Review Article

Teledermatology - Past, present and future*

*Teledermatologia - Passado, presente e futuro**

Hélio Amante Miot[1] Maurício Pedreira Paixão[2] Chao Lung Wen[3]

Abstract: Teledermatology is the area of Telemedicine that studies the application of telecommunication and information technology to dermatology practice without the presence of a specialist. It is a potential manner to deliver health planning, research, education, clinical meetings, second medical opinions and dermatological care to populations who cannot easily travel. The evolution, cost reduction and dissemination of telecommunication and information technology have enabled the implementation of low cost and comprehensive teledermatology systems to support clinical practice all over the world.
Keywords: Remote consultation; Dermatology; Health education; Telemedicine

Resumo: *Teledermatologia é a área da telemedicina que estuda a aplicação das tecnologias de telecomunicação e informática para a prática dermatológica sem necessidade da presença física do especialista, com potencial de levar planejamento de saúde, pesquisa, educação, discussão clínica, segunda opinião e assistência dermatológica às populações com dificuldades de deslocamento para ações presenciais. A evolução, redução de custos e a difusão das tecnologias de telecomunicação e informática têm viabilizado a implantação de sistemas de teledermatologia de larga abrangência e baixo custo para apoio à prática clínica em todo o mundo.*
Palavras-chave: Consulta remota; Dermatologia; Educação em saúde; Telemedicina

INTRODUCTION

Teledermatology is the forwarding of dermatological medical information among two or more physically separated places, using telecommunication and information technology and aiming to promote health and education to patients, paramedics or physicians.[1] The desire to extend healthcare coverage, to train and give opinions with no need to have patients physically present is ancient, and the use of education models through cassette tapes, video classes, slides or opinions given based on photographs have been common in dermatological practice, favoring the assimilation of educational processes or clinical assessments mediated by technology.[1,2]

In the past ten years, the diffusion of telecommunication systems, data networks such as the Internet, digital inclusion of populations and the reduction of costs needed to implement and maintain these systems has promoted an equivalent propagation of telemedicine in several countries. Some specialties, such as Radiology, Pathology, Dermatology, Cardiology and Psychiatry, account for the highest demands for these programs.[3] The easiness to send clinical data, be they texts, digital photographic images, audio or small digital videos, has significantly contributed to this reality.

Dermatology deals with diagnosis of over two thousand conditions affecting the skin, and contributes to other specialties by identifying cutaneous manifestations of systemic diseases.[4] Since the dermatologist is the most qualified physician to recognize these conditions, the treatment of dermatosis by non-specialized physicians may represent delayed diagnosis, use of inappropriate treatments, development of sequela and increased healthcare costs.[5-7]

While the number of dermatologists in Brazil meets the recommendations of the Ministry of Health,[8,9] the distribution of these professionals takes on an essentially urban characteristic, in private

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* Work done at Discipline of Telemedicine, Faculdade de Medicina da Universidade de São Paulo (USP) - São Paulo (SP), Brazil.

1 Dermatologist. Discipline of Telemedicine, Faculdade de Medicina da Universidade de São Paulo (USP), São Paulo, (SP); Ph.D. Substitute Professor, Department of Dermatology and Radiotherapy, FMB-Unesp, Botucatu, São Paulo (SP), Brazil.
2 Dermatologist. Discipline of Telemedicine, Faculdade de Medicina da Universidade de São Paulo (USP), São Paulo, (SP); Ph.D. student, Discipline of Telemedicine, Faculdade de Medicina da Universidade de São Paulo (USP), São Paulo (SP); Specialist in Dermatological Surgery from the Faculdade de Medicina do ABC, Santo André (SP), Brazil.
3 Post-graduate degree and General Coordinator of the Discipline of Telemedicine, Faculdade de Medicina da Universidade de São Paulo (USP), São Paulo (SP), Brazil.

offices,[10] Therefore, it is an unequal practice, incurring into insufficient coverage, especially for the population that depends on public healthcare systems or that are located in forests, rural or geographically isolated areas. This situation illustrates the potential benefits in employing teledermatology in countries such as Brazil.[11]

The effective application of teledermatology will enable extending specialized dermatological coverage, reducing waiting time between appointments, previous screening for diseases, promoting and coordinating large-scale collective health projects, besides conducting multicenter research protocols.[3]

Skin diseases are important causes of morbidity among troops in general. Moreover, maintenance characteristics of military operational bases, war exercises in harsh terrains and humanitarian actions throughout the world made the United States Department of Defense, one of the pioneer institutions to develop teledermatology care systems by the end of the 1980's.[2]

In Brazil, one of the first telemedicine centers to carry out teledermatology projects was the Discipline of Telemedicine from the Faculdade de Medicina da USP, established in 1997. Nowadays the discipline has several dermatologists conducting research and postgraduate activities.

TECHNICAL ASPECTS OF TELEDERMATOLOGY

1. Teledermatology modalities

One of the first concepts regarding in teledermatology relates to how the system will be used to enable sharing information among remote locations.. For this purpose, two types of solution were developed: store-and-forward and real-time.[3,12] These systems can be differentiated with regards to synchrony, that is, how transmission and reception are performed. When compared, both methods present advantages and disadvantages (Chart 1), favoring care to populations with specific needs. It can be said that choosing one of the systems should be based on appropriate analysis of the situation representing the problem to be faced.

In store and forward systems, also called asynchronous, users need not to be connected at the same time. A practical and very simple example would be exchange of information about a certain patient between two specialists, which could be made by e-mail or web form. Such strategic solutions generally give priority to less technological requirements against a larger scope. In the situation of a consultation with a physician and a patient, to give a more specific example, it is possible to provide the necessary and pertinent guidelines for diagnosis, treatment, follow-up and prevention, among other aspects.[13] Evidently, situations demanding immediate responses, such as surgery or an emergency, set limits to using this type of telemedicine.

In real time systems, also called synchronous, videoconference resources can be used to make a remote consultation, but with one fundamental difference: the consultation occurs in real time, and the interaction between the parts is instantaneous. Through an integrated network, it is possible to provide long-distance training to dermatologists. The Sociedade Brasileira de Dermatologia - SBD has already employed this modality by when transmitting events from one site to other state capitals, enabling information to flow in an instantaneous and physically encompassing manner. Despite financial

CHART 1: Main characteristics of teledermatology modalities

	Real time	Asynchronous
Implementation/maintenance costs	Higher	Lower
Possible territorial coverage	Lower	Higher
System complexity	Medium	Low
Quality of images	Good	Very good
Flexible timeframe for response	No	Yes
Bilateral interaction	Higher	Less
Capacity to adjust images	Yes	No
Capacity to program actions	Immediate	Late
Integration with teleducation systems	Possible	Yes
User satisfaction	>90%	>80%
Doctor-patient relationship	Greater	Less
Doctor satisfaction	Practical	Demanding
Level of certainty in presumptive diagnoses	Greater	Lower
Education for referring physicians	Higher	Lower
Productivity	4 cases/h	20 cases/h
Available in Brazil	Yes	Yes

restrictive reasons to its use in a large scale, it is important to say that equipment costs are increasingly dropping, like other electronic systems.

The combined systems allow versatile use, obviously respecting the resource requirements in the other extremities. Thus, they can operate either synchronous, it may be enough to transmit/receive in a non-instantaneous manner.[1]

2. Costs involved

Cost is an important variable in implementing the various teledermatology modalities. In order to be analyzed, costs should be divided into fixed and variable. The former do not depend on the number of users/patients served. They comprise teledermatology equipment (in a store and forward system it includes digital camera and accessories, computers, image editing programs, back-up system and one printer), equipment maintenance, necessary telecommunication expenses (from simple dial-up telephone lines to dedicated ?? solutions by radio waves or satellite communication), training for local photographers and physicians. It is important to point out that the type of system has a strong impact value (a real time system may require environments, lighting and sounding that demand sophisticated resources, modern videoconference equipment, in order to have simultaneous communication with several locations, etc.). The variable costs, in turn, include those related to the operational practice itself, involved in exercising the medical act, as well as those related to acquiring the physical space, supplies, travels, among others.

The appropriate analysis of the costs needed to employ teledermatology strategies will guarantee sustainability and continuity of its exercise. It is even possible to conduct a previous comparative analysis with the face-to-face consultation, even to justify the availability or not of remote techniques.[14]

3. Data transmission and scale levels

There are several ways to convey data/information. Among the most extensively available are the conventional copper wire telephone lines (also called dial-up lines). Through these lines, voice and data can travel in an asynchronous mode and at low speed (less than 64000 bits/second) - it is called high-scale mode for reaching a large population coverage. Using a modem and more modern technology called ADSL (Asymmetric Digital Subscriber Line), it is possible to synchronously transmit data and voice with high reception speed (up to 9 million bits/second reception and 640 thousand bits/second forward). This modality is well known in Brazil as broadband and has increasingly grown as data transmission in the country.

More sophisticated solutions and usually with limited scale are frequently found, ranging from systems employing radio waves and to even more sophisticated alternatives, such as satellite communication or optical fiber networks. They are high performance modalities, however with higher aggregated costs, complying with specific needs of companies that require high data flow, such as banks and financial institutions.

Project Sipam (Amazon Protection System), formerly Sivam (Amazon Surveillance System), can be mentioned as an example of a complex telecommunication system, budgeted for approximately 1.4 billion dollars when acquired for military purposes. The system currently exceeds this scale level and contributes to social projects in healthcare and education.

Como exemplo de um complexo sistema de telecomunicações pode ser citado o Projeto SIPAM (Sistema de Proteção da Amazônia), antigo SIVAM (Sistema de Vigilância da Amazônia), orçado na época de aquisição em cerca de aproximadamente 1,4 bilhão de dólares, proposto com finalidades militares. Atualmente o sistema transcende esse nível de abrangência, viabilizando, aliás, projetos sociais nas áreas de saúde e educação.

APPLICATIONS OF TELEDERMATOLOGY

1. Teleassistance

The teleassistance models include teleconsultation, telescreening, interconsultation and second opinion. These models are most often used in clinical practice and corroborated by scientific literature data.

The dermatological interconsultation systems are the most disseminated application of teledermatology. In the United States alone, more than 150 dermatological diagnosis support systems are under operation, most of them in structures or communities related to military programs.[2]

Chart 2 presents some situations that may employ teledermatology resources in health promotion. The analysis of teledermatology modality, equipment, staff training and project size require a thorough study of the health problem associated to each specific population.

Chart 3 shows studies about dermatological teleassistance.[12,15-33] Seus resultados são de difícil comparação, devido ao uso de metodologias e populações diferentes, porém permitem a situação do usuário em relação aos comportamentos dos diagnósticos elaborados a distância, com emprego de tecnologia de comunicação.

The results are difficult to compare due to use of different methods and populations; however, they enable situating the user regarding the behavior

CHART 2: Situations favorable to the use of teledermatology

- Prisons
- Rural communities or low demographic density areas
- Geographic obstacles
  Islands, mountains, ice mountains/snow storms, deserts
- War or terrorism areas
- Natural disasters
  Floods, winds, earthquakes, volcanic eruptions, environmental accidents or radioactive contaminations
- Poor countries
- Homecare systems
- Nursing homes and psychiatric inpatient units
- ICU, nurseries and emergency departments
- Oil platforms
- Fishing communities
- Shanty-towns or deprived communities in the outskirts of large cities
- Mass campaigns
  Skin cancer prevention, leprosy, STD, primary health education
- Private offices (second opinion)
- Military exercises
  Aircraft-carriers, forest training, submarines, survival training
- Spatial stations

of long distance-made diagnosis, using communication technology.

Most published studies detect a performance inferior to that of a face-to-face consultation. There are several hypotheses for this phenomenon, such as lack of training of the physician who sends the cases or who gives his/her opinion, bad quality of the image or clinical information supplied, intrinsic difficulty of each case, interference of technology in perception of three-dimension images, or lack of characteristics perceived by palpation, among others. It is also necessary to consider that when comparing two different dermatologists as to diagnostic performance in a face-to-face consultation, it usually does not surpass 90% of agreement; thus, it is not likely to expect that a telediagnosis system between different dermatologists has a 100% performance.[1]

The authors generally consider diagnostic performance of teleassistance systems appropriate for primary healthcare support, resulting in less referrals for face-to-face appointments, reducing waiting time for specific treatments (such as melanoma) and reducing social costs related to patient travel, such as productive working hours. In fact, these facts show the effectiveness of the system as a dermatological screening system.

The asynchronous systems are more disseminated, probably due to its large scale, lesser technological requirements and more affordable cost. They present a performance of approximately 80% as compared to face-to-face consultation; however they tend to order about 10% more complementary tests than the real time systems, with a diagnostic performance of roughly 85%.[2]

It is worth considering that understanding the system performance only by diagnostic accuracy can underestimate the local impact of the program, since adopting an adequate management surpasses the need for real accuracy. Another element is comparing diagnostic accuracy to face-to-face presumptive diagnosis or definite histopathological diagnosis, providing different facts about the system behavior.

Teledermatology has also been applied in remotely supervising dermatology residents with diagnostic accuracy rates of 96% and good acceptance as a learning support, which encourages the development of telescreening models.[34]

Telescreening systems may have an important impact by increasing coverage in prevention programs, such as skin tumors, and by managing waiting lists for treatment of dermatosis with different resolution priorities. In a Brazilian experiment, a telescreening system was able to correctly classify over 90% of neoplasms as benign or malignant.[35]

Another application of telescreening and second opinion systems is teledermoscopy, by which an exclusively visual component of the dermoscopic analysis can be digitalized, forwarded and evaluated at distance, not losing quality and with potential support to early diagnosis of skin tumors even for general practitioners. In study on effectiveness, the remote and face-to-face diagnostic performances were compared and achieved 91% agreement.[36-8]

Anther area with an important visual component that benefits from telemedicine is dermatopathology. Activities such as consultancy, second opinion, remote education and clinical discussion are favored by the easiness in digitalizing the slide images directly from the microscope. The agreement between remote and face-to-face diagnosis ranged from 60% to 99%, according to the type of lesion examined.[39,40] The high diagnostic performances led to successful discussion lists and virtual communities to discuss clinical cases through the internet.[41]

2. Telefollow-up (remote follow-up of patient's progression)

The use of communication technology to transmit medical data about progression of treatment can be applied to follow up chronic leg ulcers, polychemotherapy in leprosy, treatment with retinoids,

CHART 3: Desempenho diagnóstico em diferentes estudos sobre teledermatologia assistencial

Study	Modality	Nº of patients	Accurate diagnosis
Zelickson BD et al.[15]	Asynchronous	29	88%
Taylor P et al.[12]	Asynchronous	194	77%*
Rashid E et al.[16]	Asynchronous**	33	81%
Miot HA[17]	Asynchronous	71	91,5%
Oztas MO et al.[18]	Asynchronous	125	77%
Whited JD et al.[19]	Asynchronous	129	68-85%*
Kvedar JC et al.[20]	Asynchronous	116	59-76%*
High WA et al.[21]	Asynchronous	92	81-89%*
Barnard CM et al.[22]	Asynchronous	50	77%
Krupinski E et al.[23]	Asynchronous	308	73-78%
		79-87%*	
Du Moulin MF et al.[24]	Asynchronous	117	63%*
Lim AC et al.[25]	Asynchronous	53	83-89%*
Lyon CC et al.[26]	Asynchronous	100	93%*
Lowitt MH et al.[27]	Real time	139	80%*
Gilmour E et al.[28]	Real time	126	59%*
Loane MA et al.[29]	Real time	351	67%*
Oakley AM et al.[30]	Real time	104	87%
Nordal EJ et al.[31]	Real time	121	86%*
Philips C et al.[32]	Real timel	51	59%
Lesher JL et al.[33]	Real time	60	78%*

* Agreement among hypotheses made in face-to-face consultations
** E-mail

post-operative evaluation, among other situations.

Telefollow-up involves less complex decisions since diagnoses have already been established, and there is less variability of events caused by treatments that may be perceived at distance. A group of vascular surgeons recently proposed telefollow-up of chronic ulcers based on photographs obtained through last generation mobile phones, and found high agreement as to perception of lesion progression.[42]

3. Teleeducation

On of the most promising and versatile applications of teledermatology is developing teleeducation projects, training or even tutoring and assessment of medical, paramedical, or lay learning. This is due to possible integration of text, images (static or dynamic), virtual reality models or audio in teleeducation programs with didactic structure and communication strategies aiming at health education.

The scope reached by low-cost systems (such as the internet), besides flexible access periods and possible incorporation with teleassistance systems, enables creating sanitary dermatology projects that involve primary and secondary prevention of diseases.

Long distance dermatological teleassistance, in addition to resolving most dermatological cases, can provide continued education for physicians who send cases for interconsultation. In two studies, general practitioners stated having learned with 63% to 75% of cases sent for second opinion.[28,43]

As from 2003, the SBD Regional Coordination of Sao Paulo has provided scheduled refreshment courses for its members, which is a pilot model of applying teleeducation in dermatological medical re-certification.

Also, the long distance education modules from SBD, the patient association portals and other actions that will be further discussed herein are examples to be followed.

4. Formation of virtual groups

Virtual communities are formed to gather individuals involved in discussing the same theme, like in discussion lists, chats, clinical case discussions, transmission of meetings or conduction of researches.

The SBD has conducted periodic chats under the coordination of an expert, in which some subjects proposed are discussed aiming at continued education of the members.

Discussion lists, forums and chats can represent important education tools and enable users to give a second opinion when appropriate rules are adopted.[44] In Brazil, for example, the Dermlist has gathered over 800 dermatologists in regular editions, by e-mail, for more than eight years.[45]

The telemedicine training of dermatology, urology and infection disease residents from various services, who conduct internship on STD at the *Centro de Saúde Geraldo de Paula Souza*, uses a discussion list as an educational tool to optimize learning on STD, management, leadership, digital photography, communication, bibliographic search, pre- and post-consultation and laboratory methods. It is also worth mentioning dermatology communities on the internet (such as in Orkut), in which both physicians and patients are gathered by specific themes.

Finally, when participating in a virtual community, technology collaborates by not personalizing users, resulting in a more effective interaction among debaters of different levels, contributing to decrease shyness and directing the information flow to the participant's fundamental questions.

OTHER ELEMENTS INVOLVED IN TELEDERMATOLOGY PROJECTS

1. User satisfaction

By and large, 82% to 90% of patients that used teledermatology systems were satisfied and considered that they had reduced the need to travel for a face-to-face consultation. Elderly and shy patients, however, resisted more against technology-mediated consultations.[19,29]

General practitioners and healthcare professionals involved in the process had a satisfactory assessment in 80% to 90% of the questions, indicating as weaknesses their resistance against technology and criticism regarding dynamics and time of execution.[19,28]

The dermatologists that took part in the studies also positively evaluated the systems (75%), complaining about the quality and framing of forwarded images, briefness of clinical histories, impossibility of palpating the lesions and collecting direct samples.[3]

In sum, the populations with greater difficulties to have in-person consultations presented the highest satisfaction rates with implementation of teledermatology systems, and the 50% increase in the number of appointments with dermatological complaints after implementing these systems may be an indirect evidence of user satisfaction with the service.[2]

2. Resolution capacity

Several published experimental studies refer to effectiveness of a teledermatology system by comparing diagnostic performance against face-to-face consultation. This analysis method is subject to criticism because different skin diseases can demand similar management, and, even discrepant diagnoses, patients can benefit from the prescribed plan. This analysis is also difficult to carry out due discrepant treatments chosen by different dermatologists, even if they do agree on diagnosis.

In 2000, Loane et al. assessed the need of a second consultation to confirm diagnosis after teleconsultation of a randomized group of patients using a real time system and another using an asynchronous system. The need for a second appointment was 45% in the real time group and 69% in the asynchronous model.[46]

3. Legal and ethical aspects

The scientific findings advance faster than laws and regulations on their own employment. Hence, teledermatology represents an innovation, and technological novelties should create extensive discussions regarding their ethical, legal, professional and moral aspects. This is also observed in other situations, like the Genome Project or human cloning.

The *Conselho Federal de Medicina* [Brazilian General Medical Council] has shown an active attitude on this regard, which is evident in resolution number 1643/2002 (in accordance with the Tel Aviv Declaration discussing the responsibilities and ethical rules in the use of Telemedicine). This resolution aims to, among other aspects, define the area of action, establish real limits to its use and safety parameters of data forwarding, to safeguard patients through appropriate use of the data (as images or not), to anticipate how services will be rendered, to set medical responsibilities and confidentiality.[47,48] In 2004, the council regulated long- distance education for medical themes through telemedicine.[49]

In accordance with international agreements, the local physicians are directly responsible for acts deriving from dermatological interconsultation, and the decisions on healthcare policies and costs are under responsibility of local healthcare systems.[47]

SOME TELEDERMATOLOGY PROJECTS IN BRAZIL

Telemedicine Pole in the Amazon Region

The Amazon Protection System - Sipam has a vast telecommunication network infrastructure installed in the legal Amazon Region. By using this installed structure and integrating with the Federal Government Digital Inclusion Program and actions together with universities and public healthcare agencies, it would be possible to plan strategies that include long-distance education, teleassistance, telemonitoring and internet access for the Amazon region.

Thus, in December 2004, a partnership was made between *Universidade Estadual do Amazonas* (Amazon State University), *Conselho Federal de Medicina* (General Medical Council) and *Faculdade de Medicina da Universidade de São Paulo - FMUSP* (Medical School from the University of São Paulo), to establish the Tele-medicine Pole in the Amazon Region, designed to seek telemedicine solutions for that region (long-distance education, teleassistance, epidemiological surveillance, etc.). Some of the activities that already took place in that Pole include long-distance courses with online interaction through videoconference, transmission of scientific activities by videostreaming (FMUSP's telemedicine classroom of the future), availability of Virtual Man CDs and courses based on the Cybertutor.

Telemedhansen

Hansen's disease still represents a major health problem in Brazil and the goal to eradicate the disease up to year 2000, as proposed by the World Health Organization, was not met.[50]

Some fundamental elements for its eradication include: extensive distribution of multi-drug therapy to patients, adequate training to identify cases, active search of contacts, constant surveillance of endemic areas and development of strategies to reach cases in difficult access areas.[51] Particularly in these areas, the use of remote techniques to support healthcare services is a very interesting strategy.

It is important to emphasize the crucial role played by dermatologists in making differential diagnosis of leprosy in each of its main clinical forms. Dermatologists are the professionals better trained to identify early cutaneous manifestations in a reactional phase that demand immediate and accurate management.

The lack of medical care, especially dermatological care, in several areas of the country represents a scenario that would benefit from using remote techniques by means of telemedicine resources in order to extend coverage. Employing teleassistance and teleeducation strategies may be very valuable in these situations.

A network targeted at detecting and diagnosing Hansen's disease may be composed of healthcare outreach agents and professionals, who are in direct contact with a great number of individuals (non medical), apart from general practitioners and dermatologists. The training offered to non-specialists, through permanent long-distance education modules, enables a better identification of the initial or even late clinical manifestations and can provide the necessary assistance to perform complementary tests under careful medical supervision. All these benefits have an important epidemiological value to fight against and try to eliminate Hansen's disease. It is important to point out that diagnosis and indication of a definite treatment are still under responsibility of physicians, even if now aided by a larger number of people capable of referring the suspicious cases.

Under this point of view, the Department of Dermatology and the Discipline of Telemedicine from FMUSP developed a project called Telemedhansen, which is supported by the Pan-American Health Organization and by the Brazilian Ministry of Health. The project has two main focuses: (1) training of non-medical professionals and population to recognize Hansen's disease and, (2) creating a telescreening network based on the Hansen's disease cyber outpatient clinic (virtual outpatient clinic) in the internet, in which a specialized second opinion will be available by means of a specific clinical form and digital photography.

Telederma

The first experience in dermatological teleassistance in Brazil was Telederma, a project that involved the Dermatology Service from H*ospital de Clínicas* - UFRGS and the Discipline of Telemedicine of the FMUSP.

The residents photographed 71 patients from the dermatology outpatient clinic during consultation and inserted the clinical data in the system's form. In an adjoining room, the lecturers evaluated patients through the internet and, later, in face-to-face assessment.

The diagnosis was correct in 91.5% of remote clinical evaluations and in 95.8% of face-to-face assessments. Comparing all presumptive diagnoses made, there was no statistically significant difference between the modalities.[52]

Telederma includes, besides an efficient dermatological interconsultation system via internet, an educational support through discussion lists, classes, diagnostic guidelines, drug interaction support and an epidemiologic surveillance system.

Anapec (skin cancer)

Another concept developed for health promotion is the Anapec (National Permanent Control Actions). These actions are disseminated using telemedicine strategies and aim to interconnect reference assistance and research centers to health units (at several levels), providing on-going assistance support, which includes training of the participants involved and formation of task-forces (including paramedics) to train and make early detections of diseases.[53]

The integration of several centers enables maintaining a continued education system, as well as high quality diagnosis support, creating a nation-wide education network for case referral (telescreening) and medical second opinions. Anapec proposes the use of many technological resources, from dial-up internet to videoconference systems, depending on the local solution available.

Virtual man in Dermatology

In the context of using technology incorporated to educational tools, the Virtual Man was put forwarded; in essence, it represents an educational tool based on the concepts of learning objects[54] and uses three-dimensional computer graphic tools to create dynamic video sequences, with specialized scientific information that facilitate communication and learning. Several theme-sequences of the Virtual Man have already been developed (videos using resources from the virtual man to explain specific topics) in Dermatology, Audiology, Urology, Dentistry, Orthopedics, Physical medicine, Cardiology, Pneumonology, etc. There are several and important themes for Dermatology, such as normal skin physiology, hair cycle, skin hydration, photoprotection, pathophysiology of acne, pathophysiology of psoriasis, transmission and pathophysiological aspects of Hansen's disease and pathological aspects of skin cancer (Figure 1).[54]

By means of an agreement signed between the Discipline of Telemedicine at USP and Seed/Ministry of Education (Special Secretariat for Long-Distance Education), some programs on relevant health themes are being developed for elementary and high school students, which will be broadcasted during the programs of TV Escola (School TV). These programs will use the Virtual Man as an educational resource to explain many aspects of health. The expected scope to reach is approximately 40 thousand schools.

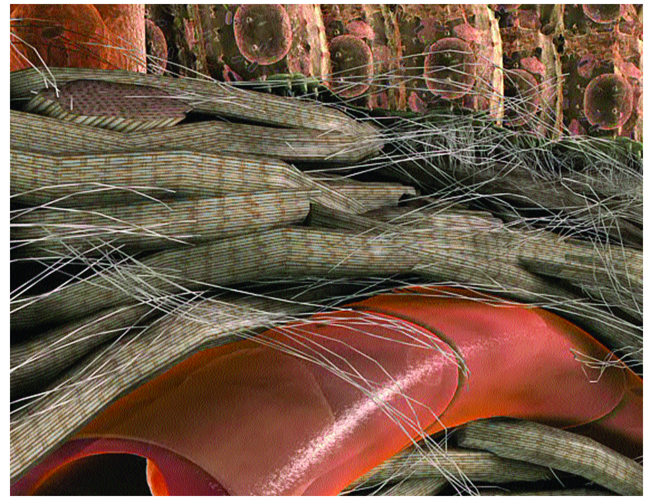

FIGURE 1: Three-dimensional dynamic model of normal skin physiology - Virtual Man

FINAL CONSIDERATIONS

Incorporating the use of technologies (whether information technology or not) in medical routine has been constant in the evolution of medicine, and this practice has led to optimizing clinical processes.

The great visual component associated to dermatological practice and the advances of telecommunication systems make dermatology an area with huge potential to apply telemedicine resources. In fact, dermatological telemedicine already stands out in the international scenario.

The reality of the on-going projects in Brazil should make dermatologists consider this modality of interconsultation, in addition to possible long- distance education in order to minimize the problem of physical distance. ❑

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MAILING ADDRESS:
Hélio Amante Miot
Departamento de Dermatologia da FMB-UNESP
Campus Rubião Jr.
18618-000 - Botucatu - SP
Tel./Fax: (14) 3882-4922
E-mail: heliomiot@uol.com.br