

The '7As' for Precision Medicine



Orion Health White Paper

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A world with complete medical information

Precision Medicine is an emerging model of healthcare that combines all information unique to an individual, and identifies prevention and treatment strategies that will be effective for them based on genetic, environmental and lifestyle factors.

Current models of care delivery focus on applying treatments for conditions, not for individuals.

The consequence of that “one size fits all” approach is that individuals do not receive treatments that take into account the factors that make people unique - their family and clinical history, environmental, social and genetic factors, which when combined with other information can reveal optimal treatment and prevention strategies.

Applying general healthcare practices to an individual means that we are failing to achieve the best outcomes possible. We know this to be true by the number of individuals who suffer every year from adverse drug reactions or inadequate responses to prescribed drugs; the amount of waste in healthcare systems globally where ineffective treatments are administered; and the number of costly and avoidable hospital readmissions reported every year.

What if we could take into account all the information about an individual - clinical, social, environmental and genomic - and understand the exact treatment that would work for that person? What if we could customize healthcare? Complete information, driving targeted treatments, with much better outcomes, at a lower cost.

This “future state” of healthcare is fast approaching and organizations need to be ready for the changed landscape. Genomic

data is more accessible now than ever before, and by 2020 it is predicted to cost only \$10 to map a human genome. The proliferation of genomic data at that point will be immense.

Consumers are also driving change, just like they have driven dramatic change in other industries. Consumers want to be at the center of their healthcare. They want access to their health record, and they want to contribute the data that they are gathering themselves, even if passively, such as through wearables and activity trackers, to get the complete picture of their health.

Add to these trends the global movements to digitize health records. Electronic Health Records are increasingly the norm in almost every country, meaning that we have more information in digital form that can be shared.

All of this data, on its own, is interesting. All of this data, in combination, as a patient-centric record, is powerful. With the complete picture of an individual’s genetic makeup and clinical history, combined with family history and social factors, clinicians can truly tailor care. Importantly, it is unrealistic to expect these clinicians to be able to digest and reason on such a wealth of information without cognitive support. Simply having all the pertinent data in one place, with basic analytics, is very powerful. But taking this further and applying machine learning techniques to patient and population records, as well as research and reference material, will further distil data into diagnostic and treatment recommendations that can be applied at the point of care. This capability will truly enable the best possible personalized treatments to be delivered each and every time.

This is Precision Medicine.

The Path to Precision Medicine

Every step you take towards delivering personalized healthcare is valuable. Orion Health's end-to-end solution, built on our Amadeus platform, with integrated real-time analytics, care coordination and patient engagement applications, will future proof your journey. From interoperability, to population health management, and precision medicine – Orion Health has the products and services to help you navigate your path through the shifting sands of the US healthcare paradigm.

Consequently, we have devised what we believe are the seven key stages in the journey to precision medicine – the seven “As”, as outlined below:

1. Acquire

For most healthcare organizations or networks, key data resides in a wide range of internal and external source systems. Multiple EHRs and other clinical systems within the organization format, store and share data in many different ways. That complexity is multiplied as they start to bring in data from an even greater variety of EHR and practice management systems in use by community practices as well as the long-term care, rehab and home health systems that round out the continuum of care. Health insurance claims data is a critical component of gathering a comprehensive universe of patient data, but there are myriad other health determinants that are important to get the complete picture of an individual's health and therefore determine the best care plan for that individual. Acquisition of all these types of data is the first critical step toward delivering Precision Medicine.

The essential IT infrastructure requirements to support effective data acquisition include integration engine technology for accurate and reliable interoperability with a wide array of systems, and secure exchange and information transport to protect the privacy and security of patient information. The various data sources include clinical data (from EHRs, labs, radiology), claims data, social information (financial and state services), consumer device data (steps, heart rate, sleep quality) as well as genomic (DNA profile and risk factors). Rhapsody Integration Engine extracts and shares data from multiple sources and in multiple formats and standards. Rhapsody is a foundational element of Orion Health Amadeus and is the technology on which Orion Health's legacy is built. It was the first integration engine to implement the HL7® FHIR® standard. Rhapsody is listed as a Class 1 medical device with the FDA. Data acquisition is also accomplished via the Direct Trust-accredited Orion Health Communicate (Direct Secure Messaging), which enables the secure exchange of clinical data between providers via the Internet.

2. Aggregate

Each of the systems contributing data to a healthcare network has its particular conventions for formatting and sharing data. Even common EHR and other Healthcare Information System (HIS) platforms can alter their data formats from version to version of the software. The differences get much more dramatic when you start to bring in data from labs, health plans, pharmacies, tertiary care, and genome variance files. Normalizing that data is not only an extremely complex challenge, it is one that must be engineered to deliver scrupulous quality of data. Small errors can mean big problems in individual patient care, and when you multiply that by thousands or millions of records, the impact is significant to population level metrics.

The essential IT infrastructure requirements to support effective data aggregation include enterprise master patient (eMPI) and master provider index and identity management systems, to ensure that as the data is aggregated it is always associated with all of the correct entities (patient, healthcare organizations such as hospitals or primary care practices, other healthcare facilities). Terminologies and translators are also essential to ensure an effective and accurate semantic layer that can normalize diagnoses and other critical components of the record that are expressed differently across multiple systems. The clinical data repository is also a key requirement for aggregation, serving as the fundamental source of normalized data for access, analytics and action.

Orion Health Amadeus is a hugely scalable platform built on modern technology that collects and integrates data into data domains and structures, and then normalizes and assigns it to the correct patient. Orion Health Amadeus also helps organizations meet privacy and security requirements for handling protected health information. This includes centralized identity management and enrichment tools to ensure that the information presents a single source of truth.

In addition to the core clinical domains covered by Amadeus, additional domains are available to capture payer data feeds, including membership, medical claims and pharmacy claims; consumer device data feeds; genomic data; and custom data dependent on the requirements of the organization. Streaming data from these Data Spaces in real-time, Orion Health Amadeus can focus on converting already aggregated and normalized data into well-structured patient registries that help identify pain points in a population and drive proactive care initiatives.

The aggregation of varied data sources to provide a complete longitudinal health record for an individual is critical and the key building block for Precision Medicine. It opens the door for physicians to make diagnostic treatment decisions based on a deeper understanding of a patient's pre-disposition to particular illnesses and the likely efficacy of treatments. Genomic data can also be applied at a population level, either identifying genome/condition combinations in patients that offer targeted treatment options, or scheduling sequencing for patients whose condition profile indicates that targeted treatments might be available. Layering genome data over other forms of patient data will help accelerate the ability of researchers to identify links between particular variations and patient conditions/outcomes.

3. Analyze

Mining data for views into population health, finding the actionable insights that can drive improvements to quality and efficiency, keeping up with the ongoing and ever-increasing regulatory reporting requirements – all of these issues and many more drive the need for analytics as a fundamental component of a successful integrated health network. Leveraging data-driven intelligence to improve care delivery is also something that a well-constructed IT infrastructure is uniquely able to do. With solid data acquisition and aggregation comes the ability to learn from and act on data in very powerful ways.

The essential IT infrastructure requirements for health data analytics include all of the foundational data gathering, normalization and repository creation components outlined so far. Additionally, solid business intelligence tools that not only allow analysts, as well as non-technical users, to mine data for useful insights, but also automatically generate the core reports and dashboards that deliver data

to the point of impact, are key. For regulatory reporting purposes, healthcare networks need analysis and reporting tools that automate the process of staying up-to-date on the latest requirements and meeting them in a timely fashion.

Analytics can help organizations review historical, present and future trends in the health of their communities. There is a large amount of existing data stored in a variety of disconnected data silos that, if connected and shared, would provide a better insight into the true state of healthcare and of a population's health today.

But to deliver Precision Medicine, analytics needs to be employed to interactively explore data sets, discover meaningful insights and identify gaps in care at a population and individual level. The Orion Health Population Health Explorer leverages the comprehensive data in Amadeus to stratify patients and define patient sets through a rich set of filters that can form the basis of care coordination activity. Care gaps and cohorts identified within Amadeus are tightly integrated into the Orion Health Coordinate application allowing clinicians, care coordinators and administrators to take appropriate action such as follow-up calls, appointment scheduling, pathway enrolments, while drilling down to the comprehensive patient record allows for deeper assessment of patients of interest and the information required to establish customized care plans.

5. Act

Too much data and too many ways to use it can create paralysis and diffusion of resources. Putting an IT infrastructure to work in support of effective data-driven action means giving healthcare providers tools to insert actionable insights into their daily workflow, allowing them to continue to do their jobs but with the

added value derived from population and individual patient data analyses.

The essential IT infrastructure requirements for putting health data into action include some of the clinical collaboration and patient communication technologies previously mentioned including secure messaging, EHR integration and multi-constituency portals. Another key technology is care coordination workflow tools that enable care managers to deploy consistent care plans based on patient and population data, and to document and communicate care plan progress with the healthcare providers and patients they support.

Orion Health Coordinate provides the technology for care teams to collaborate, proactively manage care and take preventative action. It enables complex clinical pathways and care planning, and seamlessly integrates with other Orion Health products to offer medication management and patient engagement.

Orion Health Engage integrates seamlessly with Coordinate, leveraging the rich clinical data in Amadeus to create a single point of reference for a consumer's health management and information needs, driving better and more personalized outcomes.

6. Adapt

Once the population has been stratified and cohorts of interest have been identified via Analytics, customized action plans can be put in place for each patient and care coordinated across facility lines accordingly. This big-picture view of medical decision making can allow providers to focus both their prevention strategies and interventions on appropriate individuals, while avoiding unnecessary costs and unwanted side effects for those patients who wouldn't benefit.

This is Precision Medicine – taking into account all information unique to an individual to identify prevention and treatment strategies perfect for them, based on clinical, genetic, environmental and lifestyle factors. Action taken for a cohort of patients will be adapted for an individual – tailored according to that individual’s health determinants. For example, take a cohort of 15 patients with Metabolic Syndrome that are to be put on a pre-diabetic healthcare pathway and the same standard care plan, including the same statin medication. An analysis of all relevant data for each of them might reveal that while they all have a history of hypertension and hyperlipidemia, two of them have genetic factors that significantly increase their risk for myocardial infarction. One of them might have a gene variation that shows an increased risk of statin related myopathy. Another may show a gene variation that shows a significantly decreased risk of myocardial infarction with aspirin therapy. This is why precision medicine is critical.

7. Adopt

Humans tend to be deeply resistant to change, and getting everyone to use an integrated system initially, and on an on-going basis, can be a major challenge.

Adoption is as much an issue of technical prowess – making the data seamlessly easy to get to and impeccably accurate – as an emotional and behavioral one, and those two sides of the challenge are inextricably linked. If clinicians and care coordinators fail to adopt, key information will not be used for decision-making and outcomes will suffer. Both effects are potentially devastating to the success of any integrated health network.

The essential IT infrastructure requirements to support effective integrated health systems’ adoption echo many of those relating to access: electronic health record integration, personal health record, single sign on and portal all contribute to successful adoption. Great consulting support, ideally from clinicians with a deep understanding of out patient and inpatient workflows, and a user-friendly interface are also critical to adoption. To understand the right ways to make technology work for a range of stakeholders and to waters of change management requires very specific skills and experience.

As a result, to support rapid adoption and optimal outcomes, part of Orion Health’s implementation team includes clinicians, analysts and change management experts who can bring effective, widely deployed and highly adopted Care Coordination, Clinical Engagement, and other programs to an organization.

A new era of healthcare

Outcomes-focused healthcare models require a modern open platform to connect and leverage data from multiple systems across the community. Increasingly, healthcare organizations and networks are seeking advice and IT support to put in place the infrastructure required to achieve the level of information sharing modern healthcare requires.

The guidelines and best practices outlined at a high-level in this paper can help provide a roadmap for organizations seeking to chart the course for IT infrastructure development as part of their journey to achieve better health outcomes while reducing healthcare costs, delivering population health management and future proofing themselves to enable Precision Medicine. If our communities of care can get this fundamental piece right, they will set the stage and make it possible for their organizations to achieve high performance at a reduced cost and with optimal outcomes.

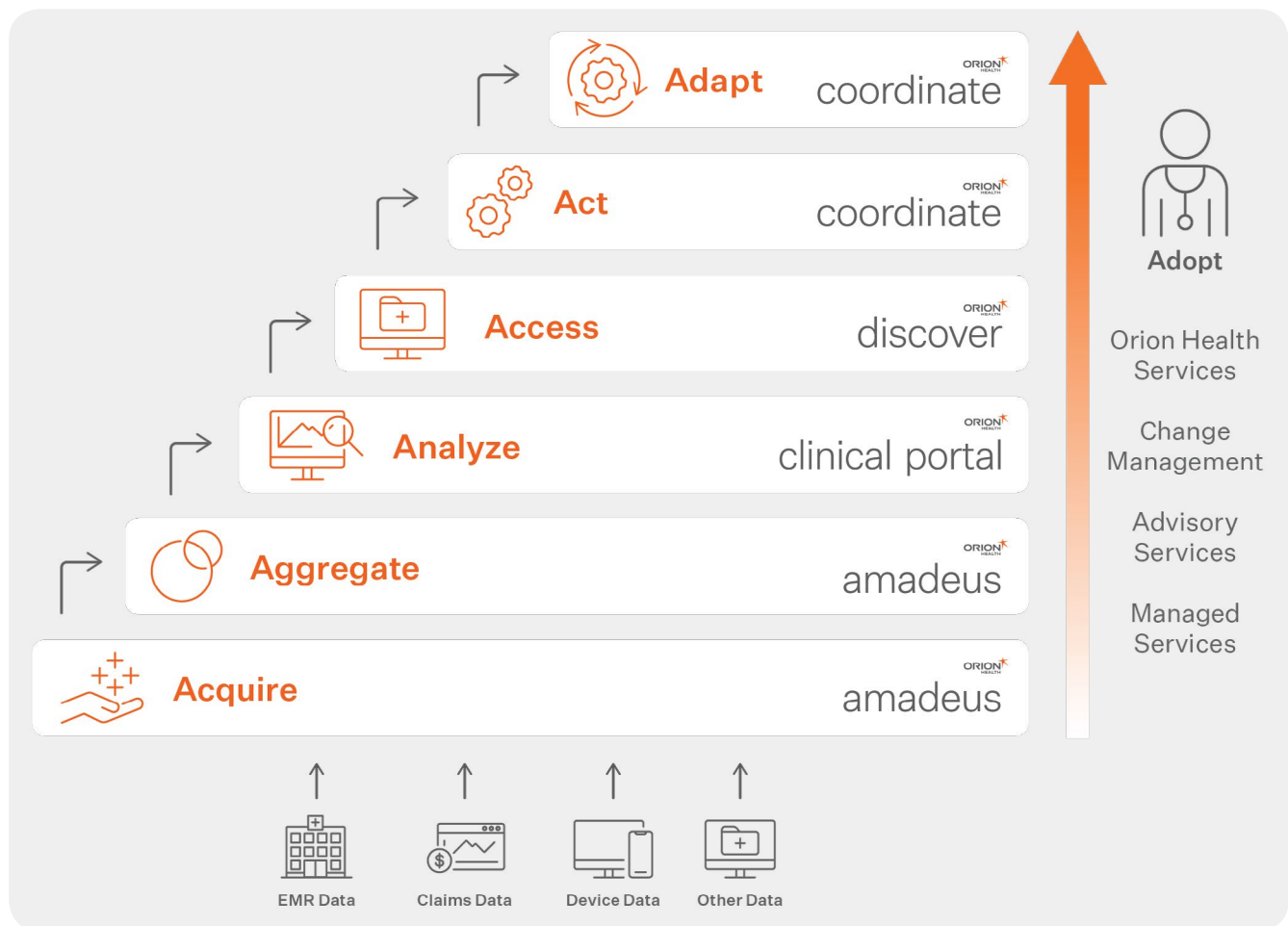


FIGURE 1: The Path to Precision Medicine



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