Application of Wireless Data Grids for Health Informatics

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INTRODUCTION

Distance and inaccessibility create special challenges for health practitioners in rural and remote areas. Health professionals in rural and remote areas face problems such as prescription concerns due to lack of information. This occurs due to a gap in knowledge regarding medications, as health practitioners do not have access to medical history of their patients. Frequent migration of patients in rural and remote communities results in the loss of patients' medical records. In addition, doctors have limited access to therapeutic information, as searching the Internet from most remote communities is expensive and slow. In addition, frequent migration of patients in remote communities results in the loss of patients' histories. This chapter proposes a refined conceptual health information management model based on the model presented by Mahmood (2006). The discussed model is based on the use of Data Grid technology and Data Recharging techniques employed in conjunction with wireless communication technologies to overcome the problems and challenges faced by health practitioners. The model categorizes the health establishments in remote areas into two categories on the basis of geographical characteristics and data access requirements. The discussed model aims to meet information and communication technology (ICT) requirements of health practitioners operating in each recognized category.

INFORMATION SOCIETY, E-HEALTH, TELEMEDICINE, AND HEALTH INFORMATICS

An information society is one in which the main product or a prerequisite to other products is information. In essence, in an information society, the workers' outputs and organizations' successes depend on their ability to utilize information (Knight, 2004). The main recognized sections of information society are information economy, electronic commerce, and e-health (Walsh, 2001).

Mitchell defined e-health as "a new term needed to describe the combined use of electronic communication and information technology in the health sector—the use in the health sector of digital data-transmitted, stored and retrieved electronically—for clinical, educational and administrative purposes, both at the local site and at a distance" (Mitchell, 1999). E-health includes the use of ICT to enable or improve health care service in both clinical and nonclinical sectors. It is composed of telemedicine and health informatics. Telemedicine is direct or indirect delivery of health care or health information. The direct means could include videoconferencing, and the indirect means could include Web sites. In telemedicine, physicians examine patients at a distance by using ICT (Preston, 1993). In relation to telemedicine, health informatics or medicine informatics deals with the resources and devices used to acquire, store, move, and retrieve data to support health care (Wang, Turner & Scott, 2003). So in essence, the application of health informatics is telehealth. This relation is presented in Figure 2.

CATEGORIES OF REMOTE HEALTH ESTABLISHMENTS

The ICT requirements and conditions for health informatics are very different in urban, rural, and remote areas. To set up effective health informatics, it is required to identify and categorize the rural and remote health establishments. The division should be based on the geographical location, mobility requirements of health service providers, current state of ICT infrastructure, and the migration habits of the patients in the recognized establishments. In this case, rural and remote area health establishments are divided into two categories: fixed and mobile remote establishments (Mahmood, 2006). Characteristics and ICT requirements of each establishment are outlined next.

Figure 1. Components of information society (Walsh, 2001)

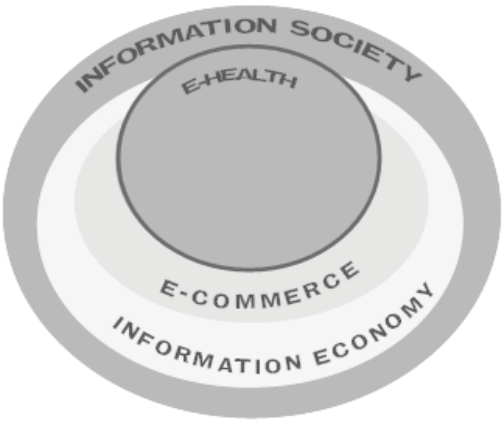
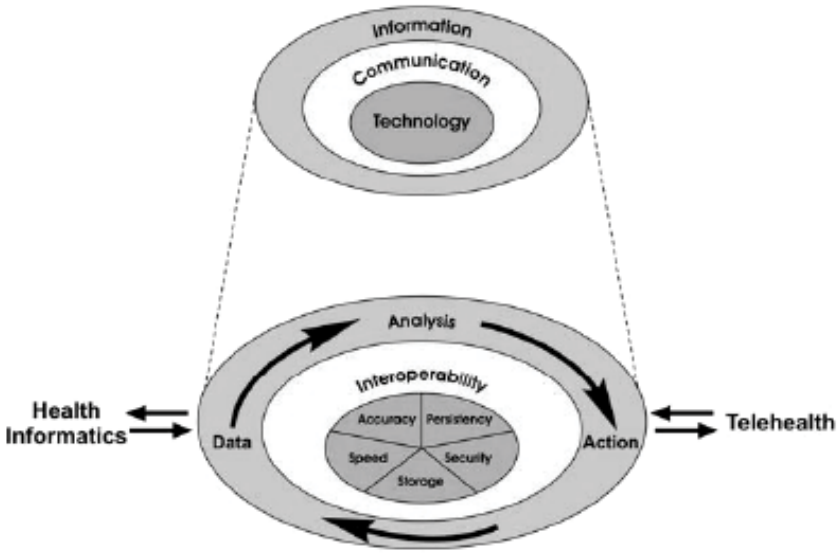


Figure 2. The e-health ICT impact model (Wang et al., 2003)



Fixed Establishments

Fixed remote/rural health care establishments consist of permanent health clinics that cater to the specific but limited health-related needs of local communities. Such establishments require access to limited data set, as the treatments and health services they provide are limited. These establishments do not require frequent synchronization of patient records between rural and urban health establishments due to lower migration of local community members. Semisupportive preestablished ICT infrastructure, such as phone lines, also exists at such establishments.

Portable Establishments

Portable health establishments generally consist of doctors, health practitioners, and district medical officers (DMOs) who visit relatively small communities in remote/rural areas. In such establishments, health practitioners take mobile electronic devices such as a laptop or a pocket PC to access and record the prescription information when undertaking consultations. Practitioners require highly filtered information as they offer limited health services. They have well-defined and limited patient base because of the community size. The data synchronization requirements of such establish-