

Telehealth, Telemedicine, Telenursing – 21st Century Progression towards Health for All

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Abstract

Health and well-being are overlapping yet significantly differing concepts; the difference being in the dimensions of human life encompassed by each entity. The practice of health sciences is continuously evolving. As with most areas of science, recent decades have seen rapidly increasing progress in application of digital technology in medical field. In past few years, there has been a global boom in telehealth systems. Telehealth is a new technology, a new mode of health care delivery, a new industry and a new area of research. The generality of applications of telehealth in the field of medical care is still in an infancy stage. The term 'Tele-health' and 'Telemedicine' are interchangeable as per American Telemedicine Association (ATA) which characterizes Telemedicine to be "the natural evolution of healthcare in the digital world". All stakeholders realize that the impact of technology in health care is inevitable and its applications in telehealth will be progressively expanded and diversified. Till recently, there was relatively spotted distribution in adoption of telehealth in the medical care; but COVID-19 pandemic has forced all healthcare systems, hospitals and clinics to rapidly implement the telehealth system and its widespread usage is now much visible. Establishing more up-to-date telehealth applications in medical care is a persistent need. The current urgency for telehealth systems has brought into focus attention- to planning, preparing and processing capacity building, budgeting for infrastructure and resources for this field, increased awareness about staff's technical and clinical competencies in this field, analyzing medical and legal issues in its usage and ensuring confidentiality and data safety.

The primary focus of this article is to examine the existing relevant literature on tele health/telemedicine in health sector - from early development to current applications, benefits of the telehealth during pandemic COVID-19, application to nursing domain, impediments to adopting telehealth systems and conclude with a look at future considerations in this field. Hopefully, it will contribute to guiding health care professionals, policy makers and nursing administrators to enhance existing knowledge, develop standard operating guidelines, technical competencies and capacity building for effective implementation of telemedicine in practice.

Keywords: Telehealth • Telemedicine • Telenursing • Health • COVID-19 • Pandemic

Introduction

Health and well-being are overlapping yet significantly differing concepts; health refers to physical, mental and social dimensions of human life and wellbeing refers to subjective and objective assessment of comforts/facilities available to an individual and his/her overall equation with the world. One of the most important focuses of contemporary society is providing appropriate and comprehensive healthcare to everyone, everywhere and at all times [1]. Globally, telehealth systems have seen rapid progress in last few decades, since they are - a new technology, new mode of health care delivery, new industry and also a new research interest. The term 'Tele-health' and 'Telemedicine' are interchangeable as per American Telemedicine Association (ATA) which defines telemedicine to be "the natural evolution of healthcare in the digital world". The word "telemedicine" literally translates to 'healing at a distance'. Increasing impact of technology in health care is inevitable and its application in telehealth will be progressively diversified. The application of telehealth encompasses various forms and it includes in its scope- telemedicine, telecare, teleconsultation, telehomecare, telepathology, teleradiology, telepsychiatry, telecardiology, telesurgery, tele-rehabilitation, tele-monitoring, teleradiology and teleophthalmology, teleeducation and emergency network forms. It is very important to understand the possibilities with use of technology and its

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application in telehealth care [2,3].

Tele- health plays a major role in providing access to cost-effective quality care to patients at a distance. It links all types of end users - clinicians, nurses, patients, academician, researcher to the general population. The purposes of interaction between individuals such as healthcare professionals to patients is to provide easier access to health specialty care, referral and consultation services with the use of smart devices and sensors [4,5]. The application of Telemedicine related study findings from India suggested that telemedicine has a variety of applications in patient care, education, research, administration and public health [6]. Technological progress, development of Internet of Things (IoT), and availability of smart devices have dramatically transformed healthcare and influenced in rapid development of telehealth. Accessibility, affordability, and availability are the main benefits of these systems providing a medium for information dissemination, interaction, and collaboration among stakeholders [7,8].

Telehealth is a vital process in enhancing access to health care services, reducing or eliminating health related travel time, linking health professional to general population, reducing costs of health services and solving the issue of uneven distribution of medical services, to a certain extent. Till recently, the usage was not fully integrated into current health care system globally especially in the developing world. There were plenty of reasons for this, such as lack of proven large-scale operations, small evidence base, inadequate implementation, or lack of attention to soft skills including – awareness, willingness to use, knowledge, accepting change by the public and the professionals both [5,6].

In India, health care services now have started to take keen interest in developing telemedicine practices. The slow and steady rise in its utilization is undoubtedly a sign of change in public health [5]. Telehealth is considered a vital key to reach health care personnel, to overcome the ignorance and lack of awareness on health and diseases, to reduce the communication gap between service providers and receivers, client and family engagement, diagnosis, prevention, better treatment, rehabilitative services. Although COVID-19 is

viewed as pandemic disaster, it has given a lot of unique challenges and has brought the integral part of mainstream practices in telehealth to reach its highest potential.

The primary focus of this article is to examine the existing relevant literature on tele health/telemedicine in health sector - from early development to current applications, benefits of the telehealth during pandemic COVID-19, application to nursing domain, impediments to adopting telehealth systems - and conclude with future recommendations for wider applications of telehealth. Hopefully, it will contribute to guiding health care professionals, policy makers and nursing administrators to enhance existing knowledge, develop standard operating guidelines, technical competencies and capacity building for effective implementation of telemedicine in practice.

Telehealth and Telemedicine through the Ages

Global initiation of telehealth

Communication and Information technology was first used in the 1860s when telegraph messages were sent to seek help for treating wounded soldiers during the American Civil War [9]. In 1960s, telemedicine was invented by National Aeronautics and Space Administration (NASA) as a way to monitor astronauts' health on space missions and this development played an important part in the early seeding of telemedicine science [5,10]. As a one-off incidence, the first known real-time (live) video consultation occurred in 1959 when doctors at University of Nebraska used interactive telemedicine to transmit neurological examinations [11,12]. Telemedicine was being used routinely to deliver general health services to remote regions of Norway in late 1980s¹². In Canada, telehealth was first introduced in the year 1996 [13].

India – Initial steps in telehealth

Tele-health is critical in that it has the potential to bridge the hospital infrastructure and service gap and provide quality healthcare to all in India; where majority of the population lives in rural areas which appallingly lag behind in specialist care facilities. Telemedicine practice was initiated in Lucknow and Chennai in 1997 and was formally launched on March 30th, 2000 [5,10]. ISRO (Indian Space Research Organization) made a modest beginning in this field in India with a Telemedicine Pilot Project in 2001, linking Chennai's Apollo Hospital with the Apollo Rural Hospital at Aragonda village in the Chittoor district of Andhra Pradesh[14]. The first unit of telemedicine was formed in Kerala, 2003, at Medical College Trivandrum. It was soon recognized as a technology effectively taking care of the common interests of a population's health and community welfare. Hence it was subsequently promoted to make available quality medical services to the needy, irrespective of socio-economic disparities and geographic challenges of remote and inaccessible rural places [10].

In India, the first telemedicine network was started between three institutions - AIIMS-New Delhi, PGI-Chandigarh & SGPGI-Lucknow. In 2005, National Telemedicine Task Force was formed by the Union Health Ministry; In the year 2010, National Medical College Network Project was conceived. SGPGIMS was made National Resource Centre for Telemedicine by MoHFW. In 2013, National Rural Telemedicine Network was established in three states of India namely, Rajasthan, Tripura, Andhra Pradesh [15,16]. Arogyasree (means "good health" in Sanskrit) is another mobile/internet-based telemedicine conglomerate that integrates multiple hospitals, mobile medical specialists and rural mobile units/clinics initiated by Indian Council of Medical Research (ICMR) [17]. For COVID-19 All India Institute of Medical Sciences (AIIMS), Delhi is running the "COVID-19 National Teleconsultation Centre" (CoNTeC) on behalf of the Ministry of Health and Family Welfare (MoH&FW) (Can be reached at 9115444155) [18].

Various Definitions of Telehealth and Telemedicine

According to various authors there have been several definition(s) given for telehealth: Health Resources and Services Administration defines telehealth as "the use of technology in care delivery, health information, and remote health education". Tele-health is therefore the use of electronic information, devices, and telecommunication technology to provide direct patient care, remote patient monitoring, and education at a distance [19]. Telehealth is "the use of ICTs to exchange health information and provide health care services across geographic, time, social, cultural, and political barriers" – Scott RE and Mars M [4]. As per National Health Information Management Advisory Council (NHIMAC, 2001), "telehealth is that subset of e-health that includes the application of information technology and telecommunications for diagnostic and treatment services, educational and support services and the organisation and management of health services (including health information management and decision support systems)" [10]. As per Picot J [20], it is "the use of communications and information technology to deliver health and health care services and information over large and small distances". More dimensions were added by Allen who defined telehealth as "the use of electronic information and telecommunications technologies to support long-distance clinical healthcare, patient and professional health-related education and training, public health and health administration" [21].

As per the World Health Organization (WHO), "Telemedicine is the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information, for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interest of advancing the health of individuals and their communities" [22]. As per ATA "Telemedicine is the natural evolution of healthcare in the digital world" [2].

Current Day Applications - Acute and Chronic Diseases

Many studies have endorsed that telehealth/telemedicine is safe for universal care, cost effective, provides quick and quality care, and as technology continues to evolve, the application possibilities are also expanding and are being increasingly utilized by patients, clinicians, and institutions. It includes many aspects of modern health care delivery, like teleconsultation, telefollow-up for preventive and promotive health care by using ICTs, home care monitoring, telepsychiatry, teleradiology, telecardiology, teleneurology, telepediatrics, telerehabilitation, virtual primary care and so on.

Tele consultation is a safe and feasible option for diabetic patients [23], a study of 80 Type II diabetic patients assessing the efficacy of videoconferencing in their management showed that telemedicine was more effective [24] in maintaining physical and physiological parameters such as physical activity, glycemic control and quality of life [25]. A prospective study on 780 patients using telehealth system for diagnosis of COPD and asthma was carried out in three remote primary health care centres. The diagnosis was accurate in 97.32% patients and it was proven to be an extremely cost effective method [26]. Another randomized controlled trial - using telephonic intervention for patients recovering from coronary artery bypass surgery by applying a series of protocols delivered by an experienced cardiac nurse from day one following discharge up to seven weeks - reported that it was an effective method in providing timely reassurance, reducing anxiety and ensuring health promotion [27].

In a report from a telemedicine camp conducted for screening of non-communicable diseases (NCD) in India (to assess awareness about risk factors of common NCDs such as diabetes, cardiovascular diseases, and anemia) in the year of 2015, from six centres across the country; 13615 beneficiaries availed of teleconsultations. From this cohort, 1409 participants

were surveyed for feedback; 99.8% teleconsultation beneficiaries reported that they were “extremely satisfied and very happy” [28].

As there is an increase in burden of chronic neurological disorders amongst geriatric population the access to neurological specialized care is inadequate in many countries. Multiple studies suggest that the impact of telemedicine on patients with Parkinson’s disease and other neurological disorders is significant. Reports have shown that there is reduction in time spent and distance travelled for attending appointments; these appointment televisits can be conducted at home/off site clinic or a nearby nursing home where the patient might be admitted [29]. Teleneurology is feasible, useful in resource limited settings carries low cost, improves long term health related quality of life enables rapid tediagnosis and is also useful in providing teleeducation to patients and their family members [30].

The trend in telepediatric consultation was analyzed for years at PGI Chandigarh, India; it was used to address a vast range of children’s medical problems. Their experience showed its feasibility, cost effectiveness and high level of satisfaction amongst parents. Their experience also highlighted - the legal and ethical issues, reimbursement, security and confidentiality, professional accountability, technical and clinical standards and resistance to change – related to telemedicine [31].

Telehealth during COVID -19 pandemic

At the end of the year 2019, the Wuhan virus pandemic started to change the functioning of the whole world [32]. The pandemic forced everyone to realize that health and immunity was the new mantra in everyone’s life. It fostered - improvement in medical services, major life style changes, changed quality of life, altered mindset towards one’s body, awakened the alertness towards self-protection and enhanced capacity building for facilitation of medical services to the unreached population. The new reality is virtual care of patients combined with the traditional mode of health care delivery system. Not surprisingly, the profound application and usage of telemedicine has been receiving great attention during this pandemic crisis.

Globally, many studies have been published during COVID-19 pandemic that have supported transformation to telehealth services - to reduce gap in provision of health services, navigate the health care system to reach out to remote areas at reduced costs, to provide quality care to the society. In the current high demand situation, e-consultations, remote patient monitoring,

patient initiated messaging, telephonic visits, video consultations have all been utilized by various health care setups to effectively reach out to those in need [33]. Telemedicine was also useful in monitoring high-risk patients with COVID-19 [34]. In India, “Aarogya Setu”; a mobile based app developed by the Government of India has been effectively used to trace infected individuals through a perimeter-network-information and it also provided a proximity-alert to individuals to avoid possible contact with COVID infected individuals [35]. Patients of stroke and post-operative neurosurgical patients were followed up and necessary consultation was provided through telenursing in PGIMER Chandigarh. Online stroke support was proposed at PGIMER, Chandigarh by the team of nurses and neurologists, but was challenging due to issues related to poor technological literacy among patients. A novel real-time remote audiovisual aided doffing approach was used to enhance the safety of frontline healthcare workers during coronavirus disease.

Increasing telehealth presence in nursing

Telenursing has been playing a significant role in COVID-19 pandemic times. Regular telephonic advice and counselling to patients or family members helps tremendously in decreasing anxiety in COVID positive patients [36]. During the pandemic, nursing students were exposed to virtual clinical experiences and telenursing – comprising of clinical case study presentations, e-documentations, improving communication skills through teleconferencing with patients, utilizing nursing process for diagnosis and for outcome evaluation [37].

Even apart from COVID management, the scope of applications of telehealth in the nursing domain is quite wide and is an area of intense research [38]. The applications of telehealth in nursing is based on the evidence based studies published in various national and international journals; these applications aim to provide sustainable and high quality care to the patients and communities placed at any remote place by nurses. Tele nursing also paves the way for many nurse-led interventions in healthcare.

Telehealth created growing roles for nurses in clinical practice, education, research, leadership, formulating policies and also prepared them to optimise health care outcomes. Looking ahead, educational institutions can further enhance telehealth nursing activities by integrating telehealth care technology into the current nursing curriculum [39]. By adopting multimodel/experiential learning modalities - such as simulation, clinical telehealth rotation or working

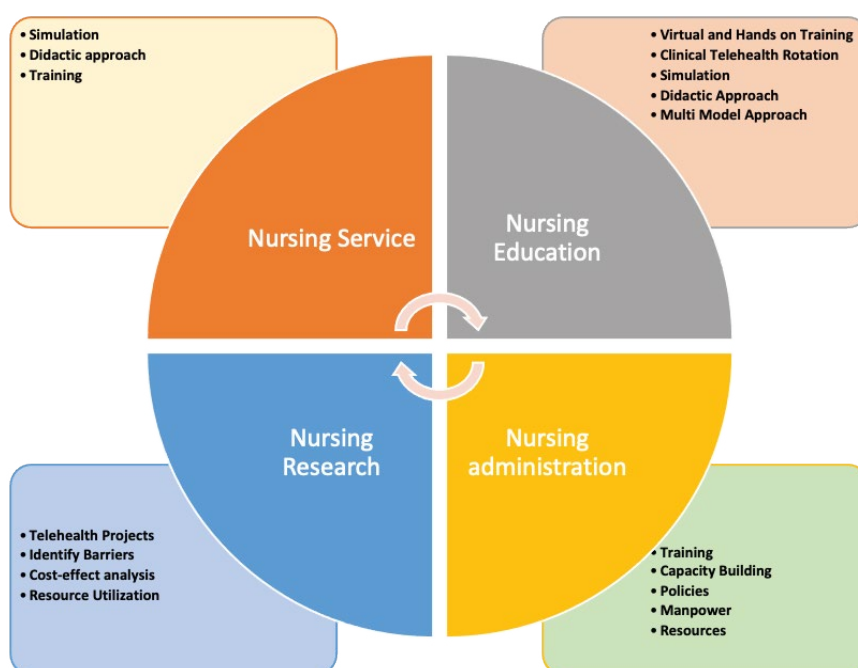


Figure 1. Increasing applications of telehealth in nursing

on projects with experienced telehealth preceptors - that reduce gaps in knowledge, provide hands on skill and competency and modernise attitude needed to maximize the use of telehealth; barriers to increasing use of telehealth technology in primary and specialty care domains can be removed [40]. 4 specific areas of nursing domain can be touched upon by various techniques in the field of telehealth (Figure 1).

Impediments to Adopting Telehealth in India

Telehealth by definition implies delivery of health care services - in situations where distance is the critical factor - by any health care professional, using information and communication technologies. It promises a broad spectrum of benefits; however there still exist certain significant problems that hamstring its adoption and implementation [41].

Lack of awareness and acceptance of new technology both by the public and by healthcare professionals are preventing its projected growth. This is inspite of the various efforts being made by the governments to develop a strong telemedicine network across geographic boundaries but the pace of development is still slow [42,43].

Unfortunately the technology that has been developed to minimize barriers to health care seeking behavior by the citizens is itself facing several hurdles. Some of these hurdles are listed below: [44]

- The concern exists that telehealth may not be ideal for discussing sensitive topics, especially if there is a strong concern for privacy or patient discomfort.
- There may be limited access to ever-evolving technological devices or connectivity issues, on part of either patients or healthcare providers.
- Low Socio-Economic Status and the limitation of understanding technology/availability of telecommunication infrastructure
- Lack of telemedicine training of clinicians may delay the unrolling of a largescale telemedicine programme.
- Regulatory and reimbursement barriers may refrain individuals from using telemedicine. (When patient avails health care services through telemedicine system insurance cover may not be available to them).
- There is no structured/organized legal framework for e-prescription, digital prescription or mobile based SMS prescription. Hence, some medical practitioners do not want to opt for telemedicine practice citing fear of medical indemnity.
- Lack of clear cut guidelines and rules and regulations specific to telemedicine field hinders its application.
- There is still lack of confidence in a proportion of patients about the efficacy of telehealth; making it difficult for a specific patient to believe in it.
- In some societal setups/cultures virtual visits are not yet readily accepted; in lieu of in-person visits by health care workers or patients.

Although certain legal and regulatory challenges remain, the COVID-19 outbreak may be the right impetus for lawmakers and regulatory agencies to promulgate further measures that facilitate more wide spread adoption of telehealth [44,45]. It is necessary for India to take aproactive approach and embrace the powerful digital health service system. Rapid developments in the digital space should urge governments to adopt this modern technology in improving the health of their remotest citizen. Success of telehealth would entirely depend on its pervasive integration with the established health care delivery system; it is bound to fail as a standalone technology. The barriers mentioned above are impeding the speed of expansion of telemedicine and telehealth in developing countries and need to be addressed by all means to maximise positive health outcomes [42,43].

Future Considerations

Application of telemedicine could have reached a tipping point during the COVID-19 pandemic; with a massive spike in its usage, it will definitely gather momentum that will sustain even after the end of this crisis. This will be strongly facilitated by improvements and access to personal mobile technology, the proliferation of 4G and 5G networks, digitally savvy population and a changing regulatory scenario and reimbursement structures.

As the nation continues to confront its post-COVID-19 future and anticipates its new norm, the fate of primary care telehealth will be determined by

- which system, regulatory, financial, policy, and clinical adaptations continue to stand;
- Institution a propensity to scale and sustain efforts
- The desire of patients to engage in new modalities of care. It will be critical that the primary care clinicians continue to maintain a form of permanency on the front foot of care and that more and more patients will expressively appreciate the convenience that telehealth brought to them so that the technology is adopted rapidly by all [44-47].

These also are areas for future study. Sharing recommendations, best practices, lessons learned, and strategies to thrive in an ever-changing landscape will be critical to take healthcare further in this modern century [48-53].

Conclusion

Telehealth is an innovative model that is changing provision of care from hospital to home through intelligent application of technological advances. By understanding and accepting new digital technology, healthcare providers are positioned to give comprehensive medical care to anyone, anywhere and at all times. Currently, limitations still exist including feasibility, cost and limited resource utilization in this field. Though initially the use of telehealth in medical care was having geographically a spotty trend, COVID-19 pandemic has forced all healthcare systems, hospitals and clinics to rapidly implement this technology and the expanded reach of telehealth is amply visible in current times. Still a lot of ground remains to be covered and continued efforts need to be made; to enable outreach of this technology to every doorstep of the country. Health service policy makers and accreditation bodies should make mandatory the availability of reliable and efficient telehealth care services in every single hospital/healthcare delivery setup in the country.

Conflicts of Interest

The authors certify that they have no affiliation with or involvement in any organisation or entity with a non-financial interest or stake in the subject matter of this manuscript. The authors did not receive any specific funding for this work.

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