The Canadian Health Record Interoperability Infrastructure

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INTRODUCTION

Countries around the globe are struggling with the rising cost of delivering health care. In the developed world, this trend is enforced by aging demographics and emerging forms of expensive medical interventions. Disease prevention, early disease detection, and evidence-based disease management are key for keeping health care systems sustainable. Electronic information management has been recognized as a central enabler for increasing the quality of health care while controlling the cost of delivering it. Secondary care facilities (e.g., hospitals) and laboratories have made use of electronic information systems for decades. However, the primary care sector has only recently begun to adopt such systems on a broader scale. The benefit provided by each system in isolation is limited since citizens generally receive their care from a multitude of providers. Health care information systems need to interoperate in order to enable integrated health information management and consequently attain the declared qualitative and economic objectives. Many industrial countries have begun to create common infrastructures for such an integrated electronic health record (EHR) (Blobel, 2006). Different approaches exist, ranging from centralized databases to highly distributed collections of mediated provider-based systems. This chapter describes the architecture of the Canadian infrastructure for health information management, which can be seen as a compromise between a fully centralized and a fully distributed solution. While in Canada the delivery of health care is a matter of provincial territorial authority, the health ministers of all provinces and the federation have created a joint organization called Health Canada Infoway with the mandate to develop an architecture for and foster implementation of a joint interoperability infrastructure for EHRs in Canada. The second major version of this architecture has now been released, and provinces have begun to implement it. The solution is based on the paradigm of a service-oriented architecture (SOA) (Erl, 2004)

and embraces a range of domain-specific and technical standards. It leverages and integrates existing investments in health information systems by making them available through interface standards-conform interface adapters. The Canadian EHR architecture has received attention beyond the Canadian context. This chapter reports on this architecture, its enabling technology paradigms, experiences with its implementation, and its limitations.

THE CANADIAN HEALTH CARE SYSTEM

Canada is a federation of 10 provinces and three territories. Funding and administration of health care services falls under the jurisdiction of these individual provinces and territories. Federal legislation (the Canada Health Act) provides a common set of conditions under which provinces and territories receive funding for health services. These conditions include *universal access* to health care for all Canadians independently of their income. Moreover, they require portability of insurance coverage among provinces such that Canadians remain entitled to medical care while moving among provinces. The Canada Health Act covers basic health services only, including primary care and hospital services. Many other services such as dental care, optometry, and prescription medications are excluded. Private insurance plans are available for purchase to cover these services. They are also a typical component of employee benefit packages.

There are approximately 60,000 physicians practicing in Canada, half of them in primary care, the other half as specialists. The Canadian health care system has been slow to adopt new information and communications technologies (ICTs) (Newbery, Gelhorn, Gutkin, Renaud & Challis, 2000). This is particularly the case for the primary care sector. While ICTs are increasingly being used for administrative services such as billing, scheduling, and managing basic de-

mographic data, the majority of medical records is still kept in paper files. At the turn of the millennium, Canada launched initiatives focused on removing the barriers of making the transition to a more efficient and modern health care system. An example is the *Primary Care Transition Fund*, which has invested $800 million over six years (2000–2006) for renewing the health care systems across the country. The Canadian Health Accord released in 2004 recognizes that "electronic health records and telehealth are key to health system renewal, particularly for Canadians who live in rural and remote areas."

The decentralized nature of the Canadian health care system has contributed to the development of a large number of heterogeneous medical information systems. A recent estimate puts this number at 40,000 (Allas, 2006). Integrating all these systems to achieve more efficient and effective use of medical information poses a significant challenge. In order to facilitate this integration, the health ministers of all provinces, territories, and the federal government have jointly formed an organization called *Health Canada Infoway* (Infoway, 2006) with a mandate to facilitate the development and adoption of interoperable electronic health (EHR) record solutions. Founded in 2001, Infoway has the goal of connecting at least 50% of all Canadians to an interoperable EHR by the end of 2009.

ARCHITECTURE

The Canadian strategy for achieving an interoperable EHR pivots on a joint information system reference model called the EHR solution blueprint architecture (EHRs blueprint). Infoway published the first version of the EHRs blueprint in 2003. Its second and final major version update was released in 2006 after extensive consultation with various stakeholder groups. This major revision adds concepts for *Telehealth* and *Public Health Surveillance* as well as extensive requirements and design specifications for security and privacy concerns. According to Richard Alvarez, Infoway's president and CEO, the EHRs blueprint provides the Canadian framework for accessing and consolidating health information and presenting it in a way that meets the needs of health care professionals such as GPs, specialists, nurses, and pharmacists across various care settings, including hospitals, emergency rooms, clinics, home care, and geographical distances (Infoway, 2006). The EHRs blueprint is based on the *Service-Oriented Architecture* (SOA) paradigm, which promotes loosely coupled and standards-based component interfaces (Erl, 2004). The following diagram gives a conceptual overview of the EHRs blueprint architecture, which consists of the *jurisdictional infrastructure* part (also called the *EHR Infostructure – EHRi*) and the actual application components used at the *point of service* (PoS).

Figure 1.
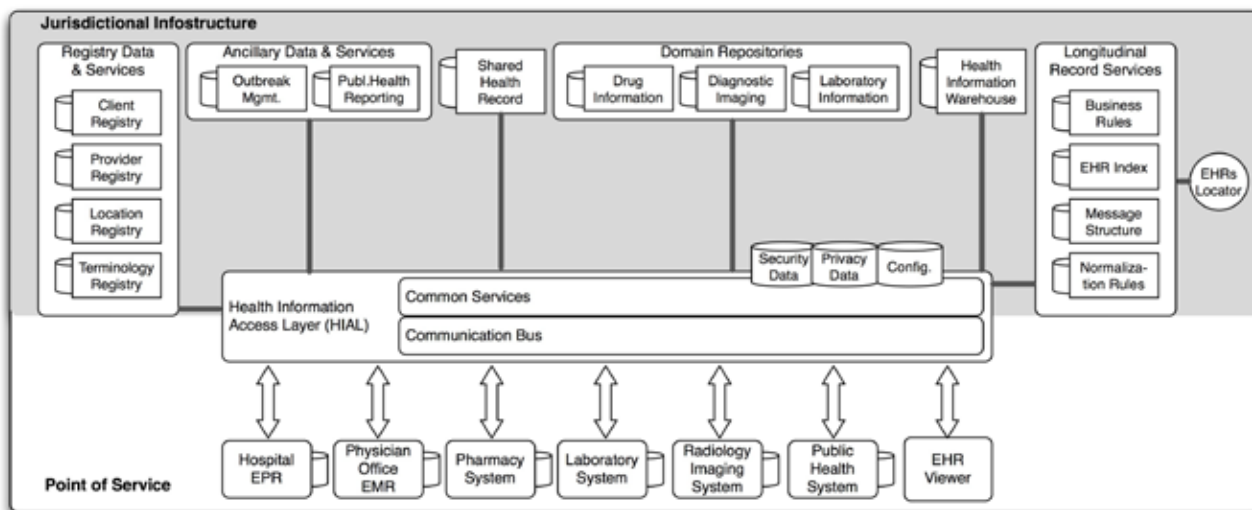
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