Interoperability of Electronic Medical Records

Open Access Teaching Case Developed for the Tech for Humanity Pathways Minor

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Background

Interoperability is the ability for different systems to work together and communicate information directly and accurately. For electronic medical records, the systems involved are primarily major vendors, like EPIC and Oracle; however, there are also many smaller programs, particularly homegrown systems. The information shared is private health information, doctors' notes, laboratory reports, and an assortment of other quantitative and narrative data. The wide range in kinds of data and variety in the structure of this data complicates interoperability.

The 2009 HITECH Act introduced incentives for healthcare providers to adopt meaningful use of electronic medical records. In 2008, only 17% of office-based physicians and 9% of non-federal acute care hospitals had EHRs. By 2021, that had surged to 78% of office-based physicians and 96% of hospitals having adopted a certified EHR.[2] Interoperability is specifically mentioned in the HITECH Act as a priority, but is not described in detail.[3] The 21st Century Cures Act of 2016 expands on interoperability and explicitly forbids information blocking, or "preventing, discouraging, or interfering with the access, exchange, or use of information."[4] The act tasked the Office of the National Coordinator for Health Information Technology (ONC) to create a framework and guidance for interoperability, including technical and social components. This led to the ONC's Cures Act in 2020, detailing the standardized framework and further describing

[1] April 1st, 2025.
[2] Assistant Secretary for Technology Policy, "National Trends in Hospital and Physician Adoption of Electronic Health Records," Office of the National Coordinator for Health IT.
[3] Sec. 13202 Research and Development Programs, Sec. 13301 Grant, Loan, and Demonstration Programs amending the Public Health Service Act, and Sec. 4104 Studies and Reports on Health Information Technology, within Title XIII HITECH Act of the American Recovery and Reinvestment Act of 2009.
[4] Sec. 4002 of Title IV within the 21st Century Cures Act.

actions that count as information blocking.[5] The Trusted Exchange Framework and Common Agreement (TEFCA) went live in December, 2023.[6] The ONC has appointed The Sequoia Project as the coordinator, meaning they are responsible for implementing, maintaining, and updating the network framework and the agreement between actors contributing to the network.

The American medical record system is built out of commercial and homegrown systems, and is therefore shaped by market forces. The emphasis on interoperability and preventing information blocking is in large part because the market on its own offers no incentives to sharing information, and instead incentivizes companies to keep their data difficult to transfer. After all, if a hospital can easily move data between two programs, then it is easier for that hospital to switch vendors. If a company makes transitioning difficult, then the hospital is more likely to stay and continue to pay for services they have already invested in. However, *patients* are not direct consumers of electronic medical record companies, and they are impacted by difficulty in moving their own personal record between different medical providers. Lack of interoperability also impacts research. Therefore, it is a priority for regulation.

Presentation of the Case

The following is a fictional version of common scenarios.

The Eastern City Hospital has an electronic health record system which was developed in 1992 as a coordinated effort between their own staff and the faculty in their affiliated university. However, the EHR is slow; it has had so many features added in over the years that the system is no longer a coherent whole, but rather a fractured assemblage. The hospital administration decides it's time to transition to a commercial vendor that meets TEFCA standards. The administrators appoint Dr. George Foreman and the programmer Sylvia Char as the heads of the search committee.

Almost immediately, the committee becomes overwhelmed by the number and kinds of options available. They begin by looking at low-cost EHR options. There are some free open-source options available, like the ONC-certified OpenEMR; however, these are dependent on donations for funding and are often lacking in specialized functions. Dr. Foreman and Char determine that

[5] 45 CFR Parts 170 and 171, "Information Blocking and the ONC Health IT Certification Program."
[6] Micky Tripathi and Mariann Yeager, "TEFCA Live! THe Future of Network Interoperability is Here," *Health Affairs*, 12 December 2023.

their hospital needs functions unavailable in current open-source solutions. Another free option would be ads-based programs, but these were rare. The most popular had shifted to a paid subscription model recently, and the idea of advertising at point of care made doctors uncomfortable.

Dr. Foreman and Char decide to look only at the organizations that have been approved as part of TEFCA, the national framework. After all, if the hospital is going to dedicate time and resources to a new records system, they should future-proof the system as much as possible to get the best longevity feasible. However, even this list is not straightforward.[7] For example, one of the approved organizations, Health Gorilla, supports the secure network and data exchange component first and foremost. While reviewing their website and resources, the programmer, Char, can easily understand the jargon, but Dr. Foreman is left confused as to how to actually *access* this network. What product do they need to buy? How do they know what EHRs coordinate with this network?

The search committee shifts their attention to another ONC-certified option, EPIC. As one of the two largest EHRs in the United States, EPIC seems to be the most likely option for meeting the hospital's needs in both the short-term and long-term. While still overwhelming in the sheer amount of services and detail offered, there is enough information for Dr. Foreman and Char to feel comfortable in moving forward. The next step, however, is figuring out how to transition decades of medical records over to the new system quickly and accurately. They also must train the entire hospital staff on the new program with enough leadup time to ensure skill and ease of use once the system is implemented in clinical care.

Transitioning between EHR systems can be so complicated that consulting firms can be hired to manage the many steps for the hospital. Data cannot be simply moved over in a straightforward transfer. Often the data is saved in different file types and in different configurations with mismatched labeling. At least the system is their own; if they were transitioning from a different vendor, there is a risk that the original vendor would intentionally save the data in a way that is difficult to convert.[8] Even then, the system is more of a collection of different processes, so the transition to a new program involves each of the hospital departments. Sylvia Char leads the

[7] The list of designated qualified health information networks for TEFCA is managed by the Sequoia Project. https://rce.sequoiaproject.org/designated-qhins/

[8] This is done to prevent loss of the client, or to retaliate against the client ending the contract. ONC, "Transition Issues," *EHR Contracts Untangled,* 51.

project of organizing the data migration, taking most of a year for a staggered rollout of the new records. Ultimately, they decide to only move the entirety of recent records over, and otherwise move only the most important aspects of older records. The remainder are given to data managers to shift into a smaller archived form.

During this staggered migration, physicians, nurses, technicians, pharmacists, and administrative staff all attend directed trainings to learn the new system. Specialists attend extra trainings to ensure they know how to access less common functions and input data properly. Dr. Foreman and some other proactive users become "super users," encouraging their fellows to engage with the new system and guiding them when providers struggle. The hospital is willing to invest time and resources into the trainings even though it takes away from clinical care, because lack of training can lead to poorer clinical outcomes and lower efficiency.[9]

The patients of the hospital must also be transitioned over to the new portal, MyChart. Some patients are already familiar with the new portal because their other medical providers also use EPIC, making the transition easy. These patients may also have an easier time now in getting their records from these other providers to the Eastern City Hospital because now the providers share one service. Some of these patients celebrate the new system, which allows doctors' notes to be readily available when they meet a new clinical care provider. Instead of patients having to describe themselves and their diagnoses and symptoms over and over, the physicians can read what has already been recorded. Many must still repeat themselves, but the goal is to reduce the amount and the frequency of these redundant conversations.

However, other patients are struggling. As end users, they don't get training on the new portal. These patients are introduced to the new platform by a printout included in the papers they take home from their clinical appointment. When they try to log in for the first time, the patients may easily find their activation code and create an account, or they may run into technical issues and have to call MyChart (not the hospital!) for help. For recent patients, their entire record is available in MyChart. For patients with older medical records, some components are available through the legacy system or through a request for a paper version.

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[9] Soumya Upadhyay and Han-fen Hu, "A Qualitative Analysis of the Impact of Electronic Health Records (EHR) on Healthcare Quality and Safety: Clinicians' Lived Experiences," *Health Services Insights* 15 (2022), 2-3; Laura Hollister-Meadows, Rachel Richesson, Jennie De Gagne, and Neil Rawlins, "Association Between Evidence-based Training and Clinician Proficiency in Electronic Health Record Use," *Journal of the American Medical Informatics Association* 28, no. 4 (2021), 828-829.

Now that the Eastern City Hospital is on a TEFCA-networked EHR program, physicians can access greater amounts of both general population data and individual patient data as needed. However, that also means greater potential security risks if someone gains illicit access. There have been many ransomware attacks on hospitals in recent years, and the threat of similar attacks are acknowledged in the TEFCA documentation. Participating in TEFCA distributes responsibility for cybersecurity for each interacting entity, with the network centralizing the major security functions. While Sylvia Char's department is transitioning the hospital to the new program, they also must learn new protocols and coordinate with EPIC on training and incident reporting. They must also make sure the hardware connects with the record program, as some equipment automatically uploads data in proprietary formats.

Dr. Foreman and his colleagues have ongoing research projects with other hospitals, sponsored by both private and federal grants. Data collection has become trickier with the transition, as they must ensure the data is consistent with both their pre-transition systems and with the systems of the other research hospitals. However, once the transition is complete, sharing data will be simpler, since at least some of the other hospitals in the research project are also moving into the shared TEFCA network. Reporting to local, state, and federal governments may also be simplified, although coordinating these reports will take time to adjust.

Processing Questions

1. Why would a hospital choose to purchase a new EHR system instead of designing a new one themselves if they have local developers, like the university faculty?
2. Why were the leaders of the search committee a doctor and a programmer? Who else should be part of this decision?
3. What does ONC certification, or lack thereof, mean for the hospital and its future? What does ONC certification imply about the EHR program?
4. Why might a medical service provider choose an open-source EHR?
5. What are the community advantages of an open-source EHR? Consider many perspectives, including researchers and administrators.
6. What are the potential consequences of advertising within clinical software?
7. What are the incentives for a company to make it difficult to transition data? What are the incentives to make data transferable?

8. What are the potential consequences of errors in data migration? Consider both minor and major problems in clinical data, personal data, billing data, and administrative data.
9. Who is responsible for security and privacy?
10. What are the consequences of a failure in cybersecurity and privacy, particularly in the shared network?
11. Who are the experts? What does it take for existing staff to gain expertise in these specific programs?
12. Why do hospitals need access to others' medical data?
13. Why do patients need their hospitals to access larger networks of medical records?
14. How does engaging in a TEFCA network affect an EHR company's marketability and competitiveness?

Thematic Reflection and Discussion

Sharing data

In science, the sharing of data and results is valued, particularly for large research projects or in open science projects. Continuing medical research requires sharing data. However, technological barriers have often impacted data sharing. While large projects can coordinate with each other to ensure effective data transfer, individual providers seeking either their own patients' data in other institutions or insights into patterns in clinical care have much more difficulty accessing data. The companies managing records, networks, and databases have incentives to not share data or to require access fees. Researchers also may not want to share data until they have successfully published their results.

1. What are the interests of different stakeholders in possible data sharing scenarios? Interests may not be straightforward, and may shift across scenarios.
2. How are patients impacted by these higher level interests? What decision-making power might they have?
3. What is the role of regulation and of market forces in managing these interests? How do these play into the priority of democracy and democratic decision-making?

Labor and work

Creating an interoperable system is not easy. Creating the framework and necessary standards is a large upfront project, but they also require consistent maintenance and updates. The actors in this work are spread across each of the institutions, including the ONC, The Sequoia Project, the approved network companies, the EHR vendors, and the hospital staff. There is also a significant amount of work in IT needs, as staff must troubleshoot problems, figure out how to make the programs work with other necessary software or hardware, and teach users how to use unfamiliar functions. Transitioning systems can require so much work that additional labor must be brought in, particularly temporary workers supporting data entry.

1. Who should be responsible for long-term maintenance of the framework and standards?
2. What kinds of labor are more or less visible? What kinds of work may be forgotten until something goes wrong, or may not be planned?
3. What kinds of work must patients do, both to access data themselves and to make sure their medical providers can access their data?

Privacy and security

Electronic medical records contain incredibly private information for millions of patients. Private health information is protected by HIPAA. While this data is private, it must also be shared with many other entities in the usual course of healthcare, research, and billing. Access to private data must be controlled and monitored, while also maintaining ease of use, creating a difficult tension between open and closed access. This is why security is so important and so highly prioritized in the TEFCA guidelines. The more data you have available on a network, the greater the risks in case of illicit access. The more entities you have on a network, the more security risks you introduce.

1. How is security centralized and/or distributed in these systems?
2. Why is privacy such an important concern?
3. Who would want to breach privacy, and what would they do with the data?

Centering the patient

The ultimate goal of medicine is to address the health of individual patients. It is easy to lose sight of the goal when working within the many intersecting elements of the large medical industry and health technology industry. In the current system, patients don't have much of a voice in how their electronic medical record is handled or delivered. One major reason for this is the structure of our medical system based in disparate hospitals and other medical institutions, a structure which has developed over the last two centuries of historical and social influences.

1. What might a patient-centered electronic medical record system look like?
2. What conditions are necessary and/or sufficient for such a system to settle into place?

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