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Teledermatology Practice: the need of the hour

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Pandemics like influenza, plague have posed a great threat to humanity in the past. Recent outbreak of COVID-19, a viral pandemic has motivated the global community for social distancing and enforcement of lock-down. Teledermatology Practice (TP) is an effective, safe and fast medium to reach the one who is difficult to reach. It is a medium for a dermatologist to cater the needy patients. Store and forward (SAF) teledermatology with mobile apps (e.g. whatsapp) performs the capture, transfer and store the clinical images. This overview provides an insight to TP. In Indian scenario SAF TP meets the technical requirement is economical and easy to practice. Spotters, pediatric, geriatric, and chronic cases are managed with TP. Indian Association of Dermatologists, Venereologists, and Leprologists (IADVL) in view of COVID-19 situation encourages its members to perform TP and provide care.The members may practice TP after observing all conditions as in telemedicine guidelines prepared by National medical council (NMC), with due caution.

History of telemedicine

In 1906, Wilhelm Einthoven discovered telecardiogram[1] and was successful in the transmission of electrocardiogram using a telephone network. The Nebraska Project[2] USA, in 1959, used videoconference (VC) for psychiatry patients which were conducted between two hospitals within a distance of 150 kilometers. Between 1960 and 1970, research to monitor astronaut's heart rate, blood pressure and electrocardiogram was conducted[3]. The term teledermatology was introduced by Prednia and Brown[4].Teledermatology in a nursing home setting was first demonstrated by Zelickson and Homan[5].

Teledermatology Practice (TP) is performed everywhere including as far as SouthPole[6], as remote as Faroe Islands[7], rural India[8], USA[9],Africa[10], in austere environments[11].Teledermatology is a branch of dermatology involving application of electronics, communications and information technology to transmit the information between the patient and dermatologist and vice versa for research and practice to cater dermatology care [4,12].

Similar to radiology, dermatology is a visual specialty; availability of clinical andhisto-pathological images for diagnosis make it an ideal choice for TP.

A TP consultation is provided without exposing staff to viruses/infections in the times of contagious disease outbreaks like COVID-19. TP can prevent the transmission of infectious diseases reducing the risks to both health care workers and patients. Unnecessary and avoidable exposure of the people involved in delivery of healthcare can be avoided using TP.COVID-19, a viral pandemic is a well suited scenario in which dermatologists can evaluate and manage patients using TP.

AIM

The aim of TP is to reach the one who is difficult to reach. provide dermatology care in remote geographic regions or needy population or in situations like serious pandemics like COVID-19 or war where the population is under lockdown . Early care is provided and difficult to manage cases are not neglected.

Scope & purpose/indications

TP reduces multiple visits for follow-up care and benefits elderly and especially those coming from far-off places. It saves cost & time. A TP applies to diagnosis, treatment, and follow-up of skin disorders and education. Teledermatology was found to be cost-effective and reliable in reducing in-person visits, saves time and allows for the faster delivery of care. TP provides triage, reduces waiting time. The various indications[13-26] are summarized in table 1.

- **Diagnosis-** Cases that present with characteristic morphology with typical distribution pattern
- **Follow-up care-Chronic cases** that persists for a longer period and **are** characterized by remissions and exacerbations like leg ulcer[13-14], psoriasis[15-17], leprosy[18] and acne vulgaris[19-20]
- **Investigation procedure-** Patch test in allergic contact dermatitis[21,22]
- **Skin cancer triage**[23-25]
- **Dermato-surgery/aesthetic care-** triage & counseling[26]
- **Second-opinion** for difficult to manage cases
- **Education** –train residents & update knowledge for dermatologists

Table-1: Summarizes the various indications for teledermatology practice

Teledermatology for geriatric care[27]

Store-and-forward teledermatology can improve diagnostic and therapeutic care for skin disease in elderly who lack easy and/or direct access to dermatologists.

Teledermatology for paediatric care[28]

Accurate triage and diagnosis of childhood dermatology cases, decreases travel and outpatient clinic visits, and provides an avenue for ongoing support and education for primary care physicians.

Teledermatology for emergency conditions[29-31]

The Skin Emergency Telemedicine Service has proved to be a successful, sustainable and valuable addition to the specialist dermatology services provided across Queensland,Australia[29].The use of teledermatology within the context of emergency-based care has gained a high degree of patient's acceptance and confidence[30].New-generation mobile devices reduce the cost of videoconferencing, increase the adaptability of teledermatology, and decrease general practitioner time[31].

Teledermatology and diagnostic agreement:

Systematic reviews by Levin and Warshaw[32]showed that there is good diagnostic agreement when comparing a teledermatology diagnosis and in-person clinical diagnosis or histopathology with traditional face-to-face consultations. The diagnosis concordance between dermatologists and teledermatologists increased from 92% to 98% (95% CI, 87%-100%) when overlaps between differential diagnoses were considered as partial agreements. The diagnostic accuracy of SAF TP was good and comparable to video conference TP. Health-care providers need to plan for appropriate utility of SAF TP either alone or in combination with video conference TP to implement and deliver teledermatology care in India[33]. Messenger apps (ex. Whatts app) are a medium for TP.

Teledermatology and patient satisfaction

One of the main areas of patient dissatisfaction for both live video and SAF teledermatology revolved around the lack of follow up[34,4]. Therefore, the referring physician plays a pivotal role in conveying the dermatologist's recommendations to the patient, which can have a major impact on patient satisfaction in the field[35]. Patient satisfaction will play an integral role in the further growth, development, and implementation of teledermatology. Direct consult may increase patient satisfaction.

Teledermatology and cost –effectiveness

SAF teledermatology is cost effective in terms of significantly decreasing the need for in-person visits[36]. Real-time interactive teledermatology has been found to be time consuming than SAF dermatology[37]. Video call is mostly used to counsel the patient.

The organization of teledermatology practice[12,38]

The organization of TP for a self-practicing dermatologist is illustrated in the figure-1. It comprises a basic model-SAF teledermatology, where a dermatologist interacts with the patients directly for regular cases (spotters) along with online discussion forum to obtain a second opinion on management of difficult-to-manage cases.

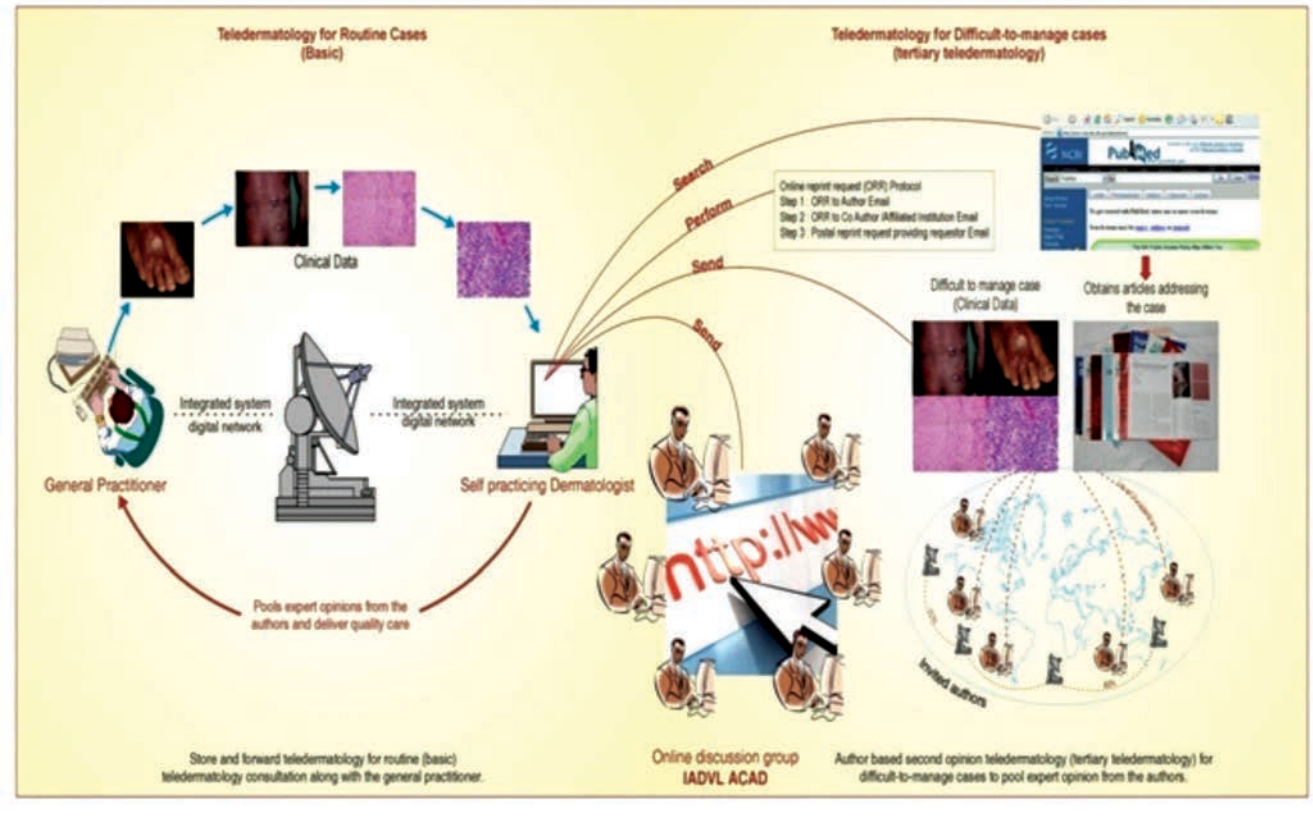

Figure:1 Illustration of the organization and process involved in of teledermatology practice for a dermatologist to manage regular case (to use Store & forward teledermatology practice) as well as difficult-to-manage cases (to use online discussion forum) and deliver care (Modified with permission from Kanthraj GR. J Eur Acad Dermatol Venereol. 2010; 24:961-6.)

Pre requisites for teledermatology practice[39-40]:

(1) A dermatologist should obtain a proper history

(2) patient Should be able to provide electronic images of the skin disorder.Landow[39] summarizes the requirements for a successful TP as: (1) image quality; (2) preselection of patients (tumoral conditions are the simplest; nevi evaluation should not exceed 1--2 lesions at most; multiple nevi patients should be excluded; hair conditions are difficult to photograph and diagnose[40]);(3) a dermoscopic image is a requirement for pigmented and tumoral lesions; and (4) good internet connectivity

Store-and-forward teledermatology

Static images of clinical and histopathological data are accessed anytime and anywhere. They are transferred from a general practitioner to a specialist to deliver the management. Dermatology cases that can be diagnosed by face-to-face examinations (spotters) have a good diagnostic accuracy by SAF TP. A diagnosis agreement of 89%[41]has been documented. SAF TP is cheap and easy to set up and practice. It is the commonest teledermatology tool as most of the cases are dealt and often regarded as a basic model for a TP

Videoconference

It is a live or interactive teledermatology. General practitioner, patient and specialist interact with one another using live/motion images. Various feasibility studies[42, 43]have confirmed good diagnostic accuracy when video conference is compared to face-to-face consultation.

Hybrid teledermatology

This is a combination of both video conference and SAF TP to overcome the shortcomings faced when either of them is used individually[44].

Store-and-forward teledermatology versus videoconference

Good patient and physician satisfaction along with good diagnosticaccuracy is achieved in all. The simultaneous presence of a health care professional is required in video conference and hybrid teledermatology and his or her presence may not be required in SAF TP.SAF TP is the most cost-effective and convenient TP tool compared to Video conference. The time taken for consultation is least for SAF TP and more in video conference and hybrid teledermatology. Motion images are used in video conference, still images are used in SAF TP,and both the types of images are used in hybrid teledermatology.A hybrid system with audio is no better than SAF TPalone[45].However, in the current context of mobile messenger apps -whatsapp consult for example, videos can be stored and forwarded and have emerged as a widely used medium for TP.

Mobile teledermatology

The term mobile teledermatology represents the transmission of images via mobile phones [46, 47]as well as through personal digital assistants[48]. Motion and still images are transferred. Advanced net-work technology along with the mobile messenger apps has revolutionized TP. Android technology and apps find an application medium to capture, transfer and store the images[49-50].

Teledermatopathology

Transmission of histopathological images of skin using information technology for expert opinion is called teledermatopathology[51]. Teledermatopathology is achieved by (i) video-image (dynamic) analysis; (ii) store and forward (static); and (iii) web-based virtual slide system[52]. A virtual slide system is a recentlydeveloped technology where a robotic microscope isused; any field of the specimen is selected for better digitalization at any required magnification at the discretion of the dermatopathologist.

Teledermoscopy[53-58]

Pigmented skin lesions and melanoma are analyzed based on the dermoscopic criteria [53] that depend on characteristic changes in epidermis and dermis. Dermoscopy images[54] are transmitted for expert opinion using routine TP tools like SAF TP or tertiary TP for second opinion. If these images are transferred using mobile technology, it is called mobile teledermoscopy. Pigmentary skin lesions are screened using mobile teledermoscopy[55].

Online discussion forums[59-63]

Difficult to manage cases are a challenge to the health care system. An online discussion forum is formed with a group of dermatologists who share constructive suggestions[59-61]for a submitted case. Feasibility studies have confirmed 81% concordance with face-to-face consultation[59]. Members of academic societies like Indian Association of Dermatologists, Venereologists and Leprologists have formed an online discussion forum at ACAD_IADVL@googlegroups.com (an e-mail group) and participate in regular academic discussions. Telederm.org[59],Rxderm[60],Virtual Grand Rounds inDermatology[61], and Black Skin Dermatology Online[63]are the examples of online discussion forums. Experts may be unavailable for an instant case or dermatologists and allied research workers who might have carried out research involving an online discussion forum may not have registered at the site and at times consensus may not be reached for a case without these experts are the limitations of online discussion forum.

The various teledermatology tools, health care professionals involved to provide dermatology care are summarized[64] in figure 2.

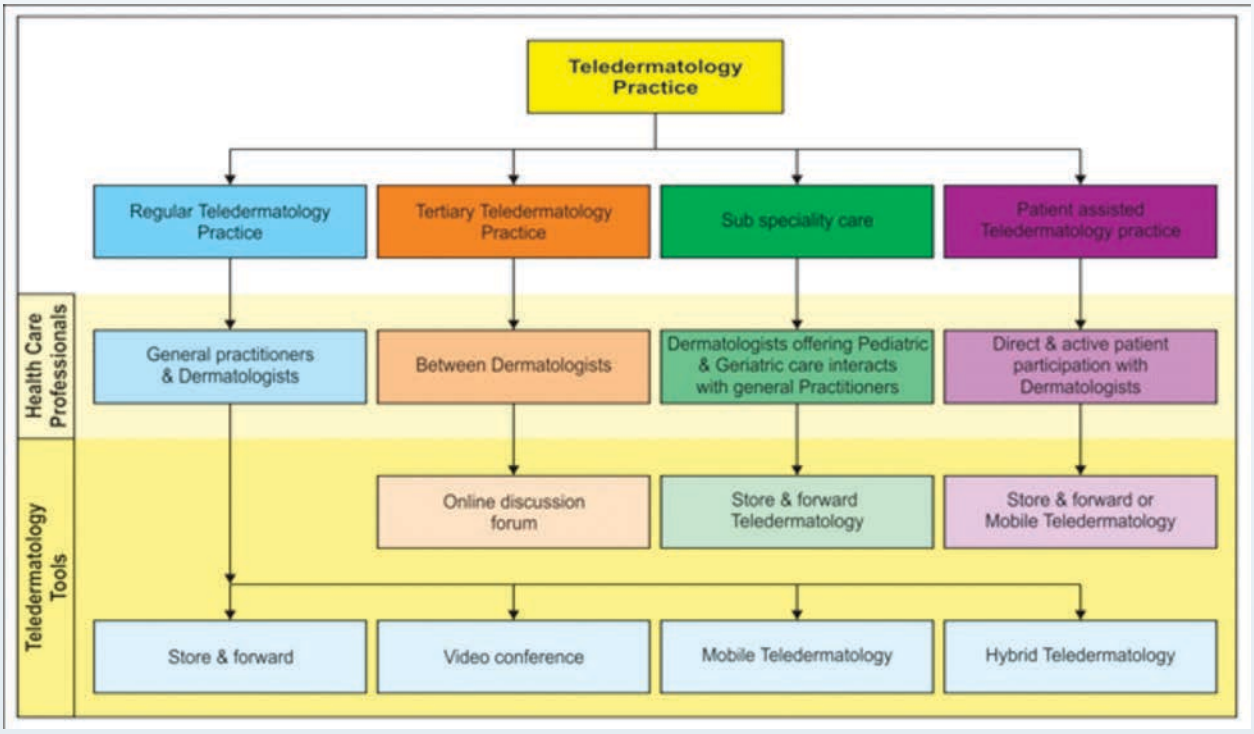

Table-2 Summarizes the various teledermatology tools used for patient care (Reproduced with permission from Kanthraj GR.*Indian J Dermatol VenereolLeprol*. 2015; 81:136–143)

Limitations

Poor net connectivity, poor image quality, and lack of referral proforma data can limit TP.

All cases are not feasible for TP with an objective of diagnosis. The cases that may not be diagnosed by spot examination are summarized in table 3.

- A typical presentation.
- Non-specific presentation.
- Varied morphology.
- Requires palpation ex. Skin tumors.
- Multi-organ involvement ex. Steven–Johnson syndrome/Toxic epedermo necrolysis.
- Rare diseases –syndromes/genodermatoses (Apart from skin examination palpation for multi system involvement may be needed).
- Diseases that requires criteria to diagnose ex. Atopic dermatitis, Systemic lupus erythematosus and Behcet's disease.
- Symptomatic presentation ex. generalized itching, burning excessive sweating /hyperhidrosis (without any obvious lesions to capture the image & requires evaluation of the symptom/s by investigations).
- Represent a clinical entity due to various causes ex, erythroderma, palmo-plantar keratoderma, urticaria & leg ulcer.

Table: 3 Summarizes the various clinical situations a dermatologist may choose not to offer teledermatology practice for diagnosis purpose. In these situations initial face-to-face examination needs to be performed followed by teledermatology practice for chronic conditions to deliver follow-up care.

The Requirements for real-time videoconferencing (synchronous encounters) and SAF teledermatology have been specified by American Telemedicine Association[65]. Monitors for viewing images shall have a minimum of 1024x768 pixel resolution, minimum contrast ratio of 500:1, minimum luminance of 250 cd/m2 and minimum dot pitch of 0.19[65].

In India, till now there was no legislation or guidelines on the practice of telemedicine through video, phone, internet-based platforms (web/chat/apps etc). Recently the board of governors of medical council of India along with NITIAayog has prepared the guidelines for telemedical practice[66].The detailed guidelines about the role of patient, health care provider and technology platform are highlighted[66].Each patient will be identified by a unique and universal patient identifier so that one central patient information record can be assimilated, comprehensive medical databases can be built, or if the patient wants, he/she can move across multiple providers without losing data. Same principles apply irrespective of the mode (video, audio, text) used for a telemedicine consultation[66].

Guidelines for technology platforms enabling telemedicine prepared by the board of governors of medical council of India along with NITIAayog[66]

This specifically covers those technology platforms which work across a network of Registered

Medical Practitioners (RMP) and enable patients to consult with RMPs through the platform

1 Technology platforms (mobile apps, websites etc.) providing telemedicine services to consumers shall be obligated to ensure that the consumers are consulting with RMP duly registered with national medical councils or respective state medical council andcomply with relevant provisions.

2 Technology platforms shall conduct their due diligence before listing any RMP on its online portal. Platforms must provide the name, qualification and registration number, contact details of every RMP listed on the platform.

3 In the event some non-compliance is noted, the technology platform shall be required to report the same to Board of Governors, in supersession to Medical council of India who may take appropriate action.

4 Technology platforms based on Artificial Intelligence/machine Learning are not allowed to

counsel the patients or prescribe any medicines to a patient. Only a RMP is entitled to counsel or

prescribe and has to directly communicate with the patient in this regard. While new technologies such as Artificial Intelligence, Internet of Things, advanced data science-based decision support systems etc. could assist and support a RMP on patient evaluation, diagnosis or management, the final prescription or counseling has to be directly delivered by the RMP

6 Technology Platform must ensure that there is a proper mechanism in place to address any queriesor grievances that the end-customer may have

7 In case any specific technology platform is found in violation, BoG, MCI may designate the

technology platform as blacklisted, and no RMP may then use that platform to providetelemedicine.

Teledermatology and law

There is no definite legislation addressing the TP. One cannot take shelter on the pretext of teledermatology consultation. A medico-legal principle of traditional consultation applies to TP[67].All prescriptions need to be signed duly by a RMP as per the Drugs and Cosmetic Rules 1945.The physician is responsible for the issues related to security, privacy and confidentiality of patient data. The American telemedicine association guidelines[65] recommend that each healthcare provider and patient should have a uniqueIdentifier and the images are stored confidentially in secured data base. Encryption for storage of patient data and for transmitting medical information should be in-built.

Use a disclaimer[68], that may read as "the medical opinion is only based on records available without direct contact with the patient and hence, this advice is only to guide the referring doctor and cannot equate face-to-face consultation".

Medical ethics, data privacy and confidentiality[66]

Principles of medical ethics, including professional norms for protecting patient privacy and confidentiality as per IMC Act shall be binding and must be upheld and practiced. RMP would be required to fully abide by Indian Medical Council

(Professional conduct, Etiquette and Ethics) Regulations, 2002 and with the relevant provisions of the IT Act, Data protection

and privacy laws or any applicable rules notifiedfrom time to time for protecting patient privacy and confidentiality and regarding thehandling and transfer of such personal information regarding the patient[69]. This shall be binding and must be upheld and practiced.

Registered Medical Practitioners will not be held responsible for breach of confidentiality if there is a reasonable evidence to believe that patient's privacy and confidentiality has been compromised by a technology breach or by a person other than RMP. The RMPs should ensure that reasonable degree of care undertaken during hiring such services.

Teledermatology and education[40,70-72]

TP plays a vital role in education. Resident training, exchange of knowledge and opinion between different dermatologists, learning of dermatological diseases from different parts of the world are the roles of tele education[70]. WhatsApp groups make it possible for dermatologists and other specialties to discuss various dermatological diseases and their appropriate management.

It is one of the easiest media to exchange knowledge and experience on a one–on-one basis. It is considered to be one of the safest instant messaging media because of encryption technology[70]. Dermatology residents feel more confident at handling various disorders with additional TD learning[71]TD can reduce the residents' empathetic nature toward patients; reduce the patient-physician relationshipand loss of integral approach rather than focusing on single lesions[71-72]

Teledermatology and reimbursement

Reimbursement policies for teledermatology services are rather new and vary significantly from pace to place. The Netherlands offers full reimbursement for services and has completely integrated teledermatology into its healthcare system[73]. However, in the United States, reimbursement remains a major challenge in telemedicine and continues to evolve in recent years. Currently, all states and the District of Columbia have defined telemedicine law, regulations, and Medicaid policies) in USA reimbursement varies from state to state[74].

Reimbursement for live video teledermatology far exceeds the reimbursement for SAF teledermatology. Many states restrict reimbursement coverage to live video teledermatology only and exclude SAF teledermatology.[74]

In Indian context as per recent NMC guideline[66], telemedicine consultations should be treated the same way as in-person consultations from a fee perspective: RMP may charge an appropriate fee for the telemedicine consultation provided[66].An RMP should also give a receipt/invoice for the fee charged for providing telemedicine based consultation.

A protocol for TP: According to a survey completed by Armstrong et al,[75] most teledermatology programs have shifted from live interaction video to the store-and-forward modality due to its technological flexibility and lower cost of service delivery. A dermatologist should screen the received clinical image from a general practitioner or **s**elf acquired patient images[76-77](selfies) and define the objective/purpose of dermatology care (Figure-2). If the case suits for diagnostic purpose, a treatment is offered. A clinician should be aware of the dermatological conditions where not to offer consultation for diagnostic purpose

(table-3). In these cases, perform face-to-face examination, investigate, analyze, offer treatment and provide for follow- up care by TP (Figure-2).

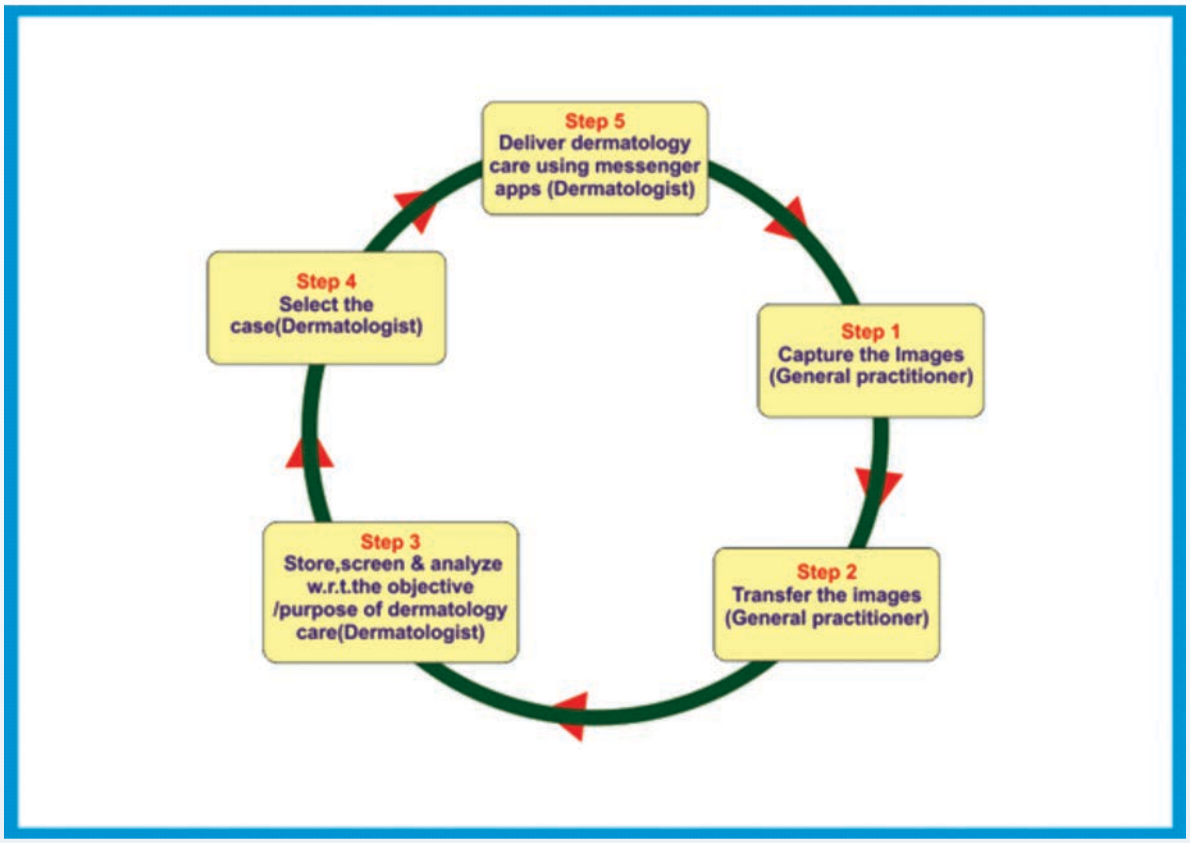

Figure-2: Illustrates the protocol for teledermatology practice

Conclusion

In Indian scenario mobile teledermatology using messenger apps example (Whats app) can be used with good diagnostic accuracy and patient satisfaction. Mobile messenger apps provide a dermatologist to capture and transfer the clinical images either in still (SAF) and motion (video) or both. Recently the Board of governors (Medical council of India) has proposed guidelines for telemedical practice. Indian Association of Dermatologists, Venereologists, and Leprologists in view of COVID-19 situation encourages its members to perform TP and provide care. The members may practice teledermatology after observing all due precautions and conditions as has been outlined in telemedicine guidelines prepared by National Medical Council.

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