FUTURISTIC TRENDS IN MEDICAL SCIENCES

Abstract

The World Health Organisation defines health technology as the "application of organised knowledge and skills in the form of devices, medicines, vaccines, procedures, and systems developed to solve a health problem and improve quality of life." In the days before the internet, patients had to deal with inadequate clinical systems, practices, and conditions... Medical technology was not developed enough in the past, which led to many medical errors. The prevention, monitoring, and treatment of critical diseases and medical illnesses have been completely transformed by digital technologies including the Internet of Medical Things, big data analytics, 5G, and artificial intelligence. Recent technological developments in the medical sciences have completely changed how healthcare is provided. It is imperative to recognise, nonetheless, that utilising the newest technology may not come without possible drawbacks**.**

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According to the World Health Organization, "application of organized knowledge and skills in the form of devices, medicines, vaccines, procedures, and systems developed to solve a health problem and improve quality of life" constitutes health technology. This covers information systems supported by computers as well as drugs, equipment, practices, and organizational structures utilized in the healthcare sector. These technologies are used in the US to treat or care for patients using both conventional and designed social means and approaches as well as standardized physical things.

I. DEVELOPMENT PHASES IN MEDICAL SCIENCES

1. **Pre-Digital Age:** Patients in the pre-digital age experienced subpar clinical systems, procedures, and circumstances. A lot of medical mistakes were made in the past due to underdeveloped medical technology. Adverse medication reactions and alarm fatigue are two examples of these medical mistakes. alert fatigue occurs when a person becomes desensitized to an alert after it has been activated or triggered frequently. Nurses believed the alert was not serious because it occasionally was set off by trivial prior incidents. Alarm fatigue is risky because it can result in fatalities and harmful circumstances. The incidence of false alarms has decreased as a result of the creation of an intelligent program of integration and physiologic sense-making. (1)

   In addition, there were fewer medical errors as a result of increased investment in health technologies. Electronic health records (EHR) have taken the role of outmoded paper records in many healthcare organizations. Studies show that this transformation has had a significant impact on healthcare. Drug administration has advanced, making it simpler for medical professionals to acquire medical data, deliver better care with quicker outcomes, and reduce expenses.

2. **Digital Age:** The American Recovery and Reinvestment Act of 2009 included the HITECH act, which Congress established to aid in promoting and enhancing the usage of health information technology. Health Information Technology for Economic and Clinical Health Act is referred to as HITECH. It granted the Department of Health and Human Services the power to promote health IT in order to enhance the effectiveness and quality of healthcare. The act offered organizations financial rewards or sanctions to encourage healthcare professionals to enhance patient care. The act's main goal was to eliminate health inequities by enhancing quality, safety, and efficiency.(2)

   Setting the meaningful use requirement, which required EHRs to support electronic health information exchange and transmit clinical data, was one of the key components of the HITECH Act. HITECH's goal is to guarantee the security of electronic information exchanged between professionals and patients. HITECH also aims to make operations for healthcare practitioners more effective and lower medical errors. There were three phases of the program. The first phase intended to boost healthcare effectiveness, safety, and quality. Phase two built on phase one and concentrated on clinical procedures and making sure that EHRs were being used in a meaningful way. In the third and final phase, efforts were concentrated on adopting Certified Electronic Health Record Technology (CEHRT) to enhance health outcomes.

   In US hospitals, the use of electronic records increased from a low percentage of 10% to a high percentage of 70% in 2014.(3) Beginning in 2018, healthcare organizations

who took part in the Medicare Promoting Interoperability Program had to submit reports regarding QPP requirements. The program sought to enhance patient access to health information while placing a greater emphasis on interoperability.

3. **Future Digital Age:** Currently, there is a significant transformation taking place in American medical practice. The adoption and integration of health technologies into healthcare are the main causes of this transformation, while there are other contributing elements as well. The growing usage of electronic health records (EHR) in recent years has had a significant effect on healthcare. Robert Wachter's book, "The Digital Doctor: Hope, Hype, and Harm at the Dawn of Medicine's Computer Age," tries to educate readers about this change.(4) In the book, Dr. Wachter has studied and discussed the future of medical technology. He predicts that hospitals will become less common in the future. People will be more likely to visit hospitals for major procedures or serious illnesses as a result of technological advancements.

   Hospitals won't require nurse call buttons in the future. Instead, medicine delivery, patient care, and system administration will all be handled by robots. The electronic health record will look different in the future. The notes will be entered by healthcare professionals using real-time speech-to-text transcriptions. According to Dr. Wachter, the patient care team will work together to update the information to improve its quality. Additionally, natural language processing will advance to aid in the separation of keywords. Patient data will eventually be stored in the cloud. Patients will have access to their information from any location or device. Individuals and authorized providers can also access the data. Big data analysis will continue to advance in the future. As more data is added, artificial intelligence and machine learning will continue to advance. Additionally, compared to the current systems, alerts will be smarter and more effective.

II. TYPE OF LATEST TECHNOLOGY USED IN MEDICAL SCIENCES

Medical technology has advanced significantly in recent years, with the development of various hardware, software, and communication networks that aim to improve the quality of healthcare services provided. One of the latest technologies used in medical sciences is blockchain technology. Blockchain technology has proven to have significant applicability in healthcare data management and can be implemented in managing patient complaint data. Blockchain technology enables patients to securely share their personal medical information with physicians, ensuring greater privacy and security.(5)

Another latest technology used in medical sciences is artificial intelligence. Artificial intelligence has been increasingly utilized in various aspects of medical sciences, such as disease diagnosis, treatment planning, and drug discovery. Furthermore, telemedicine has emerged as a key technology in medical sciences, especially during the COVID-19 pandemic. Telemedicine has allowed patients to remotely consult with healthcare providers, reducing the need for in-person visits and minimizing the risk of virus transmission. Moreover, precision medicine has gained prominence as a cutting-edge technology in medical sciences.(6) Precision medicine involves tailoring medical treatments and interventions to individual characteristics, such as genetic makeup, environmental factors, and lifestyle choices. These technologies have the potential to revolutionize healthcare by improving accuracy and efficiency in diagnosis, treatment, and overall patient care.

III. FUTURE OF MEDICINE

The field of medical science is constantly evolving, driven by advancements in technology and research. These advancements are shaping the future of medicine and transforming healthcare in unprecedented ways. One of the major megatrends in medical education is the acceleration of medical education to three years. This trend is believed to be driven by the need to streamline education and training, allowing medical professionals to enter the workforce more quickly and effectively address the growing healthcare needs of society. In addition to the acceleration of medical education, there is also a shift in clinical time allocation towards non-hospital environments. This shift recognizes the importance of community-based care and the need for medical professionals to be trained in a variety of healthcare settings.(7) Moreover, there is an increasing emphasis on integrating educational systems for training nurses, pharmacists, social workers, and medical students. This integration recognizes the inter-professional nature of healthcare and aims to foster collaboration among different healthcare professionals for better patient outcomes. Furthermore, special attention is being given to community health, with a focus on addressing the specific needs and challenges faced by different communities. This includes providing culturally competent care and addressing social determinants of health. Lastly, another important trend in medical education is the acquisition and application of managerial skills.
This trend recognizes the need for medical professionals to not only possess clinical expertise, but also to have the ability to effectively manage healthcare organizations and implement efficient healthcare systems. Researchers believe that these shifts in medical education will shape the future of healthcare by ensuring that professionals are well-prepared to meet the evolving needs of patients and provide high-quality care in a rapidly changing healthcare landscape. The rapid adoption of emerging communication, simulation, and information technology is another major trend influencing the future of e-learning in medical education.(8)

This trend is driven by the need to leverage technology to enhance medical education and training. These emerging technologies, such as virtual reality and augmented reality, offer opportunities for immersive learning experiences and realistic simulations that can enhance medical knowledge and skills. In addition, information technology can facilitate remote learning and collaboration among medical professionals, allowing for greater access to education and expertise regardless of geographical location. Competency-based, patient outcome-oriented training is another significant trend in medical education. This approach shifts the focus from traditional lecture-based learning to a more outcome-focused model that emphasizes the development of specific skills and competencies needed for effective clinical practice. This trend promotes a shift from simply acquiring knowledge to demonstrating proficiency in applying that knowledge in real-world clinical settings.

IV. FUTURISTIC TRENDS IN MEDICAL SCIENCES

In recent years, there has been an accelerated pace of technological advancements in the field of medicine. Various emerging technologies, such as artificial intelligence, 5G networks, e-health applications, and digital transformation have had a significant impact on the medical sector. These technologies have brought about new opportunities and challenges, affecting healthcare professionals across all levels of expertise and specialties. One of the most prominent technological advancements in the medical field is the implementation of 5G networks. These networks provide higher bandwidth and faster data transmission speeds,

enabling healthcare providers to access and share patient information quickly and efficiently. This improved connectivity also enhances telehealth services, allowing for remote diagnosis and monitoring of patients. Additionally, the integration of artificial intelligence in healthcare has revolutionized diagnosis and treatment planning.(9)

AI algorithms can analyze vast amounts of medical data and provide accurate predictions and recommendations, assisting healthcare professionals in making informed decisions. Another important technology is e-health applications, which utilize digital platforms to provide healthcare services and information. Telemedicine, a form of e-health, allows for virtual consultations and remote patient monitoring. This not only improves access to healthcare, especially in remote areas, but also reduces the burden on healthcare facilities and promotes patient convenience. Furthermore, the use of big data analytics in healthcare is becoming increasingly prevalent. With the large volumes of health-related data continuously being generated, big data analytics provides a means to extract valuable insights and patterns that can contribute to more effective clinical decision-making and personalized medicine. The integration of block chain technology in the medical field has also gained attention. Block chain technology ensures data integrity and transparency, making it useful for securely storing patient records and maintaining an immutable audit trail. These various technological advancements have transformed the medical sector, making it more intelligent and efficient. These advancements have improved the quality of patient care, increased access to healthcare services, and streamlined administrative processes.

The field of medical sciences is constantly evolving with advancements in technology, research, and innovative approaches. In recent years, the medical and health industry has embraced several digital technologies to enhance healthcare services. These technologies include 5G network connectivity, Internet of Things devices, artificial intelligence, big data analytics, block chain technology, and more. This integration of digital technologies has revolutionized the diagnosis and treatment planning process. Healthcare professionals can now leverage the power of these technologies to access real-time patient data, analyze complex medical imaging, and make accurate clinical decisions. These digital technologies have also paved the way for telemedicine, allowing for remote consultations and monitoring, especially in areas with limited access to healthcare facilities. Additionally, the use of big data analytics has transformed healthcare by enabling researchers and clinicians to extract valuable insights from large volumes of medical data. These insights can aid in early detection of diseases, development of personalized treatment plans, and improvement in overall patient outcomes. Overall, the integration of 5G technology, Internet of Things, artificial intelligence, big data analytics, and block chain in the overall patient's outcome.

V. COMMON MODALITIES USED AS FUTURISTIC TRENDS IN MEDICAL SCIENCES

Digital technologies such as the Internet of Medical Things, big data analytics, 5G, and Artificial Intelligence have revolutionized critical diseases and medical illness prevention, monitoring, and treatment. These modalities have significantly transformed the healthcare landscape and have opened up new possibilities for delivering efficient and effective patient care. One of the main modalities being used in medical sciences is the Internet of Medical Things. The Internet of Medical Things refers to the network of interconnected medical devices, sensors, and systems that collect and transmit healthcare data.

This data enables healthcare providers to monitor patients remotely, track vital signs in real-time, and make informed decisions about their treatment plans. Another modality used in medical sciences is big data analytics. Big data analytics involves the analysis of large and complex datasets to identify patterns, trends, and correlations. This allows healthcare professionals to gain insights into patient populations, identify risk factors, and develop personalized treatment plans. Furthermore, the integration of 5G technology in medical sciences has also played a significant role. 5G technology provides high-speed and low-latency communication, which is crucial for real-time data transmission and remote monitoring in healthcare. Additionally, artificial intelligence has emerged as a transformative tool in medical sciences. Artificial intelligence systems can analyze medical data, interpret images and scans, and even assist in diagnosing diseases.

Medical technology, also known as "Medtech," is a broad term that refers to a variety of healthcare items that are used to treat human illnesses and disorders. With faster diagnosis, less intrusive treatment choices, shorter hospital stays, and quicker rehabilitation, these technologies are meant to improve the standard of healthcare provided. The focus of recent medical technology advancements has also been on cost cutting. Medical devices, information technology, biotechnology, and healthcare services are all types of medical technology. Social and ethical concerns are part of how medical technology is used. For instance, rather than reading subjective patient reports, doctors can use technology to find objective facts. The consumerization of Medtech is a significant factor in the sector's growth. With the help of the widespread use of smartphones and tablets, suppliers may reach a sizable audience for a reasonable price; this trend is expected to continue as wearable technologies proliferate in the market. Over 30,000 investors in the field contributed US$11.7 billion between 2010 and 2015 thanks to a 200% increase in venture capital.

VI. TYPES OF FUTURISTIC TRENDS IN MEDICAL SCIENCES

Smaller portable gadgets with medical technology have developed, including smartphones, touchscreens, tablets, laptops, digital ink, voice and facial recognition technology, and more. Electronic health records (EHR), personal health records (PHR), patient portals, telemedicine, mobile home health care, and cloud computing are examples of developments made possible by this technology. Medical technologies like medical imaging and magnetic resonance imaging (MRI) have been utilized for many years in medical research, patient evaluation, and treatment analysis. The possibilities of medical imaging technology are expanding and producing better outcomes because to the development of imaging technologies, including the utilization of faster and more data, higher resolution images, and specialized automation software.

1. **3D Printing:** Utilizing specialized equipment, software, and materials, 3D printing automates the construction of specific things. Prosthetics, medical implants, innovative medicine formulations, and the bio printing of human tissues and organs are all expanding quickly. Companies like Surgical Theatre offer cutting-edge technology that can create 3D virtual pictures of patients' brains for use in preoperative training. Medical businesses may now manufacture prototypes using 3D printing to test out surgical instruments made of synthetic tissue. Because the materials used in 3D printing allow creation with control over numerous design characteristics, this technology is perfect for bio-medicine. Additional advantages of 3D printing include less expensive customization, more effective designs, and increased time savings.

2. **Artificial Intelligence:** AI is a system that gives computers the ability to perceive, think, act, and adapt. Although AI is not new, it is developing incredibly quickly. AI is now able to handle massive data volumes, provide solutions, and offer more effective operation. Because AI makes information more easily accessible, enhances healthcare, and lowers costs, it will have greater promise in the healthcare industry. The two most significant driving forces behind AI in healthcare are economics and the emergence of big data analytics. The main economic drivers of AI are costs, new payment methods, and people's desire to enhance health outcomes. According to the reading, AI will enable the US to save $150 million yearly by 2026. Additionally, by 2019, AI growth is anticipated to reach $6.6 million by 2021.

3. **Assistive Technologies:** Products that enable accessibility to people with physical or cognitive limitations are known as assistive technologies. With the use of assistive technologies, they hope to enhance quality of life. Assistive technologies come in a wide variety, from low-tech options to actual hardware to sophisticated gadgets. Assistive technologies are used to help people with four different disabilities: vision impairment, hearing impairment, physical restrictions, and cognitive limitations. The advantages of assistive devices are numerous. They make it possible for people to take care of themselves, work, study, readily access information, increase their independence and communication skills, and finally fully engage in community life.

4. **Consumer-driven Healthcare Software:** Websites and applications that offer more details about health care quality and cost to assist patients choose their providers have increased as part of a broader trend towards consumer-driven healthcare. In descending order, as of 2017, the websites with the most reviews were Health grades, Vitals.com, and RateMDs.com. Yelp, Google, and Facebook also host reviews with high traffic, albeit as of 2017, they had fewer reviews for each doctor who practice medicine. Health practitioners' websites that claim defamation may be the result of disputes over internet reviews. In 2018, WebMD, a company owned by Internet Brands, bought Vitals.com.

VII. DISADVANTAGE OF USING LATEST TECHNOLOGY IN MEDICAL SCIENCES

In recent years, technological advancements in the field of medical sciences have revolutionized healthcare delivery. However, it is important to acknowledge that there are also potential disadvantages associated with the use of the latest technology in this field.
One disadvantage is the cost. The adoption of state-of-the-art technologies in hospitals often requires a substantial financial investment. This can pose a challenge for healthcare organizations that may have limited budgetary resources. Additionally, the rapid pace at which technology evolves can make it difficult for healthcare professionals to keep up with the latest advancements. Furthermore, the integration of technology into healthcare systems can lead to a loss of human touch and personal interaction.

Another disadvantage is the potential for unintended consequences. While technologic advances in healthcare aim to make the delivery of care more efficient, affordable, and safe, there is always a risk of unintended consequences. For example, the reliance on technology can lead to an overreliance on automated systems and a decrease in critical thinking skills among healthcare professionals. Moreover, there is also a concern about the potential for technology-related errors and malfunctions. These concerns raise the question of whether the

benefits of adopting the latest technology in medical sciences outweigh the potential disadvantages.

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