After the electronic health record: Where do we go from here?

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Abstract

Purpose Statement – If implemented properly, the electronic health record (EHR) could be a wealth of information to the provider, patient, public health entities, and even reimbursement groups. The Nationwide Health Information Network (NwHIN) sets standards and policies to assist the full implementation and usage of the EHR; however, these efforts lack coordination resulting in delays and inefficiencies.

Method – I utilized journal articles and other recent publications to understand the history and structure of the NwHIN and current research and development of interoperability models. I used Google Scholar, EBSCO, and PubMed search engines. I evaluated articles for content, peer-review, and publication date.

Findings – The nation will benefit from a wide range of ideas by allowing free market development. Research and development to further the meaningful use of EHR data is conducted at all levels within the health care informatics network. However, while the development of applications and uses is widespread and expansive, the research is not comprehensive.

Conclusion – This research provides an overview of the NwHIN and a glimpse into the future world of a fully networked national health care system in which health information is freely available to direct providers of health care, researchers, and public health entities. Health information technology services will greatly impact national health care with the ability to provide effective, efficient, and safe health care. It is imperative that the American health care system coordinate efforts to ensure that these information technology services are developed in a logical, synchronized fashion.

Keywords: Nationwide Health Information Network, electronic health record

After the Electronic Health Record: Where Do We Go From Here?

The electronic health record (EHR) could be a wealth of information to medical providers and patients if there was connectivity across all sectors of health care. The ability to electronically and instantaneously access patient information in trauma or emergent situations, improve continuity of care in referred patients, or improve collection, use, and tracking of public health data would be indispensable to the medical community (Baru, Botts, Horan, Patrick, & Feldman, 2012). But, how far are we from reaching this goal? With the incentive for the medical community to invest in and implement EHRs, the community was flooded with different collection and storage options for patient information which only talk to similar products. So, any cost-saving which the individual providers might have seen is negated when paper records are needed for patients referred outside a proprietary system. There are so many options available and development of even more systems continues, but are we headed in the right direction? In this paper, I discuss the history and development of the Nationwide Health Information Network (NwHIN), several current programs including: Health Level 7 (HL7), CONNECT, DIRECT (Interoperability Pilots, 2014), and the application based SHARPn (Rea , et al., 2012) .

Methods

I reviewed the history and present status of the NwHIN through web-based searches, results included, but was not limited to, the HealthIT website detailing current applications under development, an information paper from the President's Advisory Council on Science and Technology, and the Office of the National Coordinator for Health Information Technology (ONC). Once I established baseline knowledge, further web-based searches were conducted using Google Scholar, EBSCO, and PubMed with searches limited to peer-reviewed data

published during the last five years with full text available, and keywords: NwHIN, Nationwide

Health Information Network, National Health Information Network, NHIN, CONNECT, and

DIRECT. I then widened the topics to include Health Level Seven International, SMART,

SHARPn, and CARE as well as articles referenced in recent studies or other articles. In the end,

I found 11 articles, three websites, and two federal publications most relevant to the topic.

<div align="center">**Findings**</div>

Background

The Nationwide Health Information Network (NwHIN) is a collection of standards,

protocols, legal agreements, specifications, and services developed to enable the exchange of

information through health information exchanges (Abdelhak, Grostick, & Hanken, 2012).

Originally established in 2004 by the ONC as the National Health Information Network, in

response to President George W. Bush's call for the widespread use of electronic health records,

there were four goals: 1) increase the use of EHRs and other automated information tools in

clinical practice, 2) enable interoperability among healthcare stakeholders, 3) use information

tools to help personalize care delivery, and 4) advance the surveillance and reporting for

population health improvement (Kuperman, Blair, Franck, Devaraj, & Low, 2010, p. 6). These

four goals endeavor to harness the power of shared data to improve healthcare of all in America

(Abdelhak, Grostick, & Hanken, 2012). The Health Information Technology for Economic and

Clinical Health (HITECH) Act of 2009 expanded the vision for an effective network by

promoting the use of EHRs (Federal Register, 2009) and by December of 2009, the NwHIN was

a network of networks connecting diverse entities including state and regional health information

exchange organizations (RHIO), federal agencies, and integrated delivery systems (Abdelhak,

Grostick, & Hanken, 2012). Up until 2010, the U.S. developed the national health information

architecture through the RHIOs in a bottom-up strategy. The RHIOs organized healthcare

stakeholders in geographic areas to govern health information exchange according NwHIN

standards (Lenart, Sundwall, & Lenart, 2012). The HITECH Act focused efforts of the RHIOs,

federal entities, and large integrated delivery systems into developing a system linked by

common protocols and local efforts.

An early success of the NwHIN was an exchange of health information using the Social

Security Administration's Medical Evidence Gathering and Analysis through Health IT

(MEGAHIT) System and the MedVirginia RHIO in November 2009. This exchange was an

example of a secondary use of health information: determination of eligibility. A study

conducted post-exchange found a 45% time savings in disability determination, with 11% of

MEGAHIT cases processed in under two days. Challenges identified in the retrospective study

dealt with privacy, governance, multi-organizational differences, and technical limitations

(Feldman & Horan, 2011)

The publication of the report to the President, "Realizing the Full Potential of Health

Information Technology to Improve Healthcare for Americans: The Path Forward," submitted by

the President's Council of Advisors on Science and Technology (PCAST) in December 2010,

identified shortcomings and a focus for the future. The PCAST report acknowledged that health

IT "has the potential to transform healthcare" and health IT could integrate into all aspects of

clinical practice, give clinicians real-time access to patient data, help patients become more

involved in their own health care, enable research , improve clinical trials, and streamline

processes (Holdren, Lander, & Varmus, 2010, p. 9). The PCAST identified six major

conclusions, including: the need for a universal language to ensure the ability to exchange

information across institutions, the need for robust health information exchanges, and that the

ONC should focus meaningful use guidelines on the comprehensive ability to exchange heath care information. At this time, the PCAST recommends a change to a top-down approach to the design of health information exchanges, altering focus from RHIOs to state-led and designed exchanges (Holdren, Lander, & Varmus, 2010).

Interoperability Models and Research

The ONC defines meaningful use as the improvement of quality, safety, efficiency, and the reduction of health disparities to engage patients and families and improve coordination with population and public health while maintaining the privacy and security of patient health information (Meaningful use definition and objectives, 2014). Meaningful use is the key to providers and institutions for reimbursement structures dealing with health information. Immediately after the call for EHR implementation, several versions of software with little-to-no interoperability entered the market. When NwHIN was organized health information exchange was highlighted. Now several organizations, including the ONC and HL7, are implementing strategies for health information exchange and research into health information exchange alternatives.

Health Level Seven International, founded in 1987, is a not-for-profit organization that has developed standards for the exchange of healthcare information. Health Level 7 is dedicated to providing standards for integration, data sharing, and retrieval of records to support clinical practice and management. The organization currently has over 2,300 members, include approximately 500 corporate members, representing more than 90% of the information systems vendors serving healthcare (About Health Level Seven, 2014). Health Level Seven implemented Fast Healthcare Interoperability Resources (FHIR) earlier this year with a focus on scalable physician resources for documentation, patient safety, and family history (FHIR, 2014).

The SMART Platform is an application based system with substitutable applications constructed around core services seen as a promising approach to drive down costs, keep up with advancing technology, and fostering competition in an open market. At this time, SMART aims to provide "highly consistent views for the most common data elements" in health information rather than provide a detailed model for all situations. SMART applications developed in common web-based languages provide a strong indication that a mobile EHR, or even a personal health record, are not far in to the future (Mandl, et al., 2012, p. 599)

The CyberHealth for Aggregation, Research, and Evaluation (CARE) Platform is a seeded-cloud approach to data storage and retrieval. The seeded-cloud refers to a storage and computational structure (integration, analysis, data mining) which provides on-demand and scalable access to data, providing immediate and long-term support to researchers, public health, and population health entities. The data itself would be seeded from existing entities, such as data.gov, the Centers for Excellence in Rural Safety, or the National Highway Traffic Safety Administrations, and eventually through health information provided by clinicians, public health departments, etc. This platform is in the early stages of development (Baru, Botts, Horan, Patrick, & Feldman, 2012)

The ONC also provides funding to several health information technology programs. The Direct Project, launched in March 2010, was to expand NwHIN standards and services enabling simple, direct, and secure transport of health information, specifically between providers at the local level and their patients. CONNECT is a free, open source software solution designed to support health information exchange locally and nationally. CONNECT uses NwHIN standards, services, and policies to retain compatibility to health information exchanges throughout the country. Both programs expand the existing NwHIN and increase interoperability and exchange

between providers and institutions (Get the facts: The Nationwide Health Information Network, Direct project, and CONNECT software, 2014).

The Strategic Health Information Technology Research Projects (SHARP) was established under the ONC to focus research and development on documented problems impeding the adoption of EHRs including: security and privacy, user interfaces to support clinical reasoning and decision-making, shared application and network architecture, and secondary uses of EHR data to improve health. The SHARP consortium (SHARPn) focused on secondary-use: care process and outcome measures, research, and support to public health is developing an open-source service for sharing, exchange, and reuse of clinical data. Using HL7 structure, the platform can receive data from multiple sources. Initial testing at the Mayo Clinic in 2011 showed promising results, but did not include any error checking or handling functions (Rea , et al., 2012).

Contributions

This overview of the history and current research and development of the NwHIN provides stakeholders a glimpse into the future world of a fully networked national health care system in which health information is freely available not only to direct providers of health care, but to researchers and public health entities, These improvements in health IT services will impact national health care with the ability to provide effective, efficient, and safe health care.

Conclusion

I show through this research that while full implementation of a completely interoperable, usable NwHIN may be distant, we can see it in the future. With focused and coordinated research and development, the NwHIN can become a robust network of providers, institutions, and the government to improve the overall quality of health care in the nation.

References

Abdelhak, M., Grostick, S., & Hanken, M. (2012). *Health Information: Management of a Strategic Resource.* St. Louis: Elsevier.

About Health Level Seven. (2014). Retrieved July 29, 2014, from Health Level Seven International: http://www.hl7.org/about/index.cfm?ref=nav

Baru, C., Botts, N., Horan, T., Patrick, K., & Feldman, S. S. (2012). A seeded cloud approach to health cyberinfrastructure: Preliminary architecture design and case applications. *45th Hawaii International Conference on System Sciences*. Retrieved June 30, 2104, from www.researchgate.net/publication/232637469_a_Seeded_Cloud_Approach_to Health_Cyberinfrastructure_Preliminary_Architecture_Design_and_Case_Applications

Brady, K., Sriram, R. D., Lide, B., & Roberts, K. (2012, November). Testing the nation's healthcare infromation infrastrcuture: NIST perspective. *Computer, 45*(11), 50-57. Retrieved from IEEE Computer Society.

Buntin, M. B., Burke, M. F., Hoaglin, M. C., & Blumenthal, D. (2011). The benefits of health information technology: A review of the recent literature shows predominately positive results. *Health Affairs, 30*(3), 464-471.

Colpas, P. (2013). Integration, analytics key to next-generation EMRs. *Health Management Technology*, 6-11.

Federal Register. (2009, October 30). *HITECH Act enforcement interim final rule.* Retrieved July 29, 2014, from U.S. Department of Health and Human Resources: http://www.hhs.gov/ocr/privacy/hipaa/administrative/enforcementrule/enfifr.pdf

Feldman, S. S., & Horan, T. A. (2011). Collaboration in electronic medical evidence

    development: A case study of the Social Security Administration's MEGAHIT system.

    International Hournal of Medical Informarmatics, 80, 127-140.

FHIR. (2014). Retrieved July 29, 2014, from Health Level Seven:

    http://www.hl7.org/implement/standards/fhir/index.html

Gaynor, M., Lenert, L., Wilson, K. D., & Bradner, S. (2013). Why common carrier and network

    neutrality principles apply to the Nationwide Health Information Network (NwHIN). *The*

    Journal of the American Medical Informatics Association, 1-6.

Get the facts: The Nationwide Health Information Network, Direct project, and CONNECT

    software. (2014). Retrieved from HealthIT.gov: www.healthIT.gov

Holdren, J. P., Lander, E., & Varmus, H. (2010). *Realizing the full potential of health information*

    technology to improve healthcare for Americans: The path forward. Washington, D.C.

Interoperability Pilots. (2014, July 1). Retrieved from HealthIT.gov:

    http://www.healthit.gov/policy-researchers-implementers/nwhin-history-background

Kuperman, G. J., Blair, J. S., Franck, R. A., Devaraj, S., & Low, A. F. (2010). Developing data

    content specifications for the Nationwide Health Information Network trial

    implementations. *Journal of the American Medical Informatics Association, 17*(6), 6-12.

Lenart, L., Sundwall, D., & Lenart, M. E. (2012). Shifts in the architecture of the Nationwide

    Health Information Network. *Journal of the American Medical Informatics Association*.

Mandl, K. D., Mandel, J. C., Murphy, S. N., Bernstam, E. V., Ramoni, R. L., Kreda, D. A., . . .

    Kohone, I. S. (2012). The SMART Platform: Early experience enabling substitutable

    applications for electronic health records. *The Journal of the American Medical*

    Informatics Association, 19, 597-603.

Meaningful use definition and objectives. (2014). Retrieved from HealthIT.gov:

      www.healthit.gov/provider-professionals/meaningful-use-definition-objectives

Rea , S., Pathak, J., Savona, G., Oniki, T. A., Westberg, L., Beebe, C. E., . . . Chute, C. G. (2012).

      Buiding a robust, scalable and standards-driven infrastructure for secondary use of EHR

      data: the SHARPn project. *Journal of Biomedical Informatics, 45*, 763-771.

Rough Draft Suggestions and improvements:

1) The running head correct at 34 characters. Title is capitalized, with "Running head" on title page only. I added the page number to title page.

2) I added keywords to the Abstract.

3) I added commas as appropriate and took out extraneous ones.

4) I took out the extra articles and confusing articles to clarify information, or I reworked the sentence.

5) I reworded the opening sentence to be less vague and stronger.

6) I fixed incidences of passive voice.

7) I added citations and page numbers as needed.

8) I changed numbers in the methods section, although unclear in APA book. Possible should be "11 articles, 2 federal papers, and 3 websites", because first number in series is "11".

9) I took out lesser used abbreviations for clarity. I kept the highly used abbreviations and long phrase abbreviations due to paper length.