Chapter 56
A Multi–Tiered Perspective on Healthcare Interoperability

Craig Kuziemsky
University of Ottawa, Canada

ABSTRACT

The current healthcare delivery paradigm is defined by integrative care delivery across disparate providers and services. Therefore the ability to deliver efficient and effective healthcare services is dependent on designing and implementing interoperable systems. However, the notion of interoperability is multifaceted and complex. Although the exchange of data is often described as analogous with interoperability it must be remembered that healthcare is a process oriented domain and clinical, management, organizational and other processes must be considered as part of interoperability. This chapter discusses healthcare delivery and the role interoperability plays in supporting its delivery. First, the chapter provides a background on healthcare interoperability from multiple perspectives. Then it presents a case study of collaborative care delivery and uses it to outline specific interoperability requirements. The chapter then uses these requirements to develop a multi-tiered framework of healthcare interoperability, concluding with a discussion of the implications of the framework for interoperability research and for systems design to support integrated healthcare delivery.

INTRODUCTION

The ability to deliver efficient and effective healthcare services is dependent on designing and implementing interoperable health information systems. As healthcare delivery becomes distributed across multiple providers and settings it is interoperability that will allow clinical data and processes to be accessible in these different settings. However, the notion of interoperability is multifaceted and complex. Although the exchange of data is often analogous with interoperability we need to remember that healthcare is a process oriented domain and therefore clinical, management, organizational and healthcare system processes must be considered as part of interoperability.

One of the difficulties with interoperability is that it is sometimes discussed as an abstract concept. At basic level, interoperability is the means of connecting two or more computer systems. However, those systems are used by people to conduct healthcare processes and therefore we

need to take into consideration the actual processes that we are trying to make interoperable. We suggest that interoperability is not the ends but rather it is the means of supporting healthcare delivery. The 2001 study from the Institute of Medicine 'Crossing the Quality Chasm: A New Healthcare System for the 21st Century' described the quality of care delivery as inadequate and that to improve care delivery would require a commitment to an agenda of efficient, effective, timely, safe, and equitable patient centered care (Institute of Medicine, 2001). Interoperability is the means for achieving those objectives and the true test of interoperability will be how well it helps us achieve them.

This chapter discusses healthcare delivery and the role interoperability plays in it. In particular we emphasize the need to consider interoperability at the process level. In the chapter we first provide a background on healthcare interoperability that looks at it from multiple perspectives. We then present a case study of collaborative care delivery and use it to outline specific interoperability requirements. We then use these requirements to develop a multi-tiered framework of healthcare interoperability. We conclude with a discussion of the implications of the chapter for future interoperability research and for systems design to support healthcare delivery.

BACKGROUND

Types of Interoperability

Interoperability can be formally defined as the 'ability of two or more systems or components to exchange information and to use the information that has been exchanged.' (IEEE, 1990). However, all interoperability is not the same but rather different types of interoperability exist. Benson (2010) describes technical, semantic and process interoperability as three types of interoperability.

Technical interoperability is the ability to move data from computer system A to system B (Benson, 2010). Technical interoperability comprises machine-readable aspects of data representation and addresses the problem of connecting distributed systems on a network. Solutions for technical interoperability have focused on distributed computing and includes Java, proprietary solutions such as the Object Management Group's CORBA (Common Object Request Broker Architecture) and Microsoft's DCOM (Distributed Component Object Model), and XML, web services and service oriented architectures (SOA) (Sartipi and Yarmand, 2008). Technical interoperability connects two or more computer systems without consideration of the meaning of what is exchanged.

Semantic interoperability goes one step further and addresses the need for interoperability of the concepts and vocabulary that is exchanged across computer systems so these systems can interpret and understand the data. Clinical terminologies, defined as "standardized terms and their synonyms which record patient findings, circumstances, events, and interventions with sufficient detail to support clinical care, decision support, outcomes research, and quality improvement; and can be efficiently mapped to broader classifications for administrative, regulatory, oversight and fiscal requirements"(Chute, 2000), are a key provider of semantic interoperability. Clinical terminologies include nomenclature and classification languages such as SNOMED-CT as well as reference models for representing aggregates of domain information into class diagrams such as the HL7 Reference Information Model (RIM).

Process interoperability refers to interoperability of the work processes and people who interact with the technology (Benson, 2010). Simply having the ability to exchange data via standards does not guarantee that it will lead to better healthcare delivery if we do not understand the underlying context of where and how the exchanged data is being used. Even if computers are able to exchange and understand data it

Related Content

The Significance of Government's Role in Technology Standardization: Two Cases in the Wireless Communications Industry
DongBack Seo (2010). *International Journal of IT Standards and Standardization Research (pp. 63-74).*
www.irma-international.org/article/significance-government-role-technology-standardization/39087

Activity: Evaluation of the IT Audit Tests
 (2020). *IT Auditing Using a System Perspective (pp. 141-169).*
www.irma-international.org/chapter/activity/258487

The INTERNORM Project: Bridging Two Worlds of Expert- and Lay-Knowledge in Standardization
Jean-Christophe Grazand Christophe Hauert (2011). *International Journal of IT Standards and Standardization Research (pp. 52-62).*
www.irma-international.org/article/internorm-project-bridging-two-worlds/50574

The Rise of MP3 as the Market Standard: How Compressed Audio Files Became the Dominant Music Format
Simon den Uijl, Henk J. de Vriesand Deniz Bayramoglu (2013). *International Journal of IT Standards and Standardization Research (pp. 1-26).*
www.irma-international.org/article/rise-mp3-market-standard/76886

Intellectual Property Protection and Standardization
Knut Blindand Nikolaus Thumm (2004). *International Journal of IT Standards and Standardization Research (pp. 60-75).*
www.irma-international.org/article/intellectual-property-protection-standardization/2560