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Introduction

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What is telemedicine?

In the introductory book in this series, telemedicine was defined as the delivery of health care and the exchange of health care information across distances.¹ In general terms, telemedicine is access to specialist knowledge by means of telecommunications and information technology. Teledermatology is a subspecialty of telemedicine. The term encompasses consultations between a patient with a skin disease (and/or the primary healthcare provider) and a dermatologist for diagnosis and management advice. It also covers dermatological education for health professionals and for consumers.

How is telemedicine performed?

‘Access to specialist knowledge’ implies that a telemedicine interaction occurs between an information provider and a client. The fundamental components of a telemedicine system required to bring about this interaction comprise:

1. a means of information capture
2. a means of information transport
3. a means of information display.

The interaction is almost always a two-way process, i.e. having conveyed the information to an expert, the referring doctor needs to know what the expert’s opinion is.

The communication process (e.g. information capture/transmission/display and the reply), i.e. the telemedicine interaction, can be done either in real-time, or by pre-recorded means (often called ‘store-and-forward’). In real-time teledermatology, at least two individuals are communicating synchronously. This may be during a videoconference or a simple telephone call. Store-and-forward teledermatology refers to the transfer of pre-recorded information in a time-independent fashion. Many teledermatology episodes include video or still images of the skin condition under discussion.

What equipment is required for teledermatology?

Teledermatology can be practised almost anywhere given the right equipment. Patients in private residences, rest homes, ships, aeroplanes, battlefields, up mountains or in Antarctica can access specialist expertise when required. Satellite systems enable access from the most remote locations on the planet, while DSL (digital subscriber line) connections enable fast downloads via the ordinary telephone system. The teledermatology systems described in this book use the telephone network, digital networks (e.g. ISDN, integrated services digital network), T1 leased lines, LANs (local area networks), GSM (global system for mobile communications) mobile phones, microwave links, ATM (asynchronous transfer mode) on fibreoptic cables and the Internet.

Fast, sophisticated and automated telemedicine is now possible, employing intuitive interfaces and powerful information management systems. However, quite simple systems are also described in these pages and have proved effective aids to dermatological practice.

The use of teledermatology has the potential to improve the care of the patient, particularly if there are low referral rates to a specialist, as in rural or remote areas or when the patient is institutionalized.²

What is in the literature?

There are a small but increasing number of publications on the subject of teledermatology. A PubMed search (<http://www.ncbi.nlm.nih.gov/entrez/> [last checked 26 July 2001]) carried out in June 2001 with the keyword 'teledermatology' in the title field listed 55 papers. The first was published in 1995.³ Twenty papers were published after January 2000. The keyword 'telemedicine' listed 1345 papers since 1974. Useful review articles have recently been published in British,⁴ American⁵ and Australasian⁶ dermatology journals.

Essential components of clinical teledermatology

Dermatologists were early adopters of telemedicine because their consultations are primarily about taking a careful history and visual inspection – perfectly possible if the history and images contain all the clues to diagnosis and management. The method of communication may use conventional or advanced forms of technology.

Requirements for history

In order to make a diagnosis, certain demographic details are required, including the patient's age, sex, ethnicity and geographic residence. The referral should outline the suspected diagnosis, location/distribution of the lesion/eruption, duration, size, features, aggravating and relieving factors, and any previous treatment. General

medical information should include significant concurrent and past health problems, prescribed and non-prescribed medications and allergies, and the family history. Results of investigations such as mycology and skin biopsy may be important. In addition, the reason for referral should be indicated. The dermatologist should be able to obtain further information if required.

The standard referral from a general practitioner to a dermatology clinic rarely includes all relevant information. By further interrogation – whether face to face, by telephone or by videoconference – an experienced dermatologist can frequently make a diagnosis without requiring an examination. Although there has yet to be a published study of the relative importance of history compared with images in teledermatology, diagnostic accuracy appears adequate even when image quality is poor. Successful interactive teledermatology systems described in this book include those depending on relatively low bandwidth communication (basic rate ISDN lines) as well as those based on more expensive broadband communication (e.g. T1 leased lines).

Store-and-forward teledermatology systems frequently require the referring practitioner to complete standardized templates in order to reduce error due to inadequate data. The information can then be stored in a database for retrieval later. Teledermatology consultations between experts assume that a good history has been taken, so that referrals may be less formal, but this reduces the ability to retrieve data later. A variety of store-and-forward teledermatology techniques are described in this book.

Requirements for images

Inappropriate images may result in no diagnosis or a wrong diagnosis being made during a teledermatology session. As yet there are no standards for photographic technique and referring practitioners receive little or no training in clinical photography.⁷ Modern digital cameras are easy to use and attention to detail can result in excellent images of skin diseases. Three chapters of the book are devoted to images, underlining their importance to the dermatologist. Diagnosis may require a general view to show the distribution/location of the skin problem (the ‘scout image’) as well as close-up views for morphological detail, with plain background, good lighting, correct exposure and sharp focus. Images taken with a digital camera are generally of higher quality than snapshots of video images, but the latter may be more informative if taken at the direction of the specialist. For example, a general practitioner may not realize that correct diagnosis of a rash on the hand may require a view of the patient’s feet. Images taken at high resolution initially should remain of diagnostic quality after correction of brightness/contrast, magnification, cropping and compression to reduce file sizes and speed up file transfers.

Requirements for consultation

Whether using interactive or store-and-forward teledermatology, it is essential to ensure privacy, security of data and technology that is accurate, reliable and simple to use. In general, the patient’s express informed consent is necessary, particularly if identifiable information such as a recognizable photograph is transferred. It is of

course worth keeping a sense of perspective, as case presentations are often held in a closed academic setting without the knowledge of the subject of the discussion.

Teledermatology protocols should be carefully prepared and followed to protect the patient. During a video session, the patient needs someone to explain the process beforehand and to facilitate the consultation, in effect acting as the consultant's hands and the patient's ears. The personnel involved should be adequately trained, but they do not have to be medical practitioners; remote consultations involving nurses and other non-medically qualified health workers are described in the book.

Not all teledermatology consultations will complete a healthcare episode. Ideally, health systems should be able to back up teledermatology with face-to-face consultations to verify diagnosis and to perform diagnostic tests or surgical treatment. However this may be impractical; for example when the patient is on a battlefield, in the Antarctic or in a space vehicle.

Suitable cases for teledermatology

Each practising teledermatologist is likely to have his or her list of preferred clinical presentations. Some of these are discussed elsewhere in the book. Patients suitable for real-time teledermatology, where interactive discussion is necessary (such as follow-up during phototherapy as described in Chapter 6), may have quite different characteristics from those suitable for store-and-forward consultation (such as wound care as described in Chapter 10).

Unsuitable cases for teledermatology

Which cases are unsuitable for teledermatology may depend on the technology being used. It may be possible to diagnose melanoma at a distance if the consultant is supplied with digital dermoscopic images (as described in Chapter 18), but it would be unwise to do so in other circumstances. Privacy issues may limit the examination of genital rashes, and it may not be possible to obtain an image of adequate quality of a small child's skin problem.

Teledermatology for education

There has been a vast increase in the quantity of health information over the last few years, and much of it is accessible to health consumers as well as experts. By use of the Internet, dermatologists can keep up with the latest medical advances, consult online textbooks and share clinical problems with other experts. Increasing numbers of hospital departments and universities arrange regular interactive tutorials and case discussions by videoconference.

Patients can be directed to reliable online information about hospital facilities, their disease and its management, research trials and support groups. This book includes chapters about a teledermatology teaching programme for medical students, an impressive dermatology online atlas, and patient information on the Internet.

Patient self-help

There is evidence that patients are themselves using the Internet to seek further information or advice regarding their illness. Increasingly patients search databases themselves, or send email messages to physicians for advice.⁸ Many patients who sent unsolicited email messages for advice to a dermatology department expressed frustration or lack of trust in their own physician or healthcare service; some patients were embarrassed or wanted to remain anonymous yet seek expert advice. Dealing with such unsolicited messages poses a number of problems, including privacy, confidentiality, security and medicolegal issues.⁸ Furthermore, patients getting advice via the Internet may increase their level of anxiety or reach spurious conclusions leading to poor outcome. There is, however, evidence that patients can obtain relevant advice, in a way in which they will understand, by accessing sites such as the patient information leaflets provided by the American Academy of Dermatology (AAD) website.⁸ As an indication of the public interest in such sites the AAD website received 800 000 'hits' from approximately 86 000 users in July 1998.⁹

Legal aspects of teledermatology

Dermatologists have expressed concerns that teledermatology is risky in a medicolegal sense.¹⁰ The legal implications of telemedicine have been extensively debated and are not specific to dermatology. Most legal and ethical issues are the same as those of medicine in general. Security of data, confidentiality and risk must be considered. The reader is referred to reviews by Stanberry¹¹ and Jacobson and Selvin.¹²

Cross-boundary consultations have given rise to particular concern because a licence to practice medicine is limited to a specific jurisdiction. In the USA, many consider that statutes limiting medical licensure to individual states are outdated.¹³ Several examples of international teledermatology consultation are described in this book; a system of universal licensure may therefore need to be developed. The American Academy of Dermatology has proposed minimum standards for credentialing (as well as for clinical, technical and administrative matters) in its Position Statement on Telemedicine, approved in December 1999.¹⁴ See Chapter 16 for further details.

The current scene

Despite the lack of published literature, teledermatology consultations have been reported by many multispecialty telemedicine programmes to be particularly successful, as outlined by Grigsby and Brown in their survey of teledermatology in the USA (see Chapter 5). Diagnostic accuracy seems acceptable. Patients and at least some doctors are satisfied.

The Telemedicine Information Exchange (TIE) (<http://tie.telemed.org/> [last checked 26 July 2001]) lists 36 programmes (out of 256 on the database) where

dermatology is the top-ranked application. These are mainly in the USA, as this is the TIE's primary coverage area, but Swedish, South African, Canadian, Japanese and British interactive and still image services are also listed.

International collaboration

Evidence for the growth of interest in teledermatology is shown by the emergence of international teledermatology organizations, which include the European Confederation of Telemedical Organizations in Dermatology (ECTODerm) (<http://www.ectoderm.org/> [last checked 26 July 2001]), the Internet Dermatology Society (<http://www.telemedicine.org/ids.htm> [last checked 26 July 2001]), the International Society for Skin Imaging (<http://www.issi.de/> [last checked 26 July 2001]) and the KSYOS Research Foundation (<http://www.ksyos.nl/> [last checked 26 July 2001]). The electronic mailing list rxderm-l@ucdavis.edu has about nine hundred dermatologist members (Professor Art Huntley, personal communication) practising in many different countries. It has proved an effective and educational discussion forum for clinical dermatology, sometimes posting dozens of messages each day.

The development of low-cost, fast and reliable data communication has resulted in numerous effective international collaborations, including this book.

Conclusion

Teledermatology can be used in many different ways to improve the delivery of dermatological care. The experience reported in this book demonstrates that there is no single 'correct answer' to any given problem – often a number of different solutions are possible. We suggest that you read the work reported in this book and benefit from the experience of others.

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