Home UbiHealth

U

John Sarivougioukas
"G. Gennimatas" Athens General Hospital, Greece

Aristides Vagelatos
CTI&P, Greece

Konstantinos Parsopoulos
University of Ioannina, Greece

Isaac E. Lagaris
University of Ioannina, Greece

INTRODUCTION

At the third computing era, users interact with many computing devices surrounding or implanted in them, in a natural way. These anytime and anywhere interactions implement the concept of *ubiquitous computing*, which provides the framework for computational awareness and personalization. These properties are precious in healthcare applications since the operating computing devices in the patient's environment can be aware about the evolving situations and actively participate in the medical treatment. In addition, ubiquitously supported healthcare services can be provided anywhere and at any time, allowing specific cases of the hospitalization model to be transferred to the home healthcare model.

The adoption of the home healthcare model in a ubiquitous computing environment provides the prerequisites for the development of the presented *Home UbiHealth* model. Extending medical services at home provides the capability to cover the medical needs of all population categories. Specifically, the Home UbiHealth model refers to all major population groups, namely the healthy population supported with prolepsis policies that retain health status; individuals that suffer a health crisis that requires recovery; and chronic patients who must maintain their quality of life coping with known health problems. Within the above patient categories are included the special groups of infants, children, disabled, and pregnants, which have special healthcare needs.

Thus, the home environment is transformed to a reference starting point for the implementation of healthcare processes independently of location and time, thereby bringing together the various healthcare stakeholders and the market. In this framework, the Home UbiHealth model can change the perception about the structure of healthcare systems and the concerns about medically uncontrollable environments.

BACKGROUND

In recent years, medical research has offered tremendous developments. Within this framework, specialized personnel is required to carry out advanced processes within properly structured and controllable facilities, using state-of-the-art biomedical equipment. Unfortunately, the availability of medical resources hardly meets the current social demands for hospitalization in cities and rural areas. This is partially due to the long average hospitalization periods required to perform trivial medical and nursing procedures such as screenings, lab-tests, or follow-ups. The lack of adequate infrastructures leads to longer stay of the patient in hospital.

DOI: 10.4018/978-1-5225-2255-3.ch675

These deficiencies can be addressed through new healthcare models that are supported by modern computing technologies such as ubiquitous computing. Ubiquitous computing was introduced by Mark Weiser to describe the *third wave* or *calm computing* (Weiser, Gold & Brown, 1999), where computers are enweaved into every fabric supporting the end user. In this era, the users are supposed to subconsciously interact with many computers, concurrently, in such a natural way as one uses eye-glasses to restore vision problems.

The application of ubiquitous computing in healthcare systems introduced the term *ubiquitous health* (*UbiHealth*) to describe the use of inherited computing characteristics in healthcare models (Sarivougioukas & Vagelatos, 2015). UbiHealth refers to healthcare services that incorporate ubiquitous computing means. Such services can provide critical advantages to overcome limitations related to individualized care, medical personalized treatment, patient safety, economy of scale, as well as healthcare system efficiency, effectiveness, security, and scalability.

Controllable hospitalization is directly related to quality of treatment, continuity of care services, transparency of medical and nursing supportive activities, patient safety, and administration of the involved supply-chains and related costs. In principle, UbiHealth satisfies the requirements related to the quality of the provided medical and nursing services, the demands for continuity of the involved processes, the necessary conditions of transparency in the followed procedures, and the fundamental prerequisite of safety for medical professionals and patients. Hence, UbiHealth can highly contribute to overcome issues related to hospitalization by providing the ground for medical and nursing processes within ubiquitously performing environments, such as at home.

Treating and curing patients at home (see Figure 1) has been considered as beneficial for particular population groups and has been extensively tested (Madaris et al., 2016) to the point where the treatment is under complete control by the assigned medical personnel. Usually, this refers to post-acute care or chronic patient cases. A typical example is the *Medical Home* paradigm (American Academy of Pediatrics, 1992), which was introduced by pediatricians to control infant mortality and children vaccination.

The significance of home treatment has been verified with respect to prolepsis, prognosis, testing, cure, and treatment. However, the continuously increasing costs of advanced cures, which are habitually applied in highly specialized facilities by specialized medical personnel, has turned the interest of the scientific community to home-based alternatives in order to address the lack of adequate treatment resources. Moreover, the associated risks during hospitalization, such as nosocomial internal infections, accidents, medical mistakes, and human errors, motivate researchers to delve into solutions alternative to hospitalization.

In addition, the bureaucracy imposed by long hospitalization increases the complexity of the carried processes, resulting in significant time and cost growth. In turn, this imposes substantial overhead to social security services, insurance funds, and the related market. Furthermore, limited available hospital resources are incapable to offer individualization of the provided services due to the applying workload. This is in contrast to the endeavors of medical practitioners and healthcare systems, which aim at personalization in the of-

Figure 1. Home Care main components and their relationships