

Interoperability

Shaping the New Era of Healthcare



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What is EHR Interoperability?

Interoperability

Interoperability in healthcare is the ability of various Healthcare Information Systems to exchange, interpret, and use data cohesively within and across different organizations to deliver healthcare to individuals and communities.

American Recovery and Reinvestment Act

American Recovery and Reinvestment Act (ARRA), enacted in 2009, has forced healthcare providers to switch from paper to electronic health records (EHR). ARRA outlined expectations for Health Information Technology (HIT) to electronically exchange data. It has been a prominent & leading force of development in pushing the healthcare industry towards interoperability today.

Four Levels of Interoperability

HIMSS, a member-based non-profit society dedicated to revolutionizing the global healthcare industry, labels these **four levels** as **Foundational, Structural, Semantic, and Organizational**.



Foundational (Level 1)

Establishes the inter-connectivity and infrastructure requirements necessary for one system or application to securely communicate and receive data from another.

Structural (Level 2)

Defines the structural format, syntax & organization of data exchange that includes the data field level for interpretation.

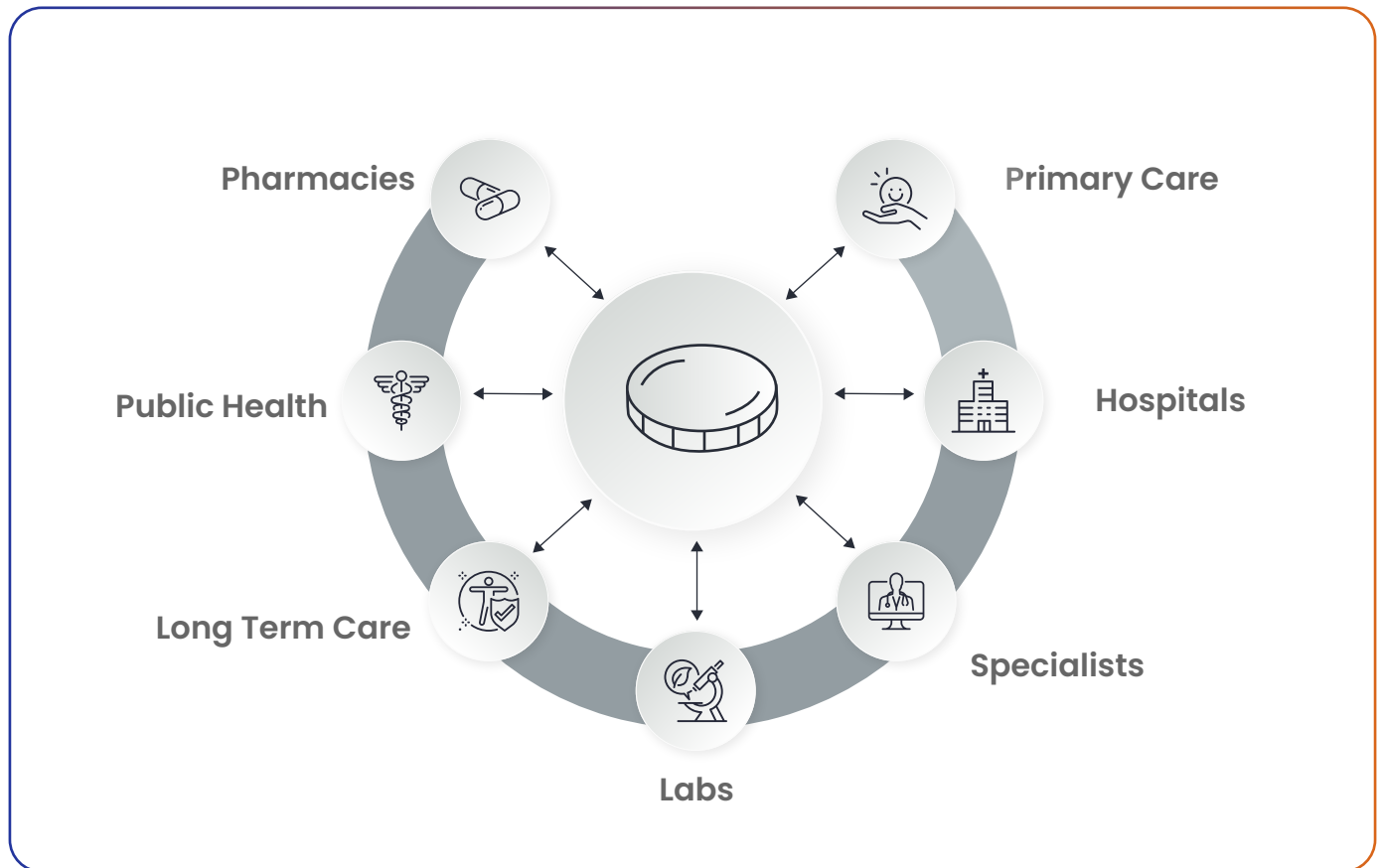
Semantic (Level 3)

Provides for standard underlying models and codification of the data where systems can exchange, interpret, & make use of information, including data elements with standardized definitions.

Organizational (Level 4)

It includes governance, policy, social, legal, & organizational considerations to enable secure, seamless, & timely communication to facilitate shared consent, trust & integrated end-user processes & workflows.

Benefits of Interoperability



Care Coordination

A variety of stakeholders who manage a patient's health across different care settings will have access to real-time patient data and a holistic view of patients using EHR systems that provide interoperability options. It improves the quality of patient care as it helps providers to make accurate decisions with the availability of richer datasets. Interoperability enhances care coordination between providers, avoids duplicate testing, and reduces adverse events. It also helps make informed care decisions and conduct appropriate follow-ups to ensure adherence to care management.

Protection of Patient Data Security

Interoperability in healthcare helps protect patient data as compliance is an essential driving factor, and patients trust their providers to keep their data secure. These interoperability solutions help leverage HIPAA – compliant environments that ensure data is stored and shared securely.

Improved Business and Administrative Process

Health information systems eliminate time-consuming tasks within a health system that include processing patient intake information, coordination across care teams and reporting associated with various regulatory requirements. Thus, interoperability enables them to develop the technological infrastructure required to maximize the value of their EHR data and deliver more comprehensive care.

For example, providers can communicate with the patient's pharmacy, which eliminates the need for handwritten prescriptions. You can save time by sending electronic or digital prescriptions, as medication can be dispensed when the patients are en route.

Reduced Cost

Interoperability solutions in health systems help reduce cost and medical errors by seamlessly sharing health data between providers, payers, care teams, labs, etc. Healthcare players are already reaping the benefits of automation on time-consuming tasks and error-prone manual work, thus impacting cost and productivity.

Financial Incentives

EHR adoption has offered significant incentives to practices and paved the way for interoperability between systems and their alignment to financial incentives. Incentivising providers will play a substantial role in interoperability adoption, leading to value-based care.

There is a positive impact on patient outcomes, and care delivery is streamlined, leading to improved financial performance. Thus, interoperability solutions provide the healthcare operators with the information they require to better coordinate care and reduce healthcare costs to patients, which is a win-win situation.





“For us, the foundation that makes the required level of interoperability possible is our common, integrated electronic health record.”

– *Michael Restuccia,*
Penn Medicine

Interoperability during COVID-19

The Covid-19 crisis was the silver lining to the healthcare industry, as it experienced unprecedented cooperation and collaboration among all the healthcare players. The pandemic proved that there was not a greater need for interoperability.

Immediate access to patient medical history, health condition & medical therapies became critical as clinicians faced many patient visits. Interoperability will help healthcare facilities aggregate patient data & provide the necessary care. Using FHIR standards, vendors can support health systems by facilitating the adoption of app-based solutions that enable data interoperability that proves to be critical and lifesaving, as in the case of the Covid-19 pandemic.

FHIR and Interoperability

FHIR (Fast Healthcare Interoperability Resources) specification is a data exchange standard published by HL7 that offer many improvements over previous standards for exchanging healthcare information electronically between healthcare patients, providers, payers, caregivers, researchers, & those involved in the healthcare ecosystem.

FHIR has transformed the way health systems communicate across medical facilities, & the entire healthcare community is adopting this next-generation exchange framework to advance interoperability. Also, across the globe, providers, patients, & payers will benefit from using FHIR in multiple applications.

FHIR Components

FHIR combines the best features of various HL7 versions with the latest web standards to solve interoperability. FHIR is built on HL7 previous standards such as HL7 V2, HL7 V3, & CDA (Clinical Document Architecture). FHIR employs RESTful web services and open web technologies, such as XML (used by previous standards) & JSON and RDF data formats. As developers widely use these technologies, it has become very user-friendly compared to other standards.

There are two sections in FHIR;

- Modular components in the form of 'Resources', and
- Specification for exchanging these resources via RESTful (REpresentational State Transfer) API interfaces, including messaging and documents.

FHIR solutions built from modular components are called "Resources". These resources are assembled into working systems that solve clinical and administrative problems at a minimal price to the current alternatives. FHIR is suitable for use in various modern contexts like mobile phone apps, cloud communications, EHR-based data sharing, server communication in large institutional healthcare providers, etc.

APIs interconnect any healthcare system, provider, patient, or medical device by normalizing all incoming requests & data as appropriate FHIR resources. FHIR encloses a document exchange format that allows the exchange of APIs, messages, resources, & various documents (including doctor notes).



Below are some of the significant contributions of FHIR to the healthcare industry are:

- Easy and swift implementation
- Lower bar for the entry and use of developers
- Free to use and easy to understand the specification
- Out-of-box interoperability
- Flexible due to the ability to adaptation in base resources
- Strong foundation in Web Standards
- Evolutionary development path from HL7 Version 2 and CDA

FHIR vs HL7

FHIR resources can be segregated into types and groups, similar to HL7 v2, wherein each type has a unique field structure, with either composite or primitive values. These fields are either optional or compulsory, & the resources are dependent on XML, Atom, JSON, HTTP, & OAuth. Resources can be combined and customized to meet the case-specific requirements.

Compared to HL7, FHIR offers various options to exchange data among disparate health systems. FHIR system leverages RESTful API approach in addition to supporting HL7 messaging format. FHIR improves interoperability among many health systems & devices, not just limiting to EHR systems.

FHIR also results in improved information sharing, simplified implementation techniques, & most importantly, offering better support for mobile apps, a recent

trend in healthcare. FHIR stands out in its ability to support critical use cases that benefit the healthcare system players. Apart from facilitating enhanced data sharing options among researchers, patients, payers and providers with coordinated care and critical decision making, FHIR enables patients to become more involved by staying healthy & tracking the health outcomes as seen in Apple Health. As data is more readily available, FHIR benefits the Researchers in clinical research with shorter and less expensive clinical trials, epidemiology, outcome research & more.

SMART on FHIR

The Substitutable Medical Applications and Reusable Technologies (SMART) platform is a set of open specifications that establishes to solve the data fragmentation challenges by standardizing how patient data (EHR & EMR) is accessed & shared among the healthcare system. SMART's inclusion in the 21st Century Cures Act paves the way to become the standard protocol for accessing electronic health records (EHRs).

According to CMS, SMART on FHIR is the preferred technical standard for implementing APIs, & the health system that accepts Medicare or Medicaid must also adopt SMART.

SMART is an open-source, standards-based API that leverages the OAuth 2.0 standard to provide secure, universal access to EHRs. The SMART platform builds on the existing Fast Health Interoperability Resources ("SMART on FHIR").



A The goal of SMART is audacious and can be expressed concisely: an innovative app developer can write an app once, and expect that it will run anywhere in the health care system. Further, that app should be readily substitutable for another.”

— *Kenneth Mandl, MD, MPH, Chair, SMART*

Advisory Committee

SMART provides a standard, universal API for accessing EHRs. Any technology built with SMART works with any disparate EHR database that uses SMART. Hence, healthcare technology becomes interchangeable, allowing health systems & patients to access medical data on the applications that best suit their needs, apart from those that work only with the current EHR database.

The functionality of SMART would be similar to authorizing apps via Facebook works. Here, Facebook is the FHIR, and it stores all the personal information about the patient. The data format and the standards that Facebook uses to store data are closely related to that of FHIR. Similar approaches and protocols that control approving this authorization in the healthcare ecosphere will be SMART.

Health systems utilising SMART enabled technologies are in for rapid innovation, as demonstrated by the recent launch of Apple’s personal health record (PHR) feature, called Health Records uses SMART on FHIR to combine existing patient-generated data in the Apple Health app with data from electronic medical records.

Few common use-cases of FHIR

A mature healthcare system will use all the available data to provide the resources in the healthcare ecosystem by ensuring appropriate usage. The ‘Health’ app on the Apple iPhone exemplifies how FHIR benefits its users. The ‘Health’ app enables users to establish a secure connection with their providers to safely access and share their health records.

Take a look at some of the common use-cases of FHIR adoption: Access to Patient Health Records that are Widely Dispersed

Using RESTful APIs, consumers can access their medical records through a web portal or a mobile app. Along with the PHR, which resides in the current EMR system like medical summary, office visits, medications, known allergies, patients can now access data from health systems that include Out-of-Network, specialists and much more.

Member Health-related Registries

FHIR resources such as organizational resources, practitioner resources include professional and institutional related information. It can utilize workflows, use-cases, and documents related to a patient with an

administrative and financial burden to verify the patient registries, treatment and coverage provided to a patient spread across several insurance types and health groups, care teams, and various points in time.

Health Documents Repository

FHIR provides a functionality, XDS (Cross-Enterprise Document Sharing), where documents are in a repository around a patient record across various health systems related to policy, procedures, reports, lab tests, etc.

Integration of Health Systems

Healthcare Providers and Payers will have to merge/integrate/transition/acquire disparate health systems maintained by EMR vendors. They can agree to put their data into an FHIR format in a separate server/database instance (FHIR) and use it securely.



FHIR Adoption Challenges

Although API adoption is limited, survey respondents predicted widespread Fast Healthcare Interoperability Resources (FHIR) API adoption by 2024.

- *ehrintelligence*

Optimized Research Outcomes

As FHIR ensures better resource management, information exchange of EHRs, and patient-centric data is available for clinical research. It helps shorten and expedite the clinical trials, improves interactions among clinicians and patients, and provides a risk assessment of new medical products, as seen in the case of Covid-19 vaccination development.

As there are multiple from FHIR, most EHR vendors adopt and implement HL7 FHIR in health information technology.

Cost Benefits of implementing FHIR

The sharing of data between healthcare providers, payers, and patients creates a value-based care model that emphasizes care management, population management, patient experience, and better coordination, which also reduces costs.

The implementation of API solutions and functionality provides seamless and efficient processes, cost-effective and practical 'Integrations' user-friendly in the advanced technological landscape. Implementing The REST methodology with open-source technologies will significantly decrease implementation costs.

SMART on FHIR provides a seamless & cost-effective way to integrate with numerous products in a marketplace. This ability will drive the innovation process & create a competitive market to easily create and replace apps similar to more mature financial mobile apps.

The healthcare sector is in a prime position to adopt this revolutionary standard FHIR as it provides strong business cases and offers immense technological possibilities. FHIR adoption can streamline patient access to data, promote clinical decision support tools, and enhance interoperability and exchange of patient data between providers. Hence, these benefits have shown massive potential for the widespread adoption of an application-based approach to health data exchange and true interoperability.

Below are some of the key challenges and considerations for FHIR implementation:

- As FHIR implementation is in its nascent stages, the adoption by healthcare players will be slow as HL7 has been the widely accepted standard for decades.
- The cost of adoption will be complex for large healthcare organizations as it involves numerous disparate systems, technical infrastructure, privacy, and processes.
- The health IT vendors are experiencing issues of integration and usability challenges.
- Threats for IT vendors are present, considering FHIR migration capacity that can compromise the deployment duration, thus impacting the outcome of common health records and hence the revenue generated.

Interoperability in Healthcare Vs Banking Services

While a few smartphone apps, a few plastic cards, and an ATM network are enough to run our entire financial lives, our interaction with health systems still depends on phone calls, copiers, and multiple time-consuming follow-ups. Also, this elaborates the routine exchange of information between health systems and financial systems. One of the primary reasons is that the banking sector has solved the foundational interoperability issues while the healthcare sector has not.

Below are some of the reasons for fragmented healthcare interoperability issues:

- Interoperability is limited among systems that do not address a broad range of needs
- Success of Interoperability will be of value only when it makes business sense to the participants
- Industry-wide efforts must drive interoperability





Future of Interoperability in Healthcare

Interoperability has seen breakthrough evolution in the last two decades. It has been assisting healthcare facilities to exchange data all over the world. Henceforth, it can bring more standardization around health data transmission and its utilization by any healthcare facility across the globe. FHIR is one such standard.

With optimized interoperability solutions across systems of different organizations, data will no longer remain confined to one provider

organization or system. The advancement of interoperability like FHIR will enable a smooth connection between systems and let providers tap into any patients' data stored in any system.

This level of advancement will allow patients to move freely within the broader healthcare network and control cases by multiple healthcare specialists without carrying their records everywhere. HL7 FHIR Interoperability will also reshape the future of EHRs, by connecting them to other systems to constantly exchange & update data.



‘Interoperability’ is one of the six investment priorities set by CIOs of major Health Payers and Providers for the next 5 years.

— *HealthcareITNews*

By having AI incorporated with interoperability, EHR data will automatically interpret and convert into a usable format, like in the case of Apple Health. AI Systems can process the ever-increasing flow of health

records, clinical notes, and patient forms and develop insights for better-optimized care coordination. It will help providers spend more time on patients than manual data interpretation.



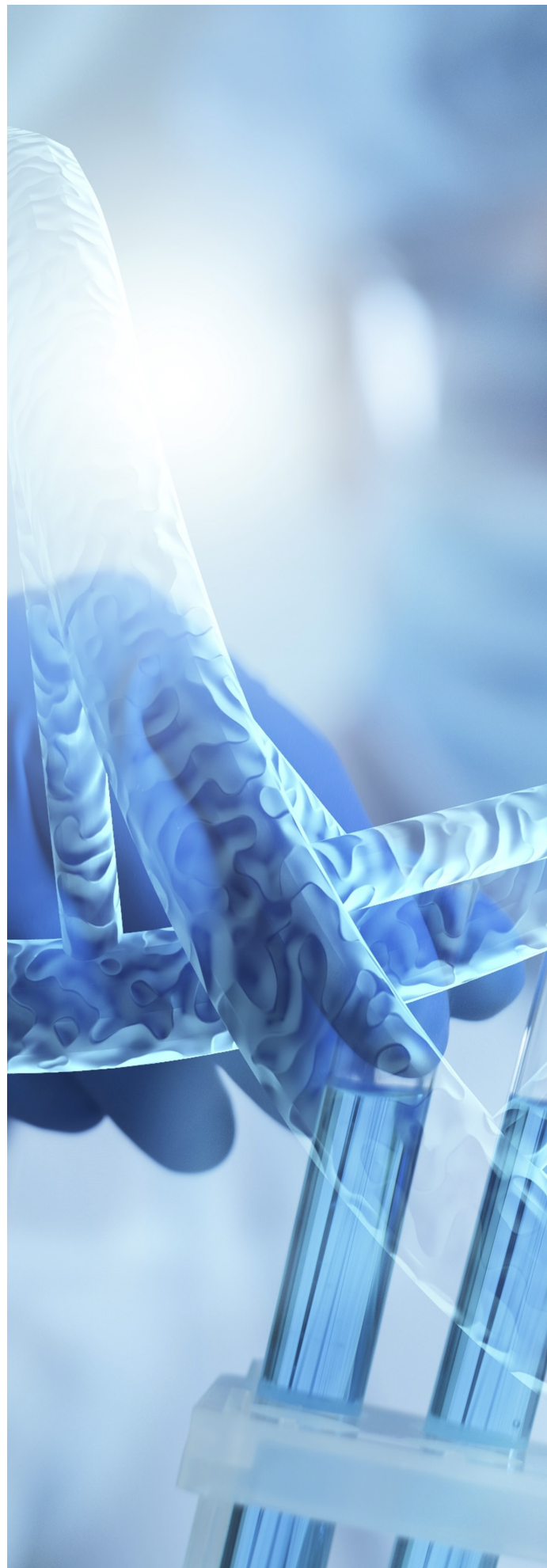
Security is vital, 'Blockchain' can be used to minimize the risk of data fraud, whether you are exchanging EHRs within your clinic or with other stakeholders.

Likewise, by implementing standards of Application Programming Interface (API), EHRs will also attain interoperability with connected devices and other applications. Therefore, FHIR APIs will soon find their way into every healthcare platform. It will establish a consistent standard for all systems, facilitating third-party integrations. Also, it will help shift care delivery from hospitals and clinics to patients' premises, where EHRs will constantly be tracking patient data. Meanwhile, when patients have any health-related issue, the EHRs will alert their care team in real-time to ensure immediate care through data integration solutions for healthcare.

The FHIR standard is gaining widespread adoption within the healthcare industry because of its benefits. Transformation of the healthcare industry through FHIR is finally possible by addressing the interoperability challenges that have impeded patients & healthcare providers from sharing patient information.




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