Chapter 46
Identification of Chronic Wound Status under Tele-Wound Network through Smartphone

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ABSTRACT

This paper presents a tele-wound framework for monitoring chronic wound status based on color variation over a period of time. This will facilitate patients at remote locations to connect to medical experts through mobile devices. Further this will help medical professionals to monitor and manage the wounds in more timely, accurate and precise manner using the proposed framework. Tele-medical agent (TMA) collects the chronic wound data using smart phone and send it to the Tele-medical hub (TMH). In TMH, the wound image has been segmented using Fuzzy C-Means which gives highest segmented accuracy i.e. 92.60%, then the wound tissue is classified using proposed Bayesian classifier. The smart phone supported prototype system has been demonstrated with snapshots using very compatible and easy to integrate Hypertext preprocessor (PHP) and MySqL. The proposed system may facilitate better wound management and treatment by providing percentage of wound tissues.

1. INTRODUCTION OF CHRONIC WOUND

Management and monitoring of chronic wounds is a major challenge. A tele-wound care comprising transmission of chronic wound (CW) images and a clinical protocol to home bound patients resulted in reductions of emergency visits, hospitalization, hospital utilization and cost [Rees, et al. 2007]. More than $25 billion is spent annually on the treatment of CWs [Hopf, H. W. 2006]. In the United States, the percentage of the aged population (age

DOI: 10.4018/978-1-4666-8789-9.ch046

65 and more) is projected to increase from 12.4% in 2000 to 19.6% in 2030 [U.S. Census Bureau. 2013]. The cost-effectiveness analysis is used to measure and compare the relative costs and results associated with various interventions as comprehensively as possible [Weinstein, M. C. et al. 1996]. The CW size can be determined using various methods have been developed and validated including wound depth [Coulomb, B. et al. 1986], surface area [Thomas, A. 2002] [William, P.B et al. 1997] length and width [Herbin, M. et al. 1993] and volume [Thomas, G. 2004]. The authors [Stremitzer, S. et al. 2007] were to investigate the spread and variety in CW judgment. The different tissues like granulation, fibrin, necrosis, CW size, depth, exudate and edges were judged and the therapeutical consequences were determined. Several CW assessment tools have been developed like pressure sore status tool (PSST) [Julien, M. et al. 2008], the sessing scale [Ferrell, B. A. et al. 1995], sussman wound healing tool (SWHT) [Sussman, C. et al. 2007], pressure ulcer scale for healing (PUSH) [Plassmann, P. et al. 2013] and wound healing scale (WHS) [Julien, M. et al., 2008] to monitoring wound healing status.

In prior work, a smart phone app has been developed to take CW images using smart phone or tablets integrated camera [Chakraborty, C. et al. 2014] [Friesen, MR. et al. 2013]. The high resolution camera integrated smart phone used to monitoring and recording apps which contains clinical information (data, wound images) through store-and-forward tele-health platform [Clifford, G. D. et al. 2012]. The high quality wounded portion images can be sent via Internet to a distant centre for advice on management. The remote patient monitoring is one of the type of home telehealth that enables patient monitoring and transfer of patient health related data. The main purpose of electronic health systems are like to improve and increase the accessibility to the health care facilities for rural peoples, provide self treatment facility, improved doctor-patient interaction, provide cost effective health care, increase patient's access their health record and maintain the health care provider [Das D. et al. 2014]. Telemedicine [Wootton, R. et al. 1999] is an emerging field in advance communication systems and medical informatics, is able to deliver the healthcare data and sharing of medical expertise using wireless technologies GSM/WLAN/SATELLITE/2G/3G/4G) in the span of tele-oncology, tele-pathology, tele-radiology, emergency healthcare and teledermatology. Today's remote people's are facing lot of problems on treatment like not available good clinicians and specialty care in rural area, provider shortages, patient can loses a day's wage, to pay for travel expenses, clinicians appointment is not readily guaranteed. Where as many cases are extremely trivial and of non emergency type. Therefore, clinicians charge a lot of money that's why Telemedicine have been taking a major breakthrough by providing fast and efficient diagnosis. And also maintaining e-prescription for referral cases, time and cost saved and clinicians can work from anywhere using smart phone. A handheld computing device like personal digital assistant (PDA) is used to monitoring patient's remotely [Chantelle, G. et al. 2006]. The author [Meum, T. 2012] discussed the implementation and use of an electronic medication management system (EMMS) using new technology to reduce the incidence of serious errors. The large numbers of rural peoples in the world have been suffering with different types wound. However, due to the lack of trained clinicians, this adds up in suffering population. The huge improvement and development in mobile communication throughout the world reduce the problem up to some extent. Our medical experts with Telecommunication engineering are trying to mitigate these problems. The portable, handheld device like smart phone can be used to capturing high quality wound images and acquiring patient's demographic information and send it to TMH through secure [Mukherjee, A. et al. 2015], web based medium. The Telemedicine based wireless body area networks can be used for continuous remote patient monitoring