

# **E-Health Technology Challenges in India: An Analysis with COVID-19 Check Ups**

**Dr. Leena Kar\* Dr. Bibhuti Bhusan Mishra\*\***

\* Ph.D. Research Scholar-2012 August Batch (MHA), IBCS, Siksha O Anusandhan (Deemed to be University), Bhubaneswar Odisha., E-Mail: [leenakar@gmail.com](mailto:leenakar@gmail.com)

\*\* Associate Professor, Siksha O Anusandhan (Deemed to be University), Bhubaneswar, Odisha., E-Mail: [bibhutibhusanmishra@soa.ac.in](mailto:bibhutibhusanmishra@soa.ac.in)

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## **Abstract**

Technology has come forth as a thrust to make life easier in our day to day life. Transformation of technology in the medical sector has emerged through different platforms i.e. e-Health, m-Health, and Telemedicine. E-Health technology can be used to disseminate health-related information or services among the health care providers, patients, and clinics. Across-the-board, e-Health is a segment of health informatics which includes m-Health and telemedicine. Due to widespread availability, the wireless connection equipped with a mobile phone has turned the process of communication faster for the patients who also increased the health care utilization. Mobile technology is enabled to provide the remote monitoring benefits for the patients who are restricted in mobility but needs continuous intervention from clinics. It can increase the probabilities to avoid emergency condition by detecting his/her vital signs and bio-signals. Comprehensive studies are taking place in the field of healthcare to discover new devices and create applications suited for clinical practices. The ultimate goal of e-Health is to ensure a rationalize treatment for all group of patients and to improve patient safety and disease outcomes. The aim of this write - up is to briefly discuss the present and future applications of e-Health technology in health care sectors in India with special reference to COVID-19 Check-Ups.

**Keywords:** E-Health, ITC, E- Prescribing, M-Health, COVID-19

## **1. Introduction**

The COVID-19 pandemic has brought to the forefront the critical need for cutting-edge technological tools and innovation in the areas of public health, medicine and wellness. Advanced intercessions supply severa chances to reinforcing well-being frameworks and may be critical property in the present trendy wellness disaster. We offer some use times to infection manipulate, domestically installation conclusion and screening, strengthening via data, stylish wellness statement and the have a look at of disease transmission, and utilizing publicly supported facts. It has revived the place of 'advanced health' in the affiliation and open talk, with buyers grade by grade taking a gander on the sizeable canvas of wearable devices, transportable properly being packages and synthetic Intelligence (AI), simply as mechanical transporters, sensors and to virtual records.

An unrest in human services is going on because of modifications in innovation. A social insurance framework incorporates of people, businesses, and property that carry medicinal services administrations to fulfill the wellness needs of humans. Digital nicely-being (E-fitness) is often characterized as human services rehearses upheld through virtual techniques and correspondence. It includes m-fitness, characterised because the act of medicine and widespread well being strengthened through cellular phones. Nowadays new enhancements like the Cloud, IOT, Human laptop interaction, Cyber protection may be brought to it alongside Anthropology, open approach and famous properly-being remedy to make this control strong. In a state like India, it is seen that there is a lot of divergence inside the high-quality and get right of entry to to the social coverage among the metropolis and provincial locales. In the rustic zones there's an intense shortage of the social insurance masters, health administrations and medicinal services providers.

## **2. Review of Literature**

Eysenbach (2001) in his paper "what is e-health?" depicts that meaning of e-health in terms of an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the internet and related technologies. Further the author defined that e-health does not only mean electronic rather it represents the efficiency, enhancing quality of care, evidence based e-health services, empowerment of consumers and patients, encouragement of relationship between a doctor and patient, education of physicians and consumers as well, enabling information exchange and communication in a standardized way, extending the scope of health care, ethics while practicing e-health and to make health care more equitable.

Akerkar and Bichile (2004) in the paper "Health Information on the Internet: Patient Empowerment or Patient Deceit?" explained that internet is the biggest medical library in the world where many people find the information what they seeking for. They add on that health information is the third most popular activity on the search engine of internet. Further in this they showed that when a person searches anything on internet related health the search engine show many results on the screen. So now the question arises that is such type of system taking the person in the right direction or in the wrong one. Because the person who is seeking some information regarding health issues do not know the information provided by the internet is authenticated or not. Further in this regard they suggest that there must be a prescription of reliable sites and besides this a quality assessment tool must be there for regular check on these sites for the secure and healthy future of the nation.

Dixon (2007) in the paper "A Roadmap for the Adoption of e-Health" defined e-health as the delivery of health care with support from various information and communication technologies like electronic health records, telemedicine and clinical decision support. E-Health is considered as a primary method of improving quality, safety and costs associated with the delivery of health care. Further he elaborates the roadmaps for the growth E-Health where he includes sustainable resources for those seeking to adopt E-Health, strong E-Health workforce and implication of best practices in E-Health. In concluding lines he advocates that these road maps are just the initiators. If we want to grow this as health care tool then government, academic and private industry leaders have to work together to achieve the goal of widespread adoption of E-Health.

Eysenbach (2001) in his paper "what is e-health?" delineates that significance of e-health as some distance as a growing discipline in the crossing point of medical informatics, popular well-being and enterprise, alluding to well-being administrations and statistics conveyed or progressed via the net and related advancements. Further the author characterized that e-health does not simply mean electronic instead it speaks to the productivity, upgrading nature of care, evidence based e-well being administrations, strengthening of buyers and patients, support of connection between a consultant and affected person, training of medical doctors and consumers additionally, empowering records trade and correspondence in a normalized way, increasing the extent of medicinal offerings, morals at the same time as rehearsing e-well-being and to make social insurance progressively unbiased.

Akerkar and Bichile (2004) within the paper "Wellbeing Information on the Internet: Patient Empowerment or Patient Deceit?" clarified that internet is the greatest scientific library on earth in which numerous individuals discover the statistics what they searching out. They add on that wellness information is the 0.33 maximum well-known movement at the web search tool of net. Further in this they indicated that after a character quests anything on web associated health the internet index display numerous results on the display. So now the inquiry emerges this is such kind of framework taking the man or woman the suitable manner or in an inappropriate one. Since the individual who is looking for some statistics with reference to scientific issues do not have the foggiest concept approximately the facts gave by using the internet is confirmed or now not. Further in such manner they suggest that there need to be a treatment of strong locations what's more this a first-class appraisal tool ought to be there for customary pay attention of these locales for the protected and sound eventual fate of the us of a.

Dixon (2007) inside the paper "A Roadmap for the Adoption of e-Health" characterised e-well being because the conveyance of medicinal offerings with assist from exclusive information and correspondence innovations like digital health facts, telemedicine and scientific preference assist. E-Health is taken into consideration as an important technique for improving excellent, protection and fees related with the conveyance of human offerings. Further he expounds the courses for the development E-Health in which he carries supportable assets for those trying to obtain E-Health, strong E-Health workforce and ramifications of satisfactory practices in E-Health. In carrying out lines he advocates that those guides are handiest the initiators. On the off hazard that we need to broaden this as medicinal offerings device, at that point authorities, scholastic and private enterprise pioneers need to cooperate to accomplish the objective of throughout the board selection of E-Health.

Srivastava, Agarwal and Agarwal (2013) within the paper "Verifying Indian E-Health System Through 'Aadhaar' A Unique Identification" look into that usage of information and correspondence innovation supply new statures to the medicinal services benefits but to offer relaxed and stable wellness information is a sizable fear in the gift state of affairs within the entire global. In this placing it is the tremendous problem for India to very well don't forget it seeing that India is a chief state with quantity of states and association areas. To tackle such problem they proposed a showed version dependent on Aadhaar a twelve digit one among a kind distinguishing evidence quantity for e-well-being administrations in the nation. As indicated by them each associate check in themself on the Indian entrance with the one of a kind recognizable evidence variety who're associated with e-wellness administrations; regardless of whether or not the customer is a widespread medical doctor, attendant, seasoned or a affected person. All in all they said that it's far a protected and solid model to give e-wellness administrations to the Indian open.

Jaroslawski and Saberwal (2014) in their paper "In e-Health in India nowadays, the concept of labor, the difficulties and the accounts: a meeting primarily based research" portrays that e-health has an capability to

enhance the nature of social coverage and are available to the unreached. They have directed an investigation to find out the concerns related with e-well being in India in present setting. They talked with 30 folks that speak to 28 associations engaged with the idea and choice e-well being in India. They discovered that India is managing inside the cause of care, statistics collection and reconnaissance, remedy consistence and a ways off scientific schooling on the name of e-wellbeing administrations. The difficulties before the achievement of e-wellbeing are: cash is a prime issue the identical range of projects are gain purpose and that is the reason beyond the compass of normal man, insufficient basis to provide forms of assistance productively and substitution of paper file into e-document is likewise a take a look at. Later in the final touch line they endorse some arrangements like: restore ostensible cost for the administrations and getting ready gadget to improve the personnel for productive and powerful acts of e-well being.

Kumar and Ahmad (2015) in the paper "A Review on use of Telemedicine and e-Health benefits in Public Health" characterized Telemedicine because the act of medicine and social insurance administrations a long way off utilising digital correspondence and statistics innovation. Telemedicine utilizes remote devices, for instance, telephones and man or woman automatic assist to change data. In this paper they've tested Telemedicine in setting of India, considering that India using Telemedicine because mid 2000 to present medicinal offerings in far off territories. Further they clarified the Indian sports within the discipline of Telemedicine through authorities and non-authorities association. In the consummation lines they summarize through pronouncing that Telemedicine is the want of Indian lifestyle to make the e-wellness program fruitful as India is a major kingdom with huge populace.

Srivastava and Agrawal (2016) in their paper "Portable Health for Elderly in India" delineates that the usage of records and correspondence innovation in the health element is one of the speedy growing sector for social insurance. Further they compose that Department of Information Technology, Indian Space Research Organization, Apollo Hospitals, Asia Heart Foundation and State Governments supporting the E-Health program. Their investigation middle around giving agreeable wellness administrations to the antique people. It is the need in India to pay attention at the power of senior people. In this placing versatile spot a extensive activity to alternate records and voice from one spot every other with out stressed institutions thru microwaves. They supply a few functions at the back of huge acknowledgment of portable administrations just like the maximum reduced cost correspondence medium, extremely simple to use by means of all age gatherings, it doesn't require any urgent basis and it tends to be utilize every time to present clinical attention at any separation. To finish up they stated that to stretch out higher wellbeing administrations to the vintage populace versatile medicinal offerings framework is the maximum best method to coordinate their desires.

Sharma, Shivaram and Sharma (2016) within the paper "A Methodical Review of E-Health Systems Developed for Indian Healthcare Sector" utilized nineteen investigations for instance to find out difficulties and holes related with E-Health in India. They applied the substance primarily based techniques to interrupt down the E-Health Systems. They observed of their investigation that the Remote Consultancy, Teaching and Learning, Hospital and Record Management are providing kinds of assistance to the residents yet Mother and Child Care has a incredible hollow it need greater regard for create it in as worthy model. All in all they said that E-Health rose as a significant tool with the factor of improving the general public health.

Malik (2016) within the paper "Effect of Telemedicine on Rural Women's Health" characterized that Telehealth modifications the correspondence station among clinicians and patients to limit geographic boundaries and upgrade conveyance of management. She concentrated her investigation on girls via along with a declaration of Nehru that the fame of ladies characterizes the fame of a state. Further she depicts the issues ladies have in India in medicinal services like pool of statistics, low nature of care, much less group of workers and so on. In this examination she observed that the usage of Tele-wellness overcomes any barrier amongst rustic and concrete mainly in putting of the girls of most people. It expels all the barriers like correspondence hole, mindfulness and separation.

Singh, Arora and Others (2017) within the paper "Extent of E-Healthcare Services in Uttar Pradesh: A Case Study of Lucknow Urban Areas" presented E-Health as Electronic Health and fate of social coverage advantages in India. They compose the sports of Uttar Pradesh in E-Health are: Uttar Pradesh HMIS, Hospital Information System, ASHA Mobile Application, M-Sehat, National Digital Literacy Mission and Pyarbitiya – PC and ANDT Website. They pointed out the extent of E-Health in Lucknow wherein they clarified approximately the institutions and institutions offering the varieties of help in social insurance division electronically, some clinics are utilising E-Health care administrations. Further they named some big players within the discipline like CDAC, Wipro, and TCS in the area of E-Health. In the consummation lines they composed that the essential focal factor of government to present social coverage is to accumulate the E-Health conveyance arrangement of medicinal offerings.

### 3. OBJECTIVES OF THE STUDY

Based on the above review of Literature, an attempt has been made in this paper to build up the concept of E-Health in general which is a part of this new way of services delivery system to the public. Therefore, the study has the following Objectives:

- 1) To explore the technological initiatives and growing efforts in health care sectors in India;
- 2) To take up the Tele-health systems and their applications in the COVID-19 Pandemic;

3) To focus on how digital solutions can impact healthcare during this COVID-19 pandemic.

A prime reason in the back of the growing occurrence and interest to e-Health is the progression in PC and correspondence innovation which has made the social coverage facts and administrations across the world available simply. As indicated with the aid of Dr. T. E. Ringer (IEEE variety 2006) the a success and powerful usage of constructing can convey down the fees gave it's miles targeted around early discovery of the ailment. Various variables are taking element in driving in the direction of a superior usage and greater substantial utilization of e-Health administrations and advances.

A couple of factors of hobby of e-Health advances are recorded in the accompanying.

(I) With the appearance of recent and contemporary innovations, voice and information in type of pix, recordings, and content may be passed-off constantly on one of a kind kinds of figuring gadgets, even versatile handsets.

(ii) Multi area continuous videoconference can be applied to steer educational conferences, stay showings, coordinated efforts, and many others.

(iii) Simple Internet association may be used by large quantity of individuals to keep in mind and to choose up facts approximately wellbeing related troubles at their own consolation.

(iv) E-well-being administrations may count on a considerable job in keeping up the professional understanding percentage all spherical the sector.

(v) Electronic wellness data (EHR) of the patients is probably saved up which thusly is probably beneficial to the medical specialists in remedy of illnesses.

(vi) Providing medical office to old is the most testing mission in this point in time. The World Health Association has assessed that the extent of humans extra than 60 years antique will twofold to 22% in 2050 from 11% in 2000.

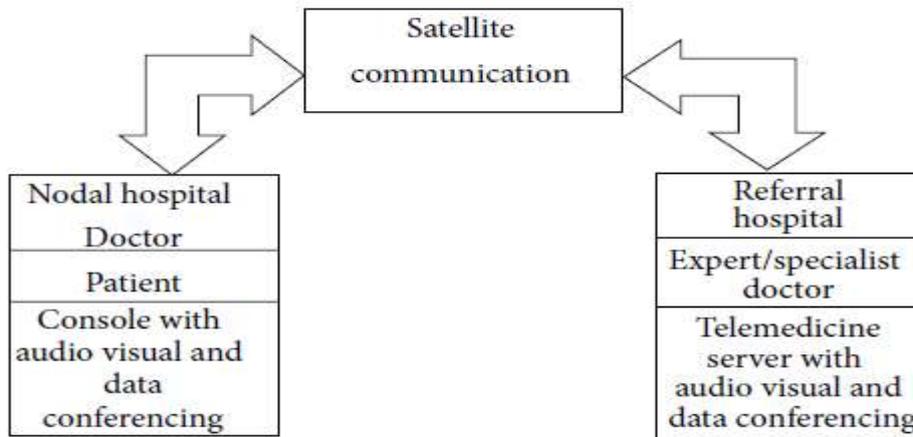
Along those traces more than 2 billion individuals will want more medical assist, even helped residing, as they'll be gradually willing to wellness related troubles. The maturing society can be served through satellite tv for pc primarily based medical end and care from their homes.

Satellite Communication: Satellite correspondence utilizes counterfeit satellites for giving correspondence connects between distinct makes a speciality of Earth. With the help of transponder (a coordinated collector and transmitter of radio signals) a satellite tv for pc receives and retransmits the symptoms lower back. Satellites are assuming an expanding task in the help of wellbeing and authorities help on Earth. Clinical help through satellite is being taken into consideration as a financially savvy and an open association in particular in the growing international locations where populaces come up short on even critical stages of medicinal offerings due to remoteness, neediness, and lack of accessibility of well-being experts. Figure 1 clarifies the operating of telemedicine focuses supplying medical types of assistance thru satellite tv for pc. Following are the connections and the name of a few telemedicine focuses in India giving clinical workplaces through satellite:

- (i) Apollo Hospital  
<http://www.apollotelehealth.com>: 9013/ATNF/aboutATNF.jsp

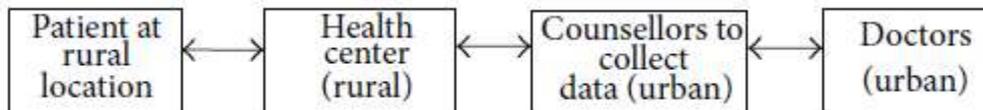
- (ii) Sri Ramchandra Medical Center  
<http://www.sriramachandra.edu.in/medical/telemedicine.htm>

- (iii) AIIMS Hospital  
<http://www.aiims.edu/aiims/telemedicine/telepage.html>



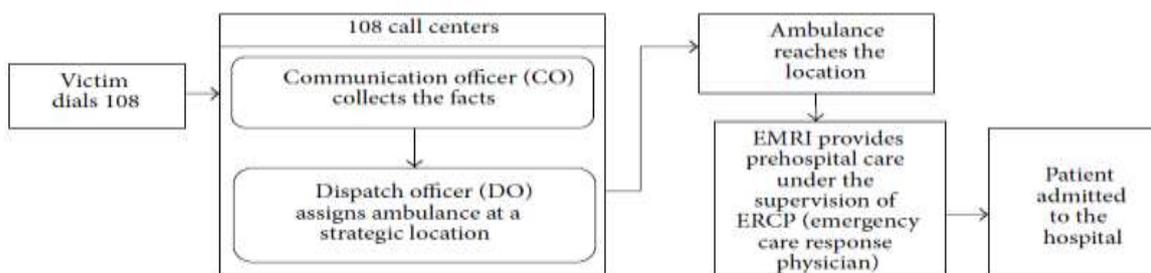
**Figure 1: Medical services through satellite communication.**

**Internet Communication:** Interconnected networks of computers which make use of Internet protocol suite (TCP/IP) to link the devices located worldwide. The network can be private, public, academic, business and government and can be linked by a broad array of electronic, wireless, and optical networking technologies. The Internet users not only can seek health information, but also can get connected to the specialist doctor for the proper consultation. For example, in India an NGO named World Health Partners is providing health services in the rural areas through Internet [<http://worldhealthpartners.org/>]. Figure 2 shows the working of WHP.



**Figure 2: Medical services through Internet at WHP India.**

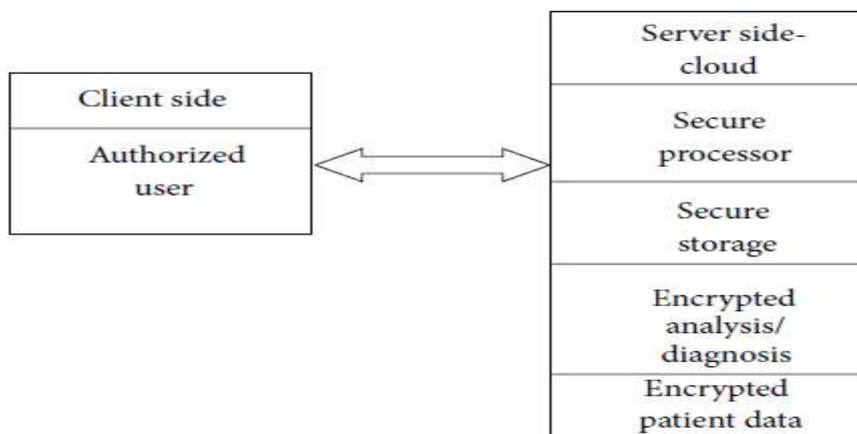
**Mobile Communication:** Mobile communication is a remote kind of correspondence wherein voice and information may be transmitted and gotten via microwaves. The trading of records have to be viable while shifting here and there, as an instance, mobile, cordless, pagers, and so on. In the continued years cell telephones can be accurately utilized in providing medical help to the sufferers situating at a long way off spots. Administrations thru cellular telephones can also contain assortment of community and medical human offerings information, conveyance of social insurance facts to professionals, and ongoing checking of affected person integral symptoms. Figure 3 offers the running of 108 disaster medical administrations in India [<http://www.Emri.In/>].



**Figure 3: Emergency medical services through 108 services in India.**

**Cloud Communication:** Cloud computing relies on sharing computing resources to handle the applications. It is a type of Internet-based computing, where different services like servers, storage, and applications are shared which results in the effective and optimized use of software and hardware resources (Figure 4). For example, in

India e-Health centers (eHC) are providing cloud enabled healthcare centers ( <http://www8.hp.com/hpnnext/posts/cloud-enabled-e-health-centers-bringing-quality-healthcare-rural-areas> ).



**Figure 4: Medical services through cloud.**

**Role of Satellites**

Satellites assume a good sized job in the help and authorities assistance of humanity by means of observing the climatic adjustments, disasters, and so on. In setting of e-Health, satellite communications (SatCom) joined with information innovation play a fundamental and noteworthy job. Satellite correspondence is especially treasured for giving health benefits to faraway and tough to reach areas. So as to assure strong lifestyles, especially in country and innate locales, the fundamental issue of giving perfect counsel and indicative places of work should be tackled. The satellite based correspondence gives a manageable arrangement and is being taken a gander at for scientific help. In the far flung regions or spots with out get admission to to standard Internet framework, the satellite tv for pc correspondence can provide instructive forms of help.

The clinical work force can make use of this to enhance their aptitudes and sufferers to teach themselves. As the most recent facts gets to be had, this could likely change into a floor-breaking instructive tool.

A framework with satellite correspondence can bolster all or a number of the accompanying administrations.

(I) Patients at domestic and clinical body of workers (specialists, attendants) at faraway emergency sanatorium or medical consciousness can cooperate via videoconferencing.

(ii) Tele-looking at of patients at domestic.

(iii) Collection and transmission of scientific data, as an example, glucose estimations, coronary heart beat estimations, and weight estimations, to an emergency sanatorium or scientific community for added system.

(iv) Satellite interchanges can likewise be utilized for looking at endemics/plagues at any region.

Tele-wellbeing frameworks and their programs in the COVID-19 Pandemic

The huge impact of the COVID-19 pandemic on worldwide medicinal offerings frameworks has incited test for novel instruments to stem the tide. Consideration has long gone to the superior health community to give plausible well being arrangements in this season of terrific scientific emergency to relieve the effect of this pandemic. As the well-being reactions to the pandemic are reinforced, there may be a full-size move inside the current focal factor of applications and gadget from way of existence improve to medical and crisis care. This is probably doable with new trends in system and programming, as an instance, sensors and other likely lifestyles-sparing functionalities. It can securely be stated that inside the technique the future, comprehensive innovation and facts driven remodel of gift-day advanced gadgets is inside the contribution, allowing sufferers to have extra noteworthy electricity over their well being and clinical consequences.

Simultaneously, India's medical enterprise has likewise been backing and tolerating advanced improvements created by way of each open and personal gamers. Bolstered through the management drove social authorities assistance activities, for instance, Aadhaar and Digital India, such advancements and apparatuses have pulled in subsidizing guide simply as helped cultivate a organic gadget of computerized wellness new agencies.

Be that as it is able to, confronted with increasing request, partners in this space have been considering issues, for example, poor advanced basis, restricted HR and opportunities to scale-up their drives and gadgets. This, whilst making certain moderateness in their objects for the patron, tending to the fee hassle on customers, increasing openness to their items and imparting fine assist.

## Use of digital healthcare by the Government of India

### Aarogya Setu

Mobile app developed by the Ministry of Electronics and IT to help citizens identify their risk of contracting the novel coronavirus.

### Telemedicine Practice Guidelines

Ministry of Health and Family Welfare in consultation with NITI Aayog released these to legitimise the practice of remote consultations. Doctors can now provide consultations through video, audio, email or text.

### National Health Stack (NHS)

It is a visionary digital framework with a holistic approach to support healthcare across the nation. The recent NHS study has also aimed for Digital Health Records for all citizens by 2022 to leverage all benefits of telemedicine and E-health for Indian citizens.

### National eHealth Authority (NeHA)

It is a visionary digital framework with a holistic approach to support healthcare across the nation. The recent NHS study has also aimed for Digital Health Records for all citizens by 2022 to leverage all benefits of telemedicine and E-health for Indian citizens.

### e-Sanjeevani

This app has been shortlisted by the Ministry of Health and Family Welfare for supporting Government's plan for a pan-India tele-medicine rollout.

**Creation of telemedicine services both for COVID-19 screening and managing non-COVID-19 cases:** On March 2, 2020, the American College of Cardiology and American College of Physicians gave a joint proclamation and recommended policymakers to recognise the important process advanced and telehealth administrations can play within the COVID-19 pandemic. With self-isolate and social isolating waiting for significance in constraining network spread, digital attention can permit HCW's to keep up coherence of care to patients remotely. The accompanying advances are being taken all inclusive in such manner.

□ Creation of digital speak bots and internet bots for COVID-19 patients so HCW's can survey and interface with patients via virtual visits and no longer risk introduction. Telemedicine companies in West are assisting teach docs to quickly display screen COVID-19 instances (using polls) and if important triage them to assigned territories to maintain a strategic distance from in-medical sanatorium bunching and limiting introduction.

□ Curtailing, constraining or conceding optionally available visits and non-compulsory scientific approaches by conveying comply with up care with the aid of virtual visits. This helps triage severa sufferers at domestic and occupy a few stable sufferers from the clinics who would possibly some manner or some other motive threat of superfluous presentation.

□ Development of automated telemedicine vans (Vici, by InTouch Health), outfitted with cameras, clever displays and essential scientific tools which may be sent into isolated affected person areas to survey patients, in this manner constraining HCW creation and danger.

□ Tele or electronic intensive care units (e-ICU): These can permit HCW's to remotely screen upto 60–one hundred sufferers in ICUs over numerous clinical clinics. In the USA, in excess of 300 emergency clinics in 34 states are exploiting such eICU administrations utilizing two-manner cameras, video screens, receivers and savvy indicators related via fast information strains.

□ Web innovation can likewise help deliver visitors into continual rooms utilising vICU and iPads, consequently in addition lessening visitors burden to emergency clinics.

# Digital healthcare technologies in India

## Telemedicine

Medical alert systems, mobile monitoring

## Telehealth

Remote diagnosis of vital health signs, healthcare education services, blood pressure or ECG, remote patient-doctor consultations

## Video Consultation

Telemedicine that uses technology to provide real-time audio and visual assessment remotely

## m-health

The practice of medicine and welfare supported by mobile smart devices

## Wearable Sensors

Health monitors and pedometers help people track their body functions

According to new Indian rules, a Registered Medical Practitioner is certified for supply telemedicine interview to patients from any piece of India whilst preserving indistinguishable professional and ethical requirements and measures from suitable to standard in-individual care, inside the natural regulations of telemedicine. All professionals are moreover advised to get familiar with these guidelines by on-line initiatives created and made reachable by using the Board of Governors.

Suggested apparatuses for finishing innovation primarily based patient interview contain portable or landline phones (related over LAN, WAN, Internet and so forth), go to programs like WhatsApp, Facebook Messenger and so on or Mobile App or web primarily based automatic stages for telemedicine or facts transmission frameworks like Skype/e mail/fax and so on. The policies likewise explicit that during all instances of disaster, the affected person need to be exhorted for an in-individual verbal exchange with a RMP on the most punctual. On the off risk that an non-compulsory consideration is absent, tele-discussion can be given on the off chance that it's far the high-quality manner to give convenient consideration. Experts ought to practice their professional judgment to choose whether a telemedicine interview is appropriate in a given situation or an in-individual assembly is required.

#### 4. Conclusions

The COVID-19 pandemic stances great difficulties to the Indian medicinal services network. Computerized health frameworks are appropriate to give novel answers for this standard well-being disaster. These incorporate development of energetic remark frameworks, tele-well-being, novel demonstrative and scientific dynamic contraptions, more widespread entrance of wearables for following of physiological parameters and improvement of intuitive go to administrations for open unfold of COVID-19 related statistics. Clinical crew is probably going to confront essential auxiliary modifications which may also alternate our paintings procedure and correspondence entries, with telemedicine growing as the most appropriate opportunity making sure wellbeing of HCW's and patients. Social insurance frameworks that make perfect pursuits in telemedicine might be properly prepared to guarantee that patients can get successful and safe scientific consideration on the subject of the present pandemic. E-Health may be regarded as a promising automobile for human services arrangement. Progressively crucial methodologies are critical for the arranging, development, and execution of m-Health.

Worldwide and country wide wellbeing associations must listen more at the development of e-well being innovation to make it adjusted for the benefits of patients.

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