A funny thing happened on the way to interoperability in healthcare: business needs took over. This is not to deny the oh-so-critical roles that technology, technical standards and clinical definition standards must play in any interoperability solution. However, after decades of toil in the technology vineyards, wailing and gnashing of CIO, CTO and CMIO teeth, industry initiatives and EHR-vendor bashing, practical business interoperability is emerging in healthcare.

This dawning is yet a thin light on the horizon to be sure, but it’s growing brighter. The technology is here, say vendors, government, providers and developers alike. It’s now a matter of will. And there’s nothing like business imperatives and market dynamics to drive will. We call it accountable, value-based care and it’s real, because so is the alternative of market annihilation by disruptors like Amazon and Google. Internal disruptors are taking action as well.

To capture this important moment in healthcare interoperability, we talked to health systems Memorial Hermann, Ascension, CHRISTUS and University Hospitals, Cleveland. We also brought in the voices of EHR firms Cerner and Epic and mixed in perspective from Deloitte and Impact Advisors. It’s a story that’s still evolving, but the dawn is rising inexorably.

Interoperability: a career-long challenge

"I learned the problem of interoperability first hand," says Michael Shabot, MD. "In the very early days of EMRs before Cerner and Epic, my team and I at Cedars Sinai in Los Angeles had the task of pulling data out of clinical labs and bedside devices. I was literally there when we connected wires from our ICU minicomputers to bedsides and wrote the interface code to pulse oximeters, electronic urimeters and the like."

Today as executive VP and system chief clinical officer at Memorial Hermann, a 19-hospital health system serving the greater Houston area, he still struggles with the issue. "I know the difficulties, the challenges and the necessity of interoperability. All the information you need—clinical, financial, lab data and other kinds of data—is not in one system. Lack of interoperability is a major stumbling block to health systems, patients and their families. Minimal progress has been made so far."

He cites a recent research paper as illustrative. A site-specific data dictionary was created for each hospital in order to unify the collection of data. Each data element in the dictionary was mapped to an existing field at each hospital EHR, and site-specific abstraction and validation procedures were developed.1

Says Shabot: "In a nutshell, that’s been the healthcare interoperability problem from day one."

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Maintaining interfaces is time-consuming and resource-intensive. Each time you update an interfaced system, you may have to update the underlying database and mapping tables. Hardware updates, software updates and database updates on either side of an interface can require mapping table changes. For each upgrade, “we have to thoroughly test the database to ensure there’s a distinction between serum sodium versus urine sodium results. Otherwise subtle discrepancies can significantly impact patient care,” he says.

Until recently the federal government has not promulgated any healthcare interoperability requirements. Meaningful Use required standards for laboratory, medication and patient-visit data exchange, but those were limited EHR standards. The Office of the National Coordinator for Health Information Technology (ONC) has made interoperability a priority, including development of a national interoperability roadmap https://www.healthit.gov/topic/interoperability/interoperability-roadmap. However, enthusiasm for establishing interoperability via a national network has shifted to more local, practical strategies based on health systems’ business needs.

No easy interfaces

“There are no easy interfaces,” says Shabot. “Standards like HL7 and FHIR are important for data exchange, but what’s missing is semantic interoperability that differentiates clinical definitions like systolic blood pressure, serum sodium and urine sodium. Network standards describe how to create messages, but there’s no standard definition of arterial blood pressure for exchange among caregivers. A standard like SNOMED defines most physiological states but that would mean the government would have to mandate it and ‘take sides,’” he says. That’s why most health systems have tried to put all the functionality they can in a single large system—to avoid interfaces. Lack of semantic operability is what makes it difficult to share data between systems.

Still, “every millisecond of the day your systems are exchanging information,” says Shabot. “Even our physician-credentialing system with the names, contact information and physician numbers has to interface with our clinical system to allow real-time access by clinical providers.”

Shabot, a national leader in high-reliability healthcare, says interfaces are weak links in the chain. “Interfaces are low-reliability. You can imagine the chaos clinically if we recorded the wrong images, reports, lab results or procedures.” At least two kinds of errors can occur: First, you could misdiagnose the problem, for example if you mixed up hepatitis surface and core antibody results. Second, you could misidentify the patient because there’s...
Architecting interoperability at Ascension

If there’s a health system that needs data interoperability it’s Ascension. With 2,600 sites of care—including 153 hospitals and more than 50 senior living facilities across 22 states and the District of Columbia—St. Louis-based Ascension is the largest U.S. non-profit health system and the world’s largest Catholic health system.

"We work with a large cross-section of providers and have many interoperability opportunities," says Julie Henslee, senior director, data architecture and development, Ascension Technologies. While interoperability is easy enough to define—the ability of systems to exchange and make use of information—the reality is clearly more challenging.

"We have to define what we want to achieve with interoperability across our system. We can’t simply focus on exchanging data," says Henslee. "Design is much, much more complex. Our primary goals with interoperability are to bring information to the patient and provider where they are, considering how they want to receive it, and where they want to receive it."

Still, given healthcare has no “unified field theory” for interoperability yet, Ascension uses multiple approaches. Henslee breaks interoperability into several buckets.

The first is **semantic heterogeneity**. "This is first on my list," she says, "because whether a product is an analytic one or an interoperable one, managing semantic heterogeneity is part of the design conversation. In any one cross-system set of transactions, there can be hundreds and even thousands of variations in the naming of the contents. When we talk about clinical content, for instance, compendiums for medications can number in the thousands and for allergies in the tens of thousands.

Not every system adheres to standards or to the same standards. For instance, when an unknown code for an allergy is received by a clinical system, the system must have a method to adjudicate that code to present the correct allergy and also de-duPLICATE and reconcile against its own allergy information. We’re returning to the user experience. A provider needs to see a clean medical record that’s not confusing."

A second area of focus for interoperability at Ascension is **identification management**. "Patient and provider identity management across an ecosystem is required to present a holistic view," says Henslee. "A patient undergoing surgery could have encounters and clinical information entered not only in a hospital, but also in the community with specialists and primary care providers. In order to group clinical data across these providers and venues of care, identities must be reconciled while exchanging data."

"We have to define what we want to achieve with interoperability across our system. We can’t simply focus on exchanging data."
The advancement of new approaches is a third key area interoperability advocates must keep abreast of. “Twenty years ago we had only a few options, like pushing HL-7. We’ve seen several new approaches emerge in the past decade as healthcare has shifted to accountable care. We have CCDs, FHIR, Direct messaging, APIs and others. We also have new approaches to data storage and retrieval with Hadoop and blockchain. As interesting as all of these approaches are, none of them is mature enough across vendors to be a fully realized single approach. What happens is health systems typically use a combination,” she says.

A fourth area is the proliferation of new technologies. “Why is this factor a challenge?” asks Henslee. “We still have to design with the user in mind. So, whether designing for the provider on an HIE portal or on an EMR in a clinic, we have to consider all of these approaches for their strengths and weaknesses to effectively support a user’s experience.”

Conflicting strategies is a fifth area of challenge for interoperability. “Most commonly this is cross-organizational. Patients may visit competing organizations and those groups are not always so willing to push or share data in aggregate with each other. We’re seeing more maturity in spaces supporting selected data exchange networks like CommonWell Health Alliance and Carequality,” says Henslee. Other conflicting strategies can be internal to an organization. However, “multiple approaches to sharing and exchanging data can and should exist in the same ecosystem.”

Privacy and security will always be a challenge, and it varies across the country, so national health systems like Ascension must emphasize continual vigilance on a region-by-region basis. “We’ve increased demand for interoperability in more venues and for more purposes, so the risk increases. What has also increased is the sophistication of cybercrime so we have to continually assess those threats,” she says.

Resources and workload balancing is key. In our journey at Ascension we decided to take a holistic approach to interoperability to help mitigate these challenges and reduce the duplicative and competing workloads across the organization,” Henslee says.

Check out three important and compelling articles related to interoperability.

**Harvard Business Review** discussed the opportunity to improve how physicians utilize EMRs and streamline interoperability across platforms.


**NEJM Catalyst** hosted an interesting discussion on interoperability and the opportunity for disruption.


Cerner’s John Glaser, PhD has suggested a three-pronged approach to improving EHR usability.

https://www.healthcareitnews.com/blog/cerners-john-glaser-how-finally-fix-ehr-usability-problem

In the diagram sequence (next page) are four scenarios to illustrate different approaches depending on information design requirements. “HL7 v2.x is the most common way we push real time data between systems,” notes Henslee. “Sometimes we need to take a federated approach. We can use XCA or FHIR approaches, among others, to support that strategy. There’s a lot of progress with Carequality and CommonWell and we’re seeing more and more vendors open up to direct API connections.”
An "Insights" stack on the left includes analytics and reporting. An "Actions" stack on the far right supports point-of-care. In the center are data-management services across technologies creating a layer of semantic abstraction. "The intent is to reduce rework of the same data," she says. "If a set of allergies is mapped to a terminology set for an analytic, that same map can be leveraged to support interoperability between these systems. In this way secondary utilization creates value."

"Resources and workload balancing is key. In our journey at Ascension we decided to take a holistic approach to interoperability to help to mitigate these challenges and reduce the duplicate and competing workloads across the organization."
Interoperability: How do we design?

Data Sharing Methods:

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Push (scheduled and real time)</td>
<td>Data is sent streaming or scheduled to end point systems. Triggers range from point of care entry to device / system initiation to scheduled jobs.</td>
<td>HL7 v2.x, CCD</td>
</tr>
<tr>
<td>Launch</td>
<td>A user in a native system is able to launch to an external system / view</td>
<td>SSO, SAML</td>
</tr>
<tr>
<td>Reference</td>
<td>Data from another system is made viewable in a native system using web transfer protocols</td>
<td>HTML HTTPS</td>
</tr>
<tr>
<td>Query Retrieve / Pull</td>
<td>A request for information / documents is initiated from a native system, typically via broker, to another system and a response is received.</td>
<td>XCA, FHIR</td>
</tr>
<tr>
<td>Direct API</td>
<td>A native system connects directly with another system to retrieve specific data without the use of brokers</td>
<td>FHIR, Custom</td>
</tr>
</tbody>
</table>

Major Considerations:

| Data Management: Semantic and Identity | Syntactic / Structural Management | Timeliness / Latency |

"How do we design?" Henslee asks. "When starting a new interoperability project we look at data management, including terminology and identity management. We consider the various data sources, their functions and the data sets to be managed and exchanged. We look at syntactic and structural management for the data exchange methods themselves. These are informed by timeliness and latency requirements driven by the use case and experience. We leverage layers of abstraction to focus on reusability and secondary utilization of mapping and integration builds."

"HL7 v2.x is the most common way we push real time data between systems. Sometimes we need to take a federated approach. We can use XCA or FHIR approaches, among others, to support that strategy. There's a lot of progress with Carequality and CommonWell and we're seeing more and more vendors open up to direct API connections."
Scenario One: The most common scenario is the push of real-time data from one system to another. For example, HL7 v2 feeds are sent to an ancillary lab system. In turn the lab system sends information back to the EMR. EMRs typically manage code sets into and out of their system.

Scenario Two: Data is pushed between EMRs using the same method as Scenario One. This usually results in a large amount of semantic variability that must be managed between systems. EMR systems can step on each other if the exchanged updates aren't managed effectively.
Scenario Three: Data is exchanged between EMRs upon request. An originating EMR sends a request through a broker that matches the request to the correct patient in other EMRs in the network. In this way only selected patient information is returned to the originating EMR. “Within Ascension we’re seeing success with this method of sharing by participating in networks like CommonWell and Carequality. We’ve been able to roll out participation in CommonWell and Carequality quickly and effectively,” Henslee says.

The last scenario is a centralized HIE. With this method EMRs and other contributors push data via CCDs and real-time HL7 v2 to a centralized data store. The data is managed in a longitudinal record where terminology, identity and de-duplication across feeds from EMRs have been managed. The single longitudinal record is then made available via launch, typically a button in an EMR that then puts the user via single sign-on into a web-page view of the patient’s longitudinal record.
Although upfront rollout time and resources required are high, the key advantage of a centralized HIE is the availability of a clean, patient-centric longitudinal record on demand that can also support complex toolsets and functions,” she explains. Ascension has built a clinical inference engine (CIE) using its HIE-based longitudinal record. Based on an ontological tool and the patient’s record, the CIE can suggest, for example, a patient has undiagnosed diabetes. “These are both examples of powerful tools for providers that can be built leveraging a centralized longitudinal record.”

Ascension Technologies Interoperability – Where are we going?

“The future is already here – it’s just not very evenly distributed.” – William Gibson

Our primary goals with interoperability are to bring information to the patient and provider where they are, considering how they want to receive it and where they want to receive it so that they have the information and care they need when they need it.

Strategies
- Rationalize systems - reduce system variability and syntactic and semantic variability
- Adhere to exchange standards – use established standards as much as possible
- Use common semantics – move toward the same vocabularies, not only in late binding data management layers but in source systems
- Focus on reusability and abstraction – when building and designing exchanges consider secondary use cases and scalability across an enterprise
- Design with experience in mind
- Consider new approaches

Innovation!
- APIs and app ‘market’ approach
- NLP and voice recognition
- Blockchain
- Predictive analytic integration
- Trusted Exchange Framework and Common Agreement (TEFCA)

Says Henslee: “We operate in a very messy space between rigidly structured systems. It’s important to consider new approaches. I have no doubt a lot of new things will become available soon—particularly with Google and Amazon and other big players joining the fray. I look forward to it.”
Why it matters

“It’s why it matters,” says John Gresham, when asked to define interoperability in healthcare. As senior VP for interoperability at Cerner, he frames interoperability practically: better informed care decisions supported by the free flow of data and information, which ultimately empowers consumers and physicians.

Achieving interoperability is not an “either/or.” It requires both connecting EHRs to each other and adopting and deploying standards. “Standards allow us to exchange clinical data in a reliable, repeatable manner,” he says. “Interoperability implies people crossing multiple networks. Facilitating that freedom means establishing network connectivity rather than point-to-point connections. Standards, deployed by organizations like CommonWell, support this ‘network of networks’ concept, which is the only way to scale interoperability.”

Cerner is pursuing the network-of-networks strategy through its participation in industry initiatives like CommonWell [https://www.CommonWellalliance.org/], a trade association focused on creating universal access to health data nationwide through services like person enrollment, record location, patient identification and data query/retrieval.
In 2018, CommonWell connected to the Carequality network, enabling healthcare providers to engage in bidirectional health data exchange with Carequality implementors for broader care coordination and better-informed healthcare delivery.

“We need to think through how we develop patient-consent models and how some of those standards impact interoperability,” he says, as a key feature of the network of networks is to query a network that “understands” where a person’s clinical information is—versus having to establish a point-to-point connection.

Heading toward a network of networks

According to Gresham, Cerner emphasized network-based connectivity early as a co-founder of CommonWell. Cerner believes that CommonWell can evolve into support for TEFCA [Trusted Exchange Framework Cooperative Agreement] and ONC’s concept of Qualified Health Information Networks or QHINs.

In early 2018 HHS’ Office of the National Coordinator for HIT drafted the Trusted Exchange Framework as required by the 21st Century Cures Act of 2016. It proposed policies, procedures and technical standards required to advance the single on-ramp to interoperability requested by Congress and generated the Trusted Exchange Framework and Cooperative Agreement (TEFCA) that Qualified Health Information Networks (Qualified HINS or QHINS) and their participants will voluntarily agree to adopt.

“TEFCA is proposed by ONC to become that national standard for a network of networks. That’s where we see the healthcare industry headed,” he says, noting the network of networks technically is a federated, brokered data-exchange model. “We are pleased with the results we see with CommonWell, and look forward to TEFCA’s ability to expand connectivity to other QHINs beyond Carequality.”
Interoperability is less a technology issue than a standards issue. “We’ve put the plumbing in place and now as an industry we need to turn on the water,” says Gresham. The problem: tapping this metaphorical water involves an extremely complicated process of agreement around everything from patient-consent models—Cerner has settled on opt-out versus opt-in—to standardized data and clinical definitions, aka semantic interoperability.

He summarizes three key elements required to advance healthcare interoperability near-term:

1. Adopt available technology—ensure the ‘plumbing’ is in place;
2. Shift to an opt-out, HIPAA-compliant patient-consent model;
3. Configure provider systems and workflows for semantic interoperability and embrace intelligent reconciliation processes where available.

Call for collaboration

Technology is available for the TEFCA network of networks model—CommonWell demonstrates that the plumbing is in place—but a critical mass of vendors and providers “must hook up,” he says.

Still, semantic interoperability is the foundation of a seamless medical record, Gresham agrees. “How can I make sense of a longitudinal record? Standards are necessary, but in the absence of complete standardization we’ll rely on the intelligent methods to reconcile information and normalize data.”

An outside disruptor like Apple or Google may ultimately attempt to enable interoperability in healthcare as an overlay or adjunct to current and future networks that exist today. However, attempting to do so still begs the question of how you create a “semantically well-defined view and plan for the patient. Someone still has to know healthcare to ensure you are able to apply and draw meaningful insights from the data for the level of accuracy required in clinical practice,” says Gresham.

Apps will likely offer an “interactive interoperability” for self-directed healthcare consumers, not unlike the way Facebook allows people to share photos. “We see a role for new enablers to assist with this last mile, but there will need to be sophistication in how the information is intelligently synthesized with the legal medical record. There’s a significant role for providers and companies like Cerner as well as for innovators as enablers,” he says, adding that a number of organizations, like Apple, have collaborated with Cerner to help advance consumer access.

In the 21st Century Cures Act (Cures Act), Congress identified the importance of interoperability and set out a path for the interoperable exchange of Electronic Health Information. Specifically, Congress directed ONC to “develop or support a trusted exchange framework, including a common agreement among health information networks nationally.”

The Draft Trusted Exchange Framework, released on January 5, 2018, outlines a common set of principles for trusted exchange and minimum terms and conditions for trusted exchange. This is designed to bridge the gap between providers’ and patients’ information systems and enable interoperability across disparate health information networks (HINs).

> **Principles for Trusted Exchange (Part A)**—guardrails and general principles that Qualified Health Information Networks (QHINs) and Health Information Networks (HINs) should follow to engender trust amongst Participants and End Users.

> **Minimum Required Terms and Conditions for Trusted Exchange (Part B)**—specific terms and conditions that will be incorporated into a single Common Agreement by a Recognized Coordinating Entity (RCE).

The final Trusted Exchange Framework and Common Agreement (TEFCA) will include Parts A and B, as well as the Common Agreement, and will be published in the Federal Register and on ONC’s [HealthIT.gov](http://HealthIT.gov) website.
Data producer and consumer

Interoperability can be a passionate issue when you head up data management and analytics at a health system—and are from outside healthcare.

“I’m actually a data customer,” says Lauren Bui, VP, data management and analytics at CHRISTUS, “so, I need both quality of data and to know where it comes from. In my role I have function in mind. It makes me a producer and a consumer.”

And it makes her an enterprise-wide player, spanning both front and back office functions, including revenue-cycle coding and billing, and, as overseer of productivity and analytics, Bui is responsible for supply-chain data. The data docket is overflowing: Irving, Texas-based CHRISTUS, which has more than 60 hospitals and long-term care facilities in six states, Chile, Colombia and Mexico, is implementing an enterprise resource management (ERP) system that will replace a third-party spreadsheet tool.

Market by market

CHRISTUS is a multi-EHR system with separate inpatient and outpatient EHRs for which it must archive data for all services, orders and results. The health system is testing a solution at Children’s Hospital in San Antonio, where clinicians previously had to open two EHRs to read a cardiologist’s notes. Today, they can see everything using a common viewer built with FHIR and open standards.

“We even built our own connectors,” which accept data and normalize it into CHRISTUS and healthcare standards, she notes. Connectors provide interoperability between a data source and a database using APIs and an abstracting layer that accommodates text, graphics and data objects.

With EHRs ranging from Meditech to Epic and Allscripts, Bui says, “it’s a strategy market by market. In some markets we have a strong HIE.”

Model platforms for interoperability

Bui came to CHRISTUS two years ago from Sabre https://www.sabre.com, which consolidates airline-passenger service providers onto a single IT platform so users can search, price, book and ticket passengers. “It creates end-to-end transparency of information,” she says, offering healthcare a model for an online marketplace with interoperability for all players.

Sabre isn’t the only potential model from outside healthcare.

“Amazon says if you want to play in our marketplace you have to conform to data standards, your product has to be competitive to create an easy, streamlined experience—like Sabre’s,” Bui says. [Amadeus (https://amadeus.com/en) is the European version of Sabre.]

These platforms create price transparency by market, by specialty. “You wouldn’t have 50,000 different standards,” she says. “You would then be able to bring in the payor side. It’s a benefit for the payor to get a quote from the provider. These possibilities all occur across the healthcare value chain. We can learn from other industry data-standardization models, including how to cut cost, increase efficiency and improve quality.”

Monetizing data results in interoperable systems.

“The airlines have figured out how to monetize the data. They’re also marketing it differently,” she says. “It’s all about personalized customer offerings. They know how much it cost you to book the flight, purchase seat, meal and baggage options, and they score you based upon your pattern. It’s the same thing with our customers and the data we collect in the EHR. We should study our customers’ behavior, then stratify, rank and rate them to reward targeted behavior. It’s all part of a broader digital consumer industry trend.”
Messenger from the future
“I came from the future and I know what needs to be done,” asserts Bui, who previously to Sabre worked for Fidelity Investments on employer-sponsored health and benefits. “We aggregated the data for employers like GM, Toyota and Bank of America.” She also worked in data-technology roles for Lockheed Martin and pager firm USA Mobility. “I have a disruptive approach,” says Bui.

Healthcare is slow to change because of cultural struggles, she argues. Ironically, the mission to serve gets in the way, obscuring the need to change. “We think to be effective at service we need to be slow moving, when today the opposite is called for. As an industry we’re not thinking disruptively. We must adopt a disruptive perspective.”

In the end, says Bui, “It’s a data issue. Healthcare says, ‘We’re special. We can’t change.’ But unless you change, healthcare will continue to crawl. When I first got into healthcare, I told my role model Edmund Jackson, chief analytics officer for HCA, ‘I’m overwhelmed.’ After talking with the veteran data executive, she realized the heart of healthcare’s problems are data-literacy and operational incompetencies.

Says Bui: “All of healthcare’s problems are tied back to operational workflow inefficiencies. The COO is the most critical title in healthcare because hospital operations and decisions on how to run the business will be healthcare’s crucible. Also, the CIO and CMIO need to do a better job of mapping out processes. It’s more than technology and operations that leads to lack of interoperability.”

Big as an ecosystem
Still, even a disruptive outsider like Bui is pursuing interoperability at CHRISTUS within the context of tools available to her, including HL7, FHIR and Open RESTful (Representational State Transfer) APIs to support an open-standards approach.

That could change in the near future. Bui predicts a disruptor like Google or Amazon—per Bui, Apple is more focused on devices like the Apple Watch—is ready to pounce with a single, interoperable healthcare marketplace. Amazon, for example, has already developed AWS (Amazon Web Services) among its universe of suppliers, all of whom have complied with its data standards in order to play in its marketplace. For consumer-focused health systems the lesson is obvious, says Bui: “If you’re a savvy consumer, you’ll go to a savvy marketplace.”

“So, what about the EHR? “The EHR should stay an EHR. EHRs are transactional, capturing encounter information regarding providers, payors and cost. But as they capture data we need an interface with suppliers, affiliated providers, and related customer-centric data. I don’t see EHR vendors becoming the marketplace. Their architecture only supports a single data platform. You need to be able to analyze high volumes of data with really fast queries,” she says.

None of the EHR vendors can come close to Google or Amazon, which are massive data corporations with plug-in data platforms. Like many EHR firms, Epic is trying to achieve plug-ins via their App Orchard which supports app development, but it’s still a transactional system, Bui adds.

“We think to be effective at service we need to be slow moving, when today the opposite is called for. As an industry we’re not thinking disruptively. We must adopt a disruptive perspective.”
Follow the patient

Dave Fuhrmann, VP of interoperability at Epic, says defining interoperability depends on your focus. For patient care, that means having the medical record follow the patient wherever she goes within a health system or building new apps that support customers in maintaining wellness. More concretely, interoperability includes connecting EHRs to each other and setting data standards, both of which are needed in an interoperable world.

Eleven years ago Epic first released Care Everywhere, its platform for connecting disparate EHRs. Today all of Epic’s customers are live with Care Everywhere and exchange 3.5 million patient records a day with 43 percent of that exchange happening with other vendors’ EHRs. “It’s grown very fast,” he says.

After Meaningful Use drove EHR adoption, Carequality also emerged as an interoperability framework. Epic is trying to create an end-to-end interoperability solution beginning with Care Everywhere. For providers using an interoperable EHR, Epic recommends joining the Carequality network which facilitates the exchange of patient information across disparate EHRs that support national standards (98 percent of Epic sites are signed up for Carequality).

Web view

Organizations that lack an interoperable EHR and share patients with organizations that use Epic can use EpicCare Link web view to access the patient’s chart, schedule appointments, place orders and communicate with the care team.

Community Connect enables an organization using Epic to extend it to a provider to make Epic become their primary EHR. Share Everywhere, a web-browser tool in MyChart—Epic’s personal health record that allows patients to communicate with doctors, request prescription refills, access test results and manage appointments—enables outside caregivers not using an EHR to view their patients’ charts.

Early in 2018, Epic launched its One Virtual System Worldwide to leverage the Care Everywhere platform through three features—Come Together, Happy Together and Working Together—to create more seamless functionality across all Epic EHR users.

Come Together enables users to locate patient EHRs and aggregate patient data from other Epic users, health systems using disparate EHRs, government sources and healthcare data networks. Happy Together provides a single, integrated view of patient data in a visually compelling format. Working Together makes it easier for providers to more efficiently schedule appointments, conduct secure messaging and access data.

Like an umbrella

Carequality, which uses digital certificates to connect networks, “is like an umbrella,” notes Fuhrmann. “It’s the standards body, framework and phone book. It’s comparable to a network.”

It’s difficult to predict whether a third-party disruptor like Amazon or Google will swoop in with a connectivity platform for all of healthcare. “The key to interoperability is an industry coming together with data terminology. How does each system recognize that a patient has diabetes and share that consistently?”

SNOMED (Systematized Nomenclature of Medicine) is an electronic vocabulary system for medical databases that may become the standard vocabulary for speech-recognition systems and EHRs.

“We’ve already solved connectivity,” says Fuhrmann. “Our next stage, our next focus is semantic interoperability. Given networks like Carequality and HL7 standards like SMART on FHIR, is there even a need for a third-party disruptor to provide an interoperability platform? And, would we want non-providers to handle patient data? We have to be very
thoughtful. As an industry we need continued work on this front.”

App interoperability is different
SMART on FHIR is a set of open specifications to integrate apps with EHRs, portals, HIEs and other HIT systems. So, will there be apps that health systems can plug in to enable interoperability?

Internal interoperability
In the absence of an industry standard for interoperability, health systems are playing the hand they’re given to frame their own business interoperability.

Robert Eardley, CIO at University Hospitals, Cleveland, breaks interoperability into two parts:

1. Interoperability for outside parties to transfer patient records to your health system—“That’s the classic view of interoperability,” he says.

2. “Internal interoperability, to unbox or unleash the information in the EHR so numerous caregivers can interact with mobile apps and other applications for targeted uses.”

Eardley focuses most of his effort on internal interoperability. “We’re trying to have—not so much an EHR—but an ecosystem of partners. The same foundational information is in the EHR, but we want to be quick, agile and cost effective. That means using APIs, FHIR, SMART on FHIR, all geared toward having more interaction with data in the EHR,” he says.

Eardley and his team continue to pursue outside interoperability, from within the health system to outside, by using the classic CCD (Continuity of Care Document, an HL7 standard) or C-CDA, which is a consolidated CDA standard for multiple electronic documents. University Hospitals also uses the federally developed Direct clinical messaging protocol, an information exchange protocol that specifies how the senders and receivers of a clinical message such as a patient care summary, can authenticate who they are, encrypt the message, transmit it and verify receipt.

Not dependent on EHR functions
However, solving internal interoperability has emerged as a kind of breakthrough for immediate needs and may hold promise for the larger industry.

“The newer use of interoperability is for interaction within ecosystems of partners and apps with fundamental information for targeted needs,” says Eardley. “Internal interoperability aims to unleash the information. You might want to have an online scheduling app without having to solely rely on EHR functionality.”

Functionally speaking, such dynamic interoperability requires an app to make an API call to the health system’s scheduling system, “which makes it a lot faster to turn around and which enhances the patient experience,” he notes.

Being fast while enhancing the patient experience is the Holy Grail for systems like University Hospitals, a classic mongrel of IT platforms. It uses Cerner Soarian for registration, scheduling and billing and then Allscripts EMR functionality in hospitals and physician offices for clinical functions.
Just a call away

“There’s a desire to have a master EHR database, but the idea of APIs making web calls is they offer windows into EHR information,” says Eardley. “We wrote a custom-developed scheduling function called ‘Schedule Me Now’ that makes an API call to our Cerner database asking ‘What’s the provider’s availability?’ When the appointment is scheduled it puts that information into the EHR. We’re not waiting on a vendor to build an HL7 interface, test it and figure out where it needs to land.

“That whole strategy of APIs is another path to interoperability,” says Eardley who experienced an epiphany when one of his app developers walked him through how they work. “An API call is not much more than when a web URL calls for information.”

APIs are capable of about 30 acceptable web calls; scheduling is one. A simple web URL call may be to check out the weather for the next seven days. “Marriott is not developing weather reports,” he cites an example. “They’re publishing weather reports based on a database call to Weather Underground. Or it may be weather underground/api/forecast/zipcode variable.” In a sense, Marriott has developed an app using Weather Underground specs that it has decided are acceptable.

Says Eardley: “The whole idea of APIs and FHIR is pre-programmed specs, for example to get scheduling information or lab results. Programmers already know what that web call is. The idea of an API is I’m going to ask you only when I need it. Let’s say you have a great app for CHF patients. It’s a lot more precise than just accessing database storage. I still want to pull in my latest data, but there’s no need for an app to store the data, just to go get it real time when I need it.”

Conclusion

In many ways, anticipating interoperability in healthcare recalls that of the electronic medical record late last century when the EMR was always “10 years away,” even after a decade or more had passed. Cerner’s Gresham estimates we’re at least five years away from true interoperability. Epic’s Fuhrman says it will require “continued evolution as an industry over time. What does the industry come together on? How do EHR systems implement it? Interoperability has arrived and will continue to evolve.”

On the other hand, continuing creative development of APIs by health systems to achieve interoperable ‘ecosystems,’ along with the seemingly inexorable thrust of disruptors like Amazon and Google to create ‘marketplace’ platforms with plug-ins for all players, just may shrink that timetable whether we’re all ready or not. Business as usual.

Docs—continue to—want interoperability

Deloitte’s 2018 Survey of U.S. Physicians* found that 62 percent of doctors believe that interoperability needs improvement, the survey’s highest-ranked issue. [see Fig. 1, next page]. Importantly, the dial had not moved at all in two years: in Deloitte’s 2016 Survey of Physicians interoperability was the highest-ranked issue also at 62 percent.

Echoing many voices, the report says, “To tackle interoperability issues, health systems may need to employ multiple approaches: moving to a unified EHR platform or connecting multiple platforms through interface engines; APIs; health information exchange (HIE) approaches; blockchain to support secure data exchange; and/or custom-built solutions.”
Still, there is room for optimism, the report says. “Market dynamics may be more favorable than in the past: Standards, such as FHIR (Fast Healthcare Interoperability Resources), have matured; several consumer technology companies are making serious plays in the healthcare field in general and in the EHR space in particular** and there are signs of growing consumer demand for centralized access to their own medical information.***”

![Figure 1](image)

As in 2016, interoperability and ease of use are the big pain points
Survey question: To deliver better care, what changes would you make to the current EHR system at your primary work setting?

<table>
<thead>
<tr>
<th>Make the current system more interoperable</th>
<th>62%</th>
<th>Make the current system more interoperable</th>
<th>62%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Improve capability to easily add patient visit information</td>
<td>58%</td>
<td>Improve capabilities to work with practice workflow and increase productivity</td>
<td>57%</td>
</tr>
<tr>
<td>Make it seamlessly available and accessible by mobile devices</td>
<td>39%</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>Better support workflow management across the continuum of care</td>
<td>38%</td>
<td>Better support workflow management across the continuum of care</td>
<td>41%</td>
</tr>
<tr>
<td>Automate reporting to meet quality reporting requirements</td>
<td>37%</td>
<td>Automate reporting to meet quality reporting requirements</td>
<td>29%</td>
</tr>
<tr>
<td>Improve capability to generate custom reports on my patient population</td>
<td>37%</td>
<td>Improve/add capability to report individual clinical and financial outcomes</td>
<td>23%</td>
</tr>
<tr>
<td>I would make no changes, leave my EHR system as is</td>
<td>10%</td>
<td>I would make no changes, leave my EHR system as is</td>
<td>12%</td>
</tr>
</tbody>
</table>


Welcome disruptors?

Amazon, Google, IBM, Microsoft, Oracle and Salesforce recently issued a joint statement* pushing for better interoperability in healthcare, especially by using cloud-based technologies and AI. “Open standards, open specifications, and open source tools are essential to facilitate frictionless data exchange,” according to the statement. “This requires a variety of technical strategies and ongoing collaboration for the industry to converge and embrace emerging standards for healthcare data interoperability, such as HL7 FHIR and the Argonaut Project.”

Impact Advisors (IA) views the move—which some observers interpret as a shot across the bow to enterprise EHR vendors**—as a sign that lack of interoperability is a very real obstacle to innovation in healthcare.

“More than anything,” says IA in a statement, “we see this joint statement as the latest reminder that ongoing issues with EHR interoperability continue to hold back innovation and disruption. Tech giants are aggressively trying to gain more traction in healthcare, but the reality is there is only so much that can be done without secure and reliable access to the valuable data in enterprise EHRs. The issue of EHR interoperability is a complicated one, though, so we don’t think the relative lack of progress is the ‘fault’ of any one group of stakeholders. Adoption of frameworks like FHIR is certainly part of the solution, but there are also other technical issues to overcome, as well as very real workflow challenges and competitive considerations to address. Bottom line, we believe that success will require significant work and collaboration between EHR vendors and providers—with input from major technology companies, niche healthcare IT vendors, standards organizations and even federal agencies being important too.”


** [https://www.modernhealthcare.com/article/20180827/TRANSFORMATION02/180829916/google-amazon-microsoft-and-others-have-a-long-road-ahead-in](https://www.modernhealthcare.com/article/20180827/TRANSFORMATION02/180829916/google-amazon-microsoft-and-others-have-a-long-road-ahead-in)
AdventHealth, Altamonte Springs, FL
Adventist Health, Roseville, CA
Advocate Aurora Health, Oak Brook, IL
AMITA Health, Arlington Heights, IL
Ascension, St. Louis, MO
AtlanticCare, Egg Harbor Township, NJ
Atrium Health, Charlotte, NC
Avera Health, Sioux Falls, SD
Banner Health, Phoenix, AZ
Baptist Health, Louisville, KY
BayCare Health System, Clearwater, FL
Baystate Health, Springfield, MA
Beaumont Health, Southfield, MI
Billings Clinic, Billings, MT
Bon Secours Mercy Health, Cincinnati, OH
Cedars-Sinai Health System, Los Angeles, CA
Centura Health, Englewood, CO
Children’s Hospitals and Clinics of Minnesota, Minneapolis, MN
CHRISTUS Health, Irving, TX
Cincinnati Children’s Hospital Medical Center, Cincinnati, OH
CommonSpirit Health, Englewood, CO
Emory Healthcare, Atlanta, GA
Henry Ford Health System, Detroit, MI
HonorHealth, Scottsdale, AZ
Houston Methodist, Houston, TX
IU Health, Indianapolis, IN
INTEGRIS Health, Oklahoma City, OK
Intermountain Healthcare, Salt Lake City, UT
John Muir Health, Walnut Creek, CA
Loma Linda University Health, Loma Linda, CA
Memorial Health System, Springfield, IL
Memorial Hermann Health System, Houston, TX
Memorial Sloan Kettering Cancer Center, New York, NY
Methodist Le Bonheur Healthcare, Memphis, TN
Michigan Medicine, Ann Arbor, MI
Mosaic Life Care, St. Joseph, MO
Munson Healthcare, Traverse City, MI
Northern Light Health, Brewer, ME
Northwestern Medicine, Chicago, IL
OSF HealthCare System, Peoria, IL
Partners HealthCare System, Inc., Boston, MA
Providence St. Joseph, Renton, WA
Rush University Medical Center, Chicago, IL
Scripps Health, San Diego, CA
Sentara Healthcare, Norfolk, VA
Sharp HealthCare, San Diego, CA
Spectrum Health, Grand Rapids, MI
Stanford Health Care, Palo Alto, CA
Tampa General Hospital, Tampa, FL
Texas Health Resources, Arlington, TX
Trinity Health, Livonia, MI
UCLA Health, Los Angeles, CA
UK HealthCare, Lexington, KY
University Hospitals, Cleveland, OH
University of Chicago Medicine, Chicago, IL
University of Virginia Health System, Charlottesville, VA
UW Health, Madison, WI
Virginia Mason Health System, Seattle, WA