The Oregon Health Authority and Health IT: Health Information Exchange Overview

Health information exchange (HIE) means sharing health information electronically. It can also refer to organizations that share health information electronically, like a regional HIE. This document is a primer on major HIE concepts and selected major national, regional, state, and local HIE efforts. It was created for Oregon's Health IT Oversight Council (HITOC) to support its 2020 strategic planning work, as a companion document to the *2019 Health IT Report to Oregon's Health IT Oversight Council*. This document will be updated regularly.

Electronic health information exchange (HIE) began largely to get electronic versions of test results and other health-related data into clinic information management systems. At that time, health IT vendors used diverse and proprietary technical standards, and health IT systems were disparate and disconnected. HIE offered a way to get more complete information about the care the provider ordered for its patients. For example, HIE helped providers electronically receive the results from lab tests or radiology studies their own clinicians ordered.

About 15 years ago, HIE began to transform into a more mature tool for care coordination. Providers began to seek not only health information about the care they ordered, but care their patients received from other providers that the original provider otherwise would not have known about. That led to the emergence of four primary roles for HIE:

1. **Interconnectivity.** HIE tools continue to be a key means for connecting systems. HIE tools help organizations avoid custom, point-to-point connections, where each provider must create a separate connection to every other system, service, and provider they want to communicate with. While HIE is still used for delivery of orders and results (e.g., connecting a lab system to an EHR), HIE tools also enable connecting to high-value data, public health reporting, connections to health registries, and more.

2. **Clinical Document Exchange.** National efforts and federal regulations have established a minimum set of data elements (currently the "Continuity of Care Document" or CCD but will be expanded to the US Core Data for Interoperability, or USCDI, the under proposed federal regulations) that providers should exchange to coordinate care. The emergence of nationwide

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information networks was largely prompted by providers' desires to retrieve this minimum data set for their patients from other providers across the community, the state, or the country.

3. **Creating a Community Health Record.** Regional HIEs can consolidate a patient's health information into a community health record, which is a more complete picture of the care a patient is receiving, unlike the view within a given clinic's EHR, which is largely limited to the care provided by that clinic or hospital. Consolidating patient information also creates new opportunities for analytics, population management, and value-based payment arrangements.

4. **Encounter Notifications.** HIE can be used to alert primary care providers, health plan care coordinators, and other members of the care team about emergency department visits, hospital admissions, encounters resulting from patient self-referrals, etc. These notifications help make providers more aware of the health problems, emergency needs, and poorly managed chronic conditions of their patients and can help providers ensure follow up after hospital or emergency care. Encounter notifications also allow providers to be more accountable for all the care their patients receive.

> HIE is a foundational component of many of HITOC's strategies. See *2019 Health IT Report to Oregon's Health IT Oversight Council, HIE Data Report Executive Summary* for an overview of the role of HIE in health system transformation. **HITOC listed five Priority Use Cases for HIE in Oregon's 2017-2019 Strategic Plan For HIT/HIE: care summary exchange, closed-loop referrals, complex care coordination, alert notifications, and data for value-based payment models**. In this brief, HIE efforts that support HITOC's Priority Use Cases are

Query-Based Clinical Document Exchange[1]

Overview of query-based clinical document exchange

There are currently three main nationwide networks and several vendor-based networks that concentrate on **exchanging clinical documents**. The main clinical document these networks exchange is a Continuity of Care Document (CCD). These networks do not offer a community health record or provide encounter notifications.

Clinical documents are snapshots of summary data about a patient at a point in time, or associated with a particular care encounter, such as a hospital admission or referral. Clinical documents are valuable because they:

- have persistence (they continue to exist intact even after exchanged),
- are stewarded (maintained by an organization entrusted with their care, such as a hospital),
- can be authenticated (may be legally signed by a provider to establish authenticity),
- have context (they establish a consistent context for content, such as a hospitalization),
- have wholeness (authentication and context apply to all contents as a whole), and
- are human readable (include readable content, along with optional computable content).

The most commonly exchanged document, the CCD, includes:

- demographic data about the patient,

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[1] Query-based clinical document exchange, as available through the nationwide query-based networks and vendor-driven query-based networks covered in this section, supports HITOC Priority Use Case #1: Care Summary Exchange.

- a list of current medications,
- a list of medication allergies,
- a list of immunizations, and
- a list of problems and chronic conditions.
- May include limited family or social history, a list of procedures, and recent vital signs or lab results.

Query-based networks have a common workflow: they depend upon a provider initiating the exchange by requesting data on a specific patient (the "query" in "query-based"). The provider searches the network for a matching patient using patient demographics, such as name, gender, and date of birth. If a match is found, there may be a CCD or other clinical document associated with that patient. In that case, the provider can retrieve, view, and (optionally) save the clinical document in the provider's EHR or HIE portal.

Nationwide query-based networks

eHealth Exchange, the CommonWell Health Alliance, and Carequality are the three main nationwide query-based networks in use today. They exchange clinical documents, most commonly CCD documents.

eHealth Exchange was the first of the nationwide networks, emerging as a result of the federal government's Nationwide Health Information Network initiative that began in 2004. Primary participants are federal agencies, large health systems, hospitals, and regional HIEs, largely due to its relatively high cost. eHealth Exchange is a **peer-to-peer network**, which means that:

- The network has no centralized index of patients or documents (and therefore, houses no protected health information (PHI))
- A querying participant must know where the patient has been seen, or query all participants
- Most participants regularly query all other participants in some limited geographic area.

CommonWell formed in 2013 as a non-profit collaboration of EHR vendors. Only EHR vendors who help fund CommonWell may participate. An individual provider cannot join Commonwell directly. Like eHealth Exchange, providers search for patients using demographics and retrieve documents on matched patients.

Unlike eHealth Exchange, CommonWell maintains a **Master Patient Index** that participants can search for matches, and **Record Locator Service** (an index of documents that may be retrieved when matches are found). This means CommonWell does store PHI. The documents themselves are held in the other participants' EHRs and must be retrieved from those EHRs. The patient index makes it easy for a provider to search for documents available from all network participants, and still allows them to retrieve only the clinical data of interest (e.g., a summary from a specific hospital admission).

Carequality formed in 2014 as another non-profit collaboration of EHR vendors. It describes itself as a network of networks, linking the networks of its participants. Participants are primarily EHR vendors, with some personal heath record vendors and community HIEs. An individual provider cannot join Carequality directly—access depends on the provider's EHR vendor or community HIE participation.

 Carequality is a **peer-to-peer network** like eHealth Exchange.

Advantages of nationwide query-based networks

The greatest advantage of these networks is their nationwide scope and high adoption rates. As many as 70% of US hospitals participate in one or more nationwide, query-based document exchange network, enabling those participants to retrieve critical information from across the country. For Carequality and CommonWell, a provider must take additional action to participate or "switch it on" even after their EHR vendor has joined (implemented) the network; for eHealth Exchange, each individual provider must actively join the network.

Clinical documents provide a convenient collection of health information for exchange. The properties of context and wholeness make them easy to maintain as "foreign" or "external" clinical information within an EHR, and "stewardship" and "authentication" allow them to be trusted.

Limitations of nationwide query-based networks

Providers must join and search all three networks to get the best chance of getting the information they seek, although this may be changing. Nearly every major EHR for hospitals and ambulatory settings participates in CommonWell or Carequality, but few participate in both. The two EHRs with the largest market share, Epic and Cerner, belong exclusively to different networks, and no EHR vendor may participate in eHealth Exchange. Because each network is governed by a different data use agreement, health systems and HIEs must conform to the requirements of each one.

In 2017, CommonWell announced that it would join Carequality, effectively linking vendors that participate in the two initiatives in an attempt to mitigate this issue. It is not clear how much data flows across the network boundaries today. eHealth Exchange is also considering joining Carequality.

Users are concerned about the potentially low patient matching rate—significant data might not be located due to the need for unambiguous patient matches based on limited patient information.

The workflow of a query-based network does not meet all clinical needs. Today, eHealth Exchange has the technical means for encounter notification, but it is not commonly implemented. CommonWell and Carequality have no mechanism for encounter notification, although Carequality is exploring creating one.

As peer-to-peer networks, eHealth Exchange and Carequality may not scale to very large volumes of data. For example, if a hospital wishes to retrieve care summaries for all of its daily admissions and queries all eHealth Exchange and Carequality participants, it is potentially placing thousands of queries for every patient, most of which result in no returned data.

CommonWell addresses this limitation using a Master Patient/Person Index (MPI) and a Record Locator Service, which allow a provider's system to search CommonWell in total – rather than each one of its participants individually – for a matching patient and determine which CommonWell participant has health records for that patient.

Finally, the advantage of the clinical document is also a limitation. **Clinical documents may not always meet the "minimum necessary" test for providers.** It is not possible, for example, to only retrieve a medication list, or only immunizations, without retrieving all the other clinical data from the same context.

Vendor-driven query-based networks

Health IT vendors, especially EHR vendors, have created proprietary networks that allow their customers to exchange clinical documents with fellow customers who elect to participate. Vendor-driven networks are usually closed and available only to customers of that vendor. However, they can be useful exchange mechanisms in markets dominated by a single vendor or for health systems that need an easy way to exchange information across facilities.

> *Epic's Care Everywhere* is the largest and most well known vendor-driven, query-based network, connecting potentially all Epic customers nationwide. Many Epic users use Care Everywhere to query for documents from other Epic users within their service area for each encounter or admission. Care Everywhere uses technologies very similar to those used by Carequality.

Other Selected National HIE Efforts[2]

There are several other national efforts that either have a footprint in Oregon or are expected to affect Oregon in the future.

> *Direct Secure Messaging* (also Direct Project, Direct Messaging, or DSM) is a standard created by the Office of the National Coordinator for HIT (ONC) to send information securely to someone the provider knows. The technology is based on the same technology as email and uses "private key infrastructure" to establish trust and encrypt health information. To the user, Direct messaging is nearly indistinguishable from email, except that users can only send messages to other Direct messaging users, and then only if that user has a Direct address with a trusted vendor. Direct messages can include attachments such as CCDs, test results, even larger files such as x-rays and echocardiograms.
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> Direct messaging is done through EHRs or through companies called Health Information Service Providers (HISPs) that specialize in Direct messaging. ONC requires that Certified EHRs support Direct. Meaningful Use requires providers to use Direct for exchanging documents during transitions of care.
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> *DirectTrust* was formed by member HISPs to create policy and procedure requirements to be a trusted HISP and manage the exchange of digital certificates needed to enable exchange among HISPs.

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[2] Direct Secure messaging can help support HITOC Priority Use Case #1: Care Summary Exchange and #2: Closed-Loop Referrals, although it is not a complete solution to #2. Patient-Centered Data Home supports HITOC Priority Use Case #4: Alert Notifications. The planned Trusted Exchange Framework and Common Agreement functionality is not yet determined, but it will almost certainly support HITOC Priority Use Case #1: Care Summary Exchange, and possibly HITOC Priority Use Case #4: Alert Notifications.

Patient Centered Data Home (PCDH) was created by the Strategic HIE Collaborative (SHIEC) to address some of the limitations of query-based networks. PCDH provides encounter notifications for encounters that occur outside of a patient's "home" health system or HIE to their "home" health system or HIE (determined by the patient's home address). A provider can then use other means, such as a query-based network, to retrieve clinical information about the encounter. Because the notification comes with a richer set of patient information, it overcomes patient matching problems inherent in query-based networks. To date, 45 HIEs across the US are participating in PCDH.

The 21st Century Cures Act directed the federal Office of the National Coordinator for Health IT (ONC) to develop or support a Trusted Exchange Framework for trust policies and practices and a common agreement for exchange between health information networks. ONC responded by releasing the *Trusted Exchange Framework and Common Agreement* (TEFCA) in draft form in early 2018 and a second draft in mid-2019.

TEFCA seeks to establish a means for linking networks (such as nationwide query-based networks, vendor-driven query-based networks, or community HIEs) to exchange data nationwide under a single data use agreement, the Common Agreement. Participation in TEFCA will be voluntary. Its primary use case is query-based clinical document exchange. Unlike the nationwide networks, it also seeks to provide a means for sending unsolicited data, like encounter notification, and a means of consumer access.

Regional or Community-Based HIE ("Regional HIE")[3]

Regional HIE Overview

Regional HIE began more than twenty years ago to share information locally on a community level—where most of the care was, and still is, delivered. HIE still flourishes in regional and community efforts, with some important benefits not provided by nationwide networks.

Regional HIE was created to connect systems and distribute health information locally, in the absence of well adopted technical standards and ambiguous interpretation of the standards that existed. As such, it was the "glue" between disparate systems created by different vendors. Today, regional HIE still fills that critical role. It has also expanded beyond simple connectivity to become a hub for patient-centered health information.

For information about *regional HIE efforts* in Oregon, see *the 2019 Health IT Report to Oregon's Health IT Oversight Council*.

Regional HIE Advantages

Regional HIEs can normally **match greater than 90% of received data with a patient.** Regional HIE uses demographic information for a patient to establish a unique profile for each patient, stored in a Master Patient Index (MPI), that uses algorithms to match health information to that identity and manage data inconsistencies.

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[3] Regional HIE has the potential to support all HITOC Priority Use Cases. In Oregon today, the primary HITOC Priority Use Cases supported are #1: Care Summary Exchange, #2: Closed-Loop Referrals (not available in all areas), and #5: Data for Value-Based Payment Models.

Regional HIEs typically **create a consolidated collection of health information showing all the care an individual received in the community ("community health record").** Like the record in an EHR, the community health record is organized around the patient, rather than encounters or episodes of care. Unlike the EHR, the community health record includes data from all the providers who participate in the regional HIE.

Some regional HIEs collect health information in a single repository, sometimes called a Clinical Data Repository or CDR. This **centralized model responds more quickly to requests** (data does not need to be retrieved and consolidated in real time) and **is robust to network outages** (information from all providers is available even if some provider systems are unreachable). **From the CDR, an HIE can create a data warehouse** that can be used for analytics, potentially supporting value-based payment models and population management.

Other regional HIEs use a federated model. Rather than pulling patient data in, these models leave the data where it is, and store its location in a Record Locator Service (RLS). When a provider requests the community health record for an individual, the HIE accesses the RLS, retrieves the information in real time, and presents it as if it were a single record. This model allows each holder of patient data to maintain control over that data. However, it is slower and more vulnerable to network outages. It also leaves analytics activities to each individual provider, hospital, or health system, or it requires other means of HIE for analytics.

Regional HIE Limitations

While regional HIE often carries a greater volume of more detailed health information that nationwide networks, **its scope is regional**. The MPI will only manage identities for regional patients, and the community health record will only include information for encounters within the region and among HIE participants. **Regional HIEs sometimes address this by participating in one or more nationwide query-based networks and 45 have joined the national Patient-Centered Data Home**.

Regional HIEs and their community health records only include data that is shared with them by labs, clinics, ancillary services, hospitals, etc. Regional HIEs thus rely on robust participation by a large proportion of providers and hospitals in their communities. The value proposition for providers and hospitals to participate in a regional HIE varies, and there have been few requirements or regulatory levers to encourage providers to participate, although this is changing (see Current HIE Levers section of this document). Given the high cost of creating and maintaining interfaces, providers that choose to participate tend to share only what was required for Meaningful Use (e.g., care summary documents) or of highest value to them and most easily accessible through their EHR vendor. Further, ensuring the quality of data submitted to the HIE can be arduous: variations across EHRs and workflows, as well as frequent updates that change standard data feeds, can impact quality. **Regional HIEs continue to struggle with gaps in data and poor data quality, and those issues must be addressed by their participants.**

It seems clear that providers can take better care of their patients when they have access to more complete health information, but the return on investment for HIE has been difficult to quantify. Many providers believe that nationwide and vendor-driven query-based networks, which may be provided by their EHR vendors at no extra cost, can provide everything they need. HIE organizations are typically small, non-profit companies. As a result, **regional HIE in some areas continues to struggle with sustainability and to successfully market the higher-value services**, such as alerts and analytics, they are especially well-equipped to provide.

Other HIE Efforts

Hospital Event Notifications[4]

HIE can be used to alert health plans, Oregon's Medicaid coordinated care organizations (CCOs) and providers in the community about their patients' emergency department (ED) visits and hospital admissions. These notifications help providers have better awareness of the health problems, emergency needs, and poorly managed chronic conditions of their patients. It can also notify ED providers about their patients' previous ED care, their other providers in the community, the care guidelines created by their care team, and more.

Access to High Value Data[5]

HIE can help providers access high-value data like public health information. This includes public health registries, special public health systems like Prescription Drug Monitoring Program (PDMP) or Physician Orders for Life Sustaining Treatment (POLST) information.

Social Determinants of Health and Community Information Exchange

HIE can help to connect health care providers and social services providers to better support social determinants of health. In Oregon, there are a variety of emerging efforts to create or enhance these connections.

> For information about *EDie/PreManage (aka Collective Platform)*, a hospital event notification effort in Oregon, and the *Prescription Drug Monitoring Program Integration initiative*, a high-value data access effort in Oregon, see *2019 Health IT Report to Oregon's Health IT Oversight Council*. See http://www.orhealthleadershipcouncil.org/currently-in-development/ for more information about some of Oregon's key efforts around social determinants of health and HIE.

Current HIE Levers

In 2009, the **HITECH Act** brought more effective policy levers to expand the use of HIE. It provided direct funding for HIE through ONC's State HIE Cooperative Agreement Program and used incentives to encourage sharing of health information, in many cases providing federal funding at 90/10 (federal/state match) rates or even fully funding programs. **The HITECH Act will sunset in 2021.** In 2015, Congress passed the Medicaid Access and CHIP Reauthorization Act (MACRA), which consolidates several Medicare payment and quality programs.

The 21st Century Cures Act (**Cures Act**) builds on the HITECH Act to penalize organizations that fail to share information effectively.

HITECH Act: Meaningful Use

The HITECH Act led the Center for Medicare & Medicaid Services (CMS) to create the Medicare and Medicaid EHR Incentive Program[6] and one of its core requirements, Meaningful Use. Among other things, Meaningful Use requires providers to send a care summary document to a patient's primary care provider upon hospital

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[4] Hospital Event Notifications supports HITOC Priority Use Case #4: Alerting.
[5] Access to high-value data is not listed in HITOC's Priority Use Cases, but is separately called out as a HITOC priority.
[6] Now Promoting Interoperability.

discharge or clinical encounter ("transitions of care") to receive incentives. Most EHRs provided this capability through Direct secure messaging (see Other National HIE Efforts section above).

Although Meaningful Use did not provide a means to easily identify providers who should receive care summaries, and it is unclear how often providers viewed them, it did prompt providers to begin coordinating care with electronic health information sharing. Meaningful Use also required that EHRs create an electronic means for patients to view, download, and transmit their health information (patient portals and application programming interfaces (APIs)).

The EHR Incentive Programs and Meaningful Use have driven EHRs to be more interoperable but have done little to directly promote the use of community HIE or even nationwide or vendor-driven query-based networks. However, the increasing capability of EHRs to share information has allowed regional HIEs to concentrate more effectively upon higher-value services, such as the community health record, alerts, and population health analytics.

Federal EHR incentives are available to hospitals and physical health providers, with a few exceptions. To be eligible for Oregon's Medicaid EHR Incentive Program, a clinician must be a physician, nurse practitioner, dentist, physician assistant practicing in a certain type of setting, naturopath, or a pediatric optometrist. See http://medicaidehrincentives.oregon.gov and the *2019 Health IT Report to Oregon's Health IT Oversight Council* to learn about EHREHR Incentive Program participation in Oregon. The Medicaid EHR Incentive Programs (MEHRIP) sunset in 2021; the last year a provider could begin the multi-year program was 2016.

MACRA: Medicare Quality Performance Program and Merit-based Incentive Payment System (MIPS)

The Medicare EHR Incentive Program transitioned in the 2017 program year to the Merit-based Incentive Program (MIPS), created by the MACRA legislation. MIPS incentivizes adoption and meaningful use of the latest certified EHR technology and has a broad reach across

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Emerging Technical Standard: FHIR

The most prevalent technical standard today is HL7 v2 (version 2) messaging, developed by the HL7 (Health Level Seven), the dominant health IT standards development organization. It is heavily entrenched in EHR certification and federal incentive programs. It transports prescriptions, lab results, radiology reports, public health reports, and other clinical data. HL7 v2 messaging is efficient for sending information from one system to another, but poorly suited for requesting information from a system or over the Internet.

HL7 developed the Clinical Document Architecture (CDA) to exchange clinical data, including the CCD document. CDA documents will likely continue to be the dominant format for discharge summaries, encounter notes, consultations, referrals, reports, and clinical summaries.

However, sometimes a provider wants a specific piece of information, like a patient's medication list when prescribing, or the most recent blood work as a baseline for a new lab result. CDA documents can provide that data, but it is buried in a lengthy document.

FHIR (Fast Healthcare Interoperability Resources) is a modern standard created by HL7 to request more granular information from a system. Using FHIR, a provider can request one piece of information, like a medication list or a specific lab result, and receive just that information.

FHIR is based on modern technologies used every day on the internet. It is also easier to develop and maintain FHIR-based APIs. Both ONC and CMS have recently proposed FHIR-based APIs as a requirement when sharing clinical data with consumers. EHR vendors and HIEs are beginning to explore the use of FHIR to exchange information between clinical systems, especially when using mobile technology.

Oregon's physical health providers who serve Medicare patients, including primary care and specialists. Many Medicaid providers serve Medicare patients and are eligible for MIPS.

HITECH Act: HIE Onboarding Funding

This funding can be used by state programs to support the costs of creating the initial connection (onboarding) between a provider and an interoperable system such as a regional HIE. These programs may provide funding to providers eligible for MEHRIP, as well as other Medicaid providers that are important participants in HIE, including behavioral health providers. Onboarding must connect the new Medicaid provider to an MEHRIP-eligible provider and help that provider meet Meaningful Use requirements. See https://www.oregon.gov/oha/HPA/OHIT/Pages/HIE-onboarding.aspx for information on Oregon's HIE Onboarding Program. Funds for these programs sunset in 2021.

Cures Act: Emerging Levers

The Cures Act requires ONC to establish or support a single nationwide network for the exchange of health information. These efforts are still in progress. Current work includes:

- Establishing new minimum requirements for the information that EHRs and other systems must be able to exchange to maintain certification. The US Core Data for Interoperability (USCDI) builds on Meaningful Use requirements, including the use of the CCD for clinical document exchange, to add clinical notes and data provenance to the information made available from EHRs. The USCDI helps standardize and increase the data available to regional HIEs. ONC has stated that the USCDI will be reviewed and updated regularly to continue to raise the bar for data that must be provided electronically by certified EHRs.

- Defined Information Blocking as, "a practice that… is likely to interfere with, prevent, or materially discourage access, exchange, or use of electronic health information." Previously, only software vendors were subject to rules against information blocking. Under proposed regulations, providers, HIE efforts, and networks can be penalized for information blocking. Preventing information blocking will make HIE efforts more effective and may spur participation in HIE.

- Creating a simple means for consumers to access their health information. Although many patients have access to their health information through provider portals, thanks to Meaningful Use requirements, that access has limitations. HIE efforts today seldom provide health information to consumers, largely because HIE organizations have no relationship with patients. The new requirements will make health information more accessible to consumers by setting standards for how EHRs must make information available to consumers and requiring health plans/CCOs to share more information with consumers. TEFCA opens the door to HIE efforts sharing information directly with consumers, but currently there are few levers to encourage such sharing.

Resources

Carequality: https://carequality.org/

CommonWell: https://www.commonwellalliance.org/

eHealth Exchange: https://ehealthexchange.org/

Direct Trust: https://www.directtrust.org/

Patient-Centered Data Home: https://strategichie.com/initiatives/pcdh/

FHIR: https://www.hl7.org/fhir/summary.html

USCDI: https://www.healthit.gov/isa/us-core-data-interoperability-uscdi

Stay Connected

You can find more information about Oregon's HIE efforts at our website, HealthIT.Oregon.gov.

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