

## Expanding the scope of tele-ophthalmology from vision centers to home

Dear Editor,

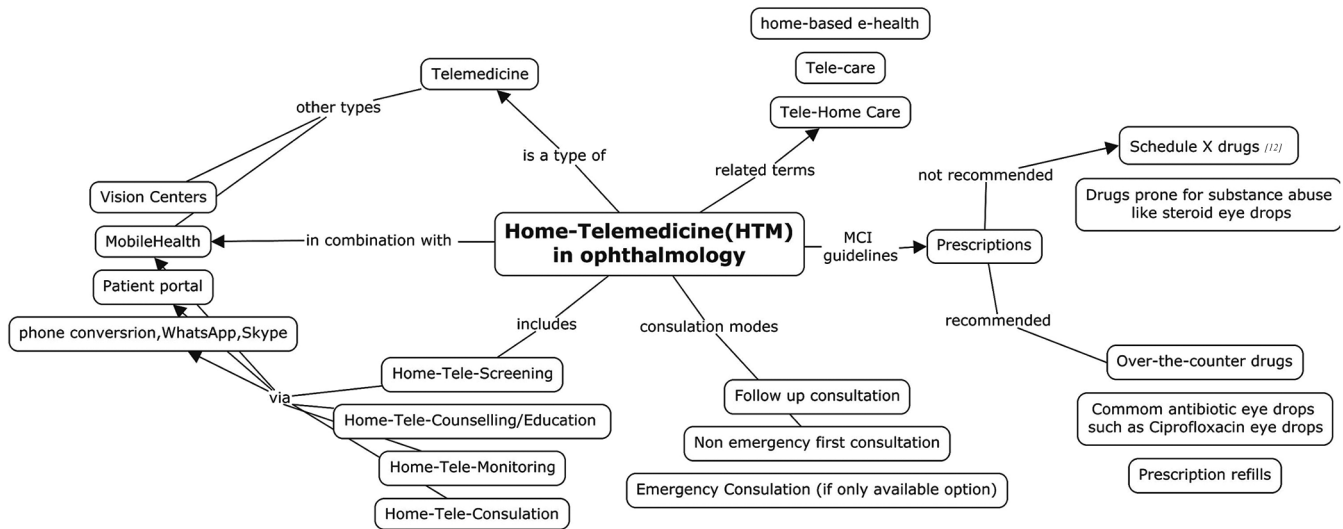
Several articles published in IJO this year have unveiled a broad spectrum of telemedicine topics beginning from challenges posed by the COVID-19 pandemic to reformations at primary, secondary, and tertiary eye care levels. Although the COVID-19 scenario may fade away in a few months to years, it cannot be denied that the new norm set forth by it is likely to raise the standards of eye care delivery. Tele-ophthalmology via Vision Centers (VC) has emerged as the central focus of remedy in assuring safe and continuous delivery of eye care without compromising on the quality of treatment. Several

eye care systems have tried different technological solutions and practice algorithms to combat current hurdles.<sup>[1-6]</sup> Yet, the uncertainty about the prevailing COVID-19 eradication or similar pandemics in the future mandates healthcare systems to further expand from VC to home-telemedicine.

Home-Telemedicine (HTM) [Fig. 1] or home-based healthcare delivery is the use of information, communication, and monitoring technologies that allow healthcare providers to remotely evaluate health status, give educational intervention, or deliver health and social care to patients in their homes. Several terms have been used in literature to describe the provision of healthcare at home such as home-based-healthcare, tele-home care, remote health care, home-telecare, etc.<sup>[7]</sup> All of them describe similar concepts of HTM with a blurred distinction. Fig. 1 provides a comprehensive overview of various concepts involved in HTM in ophthalmic practice, in short, Home-teleophthalmology.

**Table 1: Comparison of Vision Centers vs Home telemedicine**

Comparison VCs vs HTM		
Similarities		
Modes of communication	Both synchronous and asynchronous	
Legislatures <sup>[8]</sup>	1. Patient doctor identity must be established 2. The patient gets the same standard of care as face-face consult 3. Consent obtained and recorded (Implied or explicit) 4. Maintenance of medical records 5. Patient confidentiality and identity must be protected (IMC professional conduct etiquette and Ethics-regulation 2002 and IT) 6. Fee taken as face to face consult	
Differences		
Type of Tele consultation <sup>[8]</sup>	Telemedicine via Vision Centers	Home-Teleophthalmology
Set up and location	Satellite connection registered to a particular institution	At home using a broadband connection
Technical Equipment	1. A computer/mobile device 2. An integrated/external microphone	1. A computer/mobile device 2. laptop, tablet, and smartphone or even telephone
Ophthalmic Equipment	Slit lamp, tonometer, refraction units, An integrated/external camera, Fundus camera	Home screening tools such as vision screening, <sup>[9]</sup> Amsler chart for ARMD, <sup>[10]</sup> I-care. <sup>[11]</sup>
Prescriptions	Limited restrictions in prescribing a drug	Over the counter (OTC) and certain antibiotic eye drops <sup>[12]</sup>
Personnel	Vision Technician (VT) mediates the consultation	Can be patient or any layman
Patient records and confidentiality	Can be easily maintained	Might not be always possible
Advantages	Data more reliable	Comfort of home
Disadvantages	Cost for infrastructure and manpower training	Prone to errors



**Figure 1: Concept Map of Home-Telemedicine in Ophthalmology**

Moreover, several concepts of vision centers are intermixed with HTM. A comparison of HTM vs VC is depicted in Table 1.

Mhealth (mobile Health) has the potential to expand eye care in the comfort of home. WHO defines mHealth as the “use of mobile and wireless technologies to support the achievement of health objectives”.<sup>[13]</sup> According to the International Telecommunication Union over 85% of the world’s population now is covered by a commercial wireless signal. In developing countries like India, the penetration of mobile phone network has surpassed other infrastructures. With Smartphones evolving

as mini computers, the applications of mHealth have extended from home-teleconsultations to health information exchange mediums within one’s home. Smartphones can bridge the gap between patients and ophthalmologists via self-screening of vision, remote patient monitoring of visual field defects in ARMD, scheduling appointments, reminding prescription refills, and educating patients.<sup>[14]</sup> Therefore mhealth is crucial in the adoption and dissemination of Home-teleophthalmology. Vision screening smartphone applications such as PEEK Acuity, Kay iSight, and Amsler’s grid enable remote patient vision screening and monitoring.<sup>[15]</sup> Web-based refraction systems

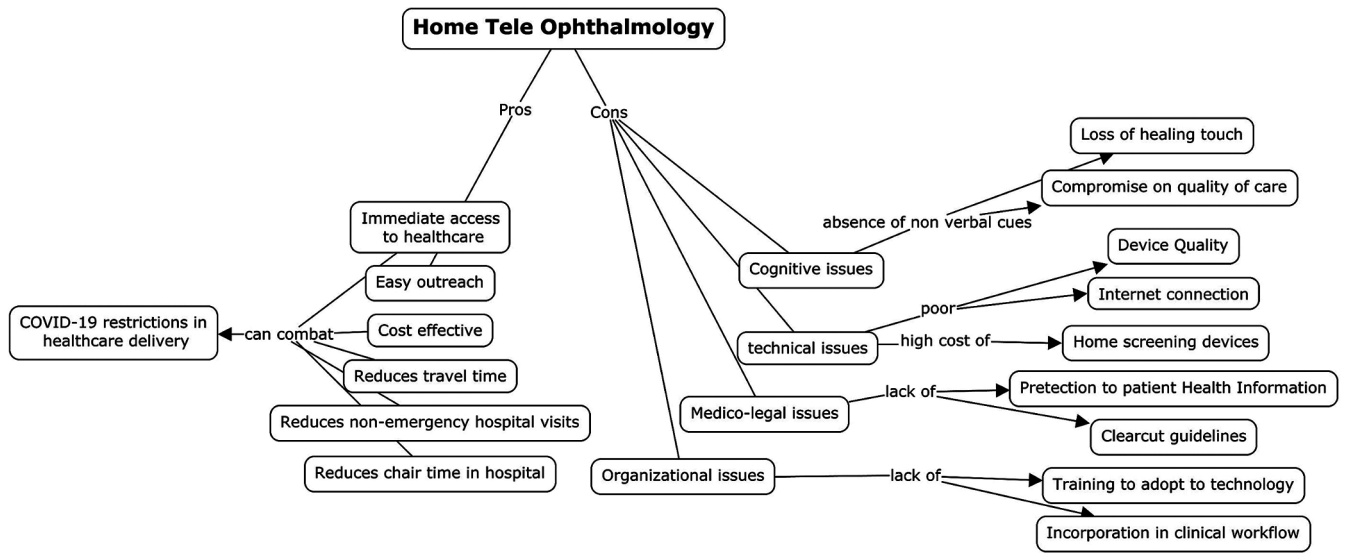


Figure 2: Pros and Cons of HTM in Ophthalmology

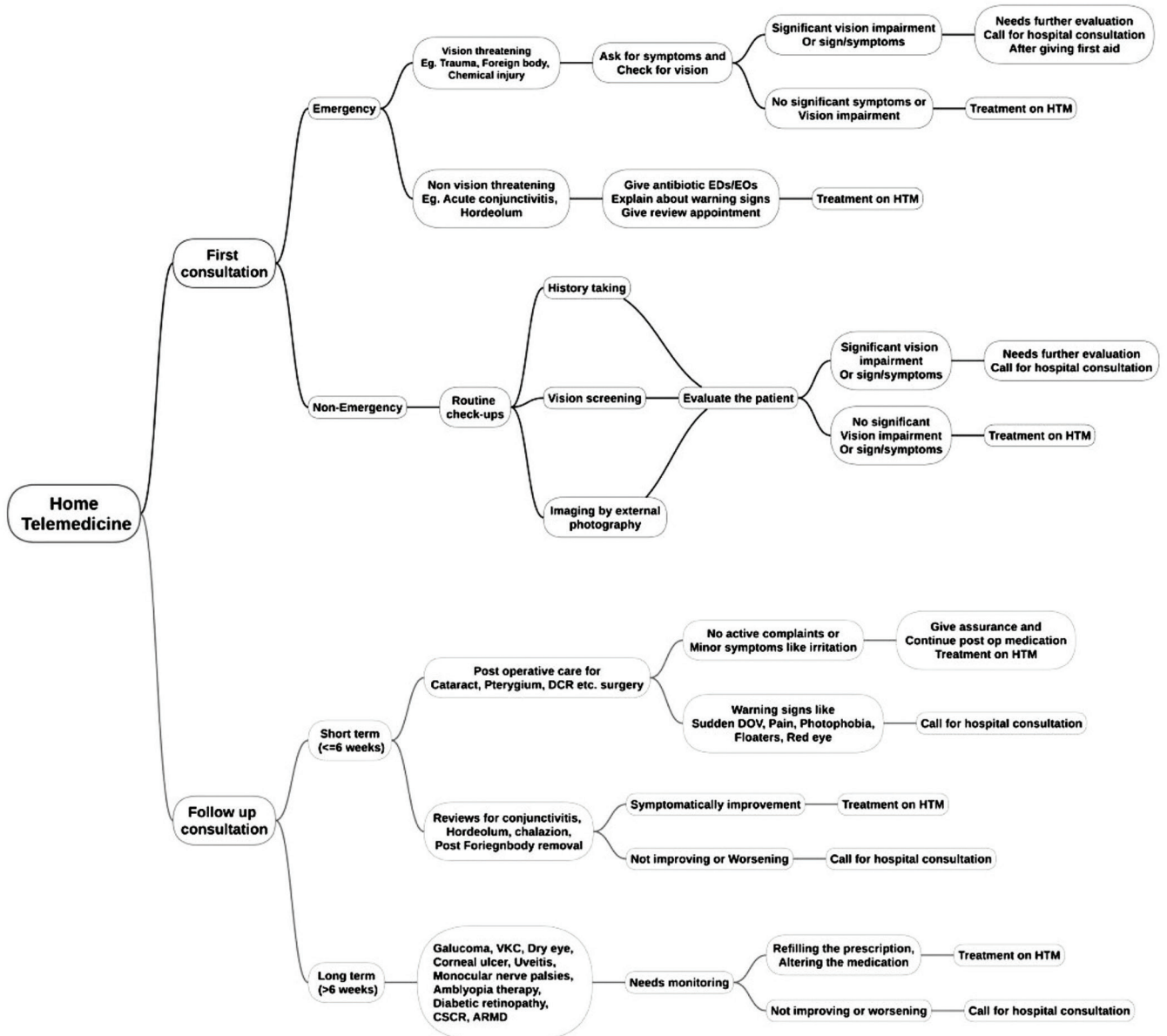


Figure 3: Management Algorithm for HTM in Ophthalmic Practice

like EyeNetra can unlock the whole new area in telemedicine in community eye health.<sup>[9]</sup> Paxos Checkup (DigiSight Technologies, Inc, San Francisco, California, USA), currently in clinical studies, is a vision-assessment application that offers patients clinically validated tests such as Snellen visual acuity, dynamic Amsler grid, contrast sensitivity, color discrimination, and low-luminance acuity/contrast.<sup>[16]</sup> ForeseeHome is a lightweight, portable device that connects to an Independent Diagnostic Testing Facility (IDTF) via a wireless network, cellular modem, or landline. The ForeseeHome device was validated in the AREDS2 HOME (Home Monitoring of the Eye) Study.<sup>[17,10]</sup> Home-teleophthalmology has the potential to solve the inequitable distribution of eye care by reaching remote areas.<sup>[10]</sup>

Barriers to implement home-teleophthalmology include medico-legal issues, deterioration of the doctor–patient relationship,<sup>[18]</sup> physician and patient readiness to adopt the technology, lack of home-based instrument technology for eye care, and high cost of existing resources. Fig. 2 illustrates the pros and cons of HTM in ophthalmic practice. The guidelines suggested by the Ministry of Health and Family Welfare (MOHFW) on telemedicine could be applied to HTM practice too. There is a concern due to a lack of clear practice guidelines exclusive to Home-teleophthalmology. Prescribing in HTM entails the same professional accountability as in the traditional in-person consult. Ophthalmologists must cautiously prescribe Over-The-Counter drugs and prescription refills with low or no abuse potential, especially topical steroids. The prescription must be issued as per the Indian Medical Council Regulations and should abide by the provisions of the Drugs and Cosmetics Act and Rules.<sup>[12]</sup> This also calls for the need to revise institutional and national policies on healthcare delivery to facilitate home-teleophthalmology. An online program will be made available by the Board of Governors in the supersession of the Medical Council of India to enable all clinicians to practice telemedicine and get familiar with telemedicine guidelines.<sup>[8]</sup> Unlike vision centers, home-teleophthalmology has to be implemented by the patient themselves. Therefore it becomes the added responsibility of Eye care professionals to educate and train patients and/or their caretakers to efficiently use technology in the management of eye disorders. high-cost instruments such as I-care HOME tonometer (I-care Finland Oy, Vantaa, Finland)<sup>[11]</sup> limits its use in household monitoring in Countries like India.

Future prospects for the practice of HTM in ophthalmic practice are promising. Under the Digital India project, internet connectivity has spread to rural areas and has increased in the use of smartphones.<sup>[19]</sup> These conditions favor virtual consultations and screening of patients through HTM. Further advancements in technological innovations in home screening devices and validation of existing technology could support healthcare systems to incorporate HTM into their workflow. 3D printing is yet another technology that has been encouraging in eye care provision beginning from smartphone adapters for fundus pictures to eye drop self-administration stands.<sup>[20]</sup> By integrating Medical instrument technology and Information technology, HTM can be more efficiently utilized in ophthalmology compared to other medical specialties which mostly need tactile contact for the diagnosis. This calls for eye care professionals to validate these technologies in their day to day practice.

Fig. 3 depicts a management algorithm for HTM in ophthalmic practice. The algorithm serves as a primer to enable ophthalmologists to incorporate HTM practice into

their current workflow. This is not a treatment protocol but a practice guideline to remotely treat patients without compromising the quality of care. Patient data collection and payment gateways should be used appropriately for medico-legal safety and patient information security purposes. To conclude expanding the scope of tele-ophthalmology from vision centers to home-teleophthalmology embarks a new era of ophthalmic healthcare delivery that can outreach to households.

#### Financial support and sponsorship

Nil.

#### Conflicts of interest

There are no conflicts of interest.

**Lokeshwari Aruljyothi, Alap Bavishi,  
Manohar Babu Balasundaram, Anuja Janakiraman,  
Kritika Shekar, Harshita Atmakur**

Department of Ophthalmology, General Ophthalmology Services,  
Aravind Eye Hospital, Salem, Tamil Nadu, India

**Correspondence to:** Dr. Alap Bavishi,  
Aravind Eye Hospital, Nethimedu,  
Salem, Tamil Nadu, India.  
E-mail: alapbavishi@gmail.com

#### References

- Sharma M, Jain N, Ranganathan S, Sharma N, Honavar SG, Sharma N, *et al.* Tele-ophthalmology: Need of the hour. *Indian J Ophthalmol* 2020;68:1328-38.
- Nair AG, Gandhi RA, Natarajan S. Effect of COVID-19 related lockdown on ophthalmic practice and patient care in India: Results of a survey. *Indian J Ophthalmol* 2020;68:725-30.
- Sanjay S, Garg A, Shetty R, Shetty N, Shetty BK. Impact of COVID-19 on a tertiary eye hospital. *Indian J Ophthalmol* 2020;68:1485-6.
- Bhaskaran K, Sharma P. Distancing? But still I-care: Tele-ophthalmology during COVID-19 era. *Indian J Ophthalmol* 2020;68:1243-4.
- Jayadev C, Mahendradas P, Vinekar A, Kemmanu V, Gupta R, Pradhan ZS, *et al.* Tele-consultations in the wake of COVID-19 – Suggested guidelines for clinical ophthalmology. *Indian J Ophthalmol* 2020;68:1316-27.
- Honavar SG. Navigating the new normal in ophthalmology. *Indian J Ophthalmol* 2020;68:957-8.
- Solli H, Bjørk IT, Hvalvik S, Hellesø R. Principle-based analysis of the concept of telecare. *J Adv Nurs* 2012;68:2802-15.
- Telemedicine Practice Guidelines [Internet]. Available from: <http://www.mohfw.gov.in/pdf/Telemedicine.pdf>. [Last accessed on 2020 Sep 03].
- Agarwal A, Bloom DE, deLuise VP, Lubet A, Murali K, Sastry SM. Comparing low-cost handheld autorefractors: A practical approach to measuring refraction in low-resource settings. *PLoS One* 2019;14:e0219501.
- AREDS2-HOME Study Research Group; Chew EY, Clemons TE, Bressler SB, Elman MJ, Danis RP, *et al.* Randomized trial of a home monitoring system for early detection of choroidal neovascularization home monitoring of the Eye (HOME) study. *Ophthalmology* 2014;121:535-44.
- Icare-USA.com [Internet]. IOP self-measuring anywhere, anytime. Available from: <http://icare-usa.com/products/icare-home-tonometer/>. [Last accessed on 2020 Jun 06].
- Government of India (2011). "National Formulary of India, 4<sup>th</sup> Edition, 2011" (PDF). [cdsco.nic.in](http://cdsco.nic.in). Retrieved 2019-02-17.

13. Kay M, Santos J, Takane M. mHealth: New horizons for health through mobile technologies. *World Health Organization* 2011;64:66-71.
14. Akkara JD, Kuriakose A. Innovative smartphone apps for ophthalmologists. *Kerala J Ophthalmol* 2018;30:138.
15. Shah VA, Pandya HK. Smartphones for Visual Function Testing. Retrieved July. 2015;4:2017.
16. Holekamp NM. Moving from clinic to home: What the future holds for ophthalmic telemedicine. *Am J Ophthalmol* 2018;187:xxviii-xv.
17. Adams M, Ho CY, Baglin E, Sharangan P, Wu Z, Lawson DJ, *et al.* Home monitoring of retinal sensitivity on a tablet device in intermediate age-related macular degeneration. *Transl Vis Sci Technol* 2018;7:32.
18. Akkara JD, Kuriakose A. Commentary: Teleophthalmology and electronic medical records: Weighing the pros and cons of unavoidable progress. *Indian J Ophthalmol* 2020;68:367.
19. Digital India.gov [Internet]. Digital India-Power to empower. Available from: <https://digitalindia.gov.in/ebook/dot/page2.php>. [Last accessed on 2020 Jun 01].
20. Akkara JD, Kuriakose A. The magic of three-dimensional printing in ophthalmology. *Kerala J Ophthalmol* 2018;30:209.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Access this article online	
<b>Quick Response Code:</b>	<b>Website:</b> <a href="http://www.ijo.in">www.ijo.in</a>
	<b>DOI:</b> 10.4103/ijo.IJO_2217_20

**Cite this article as:** Aruljyothi L, Bavishi A, Balasundaram MB, Janakiraman A, Shekar K, Atmakur H. Expanding the scope of tele-ophthalmology from vision centers to home. *Indian J Ophthalmol* 2021;69:442-6.

© 2021 Indian Journal of Ophthalmology | Published by Wolters Kluwer - Medknow