The Importance of APIs for Perfect Healthcare

Orion Health White Paper
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ORION HEALTH

Introduction

Healthcare has lagged behind other industries in terms of technological advancement. But that is about to change. Many factors are driving change and the need for healthcare organizations to share information: consumers are demanding access to their own health information; burgeoning health costs are driving incentives to integrate care across different healthcare organizations; and technological advancements in web and mobile applications are opening up opportunities.

To date, healthcare organizations have struggled with interoperability; health information often ends up in silos – trapped in the EMR of a primary care physician, GP, or hospital. This means that patients have been treated episodically, receiving advice and prescriptions from medical professionals who may not have access to that patient's complete medical record. How can individuals receive perfect healthcare if the professionals treating them only see part of the picture? Without clinical data outlining medical history, claims data to marry up medical interventions with insurance claims made, medication adherence information, genetic profile, family history, and data about social circumstance (whether they are employed or otherwise; have family support or not), it's virtually impossible for a medical professional to be certain that they are choosing the right prevention or treatment plan for that individual. Moreover, the traditional complexity and expense of healthcare integrations have limited the number and types of applications available to healthcare providers and patients. Given these constraints, it's virtually impossible to deliver perfect care.

Open APIs (Application Programming Interfaces) have been embraced by many industries as the way to provide easy access to data and capabilities. APIs can make perfect care possible by enabling the best solutions to be built for every healthcare scenario. They open the way for collaboration between healthcare organizations and players from outside of healthcare to develop innovative applications to serve any and every healthcare niche. It is through APIs that we can unlock the massive potential of aggregated and shared healthcare data and better health and wellness across communities. It is through APIs that we can capitalize on sharing new technology, such as artificial intelligence, data visualization, proximity technologies, optical character recognition technology...the list goes on. APIs open an entire new world for healthcare and its technological advancement.

The current state of interoperability

Interoperability is an opaque word. Officially defined, interoperability is the ability of different information technology systems and software applications to communicate, exchange data, and use the information that has been exchanged[1]. Simply put, interoperability is the ability to share information across multiple technologies.

And it's crucial in healthcare. Health information is, for the most part, trapped in siloed systems. Think about every time you visit your GP or PCP and he/she records notes into their own EMR. Where does that information go? The answer is nowhere, unless it is transcribed into a referral (usually still done on paper) and sent to a specialist. And even then it's only partial information that is included – not the entire medical record. So what happens if you go out of state and visit a different GP or PCP, or get sent to the emergency department of your local hospital?

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[1] http://www.himss.org/library/interoperability-standards/what-is-interoperability

What information is readily accessible for practitioners there to understand you, your conditions, your medical or family history?

Currently, this is extremely limited. There is no "shared care record." Information about you, and me, exists in multiple EMRs so no one has the complete picture of our health upon which to make treatment decisions or implement preventative courses of action.

Around the world, clinicians and managers in medical organizations – healthcare providers and health insurers – are fighting to achieve plug-and-play interoperability by unifying organizations to bring about change. Healthcare is out of step with other industries: we can access our money from ATM machines anywhere in the world; we can send text messages to any mobile network; and we can use applications to service myriad needs (whether dietary, fitness or entertainment) on our smart phones. But they're still keeping paper notes in most hospitals.

That's why things must change. Today's lack of interoperability compromises patient safety; impacts care quality and outcomes and ultimately wastes billions of dollars every year.

But it's complex. A clinical record can contain more than 100,000 different data fields and elements including numeric data, structured text, unstructured text, and scanned files and images. Often EMRs have also been tinkered with by internal IT departments to evolve software products to a specific organization's needs – which means different data fields have been defined that aren't necessarily the same as what a comparable EMR has.

To get these different systems talking to each other – exchanging data – context is critical. Without the correct context, medical professionals can overlook information.

Today most data sharing is based on sharing some data fields with contextual integration or sharing view-only document summaries. Industry standards have been developed to make data sharing less clumsy but a non-uniform approach to the application of these standards remains a hurdle for interoperability. There are myriad standards too, including RxNorm, SNOMED, HL7, FHIR, DICOM, LOINC, and IHE[2]. HL7 is constantly updating and releasing new iterations of its standards, which has increased standards heterogeneity. But standards must continue to evolve as the practice of medicine evolves – so there is a tension between driving adoption of standards and ensuring they are constantly up to date.

To explain this, an analogy from outside technology is useful – the standardization of track gauges on North American railways. Railways were built using differing engineering traditions which resulted in different widths between the inside faces of a pair of rails (gauge). But growing demand for interregional traffic and increasing cooperation among different railway companies yielded incentives to resolve this diversity and the adoption of a standard gauge – being 4 feet to 8.5 inches – as the continental standard[3]. Needless to say, the adoption of a standard gauge served the needs and wants of customers – being the ability to travel between regions without having to get on and off multiple trains, and proved commercially beneficial for operators – people travelled more, further and spent more money doing so.

[2] Interoperability 2015: KLAS

[3] The Journal of Economic History, December 2000, Volume 60, Number 4, p.933

The same is true in healthcare, except that we are talking about streamlining the exchange of data about people, rather than people per se. interoperability is crucial to deliver the business capabilities that we need in healthcare – inside and outside healthcare organizations – such as an electronic shared care record, automatic alerts and notifications by text, seamlessly transferring information between and within care settings, delivering remote care, analysing data for population health management, and resource optimization.

The part APIs have to play

APIs are programming routines or protocols that allow software applications to share data, invoke business logic or perform an action (such as send a notification, map data, calculate and return a risk score, and start a workflow). They are ubiquitous in most aspects of modern day life. Large consumer brands Amazon, Twitter, Facebook and Google all have substantial APIs that enable developers to access information so they can build new applications or businesses. Facebook's APIs allow developers to incorporate Facebook functionality into their own apps (often used for sign-on) and the YouTube API lets developers integrate YouTube videos into their websites or applications. Transport disruptor Uber has launched two key APIs to create new value for their services – UberRUSH which facilitates same-day delivery for businesses and RideRequests which facilitates the use of Uber rides through third party apps[4].

APIs originally emerged in software as a great way for companies and vendors to share the functionality they've built in their proprietary application with a wider set of developers. They enable the abstraction of data, without giving away how that data is released – thereby protecting the source code of the

application. But until recently, APIs have been glaringly absent in healthcare.

In the past, in the absence of reusable and well understood connectivity protocols, authentication frameworks, data models and the design patterns that APIs provide, developers had to reinvent the wheel and repeat work for each new integration. The knowledge, time and effort required to do this created high barriers, meaning healthcare integration became a specialist and expensive field. The complexities and costs involved in any subsequent upgrades meant that legacy systems hung around until well past their prime, and the industry as a whole could not easily and cost effectively adopt technology innovations.

Yet now APIs are favored as a way to standardize the way applications can access data. In part this has been driven by EMR vendors pushing the ability to connect standalone EMRs, but also by collaborations such as HL7 FHIR. The time and cost involved in sharing data through APIs is much less than traditional systems.

So what are the benefits of APIs? And how will they empower niche services in healthcare? APIs will do this by enabling connectivity and expansion, and driving innovation.

i. Connectivity

Healthcare data is vast and expanding. From clinical to claims to labs to radiology to social and behavioural, there are myriad data types that all help to make up the complete patient record. Not to mention quantified-self data – the numerous sources of consumer contributed data now available through wearables, smartphones, and the burgeoning number of connected devices in the Internet of Things. Access to this data is crucial.

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[4] developer.uber.com

In healthcare, information has historically been exchanged through discharge summaries and continuity of care documents. Some of these are distributed in XML formats that allow a program to extract a particular piece of data (such as a specific lab result), but are much more complicated than modern RESTful and SOAP APIs.

APIs can solve connectivity between systems by clearly defining transmission and security rules. A set of common and open APIs will enable information to flow across systems and to be accessed across geographies. In a healthcare world where APIs are commonplace, clinicians and patients themselves can have easy access to data, no matter where it is stored. Although concerns over privacy and security are ongoing barriers to technological change in healthcare, APIs are a way to agree and honor authentication protocols and ensure control over who sees what information.

In the United States, the Health Information Technology for Economic and Clinical Health (HITECH) Act 2009 instituted financial incentives to adopt certified EHR technology systems, including requirements that specific providers "meaningfully use" these systems. As a result of this program, 97% of reported hospitals had certified EHR technology in 2014, up from 72% in 2011[5]. Meeting meaningful use requirements affects the reimbursement providers receive from the Centers for Medicare & Medicaid Services. One of the objectives of meaningful use is a requirement that healthcare providers enable their patients to view, download and transmit their health data to a third party. Meaningful use stage 3 criteria – which are optional in 2017 and mandatory in 2018 – require the use of APIs that enable the development of

new functionalities to build bridges across systems and provide increased data access to help patients have unprecedented access to their own health records, empowering individuals to make key health decisions[6].

ii. Expansion

APIs can grow the healthcare ecosystem by allowing applications to share data with any other system and to leverage each other's capabilities.

Not only do APIs present the opportunity for internal innovation – where providers can build their own custom user interfaces for specific needs – but they enable third parties to access information and capabilities for specific purposes. This means that information stored in an EHR is utilised for a more tailored application – either that serves a patient's purpose or empowers clinicians.

There are also benefits in expanding access to healthcare data to other healthcare verticals – such as researchers, pharma companies and medical device organizations. Researchers can engage in "citizen science" by accessing anonymized information from thousands of individuals and analysing it to identify trends; better understand causes of conditions and outcomes of treatments; and asses asset utilization and costs. Pharma companies can access the same information to assist with the development of clinical trials, to better understand the reported side effects and effectiveness of specific treatments and drugs, and to monitor adherence to then action plans to minimize wastage. Similarly, medical device companies can use aggregated information to develop products that serve a specific patient/consumer need.

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[5] https://www.healthit.gov/sites/default/files/data-brief/2014HospitalAdoptionDataBrief.pdf

[6] https://www.cms.gov/Newsroom/MediaReleaseDatabase/Fact-sheets/2015-Fact-sheets-items/2015-10-06-2.html

But possibly the most important and beneficial expansion enabled by APIs is involving patients and their family in their own care. Through APIs, healthcare can become something that is part of everyday life, versus isolated, episodic visits to the doctor or hospital. APIs enable expansion outside of the traditional boundaries of healthcare, giving access to data from other life spheres such as finance, education, hospitality, social services, social media and retail, all of which contribute important clues to an individual's health profile. For example, connecting the home and devices through the Internet of Things – where air quality, weight and amount of sleep are all data points included in an individual's healthcare record; integrating healthcare information with an individual's social media feed; understanding an individual's financial circumstances; connecting educational and fitness applications; and giving individuals access to their own medical record, will revolutionize the way we perceive healthcare and how the healthcare industry operates.

For example, a friend of mine was recently undergoing aggressive radiotherapy and chemotherapy for a malignant (but curable) tumour and had to chronicle every day in a paper folder (her "little green book"). In this book she recorded how she was feeling, numerous quantities of medication taken, and side effects felt. This information stayed in ink and was only shared with her treatment nurse when she went into the cancer centre. It was not transcribed or shared in real-time at any point. She took this book (and a huge wad of other papers, files and notes) to each appointment with her different specialists in a bag and had to go over everything, sifting through papers, each visit. Fortunately, she had a family member caring for her who helped her navigate her bag of notes and her medication requirements (not easy for a sober person, let alone someone ingesting morphine and other medications).

Imagine if my friend had had access to an app where she could have received notifications and alerts to remind her to take which medication at which time; where she could have logged how she was feeling each day and any unusual symptoms; where she could have securely communicated with her circle of care to ask questions without having to phone and leave messages and wait for hours for a response; where she could have indicated that she was feeling slightly drowsier than usual one day; where an alert in real-time to her oncologist might have led to a phone call and assessment that might have prevented her dying, within a matter of hours at home, from an acute pneumonia.

Chronically ill
Low proportion of population but high proportion of healthcare costs

The Will
People with risk factors indicating they will develop chronic conditions
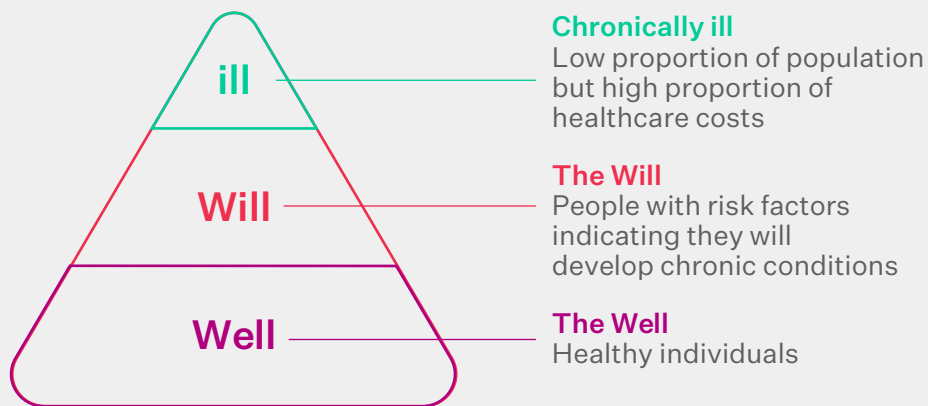
The Well
Healthy individuals

FIGURE 1: Population and Sickness

It is not just possible – but definite – that applications that access health data and enable the sharing of this data across an entire circle of care and multidisciplinary care team will improve healthcare outcomes and patient experiences.

Applications that further challenge and encourage well consumers to change their behaviour, through encouraging better diets and increased activity – will also assist in delivering better healthcare outcomes. They will encourage the "Will" section of society reflected in the diagram to undertake preventative action and reduce the likelihood of them developing an expensive chronic condition.

iii. Innovation

Perfect healthcare means catering for the many permutations of an individual's circumstances, health, expectations and experiences. But to date, the expense of creating health applications often force solutions to be generic to achieve wide but shallow coverage, and slow the uptake of new technologies. APIs can bring the level of innovation we've witnessed in other industries – like banking, travel and entertainment – to healthcare. People currently working outside of healthcare will be motivated to bring their skills, expertise and experience to the sector if given secure access to clinical and other data in a cost effective way, creating technologically advanced tools of huge value that serve not only the masses, but select groups as well.

Imagine applications designed especially for certain conditions and user groups, which cater for their specific needs. For example, applications that:

- Capture blood pressure for a specific cohort of diabetic patients;

- Provide real-time advice for patients struggling with a specific and rare skin disorder;
- Triage patients before they arrive at their GP's or PCP's office;
- Are aimed at visually impaired people by utilising voice control;
- Target people living in rural settings who are exposed to very different environmental factors than city dwellers;
- Are designed for gym junkies who have a greater interest in capturing all their activity and contributing it to their health record;
- Are aimed at frequent travellers who might suffer from jet lag-related sleep disorders; or
- Target mental health disorders where someone's unusual behaviour on social media sends an alert to a carer to check in with them.

The possibilities are endless.

Not only will APIs fast-track interoperability across healthcare organizations, but they will enable intelligent and adaptive apps that connect healthcare providers, health insurers, and other related parties with patients in new ways. This is more than creating mobile applications. It's about harnessing and connecting a spectrum of specialist capabilities such as risk prediction algorithms, data visualization engines, payment providers, workflow engines, and proximity technologies – and more.

Opening access to data is a tailwind for innovation, enabling infinite possibilities. No one organization or individual can foresee all the needs that healthcare of the future will surface, so we need to set in place systems that are flexible and adaptable, ones that can grow as healthcare technology becomes more sophisticated and consumer expectations increase.

The barriers to APIs

As fantastic as APIs are, and as exciting as the future of healthcare is that they promise to unlock, there are barriers to adopting APIs that need to be mitigated. An article in the Harvard Business Review7 identified four main challenges to the adoption of APIs:

- **Financial**
  Enterprise software is a significant investment for any healthcare organization. Financial incentives for information exchange will support the case for implementing APIs. These already exist in many parts of the world (in the US, Medicare's new merit-based incentive payment system (MIPS); in the UK (reimbursement schemes and free computers helped to drive EHR adoption years ago) but the promise of improved outcomes and increased efficiency alone are financial incentives.

- **Privacy and Security**
  Exchanging data raises concerns about privacy and security, especially in healthcare where Personal Health Information is so sensitive. There are standards for the secure exchange of data – adopted by other industries – such as OAuth2.0 and Open ID Connect, which can be used to authenticate and authorize access via APIs.

- **Standards**
  As referred to previously, a lack of consistent application of standards means that integrating with EHRs can still be costly. Consistent standards are needed to give developers and small start-ups confidence that they won't start working on accessing healthcare data, only to find that the resources required are cost prohibitive.

- **Workflow and Culture**
  Healthcare providers fear a deluge of data when APIs are implemented that allow patient-generated data to enter the system.

At Orion Health, we have spent a lot of time addressing the above challenges and are investing in Open APIs as a central tenet of our interoperability and platform strategies. We have evolved our culture and ethos towards API-led design where our own applications use our APIs to work together and leverage our Amadeus data platform. We are embracing FHIR® (Fast Healthcare Interoperability Resources), the leading open industry standard, to ensure true interoperability within and across organizations. We are leveraging our track record in securely handling private health information and continue to invest in robust security and privacy protocols. And, of critical importance, we are engaging with customers (providers, payers and pharma), users (clinicians, care coordinators and administrators), and developers to ensure that our API platform is fit for purpose and commercially viable for adoption.

Conclusion

To build a healthcare ecosystem that truly serves the delivery of perfect healthcare for every individual, challenges around interoperability and APIs must be tackled head on. Open APIs can, and will, revolutionize healthcare delivery through empowering patients and enabling cross community collaboration between traditional healthcare providers as well as new players.
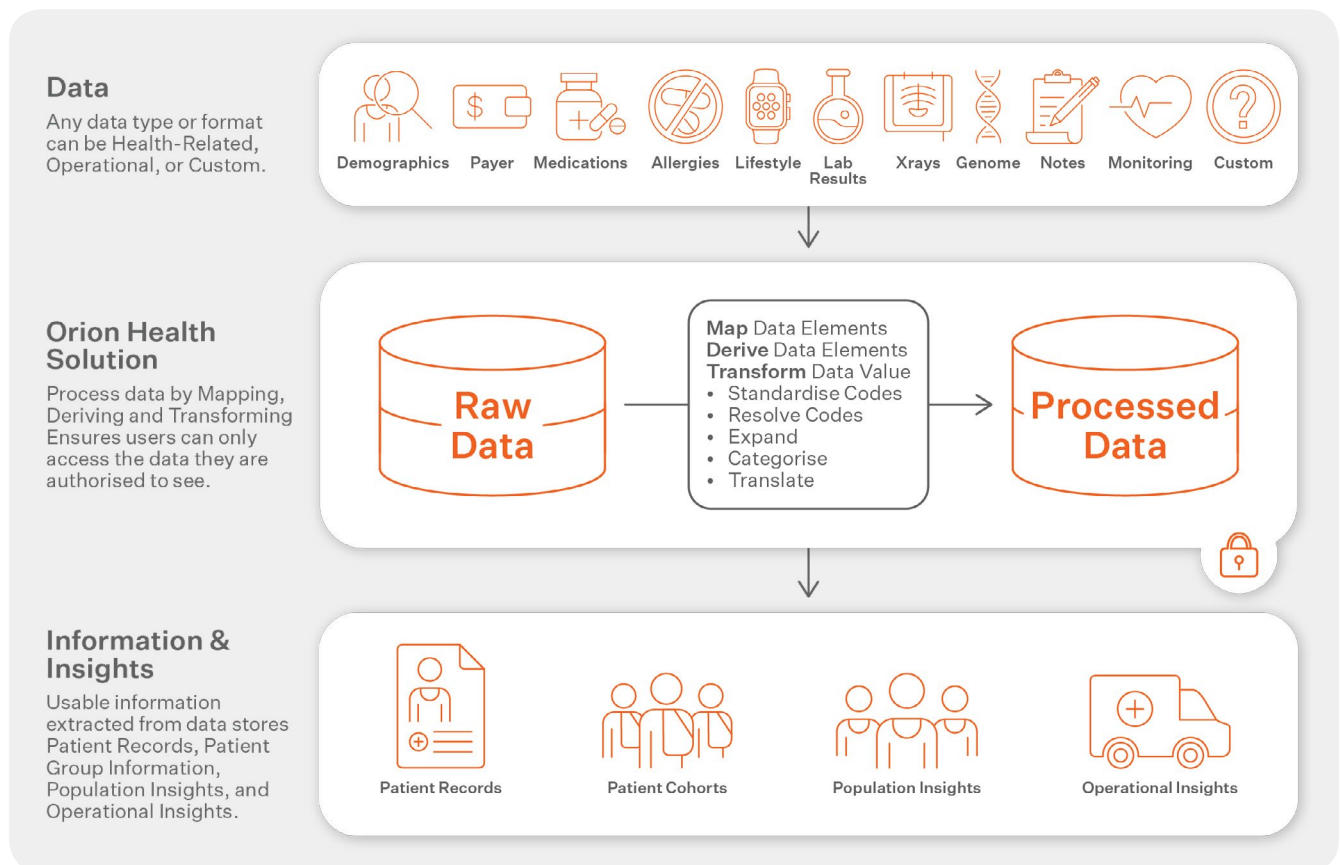
Data

Any data type or format can be Health-Related, Operational, or Custom.

Demographics · Payer · Medications · Allergies · Lifestyle · Lab Results · Xrays · Genome · Notes · Monitoring · Custom

Orion Health Solution

Process data by Mapping, Deriving and Transforming Ensures users can only access the data they are authorised to see.

Raw Data

Map Data Elements
Derive Data Elements
Transform Data Value
- Standardise Codes
- Resolve Codes
- Expand
- Categorise
- Translate

Processed Data

Information & Insights

Usable information extracted from data stores Patient Records, Patient Group Information, Population Insights, and Operational Insights.

Patient Records · Patient Cohorts · Population Insights · Operational Insights

FIGURE 2: Data Processing Pipeline

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