IMPROVING THE QUALITY OF PRIMARY CARE DATA WITH INTEROPERABLE STANDARDS

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Abstract: The quest to improve the quality and safety of healthcare delivery has resulted in the development of many interoperable standards. Most of these standards are developed so as to ensure that primary care data are captured, represented and conveyed appropriately in integrated healthcare information systems. Appropriate representation of primary care data will facilitate the secondary uses of the health data. Secondary uses of primary care data have the potential to not only support the clinical decision-making process by healthcare providers but also provide an evidence-based practice. In this paper, a literature review methodology is used to explore how the quality of primary care data can be improved using interoperable standards.

1 INTRODUCTION

The use of healthcare information systems to record primary care clinical data is significantly variable among general practitioners (GPs) (S. de Lusignan et al., 2004; Rollason, Khunti, & de Lusignan, 2009). In a study conducted in the UK to examine the accuracy of primary care data reporting by GPs, Gormley et al. (2008) found that "when GPs were asked to record basic clinical information, for the purposes of a primary care-based study, there was a significant level of inaccurate reporting" (p. 209). This variability could be attributed to lack of interoperable standards and no standardized approach to recording clinical encounters in information systems at the primary care level.

Acknowledging the fact that lack of training and support in using healthcare information systems contribute to the incomplete and inaccuracies in primary care data, S. de Lusignan, Hague, Brown, & Majeed (2004) noted that there is little publication on initiatives to improve data quality in primary care. It is, therefore, essential that good quality data is captured and stored in primary care computer records (S. de Lusignan, 2006). Even though what constitutes data quality and what interventions promote high-quality data remains open to debate, there is a general consensus among healthcare providers that data quality should be characterized by completeness, accuracy, currency, relevance, accessibility and 'fit for purpose' (S. de Lusignan, 2006).

Improving data quality of diagnoses, procedures, and medications is of great importance in healthcare delivery. These data are used throughout the healthcare system to prompt for other interventions within the individual consultation (S. de Lusignan, 2006). Interoperable standards hold the promise of improving clinical data quality, thereby, improving the quality of data reporting by general practitioners. The objective of this paper is to explore the best practices for integrating interoperable standards with primary care data so as to maximize its usefulness in healthcare delivery. The first part of the paper gives an overview of primary care data and secondary uses of primary care data. In the second part, the focus is on the key components of interoperable standards. The third part focuses on the best practices for integrating interoperable standards with primary care data.

2 PRIMARY CARE DATA

The term primary care, as distinguished from primary health care, is commonly reserved for clinical activity that is primarily focussed on the individual (Lee et al., 2009). Primary care data are usually obtained when healthcare practitioners record clinical encounters in healthcare information

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systems. Most healthcare practitioners now use electronic health records and/or electronic medical records during consultation, both to guide and record clinical care (Teasdale, Bates, Kmetik, Suzewits, & Bainbridge, 2007). According to Teasdale et al. (2007), the main driving force for the "ubiquitous primary care uptake of clinical computer systems is that they support both the clinical and business processes of general practice" (p. 157).

Primary care data are used not only to support direct clinical care but also to support a broad range of secondary uses of health data including "support of preventive care and health promotion; clinical audit and clinical governance; national screening and preventive campaigns; audits against national standards; payment; national statistics; planning future services; and resource allocation" (Teasdale et al., 2007, p. 158).

Moreover, the increasing threat of bioterrorism and emerging infections with pandemic potential such as influenza has made primary care data very crucial and a necessary product that cannot be simply ignored by healthcare providers. This is because primary care data will be needed at both national and local level to inform and help those managing a pandemic and bioterrorism (Smith et al., 2007). These properties of primary care data has contributed to the increasing movement in the healthcare IT domain to "operationalize" primary care data to support secondary uses of data such as clinical decision support and evidence-based practices.

3 SECONDARY USES OF PRIMARY CARE DATA

Secondary uses of primary care data have the potential to not only support the clinical decision-making process by healthcare providers but also provide an evidence-based practice. As clinicians continue to adopt interoperable standards such as electronic health records (EHRs) and electronic medical records (EMRs) as the standard for clinical practice, there is an expectation by healthcare providers that new sources of detailed clinical information will be created and stored. Those data, combined with any existing clinical data, will dramatically increase the breadth and depth of information available for non-clinical applications (Safran et al., 2007).

The secondary uses of primary care data is very important because it "can enhance individuals' health care experiences, expand knowledge about diseases and treatments, strengthen understanding of health care systems' effectiveness and efficiency, support public health and security goals, and aid businesses in meeting customers' need" (Safran et al., 2007, p. 2). Health studies and research based on the secondary use of health data contributes to our present level of knowledge of the causes, trends and natural history of diseases and symptoms (Safran et al., 2007).

While many healthcare providers consider the secondary uses of primary care data as a threat to the integrity and confidentiality of individual health information, the widespread use of personal health information "outside of the primary care setting often occurs with commercial intent as employers, payers, and insurers attempt to fulfill business and proprietary-oriented goals and objectives" (Safran et al., 2007, p. 7). The migration of the primary care data to support secondary uses of health data such as clinical decision support and evidence-based practices will ultimately require data mining techniques and high computational resources that might grow exponentially in the coming years.

4 INTEROPERABLE STANDARDS

Interoperable standards aim to achieve semantic interoperability by providing and satisfying the information-sharing needs across care settings, providers, patients, and population health care environments (Halley, Sensmeier, & Brokel, 2009a). The goal of using interoperable standards is to minimize the technical barriers to adoption while providing a migration pathway toward progressively richer computer-processable content of clinical information (Dolin, Alschuler, Boyer, & Beebe, 2006). Most of the available interoperable standards could be categorized into three themes: *functional systems*; *classification and terminology*; and *messaging and document* standards.

The *functional systems* are made up of standards such as Electronic Health Record (EHR); Electronic Medical Records (EMR) and Personal Health Record (PHR). Interoperable standards such as EHR, EMR and PHR are gaining popularity in the healthcare industry because of their ability to support interoperability of integrated healthcare information systems. These functional systems provides a platform for clinicians to capture primary care data in a standardized format while eliminating

the healthcare problems associated with paper charts and human errors (Adler-Milstein & Bates, 2010; Reti, Feldman, & Safran, 2009). EHR, EMR, and PHR offer the promise of reducing medical errors, improving disease management, and reducing the overall costs of healthcare delivery (Reti et al., 2009).

The *classification and terminology* standards are made up of Systemized Nomenclature of Medicine - Clinical Terms (SNOMED-CT); International Classification of Diseases: Tenth Revision (ICD-10); and Logical Observation Identifiers Names and Codes (LOINC) (International Health Terminology Standards Development Organization (IHTSDO), 2010; Logical Observation Identifiers Names and Codes (LOINC), 2010; World Health Organization (WHO), 2010). These classification and terminology standards are very useful and provide the words and phrases needed to consistently define and document patient care and clinical encounters (Watkins et al., 2009). For example, the ICD-10 code for *Diabetes insipidus* is E23.2; the SNOMED-CT code for *Hepatitis B vaccination* is 16584000 and the LOINC code for *Body mass index* is 39156-5.

The *messaging and document* standards are made up of standards such as Health Level Seven (HL7) Version 3 Messaging and HL7 Clinical Document Architecture (CDA). For example, the HL7 CDA leverages XML technology and coded terminologies to support a clinical document that can be "transferred within a message, and can exist independently, outside the transferring message" (Dolin et al., 2006, p. 31). The HL7 CDA standard is very effective in documenting clinical encounters at the primary care level. On the other hand, the HL7 V3 messaging standard is very useful in transmitting healthcare information across different healthcare providers.

5 INTEGRATING PRIMARY CARE DATA WITH INTEROPERABLE STANDARDS

The idea of integrating primary care data with interoperable standards is of great necessity in the healthcare IT community. The integration of interoperable standards with primary care data is very crucial in ensuring that primary care data are captured, represented and conveyed appropriately in integrated healthcare information systems.

Healthcare information systems record health data in two ways: coded or structured data; and free text or narrative (unstructured data) (S. de Lusignan & van Weel, 2006). Recognizing the fact that natural language processing (NLP) has not yet developed to the point to replace 'coded' clinical data, S. de Lusignan and van Weel (2006) emphasized that "coded data are needed because there are so many ways that a clinical concept can be represented" (p. 255). There is an increasing consensus among healthcare providers that the use of classifications and terminology standards are very useful in capturing structured data (S. de Lusignan et al., 2004; Watkins et al., 2009).

Similarly, Rollason et al. (2009) found that migrating general practitioners' computer systems to SNOMED-CT or to another more limited coding system which would map to ICD-10 would enable primary care systems to better support improved standards of care. There is an expectation that the use of SNOMED-CT in healthcare information systems will provide an "opportunity to standardise the use of codes across clinical computer systems, removing the difficulties associated with the use of different variants of the same coding system" (S. de Lusignan et al., 2004, p. 154). This expectation has contributed to the reason why clinical terminologies such as SNOMED-CT and LOINC are getting larger and popular, enabling clinicians to code a wider range of clinical concepts (S. de Lusignan et al., 2004).

According to Rollason et al. (2009) the inconsistent data across GP practices could be reduced in two ways: "first, the use of a code-set with fewer diagnostic codes whilst still maintaining an appropriate degree of granularity; and second, a more standardised software for entering the data" (p. 117). The first requirement could be met using terminology and classification standards such as SNOMED-CT, LOINC and ICD-10 (IHTSDO, 2010; LOINC, 2010; WHO, 2010).

The standardized software requirement could also be met with the use of interoperable functional systems such as the EHR, EMR and PHR (Detmer, Bloomrosen, Raymond, & Tang, 2008; Diamond & Shirky, 2008; Follen et al., 2007; Jamal, McKenzie, & Clark, 2009). The ability for functional systems to "communicate with each other, share information, and understand what is being shared is the fundamental interoperability notion" (Halley et al., 2009, p. 310). Both EHR and EMR can assist physicians and practitioners in eliminating the inconsistency of data collection at the primary care level during consultations. Halley et al. (2009) indicated that "it is through the interoperable

exchange of health information that expected decreases in costs will be realized, such as eliminating duplicate tests, improving administrative efficiencies, increasing access to patient clinical results, and providing information to decrease repetitive input" (p. 310).

6 CONCLUSIONS

This paper has discussed the importance of improving the quality of primary care with interoperable standards. There is no doubt that as EHRs, EMRs, and PHRs continue to evolve and the adoption of health information technology increases, more health data will become readily available, with predictable increased efforts to access and use these data for various non-patient care purposes (Safran et al., 2007). These secondary uses of primary care data are very essential in preventing bio-terrorism; monitoring diseases and ensuring health protection surveillance. For example, a study conducted by Smith et al. (2007) established the potential of using electronic coded records from general practice for health protection surveillance.

Using electronic coded primary care data will not only help healthcare providers in the development of clinical decision support systems and surveillance systems but also provide the platform for primary care researchers to conduct evidence-based research (Gormley et al., 2008; Patel et al., 2005; Smith et al., 2007).

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