The Impact of Mobile Phones on Plastic Surgery and Burn Management

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INTRODUCTION

Traditionally defined as "a specialized branch of surgery concerned with deformities and defects of the integument (the skin) and the underlying musculoskeletal framework" (Converse, 1997, p.3), plastic surgery nowadays combines traditional areas of expertise and principles with innovation; the plastic surgeon performs operations in diverse anatomical areas of the body, using creativity and innovation to restore the form and function affected by traumatic injuries, burns, congenital abnormalities, and losses caused by infection, tumours or cancer excision (Thorne, 2007). Subdisciplines of plastic surgery may include, amongst others: cosmetic or aesthetic surgery, burn surgery, craniofacial surgery, hand surgery, microsurgery and paediatric plastic surgery.

Although recognized as a specialty with extensive field of work, plastic surgeons are not always available in most hospitals around the world; besides, plastic surgeons are usually busy seeing patients in their offices, running between different hospitals and clinics, or operating, which makes them difficult to reach by emergency department doctors and in training young surgeons. There is an even greater shortage in developing countries, particularly in rural areas where, due to costs, distances to bigger centres must be considered before the referral of patients who need assessment from the specialists. To address this issue and improve patient care through cost saving and time efficiency, an exponential growth for *telemedicine* (from the Greek prefix *tele* meaning 'at a distance' and the Latin word *meden* meaning 'healing') services in the field have been identified in recent years, varying from consultations by the telephone and image transfers with the purpose of diagnosis at a distance, to the complex technology of telesurgery (Grunwald, Krummel, & Sherman, 2014).

The new generation of smartphones are mobile phones with more advanced computing capability and connectivity. They boast higher resolution built-in digital cameras; larger crystal display screen; capacity to store data and images in archives; access to wireless data allowing online communication anywhere in the world and access to mobile applications – apps (Smartphone, 2014). These smartphones are equipped with the necessary technology to fulfil the prerequisites for a complete telemedicine system ('m-health'), which by the World Health Organisation's definition includes:

… the delivery of health care services, where distance is a critical factor, by all health care professionals using information and communica-

tion 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. (World Health Organisation [WHO], 1998, as cited in WHO, 2010)

In the field of plastic surgery, patient's conditions are basically evaluated by visual inspection (including acute traumatic wounds and burns), and mobile phones may be used in remote, rural and resource-poor settings to provide essential information to specialists in larger and academic centres. Plastic surgeons are able to assess images and data and define management strategies required for those patients. Communication occurs not only between the plastic surgeon and the referring physician from other sites in the emergency setting, but also between plastic surgeons and patients (for continuity of care); nurses and plastic surgeons (for surgical care instructions); junior/trainee and supervisor/ mentor plastic surgeons (for management instructions), and between senior plastic surgeons and their peers (for remote collaboration on diagnostically complex cases).

The availability of information in mobile technology has also allowed a growing market for education tools for plastic surgeons and their potential patients, and the use of social media for marketing's purpose.

In this chapter, the authors review the available literature on the use of mobile phones in the field of Pastic Surgery and Burns.

BACKGROUND

The majority of published studies debate telemedicine in plastic surgery using one of the two conventional systems, either the *store-and-forward (pre-recorded, asynchronous)* mode, which involves prior storage of still images or videos followed by transmission of the data (Buntic et al.,

1997; Roa, Gomes-Cia, Acha & Serrano, 1999; Baldwin & Langton, 2001; Pap, Lach & Upton, 2002; Jones, Milroy & Pickford, 2004; Wallace, Smith & Pickford, 2007; Varkey, Tan, Girotto, Tang, Liu & Chen, 2008; Wallace, Jones, Milroy & Pickford, 2008; Diver, Lewis & Gordon, 2009; Gray, Armfield & Smith, 2010; Trovato, Scholer, Vallejo, Buncke & Granick, 2011; Hoppe, Lee, Granick, & Scott, 2014) or the *real time (video conferencing, synchronous)* mode, which implies the interaction between patient, referring physician and specialist at the same time (Syed-Abdul, Scholl, Chen, Santos, Jian, Liou & Li, 2012).

Studies using mobile or cellular telemedicine, where portable devices with in-built camera capture digital images and computing and networking features allow direct and real time interaction, are still scarce but have shown promising results, particularly related to low costs associated with the use of this technology. Lam, Preketes, and Gates (2004), at Nepean Hospital in Australia; Tsai, Pong, Liang, Lin and Hsieh (2004) and Hsieh, Tsai, Yin, Chen, Yang and Jeng (2005), at Chang Gung Memorial Hospital in Taiwan; Saffle (2006), from the University of Utah, USA, and Shokrollahi, Sayed, Dickson, and Potokar (2007), from United Kingdom were amongst the earliest to report the successful use of mobile phones for teleconsultation in plastic surgery and burns.

Probably due to ethical and medico-legal issues related to the use of images and security concerns, and due to limitations to perform proper randomised controlled studies on the use of telemedicine, only a few more studies have been further published on the application of m-health for plastic surgery-related topics (Knobloch, Gohritz & Vogt, 2009; Knobloch, Rennekampff & Vogt, 2009; Engel, Huang, Tsao, Lin, Chou & Brey, 2011; Farber, Haik, Liran, Weissman and Winkler, 2011; Suliman, 2013; Hernandes, 2016. Wani, Rabah, AlFadil, Dewanjee & Najmi, 2013). Gardiner and Hartzell (2012), from Addenbrooke's Hospital in Cambridge, United Kingdom; and Wallace, Hussain, Khan and Wilson (2012), from Queen Elizabeth Hospital, Birmingham, United

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