

eHealth: easing the transitions in healthcare

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Summary

Our complex healthcare systems are fragmented, and their functioning, both in terms of efficiency and quality, are plagued by multiple discontinuities. eHealth has the potential to ease transitions between the many settings and stakeholders of healthcare. eHealth can improve the continuity of healthcare information flow, can facilitate the re-engineering of care processes so that they become much more patient-owned and patient-controlled, and can enable better ways of accessing and producing care. Such capabilities evolve with the development of our information and knowledge-based society, reflected by the various generations of the world-wide-web. Starting with the “read-only Web” where the main task was to give access to health information, it has evolved into the “social Web” and provides support of patient-centred, collaborative care, and is reaching a stage where pervasive computing tools can intelligently partner with citizens to help them take better care of their health.

Key words: *eHealth; healthcare quality; healthcare safety; clinical information systems; health information exchanges; patient empowerment*

Introduction

Our current healthcare systems are characterised by an increasing complexity, fuelled by the accelerating sophistication of diagnostic and therapeutic tools, by the multiplication of stakeholders, and by an escalation of economical and societal challenges. This complexity leads to inevitable discontinuities, and many gaps have been identified, and their impacts on the quality and safety of healthcare processes documented [1–3].

Following the dire account about the lack of safety in the healthcare industry [4], reports have highlighted the important contribution of various discontinuities in healthcare as a source of potentially correctable factors, as well as the potential role of information and communication technologies to help improve the situation [5], calling, in 2001, for “...an information infrastructure to support health care delivery, consumer health, quality measurement and improvement, public accountability, clinical and health services research, and clinical education...” [6]. In 2004, the United States President’s Information Technology Advis-

ory Committee summarised existing evidence [7] and recommended a framework for a 21st century healthcare information infrastructure able to lower cost, reduce errors and improve quality, based on four components: electronic health records, clinical decision-support systems, computerised provider order entry, and a secure, private, interoperable health information exchange.

Since then, the healthcare information technology (HIT) industry, embracing this vision, has gone through the various stages of Gartner’s hype cycle [8], moving from a *peak of inflated expectations* (“... the potential of IT to improve the delivery of care while reducing costs is enormous...” [7]), to a “through of disillusionment” (“...increased mortality after implementation of a commercially sold computerised physician order entry system...” [9]), to reach what seems to be the “slope of enlightenment” (“...hospitals with automated notes and records, order entry, and clinical decision support had fewer complications, lower mortality rates, and lower costs...” [10, 11]). Still, the last stage of this cycle, known as the “plateau of productivity”, has not been reached yet, as reflected when surveying the existing literature for strong evidence of the impact of eHealth [12].

This paper highlights important trends in the development of information and communication technology-enabled healthcare and their potential to address issues related to care transitions, by bridging information gaps, by improving the continuity of information flow, by facilitating the coordination of care processes, by instrumenting the empowerment of patients, or by making use of mobile and permanently connected digital devices.

It explores several scenarios which consider the increasing maturity of our information society and communication technologies.

Informing the healthcare professional

For decades, the main efforts of using information and communication technologies (ICT) and tools have been geared towards supporting healthcare professionals, with the aim to bring the required information at the right time to the right person in order to support better decision-making processes. This has led to the development of sophisticated diagnostic- and decision-support tools. However, their impact on actual healthcare outcomes has been lim-

ited, not only because of the relative inability of artificial intelligence to deal with the complexities of healthcare processes, but also because of their disconnection from the existing information flows.

Integrating these tools into the actual information processes of healthcare has been a key challenge, and pioneering sites have demonstrated that many of the benefits come from the ability of such integrated systems to bridge some of the information and communication gaps in healthcare. It is only more recently that such benefits have also been documented using more widely available solutions, outside of medical informatics excellence centres [10]. Interestingly, the main benefits are not so much linked with the technical solutions, but they depend mostly on how much these tools actually get used by healthcare professionals in their daily clinical activities. Ergonomics and human factors, along with processes of re-engineering and change management, therefore play a significant role to maximise benefits of such systems, but also to avoid potential ICT-induced iatrogenic complications (now known as “e-iatrogeny”) [9].

In the information-rich and information-dependent setting of healthcare, tools that provide a faster, and more reliable circulation of information amongst stakeholders have been shown to produce the most benefits, by avoiding errors of transcription (for medications), by accelerating the notification of important clinical information (such as abnormal lab test results), and by improving continuity of care (through automated notes).

Informed-patient care

With the democratisation of personal computing and the development of the World-Wide-Web, it has become easier for citizens and patients to look for and access health and healthcare information. These trends, combined with societal changes such as the wish for more “patient empowerment”, have led to the recognition of the central and partnering role of the patient in his/her care processes, and the development of new tools and resources to support it.

The Web 1.0 (the “read-only Web”) has become a significant source of health information for the general population, where patients “Google” for information before and after they consult their physician, or make a self-diagnosis and start an over-the-counter treatment [13]. An obvious challenge is to help patients judge whether they should trust the information they find. Trustworthiness is difficult to guarantee, but tools such as the Health-On-the-Net code of conduct [14] can guide web users to quality information sources.

The Web 2.0 (aka the “read-write Web”), with its social tools, enables new forms of communication and interaction between patient themselves. Pew Research in 2011 [15] showed that 23% of patients with chronic diseases looked online for other patients with similar conditions. Thus, collective wisdom is becoming a competitor of established knowledge sources.

Although perceived at times as a challenge to the authority of healthcare professionals, such tools can be used productively to engage patients in their responsibility to learn about their condition and participate in their care. Professionals must be aware of these trends, learn about these

tools, and use them, for example, to prescribe information to their patients, in addition to prescribing treatments, and guide them to quality Web portals that value interactivity and enable feedback such as the rating of services.

A good example is the NHS Choices [16] portal, a comprehensive source of information aimed at increasing the engagement of patients to take responsibility for their own health, supporting informed choice of treatment and services. It combines general medical information with locally-relevant healthcare and social care information, and enables citizens to network and share their experiences.

Coordinating patient care

With most of the stakeholders now connected to the internet, and potentially connected to each other, new ways to improve coordinate healthcare can be implemented. Many efforts are underway to create patient-controlled health information exchanges. These are technical infrastructures and software which enable the patients to grant access to a consolidated view of their healthcare information, federating documents from hospitals, outpatient consults, pharmacy visit or home nurse care (see box 1) [17, 18], and eventually their own contributions. If the primary goal of these tools is to improve the continuity of care, they can also be leveraged to orchestrate the collaboration of multiple care professionals, in particular when dealing with complex, chronic patients. A shared dashboard for the management of diabetic patients, and shared treatment plans to cover the medication prescription-dispensation-administration process across healthcare settings are good examples of such tools. Integrated collaborative care pathways represent another level of coordination, as they enable a more proactive definition of optimal care processes and can embed quality and efficiency improvement tools within the care documentation and monitoring tools [19]. Their benefits have been demonstrated within hospitals, but their implementation throughout the complex journeys of patients in healthcare systems remains a challenge [20]. Fostering trust amongst the various stakeholders is essential, so that the transparency created by these tools is seen as an advantage and not as a new way of controlling and enforcing healthcare provision and usage behaviours (both by producers and consumers).

Patient-informed care

The increasingly pervasive nature of information and communication technologies is enabling new developments in eHealth, with potential significant impacts on improving care transitions.

Our societies are rapidly getting to a situation where most citizens will be equipped with their “digital proxy”, a mobile, always-on, permanently-connected, and context-aware device such as a smartphone, and where homes can be made intelligent, aware and reactive to the wishes and needs of their inhabitants. A rapid development of “ambient assisted living” tools is occurring, providing intelligent technologies aimed at supporting our ageing, chronically-ill populations, who want to remain autonomous, at home, for as long as possible.

The ability to remotely supervise and monitor healthcare tasks accelerates the changes of roles and responsibilities, and the shift in tasks amongst care professionals, and towards patients and their families.

In parallel, an increasingly consumer-oriented healthcare requires further personalisation of healthcare services and of its ICT enabling tools. This is both an opportunity and a risk. The opportunity is to increase acceptance and usage of consumer-adapted tools, and to be able to make use of additional, personalised contextual information to enhance their relevance, accuracy and usefulness. The risk is to further fragment information and services, as witnessed when looking at all those small “apps” that are being installed on smartphones, each with a different purpose. In order to maintain consistency and continuity, these “apps” should function within a coherent environment, which, hopefully, will be developed by large-scale eHealth infrastructure projects at national or international levels. If these succeed, we will move one step closer to providing personalised, adapted, coherent and interoperable eHealth services to citizens and their care professionals.

Conclusion

It is established that transitions in healthcare are risky and account for a significant share of preventable medical errors. eHealth tools can help secure these transitions by improving communication and coordination, by involving and empowering patients, and by enabling new ways to get access to quality care. There are many challenges, and they include the need to foster more trust amongst the multiple and diverse stakeholders, to create a sustainable, open infrastructure on which innovative services can be de-

veloped, and to demonstrate their added value, return on investment, and contribution to improving healthcare and health outcomes.

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Box 1

The Geneva Health Information Exchange Project: e-toile

The e-toile project aims at connecting all the stakeholders of the healthcare system in Geneva via a community healthcare information network. Its primary goal is to support the Geneva health network which combines public and private healthcare services, by improving continuity and coordination of care. It is also expected to empower patients to take a more active role in understanding their health conditions and participating in their care, and to provide a common infrastructure for the distributed development of added value services to consumers. The system is based on the following key concepts:

- On a voluntary basis, all participating professionals provide useful information for continuity of care;
- The patient owns the key (a smartcard) which gives access to the information;
- The access is based on the notion of the “therapeutic relationship” materialised by the patient card and the healthcare professional card;
- Healthcare information remains at the source; it can be virtually consolidated but not centralised.

Initial services built on the e-toile platform include:

- A distributed, shared electronic patient record;
- Secure communication between healthcare professionals;
- e-prescription including a shared treatment plan which brings together prescription (medical), dispensation (pharmacist) and administration (home nurse) information, and facilitates medication reconciliation during care transitions;
- Collaborative, multi-professional dashboards for chronic disease management such as diabetes and heart failure.

- network using peer-to-peer communication in a highly distributed architecture. *Stud Health Technol Inform.* 2004;107:1048–52.
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