Predictive Analytics and Health Information Exchange

HIMSS HIE Thought Leadership Brief
## Table of Contents

Defining Predictive Analytics ................................................................. 4  
What Is It? ........................................................................................................ 4  
EHRs and Portals (Messaging and Access) ............................................. 5  
Monitoring and Coordination of Care .................................................... 5  

Background .............................................................................................................. 6  
Clinical Outcomes ............................................................................................... 6  
Overcoming Barriers to Provider Engagement with HIE .......................... 6  

Meaningful Use Stage 2: Implications for Health Information Exchange and Analytics ................................................. 7  
Meaningful Use and Health Information Exchange ................................... 7  
Predictive Analytics and the Meaningful Use of Healthcare Information ........................................................................... 7  
Intersection of HIE, Analytics and Meaningful Use ..................................... 8  

HIE and Analytics: Network Standards and Certifications .......................... 8  
ONC S&I Framework: HIE and Analytics Initiatives .............................. 8  
Implications of Existing and Future Standards ......................................... 9  
Patient Trust, Patient Engagement ................................................................. 9  
Direct and CONNECT: Steps Forward in HIE ............................................. 9  

Evolving Models for Analytics: Roles for Health Information Exchange ............................................................ 10  
Ambitions for the Automated Blue Button Initiative .............................. 10  
Beacon Community Models ......................................................................... 11  
Insurance Payers ............................................................................................... 12  
Public Health Initiatives and Disease Surveillance .................................. 12  
ACOs and Population Health Management .............................................. 12  
State HIEs .......................................................................................................... 13  
Private Health Information Organizations (HIOs) ................................... 14  

Predictive Analytics: Implications for HIE Sustainability ...................... 14  
Driving ROI ........................................................................................................ 14  
Content / Data Providers ............................................................................. 15  
Analytics Services ............................................................................................ 15  

Conclusion .......................................................................................................... 16  
Acknowledgements ........................................................................................... 16  

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In today’s world of healthcare, advancing health data exchange and improving our collective ability to use that data to improve patient care have become more crucial than ever for provider organizations, payers, and patients. Healthcare reform initiatives to bolster information exchange across the healthcare industry ramped up with the 2009 American Recovery and Reinvestment Act’s (ARRA)\(^1\) national broadband expansion program, and continued with the 2010 Patient Protection and Affordable Care Act’s (PPACA)\(^2\) legislation that required the establishment and support of Health Information Exchange (HIE). In particular, Subtitle C\(^3\) provides authorization to extend public health functions via grants/awards to states. The trajectories of these health initiatives are becoming more clear and will continue the forward evolution of HIE capabilities across the nation. As these capabilities continuously mature, we can expect more opportunities for use of predictive analytics to help give providers, caregivers and healthcare organizations valuable information needed to assess and make better decisions in patient care.

This paper addresses some of the key factors associated with health information exchange initiatives and the use of predictive analytics, particularly as both public and private health information exchange organizations (HIO) expand and become a more sustainable part of the infrastructure of the national and global health information networks. The accelerating growth and robustness of opportunities for advancing and using predictive analytics will support care quality improvements and facilitate lowering healthcare costs.

### Defining Predictive Analytics

**What Is It?**

Predictive analytics\(^4\) leverages data mining to identify trends and variables that can be used to predict future events, behaviors and outcomes. Negative patient safety incidents and poor health outcomes can be reduced by using tools and techniques that anticipate future events based on current variables and past history. In healthcare, business intelligence capabilities such as this are being used more every day to help organizations improve their clinical operations and services. Analysis of patient demographics, past medical histories and current clinical findings can help provider organizations and public health organizations deliver better care to individuals and populations alike.

In healthcare, predictive analytics leverages the aggregation and normalization of information from individual health records to provide clinical views of various groups or populations. This information can then be used to model future events in order to inform key stakeholders who wish to change behaviors of patients and clinicians, to improve chances of achieving desired health outcomes, and to achieve new operational goals. Building a pipeline of capabilities for sharing and transmitting valid, reliable, and timely health data for use in predictive modeling activities is essential. Data collection is at

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\(^3\) Strengthening Public Health Surveillance Systems, SEC. 2821: EPIDEMIOLOGY-LABORATORY CAPACITY GRANTS

the heart of predictive modeling—without sufficient usable data, models that suggest actions and behaviors that result in better patient care and health outcomes cannot evolve.

**EHRs and Portals (Messaging and Access)**

The Centers for Medicare and Medicaid Services’ (CMS) Meaningful Use of EHRs program\(^5\) has accelerated the implementation and use of electronic health records (EHR). Many of the EHR systems provide patient portals that give patients access to their health data, and Stage 2 of the Meaningful Use program includes mandates for increased patient use of EHR access modalities, including patient portals. In addition to ameliorating perceptions related to privacy, systems have been advised to facilitate viewing more of the patient’s longitudinal health information, as well as to allow for patient-generated input of data.\(^1\) Patients’ interaction with their own healthcare information is essential, and key benefits include improved administrative efficiency with reduced calls from patients to providers and increased patient engagement.\(^a\)

Clinicians’ EHRs, interactive patient portals and “un-tethered” Personal Health Records (PHRs) should be key sources of data for use in health information exchange activities and related predictive analytics. In addition, messages between patients and care teams can serve to include patients and their family members in the care team, thereby helping to engage patients in managing their own healthcare. Records of messaging between parties can be captured in both structured and unstructured formats, providing an added level of available data for analysis.

**Monitoring and Coordination of Care**

Care provider organizations and insurance payers have traditionally relied on historical or retrospective data to suggest what care resources will be required by targeted patient populations. Attempts by these stakeholders at using predictive modeling and analytics to improve health outcomes have been hampered by incomplete data of questionable validity and timeliness. CMS was mandated to start use of predictive analytics capabilities in 2011 in order to analyze and monitor fee-for-service (FFS) claims, and to “detect potentially fraudulent claims activities.”\(^i\)\(^ii\) While the CMS efforts focused on financial matters, similar approaches are being adopted in the private sector of the insurance industry to help target services for high-risk patient populations with chronic diseases. The industry believes that predictive modeling will inform disease management activities that can improve care coordination. As new data management sets arise from predictive models, they must be evaluated for efficacy; at the same time, insurers must address patient privacy concerns regarding the use of personal health data in the forecasting analyses.

Improved patient surveillance can lead to more timely interventions targeted to help improve care management, and support national efforts to reduce hospital readmissions.\(^iv\) Efforts to reduce hospital readmissions are also being driven nationally by CMS through the Readmissions Reduction Program initiated under Section 3025 of the Affordable Care Act.\(^6\)


\(^6\) Centers for Medicare and Medicaid Services (CMS). Readmissions Reduction Program. [CMS Website](http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html). Accessed online February 24, 2013 at [http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html](http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/AcuteInpatientPPS/Readmissions-Reduction-Program.html).
Robust and effective health information exchange capabilities can be designed to support more efficient and effective monitoring and coordination of patient care. By increasing the availability of and timeliness of access to comprehensive patient health information, providers and patient care teams can see a more holistic picture of a patient. Such a view can be critical when delivering care in those emergency medical situations in which a patient may not be capable of providing information about problems, medication history, allergies, past surgeries, and test results. These critical clinical data elements should be readily available to those providers who participate in health information exchange initiatives and HIOs.

Background

Clinical Outcomes
Predictive analytics provide value when they result in the optimization of targeted interventions that improve clinical outcomes. HIOs that support predictive analytics can enable improved clinical outcomes by providing more robust capabilities for monitoring and coordinating care. Accountable Care Organizations (ACO), patient centered medical homes (PCMH) and other innovative care provision programs reward providers who embrace quality-driven performance evaluations. Payments from both private and public payers are tied to achieving improved clinical outcomes in their target patient populations.

Overcoming Barriers to Provider Engagement with HIE
Many clinicians already realize that engagement in health information exchange activities is an essential component for providing high quality, cost-effective care for their patient populations. Stage 2 of the CMS Meaningful Use of EHRs program increases the requirements for eligible providers to participate in health information exchange, so resolving barriers to provider engagement in HIOs and related exchange activities is taking on even greater significance.

While the pace and breadth of health care delivery reforms in recent years may have distracted providers from proactively embracing HIE activities, these reforms are clearer now. With the increased adoption of EHRs, stimulated by recent regulations, this makes participation in both public and private HIOs more likely.

New Health information Portability and Accountability Act (HIPAA) rules place additional emphasis on the security of patient health data, safeguarding the patient’s rights around the use and sharing of their personal healthcare information with other organizations (e.g., insurance health plans, research organizations, public health agencies, etc.). Wider participation in HIE underlines the need for more stringent requirements for patient and provider authentication and identity proofing for secure exchange transaction. This issue was addressed in recommendations to the Office of the National

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Coordinator for Health Information Technology (ONC) by their Privacy and Security Tiger Team in 2012 and early 2013, and continues to be a priority.

Ongoing challenges include identifying community physician champions, getting provider (and provider organization) buy-in to the strategic planning and design of regional HIOs, and developing clinical operation workflows to allow any provider to exchange patient information safely and securely with other providers. These workflows can be achieved through tighter integration with available public and/or private HIO capabilities and service offerings.

Meaningful Use Stage 2: Implications for Health Information Exchange and Analytics

Meaningful Use and Health Information Exchange
Stage 2 of the CMS Meaningful Use program emphasizes the obligations for eligible providers, hospitals, critical access hospitals, public health agencies, registries and other stakeholders in the care delivery process to engage in secure health information exchange activities. In order to meet the requirements for Stage 2, barriers to exchange for these organizations must be lowered by reducing the complexity involved in data exchange, and by stimulating the vendor community to support the exchange of structured care summaries across multiple vendor EHRs. Ensuring that a common dataset and vocabularies are used across all platforms will facilitate improved interoperability across EHR platforms. While a common standard patient data set is still being rigorously defined for the industry, key elements for meeting Meaningful Use requirements include demographics, vital signs, patient problems, medications, medication allergies, procedures, immunizations, lab test results and discharge instructions.

Predictive Analytics and the Meaningful Use of Healthcare Information
Requirements for Meaningful Use are evolving at the same time that provider organizations are being urged to make care delivery more accountable for the quality and cost of caring for their target populations. Providers and healthcare executives across the country are immersed in a data-driven environment that requires “future focused” information to help care for the patients in their community, at both the individual and population levels. Along with predictive analytics, descriptive and optimization analytics will be crucial to translating real-time and retrospective data into the most relevant information for clinical decision making.

While all three types of analytics can play a role, predictive analytics is more likely to support evidence-based clinical decision-making. Using available data from Meaningful Use data sets in certified EHRs strengthens the statistical modeling that can yield risk reduction strategies, preferred interventions and predicted outcomes—each of these, when applied effectively, can lead to improved clinical quality measures and better health for the population.

Office of the National Coordinator for Health IT (ONC): http://www.healthit.gov/
As industry tools and applications continue to evolve for these three areas of analytic techniques, a maturity scale could emerge similar to the Carnegie Mellon University Software Engineering Institute’s (SEI) Capability Maturity Model Integration (CMMI) five-level program\textsuperscript{ix} or the HIMSS EMR Adoption Model (EMRAM) seven level model.\textsuperscript{x} Basic levels of maturity for analytic tools and applications could proceed from descriptive analytics to optimization for more complex analyses; a full maturity level could be reached when organizations are able to fully adopt and use predictive analytic tools.

**Intersection of HIE, Analytics and Meaningful Use**

ACOs, PCMHs and other organizational approaches to clinical care delivery are now at the confluence of Meaningful Use, Predictive Analytics and data exchange. In order to navigate the flow, organizations must not only achieve increased system interoperability and connectivity, they must clearly understand what healthcare information is needed by all stakeholders—including traditional clinical care providers, patients, extended care provider team members, analysts and informaticists. Normalizing source data to produce analytically meaningful information that can be used to help improve the quality of care delivery is a top priority.

HIOs can serve as the central hub for transporting the right information to the right person at the right time across the continuum of care. HIO participants may be able to apply predictive analytics to the data, thereby utilizing the most current available information for forward-looking clinical care action plans and recommended interventions. As Meaningful Use proceeds through Stage 3 and eventually Stage 4, EHRs and communications between EHR systems will become increasingly standardized, thereby strengthening the validity of data sets and enhancing the reliability of results from predictive analytics forecasts.

Data exchange value will continue to increase as barriers to usage are reduced. HIOs can integrate technical solutions, workflow redesigns and clinical quality measures that are aimed at reducing the complexity, cost and challenges of healthcare to better meet the needs of patients and improve their quality of life.

**HIE and Analytics: Network Standards and Certifications**

*ONC S&I Framework: HIE and Analytics Initiatives*

The healthcare industry’s need for meaningful exchange of protected patient health data requires the design, testing and adoption of standards that govern the flow of information throughout both public and private HIOs. The **Standards and Interoperability (S&I) Framework**,\textsuperscript{10} a program of the ONC’s Office of Interoperability and Standards, leverages the collaboration of industry stakeholders to harmonize gaps in existing standards, define new standards, and resolve interoperability challenges. These activities serve to strengthen the exchange of analytic quality health data.

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\textsuperscript{9} HIMSS Analytics Electronic Medical Record Adoption Model (EMRAM)\textsuperscript{SM}. Accessed February 24, 2013, at  
http://www.himssanalytics.org/emram/index.aspx

\textsuperscript{10} ONC Standards and Interoperability (S&I) Framework: http://www.siframework.org/
Core funding for the S&I Framework Initiatives, from the ARRA stimulus funds, expires in 2013. Current projects include electronic submission of medical documentation (esMD), Query Health (e.g., standards identification for distributed population health queries), Longitudinal Coordination of Care, and Public Health Reporting (development of standardized approaches to public health reporting from EHRs).¹¹

**Implications of Existing and Future Standards**

Work done by the ONC Standards Committee over the last three years has driven the identification, design and testing of rigorous standards that are required for public and private HIOs to securely push and pull health record information among ever-growing groups of stakeholders. Some of the standards being enforced include HL7 (for messaging protocols), SNOMED-CT (for problems), LOINC (for laboratory test results), CVX (for immunizations) and RxNorm (for medications).

Two additional standards-related issues arise as a result of the mandated conversion from ICD-9 CM (International Classification of Diseases and Related Health Problems 9th Revision, Clinical Modification) to ICD-10 CM, as well as the availability of the Healthcare Data Dictionary (HDD), originally created by 3M originally for the Departments of Defense (DoD) and Veterans Affairs (VA) and made freely available to the public in 2012.¹² ICD-10 CM will greatly increase the granularity of diagnosis codes for the U.S. health system, making more granular data available for use in predictive analytics modeling. The HDD includes standard terminologies for ICD-9 CM, ICD-10 CM, SNOMED CT and LOINC, and can be used to help healthcare organizations throughout the U.S. healthcare system that are striving to achieve semantic interoperability.¹³

As standards for vocabularies, terminologies and communication protocols become more widely adopted, the value of patient health care data records increases. The richer the available dataset, the more meaningful the analyses will be in support of helping improve quality measures and health outcomes for the patient population served.

**Patient Trust, Patient Engagement**

Establishing trust with patients, in healthcare delivery systems such as ACOs as well as in more widespread deployment of information exchange capabilities, will be a critical enabler for success. Patient consent for data sharing, patient review of their clinical information and patient participation in data generation will all serve to make additional and more accurate data available for analysis. Educating patients will be an added responsibility for providers, as noted by the Privacy and Security Tiger Team in their 2013 presentation, so simplicity of use for authentication and identity proofing will be essential.¹⁴ Patient identity proofing and authentication may be handled, in part, by the adoption of remote techniques for consumer access and password management, similar to the techniques used in the banking industry for account access.

**Direct and CONNECT: Steps Forward in HIE**

With Direct and CONNECT, ONC established momentum for state level HIE organizations including state designated entities (SDE) and private HIOs to adopt standardized exchange protocols.
The Direct Project was designed, piloted and initially launched in 2011 by the ONC. It established the specifications for standards-driven electronic messaging to securely exchange encrypted patient health information between providers, laboratories, hospitals, pharmacies and patients over the Internet. Direct is not a health information exchange service; rather it sets standards by which eligible participants can meet Stage 1 requirements of the Meaningful Use Program. In order to comply with Stage 2 of Meaningful Use, however, eligible providers and eligible hospitals must do more than comply with Direct standards and protocols.

CONNECT is an open source software solution, managed under the Federal Health Architecture (FHA), that supports health information exchange activities. It was started in 2007 by government agencies, and now has over 15 federal agencies and 67 private sector partners involved in its development. CONNECT provides standards and governance to enhance compatibility and interoperability of HIE activities as they are established across the country through both private and public initiatives.

While the Direct Project did not have a mandate to create analytic capabilities, it does provide a means for standardizing message formats that can further the work of both public and private HIOs. Likewise, CONNECT is not a platform with analytic capabilities, but it can serve as support for information exchange activities leading to opportunities for more robust and advanced descriptive, optimization and predictive analytics. As data warehouses accumulate incoming data from exchanges, analytics can be performed based on normalized, foundational standardized datasets.

Evolving Models for Analytics: Roles for Health Information Exchange

Ambitions for the Automated Blue Button Initiative
The Automated Blue Button Initiative (ABBI) was launched in 2010 by the VA to give veterans a simple and easy way of obtaining a human-readable report of their health history. It has been embraced by the Department for Health and Human Services (HHS) under the ONC to replicate its success on a broader scale for other government agencies such as CMS and the DoD, and for adoption by private sector insurance payers, such as United HealthCare and Aetna, for beneficiaries in public and private health plans. ONC’s Office of Standards and Interoperability is involved in leading the evolution of the Blue Button program and, through the S&I Framework, has focused efforts on defining and harmonizing implementation standards, content structures, specifications and protocols around the identification and credentialing features of the program.

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ABBI is expected to accelerate the growth of data exchange capabilities, stimulate adoption of personal health records (PHR), and leverage adoption of EHRs. It supports the empowerment of consumers, making them more active in managing their health by giving them easier access to their health record information. Blue Button Plus helps eligible providers and hospital organizations use ABBI to achieve compliance with Stage 2 of the CMS Meaningful Use program’s goals for giving patients more accessibility to their health records.

It is hoped that the program will eventually be able to aggregate health records into a singular repository for the patient, using health care information from pharmacies, hospitals, insurance carriers and providers alike. As Automated Blue Button continues to mature, real-time analytics may evolve so that consumers can better understand their health issues using the power of their own health information.

**Beacon Community Models**

The **Beacon Community Cooperative Agreement Program**, an extension of the 2009 HITECH ACT, has funded a total $250M to 17 different communities. Advancing the development of their health information technology infrastructure, achieving meaningful use of EHRs, and expanding/strengthening data exchange capabilities were and are central to the program. In addition, although communities differ in their needs and approaches, the Beacon Community Program aims to foster innovation that will accelerate and produce measureable performance improvement in patient population health outcomes, and improve the quality and cost of care delivered.\(^\text{15}\)

In 2013 the Beacon Communities Program enters its final phase. Per a December 2012 [Beacon Community Program report](http://www.healthit.gov/policy-researchers-implementers/beacon-community-program) to the ONC Health IT Policy Committee, key relevant accomplishments of the program as of October 2012 included:\(^\text{xvi}\)

a) **Outreach.** 8,500 providers are participating in 17 community-based projects, touching over 8,000,000 lives.

b) **Sustainability.** One Beacon-Pioneer ACO program has been launched, three community programs are transitioning to CMMI Comprehensive Primary Care Initiatives, and seven community programs have established new health information exchange capabilities.

c) **Clinical Quality Improvements.** Seventeen communities have realized improvements in areas such as improved diabetes HbA1c screening, colorectal cancer screening, depression screening and reduced 30-day readmission rates for CHF patients.

The benefits derived from these projects will provide roadmaps and best practices for other communities, ACOs and healthcare provider organizations across the country. Underlying these accomplishments are the changes to health information technology architectures, data warehousing initiatives, analytics, EHR implementation and expanded HIE activities that make it all possible. Some of the communities involved include San Diego, CA; Cincinnati, OH; Rochester, MN; Spokane, WA; Indianapolis, IN; and New Orleans, LA.

Insurance Payers

Insurance payers (public and private) have been using predictive modeling for several years to model, evaluate and stratify the risk of their beneficiary populations in order to identify treatments and interventions to be included in various health plans. While most HIOs are led by healthcare provider organizations driving data exchange activities for both public and private exchanges, there are some geographic areas where insurance payers have joined provider organizations to lead efforts in establishing health information exchange capabilities.

Payers that have employed predictive analytic capabilities for their beneficiary population have found it useful to share their results with provider organizations to help identify and close care gaps, and to find opportunities for improving disease management.**xviii** Kaiser Permanente, for example, which founded one of the first **health maintenance organizations (HMO)** in the nation, has established health information exchange capabilities with the San Diego Beacon HIE and the Social Security Administration to speed and facilitate the exchange of protected patient data in the past year.**xviii** Geisinger Health System has an integrated health plan as part of their operating structure; Geisinger’s broad participation in the founding and continuation of the Keystone HIE has provided valuable support for the Keystone Beacon Community Program.

In terms of wholly operated health plan insurers, Blue Cross Blue Shield has been an early adopter of facilitating exchange capabilities among providers in several states, including Minnesota,**xix** New Jersey,**x** Indiana and Massachusetts. Aetna (which owns Medicity), United Healthcare (which owns Axlotl) and Humana**xx** have all increased support for the development and sustainability of HIE capabilities.

Public Health Initiatives and Disease Surveillance

Public health organizations have great interest in leveraging data flowing through HIOs to monitor infections and chronic disease conditions. In 2005, the Indiana Department of Health was able to conduct syndromic surveillance by tracking early indicators of potential disease outbreaks through analysis of information exchanged from emergency department encounters.**xxii** In 2011, the **Centers for Disease Control and Prevention (CDC)** launched an initiative to identify standards and requirements for syndromic surveillance data to be obtained from health information exchanges; that work is reflected in the requirements for Stage 1 of the Meaningful Use of EHRs program.**xxiii**

Opportunities to leverage data from HIOs—especially to monitor the prevalence and occurrence of disease and infections throughout the nation—continue to strengthen with the ongoing adoption of EHRs and expansion of health information exchange. The increased availability of more timely data should lead to more accurate predictive modeling and the ability to identify appropriate interventions that can lead to a reduction in prevalence and/or acuity of such conditions.

ACOs and Population Health Management

ACOs are at the forefront of the care delivery organizational evolution. As the focus of the nation shifts to caring for communities and their populations, safe, accurate, secure and efficient exchange capabilities are needed by these organizations. Formed through the integration of networks of physician practices and hospital organizations, ACOs are more community focused than previous organizations.
that focused on deployment of exchange capabilities and participated in exchange initiatives. Whether formed to meet guidelines of the Medicare Shared Savings Program, Pediatric Medicaid ACOs or private payer-driven initiatives, the incentives are the same: *reward for improvement in quality of care delivered at the population level.*

With over two hundred Medicare ACOs formed under the CMS program between April 2012 and January 2013, it is apparent that the tenets of this new organizational structure with its quality and patient-centered focus will be a driving force in the U.S. health system for decades to come.\textsuperscript{xxiv} Participating organizations include Sharp Healthcare (San Diego, CA); Advocate Healthcare (Chicago, IL); Cedars-Sinai (California); KentuckyOne Health Partners (Louisville, KY); Keystone-Geisinger (New York and Pennsylvania); Memorial Hermann (Houston, TX); and Marshfield Clinic (Wisconsin).

Some of the key needs for predictive analytics that must be supported by information exchange activities in ACOs include:

\begin{enumerate}
  \item Technology infrastructure that incorporates data warehouse capabilities for managing bidirectional flow of patient care information across multiple care settings,
  \item Interoperable EHR platforms to facilitate timely sharing of patient health care information among all members of a care provider team,
  \item “…optimizing data by extracting patterns and correlations using sophisticated data mining to identify care practices that result in better outcomes, such as reduced readmissions,”\textsuperscript{xxv} and
  \item Integration of financial data and clinical outcomes data to pinpoint the most cost effective interventions to optimize care.
\end{enumerate}

ACOs need to utilize robust information exchange capabilities. An infrastructure that supports bidirectional data flow through both public and private HIOs will reduce fragmentation of health data and improve care coordination. Such capabilities give care provider teams “*actionable data*” that they can use to reduce gaps in information flow for patients moving from one setting of care to another, as well as to manage individual and population health.\textsuperscript{xxvi}

**State HIEs**

The **State HIE Cooperative Agreement Program** was established by ONC to help states implement innovative approaches to exchanging health information within and across their respective states. Fifty-six initial grant awards were made in early 2010, totaling $548M, to fund states and other eligible entities to develop resources for the exchange of health information among health care providers and hospitals within and across their states.\textsuperscript{17} In order to contribute to national interoperability, each state/eligible entity has been responsible for increasing connectivity and efficient information flow, and for establishing governance, policies, technical services, business operations and financing for their HIEs. These organizations face challenges in demonstrating sustainability, as well as for achieving interoperability and connectivity with multiple vendor platforms within their state and in exchanges with other states.

\textsuperscript{16} CMS Medicare Shared Service Program. http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/sharedsavingsprogram/index.html?redirect=/sharedsavingsprogram/

At the same time that effective state health information exchange or their designated SDE can enable participating providers and hospitals to meet Meaningful Use requirements, they also have the potential to develop analytic services from the provider level up to the population level. Sustainable operations will not be able to rely on the original federal grant funding much longer, so revenues for continued operation must soon rely on subscription or transaction fees to cover maintenance and administration expenses.xxvii

The establishment of state-based health insurance exchanges or health insurance market places—now in a formative stage for all states either through initiatives by state governments or the federal government—may provide opportunities in the future for the use of their analytics capabilities by various stakeholders such as consumers, employers and insurance providers.

**Private Health Information Organizations (HIOs)**

Private HIOs can sponsor regionally focused exchanges that support network connectivity, data exchange and agreements for clinical data security services.xxviii These organizations have often been successful in identifying paths of sustainability through private funding, and have not been subject to constraints that can accompany public funds or grants. Often funded through memberships and transaction fees, these organizations build an exchange highway among regional providers and healthcare organizations that share a common patient population. In addition to having private funding and a strategy for securing provider engagement, another success factor for these private HIOs is having a shared vision (based on a unified commitment among the region’s stakeholders) for a system to meet the health information exchange needs of ACOs and other 21st century care provider organizations.xxx

When private HIOs have based their infrastructure and standards on those used by key vendors within their region and have tailored those standards to their community of care provider organizations, interoperability for exchanging data with organizations outside their network may be limited.xxx Any movement toward cross-network interoperability will be hastened by the continued evolution of interoperability requirements established to achieve national health information network goals.

**Predictive Analytics: Implications for HIE Sustainability**

**Driving ROI**

Evaluating the **return on investment (ROI)** from both public and private HIOs require the identification of key financial metrics. A number of surveys to evaluate ROI and quality impact for HIOs have been conducted. In one of the most recent surveys, reported in the summer of 2012 in *Perspectives in Health Information Management*, 149 information exchange organizations were sent surveys, and 21 responded.xxx The survey contained 21 questions that focused on use of metrics by the HIEs to evaluate their ROI and impact on quality of care. Two key findings were:

- 40% of organizations were using ROI metrics but felt more evidence was needed to show a positive impact of HIEs
- More than 50% of organizations used or planned to use a reduction in duplicative tests or procedures, improved communication among providers, and improved health outcomes to evaluate ROI.
Providers and hospital organizations have also used HIE to display alerts about specific patients’ care, query for available relevant information on a specific patient, and engage in secure messaging with patients and other providers.\textsuperscript{xxxiii}

Despite concerns about sharing information due to data privacy or competitive issues, providers, hospitals and other community organizations facing the HIE requirements for Meaningful Use Stage 2 will find that participation in both public and private HIOs will become increasingly attractive. This market dynamic should drive increases in membership for community stakeholders in private HIOs along with increased funding for public HIOs. Finally, whenever HIOs strive to document their ROI, they can use predictive analytics to model and forecast revenue generation and profitability based on increases in provider and hospital participation and membership. Forecasting these trends will show the real projected increases in ROI for each health information exchange as participant organizations move through Stages 2 and 3 of Meaningful Use.

\textit{Content / Data Providers}

In response to increased volumes of data and numbers of participating providers and hospitals, some HIOs have already been prompted to provide analytical services to their stakeholder organizations. These services can be seen as natural extensions of data warehousing, business intelligence and data transfer capabilities. For example, HealthBridge in Cincinnati, OH, offers insights into population health and cost analytics to authorized individuals through its hbAnalytics Services,\textsuperscript{18} and HealthShare Montana offers a clinical claims data warehouse with analytics services.\textsuperscript{xxxiii} These services will provide additional revenue streams that can positively impact an HIE’s ROI and sustainability. Other HIOs are certain to follow as momentum continues to build for these services.

\textit{Analytics Services}

There are a number of vendors in the market that provide exchange services to both public and private HIOs. These vendor organizations provide software technology platforms that are being shaped by standards set by the ONC’s Standards Committee in its efforts to build a \textit{nationwide health information network previously known as the NwHIN}. In 2013, Healtheway launched as a non-profit organization that will provide oversight to this nationwide network now known as eHealth Exchange.\textsuperscript{19} The work done by these vendor organizations is crucial to the continued advancement of health information exchange capabilities and services. In September 2012 ONC decided to back away from regulating the governance and growth of the evolving NwHIN. Feedback received from across the industry in response to their request for information (issued in May 2012) indicated that regulation would retard progress and innovation in a marketplace that is rapidly evolving.\textsuperscript{xxxiv} Many of these top vendors offer analytics capabilities, such as RelayHealth’s RelayExchange\textsuperscript{TM} and Orion Health, through their HIE solution. These offerings include analytics capabilities such as public health reporting, disease management tools and business intelligence tools.\textsuperscript{xxxv}

\textsuperscript{18} HealthBridge hbAnalytics Services. Accessed online January 25, 2013 at \url{http://www.healthbridge.org/hbAnalytics.aspx}.

\textsuperscript{19} Healtheway eHealth Exchange: \url{http://healthewayinc.org/index.php/exchange}
Conclusion

Healthcare is rapidly moving toward an accountable, clinically integrated model of care coordination which requires accessible health data for providers, patients, insurers, and other stakeholders alike. This requires the ability to turn data into useful information for a wide variety of purposes ranging from direct patient care activities to public health programs and population health. As adoption of EHRs and Meaningful Use activities continues, the need for quality data analytic capabilities integrated with information exchange activities will only increase. HIOs providing analytic services are poised to demonstrate the power of predictive analytic capabilities and advance data analytics in the industry. Predictive analytic HIO services will add value to what these organizations provide to the industry, ultimately driving effective patient care, quality improvement efforts and cost containment.

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2012-2013 HIE Committee Predictive Analytics Workgroup
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References


