Notable e-Health Developments

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Abstract—The field of information and communication technologies (ICT) in health care, now called e-health, is coming to maturity. This is demonstrated by several “real world” accomplishments that will hopefully demonstrate the benefits of ICT in health for all those involved, not only the society and the patients at large. In this article, we will highlight the technical and the profession-specific building blocks, on which e-health applications are based, give a few examples of typical realizations and discuss the evolving political context.

Keywords—e-health, medical informatics, health telematics, electronic health records, electronic prescriptions

INTRODUCTION

The development of the Internet has had a major impact on communication modalities and processes within the health care world. This field once called “Internet and medicine” now obtains the label “e-health”. In close relationship with all other e-fields such as e-government, the e-health field has its similarities but also its specificities which we will highlight. Sophisticated long distance communication is not necessarily involved, indeed, very often successful e-health applications have to do with transitions from the paper world to the digital world: not the least being the introduction of adequate electronic medical records replacing paper records to the benefit of all those involved and especially the patients.

Because e-health is such a broad field involving many aspects, some authors have tried to come up with a very global, all covering definition. From these efforts the following one (already dating back to 2001) from Eysenbach is still perceived as a very good overall statement of what is covered by the term e-health: “e-health is an emerging field in the intersection of medical informatics, public health and business, referring to health services and information delivered or enhanced through the Internet and related technologies. In a broader sense, the term characterizes not only a technical development, but also a state-of-mind, a way of thinking, an attitude, and a commitment for networked, global thinking, to improve health care locally, regionally, and worldwide by using information and communication technology” [1].

Thanks to the appropriate technical building blocks (mainly internet technology), thanks to the recognized e-health good practice rules and thanks to the benefits for both patients and health workers, we fortunately see the emergence of several inspiring success stories.

In this paper we will illustrate these developments by several e-health realizations, analyze the technology they use and how they fit into the health system. Furthermore, e-health initiatives regarding Europe (European Commission) Africa (African Union) and the WHO will also be highlighted.

THE E-HEALTH BUILDING BLOCKS

Based on the building blocks consisting of:
- Internet (broadband) communication
- web services
- encryption, authentication
- databases
- XML technology (Extensible Markup Language)

This e-health applications, satisfying the requirements of medical practice can be built and maintained in operation. Moreover solid legal, ethical and operational frameworks as well as full support by the medical professions are needed as essential “border conditions”.

Internet communication

The open protocols based on the Internet Protocol (IP) serve as a basis for communication. Some countries and institutions opt for a separate, completely isolated network infrastructure, enforcing isolation from external networks by all possible means. Others rely on the “public Internet” but make use of appropriate encryption and other security measures to protect their data-flows.

Web services

Whereas web portals serve interactive users with information, web services provide a program-to-program interface, appropriate for e-health services. So-called “software as a service” (SAAS) e-health solutions rely on web services as inter-program communication exchange.

Encryption, authentication

For messages with known destinee, the “public key encryption infrastructure” (PKI) is perfectly adequate. When destinees are not known, symmetric encryption schemes can be used. Well defined certification authorities (state, city, institution, third party) can issue digital certificates that certify that a party is who he claims to be in the context of authentication and digital signatures. Virtual private networks or single-sign-on session schemes rely on users’ or/and system’s certificates to establish secure communication channels, suitable for health data communication over “public” networks.

Databases

Relational database technology is currently available “off the shelf”. Both commercial and freely available database systems of high quality, reliability and performance and within the reach of even individuals.

A recent development, of interest for several e-health applications is the availability of “non-relational” databases. Often data, stored in a database does not need updates (think of a hashed web-page scan or the compilation of access-logs to medical records). In these cases the full functionality of relational databases is “overkill” so that the “non-relational” systems are far more efficient and cost-effective.

XML technology

The appropriate format for e-health messages is XML. The XML format comes with automatic conformance testing to the format definition of the given message and also an arsenal of processing modalities which are themselves written in XML to define the processing unambiguously.

Ethical, legal and operational frameworks

Health applications have de-facto to do with the extremely sensitive individual’s health data. In Europe, the main ethical rule states that “individual health data cannot be processed “. There are however exceptional conditions that allow processing under strict conditions such as the explicit approval of the patient. The “therapeutic” exception allows e-health applications to exist in current medical practice.

For research purposes however, explicit patient consent and approval by the appropriate national bodies is required.

Privacy legislation and the operational bodies put in place vary greatly between countries. The optimal situation being a comprehensive privacy law, protecting the privacy of the civilians and an independent body (Privacy Commission) with strong legal powers to enforce the privacy laws. Privacy “by force” is not an option: it is far more efficient to make all concerned institutions themselves responsible for their security and privacy matters, ideally adhering to a recognized ISO27000 framework, including ICT security and privacy.

Full support and involvement of the medical professions

A critical success factor for e-health developments is the involvement of the medical workers themselves. Win-win situations (for the medical professional and for the patient) need to be created or the chances of failure, astronomical costs, largely surpassed deadlines or all three of them will be very likely outcomes.

E-health projects by nature involve changes and medical professionals are usually critical to change, unless they see clear advantages and have the assurance they stay in control of their own professional and administrative environment.

Interferences by government or by health insurance institutes are perceived as threats. Technical realization by the private sector are looked at with suspicion, indeed successful public-private partnerships do exist, but the impact of the failed ones has marked the health care sector.

In most large scale e-health projects, government, health insurance, medical professionals and private companies are all