A Case for Using the Analytics Ecosystem in Interoperable HIEs

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As the name indicates, the Triple Aim for healthcare as defined by the Institute for Healthcare Improvement has three prongs: improve the health of the population, reduce the per capita cost of care, and enhance the patient experience.[1] Making healthcare systems work towards achieving this Triple Aim seems to be an uphill task with many challenges. More complex healthcare needs, skyrocketing healthcare costs, and a more evolved and involved healthcare consumer provide just a few of the challenges in achieving the Triple Aim. Lack of healthcare data availability—including past medical history/health information—at the point of care or when needed the most is also a major hurdle in achieving the Triple Aim. This unavailability of data, among other things, leads to repeated and unnecessary medical tests and uncoordinated healthcare, resulting in sub-optimal health outcomes and avoidable medical costs to the system. Interoperability, a buzzword in healthcare since 2010, was looked to as a solution to attack the mammoth task of easy, safe, and quick exchange of health data.

Interoperability and the Role of Analytics

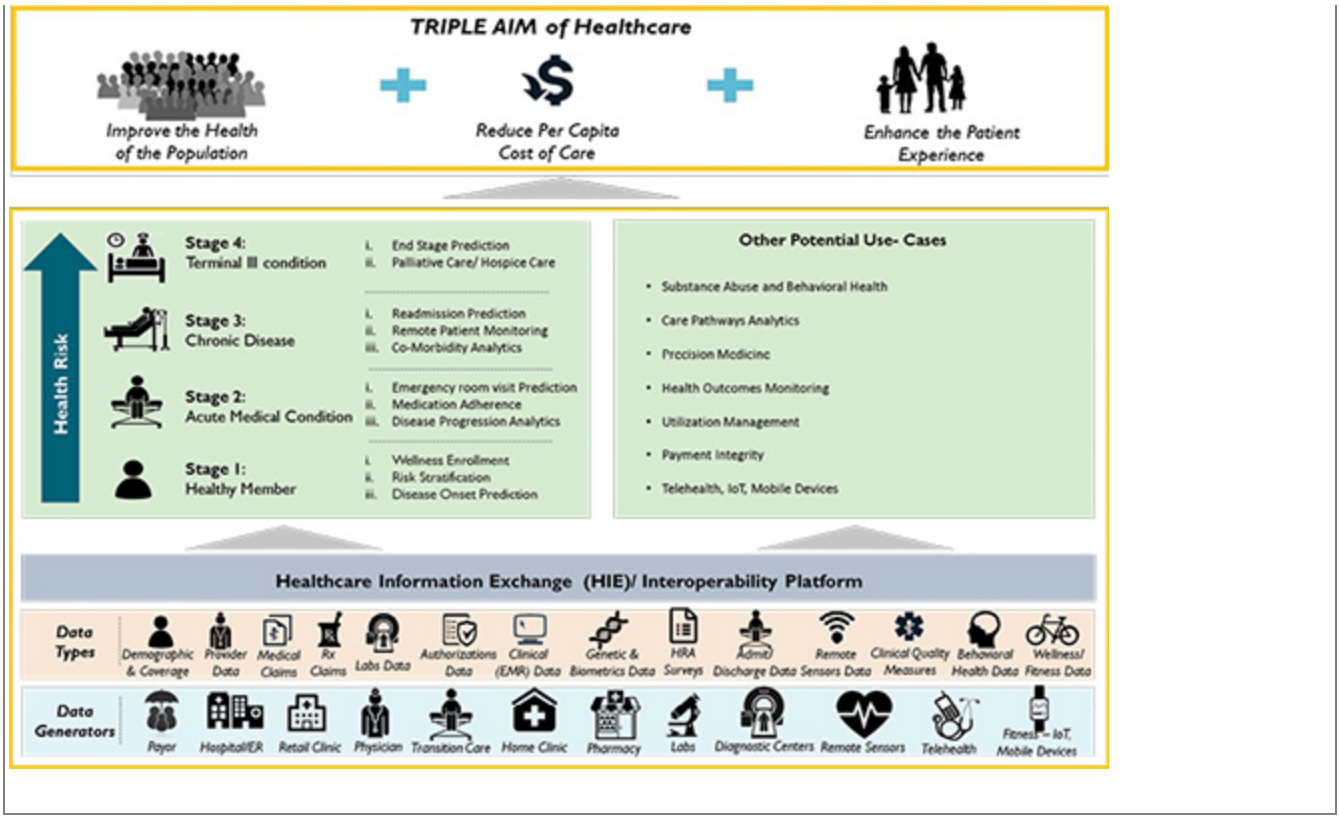
In 2009, the ARRA-HITECH Bill was passed and the Office of the National Coordinator for Health IT (ONC) and the Centers for Medicare and Medicaid Services (CMS) were tasked with encouraging providers to adopt electronic health record (EHR) systems, as well as make these systems interoperable.[2] The national project, with a grant of $548 million, was started to help states develop and advance resources to facilitate the exchange of health information among healthcare providers and hospitals within their jurisdictions. Multiple state- and regional-level health information exchanges (HIEs) were launched. Unfortunately, many of them eventually closed due to technical, financial, and existential problems.

Payers were largely absent in these HIEs or other interoperability conquests, since swapping health data was largely seen as something that might benefit only providers. But today payers are increasingly becoming involved in HIEs due to the emergence of value-based programs. Payers now need access to all the data/information pertaining to their members, even if that is generated outside their premises, in order to keep care costs down and their members healthy. In order for this value-based partnership between payers and providers to be successful, payers and providers need to come together and supplement each other's data needs.

It is beyond doubt that successfully implemented interoperability platforms will facilitate data exchange amongst providers with or without payers. But setting up interoperability is just the beginning. In order to achieve the Triple Aim, the healthcare industry needs to do more than just exchange data—the data needs to be available for analysis. This will allow providers to make informed health decisions at the population and individual level; decisions that are both outcome-oriented and economical.

In order to leverage the full potential of HIE/interoperability platforms, data that resides in provider-, payer-, and patient-owned devices, systems, and platforms—such as membership, enrollment, labs, authorizations, claims, EHRs (structured and unstructured), quality measures, patient-generated data through mobile devices, and the internet of things—need to be used for unleashing the power of analytics, thus enabling better care coordination and population health management insights. ONC also outlines these analytics needs in their 10-year vision to achieve an interoperable health IT infrastructure.[3]

Overview of Data Analytics Utilization in Healthcare



Analytics Ecosystem to Harness Benefits of HIEs

At the core of any analytics/reporting/business intelligence object is a robust data layer. Interoperability resolves regulatory and technological hurdles to bring data from multiple sources—such as payers, provider systems, clinics, pharmacy, labs, diagnostic sensors, remote sensors, and telehealth technologies—to one place. Gathering the data in one place is only the start of the journey; it is also imperative that the healthcare industry create a longitudinal view of patient data, linking data across the disparate data sources and providing a timeline view. A strong master data management framework based on principles of business understanding comes to the aid here.

Once the data has been integrated and a comprehensive 360-degree patient view has been formulated, this data layer can be used to generate disease stage-specific analytics for effective population health management and care coordination. The graphic above gives an overview of the kind of analytics this layer can facilitate.

Using Analytics in Four Stages of Care

The biggest advantage that data analytics, facilitated by interoperability, brings the healthcare industry is the ability to learn from the health and wellness journey of millions of patients. Unsupervised learning algorithms can glean valuable information with regards to disease onset, disease progression, and wellness management from this data.[4] For example, there are four stages of healthcare where analytics can be applied:

- **Stage 1: Healthy member/population**—The objective of analytics here is to keep the members healthy. Prevention is the core tenet. Health risk stratification of the population based on their demographic data, psychographic data, and clinical data forms the first step. Once the health risk stratification businesses can formulate strategies, they give members relevant information to manage health based on their health risk. Neural network-based disease onset prediction models can help care management teams take preventive measures to delay or prevent disease onset. Analytics for identifying which members to enroll in wellness management, and through which channel to do so, gives the outreach teams a way to ensure tangible return on investment on their marketing dollars.
- **Stage 2: Acute disease/population with acute medical condition**—The objective of analytics here is to better manage the healthcare of members in question. Management is the core tenet. Using regression-based models to predict which members are likely to stop taking medication becomes a first critical step. Data-driven strategies to prevent medication cessation and hence reduce chances of an emergency room visit become relatively manageable.

The learnings from the health and wellness journey of millions of members (by the unsupervised learning algorithm) enable the prediction of the course of disease progression, hence giving the ability to slow the pace of disease progression.

- **Stage 3: Chronic disease/population with chronic medical condition**—The objective of analytics here is to slow the progression of chronic disease. This is typically done by marrying the clinical indicators and the timeframe associated with each indicator's change to the disease stages. The combination of neural networks and unsupervised learning algorithms helps achieve the said objective.[5] Also very relevant to this stage are analytics looking at preventive interventions to stop the onset of co-morbid conditions. Analytics can help identify potential co-morbid conditions that a member is at risk of acquiring. Knowing this information up front can help individuals take preventive measures to prevent the onset of these conditions.
- **Stage 4: Terminally ill condition**—Typically, medical conditions/mortality or quality of life at this stage is, to a great extent, determined by factors other than medical/clinical indicators. Analytics/data on terminally ill conditions can only solve part of the puzzle. But that shouldn't stop data professionals from making an effort to improve care. A case for analytics in this stage is to help determine when palliative care should be used versus traditional medical care. A decision on whether to provide hospice care to a patient can also be aided by analytics.

There are other potential analytics use cases that can be enabled by HIE platforms (see the graphic on page 29 for details). This article is too short to do justice to the depth and breadth of analytics that HIE platforms can support. The above pointers are more intended for data analytics professionals and the healthcare C-suite to take tangible steps to get some analytics up and running, and expand and build upon those analytics as HIE platforms mature.

Analytics Ecosystem: The Way Forward

Even today, HIEs and interoperability platforms face certain hurdles in the exchange of data, such as:

- A lack of standard data formats
- The inability to match the right record to the right patient
- Different technical standards of EHR platforms
- The blocking of data sharing among competing EHR systems
- Lack of financial sustainability
- Lack of a roadmap to use the data on the interoperability platform
- Security concerns over data transfer

While technological advances like blockchain, uniform technical standards, and laws against information blocking all help improve interoperability and data analytics use, a close collaboration amongst the C-suite with regards to a roadmap for the creation, use, and expansion of HIE platforms is the need of the hour. Interoperability platforms and HIEs, if implemented the right way and with the right intent, will pay for themselves by improving care management and reducing duplication, fraud, waste, and abuse.

Organizations now need to start taking steps to generate meaningful insights that harness the plethora of data sources made available by interoperability initiatives in order to achieve tangible benefits and make the HIE systems pay for themselves. At the same time, this is all easier said than done. The healthcare system is anything but simple, and while hurdles like these are expected, they must soon be addressed so that quality care can move forward.

Notes

1. Institute for Healthcare Improvement. "IHI Triple Aim Initiative." www.ihi.org/Engage/Initiatives/TripleAim/Pages/default.aspx.
2. Centers for Disease Control and Prevention. "Meaningful Use." www.cdc.gov/ehrmeaningfuluse/introduction.html.
3. Department of Health and Human Services. "A 10-year Vision to Achieve an Interoperable Health IT Infrastructure." HealthIT.gov. August 25, 2015. www.healthit.gov/providers-professionals/implementation-resources/10-year-vision-achie-ve-interoperable-health-it.
4. Gupta, Puneet. "Machine Learning: The Future of Healthcare." *Harvard Science Review* (Spring 2017). https://harvardsciencereview.com/2017/05/16/machine-learning-the-future-of-healthcare/.

5. Colak, MC et al. "Predicting coronary artery disease using different artificial neural network models." *Anadolu Kardiyol Derg* 8, no. 4 (August 2008): 249-254. www.ncbi.nlm.nih.gov/pubmed/18676299.

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