Telemedicine, mobile phones and burn wound assessment and management: A valid resource for South Africa?

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Abstract
Access to specialist care in the management of burn injuries may be possible through the use of telemedicine. The burned area extent and depth are mainly visual, allowing the transmission of digital images from remote areas in rural South Africa to higher levels of care, such as burn units. Regulations to keep patient’s confidentiality and safe transmission and use of the images must be achieved through a proper discussion of the medico-legal issues with the official statutory body.

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Introduction
The World Health Organization (WHO) defines telemedicine (from the Greek prefix tele meaning ‘at a distance’ and the Latin word meden meaning ‘healing’) as “the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities”.1,2 The Heath Professions Council of South Africa’s (HPCSA) proposed definition of telemedicine (TM) is “the exchange of information on health care at a distance for the purpose of facilitating, improving and enhancing clinical, educational and scientific health care and research, particularly to the under-serviced areas in the Republic of South Africa”.3 Both cited definitions encompass activities beyond clinical services, although the terms “telehealth” and “e-health” should be more appropriately used for the broader definition including the education and administrative services.2,3

Telemedicine is not a new branch of medicine or an activity aiming to replace health care workers and face-to-face consultations. In fact, historically, it has been performed since the primordial times of post services, telegraph and telephone creation, radio transmission, and initial video recording. Basically there is a clear role in which it should be used:

1. where there is no alternative to telemedicine, such as in emergency situations in remote places where medical care would be difficult or impossible to reach the patient in time; and
2. where it improves the access to health services avoiding the travelling of patients/healthcare workers, such as in remote/rural areas.2

There are a few modes were TM may be executed, particularly for the assessment of wounds in general:
1. Store and forward (SAF) or pre-recorded (asynchronous) TM, where information required (e.g., about a wound) is acquired and stored in some format before sent by appropriate means for expert consultation.
2. Real time or video conference (VC, synchronous TM), where there is no delay between the information being collected, transmitted and displayed and interactive communication between professionals is possible.
3. Hybrid TM, where there is a combination of the two previous types.
4. Mobile or cellular TM, where portable devices with inbuilt camera (cellular phones, laptops, tablets) capture digital images and computing and networking features allow direct interaction.
5. Integration model, where integration of electronic devices and software allows capturing, transferring, storage, measurement and deliver of follow-up.1

Many issues of concern regarding the medico-legal and ethical aspects of TM have been raised, including the licensure, responsibilities and potential liabilities of the health professional, the continuity of care, the duty to maintain the confidentiality and privacy of patient records, informed consent, data security, the jurisdictional problems associated with cross-border consultations, and reimbursement of care provided by using a TM service.1,3,4 Guidelines for telemedicine are currently considered by the Council in line with existing ethical rules. A few studies
have discussed the need to look into telemedicine with a model which differs from the current regulations in place.4 In spite of those issues, several published studies demonstrate the role of TM in multiple disciplines to provide remote access to areas where those disciplines are not available, inclusive studies assessing the use of TM for chronic wound care.5,6

Telemedicine in burns assessment and management

The severity of burn injuries is determined by the percentage of the body surface injured (TBSA), the depth of the burn, the age of the patient, the presence or absence of inhalation injury and other co-morbidities. The injured body surface area and the depth of the burn wound are assessed mainly by visual inspection, and this is influenced by the experience of the health professional who examines the victim (usually a doctor, but it may be a nurse in remote areas in the country).

As the image of the burn plays an important role in the diagnosis of this injury and in the following steps needed to be taken (selection of emergency treatment, need for surgery, type of dressing, need for referral to the next level of care), a telephonic discussion between the referring facility and the burn expert/unit usually lacks important clinical information, which may result in less than optimum treatment. Therefore, the inclusion of a digital/coloured image of the burn wound is helpful and almost mandatory for better burns assessment: the receiving clinician will be able to validate any information given over the phone, as well additional information may be released from the images supplied.

The traditional equipment for real time TM is expensive, requires major infra-structure in both site locations, training of users with the equipment, and besides, is unavailable in most hospitals in South Africa. E-mail or computer-based data transmission also requires some infra-structure at both end sites, involving a image capture system (digital camera), transfer of image onto computer (by cable or wireless transmission), processing of image to reduce file size to allow email transmission (use of software program), sending of email (need of broadband or high speed internet connection) and viewing of email at the remote location. Enormous quantity of data needed to be transmitted temporarily, transmit this image to a remote location, and view this image without loss of resolution make the mobile phones ideal over other methods of data transmission to support any remote area, within the range of a mobile phone signal, in the assessment and management of the burned patient, particularly in the initial phase where decision has to be made regarding the need for transferral to a specialised centre.

Although the use of mobile phones in hospitals has been controversial, and restrictions on camera phones have been advocated in some countries, recent evidence has provided clear guidelines on the safety margin of their use in hospitals.9 A camera mobile phone, especially the newest smart phones, has the prerequisites for a complete TM system, with the potential capability to enable assessment of both total burn surface area and burn depth. The ability to capture an image with high resolution, store it temporarily, transmit this image to a remote location, and view this image without loss of resolution make the mobile phones ideal over other methods of data transmission to support any remote area, within the range of a mobile phone signal, in the assessment and management of the burned patient, particularly in the initial phase where decision has to be made regarding the need for transferral to a specialised centre.

Due to the restriction policy on the use of camera phones, minimal research on the potential clinical applications of mobile phones has been published, and the sophisticated resources of the modern devices are not fully explored to the benefit of the burns management as they should.10 Few published studies using “teleburns” are available, but they usually compares SAF networks to the face-to-face assessment, and in theory this mode of TM provides better image accuracy than the real time/videoconferencing mode.

In most hospital settings, restrictions to the use of mobile phones and cameras by the patients and staff are disregarded, and the widespread use of these devices is a norm. The technology provided by the current phones make them indispensable for providing access to evidence-based information, required for the improvement of care in all areas of health care.

Discussion

The World Health Organization (WHO) has advocated the vision to provide high-quality health care available to all in its health-for-all strategy in the 21st century.12 This is a challenge in developing countries where the burden of diseases adds to the shortage of skilled professionals (specialists and nurses), concentration of professionals in urban areas and distances of centres to reach adequate provision of care to patients. The advances in information and communication technology over the past years have created the opportunity to overcome those challenges,
and the use of TM (roughly seen as “the practice of medicine at a distance”) allows the rapid access to remote medical expertise using the latest available telecommunication and information technologies. Thus, an immense number of opportunities have been offered in the medicine field, not only for consultation, diagnosis and treatment purposes but also for distance and continuing medical education in several medical specialities and subspecialities.

Experience has shown that healthcare professionals have little experience in the diagnosis and management of burn injuries, providing inadequate initial assessment. Inappropriate or unnecessary referrals and transfers have been made to the few Burn Units in the country, sometimes using resources not readily available and costly such as the transfer of patients via aeroplane air ambulances in provinces where distances make ground transportation of patients risky. Significant errors in burn surface area estimation are also common in other countries, with tendency to overestimation of burns extent and underestimation of depth, creating opportunity to inadequate referrals and subsequent increase in costs.13

On the other side, patients under evaluated incur in elevated risks should they remain in health care facilities not prepared to manage them, increasing their morbidity and mortality. There is an increased pressure to refer burn patients to higher level hospitals, mostly because of lack of experience of the initial health care provider, lack of infrastructure of the referring facility, or fear of future liabilities. The need for specialist assessment (a general surgeon, a plastic surgeon, or a medical officer trained in burns) for proper initial assessment would be ideal, but that is not possible in most facilities of the country.

The use of ‘low-tech’ equipment represented by a single photograph of a burn wound taken by a mobile phone may convey a tremendous amount of information. In the case of a minor burn injury, this TM assessment can prevent unnecessary and costly transportation of the patient to the burn unit/centre (See Figure 1). Conversely, when injuries prove to be significant the assessment made by the specialised centre may help the referring healthcare provider initiate adequate care until safe transportation of the patient to the Burn Unit (See Figure 2).

Communication and technology currently available in the country should also allow official health organisations to make use of TM resources to extend training to professionals, improving education of health care professionals in burns assessment and management; thus, cost issues related to travelling expenses of professionals to and from training centres should be lessened. In developed countries, TM
resources have been used for continued education of professionals through videoconferencing rounds and online tutorials in virtual classroom, allowing interaction of professionals previously only available at burn care and trauma conferences.13,15

Medico legal issues and security concerns must be addressed in a constructive way to enable integration of this tool into wider practice; through anonymising all data transferred, documenting the patient’s consent, and keeping patient’s confidentiality by an adequate and safe use of the images obtained (one phone available for the receiving unit), a par with the current regulations provided by the country’s official organizations should be pursued.4,10

Conclusion

There is a great potential for telemedicine to help addressing adequate referrals (triage) to tertiary centres specialised in the management of burn injuries in South Africa, facilitating burn treatment and bringing specialized burn expertise to reach patients and healthcare professionals in remote places where there is a lack of resources and infrastructure to manage the burned patient. The burn community, although small and still in the raise in the country, should consider developing resources to maintain or create telemedicine services in the few burn centres in the country, within resources available, in order to assist smaller units and regional hospitals, and concentrate efforts to publish researches made about this topic in order to support the incorporation of telemedicine into the routine burn care in South Africa.

The HPCSA, as the main provider of rules and mandates to protect the public, should participate in debates with the representatives of the burn care in South Africa to clarify the ethical and medico-legal issues related with the use of a “teleburns” network. After all, at its fundamental core, telemedicine is based on the ethical principle that quality care should be made available to all people, anywhere and at anytime.

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References