



Teleophthalmology

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Abstract

The current Covid-19 pandemic is recharting the definition of medical consultancy services, in the interest of safety of both patients and health care providers. Telemedicine is a tool that has seen renewed interest in this regard. Doctors across various fields including ophthalmology are switching to e-consultation formats to improve access to their clientele and to deliver emergency as well as routine care. It is essential to be aware of the various outreach modalities available under the broad umbrella of telemedicine, as well as the medicolegal aspects of such consultancy services. Case consultation for ophthalmologist through telemedicine platforms poses unique challenges and one must be aware as to which tool could act as an efficient adjunct for optimum patient care.

Keywords: Telemedicine; Tele-consultation; COVID-19 Pandemic; Telemedicine Challenges; Digital Health Policy; Tele-ROP; ARMD; Diabetic Retinopathy

Introduction

An integration of electronic information and medical technology, Telemedicine is a rapidly developing field aided by the application of clinical medicine via telephone, internet or other sources for purpose of consultation and occasionally to carry out medical examinations or procedures [1]. World Health Organization defined telemedicine as the delivery of health care services at a distance by using electronic means “for diagnosis or treatment, prevention of disease and injuries, research and evaluation, education of health care providers to improve health” [2]. Similar to telemedicine, the terms “telehealth” and “e-health” refer to broader definitions of remote healthcare that involves both clinical as well as non-clinical services like-medical education, administration and research [3].

Earlier the use and access of telehealth (use of digital technologies to deliver medical care, health education and public health)

was limited to remote or underserved areas for emergencies and disasters, however now it has expanded rapidly around the world.

Telemedicine and India

It has been extensively used since 1960's through telephone mainly in military and space sectors. However, its use has outgrown in recent times and a rapid emergence of various technological modalities to facilitate delivery of health care services at a distance has been seen. In India, the emerging trend of telemedicine is slow, however a few private Telemedicine service providers/clinics have come up in larger cities [4].

Despite the advances made in the medical field, 75% of the overall qualified Doctors and specialists in India are those residing in urban areas. This serves as a major disadvantage to the vast majority of India's population that lives in rural areas. In order to

overcome this problem, Telemedicine could function as a bridge and help enhance the basic healthcare for India's population that is predominantly rural [5].

Classification

There are three main types or categories of telemedicine namely- store and forward, remote monitoring and real-time interactive services [6].

In store and forward type - the medical data like images, bio signals are acquired and then transmitted to a doctor or a medical professional and then it is assessed offline at a convenient time. The presence of both the parties at the same time is not required. The specialities that employ this type of telemedicine include- dermatology, radiology, pathology wherein the clinician mainly relies on history/report and audio/video information of the patient.

In remote monitoring which is also addressed by other names like- self-monitoring or testing, the medical professional monitors patient remotely using various technological devices and this is mainly used for management of chronic diseases or specific health conditions like- heart disease, diabetes, asthma.

Interactive medicine involves-real time interactions between the patient and health care provider by means of online and phone communications and home visits.

Tele-ophthalmology

Teleophthalmology means ophthalmology from a distance and involves examination, investigation, monitoring and treatment of patient's eye related problems with the health care provider and patient located in different geographical areas [7]. The commonly used modes in tele-ophthalmology includes- store and forward in which the data is transmitted to distantly located health care professional and is then assessed and reviewed and the real-time in which there is a live telemedical consultation along with simultaneous collection and transmission of data. Owing to being a highly image-driven speciality, in teleophthalmology the most ideal means of information transmission is the store and forward mode when compared to the real-time videoconferencing [8].

The most common eye diseases that can be easily studied by using teleophthalmology include- age related macular degeneration (ARMD), cataracts, glaucoma and diabetic retinopathy. These

diseases are usually asymptomatic in the early stages thus contributing to a large number of undetected cases and those diagnosed at a stage when the ideal time for treatment has already passed [9]. Since these are diseases of posterior segment, they can easily be evaluated by using retinal examination. Therefore, unlike the visual acuity tests and tonometry, retinal photography can lead to the cause of the disease and serve as an effective diagnostic tool in tele-ophthalmology.

Teleophthalmology and diabetic retinopathy

Visual impairment related to diabetic retinopathy is a major health problem and is known to cause blindness in about 65% - 82% of the people in the age group of 50 years or more [10]. This severe loss of vision can be prevented by early detection and timely treatment. This Early detection and treatment of diabetic retinopathy with the help of tele-ophthalmology has been possible in many rural and urban areas. Fundus photography has proven to be beneficial for patients who do not attend the regular necessary eye exams [11]. The Indian Health Service-Joslin Vision Network has performed diabetic retinopathy screening for American Indians and Alaskan Natives since 2001. This group has demonstrated the utility of teleophthalmology in screening at-risk and remote populations [12].

DR (diabetic retinopathy) screening using tele-ophthalmology has proven to be reliable, cost-effective, accurate and sustained method to identify patients with DR, grade the disease according to its severity and further deciding on the treatment options [13].

Teleophthalmology and age-related macular degeneration

A pilot study done in Singapore showed success rate of teleophthalmology in diagnosing ARMD, media opacity and keratopathy. The study proved that tele-ophthalmology is 100% sensitive and specific in diagnosing such cases [14]. Many other studies were done to identify the factors that could increase the efficiency of teleophthalmology care in relation to ARMD. It was then concluded that incorporation of OCT images can help with telemedicine based screening and management of the same [15].

Teleophthalmology and retinopathy of prematurity

Retinopathy of prematurity (ROP) is seen in low-birth weight pattern infants and is a vaso-proliferative disorder of developing retina that potentially leads to blindness in significant percentage

of affected infants [16]. Amongst the paediatric age group, it is the most common eye related problem that is taken up for diagnosis and treatment via tele-ophthalmology. In tele-screening of ROP cases, the main aim is to assess at risk babies and decrease reliance on limited number of pediatric ophthalmologists. The Ophthalmic Mutual Insurance Company (<http://www.omic.com/rop-safety-net/>) published the "ROP Safety Net" guidelines to provide guidance for safe tele-ROP practice.

It has been reported that diagnosis of ROP by an expert via tele-ROP requires less time in comparison to bedside binocular indirect ophthalmoscopy [17]. Its other advantages includes timely diagnosis and referral of high risk infants to experts, good reliability and point of care treatment services and enhanced patient outcome. Owing to its advantages, many good tele-ROP practice models have evolved over the past decades. A few to be mentioned are- The Stanford University Network for diagnosis of Retinopathy of Prematurity (SUNDROP) and Karnataka Internet Assisted Diagnosis of Retinopathy of Prematurity (KIDROP).

Teleophthalmology and glaucoma

Glaucoma is another common eye disease that is nowadays being screened via using tele-ophthalmology. The screening is often performed by using digitally transmitted optic-nerve photographs usually taken with the help of portable or handheld cameras. This technique helps in capturing stereoscopic optic nerve photos for remote evaluation [18]. Additional tools like intraocular-pressure measurements can help in achieving a better diagnosis. A recent meta-analysis of tele-glaucoma versus in-person screening demonstrated that tele-glaucoma screening has higher specificity and lower sensitivity for glaucoma detection compared with traditional in-person clinical examinations.

Along with its many advantages, tele-ophthalmology has various shortcomings. The most cited ones are the concern of its utility in ocular trauma wherein the photographs and videos aren't very conclusive and also the cost of installation and maintenance of the setup required for tele-ophthalmology are exorbitantly high and could pose a challenge in its widespread acceptance [19].

Discussion and Conclusion

Tele-ophthalmology is a potential resource which if developed properly could work wonders for both patients and healthcare workers both especially in these exceptional situation amidst

the pandemic. Covid-19 has challenged the health care resources of countries across the world and telemedicine can be the key to ease the burden on healthcare. Although tele-ophthalmology is not a new concept but its use is rising rapidly in India and across the world and these days and hence it is pertinent to also discuss about and make sure of the privacy of the doctor-patient interaction which could prove to be a challenging task at times.

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