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Breaking the Healthcare Interoperability Barrier by Empowering and Engaging Actors in the Healthcare System

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Abstract

There is an increasing need for an interoperable healthcare data system that provides a shared common view of the essential data for a person to any healthcare provider involved in the circle of care regardless of where provider or person are physically located or what organization they belong to. This paper introduces a framework that characterizes the essential elements of such a system: minimal data set, information technology architecture, and legal governance. We evaluate related work and propose a cloud-based portal and a web-service API for accessing and managing shared data. The proposal is evaluated and compared using a representative usage scenario from community care.

Peer-review under responsibility of the Conference Program Chairs.

Keywords: healthcare, interoperability, minimum dataset, architecture, governance

1. Introduction and problem definition

Healthcare in Canada is legislated and funded by the federal government and administered provincially[14]. The provincial Ministry of Health allocates funding to the healthcare providers in the province. While urgent and acute care is provided at hospitals and clinics, there are also publicly funded community healthcare providers that deliver care in homes, hospices, long term care facilities, retirement homes, etc. Provincial health ministries in Canada have facilitated the adoption of electronic health record (EHR) systems across various healthcare providers[8]. In this paper we focus on the healthcare systems within the province of Ontario.

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There is an increasing need for an interoperable healthcare data system that provides a shared common view of the essential data for a person to any healthcare provider involved in the circle of care regardless of where provider or person are physically located or what organization they belong to. Too often time is wasted repeating collection of information in an ad hoc manner, and too often critical information is missed or provided too late. Furthermore, cross-organizational collaborations are often not fully compliant with evidence-based, patient-centric, timely, and safe[6] practices. Privacy, continuity of care, and patient care fragmentation[17] are all problematic. As well, individuals receiving care are often under supported in their right to access their own health data[11].

This paper introduces a framework that characterizes the essential elements of such a system: minimal data set, information technology architecture, and legal governance. We evaluate related work and propose a cloud-based portal and a web-service API for accessing and managing shared data. The proposal is evaluated and compared using a representative usage scenario from community care.

2. Background

2.1. Electronic Health Records and Cloud-Based Health Apps

Nowadays, most healthcare organizations (HCOs) each have their own Electronic Health Record (EHR) system that records the care they provide. Within an individual HCO, healthcare data is available to the various stakeholders through software applications. Healthcare data can also be available through healthcare application programing interfaces (APIs) in an ecosystem of applications similar to that of smartphones[15]. Furthermore, EHRs rely heavily on HL7 standards and APIs[3].

At the same time, individuals increasingly track and manage fitness and telemetry data generated by various tracking devices and sensors that send real-time data to their cloud servers. There is the potential for improved healthcare if EHRs can be integrated with this new individually managed cloud-based data. Examples of such integrated data, like predicting an imminent heart attack based on the stream of data from an apple watch that monitors the heart rate, have been explored by various researchers[7].

2.2. Healthcare Data Governance

In Ontario, Personal Health Information Protection Act (PHIPA) regulates healthcare providers involved in handling personal health information (PHI)[5]. To protect privacy, many healthcare providers severely restrict cross organizational data exchanges. However, PHIPPA allows sharing PHI to deliver efficient and effective care delivery[1].

In the United States, the Health Information Technology for Economic and Clinical Health Act was passed to facilitate adoption of EHR systems by providing financial incentives for those who succeed at digitizing their health data, automating their internal processes, and providing seamless collaboration with other healthcare providers[16].

In Europe, governance of EHR systems varies from country to country and even from region to region. As an example, Denmark developed a national action plan for governing and harmonizing all EHR systems in the country, but so far this had met with mixed results[10].

2.3. Interoperability and Related Work

Interoperability can be defined as an efficient transition of data and services that ensures continuity of care across organizations and providers at the level of data, process, and context[12]. Data interoperability focuses on the integration of data across all actors, processes and contextual factors. Process interoperability is integrating work processes across all actors who deliver healthcare services, a key part of which is integrating knowledge and collaborative processes to enable team based care delivery. Finally, contextual factors such as political and social environments, can affect the ability of healthcare providers to achieve complete interoperability.

There are government initiatives to reduce the number of EHR systems in a region and encourage healthcare providers to use one shared system including Sweden[4] and Denmark[10]. Epic[3] is an example of a commercial EHR