

Chapter 17

Bridging the Abridged: The Diffusion of Telemedicine in Europe and China

Xiaohong W. Gao
Middlesex University, UK

Martin Loomes
Middlesex University, UK

Richard Comley
Middlesex University, UK

ABSTRACT

In this chapter, a comprehensive review of the development of telemedicine in China, with the focus on the establishment of PACS (Picture Archiving and Communications Systems) and image-guided tele-surgery, will be accounted for together with a comparative study in reference to the counterparts in Europe, leading to a framework of a sustainable, scalable, and flexible e-health infrastructure for the future global digital (paper-less) hospital. The study is drawn from the first-hand knowledge gained through the conduction of a 3-year networking project on Telemedicine: Tele-Imaging in Medicine (TIME, 2005-2007) funded by the European Commission under the Asia-link programme. It is the authors' hope that this chapter resonates with the future prospect of telemedicine by providing the right contents, at the right time and to the right extent, especially when the implementations taking place are in countries with disparate economic development.

INTRODUCTION

Over the last twenty years, China has achieved unprecedented economic growth, with an accompanying growth of the wealthy and middle

classes, which has led to the building of a well-off society in a comprehensive way. To this end, China is currently in the process of reforming its health care systems by equipping its hospitals with many modern medical systems, such as, medical imaging scanners, as well as building its own. Because of the size of its territory and

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the number of its population coupled with the uneven development of the economy across the country, the distribution of the facility of modern medicine mainly resides in the major cities, such as Beijing and Shanghai. In order to reach to remote areas, China has begun the development of telemedicine techniques in the late 1980s. In the first decade (~1990-2000), the main focus was on the implementation of communication networks with a faster and wider bandwidth, such as ISDN (Integrated Services Digital Network), in the hope to connect far and wide. Within this digital network service, tele-education, tele-conferencing, and tele-consultation have flourished. However, these activities mainly serve as demonstrations to showcase the feasibility of the communications networks and the advances of computer technology. With the advent of World Wide Web, many internet-based services are made available and more importantly free, such as Skype, making the services of tele-conferencing/tele-consultation not only affordable but also flexible and mobile, i.e., a network connection being able to set up in an operation room instead of in a conference room, bringing hopes of practical applications at the point of care, such as tele-surgery, a reality. The first case of tele-neurosurgery took place in 2005 between Beijing and Yan'an with a distance of 1300 kilometres.

By contrast, Europe is well advanced in many of these fields. Firstly, Europe originated imaging field when the first Nobel laureate, physicist Wilhelm Roentgen, discovered X-rays that led eventually to the birth of radiology, and thereafter the medical imaging industry. With the application of advanced computer techniques in the 1970s, Computerised Tomography (CT) and Magnetic Resonance Imaging (MRI) were invented, prompting another Nobel Prize award shared between the UK and the USA. With typically 80,000 2D images (e.g., in Geneva Hospital) generated per day, *Picture Archiving and Communications Systems* (PACS) have been developed to manage them. Up to 2005, most European countries have

installed PACS in their hospitals with Norway topping the chart with 100% hospitals equipped with PACS. Elsewhere more than 70% hospitals in the countries of United Kingdom, Germany and Italy are implemented with PACS, whereas in China up to 2005, only 1% hospitals managed to install miniPACS, a stand-alone version of PACS.

On the other hand, PACS is not penicillin taking care of any type of images. In its current form, it can only archive radiologic images. Hence, a plethora of effort has been put into it to entail PACS with the ability of managing the other images. Unfortunately, it has been proven that the model of 'one size fits all' is not sustainable in the e-health domain.

This chapter will give a detailed account on the latest development of telemedicine and PACS systems with a focus on China. In comparison with their counterparts in Europe, the results are drawn from the completed TIME project funded by EU and the initial work conducted from the newly funded FP7 project WIDTH on *Infrastructure for the Digital Hospital*. The novelty of this chapter lies in the fact that it might be the first of the kind since most of existing literature reviews tend to be in comparison with the USA or Japan who has more presence in China than in Europe, aiming at exploring the breadth of innovations in the field of telemedicine and keeping abreast of the new developments, leading to a roadmap for the future global digital hospital.

It starts with a background study on the standards and terminologies that are currently adopted in telemedicine, including PACS, DICOM, HL7, RIS, HIS, and EU Asia ICT programme, in particular, the TIME project. This is then followed by the introduction of telemedicine activities that have been conducted or are on-going in Europe, specifically, in the United Kingdom, Switzerland, Italy, Norway and Poland. Although not comprehensive, it is representative of the range of recent advances. Preceding the Section on Lessons Learned, *Telemedicine in China* is detailed, spanning from *Hospital Infrastructure*, *Tele-communications*

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