ISO/IEEE11073 Family of Standards:
Trends and Applications on E-Health Monitoring

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INTRODUCTION

Throughout the last two decades, healthcare applications have gradually experienced a substantial progress. This is mainly due to advances in Information and Communication Technology (ICT) resources and the evolution of Medical Devices (MDs) into Personal Health Devices (PHDs) focusing in user e-Health services. These devices use wireless technologies and portable computing devices in order to report signals and events for remote supervision.

Nevertheless, device manufacturers usually provide not only single devices but also optional hardware and software resources to improve their functionalities and the system overall performance. Making them work flawlessly is usually achieved by making the devices and the other components communicate conforming to a protocol with specific features using proprietary models and data formats. This lack of interoperability constitutes the main obstacle to the mainstream development of e-Health services (Martínez I. et al, 2010). Finally, the end user is forced to use a unique brand of devices, regardless of their specifications such as reliability, security, usability, price, etc. As a result of that, other devices with similar or even better specifications are disregarded, and updates or changes missed because they use different communication protocols than the implemented by the system developer.

In this context, a standardization effort has been strongly remarked to solve this problem and, as result, the ISO/IEEE11073 family of standards is proposed as the international recommended norm for interoperability of medical devices and personal health devices in e-Health services. In this chapter for "Encyclopedia of e-Health and Telemedicine", a complete review of ISO/IEEE11073 family of standards for interoperable communication of devices (MDs and PHDs) is proposed.

INTEROPERABILITY AND E-HEALTH SOLUTIONS: ISO/IEEE11073

Interoperability in the healthcare domain can be compared with the nervous system of the human body, wherein standardized information is conveyed back and forth for seamless understanding, analysis and effective information sharing (Perficient, 2014). The concept behind this is to accept basic electronic communication standards such as controlled vocabularies, code-data set, etc. that will enable stakeholders to uniformly transmit, store, manage and interpret data (Walker et al., 2005).

While the development of a design for an individual medical device itself is so complex, the concept of plug-and-play increases the design complexity, and a manufacturer may choose not to implement interoperability features for his stand-alone instruments. On the other hand, traditional barriers such as time, resources, cost, space, power consumption or system resources, can be solved with strategies to simplify adoption of standardization and interoperability features, being proposed to health devices companies to encourage adoption with their products (Leone, 2011; Jacob, 2012).

In addition, there is increasing evidence supporting the value of e-Health monitoring for individuals with chronic conditions, including: 35-56% reduction in mortality, 47% reduction in risk of hospitalization, 6 days average reduction in length of hospital admission, 65% reduction in office visits, 40-64% reduction in physician time for checks and 63% reduction in transport costs (Willmitch B. et al., 2012). These advances towards interoperability play a key role in e-Health monitoring, as they are the way to guarantee transparent end-to-end integration (with new medical use cases) promoting the auto-control and follow-up of the own health through newest e-Health monitoring solutions (Trigo J.D. et al., 2010).

E-HEALTH APPLICATION DOMAINS

A wide-adopted segmentation of the e-Health solutions and health devices market is done in three large domains: health and wellness (including fitness, sport activities, among other topics), living independently longer (including Ambient Assisted Living (AAL), Active Healthy Ageing (AHA) and home monitoring of elderly people, among other topics), and chronic conditions management (including diabetes, heart failure, patients who have undergone surgery, urgencies and emergencies, etc.) (Haux, R., 2010; Hovenga, E. J. S., 2010).

These application domains present a similar topology (see Figure 1) that includes the health devices associated to every health scenario, a gateway or information manager, and a third care provider to man-

Figure 1. General topology for three wide-adopted e-health application domains (health and wellness, living independently longer and chronic conditions management), including health devices, services and providers
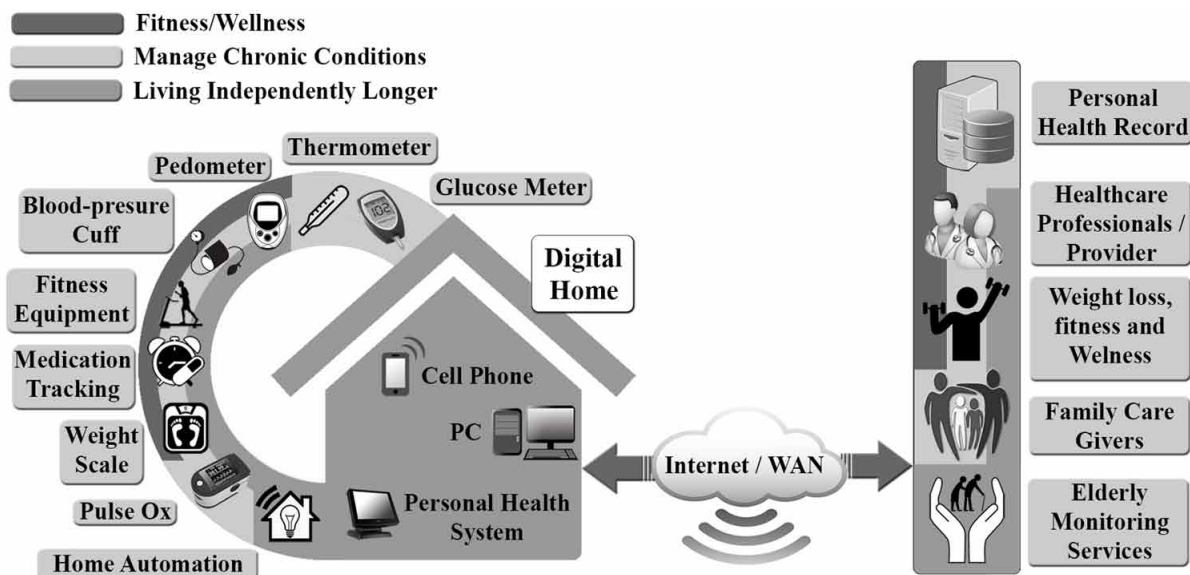
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