Towards E-Health Interoperability: Challenges, Perspectives and Solutions

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I. Introduction

Healthcare needs to be more efficient and provide more services with the same or fewer resources. Our aging population and increased occurrences and survival with chronic diseases threaten to put a strain on our already overloaded healthcare system. When healthcare makes the news it is frequently bad news about prolonged waits in emergency wards, increased surgical wait times and patients unable to obtain basic medical services such as a family physician.

The 2001 Institute of Medicine (IOM) study 'Crossing the Quality Chasm a New Health Care System for the 21st century' described the need for a healthcare system with high performing patient care teams that provide safe, effective, personalized patient care across different sites and services [1]. However that vision is challenging as our healthcare system is still largely built around individual tasks and information usage, which is clearly inappropriate for the level of integration our healthcare system needs to provide coordinated care across distributed settings.

Although today one is, for example, able to access our banking information and withdraw money or pay bills from computers and kiosks around the world it is often difficult to access a patient's healthcare data across different settings in the same city much less across a country. Thus a critical need for the healthcare system is interoperability, defined by the Healthcare Information and Management Systems Society as 'the ability of health information systems to work together within and across organizational boundaries in order to advance the effective delivery of healthcare for individuals and communities.'[2].

Interoperability research has become a priority area with some countries having entire divisions of the healthcare system dedicated to interoperability. For example Australia's national E-health transition authority (NEHTA) has the sole purpose of defining the interoperability standards for any future national health information system [3]. Similar efforts are under way in the United States where the Healthcare Information Technology Standards Panel is attempting to develop standards for local, regional and national health information networks [4]. Many of the efforts to introduce an interoperable health record in Canada have originated from Canada Health Infoway [5].

Emerging technologies such as Web 2.0 can serve as the architecture for an integrated healthcare system. The application of Web 2.0 in healthcare, designated as Health 2.0, has unlimited potential for reshaping the way that healthcare is delivered. Many of the recommendations from the IOM study involve coordination of services across different diseases, and settings, and the ability for patients, caregivers and medical professionals to collaborate and share data. Health 2.0 can help us achieve those recommendations. Further, an increased prevalence of chronic illness and the move towards proactive wellness rather than reactive treatment will change the way healthcare is managed. Health 2.0 applications can help transform patients from passive recipients to active participants in healthcare service delivery.

Health 2.0 applications, services and tools have emerged along five themes: social networking, participation, apomediation, collaboration and openness [6]. The common business model in Health 2.0 applications is openness and sharing. For example Google [7] and Microsoft [8] and Telus [9] are proposing services to maintain personal electronic health records of consumers while allowing appropriate access as needed by physicians, clinics, and other health care providers.

However there remain numerous issues including technical, social, legal and policy-based issues that must be resolved before Health 2.0 can realize its full potential. A particular challenge is interoperability for healthcare as interoperability has several different levels including technical, workflow, privacy and semantics. Much of the interoperability research to date has focused on terminology standards but we need to remember that interoperability includes other factors including workflow and communication [10]. Problems occur when the technical aspects of interoperability are implemented

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without consideration of the underlying work processes [10].

As we move towards the goal of an interoperable healthcare system we must remember that healthcare is a complex system consisting of people, processes, languages and architectures. Interoperability goes beyond technical issues. Rather we must look at interoperability as the infrastructure for the entire healthcare system that includes technical, clinical, workflow and human aspects.

In the spring of 2009 a group of researchers from across Canadian formed the eHealth interoperability group to study interoperability issues in healthcare. The group held a workshop in May 2009 as part of the MCETECH 2009 conference in Ottawa, Canada. This special edition contains expanded versions of papers originally presented at that workshop. Each paper from this special issue is introduced below.

Mouttham, Peyton, Eze and El Saddik propose an architecture for data integration within an electronic health care network that extends existing work on service oriented architecture (SOA). Their architecture also incorporates business process management to facilitate outcome assessment.

Cao, Archer and Poehlman propose a software agent based virtual integration framework to integrate multiple electronic health record (EHR) systems from distributed (possibly heterogeneous) databases. The framework can help mitigate eHealth interoperability issues such as the development of personal health record systems.

Kuziemsky and Weber-Jahnke draw upon the successes in eBusiness integration, specifically supply chain management, to propose an interoperability framework for eHealth. They remind us of the need to look at interoperability and the application of emerging technologies to support interoperability from a system perspective and not as disparate technologies.

Miller and McCaull describe a web-based Careflow Management System that draws upon emerging web technologies to extend existing workflow management systems through formal verification features applying high performance computing methods.

Mohammed, Fiaidhi and Mohammed propose the open source SVG (Scalable Vector Graphics) standard for representing interoperable electronic healthcare records. A prototype system is presented along with experiments to test its applicability in a web environment for sharing SVG EHRs.

Barrett and Weber-Jahnke describe the need for interoperability between clinical terminologies and services that make those terminologies available on a shared infrastructure. They identify a list of service requirements and terminology services to support interoperable ehealth system infrastructures.

Masaud-Wahaishi and Ghenniwa look at the complexity of healthcare systems and the need to support privacy as part of information sharing. They present a privacy-based multi-agent information brokering architecture that supports different privacy degrees.

As the papers show there are many interoperability challenges but also many different perspectives on solutions to address the challenges. We believe this special issue provides innovative perspectives that will help drive eHealth interoperability research.

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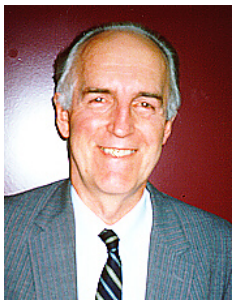

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