ADVANCING INTEROPERABILITY FOR HEALTHCARE

Employer-Led, Standards-Based Collaboration to Support the Triple Aim

Intel's Connected Care program for employees and dependents uses the eHealth Exchange and Direct standards to improve care coordination between onsite health centers and delivery system partners.

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Executive Summary

As a self-insured global innovator and Fortune 100 leader, Intel Corporation views a healthy workforce as a strategic business advantage. To improve the health of employees and dependents, Intel has developed a next-generation healthcare program aligned with the Institute for Healthcare Improvement's (IHI's) Triple Aim.[1] This program, branded as Connected Care, includes a custom integrated delivery system based on a patient-centered medical home (PCMH) approach to care and a value-based, shared-risk payment model—essentially an employer-sponsored and facilitated accountable care organization (ACO) for Intel members.[2]

Bringing Connected Care to Oregon in the program's third year, Intel and its delivery system partners (DSPs) encountered interoperability issues that are endemic to healthcare in the United States. Interoperability—the fluid and secure sharing of electronic health record (EHR) data and other health information among all members of a patient's healthcare team—is essential to achieving the Triple Aim. With data flowing securely and openly among all members of the team, providers and medical systems can ensure all providers and staff have the information they need to deliver outstanding care. This can help:

1. **Increase patient satisfaction** by providing an efficient and seamless experience

2. **Improve outcomes** by enabling more informed decision-making based on a comprehensive view of the patient's medical history, current situation, and potential drug interactions

3. **Reduce costs** by improving providers' efficiency, avoiding redundant or unnecessary tests and procedures, and building a richer foundation for data analytics

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Yet despite attention from EHR vendors and policymakers, frictionless sharing of actionable EHR data has remained limited and cumbersome. The results are detrimental to patients, providers, and payers—and they would have prevented Intel from meeting its Connected Care objectives.

Intel is using industry standards to address these limitations. Collaborating closely and supported by Epic and Greenway Health, Intel and its Oregon healthcare partners—Kaiser Permanente Northwest, Providence Health & Services in Oregon, Premise Health, and The Portland Clinic (TPC)—needed just eight months to implement coordinated workflows with push and pull connectivity across Greenway PrimeSUITE* and three separate instances of the Epic EHR.

While issues continue to be addressed, Intel's healthcare partners are using the interoperability improvements to provide Intel employees and their dependents with more coordinated, efficient care and a better patient experience. Integral to accomplishing these goals is the associated work of building more complete and accurate information for data analytics to help manage individual and population health. Intel expects this foundation of interoperability and data exchange to help improve the health of Intel employees, support the shared-risk compensation model, and scale Connected Care to other areas where Intel has a large employee base.

What if Intel set a singular goal of having the healthiest workforce on the planet?

Connected Care shows that employers can be effective drivers in accelerating progress toward national healthcare objectives. Highlighting the program's success, Intel received the prestigious Helen Darling Award for Excellence and Innovation in Value Purchasing from the National Business Group on Health in March 2015.[3]

Intel's approach is consistent with those proposed by the Affordable Care Act, the Office of the National Coordinator for Health Information Technology (ONC) at United States Department of Health and Human Services (HHS), and the Medicare Access and CHIP Reauthorization Act (MACRA). It aligns with the goals set out by HHS Secretary Sylvia M. Burwell to shift the nation's healthcare system from fee-for-service to quality-focused payment models. The Connected Care experience also shows areas where further improvements to standards and certification processes are needed to support the shift to coordinated, value-focused healthcare.

Intel's Ambitious Goal

As the company whose technologies are "inside" most of the world's computers, Intel's DNA drives us to dream big and execute complex processes to turn visions into reality. We collaborate deeply with other organizations, both to manage our global supply chain and to advance technology innovations. We have seen that open standards promote rapid innovation, and have supported standards development in a range of industries.

As an employer, Intel spends approximately USD 680 million annually on healthcare benefits. The company provides health insurance to approximately 50,000 U.S. employees and 80,000 dependents through several national plans.

For well over a decade, Intel has worked to contain healthcare costs. After pursuing greater member engagement, wellness programs, high-deductible consumer plans, and on-site primary care clinics, Intel was ready to think radically. What if, instead of multiple competing initiatives and strategies, Intel set a singular goal of having the healthiest workforce on the planet? A healthy workforce can enhance employee satisfaction and recruitment, reduce absenteeism and turnover, and help reduce costs, particularly if it improves the health of the sickest members.

Driven by this ambitious goal, Intel decided to engage directly with local healthcare delivery systems. In addition to improving outcomes and costs, we wanted to provide a better healthcare experience for our employees. In surveys, focus groups, and ethnographic studies, they had told us they wanted more coordinated, convenient, and efficient care.

Recognizing the importance of interoperability to healthcare, we also wanted to use Intel's influence as an employer to provide a business case for healthcare interoperability and a design for success.

Moving Toward the Goal: The Connected Care Program

Intel launched the Connected Care program in January 2013 for employees and dependents at its Rio Rancho, New Mexico site. Working with a single delivery system partner, Presbyterian Healthcare Services, we avoided interoperability issues and concentrated on the care model. Intel and Presbyterian established a custom, integrated delivery system model that:

• Gives Intel employees more personalized, evidence-based, coordinated, and efficient care based on a patient-centered medical home model. The care delivery system focuses attention on members with the actionable chronic conditions of asthma, depression, diabetes, hypertension, lipid disorders, osteoarthritis, and spinal/back conditions.

• Implements a value-based, shared-risk payment model with an emphasis on shared decision-making between patients and providers.

Connected Care had a successful first year, with extensive system redesign and measurement targeting four objectives:

• **Right care:** Use of evidence-based medicine to improve population health

• **Right time:** Timely access to care

• **Best outcome:** Patient satisfaction 100 percent of the time

• **Right price:** Material decrease in the cost of care

Goals were achieved in three of four key areas. Members showed greater engagement with the healthcare system and were highly satisfied with their care. Their access to services improved. Along with other indicators of evidence-based care, diabetic members showed statistically significant improvements in a bundled measure of diabetes control. Highlighting the challenges of achieving all three aspects of the Triple Aim, Connected Care's Year 1 cost targets were not met, however. Costs are being managed through ongoing analysis and innovation.

"The Connected Care experience in Oregon demonstrates that standards-based, cross-vendor interoperability, while not perfect, is achievable today. It also shows that data exchange can be implemented quickly when appropriate rewards and penalties are in place to promote care coordination. Now the question is how such deployments can be scaled rapidly across the nation, and the answer is clearly to rely on industry standards rather than on one-off, point-to-point integration efforts."

Eric Dishman
Intel Fellow
General Manager,
Health and Life Sciences
Intel Corporation

Delivery System Collaborators

- **Kaiser Permanente Northwest** is a not-for-profit organization providing healthcare (including Medicaid and Medicare) to more than half a million people living in the Portland/Vancouver metropolitan area, as well as the communities of Longview and Kelso, Washington, and Salem, Oregon. Founded in 1945, Kaiser Permanente serves approximately 9.6 million members in eight states and the District of Columbia. ambulatory surgeries.

- **Providence Health & Services** in Oregon is a not-for-profit network of hospitals, health plans, physicians, clinics, home health services, and affiliated health services. Established nearly 160 years ago, Providence in Oregon is part of the greater Providence Health & Services, which comprises the third largest not-for-profit health system in the United States.

- **The Portland Clinic** was established in 1921 and has more than 100 providers at seven locations within the Portland metropolitan area. TPC offers both primary and specialty care, as well as ambulatory surgeries.

Connected Care in New Mexico also showed the importance of the on-site center and the value Intel members place on receiving convenient, high-quality care at their place of work. Presbyterian Healthcare Services took over the management of Intel's on-site Health for Life Center (HFLC) and transitioned it to a dual PCMH and walk-in clinic running the same EHR (Epic*) as other Presbyterian PCMHs. The center achieved Level 3 recognition by the National Committee of Quality Assurance (NCQA), was the designated PCMH for more than 20 percent of the total population, and maintained one of the highest satisfaction levels of all the New Mexico PCMHs.

Scaling to a Second Location: Multiple Organizations and EHR Systems

While continuing with Connected Care in New Mexico, Intel set out to scale the program by bringing it to the Portland, Oregon area. Scaling is a key challenge for any program, and deploying Connected Care in Oregon brought additional challenges. Portland has Intel's largest employee population. It is also a larger metropolitan area with a more diverse healthcare ecosystem. Instead of a single delivery system partner, meeting Intel's Connected Care objectives in the Portland region would require care coordination—and meaningful data exchange—across multiple institutions and health record systems. The Portland region also does not have a regional Health Information Exchange (HIE) organization that could facilitate this data exchange.

Working from the clinical and business requirements, Intel wrote the need for data fluidity into the Connected Care Request for Proposal (RFP). We chose Kaiser Permanente Northwest and Providence Health & Services in Oregon as our delivery system partners. Kaiser Permanente included its affiliated provider The Portland Clinic as a component of its Connected Care medical neighborhood and TPC became an important part of the Connected Care team. These organizations all used separate instances of Epic.

Intel's two on-site HFLCs in Oregon are managed by Premise Health and use a single instance of Greenway Health's PrimeSUITE as their EHR. (Premise Health formed in April 2014 from the merger of Take Care Employer Solutions, which previously managed the HFLCs, and CHS Health Services.)

Intel contracted with Kaiser Permanente and Providence in 2014, offered Connected Care in Oregon during its October 2014 open enrollment, and went live on January 1, 2015. Nearly 17,000 Oregon employees and dependents are currently enrolled—around 36 percent of Intel's Oregon population, exceeding Intel's projections. Both Providence and Kaiser Permanente increased their enrollments of Intel employees and dependents.

Interoperability Drives Innovation for the Triple Aim

Interoperability and fluid data exchange are central to integrating the on-site HFLCs in Oregon with the delivery system partners. Intel wanted members to have an improved experience and receive high-quality, coordinated care regardless of where they entered the Connected Care system. We wanted hand-offs and care coordination to be smoothly handled between DSPs and HFLCs, especially for the chronic, more complex populations. We also wanted providers to have seamless, efficient workflows with the comprehensive, accurate, and up-to-date clinical data they need to deliver optimal care. Meeting these goals would require coordinated processes and fluid communications, as close to real-time as possible, across these organizations.

With the at-risk compensation model providing a strong business case, Intel and its delivery system partners have implemented a foundation of interoperability in Oregon. The DSPs are using the improved interoperability in purposeful innovations to:

• **Enhance the patient experience.** DSPs have established one-touch call centers, concierges, and/or dedicated care coordination teams to ensure convenient access to high-quality care for Intel members. Concierges use their standards-based communications to help give Connected Care members a seamless and more productive encounter with the healthcare system, including smoother care coordination and follow-up when the member receives care at multiple locations. The personal relationships forged by concierges and coordinated care teams not only enhance the patient experience, but also are crucial in improving outcomes for members with complex health needs.

• **Improve quality and outcomes.** Concierges help keep each member's records updated in the EHR systems so providers have accurate and complete information about their patients. Having a more complete medical record, enabled by standards-based interoperability, can save time for providers and enable them to provide a higher quality encounter with their patients. Information shared between DSPs and HFLCs includes care plans with goals and next steps, as well as patient visit summaries, any gaps in care, lab results, problem lists, specialty referrals, medications, allergies, and immunizations.

• **Increase population health and healthcare quality.** Comprehensive patient records provide richer data for analysis. This data can generate actionable insights to drive targeted interventions, advance evidence-based treatment guidelines, and optimize population health. Both Kaiser Permanente and Providence are actively drilling into the clinical data to manage and optimize the health of their Connected Care populations, particularly members with a targeted set of actionable chronic conditions. Other aspects of the program, including member satisfaction and costs, are also being measured and monitored to track the quality and outcomes of services delivered.

"There's a lot of value in direct engagement with a purchaser who brings you the voice of the consumer. It gets us out of our insular world. But it's not sustainable to do it with 50 employers. The way to scale is through greater interoperability of the health record aligned with nationally approved standards of care. If the next phase of meaningful use could strengthen interoperability, that would be of huge value."

Benjamin LeBlanc, MD
Medical Director of Clinical Informatics
Providence Health and Services

Additional innovations such as telehealth deliver value for Intel and its members and are consistent with the DSPs' overall direction. For example:

• Unlike many traditional payment models, Intel supports reimbursement for alternative venues of care that increase convenience for members while making effective use of healthcare resources. DSPs are conducting video-enabled visits as appropriate with Connected Care members. Providence is exploring methods of HIPAA-compliant secure texting to provide high-quality, affordable care that is efficient for members and providers alike.

• Intel encourages members to be informed and engaged in their healthcare. This includes shared decision-making based on awareness of the costs, risks, and projected outcomes of various potential treatments. DSPs are developing information tools to support this level of shared decision-making, including making costs transparent.

Many changes made for the Connected Care population can benefit other populations, and where there is a business and clinical case, DSPs are planning to implement these changes more broadly. For example, Providence, Kaiser Permanente, and TPC are implementing or exploring video visits for broader populations. Kaiser Permanente Northwest is piloting a new web-based interactive solution for low-acuity mental health issues with the Intel population, and plans to spread the tool broadly if the pilot proves successful.

Enabling Coordinated Care

Intel's ideal for interoperability was frictionless workflows and single-chart convenience, achieved through the use of industry standards where feasible. To provide a realistic starting point, we identified four scenarios where data exchange would be necessary for efficient, comprehensive, high-quality care. Table 1 illustrates these scenarios for Intel employees who are Providence Connected Care members.

Column 4 summarizes the methods of data exchange used as Connected Care launched in Oregon. It illustrates our use of industry standards, as well as some of the manual steps that are still part of the workflow. These manual steps offer significant opportunities to further improve care coordination, efficiency, and the member experience—including, as we'll see, through additional advances in the standards themselves.

Drawbacks to Traditional Solutions

Once contracts were signed, Intel brought leaders of its partner organizations together in a series of face-to-face meetings to develop solutions that could support the goals of care coordination between the HFLCs and the delivery system partners. The team specifically rejected several traditional, non-scalable approaches to interoperability:

• **Read-only clinical data** would have provided non-actionable data and one-sided communications. It would not have allowed providers to harness EHR capabilities such as automated checking for drug interactions—or to maximize their EHR investments. It would also have been highly inefficient, requiring massive duplication of workflows. The read-only portal was deemed an onerous burden to use, with multiple clicks for every encounter to navigate virtual private networks (VPNs), go through multiple logins, search for the right patient, and so forth.

• **Point-to-point integration** would have been costly and would not have allowed the team to move as quickly as Intel wanted. The lack of scalability would have slowed Intel's plans to bring Connected Care to other employee sites.

• **Pushing everyone onto a single vendor's EHR** would have sacrificed the flexibility and innovation of open marketplace. It would also limit each organization's freedom to select the EHR that best meets its needs.

Choosing Standards-Based Approaches to Interoperability

Intel has a long history of standards leadership as a way to advance innovation among diverse organizations. This paper's authors have been involved in development of the Health Level-7 (HL7) international standards for data exchange (Prashant Shah) and the Dossia open-source framework for personal health records (Brian DeVore). Intel also has in-house software and hardware experts who could work with the DSPs and consultants to implement standards-based solutions.

Focusing on national and international standards, the Connected Care interoperability team worked to identify those that were readily available or would be available in the near term, and would support the clinical and business requirements for coordinated care. The team recognized the need for both push and pull communications, and selected the Direct messaging standard and the Healtheway eHealth Exchange to deliver these capabilities. The Connected Care data exchange model utilizes the HL7 Consolidated Clinical Documentation Architecture (C-CDA), which is a key part of the data interoperability specifications of Meaningful Use Stage 2.

Table 1. Data Exchange Examples for Intel Employees Who Are Providence Connected Care Members

Type of Exchange	Clinical Scenario	Data Exchange Objectives	Data Exchange in Practice
Pull	A member visits the Health for Life Center (HFLC) for an upper respiratory infection.	• Give Premise Health/HFLC caregiver comprehensive information for optimal care • Provide a smooth experience for member • Enhance provider and staff efficiency	• HFLC caregivers or staff manually pull a Providence Connected Care member's Summary/Continuity of Care Document (CCD) from the Epic* EHR through Epic Care Everywhere* (Epic's interoperability functionality) via the eHealth Exchange standard. They perform clinical data reconciliation into the Greenway PrimeSUITE* EHR.
Pull	A member has a new-patient visit with a Providence primary care provider (PCP) and mentions that he previously received care at the HFLC.	• Give Providence PCP comprehensive information for optimal care • Provide a smooth experience for member • Enhance provider and staff efficiency	• Providence caregivers or staff manually pull a Providence Connected Care patient's CCD from Premise Health's Greenway EHR using the eHealth Exchange. They perform clinical data reconciliation into the Epic EHR.
Push and Pull	A 55-year-old member visits the HFLC for a skin rash. Premise Health provider treats the rash and notes the member's high blood pressure and family history of heart disease.	• Give HFLC and Providence caregivers comprehensive information for optimal care • Coordinate follow-up for chronic conditions • Provide a smooth experience for member • Enhance provider and staff efficiency	• HFLC caregivers/staff pull the member's CCD from Providence's Epic EHR system prior to the visit and perform clinical data reconciliation. • After the visit, Premise Health caregivers/staff manually push secure messages from the Greenway EHR via the federally supported Direct messaging standard for secure message exchange, using Greenway's Health Information Service Provider (HISP), Updox.* • The message is received in the Providence Epic system. The Providence concierge monitors the Epic in-basket for messages and triages them appropriately. • Providence care-team member reviews the message, pulls the member's CCD from Premise's Greenway EHR, attaches the CCD to the member's Epic record, notifies the PCP of the HFLC visit and message, and ensures the member receives appropriate follow-up.
Push	A member has struggled with persistent back pain and has visited the Emergency Department in the past to seek pain relief. Her Providence PCP has recommended physical therapy (PT), but the member has had trouble fitting the appointments into her schedule. Her Providence nurse case manager suggests receiving PT at the HFLC as a more convenient option, and the member agrees to try it.	• Coordinate follow-up for chronic conditions • Provide a smooth experience for member, increasing likelihood of follow-up and of improved outcomes • Enhance provider and staff efficiency	• Providence nurse case manager or staff manually pushes secure messages using the direct messaging standard from the Epic EHR via Providence's HISP, Surescripts, to recommend the member receive physical therapy at the HFLC and coordinate her follow-up care. The message is received in the Greenway EHR, picked up by the HFLC concierge, and routed to Premise Health providers/staff.

"Secure interoperability through the eHealth Exchange gives us as healthcare providers a much larger ability to have right information at right time and place to deliver the best and most efficient care possible. It's powerful from a cost-savings perspective, since we can avoid duplication of tests and avoid taking the workup in a wrong direction. It's especially powerful from a patient safety perspective to know that we're not acting without having all the pertinent information."

Roy Frieband, DO, MS
Executive Medical Director,
Intel Accounts
Premise Health

Healtheway[4] is a non-profit organization with a public mission to advance the implementation of secure, interoperable health information exchange across the United States. Healtheway supports the eHealth Exchange, which started as an ONC program initiative for the Nationwide Health Information Network (NwHIN) and is now the largest health information exchange network in the country. The eHealth Exchange provides a legal and governance framework for secure information exchange with trusted partners. It offers connectivity enabled by a common set of standards and implementation specifications based on international standards, Integrating the Healthcare Enterprise (IHE), and HL7. Figure 1 illustrates the role of the eHealth Exchange in Connected Care workflows.

DirectTrust[5] is a nonprofit trade association that grew out of the earlier Direct Project and the ONC's portfolio of standards for the NwHIN. DirectTrust services provide a standards-based way for healthcare organizations to send authenticated, encrypted e-mail messages and attachments to known, trusted recipients over the Internet. Direct participants exchange secure e-mail through a Health Information Service Provider (HISP) that encrypts and decrypts data, confirms the digital signage, and handles the e-mail exchange. EHR vendors must implement the Direct protocol for Stage 2 Meaningful Use, and more than 200 EHRs are Direct-enabled as of this writing.

Further promoting standards-based rather than proprietary solutions, Intel specified that DSPs use a HISP accredited by Electronic Healthcare Network Accreditation Commission (EHNAC), a nonprofit standards development organization and accrediting body.[6]
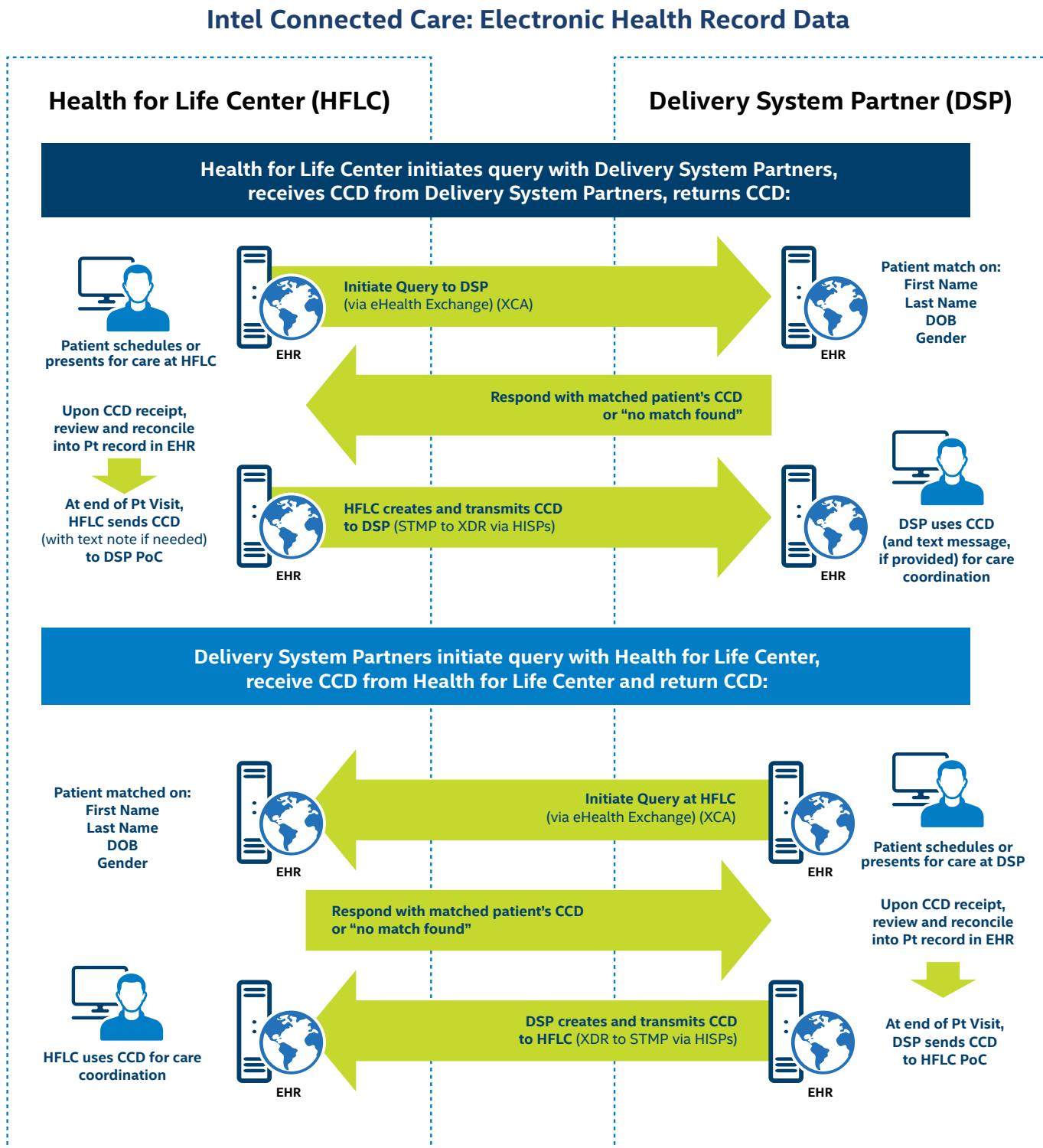
Implementation Issues

Standards provide a foundation for interoperability. With Direct communications, personnel can electronically push clinical data from one EHR system to another, such as when referring the member to a specialist or adding immunization data to a DSPs' EHR. They can use the eHealth Exchange's data-sharing capabilities to support the real-time need to find, retrieve, and use patient data at the point of care, such as retrieving data for an Emergency Department visit.

In practice, however, healthcare suffers from an abundance of technical standards, many of them lacking specificity and varying greatly in their implementation by vendors. Healthcare standards should be clear and specific, leaving minimal room for interpretation and optionality. Instead, they often offer options and choices that improve flexibility but require additional work to resolve differences. Adoption may not be consistent across all stakeholders, leading to operational gaps. In addition, healthcare organizations make their own EHR customizations over time, so cross-system electronic collaboration can require identifying and resolving different "permissions," application program interface (API) settings, internal EHR message routing structures, and other differences in EHR and HISP implementations. Something as simple as the lack of standards-based provider directories can interfere with friction-free communications and information exchange. Beyond technical issues, interoperability often requires changes to procedures, staffing, and cultures.

The upshot is that even with standards such as Direct, HL7, and IHE profiles, each connection between customized EHR systems is a unique experience requiring significant resources to examine and resolve differences, fill gaps, and incorporate the exchanged data into coordinated care workflows.

Figure 1. eHealth Exchange high-level workflow for Connected Care.

Intel Connected Care: Electronic Health Record Data

Health for Life Center (HFLC) — Delivery System Partner (DSP)

Health for Life Center initiates query with Delivery System Partners, receives CCD from Delivery System Partners, returns CCD:

Patient schedules or presents for care at HFLC

Initiate Query to DSP (via eHealth Exchange) (XCA)

Patient match on: First Name, Last Name, DOB, Gender

Respond with matched patient's CCD or "no match found"

Upon CCD receipt, review and reconcile into Pt record in EHR

At end of Pt Visit, HFLC sends CCD (with text note if needed) to DSP PoC

HFLC creates and transmits CCD to DSP (STMP to XDR via HISPs)

DSP uses CCD (and text message, if provided) for care coordination

Delivery System Partners initiate query with Health for Life Center, receive CCD from Health for Life Center and return CCD:

Patient matched on: First Name, Last Name, DOB, Gender

Initiate Query at HFLC (via eHealth Exchange) (XCA)

Patient schedules or presents for care at DSP

Respond with matched patient's CCD or "no match found"

Upon CCD receipt, review and reconcile into Pt record in EHR

At end of Pt Visit, DSP sends CCD to HFLC PoC

DSP creates and transmits CCD to HFLC (XDR to STMP via HISPs)

HFLC uses CCD for care coordination

Implementers must also address a range of usability challenges. For example, Direct messaging is useful only if the clinician or care coordinator can provide contextual information about the message to the recipient. We found that the systems lack the ability to provide this contextual information; this makes the standard difficult to use in a busy clinical environment and requires the constant attention of a concierge-level staff member.

Intel and its partners are resolving these issues through a combination of people, processes, and technologies, all involving close collaboration among clinical and technology leaders and all directed toward meeting the business and clinical objectives. In many cases, DSPs who are technically competitors worked collaboratively to optimize workflows, processes, and even organizational policies. This reduced duplicate development work and helped give Connected Care members an efficient experience while ensuring care providers have the information to deliver optimal care. Greenway Health and Epic also supported the team.

Figure 2 illustrates the Connected Care coordination workflow and the exchange of C-CDA documents to support the workflow, and shows some of the technical issues addressed. As we saw earlier in Table 1, some issues remain, leading to less-than-optimal workflows and in some cases demonstrating the need for further work to advance healthcare standards.

Onboarding to the eHealth Exchange

Part of the reason for choosing the eHealth Exchange was that Providence and Kaiser Permanente were already participating in this nationwide network. However, Premise Health and The Portland Clinic were not.

TPC and Premise Health worked through both operational policies and procedures and technical steps to full eHealth Exchange connectivity within six to eight months. In addition, Greenway Health became the first ambulatory EHR company to certify that its product interoperates using the international standards adopted by the eHealth Exchange network.

The onboarding, like many other aspects of the Connected Care process, was highly collaborative. Intel and Greenway Health supported Premise Health's efforts to join the exchange, with Kaiser Permanente and Providence providing practical guidance. The Portland Clinic joined the effort later, and worked through the steps even more quickly. TPC found Epic's technical support plus insights from consultants and the broader team were invaluable. Healtheway's testing process, which leverages the AEGIS

Developers Integration Lab (DIL),[7] was a valuable resource for all.

Options within the Direct Standard:
HISP Transmission Protocols

Direct provides a choice of e-mail-based transmission standards, and as we've seen, choice within standards generally adds complexity. Specifically, Direct supports communications between HISPs using both XDR/SOAP (which Epic uses through a HISP (Surescripts, in this case)) and SMTP/SMIME (which Greenway Health uses through its HISP, Updox).

Surescripts and Updox are both EHNAC-certified HISPS, providing compatibility between the HISPs themselves. However, a range of lower-level challenges had to be resolved to translate between SMTP/SMIME and XDR/SOAP. Figure 3 (see page 13) shows the process of stepping up and stepping down to move between the two different Direct standards. While the HISPS were able to work together to bridge the two standards despite significant optionality within the standards themselves, functionality such as the ability to transmit free text (such as customized subject lines, ad-hoc messages, or metadata) suffered as a result. Updox supported Greenway Health in this work.[8]
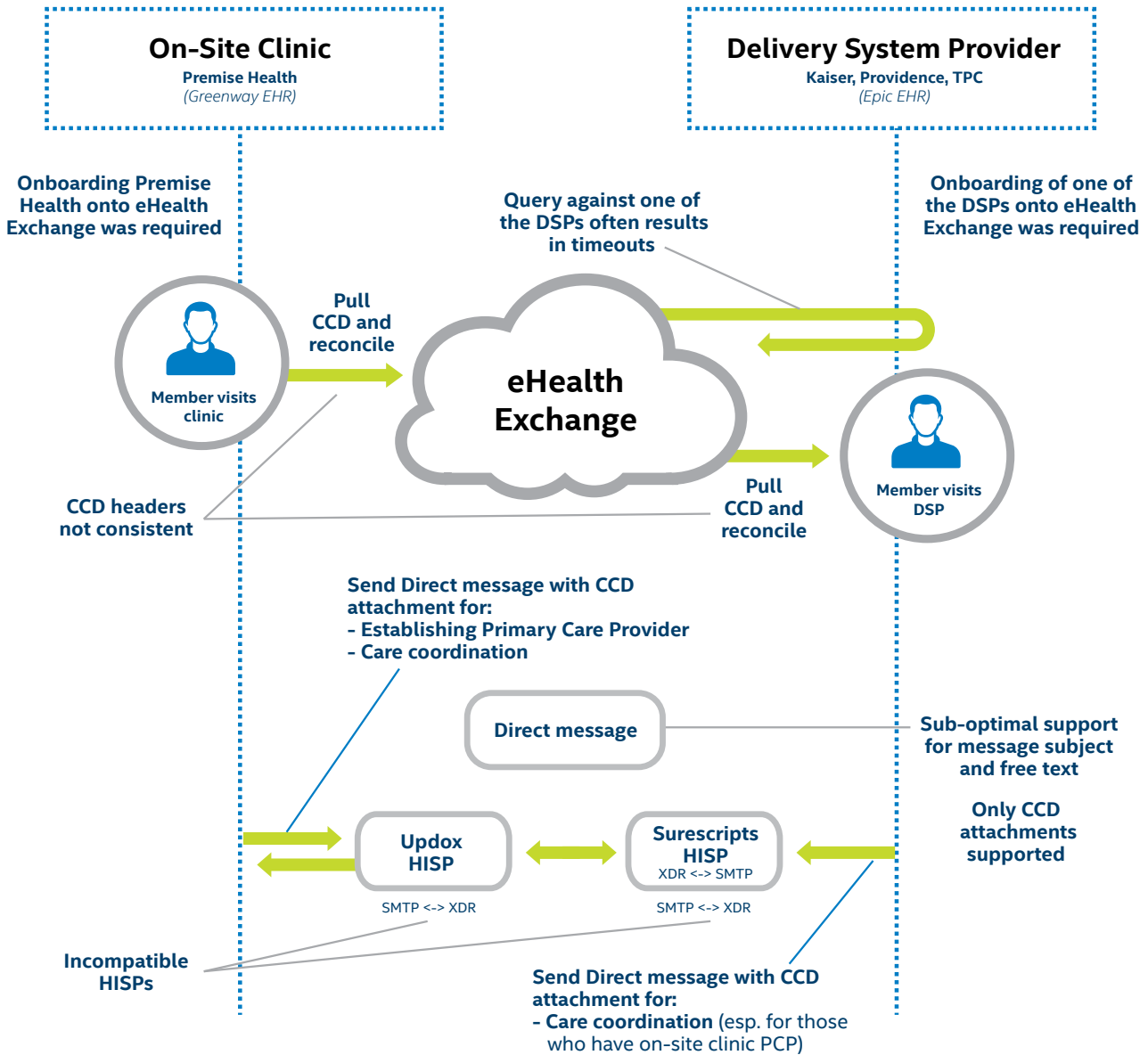
Practical Data Exchange

When standards offer wide latitude for implementers, even standards-compliant solutions can have incompatibilities. The Connected Care team saw this in the sharing of standards-compliant Summary/Continuity of Care Documents (CCDs) using the HL7 Consolidated Clinical Documentation Architecture (C-CDA Release 2). One EHR solution provider followed best practices that called for each C-CDA to have an XML header, and rejected C-CDAs that lacked the header. The other solution provider did not include the header. This issue was resolved through collaboration with the EHR companies.

We also worked through interoperability issues caused by the lack of clearly defined operating rules in areas ranging from vendors' implementation of standards to DSPs' system settings. For example, at the transport protocol level, one EHR might allow 60 seconds to respond to an eHealth Exchange query request; another might be set to time-out if it doesn't receive a response within 30 seconds. These and similar mismatches can be more or less difficult to address depending on whether they require modifications to system configurations or EHRs. Tighter specifications for conformance to operating rules for those using the transport controls can help avoid such conflicts.

A more substantive issue relates to the clinician's need for meaningful context when sending and receiving CCDs and other clinical documents. This can be provided through free text that can be communicated along with the structured documents. Epic and Greenway Health differed in their ability to send and receive free text, in part due to limitations created while bridging between the SMTP/SMIME and XDR/SOAP Direct standards. The issues were compounded by HISP limitations on the exchange of free text, including the inability to send or receive secure messages without attachments. These issues limited or precluded the ability to include a patient's name in the subject line or to add text in the body of a message.

Figure 2. Data Exchange Showing Some Technical Issues Encountered.

"Projects like Connected Care show what's possible. They make it clear that as an industry, we have to dream big and not just meet regulations. We have to develop open, secure information flow, standards for care coordination, and automated processes to support patient care. We're working with our own physicians to determine best practices based on what's most beneficial for patients, but we would all benefit from shared standards and clarified responsibilities. We should imagine healthcare without limitations and then create solutions across differing organizations and EHRs."

Shannon Tunnell
Epic Senior Analyst –
Project Coordinator
The Portland Clinic

People and Processes

Issues with context are being resolved in ways that demonstrate the importance of people and processes in delivering interoperability. To support Intel's goals for coordinated care and a positive member experience, DSPs and HFLCs established concierges or dedicated staff to coordinate care seamlessly for the Intel Connected Care members. These are dedicated staff from the DSPs and HFLC with newly created roles and responsibilities to support the HFLC integration and perform other tasks related to coordinated care delivery for Connected Care patients.

Context-sharing issues continue to be addressed through technology fixes. In the meantime, concierges have stepped in to provide this context via phone, fax, and secure e-mail. In some cases, care coordinators have developed and standardized their own shorthand language or codes to include some contextual information in addition to the structured clinical data. This is especially valuable for high-risk patients with complex care needs who require follow-up care from the DSP quickly. However, the workarounds are not scalable. For nationwide exchange, standards for Direct exchange that allow e-mail context are needed.
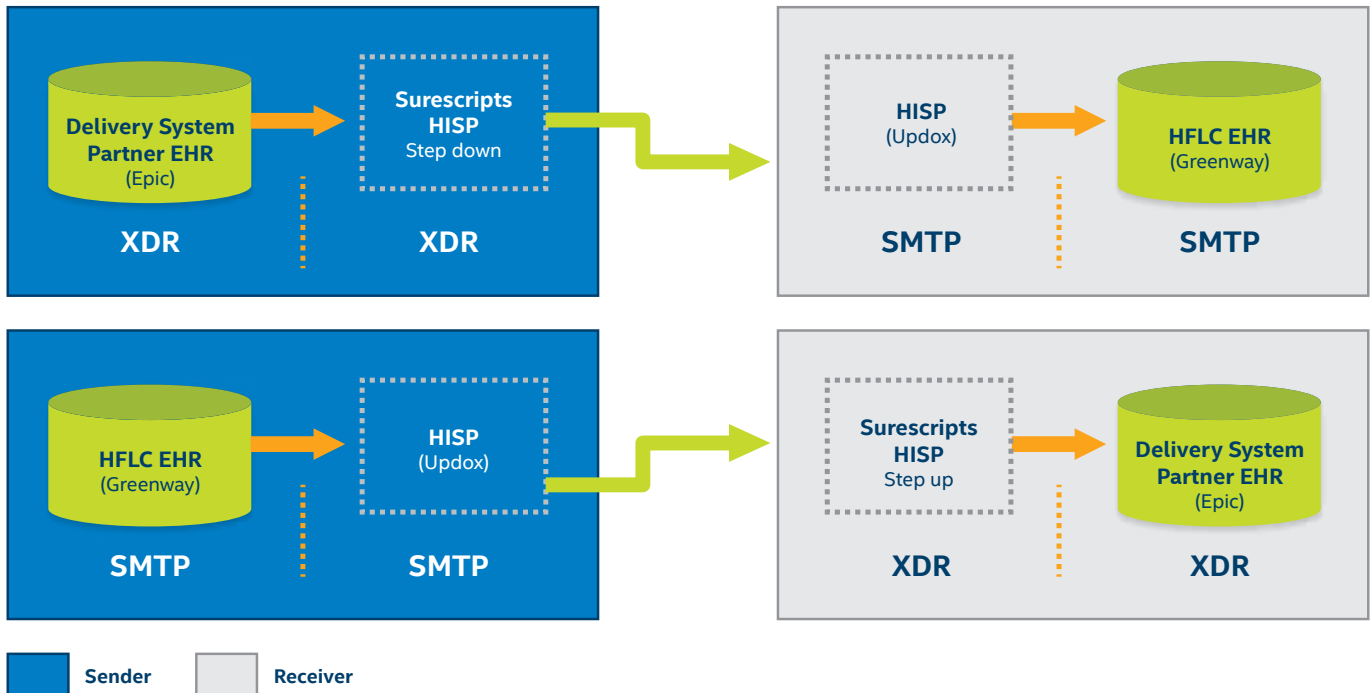
More broadly, Intel's Connected Care partners are working individually and collaboratively to advance their best practices for care coordination. How much clinical information needs to be exchanged? When is it needed? What are the best ways to close the feedback loop? These people and process issues increasingly come into play as the technology foundation for interoperability gets established.

Early Validation

In the first quarter of operation, Kaiser Permanente and Providence Connected Care members represented 65 percent of the total patient visits at the Oregon Health for Life Centers, confirming the importance of interoperability between the Health for Life Centers and delivery system partners. While some reporting functionality is still being developed, early results show that significant bi-directional data change is occurring. In the first quarter:

- HFLC concierges pushed CCDs via Direct message to Providence, Kaiser Permanente, and TPC dedicated teams after every member encounter, averaging 4.9 times daily.

- HFLC concierges pulled or queried for CCDs before each scheduled encounter or when additional information was needed for care coordination. This occurred an average of 15.7 times per day. Queries returned data an average of 73 percent of the time.

- Kaiser Permanente queried the HFLCs for 413 patients during the quarter. The CCD was returned in 302 cases, with roughly half the failures caused by time-out errors due to a mismatch between system settings that is being addressed. Kaiser and Providence also pushed CCDs to the HFLCs as needed.

Figure 3. Step Up and Step Down to Bridge Transmission Standards.

| ■ | Sender | □ | Receiver |

Next Steps

Intel, the DSPs, and the HFLCs continue to track technology adoption, focusing on using technology and increased data movement to improve the quality of care, deliver an outstanding patient experience, improve efficiency, and meet other Connected Care objectives. Teams are seeking to improve workflow processes related to Direct communications, with the goal of more straightforward bi-directional sharing of contextual data and attachments, and eventually a much more automated solution.

The percentage of queries facilitated by an automated workflow that return data is expected to improve significantly. We anticipate seeing this rise to hundreds of successful queries daily as HFLCs begin using demographic information from Providence and Kaiser Permanente Connected Care such as eligibility files and utilization reports to optimize patient matching. Teams are also tracking ongoing improvements in functionality for Direct communications.

Longer term, Intel is driving toward greater automation of reconciled data, with data flowing directly into the patient's EHR and triggering the appropriate notifications and next steps subject to clinical and operational best practices. We continue to track the advance of standards, such as the emergence of the HL7 Fast Healthcare Interoperability Resources (FHIR[9]) and the continued expansion of capabilities by Direct and the eHealth Exchange. We will continue our commitment to standards-based rather than proprietary solutions where feasible.

Intel is also moving to bring the Connected Care model to Arizona, California, and other areas where Intel has a large employee base. The use of industry standards such as Direct messaging, the international standards implemented in the eHealth Exchange, and certified HISPs will make it easier to collaborate with other healthcare providers in the Portland area, as well as to scale to other locations—and bring us closer to our goal of having the healthiest workforce on the planet.

"Connected Care makes sense for us because Intel's goals sync with our core mission and values. We're not fee-for-service. We're evidence-based and outcomes-measured, and we're excited to work with an organization that wants to reward better care, not just look at claims data. Claims-based decision-making is like looking in the rear-view mirror. We want to use data to predict and intervene and look forward."

Mark Charpentier
Vice President of Corporate Development
Kaiser Permanente Northwest

"Intel's Connected Care experience exemplifies that effective interoperable health information exchange is achievable now. This program is a shining model of how employers and health systems can tap the potential of a mature, working nationwide network to begin to realize the benefits of value-based care, by improving employee health while lowering the cost of care."

Mariann Yeager
Executive Director
Healtheway Inc.

Broad Benefits and Ripple Effects

Connected Care and its focus on standards-based interoperability are aligned with national efforts, and the program's effects extend well beyond Intel and its employees.

The shift to value-based compensation and the growing focus on coordinated, team-based care are increasing the need for diverse organizations to share patient information. By sharing financial risks and potential savings with its collaborators, Intel provides its delivery system partners with a business case for standards-based data exchange and outcomes-focused innovations to achieve the Triple Aim.

The DSPs' pioneering collaboration with Intel is elevating their position as leaders in the healthcare ecosystem and extending their meaningful use activities. It is helping Kaiser Permanente Northwest, Providence Health & Services in Oregon, and Premise Health gain expertise that they are sharing throughout their organizations.

The Portland Clinic has increased its expertise and expanded its collaborations throughout the community. Within days of being certified on the eHealth Exchange, TPC was fielding invitations to collaborate.

Each collaborator has made advances in standards-based interoperability and clinical care that position them for further success as they navigate the mergers, acquisitions, and collaborative relationships that are so fundamental to today's healthcare environment. The advances they have made in interoperability, cross-institutional clinical collaboration, and value-focused population management are also valuable as they implement Oregon Medicaid's Coordinated Care Organizations (CCOs).

Epic and Greenway Health have shown leadership by accelerating their interoperability efforts, resolving a range of issues, and identifying others for further work. By proving that the combination of its PrimeSUITE EHR and its Greenway Exchange* cloud-based interoperability engine interoperates with other health IT systems, Greenway has strengthened its market position and made it vastly easier for other Greenway Health customers to exchange data via the eHealth Exchange. These customers should automatically meet the eHealth Exchange's technical onboarding requirements and will only need to address operational and legal issues to begin exchanging data.

Advancing Innovation for Healthcare

Healthcare is ripe for innovation. As consumers become more empowered and more accountable for the costs of their care, they will demand it. Healthcare systems that ignore this mandate will do so at their own peril.

As we know from other industries, enabling data to move freely between proprietary systems can drive rapid, collaborative innovation while adding significant value to those proprietary platforms. For healthcare, standards-based interoperability can empower delivery systems to deliver higher quality, more affordable care in ways that satisfy members, providers, and payers. Robust interoperability also allows solution developers to invest resources in creating new capabilities rather than solving interoperability challenges.

Many industry stakeholders can contribute to achieving this vision:

Standards and certification bodies can accelerate their work to reduce variability and bring greater precision to healthcare standards, addressing the practical functionality gaps that result from optionality in standards implementation. It will also be helpful for certification processes to examine usability in the context of practical workflows, and to provide guidance in the use of best practices or embed best practices into the standards themselves. Other areas for improvement include greater clarity in vocabulary to improve patient matching and support more automated data flow between EHR systems. Clinician-driven guidelines for data exchange to support clinical best practices is another area where greater clarity can reduce complexity and support the effective use of exchanged data. Standards-based directories of healthcare providers can also facilitate efficient, secure data exchange and coordination.

Policymakers and healthcare purchasers can extend meaningful use criteria and contracting criteria to promote more sophisticated information exchange and more advanced use of the data that's exchanged.

EHR and other healthcare software companies can move more rapidly to support standards-based interoperability and to follow best practices in their implementation of industry standards. They can differentiate their products through capabilities that take advantage of electronic communication standards to advance workflows, collaboration, and analytics.

Delivery systems and provider organizations can press their health IT suppliers for better interoperability, and use industry standards rather than expensive point-to-point interfaces to connect with their networks of provider organizations. Building on standards-based data fluidity, they can collaborate with other delivery systems to implement strategic innovations that improve the patient experience, enhance clinical outcomes, and reduce inefficiencies in their workflows. They can engage with employers and insurers to build the business case. As the experience of TPC shows, even smaller organizations can take advantage of standards-based interoperability to improve care coordination and strengthen relationships across their communities.

"Healthcare is dealing with a new entrant called the consumer. Consumers are more educated about the quality and cost of what they're purchasing, and they won't accept poor quality. Interoperability is the way consumers are going to be attracted to a hospital system or care provider. So, we need to free the data. Tear down the walls. Unlock the data and share it so we can build a smarter healthcare system, and our customers can get more coordinated, effective, and efficient care. And the impact for the nation will be phenomenal."

Tee Green
CEO
Greenway Health

Employers can be effective collaborators and leaders in the drive to advance healthcare innovation, move the United States toward a value-based healthcare system, and ensure our members receive efficient, high-quality care. As providers of health insurance for nearly 60 percent of Americans,[10] employers have a clear interest in containing costs. Equally important, employers can be powerful advocates for the interests of employees and their dependents as they engage with the healthcare system.

To accelerate progress, we encourage employers to provide the business case for using industry standards to achieve data liquidity in healthcare. Offer incentives, and set requirements for standards-based interoperability and communications in your contracts with insurers and delivery systems. Align with national initiatives, and measure your success. Consider engaging directly with local healthcare ecosystems to advance innovation based on data fluidity. We all stand to benefit as a result.

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1   See http://www.ihi.org/engage/initiatives/TripleAim/Pages/default.aspx

2   For background on Intel's Connected Care program and its implementation in New Mexico, see Employer-Led Innovation for Healthcare Delivery and Payment Reform: Intel Corporation and Presbyterian Healthcare Services, 2013. http://www.intel.com/content/www/us/en/healthcare-it/healthcare-presbyterian-healthcare-services-whitepaper.html and Disruptive Innovation for Healthcare Delivery: Year 1 Report from Intel Corporation and Presbyterian Healthcare Services, 2015. http://www.intel.com/content/dam/www/public/us/en/documents/white-papers/healthcare-presbyterian-paper.pdf.

3   National Business Group on Health Recognizes Intel with 2015 Helen Darling Award for Excellence and Innovation in Value Purchasing, News Release: March 9, 2015. http://www.businessgrouphealth.org/mobilesite/mobile_pressRelease.cfm?ID=241

4   For background, see Healtheway, About eHealth Exchange. http://healthewayinc.org/ehealth-exchange/

5   For background, see DirectTrust, Welcome to DirectTrust, http://www.directtrust.org/ and How Does Direct Work, http://www.directtrust.org/directtrust-101-part-3/.

6   See EHNAC Overview, https://www.ehnac.org/about/.

7   AEGIS.net is a national leader providing interoperability planning and testing services for healthcare. For more, information, see www.aegis.net/interoperability.html

8   Updox provides direct secure e-mail and HISP capabilities to physician practices and EHR suppliers. For more about Updox, see www.updox.com.

9   FHIR is a next-generation standards framework; see more at http://www.hl7.org/FHIR/.

10 Robert Wood Johnson Foundation, State-Level Trends in Employer-Sponsored Health Insurance, April 2013. http://www.rwjf.org/en/library/research/2013/04/state-level-trends-in-employer-sponsored-health-insurance.html