

Consumer Electronics Opportunities in Remote and Home Healthcare

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Abstract – This paper discusses opportunities in remote and home healthcare for the consumer electronics industry. First, trends, drivers, market segments and barriers to adoption are introduced. Next, the Continua Health Alliance is introduced, a consortium that aims at addressing these barriers, notably by defining an interoperability framework for remote and home healthcare systems, built on open industry standards. Finally, related opportunities to the CE industry are presented.

I. INTRODUCTION

In many developed countries, traditional healthcare systems are struggling to cope with the future. A prime challenge is the increased demand and cost, notably due to aging populations and corresponding chronic and elder care needs, coupled to decreased resources, notably via shortage of money, beds, and qualified physicians and nurses.

Consumerism in healthcare is on the rise, with patients demanding more voice (decision-making) and more choice (shop-around) in their treatments. This will demand patient-centric care, with patients and their providers having access to personalized and contextual health information management.

Public health issues, such as an overweight and physically-inactive population, with corresponding risk factors for acquiring chronic-diseases, will raise or even enforce awareness for primary prevention and health maintenance.

To address these challenges, over the coming decade, new models of care will increasingly become important.

II. REMOTE AND HOME HEALTHCARE

Such new models of care are found in remote and home healthcare (RHHC), which is defined as healthcare being delivered outside formal institutions, by remote care providers, to the home or other personal settings of the care consumer. Overlapping terms for RHHC include: telehealth, telemedicine, telecare, healthcare unbound, connected personal health, consumer health, etc.

A. Market segments

Three main market segments are distinguished in the RHHC domain. Firstly, long-term care and chronic disease management, including remote patient monitoring and patient self-management. Secondly, risk monitoring and piece-of-mind provision in both post-discharge home-based rehabilitation and independent living solutions for elderly. Thirdly, health and fitness promotion, through education and healthy and balanced lifestyle coaching.

The author's work, and that of many other RHHC innovations using ICT technologies, has been focused on the first segments, extending the traditional clinical-and home-

care to remote and home-based solutions, aiming at improved health outcomes and resource savings.

B. Barriers to adoption

Several barriers exist to the large scale adoption of RHHC solutions. On the financial side, failure to demonstrate economic value of such new models of care, and failure to get the business model right in the absence of reimbursement and limited out-of-pocket co-payments, are the main barriers, particularly in long-term care.

On the technical side, lack of technology is typically *not* a bottleneck. Rather, the challenge is the proper integration of existing technology that will provide a tailored user experience. However, today's RHHC solutions are very proprietary, with individual technology choices and information models.

IT integration and interoperability, both at the patient-end device-data level and at the back-end patient information level are therefore main challenges. These should enable broad personal health data transportability across solutions and providers.

Also, this would allow for cost and deployment benefits from leveraging high-volume off-the-shelf and proven CE/IT solutions, that are open, standards-based, and interoperable. However, such suitable off-the-shelf RHHC platform components are basically missing today.

III. THE CONTINUA HEALTH ALLIANCE

A. Overview

In June 2006, the Continua Health Alliance [1] was formed with the objective to “enable connected personal health for the world”, by addressing the main barriers as described above. Today over 130 international members have joined forces in this non-profit, open industry alliance, and are working towards enabling multi-vendor product and service interoperability via technical guidelines and logo certification, built on a comprehensive set of open industry standards. The scope of Continua includes all of the RHHC market segments as described above: disease management, aging independently, and health & fitness.

The organization consists of several workgroups (marketing, use case, technical, reimbursement, government affairs, etc.) that work in parallel, and over 200 people meet quarterly to disseminate and synchronize results.

A first release of the guidelines is planned for the first quarter of 2008, together with a certification and testing program.

B. Addressing technical barriers: interoperability

Conceptually, two types of end-to-end services platforms can be distinguished in a typical RHHC ecosystem. On one hand, a remote monitoring and alarming platform, coupling sensors and actuators to remote services, and interfacing these services to health-records systems, with RHHC specific requirements such as privacy, integrity, availability, and other QoS. On the other hand, an interactive services platform, enabling user-service interaction and inter-user communication, with RHHC-service specific requirements such as usability, simplicity, tailoring towards care consumers in specific target groups.

In Continua, a use-case process is used to go from member-submitted use cases to a technical work scope, per release. The technical starting points for release one are: the device-data interfaces of the monitoring and alarming services platform, plus the health-information interfaces to health records systems. The interactive services platform is initially not addressed.

In that scope, Fig. 1 shows the Continua end-to-end reference architecture, applicable across the three application domains. It defines topology constraints amongst the five reference device classes and four network interfaces, that together form the basis of the interoperability-guidelines [2].

In the upcoming first release of the interoperability guidelines, data models, protocols, and wired & wireless transports for the PAN-interface (i.e. point-to-point sensor/actuator device connectivity) are profiled, together with a set of xHRN-interface (i.e. information exchange with electronic health-records) profiles. To this end, Continua works together with selected standard-development organizations (ISO/IEEE 11073, USB, Bluetooth, HL7, etc.) to complete the required set of standards [3]. The LAN-interface (i.e. home health networking) and WAN-interface (i.e. interfacing home/personal settings to the remote PHHC enterprise services) will be address in follow-up releases, to cover the entire eco-system. Towards interoperability, Continua aims at clearly separating the sensor/actuator data & protocol layers from the various underlying transport technologies, across the various interfaces.

A test and certification program will complement the interoperability guidelines, enabling logo-ed products.

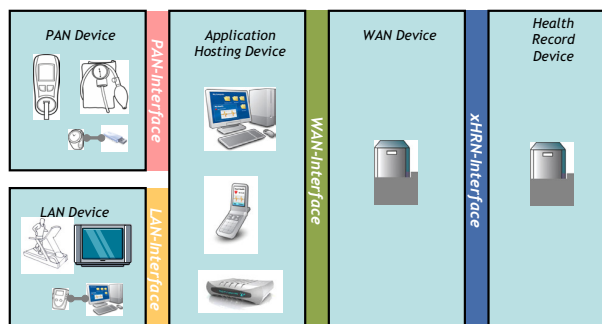


Fig. 1. The Continua end-to-end reference architecture. Real-world example devices are overlaid as icons for clarification.

C. Addressing economic barriers: reimbursement

Next to addressing technical barriers, efforts are underway in Continua to demonstrate economic benefits of RHHC solutions. For example, international trial data over the recent years has been compiled. Such efforts should facilitate reimbursement discussions with governments and insurers, to help open up the RHHC market.

IV. OPPORTUNITIES FOR THE CE INDUSTRY

Leveraging CE industry achievements to date, plus increase their active participation in future RHHC developments, is required to make RHHC a success.

First of all, people do not want multiple different home-gateway devices and user interfaces for their services from the entertainment, communication, home security, healthcare, and wellness industry. The CE industry should take advantage of its lead in cost and scale to enable these next-generation remote services through common services platforms and devices. Key is defining and adopting open standards that let the various industries, including RHHC, cost-effectively deploy on the same residential and mobile platforms, supporting 24x7 media-rich interactivity, interpersonal communication, and device connectivity. Examples include: interactive-TV platforms, connected interactive displays (ala photo-frames), residential and mobile gateways for medical device connectivity.

Second, dedicated extensions to existing platform capabilities will be required to serve the unique needs of the vertical markets, including RHHC. Examples include quality-of-service (data integrity, service availability), service-delivery middleware (off-line use, security & privacy), location and presence awareness, and remote systems management.

Last, to create demand and increase adoption of remote services, incl. RHHC services, knowledge is required about making attractive, engaging and easy-to-use products and services, and the CE industry can play an important role here.

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