fundamental problems of wellbeing, health, and happiness, will remain. However, the emerging healthcare technologies discussed hitherto will make better offers.

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