

The Transition from Cards to Portable Devices and Sensors Networks for Wireless Personalized Health Services

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Abstract. Modern healthcare in the 21st century aims at involving citizen and health professionals alike entitling especially citizens to take over responsibility for their own health status. New technologies (Internet, mobile phones, sensors, etc.) enable patients to actively participate in healthcare processes. It's not any longer just health data storage data cards; it's an ongoing personalization of health services including application of portable devices and sensors/actors stipulating the personalized health approach which offers a real chance for practicing high quality wireless personalized shared care. The workshop jointly organized by EFMI WG "Personal Portable Devices (PPD)" and ISO/IEC JTC 1 "Study Group on Sensor Networks (SGSN)" will therefore aim at identifying a set of criteria/factors determining the application of personalized portable devices, sensors, and actors in a wireless healthcare and welfare, the paradigm change from health cards to wireless health devices, and the citizen's confidence in, and acceptance of, the underlying technologies and methods. The presentations are based on experience from different national, European and international projects and standardization activities as well as existing and emerging routine implementations in the domain.

Keywords. eHealth, pHealth, mobile health devices, wireless health services, sensors, portability, interoperability.

Introduction

Smart cards have widely been used in health care for about 40 years. Many countries are still scheduling the introduction of patient data cards. The European Health Insurance Card (EHIC) is being introduced in almost all countries within the EU; an electronic version (eEHIC) is under standardization. But cards and other related security tokens are just single pieces of the complex solution. They need readers and infrastructures – they thus need related devices. It has been quite a long way from early 1980s plastic cards via the 1990s chip cards and chips to personalized portable devices being just beyond the horizon. Mobile phones are well-known and well-applied for different purposes in many countries. Sensors and sensor networks help providing both health services and collect patient-related medical information. Personalized portable (wireless) devices are more and more going to play an important role in the context of modern Health Information Systems and the pathway towards the "wireless patient". The ways to make use of them are manifold. Devices are either considered just to be secure tokens bearing keys and pointers to access information stored in networks. They are in addition able to bear a certain amount of administrative data (e.g. access rights, attributes) and medical information (e.g. a basic set of emergency data, allergies, vaccination and immunization records, specific disease records like diabetes). In addition to these "traditional" healthcare and welfare approaches, new requirements arise from the establishment of portable wireless sensors. Specific networks for sensors shall be implemented for data capturing and data analysis. Solutions from industrial domains like transportation can be adopted and adapted to health service scenarios. Sensors need to store not only raw data but also the variance of data outside some predefined levels as these data items may indicate a very specific health situation. The term of emergency shall be defined in a different way in this respect. Analogue to traffic lights, the patient status can be divided into a "green", "yellow" and "red" status. Collected data lead to only initiating alarms in "red light" situations of serious health problems. Otherwise, data shall continuously be collected, stored, pre-processed, and transferred upon request only (e.g. once in 24 hours as a summary report being later on transferred into the patient's Electronic Health Record).

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Advanced standardization both from a technical and administrative perspective is underway to allow for achieving a significant level of harmonization and interoperability in Europe and worldwide. Is this just fiction? Is this a realistic approach? Is there a roadmap towards a health service provision in a completely wireless environment? What are the steps to go?

Objectives

Personal(ized) Health (pHealth) focuses on personal health service provision and do therefore see citizens in the centre. Wearable micro and nano-systems and technologies for personalized health need to be mentioned. Related portable devices (cards, chips, tokens, mobile phones, smart devices, sensors, actors, etc.) are considered first line communication tools. They can hold medical / clinical data and improve

- Identification and identification management for insurance purposes, for access control, for reimbursement and entitlement;
- Security, privacy and trustworthiness of health services delivery by allowing advanced standardized privilege management and access control measures;
- Availability of, and accessibility to, information on health services as well as on personal(ized) healthcare data and thus enable better health provision;
- Secure and reliable access to vital signs (parameter data) in routine use as well as in case of emergency;
- Application of technical solutions like nano-sensors as small as they will not harm the human body, and
- Quality of care provision by providing stakeholders with up-to-date portable devices allowing access to personal health data from everywhere anytime.

Beside the presentation of different views on the topic (i.e. mobile devices, sensors, security, privacy, interfaces, personalization, ID management, related health scenarios), the workshop's main objective is a discussion about key questions in the context of the paradigm shift towards pHealth and personalized portable devices including sensors and networks. Standardization is a key issue in these processes as it allows to seamlessly and successfully combining tools, sensors, devices, applications, etc. from different vendors.

Methods

The workshop takes a closer look at different aspects, approaches, and strategies as well as the current situation concerning the paradigm shift towards personalized health service delivery and the related application of cards, tokens, sensors, actors, and related devices in projects and initiatives. The speakers aim at presenting important steps on the way from plastic cards, memory cards, and chip cards via implantable chips as such towards the personalization of health services supported by existing and emerging portable devices. The speakers from Europe and beyond will highlight the progress in their domains and nations, respectively, during the course of applying personalized portable devices for different purposes in healthcare and welfare.

In addition to this traditional approach, new technologies already applied to different industry domains like transportation can be adopted and adapted to health service scenarios. Solutions like, e.g., the investigation of holes and flow-stops as well as the localization of certain bottle necks in such oil pipelines could be transferred into the field of medical investigations inside humans like, e.g., finding blood-stop in blood vessel. It's far from being just science fiction; it's becoming reality.

The workshop presents the paradigm shift from cards to personal devices including sensors, and takes many different views on the subject. It presents current and future health service and management scenarios for providing personalized care and addresses wireless technology in areas like healthcare, welfare, and transportation. Related scenarios and their application into the health services delivery will address practical terms of usage. The workshop will finish with a discussion on how to comprehensively move from simple tokens to device networks without leaving existing applications, strategies, developments, persons, and nations behind. Identified criteria/factors which determine the acceptance of these technologies and methods by stakeholders, and their vital interest in these topics shall be discussed based on the key questions.

Key Questions to Be Raised

- Who represents the driving forces for the paradigm shift towards wireless and device-based health service provision?
- Can such a device be used for seamlessly providing identity management, health data including vital signs, health information, and access to related wireless health services?
- What are the new requirements arising from adopting and adapting solutions from other domains?
- How can the approach of industrial investigation of oil and gas pipeline to find holes and flow-stop, and the localization of dangerous bottle necks be transferred to the medical field?
- How can nano-technology be applied to investigate human beings to, e.g., finding vessel blood-stop?
- Can such a device incorporate the advantages of nowadays cards and chips?
- Can security, safety, and privacy be guaranteed while applying such devices?
- What are the key science and technology trends in personalized healthcare?
- How can health management scenarios benefit from sensors and devices?

Expected Benefits

Based on their experience in national and international projects and initiatives as well as on their expertise as developers of portable device solutions, the presenters explain their ideas and strategies of implementing personalized health service provision based on portable nano, micro and macro-devices. The outcome is manifold. Attendees from countries with such a strategy in place will be able to compare their aims and goals with those of other countries and the EU level. Countries without (yet) such a strategy can learn from others on how to implement such portable device scenarios, and on how to use existing European and international standards (CEN, CENELEC, ETSI, ISO, IEC, IEEE, ITU, ICAO, HL7, OMG, etc.) in this domain.

The workshop aims at addressing people involved in card/token/devices/sensor business in the healthcare and welfare domain, and anybody interested in these topics. In particular, informatics specialists and computer scientists, people involved in related standardization, ombudspersons, medical doctors and health device technicians intended, engaged to or responsible for the analysis, design, implementation and use of distributed health information solutions including cards, tokens, sensors, actors, networks, and related portable health devices should attend the workshop.

Speakers and Presentations

The workshop will jointly be organized by EFMI Working Group Personal Portable Devices (PPD) and ISO/IEC JTC 1 “Study Group on Sensor Networks (SGSN). It aims at analyzing the topics related to portable devices, sensor networks, and the personalization of the devices and from the groups’ own perspective allowing a comprehensive view on the application of sensors and devices as such. Followed by a concluding and summarizing discussion with the audience, the invited speakers and their presentations are:

1. Peter Pharow (Magdeburg, Germany): “Introduction: From chip cards to personalized portable devices and sensor networks”
2. Pekka Ruotsalainen (Helsinki, Finland): “Intelligent chips – an adviser towards health support for the wireless patient”
3. Tomas Trpisovsky (Prague, Czech Republic): “NFC – Near Field Communication mobile phones as enabler for wireless health services”
4. Françoise Petersen (Sophia Antipolis, France): „Standard for Personalized eHealth Services“
5. Asbjørn Hovstø (Oslo, Norway): “Intelligent transport including support for sensor networks”
6. Fritz Meier (Nuremberg, Germany): “Sensor networks for optimization of blood bag logistics in hospitals”
7. Qiang Pan (Shanghai, China): “Collaborative Information Processing in Sensor Networks”