Chapter III

Management and Analysis of Time-Related Data in Internet-Based Healthcare Delivery

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Abstract

Technological advancements have and will continue to revolutionize the way healthcare is being delivered and the interaction between patients and healthcare professionals. A key component to these changes will be an extension to the utilization of the Internet, further exploiting the extensible and interoperable features it offers. In addition to providing a distributed communications infrastructure, the ability to incorporate within Internet-based systems a means of intelligent data analysis in supporting healthcare management has now become a reality. In this chapter, we provide the rationale for usage of the Internet as a core infrastructure for a holistic approach to distributed healthcare management and supplement this through the identification of the potential role of temporal reasoning in addressing the time relevance of patient centered clinical information. Our work is exemplified through case studies where Internet-based systems and temporal reasoning may be employed.

Introduction

With the recent advancements in computing power, digital signal processing techniques and data communications a new era in the delivery of medicine and patient management has evolved. As the underpinning communication systems and infrastructures continue to develop and move from being fixed or terrestrial in nature to being Internet and mobile based, we can expect the flexibility and application of Information and Communication Technologies (ICT) in healthcare to expand.

As the percentage of the elderly within the population increases, we now face the challenge of healthcare service initiatives driven by the goals of individual autonomy and quality of life. The results have subsequently produced a manifest shift from institutional to community care. To improve upon current levels of care provided requires the cost-effective application of ICT. As shown in Figure 1, (Malaysian Telemedicine Blueprint, 2001) this requires the redevelopment of healthcare infrastructures and their service provision by shifting the allocation of resources from secondary and tertiary-care institutions towards the preventative management at the primary care level, as well as providing services to individuals at home where they are likely to be most cost-effective.

Central to the uptake of ICT solutions within healthcare will be the usage of the Internet. The Internet has the ability to harness the communications between patients and healthcare professionals and also between healthcare professionals. Such an infrastructure is driven by vast amounts of clinical information, however, care must be taken that efficient processing takes place to optimize usage of the information collated. One of the many attributes related to healthcare information is "the notion of time". The application of computational approaches that can effectively manage time related healthcare information has recently been found as not having their full potential exploited (Augusto, 2003a). It has been the aim of this work to focus on these time related healthcare information issues and show how techniques, capable of effectively managing time related information, may be employed in the healthcare arena.

Figure 1. The shift of allocation of resources during the transition from Industrial Age medicine to Information Age healthcare
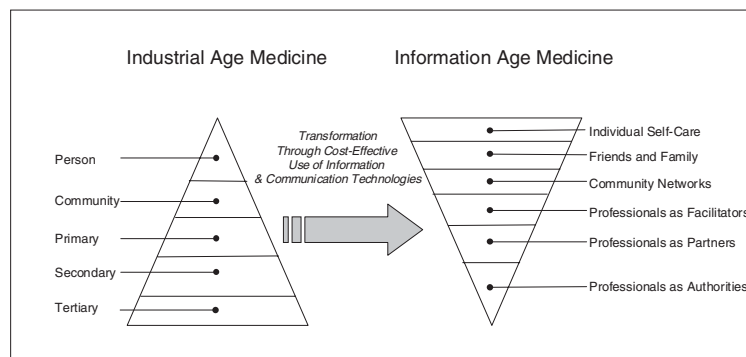
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