

Implementation of Certified EHR, Patient Portal, and “Direct” Messaging Technology in a Radiology Environment Enhances Communication of Radiology Results to Both Referring Physicians and Patients

Joshua Jay Reicher¹ · Murray Aaron Reicher²

Published online: 20 November 2015
© Society for Imaging Informatics in Medicine 2015

Abstract Since 2009, the Federal government distributed over \$29 billion to providers who were adopting compliant electronic health record (EHR) technology. With a focus on radiology, we explore how EHR technology impacts interoperability with referring clinicians’ EHRs and patient engagement. We also discuss the high-level details of contributing supporting frameworks, specifically Direct messaging and health information service provider (HISP) technology. We characterized Direct messaging, a secure e-mail-like protocol built to allow exchange of encrypted health information online, and the new supporting HISP infrastructure. Statistics related to both the testing and active use of this framework were obtained from DirectTrust.org, an organization whose framework supports Direct messaging use by healthcare organizations. To evaluate patient engagement, we obtained usage data from a radiology-centric patient portal between 2014 and 2015, which in some cases included access to radiology reports. Statistics from 2013 to 2015 showed a rise in issued secure Direct addresses from 8724 to 752,496; a rise in the number of participating healthcare organizations from 667 to 39,751; and a rise in the secure messages sent from 122,842 to 27,316,438. Regarding patient engagement, an average of 234,679 patients per month were provided portal access, with 86,400 patients per month given access to radiology reports. Availability of radiology reports online was strongly associated with increased system usage, with a likelihood ratio of 2.63. The use of certified EHR

technology and Direct messaging in the practice of radiology allows for the communication of patient information and radiology results with referring clinicians and increases patient use of patient portal technology, supporting bidirectional radiologist-patient communication.

Keywords Meaningful use · Patient engagement · Patient portal

Introduction

In an effort to facilitate interoperability and improve provider-patient engagement, Congress approved and implemented the Health Information Technology for Economic and Clinical Health Act (the “HITECH Act”) in 2009 [1]. Through February 2015, the program distributed US\$29.6 billion to providers adopting federally compliant electronic health record (EHR) technology [2]. Moving forward, lack of compliance will be associated with a reimbursement penalty. Requirements and eligibility for physicians with regard to meaningful use (MU) include the use of certified EHR technology necessary to store up-to-date patient health information, including medication and problem lists [3].

According to the last complete CMS data update through May 2014, about 4300 radiologists successfully attested for the EHR Incentive Program by that time, reflecting approximately 15 % of the 27,986 radiologists in the USA [2, 4, 5]. This rate is low in comparison to the approximately 60 % participation rate among physicians in the USA in general. However, some radiology practices have aggressively implemented radiology-centric EHR technology leading to MU attestation and collection of the financial incentives, as previously reported (Kato K et al., presented at the 2013 annual meeting of the RSNA). Simultaneously, the advent of

✉ Joshua Jay Reicher
jjreicher@gmail.com

¹ Stanford Healthcare, Department of Radiology, 300 Pasteur Dr.
H1307 MC 5621, Stanford, CA 94305, USA

² Merge Healthcare, 10140 Mesa Rim Road, San Diego, CA 92121,
USA

“Direct” messaging tools (a secure e-mail technology for health-related communication) in combination with a new framework of “health information service providers” (HISPs) has produced interoperability ecosystems with multiple potential applications to radiology.

We explore herein two impacts of radiologist utilization of certified EHR technology: the impact on interoperability with referring clinicians’ EHRs and the impact on patient engagement. We also discuss the high-level details of how the supporting frameworks contribute to both interoperability and patient engagement endpoints, with structural descriptions of Direct messaging and of HISP technology.

Materials and Methods

Methodology was structured to address the two primary impacts under investigation, interoperability and patient engagement, in parallel.

For the purposes of our discussions, the term interoperability is used to refer to the ability to share and process clinical data between disparate clinical information technology systems, especially across unrelated clinical organizations. An important component of certified EHR technology is the support of Direct messaging. Direct messaging is a secure protocol built to allow the exchange of encrypted health information between trusted senders and recipients online, supported by the Nationwide Health Information Network (NHIN). Structurally, Direct messaging closely resembles e-mail, including e-mail-like addresses for senders and recipients (eg., example@direct.vendor.com). Like e-mail, live data exchange also requires an entity between the two addresses to relay the data over the web, namely a health information service provider (HISP), paralleling the function of an internet service provider (ISP) (Fig. 1). Direct messaging can be used for HTML/text-based communication, but can also support transmission of a file type called the C-CDA. These C-CDAs contain patient health data, and importantly, can also include radiology reports in the form of a

newly defined subtype file, the C-CDA-Dir. Direct addresses and supporting HISPs offer one solution to the technical barrier to communication. In addition, in cooperation with the Office of the National Coordinator (ONC) for Health IT, a non-profit organization (DirectTrust.org) approaches the business and medicolegal barriers to health record sharing via a nationwide interoperability ecosystem called a “Trust Bundle.” Accredited member entities (HISPs, healthcare organizations, or otherwise) in the Trust Bundle can exchange personal health information (PHI) with other co-member organizations, under the governance of universal business associate agreements (BAAs) included within the accreditation process.

In order to evaluate this new interoperability ecosystem, data were collected from this non-profit entity (DirectTrust.org). Statistics related to both testing and active use from the included HISP vendors within the Trust Bundle were obtained, including number of healthcare organizations involved, number of Direct addresses issued, number of secure messages sent, and overall utilization of the nationwide interoperability ecosystem.

Regarding patient engagement within digital context, the most basic, core components of patient engagement by physicians include the provision of patient personal health information online (eg., lab and radiology results) and web-based communication between patients and physicians; these are the two components of patient engagement investigated herein. The EHR Incentive Program (ie., MU) defines standard requirements for patient engagement online. Beginning with Stage 1 of MU in 2011, healthcare providers were required to provide access to patient clinical information online in the form of Problem List, Medications, Allergies, etc. In 2014, Stage 2 of MU added new requirements, including the requirement that providers also prove that at least 5 % of their patients were actively using the online systems to communicate with their physicians.

For our evaluation of patient engagement with certified EHR technology, data evaluating use of an online patient portal associated with a radiology-specific EHR were obtained on a monthly basis from July 2014 to March 2015 (Health Companion, Inc.; San Diego, CA; Merge Healthcare, Inc; Chicago, IL). Aggregate statistics were provided for purposes of this investigation, and no secure patient data or PHI was utilized in this evaluation. PHI was maintained in secure servers under the care of the patient portal vendor. Data included technology applying to both Stage 1 and Stage 2 of MU, with the latter contributing more strictly defined requirements related to patient engagement, including the requirement for demonstration of a greater than 5 % active rate of secure back-and-forth messaging between eligible physicians and their patients, as described previously [6]. Patients were provided the opportunity to access their basic healthcare information, with or without added access to their radiology reports upon report completion (initially set to deliver at day 10 after the patient’s visit date). Patients were also given the

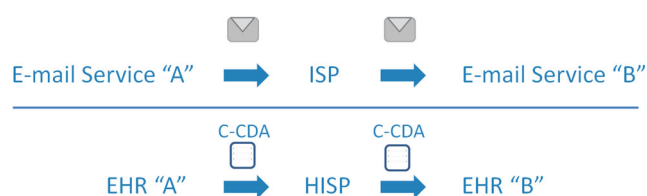


Fig. 1 Parallel workflows demonstrating the high-level design of technical workflow for e-mail exchange across the internet and healthcare data exchange across the Direct exchange. Standardized e-mail data in HTML or text format (top) is transmitted between vendors via an internet service provider or ISP. Standardized healthcare data in C-CDA format (bottom) is transmitted between EHR vendors via a health information service provider or HISP

ability to message their radiology provider organizations through the online portal. Patient access to radiology images online was not included, as this was not within the core MU requirements considered standard to certified EHRs nationwide. Patients and providers were given access to an online web support portal for submission of technical issues and other concerns.

Results

Regarding interoperability and use of the Trust Bundle nationwide interoperability framework of HISP services, statistics gathered between Q2 2013 and Q1 2015 showed a rise in the number of healthcare organizations nationwide utilizing HISP services from 667 to 39,751; a rise in the number of issued secure Direct addresses from 8724 to 752,496; and a rise in the number of secure messages sent through the national framework from 122,842 to 27,316,438 (DirectTrust.org) (Fig. 2). Testing between 36 different HISP vendors demonstrated successful transmission of bidirectional messaging across all included systems. Sent messages included communicative messages (between physicians and EHR systems primarily) as well as messages with C-CDA document attachments, including C-CDA-Dir documents.

Regarding analysis of utilization of certified EHR technology and its effect on patient engagement, data and analysis are presented here for July 2014 to March 2015, averaged over a monthly basis, with health information made available to patients through the patient portal for an average of 234,679 patients per month. An average of 16,101 patients accessed their health data online during that time (an approximately 6.9 % rate of use), and about half of these patients were new users to the system (the remaining half were returning users from previous months). Radiology reports were made available for participating provider practices through the patient portal for an average of 86,400 patients per month. The remaining provider practices did not participate in radiology

report delivery online. For the providers that did participate in distribution of radiology reports online, an average of 9747 patients per month accessed the reports, approximately 11.3 % of those patients provided access, and about half of these patients were new users to the system. Availability of radiology reports online was associated strongly with increased patient use of the system, with a likelihood ratio of 2.63. Patient and provider concerns through the web support portal were not statistically tracked, but there were no complaints captured expressing concern about results having been made available to patients prior to review by referring providers. The most common concerns raised by patients were related to technical support issues (eg., internet browser issues) and request for more rapid access to reports (ie., related to the built-in 10-day delay between report approval and report delivery previously described).

Discussion

Radiologist utilization of certified EHR technology provides solutions for interoperability with systems used by referring clinicians and enhances patient engagement. Regarding interoperability, the HISP interoperability environment and Trust Bundle framework encompass a rapidly growing network now including greater than half of the US healthcare system (growing to this size in approximately 2 years). Radiologist utilization of EHR technology that supports participation in this ecosystem can allow direct transport of health data to and from these systems, enabling electronic gathering of patient health data without customized interfaces and now, delivery of radiology results back to referring clinicians through the network in the form of C-CDA-Dir files. Receipt and display of a transfer of care document associated with an ambulatory referral through these systems has the potential to significantly improve the clinical information available to radiologists when they view exams. Furthermore, future computer systems may even incorporate the MU data set and lab data to help the radiologist better understand the overall probability of certain diagnoses when integrated with imaging findings. Yet radiologist adoption of these technologies lags woefully behind the physician world in general, threatening to leave radiologists in a technological silo, unable to communicate efficiently through otherwise widely accepted and supported technical networks. In an environment where the value of the radiologist is tied closely to his/her ability to produce quality reports and transmit them efficiently and in a timely fashion, the importance of supporting interoperable technology is growing.

Certified EHR technology also supports basic components of online patient engagement, specifically including delivery of PHI online and patient-provider communication electronically, and securely. Within radiology, the value-added service

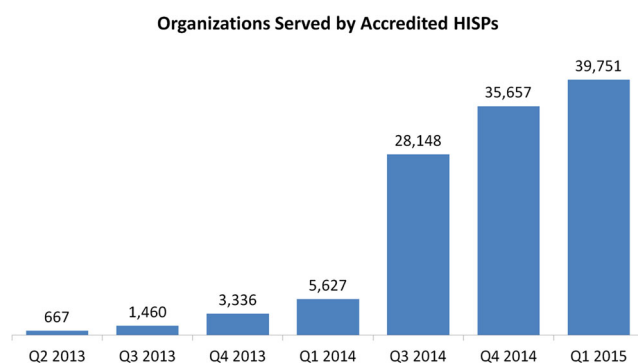


Fig. 2 Nationally tracked statistics demonstrating growth in the number of organizations served by accredited health information service providers (HISPs) between Q2 2013 and Q1 2015

of offering radiology reports directly through these systems was associated with a greater than twofold increase in patient utilization of the service, potentially allowing for increased visibility of the radiologist. In congruence with our findings, prior investigations of direct-to-patient delivery indicated a high patient interest in such a service; patients generally want results as quickly as possible, regardless of who provides them or how they are provided [7]. This system raises awareness of radiology contribution to clinical care among patients, considered by many a key to increasing the value of radiologists in a growing “pay-for-performance” system.

Concerns have been raised previously about the possibility of negative feedback from patients wanting their results better explained, increased administrative burden on the radiology practice, and anxiety associated with online as opposed to in-person provision of abnormal results. Thus far, these complaints have not been reported by patients or providers in this investigation, through the web-based support portal or externally. Further data are being collected to assess detailed impact. The pre-programmed delay in delivery of the radiology reports to patients, allowing referring providers to view results first, may have played a role in preventing these particular concerns. Beyond delivery of reports online, we query whether the establishment of an online provider-patient relationship creates opportunities for additional “added-value” services naturally follow (e.g., reminders for routine screening imaging exams). These emerging technologies support the current standard-of-practice by providing patient-centered tools as part of a general progression towards patient-centered radiology.

Conclusion

Usage of MU-compliant EHR technology and Direct messaging in radiology practice allows for communication of patient information and radiology results with referring clinicians and increases patient use of patient portal technology supporting bidirectional radiologist-patient communication.

References

1. Health Information Technology for Economic and Clinical Health Act (HITECH). Title X2I of the American Recovery and Reinvestment Act of 2009, Pub L No. 111–115, 123 Stat 115, 2009
2. Data and Program Reports. Baltimore: Centers for Medicare & Medicaid Services. Available at <http://www.cms.gov/Regulations-and-Guidance/Legislation/EHRIncentivePrograms/DataAndReports.html>. Accessed 24 April 2015
3. Morgan TA, Avrin DE, Carr CD, Dreyer KJ, Flanders AE, Khorasani R, Langlotz CP, Arenson RL: Meaningful use for radiology: current status and future directions. *Radiology* 2:318–321, 2013
4. 2012 Physician Specialty Data Book. Association of American Medical Colleges. Available at <https://members.aamc.org/eweb/upload/2012%20Physician%20Specialty%20Data%20Book.pdf>. Accessed 2 September 2014
5. CMS Medicare and Medicaid EHR Incentive Program, Electronic Health Record Products Used for Attestation. *Healthdata.gov*. Available at <http://www.healthdata.gov/data/dataset/cms-medicare-and-medicare-ehr-incentive-program-electronic-health-record-products-used>. Accessed 24 April 2015
6. Centers for Medicare and Medicaid Services. Meaningful Use. Available at <http://www.cms.gov/>. Accessed September 2, 2014
7. Basu PA, Ruiz-Wibbelsman JA, Spielman SB, Van Dalsem VF, Rosenberg JK, Glazer GM: Creating a patient-centered imaging service: determining what patients want. *Am J Roentgenol* 196:605–610, 2011