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Cyber Medicine: A Review

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ABSTRACT

The internet is a global computer network. This infinite pool of digital networks has put humanity in an inescapable web of operated binary numbers which are intractable but intractable. The universe of medicine and its numerous specialties are similarly boundless and unbounded. When the two collide, as they do now, an explosion of data is unavoidable. The effects of the explosion are still being felt, with waves of information crashing down on the medical community. As far as humans are concerned I can tell, browsing and evaluating all of the medical and health care related websites would be impossible to operate without dossier contributions from medical as well as paramedical professionals. The purpose of this article is to describe medicine on the Internet, its intimate and growing relationship with the information structure available to us in form of zeros and ones and how, in order to make it easier for all medical workers to obtain useful information fast. It is also very vital to understand how this amalgamation of abstract knowledge of medical science with a more practicable approach to electronics will give direction to the future. A future that can either end in catastrophe or commencement towards a wonderful creation. At the turn of the century, it is evident that the net, e-mail, the web browsers and the information superhighway are here to stay, it has now become unavoidable and these innovations will impact medical training, learning and research, as well as healthcare delivery, in a number of ways, but there is still and always lot to discover and invent.

Key words: Cyber, Medicine, Internet, COVID-19, Electronics, Robots

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INTRODUCTION

With the invention of the Internet, new onset of potentially global revolution entered the arena of medical science. It was a perplexing trail to walk on initially but the profound and unprecedented changes in information technology along with the world wide web have aided the health sector towards a bigger revolution, increasing not only efficacious relationships between doctors and patients but also between doctors globally. This not only expands the pool of information but also aids physicians throughout the world as a telemedicine medium. Telemedicine focuses on the limited interchange of clinical and private data between a small number of parties, often a patient and a clinician. According to the brave new world of cyber medicine, "There is a worldwide flow of open, non-clinical information mostly between patient and patient, occasionally between patient and physician and between physician and physician." Telemedicine is mostly employed in diagnostic and therapeutic medicine, whereas telemedicine is mostly used in preventative medicine [1].

The birth

The bigger questions here are when and how did it come into existence? With the birth of the World Wide Web, popularly known as “The internet”, there was an outpouring of new and extensive ideas from all around the globe. This proved to be a boon for the healthcare sector. Doctors around the world could easily now discuss cases and the line of treatments. The forerunner of the Internet, which connected a few computers in 1969, has expanded to more than 5 million websites now, with at least 100,000 including health related information. Currently, more than 150 million individuals use the Internet to communicate [2].

As a consequence of the confluence of many social, economic and technical changes, a unique moment in information history has developed, in which there is a considerably increased demand for information and a significantly increased motivation on the part of many distinct organizations to supply that need. Two categories

of causes are driving the growth of medical information, particularly that which is publicly available and accessible *via* the Internet, "pull," which stipulates a demand for knowledge and "push," in which information producers actively seek out users [3]. This dynamic has been developing over the years as it is becoming more and more consumers focused, *i.e.* the "push" factors are becoming more and more "pull factors" oriented. More so, the information is becoming more and more accessible due to unrestrained browsing, hence available to the medical fraternity and the standard population.

LITERATURE REVIEW

The journey

The journey began with the introduction of search engines. A search engine is a piece of software that allows you to operate web searches. They systematically search the world wide online for distinguished information provided in a textual web search question. The search results are often shown on a single line on a page known as a Search Engine Results Pages (SERPs). The content may include links to Internet pages, images, animations, visualizations, essays, research papers and other forms of media. Some search engines also scour databases and open directories for information. Some examples are Google, Bling, Yandex.

Further development in the search engines led to meta-search engines, a meta-search engine (sometimes called a search aggregator) is a web based info recovery tool that uses data from an online search engine to produce its own results. Meta-search engines accept user input and immediately query browsers for results. The users are given a sufficient amount of data that has been collected, ranked and presented to them. Spamming, for example, has an impact on the precision and accuracy of results. Fusion is a technique used to improve the engineering of a meta-search engine. Best practice, dyna med, up-to-date and database of abstracts of reviews of effects are a few examples of meta-search engines [4].

The information only site types:

- Sites where a medical practitioner provides the user with broad instruction and information on a medical condition or disease. This basic information is commensurable to what you'd see in a healthcare newsletter and it's intended simply for user education.
- Sites that are more users focused and provide answers to particular questions. If a middle aged diabetic asks a query about heart illness in diabetics, for example, the 'net physician' may respond with a lot of detail regarding diabetes and heart disease. Only if the knowledge provided is customized to the unique symptoms and purported medical history of the patient is the doctor likely to "reach the line." In such a circumstance, providing thorough information closely mimics medical practice.

Here are some of the most fascinating and appealing specialty medical websites. Path max, web lab and hemo surf are the best sites for pathology. Cardiology links (cardio info), welcome to cardiology compass and the second vision are all good places to start.

Many internet sources for cardiac and respiratory auscultation include downloadable audio recordings that may be listened to [5].

Cardiac auscultation links at western and McGill cardiac respiratory auscultation sounds atlas at music. McGill is two examples. Neosoft is a great resource for pediatric cardiology links. The pediatric database at icon data has a descriptive text about 550 children's diseases.

Abta.org contains a primer on brain tumors. Dr Bagga's surgery links bgsm.edu is a link to an online atlas of surgery. Med.umich.edu has a big collection of breast carcinoma connections. Micf.mic.ki.se and advocacy net have the greatest collection of oncology links [5].

Mental health has become a rising concern in a country like India, with the highest number of people suffering from mental health disorders. In India, suicide is the biggest cause of mortality among those aged 15 to 29 [5]. In the recent COVID times, this number has been increasing alarmingly. This is where cyber medicine steps in to save the day. Now, people can get psychiatric consultations online. Here are a few examples manastha.com, logintohealth.com, talkspace.com, rethinkmyhealthcare.com.

The evolution moved forward and gave way to various medical directories and medical resources which become more specific with time.

Resources for professionals, patients and students

This journey that started with and helps clinician's worldwide tele medical invention of the Internet has been going strong and has progressed enormously. This boon of technology has become more comprehensive and ecumenical. This has attracted a large audience and a lot of participation from young minds. It is now not only restricted to computer screens but is in hands of toddlers as tracking and monitoring devices linked to an application. These applications are available for free downloads from the Google app store and apple app store. These applications range from decision support resources to guiding med students through their period in training. Some decision support resources for clinicians are Up-to-date, Dyna Med, ClirNet, PlexusMD, MDCalc, Curofy, etc. health information service provider applications are WebMD, mayo clinic, Medline plus, Health line, etc. Telemedicine applications: Health tap, Phable doctor, etc. Research resources applications Pubmed, Medscape, medical reads, The BMJ, etc. applications available for med students InSimu patient, ACLS rhythm tutor, histograms, geeky medics OSCE revision, medical flash notes. Many of these entrepreneurship ideas are the brainchild of a lot of medical professionals and have been aiming to become more and more transformative in the medical education system rather than just focusing on the platitude nature of instructions. Platforms like marrow and prep ladder

have come into the picture to provide preparation for entrance exams like INI CET, NEET-PG, etc. with the collaboration of lectures by many renowned teachers in their respective fields. Osmosis is a platform where different topics are taught using short animations. This kind of approach has become main stream amongst young medical students [6].

DISCUSSION

A peek into the future

As Abraham Lincoln once said, "the best way to predict the future is to create it". Cyber medicine is not only online consultations, research resources, or just the global connection of healthcare providers; it is the dawn of an incredible future. An interesting example of this is electroceuticals. Electrical impulses are used to target the neurological system to cure a variety of medical problems. Brain Computer Interfaces (BCIs) links the central nervous system to Artificial Intelligence (AI) *via* invasive technologies implanted in the brain. These interfaces, on the other hand, can be worn on the body externally as wearable or non-invasive devices. These invasive or non-invasive sensors, which are often electrodes, then use complicated algorithms to analyze brain data and extract important brain patterns to treat a variety of mental health disorders [7]. Another fascinating instance is of application of virtual reality in the field of medicine. In the realm of medicine, virtual reality technology is frequently used. Its application for rehabilitation, handicap management, surgical training, psychological illness therapy and analgesic modality has yielded significant results [8]. The emergence of low cost 3D printers, 3D printable multi materials and 3D medical imaging technologies has boosted the popularity of 3DP medical applications. Because see through, full color and flexible multi materials are now accessible, 3DP objects may be more realistic, matching the features of the real body, including both hard and soft tissue [9]. Not only is this but robots being employed in Saudi Arabia for COVID patients [10]. Robots are immune to viruses such as the new Coronavirus, but they are vulnerable to technical infections. As a result, robots have become more important, serving as a link between patients and nurses and physicians on the one hand and nurses and doctors on the other.

To combat the virus, Saudi Arabia has used artificial intelligence technologies to decrease the danger of transmission to medical personnel combating the infection. They use cyborgs that travel between patients and have considerable characteristics that shield physicians and nurses from the psychological strains of patient examinations. The cyborgs can do a clinical evaluation, measure the patient's pulse, perform an eye examination and inspect the patient's skin, ears and chest using medical equipment connected to it. They also act as a visual form of exchange of information tool amid the patient and the human surgeon, who operates the robot from a different room or from outside the hospital *via* a mobile application. The robot is well versed in navigating the hospital structure and getting to patient rooms. When a room number is put into the program, the robot immediately attends to it. Doctors and other healthcare personnel can use cyber medicine to offer treatment and conduct consultations without needing to be present alongside the patients' beds. It also allows clinicians to interact with patients outside of the hospital by alluring them to a virtual medical consultation making the use of the robot. The recent introduction of neuralink has sent a wave of astonishment across the globe. The area of neuroscience and neuro engineering is being advanced by neuralink, a neurotechnology firm. The neural ink implant, with its possibilities for neuro amplification and therapy modalities, offers hope for patients suffering from spinal cord injuries, neurodegenerative diseases and neurobiological deficiencies. However, while neuralink's technology and early testing results look promising, the device's large number of electrodes necessitates the use of neurosurgical robots, which poses safety and training issues [11]. Only educated guesses can be made about the device's safety and efficacy at this time. The scarcity of information necessitates more inquiry and research. For neuralink to be approved and unified into the vanguard of future neurosurgical disciplines, clinical studies are also required.

A newfangled addition to this volume of advancement was made recently. Apparently, it is not necessary to be in contact with the patients to assess or monitor the covid situation, in fact, it is not even necessary to be on the planet. According to a report published by USA TODAY, it is possible to evaluate and determine the COVID situation using satellites. According to the study, satellites flown into space have already assisted in tracking disease transmission during the Ebola outbreak. In the fight against polio, satellite photographs discovered previously undiscovered and neglected areas in Nigeria, contributing to eradication efforts [12].

Some newer modalities:

- **Video games and virtual patients:** Cyber patient, which provides medical students with an interactive learning platform, has developed a virtual medical instructor. The model may be that much comprehensive as compared to the high-fi stimulators that are currently available. There is still a lot of scope of development for technologies like these. Another interesting model is developed by levelex, it allows doctors to practice real life scenarios over a video game in a virtual context. Although the hype created by these models sounds efficient there is still a question mark on their inclusivity in regular medical practice [13].
- **Bleeding robots:** one of the most striking appearances made by Gaumard, a stimulator developer company, was making a robot that can go into labor and even deliver babies, it can even mimic catastrophic head trauma, gunshot wounds and infection in the extremities. It is not enough to provide virtual stimulation, it is important to learn one's own environment.

- **Bionic cyborg eyes:** The University of Minnesota conducted research in 2019 and 3D printed a hemispherical arrangement layer of light sensors. This is being hailed as one of the most crucial steps in the development of artificial eyes, which may eventually become a stepping stone to help visually handicapped and blind people. According to the developers, photodiodes can convert light energy into electrical energy with twenty-five percent accuracy. Moreover, it is been subjected to be developed with smoother surfaces and more optical sources.
- **Augmented and virtual reality:** The range of advancement in the field of medical technology is endless. With evolving newer technologies like virtual reality, commonly known as VR and augmented reality, commonly known as AR, have been teaching clinicians by re-creating a real life scenario and exhibiting its significance and potential as a medical resource. Significant promising results are seen by VR in various therapy modalities. Research published in 2020, noted encouraging and favorable results in utilizing VR and AR in the treatment of, pain management, phobias, PTSD and etc. With the newer addition of VR gloves, which can in experiencing cutaneous sensations, a more immersive involvement may be seen.
- **Self-diagnosis through selfie:** Recent software developed by the University of Washington is a mobile phone application, which allows its user to take pictures of them and test software is programmed to focus on the sclera or the white part of the eyes to detect themselves for any underlying ailments such as malignancies, liver failure, etc. The any discoloration, for example, yellowish discoloration in the eyes is called jaundice and can be a symptom of early pancreatic disease. This feature detects the discoloration before it is visible to unaided eyes.
- **Exoskeletons assist paraplegic persons in walking:** Scientists recently discovered that a paraplegic guy who was motionless from the shoulders down was capable of walking again. He was enabled to do so because of a suit and a neural implant.

There are much more cutting edge, avant garde technologies being born in the realm of medicine. Cyber medicine has not only been a tool but also the preliminary idea behind these inventions. A promising future waits ahead in all its glory, till then the effectiveness of these technologies, telemedical is safe in the womb of time.

The imperfections

For a lot of doctors, cyber medicine has been working as an advantage because of providing better healthcare consultations but a bigger question arising here, from a patient's position is of privacy and confidentiality. According to recent research, while many internet health information websites have privacy policies in place, the majority of them violate them. Medical web sites, more than practically any other type of online information, must conform to stern intern privacy requirements to prevent individual medical information, such as usage habits and interests, from coming into the hands of marketers, managers and insurers. Although inactive information does not entitle medical practice, the usage of programmed pictures may.

CONCLUSION

Practicing healthcare would entail charging money for services. Nothing can substitute a visit to the doctor and any online conversation, whether passive or active, can only be viewed as a kind of patient knowledge. Injuries or other "negative patient outcomes" as a result of relying on this data would be investigated for careless misrepresentation.

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