Emerging Technologies In Healthcare

By Piyush Kumar Sahu

February 25, 2022

1 Introduction

The healthcare sector of today benefits immensely from technological advancements. Emerging technologies are helping develop newer, better treatments while alleviating cost burdens. Some technologies are yet to be explored to their full potential, but have still brought about a massive shift in the sector. Innovations such as artificial intelligence and robotics are completely changing the landscape, ushering in a new future for healthcare.

Digitalization has sped up transformation in industries. Today, equipment and processes are benefiting from new technologies, which are increasing productivity and efficiency across sectors. The global healthcare sector has also gained from these emerging trends. While the adoption rate is still slow, it is a boon to patients and doctors alike.

Medical technology has come a long way since the invention of eyeglasses and the stethoscope. The broader availability of mobile internet, the expansion of a more affluent middle class, and an aging global population are all driving change in the healthcare industry, and the associated technology is changing faster than ever before.

2 Artificial Intelligence

Across multiple industries, artificial intelligence has made great waves as a useful technology in 2022, especially for healthcare.

2.1 AI'S ROLE AGAINST COVID-19

The global pandemic has had a profound impact on our society, but cutting-edge technology has helped us stay ahead of the curve. In fact, a company from Toronto, Canada was able to predict that COVID-19 would spread worldwide. By scanning 100,000 media sources in over 65 different languages daily, their application called BlueDot can ascertain dangerous outbreaks in what is nearly real time.

2.2 AI IN DIAGNOSIS AND DRUG DEVELOPMENT

Artificial intelligence has plenty of applications outside of treating and responding to the pandemic. AI is incredibly helpful for improving efficiency with information processing and decision making. In the healthcare industry, machine learning is extremely helpful for the development of new pharmaceuticals and the efficiency of diagnosis processes.

For those being treated for the effects of COVID-19, AI is helping analyze CT scans to detect pneumonia.

2.3 AI IN MENTAL HEALTH

Artificial intelligence innovations don't just apply to physical health. MIT and Harvard University researchers have utilized machine learning to track trends and mental health in correlation to the COVID-19 pandemic. By using an AI model, they were able to analyze thousands of online Reddit messages to find that topics of suicidality and loneliness had nearly doubled over a period of time. This has the potential to transform our understanding of the mental health of larger populations.

3 Telemedicine and the Evolution of Remote Care

Telehealth has come a long way since the beginning of the pandemic in 2020. In 2022, care providers regularly have video conference meetings with patients over the Internet to discuss concerns and give advice. The infrastructure to support this has vastly improved. Telehealth is expected to grow to 185.6 billion dollars by 2026.

3.1 WEBRTC FOR VIDEO CONFERENCING

In many instances, a more dedicated solution is required that can more specifically adhere to legal privacy requirements. If you need a dedicated telemedicine app, one of the most important technologies that will be needed is WebRTC, an open-source API-based system that connects web browsers and mobile applications and allows for transmitting audio, video, and data. This is especially helpful for teleconferencing features.

3.2 CLOUD HOSTING AND DATA STORAGE

Storing data in most cloud storage services is relatively secure, but not necessarily compliant with government regulations on protected health information. HIPAA compliant cloud hosting solutions are critical for maintaining functionality and efficiency for any healthcare operation needing electronic health records (EVR).

Some applications may need to store fitness data from consumer devices such as Google Fit and Apple HealthKit. Being able to maintain these integrations in a secure and efficient manner can benefit the patient and caregiver greatly.

4 Extended Reality in Healthcare Settings

Extended reality, a blanket term including augmented reality, virtual reality, and mixed reality, has a great deal of potential in the healthcare industry. From assisting surgery to aiding telehealth applications, AR and VR technologies can improve the healthcare industry substantially.

4.1 AUGMENTED REALITY AND MIXED REALITY IN HEALTHCARE

Augmented reality and mixed reality are useful in a variety of healthcare settings. One of the most popular and useful forms of this technology is the use of mixed reality headsets like Microsoft Hololens 2 by surgeons. The headset can provide heads up information to the surgeon while allowing them to use both of their hands during the procedure.

Not only can these surgeries be enriched by this heads up information, but it can be a collaborative and remote effort and assist in training purposes. The head-mounted camera view of the headset can enable other doctors to observe the surgery and offer advice. The 'holographic' nature of the device can be used to enrich training as well. Similar applications are possible with on the rise AR headsets. More specialized software solutions will also be necessary to expand its use to different types of surgeries into the future.

AR isn't just restricted to headsets and operating rooms. The technology can also be used to help nurses find veins to draw blood from.

Augmented reality development relies heavily upon artificial intelligence and specialized sensors to function. Whether you're developing for mobile devices or other kinds of hardware, appropriate data and software expertise will be required. AR developers focus heavily upon leveraging AI with the software frameworks of target hardware to make these products successful.

5 IOT and Wearables in Healthcare

With wearables and IoT technologies becoming more popular, their potential in the healthcare industry has grown significantly. For applications in telemedicine and telehealth technologies many have come to call this trend in micro processing the Internet of Medical Things.

There were 11.3 billion IoT devices connected at the start of 2021. The global IoT medical devices market is projected to reach USD 94.2 billion by 2026 from USD 26.5 billion in 2021. With the healthcare industry becoming increasingly more connected through these technologies, IoT cannot be ignored.

5.1 WEARABLES

One of the most important innovations in the healthcare industry is the advancement of wearable technology. The ability to monitor the status of a patient throughout the day remotely or for an individual to monitor their own status is incredibly valuable. A survey conducted by Deloitte found that 39

One of the most basic things that a smartwatch can provide that can be useful for monitoring a person's health is heart rate. However, this is not the only thing that a smartwatch can measure. These devices can also monitor physical health with pedometers and blood oxygen saturation. Low blood oxygen saturation is difficult to detect without specialized sensors. Since this can be a life-threatening condition, smartwatches with this sensor can save lives.

Smartwatches are also improving in their ability to measure blood vitals in their users. Photoplethysmography (PPG) is an optical technology that can measure variations in blood volume and composition. Since it has been miniaturized for use on smartwatches, it can provide users with more data than ever about their blood vitals. Healthcare providers can use this data to help advise patients and complete diagnoses.

Smartwatches aren't the only wearable that has potential for the healthcare industry. Bio patches and smart hearing aids have similar levels of impact. Bio patches can provide a better understanding of a person's vitals without the use of a smartwatch. Artificial intelligence can also be used to improve noise isolation of hearing aids.

5.2 SMART PILLS

One of the most profound applications for IoT technology in healthcare is the concept of a smart pill, which transforms The Internet of Things into The Internet of Bodies. Smart pills are edible electronics that not only serve as pharmaceuticals, but can provide care providers with valuable information about patients. The first smart pill approved by the FDA was released in 2017.

6 Organ Care Technology And Bioprinting

With the world's transplantation market size predicted to reach 26.5 billion dollars by 2028, organ transplants are certainly an important part of the healthcare industry.

6.1 IMPROVING ORGAN CARE TECHNOLOGY: EXTENDING TIME FOR ORGAN EVALUATION AND TRANSPORT

One of the approaches to this issue is to improve organ care technology. This means taking care of the organ while it's outside of the body. The Organ Care System developed by Transmedics is a great example which is in use by the Ohio State University's Wexner Medical Center. This device can keep a heart, lung, or liver outside of the body for several hours through proper care, heat, and provision of important nutrients.

It's possible that the future of this technology may depend on artificial intelligence to automatically take action without a doctor's intervention to preserve the organ for longer periods of time.

Perhaps more importantly, machine learning may be able to better determine if an organ being preserved is suitable for transplantation or not. The faster that this can be determined, the more quickly a life could be saved.

6.2 BIOPRINTING: CREATING NEW ORGANS

In addition to keeping organs alive outside of the body, other options should also be explored. Although it may sound like science fiction, 3D printed organs are a very real, although developing, technology

that has already made its way into clinical testing. Ears, corneas, bones, and skin are all organs in clinical testing for 3D bioprinting.

The process is not too different from traditional 3D printing. First a digital model of the tissue must be created. Careful attention needs to be paid to the resolution and matrix structure, as the materials used in the printing process are quite literally living cells called bioink. They then need to test the organ's functionality with stimulation.

One of the ways that rejection of an organ can be prevented is by using the cells of the patient requiring transplantation. These cells can be grown in a culture and then cultivated into the bioink necessary for printing.

Bioprinting has been done in the past but has not yet hit the mainstream. It's possible that through AI analysis of organs and of recipient patient characteristics, organs can be better engineered to be compatible with their new hosts.

7 NANOTECHNOLOGY

We are living at the dawn of the nanomedicine age. I believe that nanoparticles and nanodevices will soon operate as precise drug delivery systems, cancer treatment tools or tiny surgeons. As far back as 2014, researchers from the Max Planck Institute designed scallop-like microbots designed to literally swim through your bodily fluids. Small, smart pills like the PillCam are already in use for colon exams in a noninvasive, patient-friendly way. In late 2018, MIT researchers created an electronic pill that can be controlled wirelessly and relay diagnostic information or release drugs in response to smartphone commands.

Nanotechnology is also making progress in the form of smart patches. At CES 2020, France-based company Grapheal demonstrated its smart patch that allows continuous monitoring of wounds and its graphene core can even stimulate wound healing. As the technology evolves, we will see more practical examples of nanotechnology in medicine. Future PillCams could even take biopsy samples for further analysis while remote-controlled capsules could make the prospect of nano-surgeons a reality.

8 ROBOTICS

One of the most exciting and fastest growing fields of healthcare is robotics; developments range from robot companions through surgical robots until pharmabotics, disinfectant robots or exoskeletons. 2019 was a great year for exoskeletons. It saw Europe's first exoskeleton-aided surgery and a tetraplegic man capable of controlling an exoskeleton with his brain! There are loads of other applications for these sci-fi suits from aiding nurses through lift elderly patients to helping patients with spinal cord injury.

Robot companions also have their place in healthcare to help alleviate loneliness, treat mental health issues or even help children with chronic illness. The Jibo, Pepper, Paro and Buddy robots are all existing examples. Some of them even have touch sensors, cameras and microphones for their owners to interact with them. For instance, ikki from an Australian startup is helping children with chronic illnesses monitor their medications, temperature and breathing rate while keeping them company with music and stories.

9 Future Of Healthcare Technology

As 2022 rolls forward, healthcare technology will continue to improve in every area. Although security will improve across the industry, threats are always evolving that must be dealt with through prevention rather than response. Quality and efficiency of care will continue to improve due to groundbreaking and evolving technologies like artificial intelligence, machine learning, and extended reality.