The Office of the National Coordinator for Health Information Technology

Building Technology Capabilities to Aggregate Clinical Data and Enable Population Health Measurement

A Learning Guide

Presenting lessons learned by the 17 Beacon Community Awardees of the Office of the National Coordinator for Health Information Technology in the U.S. Department of Health and Human Services

September 2013

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The Beacon Community Cooperative Agreement Program demonstrates how health information technology (health IT) investments and meaningful use of electronic health records (EHR) advance the vision of patient-centered care, while supporting better health and better care at lower cost. The U.S. Department of Health and Human Services (HHS), Office of the National Coordinator for Health IT (ONC) is providing $250 million over 3 years to 17 selected communities throughout the United States that have already made inroads in EHR adoption and the development of secure, private, and accurate systems of health information exchange. Each of the 17 communities — with its unique population and regional context — is actively pursuing the following areas of focus:

- Building and strengthening the health IT infrastructure and exchange capabilities within communities, positioning each community to pursue a new level of sustainable health care quality and efficiency over the coming years.
- Translating investments in health IT to measureable improvements in cost, quality, and population health.
- Developing innovative approaches to performance measurement, technology, and care delivery to accelerate evidence generation for new approaches.

For more information about the Beacon Community Program visit www.healthit.gov.

This Learning Guide was developed by the Beacon Nation Project, funded by the Hawaii Island Beacon Community, an awardee of the ONC Beacon Community Program. The Beacon Nation project seeks to promote innovation in health IT by gathering and disseminating lessons learned from the 17 Beacon Communities about building and strengthening health IT infrastructure, testing innovative approaches, and making strides toward better care, better health, and lower costs.

For more information about the Beacon Nation project, visit www.beaconnation.org.

Acknowledgments

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Background

While it is estimated that health care costs for treatment of chronic conditions account for more than 75% of national health care spending,[1] the U.S. health care system has historically been organized to deliver care in a reactive manner, treating patients as they arrive in the medical practice or hospital. The dominant method of paying health care providers is the fee-for-service method, a type of reimbursement that provides incentives for volume rather than for value of services.

Moreover, care is often highly fragmented; care coordination is often an exception rather than the rule.[2] Both federal and private sector efforts, driven by the Affordable Care Act (ACA),[3] are focused on increasing the integration of patient care across the care continuum to improve the health of individuals and populations of patients. Major ACA-created programs that target population health improvement management include new care models, such as accountable care organizations (ACO), care transition and care management, and advanced primary care and medical home models. The focus on population health management through programs, such as ACOs and others mentioned, are viewed as a promising practice for helping to improve health outcomes and "bend" the health care cost curve. Improving population health by focusing on the upstream factors that affect health, such as poor nutrition, physical inactivity, and substance abuse, is also a core goal of the triple aim of improving health, health care, and health care costs.[4] Population health management includes measurement and analytics activities as well as creation and implementation of interventions designed to improve patient care. This Learning Guide focuses on the measurement and analytics aspects of population health management.

These new care models need to be enabled by population health measurement activities and integration to meet the goals of improved patient outcomes and lower costs. Data integration from a number of different and often disparate data sources is necessary. Data types needed for population health measurement include clinical, financial, and administrative data, which must be aggregated, integrated, and analyzed to produce accurate and actionable information on patient populations.

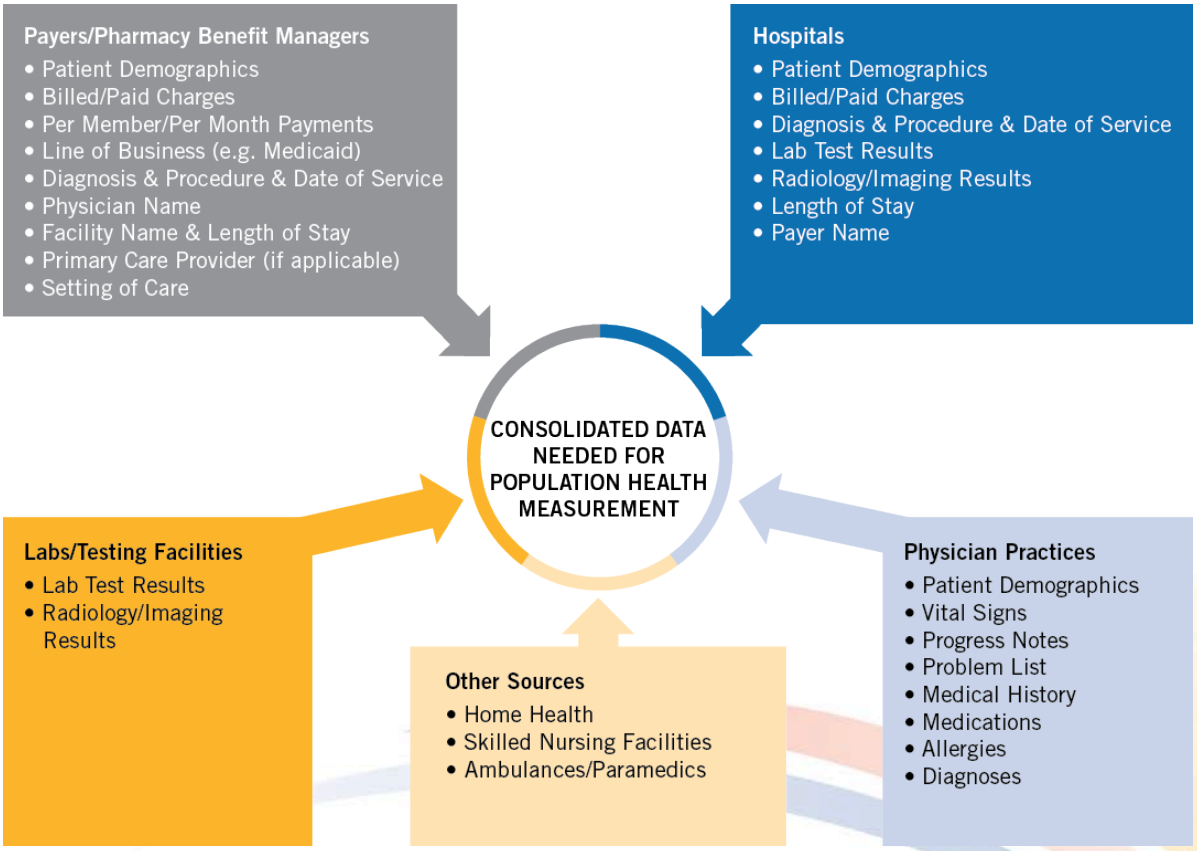
The ACA addresses population health in four main ways:

1. **Expands insurance coverage and access** to care through the individual mandate, Medicaid expansions, and state insurance exchanges and marketplaces.
2. **Improves the quality of care delivered to patients** through the support of organizations focused on quality improvement, innovation, and patient outcomes.
3. **Enhances prevention and health promotion** within the care delivery system through the implementation of ACOs and the expansion of provisions to encourage clinician training and coverage of preventative services.
4. **Promotes community and population-based activities** through the establishment of organizations and programs focused on public health and health promotion. deploy further based on the success of the initial group.

Comprehensive population health measurement requires collaboration and data sharing between physician practices, hospitals, payers and pharmacy benefit managers, and laboratories and testing facilities, among others. However, despite the fact that accountable care is beginning to align the incentives and provide a business case for data sharing across organizations, there are still many barriers to accessing and integrating data needed to measure (and subsequently manage) population health. First, technical challenges can result from difficulties in integrating data from similar data sources (e.g., physician practices) that may use different standards and methods to record and store data related to patient care. Some of the data may be electronic, and some may be recorded in paper form. Even when data is stored in an electronic format, it may be in free text form or not recorded following a common documentation standard. There is also the challenge of linking individual, unique patients' data that comes from different types of organizations, such as physician practices and hospitals, because they may use different standards to identify patients.

Also, cultural challenges include the concerns organizations have of sharing data with competitors, as data is often considered a competitive asset. Patient privacy and data security concerns have hampered data sharing needed for population health measurement. Exhibit 1 lists sample data types of major data sources commonly needed for population health measurement.

Exhibit 1: Common Population Health Measurement Data Sources and Types



Defining Population Health

A review of the scientific literature shows that population health can be defined in many ways[5] and can be considered to span a continuum, ranging from a focus on individuals with specific conditions within the care delivery system to a focus on the factors that affect health within and outside the care delivery system. Exhibit 2 shows the continuum of how population health can be defined. The population health definition used in this Learning Guide is *the level and distribution of a medical condition and associated clinical outcomes of a population or all the inhabitants of a given geography.* This definition reflects the focus of Beacon Communities on clinical outcomes and patient care within a defined geography.

Exhibit 2: The Continuum of Population Health

Population Health Measurement and Analytics

Population health measurement uses tools to analyze data about care provided to patients and clinical outcomes and to predict future health events and outcomes (predictive analytics). Predictive analytics relies on data modeling and algorithms to predict the risk that a patient will experience a health event, such as heart failure, an avoidable hospital admission or readmission, or an emergency department admission. Physicians and other caregivers can use this information to create and implement patient intervention strategies that target high-risk patients, with the goal of reducing the risk of a potential negative health event. Analytic tools may also support care coordination and management and patient engagement functions.

There is a growing number of analytic tools available in the market, each with its set of own strengths and weaknesses. Exhibit 3 highlights some specific analytic solutions used by Beacon Communities to support population health.

Exhibit 3: Overview of Beacon Community IT and Analytics Solutions

Analytics Solution	Solution Attributes	Beacon Examples	Target Conditions
Meridios Health Matrix http://www.meridios.com/	▸ Adaptable health registry that gives control over EHR data ▸ Data resides within the network rather than being sent off site ▸ The tool also provides the ability to create custom standards in addition to providing National Committee for Quality Assurance, Physician Quality Reporting Initiative, and others	Bangor Beacon Community (Maine)	Diabetes, chronic obstructive pulmonary disease, congestive heart failure, and asthma
PluralSoft http://www.pluralsoft.com/Home.php **Initiate** http://www.ibm.com/us/en/ **Symedical** http://www.clinicalarchitecture.com/solutions/symedical-server/	▸ Monitor patient health outcomes and improve quality of care ▸ Improve clinician satisfaction by providing more trusted and accurate patient identification at the point of service	Greater Cincinnati Beacon Collaboration (Ohio)	Diabetes, asthma
Archimedes Individualized Guidelines and Outcomes (IndiGO) http://archimedesmodel.com/indigo	▸ Results provide a graphical representation of an individual's risk of conditions or diseases and the predicted impact of interventions that are most effective at reducing these risks ▸ Can be used at the point of patient care ▸ Provides physicians with an interactive tool for educating patients about their risks and engaging them in addressing those risks	Colorado Beacon Consortium	Diabetes, heart disease

Analytics Solution	Solution Attributes	Beacon Examples	Target Conditions
Mirth Tools http://www.mirthcorp.com/	▸ Functionality allows multisystem interoperability support and secure hosting, broadly accessible Direct Project protocol-based secure email, and a comprehensive care management platform that has been tested in large-scale implementations ▸ Integrates data from EHRs already in use across the community, including four of the top five ambulatory EHR systems on the market ▸ Practices not yet using an EHR system will still be able to participate by accessing the Mirth Results portal solution or by using Mirth Mail to securely send or receive patient information	Crescent City Beacon Community (Louisiana)	Blood pressure management, diabetes, or cardiovascular disease
Pentaho http://www.pentaho.com/	▸ Community Analytics Platform with organization specific sand-boxes	Greater Tulsa Health Access Network Beacon Community (Oklahoma)	Breast cancer screening, immunizations for influenza and pneumonia

Beacon Communities

The U.S. Department of Health and Human Services (HHS) Office of the National Coordinator for Health IT (ONC) provided $250 million over 3 years (2010–2013) to 17 selected Beacon Communities throughout the United States that had already made inroads in using health IT as a foundation for local improvement and innovation. The Beacon Community Program is part of ONC's innovation portfolio and brings together many aspects of ONC's efforts to modernize the nation's health care.

Each of the 17 Beacon Communities is building and strengthening local health IT infrastructure; testing innovative approaches for using connected technology to improve care delivery; and supporting measurable improvements in health, care, and costs. Through these efforts, each community serves as a model of change that can help instruct the work of other cities, counties, and regions.

Beacon Nation Project and Learning Guides

The Beacon Nation Project, launched by the Hawaii Island Beacon Community, Hilo, Hawaii, in early 2013, is translating the experiences and lessons learned from the Beacon Communities into actionable information that can be adapted for use by individual practices, hospitals, payers, and other organizations in the community involved in patient care. This information is included in Learning Guides, which are a set of materials describing a promising IT-enabled intervention that can be deployed in a community to accelerate health care transformation. The Learning Guides cover diverse topics, including strengthening care management, capturing high-quality EHR data to support performance improvement, and health IT capabilities to support clinical transformation. Copies of the Learning Guides can be downloaded from the Beacon Nation website at: http://www.healthit.gov/policy-researchers-implementers/beacon-community-program/learning-guides.

Learning Guide: A Learning Guide describes a promising IT-enabled intervention that can be deployed in a community to accelerate health care transformation.

This Learning Guide documents the approaches, lessons learned, and best practices of Beacon Communities to aggregate clinical data to enable population health measurement at a community level across multiple health organizations. It includes Implementation Objectives and supporting tactics for success, implementation vignettes from organizations, resource and cost considerations, and reference documents.

Following are a few items to keep in mind while reviewing the materials:

- A Learning Guide is not an implementation manual with detailed checklists for a technical review and revision of clinical data systems architecture and infrastructure. Instead, the materials lay out the most important decisions and considerations for practices and communities interested in implementing processes that result in the aggregation of clinical data and enabling population health measurement.
- This Learning Guide discusses the key steps necessary to aggregate clinical data from a provider organization for the purpose of reporting, performance improvement activities, and patient care. These include quality measurement, performance reporting, and outcome measurement, enabling reimbursement under new payment models.
- A wide variety of organizations may find this Learning Guide useful to develop and implement activities enabling population health measurement. These organizations include individual physician practices, hospitals, and other stakeholders in geographic communities with varying levels of sophistication in EHR use and reporting capabilities that are interested in establishing wide-scale population health measurement.

Setting the Stage for Success

This Learning Guide focuses on the population health measurement experiences of the Beacon Communities along with the analytics used to support these measurement activities. Beacon Communities have focused on populations of patients with chronic conditions, such as diabetes, heart disease, and asthma. This Learning Guide focuses on the health care and health outcomes influenced by the health care delivery system rather than overall health and well-being, which a host of other factors also affect, such as the environment, patient behavior, and socioeconomic status.

To clarify terminology used in this Learning Guide, a *community* is a group of organizations collaborating to measure population health for a group patients; the targeted patients may be either located in a distinct geography or shared through patient attribution to providers based on which providers provide the majority of their care (the methodology used to assign patients to providers in ACOs for quality and cost calculations). In many instances, these organizations may compete for market share. These organizations include entities, such as physician practices, hospitals and hospital systems, payers and pharmacy benefit managers, and laboratory and testing facilities.

Target Audience. This Learning Guide is designed for communities and data aggregators that have a stated goal to measure the health of patient populations. Data aggregators can include a partnership of different providers (e.g., a hospital system and its affiliated practices); states; health information exchange (HIE) partnerships; quality improvement organizations (QIO); and ACOs that track performance across time, organizations, and patient populations.

As communities consider developing and implementing population health measurement activities, they need to examine how prepared they are. The Beacon Community experience has shown the importance of several foundational elements that supported success, such as strong leadership, vision and project goal alignment, and technical capacity to implement the analytics necessary to measure population health.

Depending on the degree to which a community has participated in prior collaborations, some foundational elements will be more important than others. These foundational elements represent a continuum of maturity, as noted in Exhibit 4. Communities in an early stage of collaboration, for example, can focus on dealing with the considerations of the foundational element "leadership, commitment, and collaboration." Communities in a later stage can focus on dealing with the considerations of the foundational element "sustainability." Communities that focus on the more mature foundational elements should have already dealt with the considerations of foundational elements in earlier stages of maturity.

Exhibit 4: Foundational Elements for Success

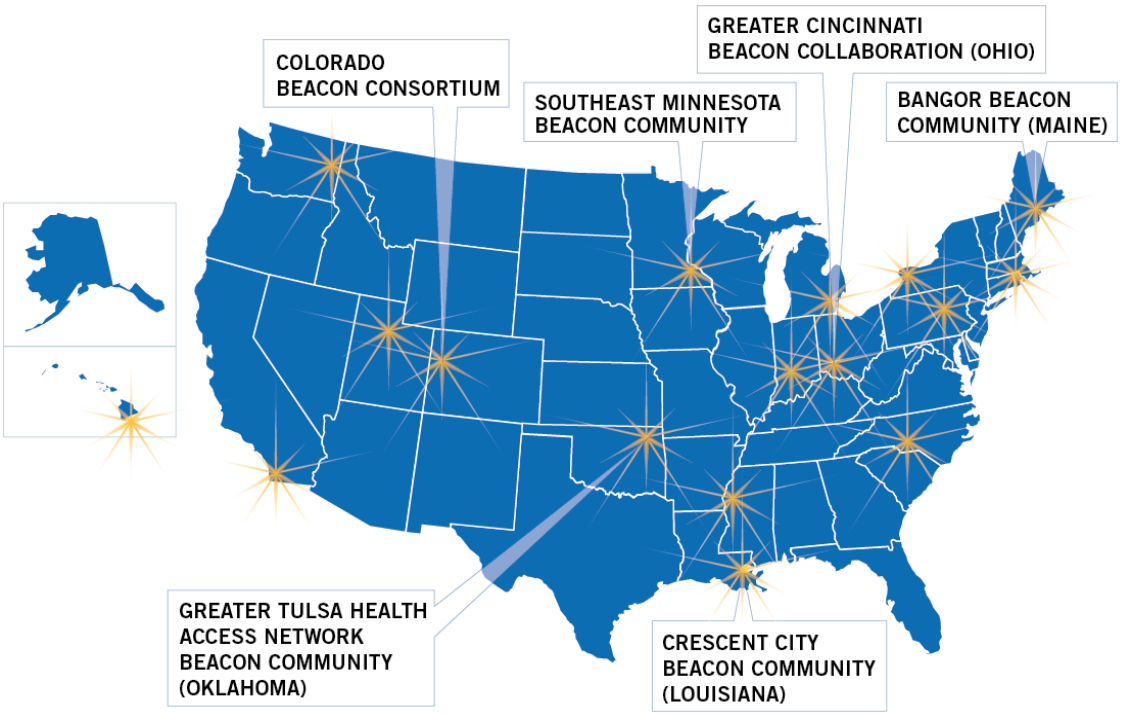
Consideration for Communities with Higher Levels of Maturity

Foundational Element	Considerations
Leadership, commitment, and collaboration	▸ Is there historical community stakeholder focus, agreement, and buy-in on the need to focus on population health measurement? ▸ Has the purchaser community been involved with, encouraged, and supported payers, providers, and other stakeholders in data sharing activities? ▸ Have population health goals been established and do they align with national reporting requirements and quality initiatives (e.g., improve outcomes for patients with diabetes)? ▸ Has a community needs assessment been done to determine the unique population-based issues facing the community? ▸ Are there one or more strong and passionate champions who are able to establish a unified vision across stakeholders and rally participants to overcome obstacles?
Health IT	▸ Have certified EHR systems been implemented or are they in the process of being implemented within the community and individual practices? ▸ Are providers working toward meaningful use (MU) certification? ▸ Does an infrastructure exist in the community to transmit data from multiple data sources to a shared repository on which analytics can be performed?
Clinical data capture, transmission, and aggregation	▸ Does the infrastructure meet federal and state requirements, including Health Information Portability and Accountability Act (HIPAA) and Health Information Technology for Economic Clinical Health (HITECH)? ▸ Do data use agreements (DUA) exist among providers and other participating data sources? ▸ Do DUAs include how partners will address patient consent issues, breaches, and other related privacy and security matters? ▸ Do standardized EHR data capture and documentation protocols exist within practices across the community? ▸ Is information transmitted in a way that is consistent with existing standardized formats (e.g., Continuity of Care Document)?
Sustainability	▸ Is it possible to demonstrate the value of stakeholder participation and data sharing and articulate the business case for different stakeholders? ▸ Are there identified resources for developing the technical capabilities and to conduct training?

Lessons from Beacon Communities

Six Beacon Communities provided in-depth information about their experiences measuring population health through the aggregation of clinical data. These communities are located in a diverse set of health care markets, including densely populated communities with multiple large physician and hospital organizations as well as less populated areas with fewer and smaller physician and hospital organizations. The six communities are Bangor Beacon Community (Maine), Colorado Beacon Consortium, Crescent City Beacon Community (Louisiana), Greater Cincinnati Beacon Collaboration (Ohio), Greater Tulsa Health Action Network Beacon Community (Oklahoma), and Southeast Minnesota Beacon Community (see Exhibit 5).

Exhibit 5: Contributing Beacon Communities

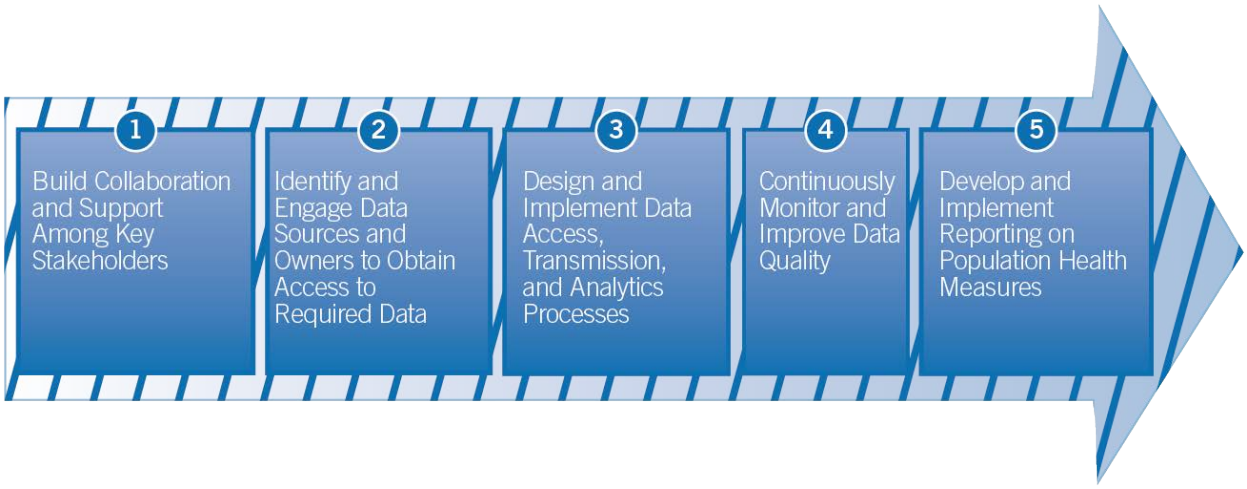


The Beacon Community experience, lessons learned, and insights in building technology capabilities to enable population health measurement can be described in five overall tactics or *Implementation Objectives.* Exhibit 6 provides a description of each of the five Implementation Objectives. Following each Implementation Objective is detail on the major steps that fall within each. Challenges that communities are likely to face are described along with suggestions for how to address them.

Several steps that make up each Implementation Objective are covered in detail in previously published Learning Guides) and, so, are only introduced and briefly discussed in this Learning Guide. When this is the case, a citation is provided that explains which Learning Guide (and section within) can be

referenced to access a more detailed discussion of the Implementation Objective step. Previously published Learning Guides can be found on the Beacon Nation website.[6]

Exhibit 6: Implementation Objectives



Implementation Objective #1: Build Collaboration and Support Among Key Stakeholders

The first Implementation Objective involves laying the groundwork for necessary collaboration to enable the exchange of data needed to support population health measurement goals. Potential collaborators include physician practices, hospitals, payers, pharmacy benefit managers, laboratories, and others. Establishing a framework and structure for collaboration are particularly important for communities where organizations do not have preexisting partnerships or business relationships that support data exchange. The major steps for this Implementation Objective include—

1. Clarify potential benefits of health information exchange (HIE) to support population health measurement
2. Reach a consensus on population health measurement goals and obtain buy-in from data owners to gain access to required data.

1.1 Clarify potential benefits of HIE to support population health measurement

Those seeking to engage potential participants in a population health initiative should consider both financial and nonfinancial benefits. Stakeholders will want to understand how they might fund or recoup the expected start-up and operational costs; payment reform opportunities could provide a strong value proposition. Other benefits could include a role for population health measurement in the achievement of a stakeholder's mission and strategic goals, the ability to meet federal and state reporting requirements, improved accuracy of reporting and evaluation metrics, and—importantly—improving patient outcomes.

The imperative to participate in the exchange of health information will continue to grow as the industry continues to transition to value-based payment mechanisms because the data needed to assess value (i.e., cost and quality or outcomes data) will come from multiple sources across the community. While this transition will be incremental, there is an increase in the proliferation of value-based contracts from payers. Communities that have built the infrastructure for population health measurement will be well positioned to manage the total quality and cost of care across patient populations and to succeed under such arrangements.

All stakeholders must assess for themselves whether to participate in a population health measurement initiative. Exhibit 7 lists examples of key considerations about participating in a community-wide population health measurement initiative.

Exhibit 7: Key Considerations by Stakeholder Group

Stakeholder Group	Considerations
Champions and community stakeholders	▸ Value proposition(s) for developing and using IT-enabled population health measurement systems, based on specific use cases ▸ Upfront and long-term funding requirements ▸ Business model for cost sharing ▸ Alignment with other community and organizational goals
Physician practices	▸ Alignment of practice goals with community-wide population health goals; the relationship to MU and payment reform initiatives ▸ Community policies that affect practice participation (consent, privacy, access to information) ▸ Security and protection of protected health information (PHI) and personally identifiable information (PII) ▸ Access to patient data across community and data sources ▸ Impact on quality, efficiency, and cost of care ▸ Resources to commit to workflow changes and data quality management
Hospitals	▸ Release of clinical data considered proprietary and of a competitive nature ▸ Requirements around handling of PHI ▸ Financial, quality of care, and other potential benefits to providing clinical data ▸ Resources to commit to the initiative
Physician, hospital, and payer IT leadership and decision-makers, including HIE organizations	▸ Ability to provide high-quality data for population health measurement purposes ▸ EHR and data system impacts of creating technical infrastructure necessary to exchange clinical data ▸ Costs to implement needed system changes ▸ Scope of ongoing data quality monitoring
Patients and families	▸ Security and protection of PHI and PII ▸ Access to patient data across community and data sources ▸ Impact on quality, efficiency, and cost of care ▸ Access to needed care in a timely manner

Stakeholder Group	Considerations
Payers	▸ Release of clinical data considered proprietary and of a competitive nature ▸ Protection of and liability with providing PHI and PII ▸ Financial, quality of care, and other potential benefits to providing clinical data ▸ Resource intensity and cost implications of providing claims and other administrative data

1.2 Reach a consensus on population health measurement goals and obtain buy-in from data owners to gain access to required data

Each community will need to define its population measurement goals. These goals may include broad outcome goals, such as improved life expectancy, disability-adjusted life years, or years of healthy life. ACO programs, like many Beacon Communities, generally focus more on clinical process or intermediate outcome measures and targets, such as those for prevention and chronic disease care. Goals and measures should be aligned with national reporting requirements and quality initiatives whenever possible.

Communities implementing population health measurement activities will generally need access to data from across the community, including physician practices, hospitals, payers, and testing facilities, among other data sources. Data owners will need documentation of security protocols that will be in place to securely transmit patient data and protect patient privacy. The value of data access (e.g., to support performance measurement, improve patient outcomes, or provide data needed for ACO participation) may also need highlighting to remind data owners of the uses and benefits of allowing access to their data. Clearly communicating data security and protection protocols and systems can help alleviate data owner concerns. Supporting documentation can include descriptions of how data flow infrastructure conforms to patient data privacy laws, such as HIPAA, as well as how data will be protected during transmission or aggregation for analytic purposes.

The Beacon Community experience has shown the usefulness of developing clinical scenarios to effectively engage clinical and technical staff and gain their support for community population health measurement goals. Clinical use case scenarios describe how data shared between data sources can enable the analytics necessary to document current performance and inform intervention strategies. After the use care scenarios are drafted, technical staff can identify which data elements are required to meet the measurement goals so that clinical and other leadership clearly understand what data is needed from them. It is important that the use case scenarios show how the sample data access, transmission, and analytics will tie into and support the community's needs and measurement goals. Clinical scenarios should be reflective of and describe actual care scenarios that the community has identified as areas of focus in support of improvement goals. Elements of effective use cases include—

- **Description.** This is a short summary of the ideal sequence of events starting with a trigger event, such as a patient is admitted to an emergency department (ED).

- **Assumptions.** This includes assumed policies, procedures, and events that are in place, true, or will be adhered to for the patient to receive optimal care, such as patient consent for data sharing being obtained.
- **Risks.** These are events or occurrences that could jeopardize the successful sequence of events that will result is optimal patient care, such as the inability to identify a patient's primary care provider (PCP) or where there is limited ability to access identifying patient information (e.g., a social security number).
- **Flow of events.** This is the sequence of actions that will occur and result in the optimal care provided to the patient. The flow of events may include information, such as the specific event to occur; the setting of care; the actors involved (e.g., PCP or registration staff); the systems involved (e.g., ED EHR or PCP's EHR); and the inputs and outputs (e.g., ADT feeds).

Appendix A includes three sample scenarios based on an ED admission from the Crescent City Beacon Community (Louisiana).

The deliberations between data owners should focus on value and the information they will receive in exchange for allowing access to their data. The value may include access to information they do not currently have but can use to close gaps in care, improve patient health and well-being, reduce duplication (e.g., ordering multiple tests), and improve resource use. The information can also highlight issue areas to focus on to improve the performance of the organization, especially on measures used in payment reform initiatives the organization participates in. Involving data sources in exercises to develop clinical use case scenarios can be an effective strategy for engaging data owners and identifying the value they can gain from participating in needed data-sharing activities to support population health measurement.

For more information on collaboration, stakeholder engagement, and goal setting see the Learning Guide "Strengthening Care Management with Health Information Technology" for additional detail.[7]

The Colorado Beacon Consortium Focuses Efforts on Population Health Management

Background. Colorado has focused its efforts on the management of chronic conditions, such as diabetes and heart disease. Covering seven counties in Western Colorado, the Colorado Beacon Community includes 51 primary sites with 240 team members (clinicians, staff, and performance coaches) and serves approximately 258,000 patients. As part of its Beacon Communities project, Colorado is working to achieve fundamental, sustainable change in how care is delivered to improve the health of the community.

Approach to Population Health. Colorado wants to help its clinicians think about population health as the aggregate impact of a set of individual decisions. Instead of thinking about patients one at a time, think about how they are doing collectively. Patrick Gordon, Colorado Beacon Consortium Executive Director, explains, "When clinicians look at their patient population health measures as a way to check their effectiveness, they begin to start thinking about the systems, processes, and teams that need to be in place to make sure things get done."Colorado is focused on aligning health care improvement activities at multiple levels within the community and facilitating patient access to the system using the three Ps of focus: population level, practice level, and personal level. To do this, clinicians at the point of care need to access data that enables them to see a broader picture of paitent care at each of these levels.

Use of Analytic Tools. The Beacon Communities program is helping to equip physicians with new tools, data sources, and skills to enable them to align their improvement activites with community-level population health priorities. It is also helping to support primary care practice redesign activities through the use of community-wide patient-centric registry tools for population monitoring. Another tool being deployed is Archimedes IndiGO, a decision support health IT tool designed for use by physicians, other providers, and patients to help understand patient risk. A key part of the approach is to have multiple systems with diverse functionalities to bring relevant data together in a useful way for physicians.

Implementation Objective #2: Identify and Engage Data Sources and Owners to Obtain Access to Required Data

The second Implementation Objective focuses on building upon stakeholder engagement and established goals to begin working toward obtaining organizational buy-in and accessing the data needed for measurement. The major steps for this Implementation Objective include—

1. Identify measures and related data elements
2. Create or revise existing DUAs to support population health measurement.

2.1 Identify measures and related data elements

The measures that a community selects will derive from the community's population health measurement goals. If, for example, a community has a goal to improve care for patients who have diabetes, a commonly used set of five diabetes measures (i.e., the D5) may be appropriate.[8] Data needed to calculate the D5 can originate from multiple sources, including practice EHRs, testing facilities and laboratories, and pharmacy claims systems. Once measures are selected, the data elements needed to calculate the measures must be identified and mapped to data sources across the community. Data sources will need to confirm (1) their ability to extract and transmit data for measurement purposes and (2) their ability to document and transmit data in a structured way, using vocabulary standards the community has agreed on (e.g., International Classification of Diseases version 9 [ICD-9] and Systematized Nomenclature of Medicine).

Although data required to calculate population health measures may come from multiple sources across the community, detailed clinical information from EHRs is critical. In fact, EHRs may be the sole source of data for many clinical measures a community selects. Measures generated using EHR-based data are known as *eMeasures* (i.e., electronic measures). These eMeasures are standardized performance measures in an electronic format that were developed specifically for EHRs to promote more accurate, efficient, and comprehensive performance measurement.[9] They are specified to facilitate consistent implementation and the production of comparable outputs across clinical IT systems. See the Learning Guide "Capturing High Quality Electronic Health Records Data to Support Performance Improvement" for additional detail.[10]

2.2 Create or revise existing DUAs to support population health measurement

DUAs are a core requirement for the exchange of health information between different data owners. DUAs are legal agreements between two or more organizations detailing the specific terms under which data can be exchanged and used. DUAs establish the terms and boundaries for permissible use of data, provisions for transferring and managing data, mechanisms in place to protect data privacy, and the requirements of each entity participating in data exchange.

Several steps are needed to analyze and amend DUAs and reach consensus. First, one must identify the organizations that will be sharing the information and determine the direction in which information will flow. Any existing DUAs should be provided to the participating entity's legal counsel for review. It may be helpful to then have all attorneys discuss whether amendments, changes, or new DUAs are required

and the most expedient strategy for achieving consensus and executing the changes. Leadership engagement is important in ensuring that legal teams follow through with agreeing upon a final DUA and in executing the agreement. The entire process, even for communities with some established agreements, can take up to several months. See Appendix B for a sample DUA. See the Learning Guide "Strengthening Care Management with Health Information Technology" for additional detail.[11]

The New York City Department of Health and Mental Hygiene (DOHMH) developed a public health–oriented EHR by combining its existing EHR with ad hoc query and alert features that allow public health officials to quickly determine disease burden or investigate outbreaks

Background. The DOHMH is a pioneer in the development of a geographic EHR feature to alert public health officials of specific patient outcomes. The Primary Care Information Project (PCIP) is a bureau within DOHMH formed with the mission to develop and implement a public health–enabled EHR in ambulatory primary care practices serving the medically underserved. PCIP, in collaboration with eClinicalWorks, built the Hub Population Health System (Hub) to enable the creation and distribution of queries for aggregate count information, clinical decision support alerts at the point-of-care for patients who meet specific conditions, and secure messages sent directly to provider EHR inboxes.[12] As of January 2013, the Hub was live in ~600 practices, representing more than 1.2 million New Yorkers.[13]

System Overview. Each individual EHR connects on a nightly basis to a central server (the Hub) to receive and transmit information using a secured HTTPS connection. All information is summarized at the aggregate count level before transmission to the Hub. This helps protect patient privacy by limiting the information shared between institutions. All practices sign data sharing agreements that permit the sharing and use of the aggregated data with PCIP. No aggregate data with practice identifiers are shared with third parties unless specifically authorized to do so by practices.

The Hub provides four primary services to authorized users. First, it permits the distribution of SQL query reports for aggregate count information and EHR point-of-care decision support alerts. Second, it enables the distribution of the reports and alerts to any practice in the network according to defined reporting policies. Third, it provides an interface for viewing and downloading aggregate results reported from the queries run on each of the practices. Fourth, it has the ability to securely message providers directly in their EHR inbox.

System Use in Food and Drug Administration (FDA) Drug Recall. On January 6, 2011, the FDA recalled underweight metronidazole tablets. On January 12, the DOHMH distributed a clinical notification describing the recall. Using this notification, clinical and public health experts distributed queries to two pilot practices that same evening. The reports returned a count of 62 patients who were prescribed metronidazole in the last year.

A secure follow-up message was sent on January 14 to the providers' inboxes embedded in the EHR that included the specifics of the recall as well as step-by-step instructions on how to use the EHR's Registry function to identify the affected patients for purposes of patient notification. The message also included a hyperlink to the FDA's MedWatch website with detailed information on the recall.

A clinical decision support alert was activated from January 19 to February 19. For any patient prescribed metronidazole in the two pilot practices in the last 60 days, the alert appeared in the progress note documentation screen. A pop-up information window contained the text of the recall, pertinent hyperlinks, and a reminder to review the longer inbox message.

Other Population Health Uses. Through the Hub system, the DOHMH can investigate population health issues without clinical or vendor resources. This type of innovation has already had national implications—similar alerts are being considered as a required EHR feature for Meaningful Use Stage 3.[14] The EHR data sets can also be linked to other geographic or geospatial information system data, like air quality and census socioeconomic information, to give a more complete picture of health issues and disparities through NYC. Eventually, the de-identified data sets may even form the basis for an aggregate population health record for monitoring health city-wide.[15]

Implementation Objective #3: Design and Implement Data Access, Transmission, and Analytics Processes

The third Implementation Objective addresses how to select vendors and purchase solutions that best meet the needs of the community within existing budgets of community stakeholders. Once a community has selected the vendor and IT solutions, the work to build the data transmission, integration, and analytic capabilities can begin. The following steps will be discussed in this section:

1. Develop vendor selection criteria and process
2. Determine data repository functionality and scope requirements
3. Build and implement analytics capabilities
4. Conduct pilot to test a limited data set to prove proof of concept.

3.1 Develop vendor selection criteria and process

When selecting a vendor to meet the community's specific needs, communities generally used the following approach:

- Assess the community needs, both current and anticipated
- Assess current capabilities and IT infrastructure
- Prioritize functionality requirements, which can become a baseline for Request for Information (RFI) or Request for Proposal (RFP) to seek potential vendors.

A **clinical data repository** (CDR) is a real-time database that consolidates data from a variety of clinical sources to present a unified view of a single patient. It is optimized to allow clinicians to retrieve data for a single patient rather than to identify a population of patients with common characteristics or to facilitate the management of a specific clinical department. Typical data types that are often found within a CDR include clinical laboratory test results, patient demographics, pharmacy information, radiology reports and images, pathology reports, hospital admission, discharge and transfer dates, ICD-9 or ICD-10 codes, discharge summaries, and progress notes.

The RFI and RFP can include requirements for the entire process, including securing data from existing repositories and systems and aggregating data in a single location for reporting and performance analytics. The community can assess what data elements are needed for identified outputs it will report on as well as preferred terminology, language, or coding (e.g., ICD-9) formats for reports and other outputs. The Greater Cincinnati Beacon Collaboration (Ohio) and Crescent City Beacon Community (Louisiana) clinical data repository (CDR) RFPs are included as Appendix C and Appendix D for reference. Both Beacon Communities used similar strategies to conduct final vendor selection, providing detailed process questions for vendors to answer as well as specific use cases for which the vendors proposed a solution. In the selection process, an interdisciplinary group of reviewers provided an analysis of the vendors' responses to determine which ones could best meet the needs of the community.

When assessing the community needs, the Beacons considered the end users as well as the managers, to ensure optimal usability for all parties. Through a comprehensive and thoughtful assessment of the current systems and technologies in place, the Beacons were able to identify the most efficient and cost-effective approach and IT application.

Greater Cincinnati Beacon Collaborative Clinical Data Repository RFP Sample Vendor Requirements

- Ability to store data from a wide variety of sources, including bidirectional interfaces
- Experience developing and implementing CDRs and the solution's suitability for an HIE to serve communities with large patient and physician populations and data from numerous EHRs and organizations
- Experience developing and implementing Financial Data Repositories, including payer claims and reimbursement, practice or hospital billing data, and operational data
- Experience developing, implementing, and using messaging and interoperability standards, such as Health Level Seven International
- Experience developing and implementing semantic normalization and using standard clinical code sets
- HIPAA and HITECH requirements compliance
- Experience developing and implementing secure service oriented architectures to provide bidirectional interfaces to data
- Options for querying or extracting data
- Integration with proposed solution with third-party Master Patient Index systems and Master Provider Index systems.

3.2 Determine data repository functionality and scope requirements

Successful population health measurement is dependent on the availability of comprehensive, high-quality data from data sources across a community. Generally, there are two main approaches to collecting the data necessary to support the required outputs: (1) a centralized model where data from across the community is aggregated into a single CDR or data platform, which can then be used to feed various analytics tools; and (2) a decentralized model[16] where ad hoc data extraction from data sources is done as needed for specific queries. This section will focus on the centralized approach, which was the preferred approach for the Beacon Communities.

Build a data platform to process and analyze data

A common strategy across the Beacon Communities was to use a CDR as a foundation to aggregate data from a variety of clinical sources. A common CDR functionality is to import data from the original data source to a data structure or platform to perform data cleaning and mapping; this information can then be used for data analyses. Building a CDR requires an iterative approach to determine functionality and scope requirements.

Exhibit 8 includes common CDR data aggregation challenges, along with potential causes. The following information can assist in the development of a CDR project. In a centralized approach, there is often a more rapid response as the data is in a single location, though this is often the most expensive approach, with much of the cost required upfront. In a decentralized approach, there is a smaller amount of data available through any one system.

Exhibit 8: CDR Data Aggregation Challenges

Challenge	Potential Causes
Inadequate data quality	• Differences in EHR standards • Various ways in which EHRs are used for clinical workflow • Level of data required by statistical matching models • Differences in data entry practices within and across EHRs • Differences in the manner in which data elements are coded (e.g., ethnicity coded as numbers versus words) • Inconsistencies in data usefulness, including different dummy codes or terms used by different providers to designate particular types of data (e.g., 000-00-0000 used to designate patients without a social security number) • Issues with data concatenation during transmission from EHRs to HIEs • Issues with data element completeness
Competing clinical priorities	• Varying priorities and goals for data collection between clinicians and practices • Lack of current alignment to drive priorities, goals, and outcomes of population health analytics
Analytic model transparency	• Clinicians, administrators, and IT personnel must have insight into health analytic models being used to generate reports to expand their ability to collect and provide appropriate data
Data governance	• Unclear or nonexistent data oversight, management and ownership policies
Privacy and security	• Inadequate security procedures and protocols that prevent patient data access and extraction or the transmission of data needed to perform comprehensive population management

Create data architecture charter to document needed scope and functionality

A data architecture (or data platform) charter can document expectations of community stakeholders and data requirements and scope. The charter can include sections, such as:

- Description of the analytics project
- Project objectives

- Estimated timeline
- Planned milestones
- Acknowledged risks

The charter can also include functional requirements and scope of the data architecture, which may include the ability to:

- Support complex access authorization matrix to protect patient information
- Merge and unmerge data to accurately identify patients
- Easily access various authorized data sets for reporting and analytics requirements
- Be scalable and cost-efficient.

The process of developing and defining a project charter can help ensure that the data platform will meet the community objectives and needs.

Document technical infrastructure needed to enable data platform scope and functionality

Beacon Communities also created detailed technical infrastructure descriptions to frame the specific working requirements of their data platform. This provided the opportunity to determine the best approach to building the infrastructure and architecture and aided in the selection of vendor and technology platforms.

The Beacons balanced their immediate goals and needs against the long-term objectives and plans—in one case, acknowledging that a chosen technology may not have the ability to grow with the community, either in scope or in number of partners. In this case, the community recognized that standing up a potentially short-term solution was the best and most cost- effective approach given its project objectives and timeframes.

Southeast Minnesota Beacon Community CDR Charter Overview

Requirements

- Correlate patients, students, and PH cases
- Identify and anatomize patient access
- Merge and unmerge patient EMR data to accurately identify patients for clinical care
- Support complex access authorization matrix to protected patient information
- Access to various authorized data sets for reporting and analytics requirements
- Secure, audited, scalable, and cost-efficient

Functionality and Scope

- Aggregation of the following patient health information
  - Patient demographics (including ZIP code and age)
  - Vital signs (including blood pressure measurement)
  - Laboratory findings
  - Immunization records
  - Tobacco use documentation
  - ED visit information from current procedural terminology coding or visit codes
  - Any additional metrics deemed in scope by Beacon Governance
- Patient cross correlations provided by Regenstrief
- Submission of patient clinical information to provider population health solutions from Regenstrief-based repository

3.3 Build and implement analytics capabilities to support measurement goals

The ability to extract, transmit, and import data is essential for the IT solutions to conduct successful population health data analytics. Though full HIE is not required, the ability to exchange data is necessary for community stakeholders to be able to use the data from disparate organizations and data sets. Performing testing first will ensure that each of the partners can work across the same vendor product or technology platform to interface with or extract data to or from the platform. The community should require data contributors and the vendor to adhere to specific data standards then establish a quality assurance process for all components. In addition, the Beacons established processes to continually monitor progress and be able to resolve issues as they arose.

While reviewing the architecture and conducting the interface or data import testing, the lead implementers should also consider what additional data sources might be needed in the future to create reports articulated in the community goals. This includes reviewing the processes for acquiring the additional data, for example, whether the current platform can work with the additional data source

and what might be required to acquire the information. Each assessment will continually review potential future needs, so the community can continue to build upon its technical abilities.

Once the community's lead implementers and the vendor have agreed to a detailed statement of work (SOW) based on the preceding architecture and analytics review, the vendor can begin to build out the desired systems architecture. Throughout the process, the lead implementers should work with the vendor to ensure the system can draw the appropriate levels of data (e.g., practice and community-wide) and be able to validate the data within the system, ultimately creating the agreed-upon reports and outputs. The lead implementers should work with the vendor at this stage to ensure the outputs and analytics used are in line with the community's needs as well as in compliance with the SOW.

The lead implementers should also work closely with IT subject matter experts and the vendor to develop a set of specific measures against which to internally test the tool and the data fidelity. While conducting initial pre-pilot trials to test the tool, the community should consider what adjustments to the analytics capabilities or the data capture techniques might be necessary. These initial testing opportunities will lay the foundation for a subsequent pilot testing among selected community partners.

3.4 Conduct pilot to test a limited data set to prove proof of concept

As part of the final process, conduct a pilot test of the technology solution and process to ensure all objectives of the CDR defined in the charter are met. It is through this testing that stakeholders and a selected group of testing end users can determine if report formats or data included need to be modified or if additional reports would be useful or necessary to include.

A pilot would include a small group of end users across the community to ensure the end users are able to easily access the tools needed and the data and analytics outputs work well in their daily environment. Stakeholders should be reviewing throughout to ensure the entire process is practical across the partners and from a tools management perspective.

Through pilot testing and subsequent analyses, the next step is to assess what alterations to the planned output or reports should be made. For example, during the pilots, managers or end users may find some reports can be combined, eliminated, or new ones created. Using this small test of change through the pilot and reviewing pilot test findings, the implementation team can work with the vendor to determine how these additional analytics needs could be met (e.g., accessing new data, incorporating a new analysis approach in the tool). To ensure that changes can be made to the analytics and reporting capabilities in progress, a community could include a clause in vendor contracts that these additions or modifications can be implemented during development.

Colorado Beacon Consortium: A Crimson Care Case Study

The Colorado Beacon Consortium has focused on achieving fundamental, sustainable change in the delivery of health care within their community. To enable providers to take a more complete approach to patient management, elevate their care team performance, and support the long-term ambition of comprehensive HIE, the community implemented the Advisory Board's Crimson Care Registry (CCR).

The CCR helps primary care physicians address not only the acute needs of patients but also important elements of chronic care management and preventive care by offering longitudinal monitoring capabilities that allow providers to easily understand and identify a population's needs. Unlike tools, such as Archimedes IndiGO, the CCR does not assess risk. Instead, the tool tells a practice what each patient needs, identifies gaps in care and highlights what information needs to be discussed with the patient.

The phased rollout of the program began with physician-led focus groups to determine standardized guidelines. Practices were then grouped into three levels based on technical competency and readiness for adoption. Colorado focused intensively on physician engagement, promoting a common vision of how the tool could improve care and developing comprehensive workflow maps to build understanding of how to incorporate the tool in care delivery. The ongoing feedback phase consisted of stakeholders signing off on the completion of each practice launch and the development of a physician satisfaction survey measuring the success of the individual practice rollout.

Colorado's deployment of CCR has incorporated data from across the community using Quality Health Network, the regional HIE platform. This infrastructure captures key clinical information, including hospital data, ancillary services data, patient data, and physician practice data and imports into the CCR, improving the tool's effectiveness.

Implementation Objective #4: Continuously Monitor and Improve Data Quality

Data quality monitoring, within organizations' IT systems and across the aggregated data repository environment, is a continuous process to ensure that data used for population health measurement is reliable, accurate, and actionable. Many of the Beacon Communities developed programs to work with health care practices to improve data quality, driven by an interest in accurately representing clinical performance and facilitating quality improvement. Community and practice leadership may set the expectation that ongoing data quality monitoring will be institutionalized as their way of doing business. Over time, goals may change and new measures may be selected to monitor progress in meeting new or revised population health goals, underscoring the need for ongoing data quality monitoring and improvement. The following are considerations for ongoing data quality monitoring and issue resolution:

1. Create shared community resources to identify and resolve data quality issues
2. Create and document policies that explain data quality issue resolution processes
3. Determine feedback mechanisms to data sources.

4.1 Create shared community resources to identify and resolve data quality issues

Data quality can be reviewed at the community level to identify issues that may be occurring across data sources in the community. For example, there can be a shared, centralized resource used to review data quality practice by practice to identify those that may have data quality issues. This shared resource would include staff that has experience and expertise in working with clinical data and resolving quality issues. Once practices with potential issues are identified, resources can be directed to those practices to assist and support their efforts to resolve the causes leading to the issues. Use of shared resources can facilitate the efficient use and deployment of resources to resolve issues that have the greatest impact on data quality and the ability to accurately measure population health.

As organizational and community population health goals grow and shift, data sources may need to supply different data to produce additional performance reports that depend on high-quality data. The data quality reviews can be ad hoc and simultaneous with population health quality and cost measure report updates or can be on a scheduled review timeline. Organizations with multiple practices may need to sequence reviews according to the number of sites and available resources. Data sources need to be educated on the data quality monitoring process so that they understand the timelines and expectations following feedback on data quality issues.

A couple examples of ongoing data monitoring approaches include—

- Closely examine measure results for practices across the community (i.e., population health clinical and cost measures) on a regular schedule, examine for outliers, inconsistencies, and unexpected patterns and results
- Onsite walkthroughs with staff to observe workflow and documentation practices.

As mentioned, a key benefit of community-led data quality improvement activities is the ability to pool resources used to support ongoing monitoring (e.g., monthly, quarterly) of data quality and production of reports for practices that identify data issues. Communities were better able to maintain high-quality

data when they committed dedicated personnel to provide ongoing monitoring to ensure that data review processes are standardized and comprehensive across data sources.

Practices should maintain an ongoing line of communication with their EHR vendor. In addition to ongoing issue resolution, software releases present both opportunities and challenges. Practices may need help installing upgrades as well as understanding how best to use new functionality to improve data quality.

4.2 Create and document policies that explain data quality issue resolution processes

Issue resolution approaches that communities identify through ongoing monitoring will vary according to the scope and nature of the problem (e.g., an individual user struggling with documentation versus a large organization struggling with standardization across departments). Policies may outline how issues will be triaged, who will review and prioritize the list of issues, who will work on resolving them, and how the resolutions will be released to staff or to the live system. Policies could also provide answers for the following scenarios:

- If the issue relates to an organization-wide problem, who will coordinate and facilitate the resolution process across stakeholders?
- If making a technical fix, how long will it take? According to the usual release process? Ad hoc?
- If changing a workflow or user screens is required, how will staff be trained? Online? Tip sheet? At the elbow?
- If an individual user resists recommended solutions, what is the escalation path?

Some issues may not be recognized immediately or even through pilot testing—others may require communities to develop a workaround with the vendor and community partners. For example, in the Southeast Minnesota Beacon Community, stakeholders recognized that when capturing pharmacy and prescription medication data from patients, the analytics tool could not recognize the comparative data in its own specific coding; though the coding issue was never resolved, the community was still able to work with the data as desired. With another potential issue, the community and the vendor worked closely to create and develop the infrastructure required to ensure that patients' preference on inclusion in research was recognized according to state law.

See the Learning Guide "Capturing High-Quality Electronic Health Records Data to Support Performance Improvement" for additional detail.[17]

4.3 Determine feedback mechanisms to data sources

An important aspect of maintaining high-quality data is to develop feedback channels to the data sources through which to deliver data quality monitoring and improvement progress reports. Data sources will need to know where outliers, errors, or other potential discrepancies exist in their data so they know where to focus their corrective resources (e.g., clinical processes and workflow). Data sources also need ongoing feedback on performance to track their success in resolving specific issues. It is important to recognize improvements in data quality and performance to maintain engagement and the investment with the health care provider team. See the Learning Guide "Capturing High-Quality Electronic Health Records Data to Support Performance Improvement" for additional detail.[18]

Implementation Objective #5: Develop and Implement Reporting on Population Health Measures

The fifth Implementation Objective involves creating reporting tools and templates to be distributed to stakeholders and creating processes that allow appropriate access to data and reports. The report development process should be driven by the community's population health measurement goals (i.e., the reports should include reporting on the measures the community agreed upon during the goal-setting process). The following is a detailed discussion of the steps, including:

1. Distribute standard vendor reports and customized report prototypes for feedback on design and content
2. Determine report access points and levels and provide training
3. Finalize report delivery frequency, methods, and recipients.

5.1 Distribute standard vendor reports and customized report prototypes for feedback on design and content

Most communities and practices will have two types of reports to consider for their purposes: (1) standard off-the-shelf reports that come as part of the vendor solution and (2) customized reports tailored to community preferences. Communities and practices can also incorporate in contracts creating reports and any training on available reports to be deployed to community stakeholders. Feedback sessions, either in-person or virtual, can allow users to learn about standard report structure and content. Users can provide feedback on the usability and utility of the reports directly to the vendor. The vendor may be able to tweak the standard report to satisfy user needs and preferences or necessary report revisions may be substantial enough to warrant the creation of customized reports. The vendor evaluation and selection process may consider the vendor's ability to respond to requests for standard report revisions or creation of customized reports and associated costs.

Vendors can create customized report prototypes that include aggregated information and then distribute to key individuals across the stakeholder audience for feedback on the design and content. Soliciting feedback from report users is critical to ensuring that the reports provide the information that users expect and need and are at the right level of detail and unit of measurement needed to make informed decisions. User feedback can be obtained in a number of ways, including:

- **Email.** Report prototype reviewers can email feedback to report development managers.
- **Questionnaire.** Report development managers can create a questionnaire that includes specific questions for reviewers to guide the review and type of feedback received.
- **Online or webinars.** Report development managers can conduct webinars where they orient the reviewers to the content, structure, and organization of the report and receive live feedback.
- **In-person forums.** Some communities may prefer to hold in-person review meetings for tradition, cultural, or political reasons. Facilitators can solicit feedback from reviewers during these forums.

Depending on the community's population measurement goals and the established partnerships and DUAs in place, reporting and data access may include patient-level data or aggregated de-identified information only or both. To maximize the utility of the reports to the end users, a community may allow reporting at multiple levels. This way, information obtained at an aggregate level can be parsed into finer units of measurement to allow detailed analysis that informs targeted resource deployment and program design.

Aggregate reporting

Communities can develop reports to provide aggregated information on population health measures that are disseminated to a broad audience. As noted in the PCIP example, many patient privacy and confidentially concerns are alleviated with aggregated, de-identified reporting. For example, if a community goal is that 90% or more of patients with diabetes within the community achieve the D5, reports can show performance at a city level, a community level, or at a neighborhood level. The report may also parse data by race or ethnicity, gender, age group, and language spoken, as long as the number of patients within each stratus is large enough so that no individual patient's identity can be inferred or recognized.

Another key consideration with aggregate reporting is whether an individual provider's performance information is included in reports. Beacon Communities consistently note that aggregate reporting did not included individual provider information. Information was submitted at a practice level, organization level, or only at a community level, for example. Reporting was also done by patient type (e.g., patients with diabetes) but only when an individual provider's performance could not be deduced. However, as providers became more comfortable with sharing their information, they became more confident in the data reliability and validity and analytics methodologies.

Detailed reporting

For aggregate reports to be useful and actionable, systems must support detailed analysis that informs targeted resource deployment and intervention design. To continue with the example introduced previously, although an aggregate report for a community may show a 75% achievement rate for the D5, there may be wide variation in performance among the practices within the community, ranging from 50% to more than 95%. Providing more detailed reports can highlight those practices with the lowest performance scores and facilitate the design and implementation of effective interventions based on the unique characteristics of those practices and the patients they serve.

Greater Tulsa Health Access Network Deploys Archimedes' IndiGO

A goal of MyHealth Access Network, established by the Tulsa, Oklahoma, Beacon Community, is to improve the delivery of preventative services, such as breast cancer screening and immunizations. Serving 11 counties in Northeastern Oklahoma, the Tulsa Beacon has 1,200 participating providers who serve more than 1,100,000 patients. To support their efforts, Tulsa was in need of a physician and patient decision support tool. The MyHealth Access Network implemented the Archimedes' IndiGO platform across its region to enable physicians to provide their patients with timely, personalized information about their own risks of diabetes, heart disease, and cancer.

IndiGO provides clinicians and patients with information about the relative impact that various activities could have on reducing risk, such as losing weight or quitting smoking. Physicians and patients will be able to use the tool together to establish a plan tailored to each patient's health conditions and goals. Patients will have access to a printed plan of action that they can leave the physician's office with and can follow daily. IndiGO could ultimately be used by physicians to work with their patients to inform the health decisions of as many as 810,000 Oklahomans. The IndiGO tool will enable health care professionals to sift through the enormous volume of health care data on each patient to focus on what is most important.

5.2 Determine report access points and levels and provide training

Detailed information at the patient level is needed to identify those who are not receiving care according to evidence-based medicine or whose health outcomes are below set goals or standards. Access to identifiable, patient-level data should be restricted to those individuals (e.g., physicians, clinical support staff, and care managers) who are directly involved or support those directly involved in patient care. While a community may decide stakeholders across the community can access aggregate reports, it will need to identify specific individuals who can access more restricted, HIPAA-protected patient information. There will need to be clear protocols established on what individuals with advanced access can do with the patient data they have access to. Protocol restrictions may include—

- **Physician-directed retrieval only.** Individuals should only access restricted patient data when directed by a physician or physician designee.
- **Data elements.** Even individuals with access to restricted data may not need to have access to all data elements collected for patients. Access may only be needed for certain patient data, such as diagnosis, visit history, name and address, and phone number. Access may not be needed for other information, such as medications, procedures, payer source, or problem lists.
- **Data handling.** There should be clear procedures for what can be done with the restricted data once accessed. This may include whether and where the data can be saved (e.g., only on specific computers or hard drives within the walls of the practice, must be password protected), how it

can be transmitted others (e.g., no hard copies, electronic transmission only), and to whom it can be transmitted.

- **Data lifespan.** This relates to how long the data can be kept saved or possessed by any individual and when and how it should be destroyed.

Each community and each practice will need to determine access points and levels based on its unique improvement goals, quality improvement and clinical intervention approaches, and the agreements in place that provide the parameters for data access and exchange.

Create a training strategy

Training aggregate and detailed report users as well as those with restricted data access will help ensure reports are informative and actionable and patient confidentially is protected. This is another area where conducting a small-scale pilot can be useful. Train a small group of users and gather feedback to inform larger scale deployment of training across practices in the community.

An important consideration to address is where to obtain resources to train staff on appropriate access to restricted data, procedures to generate reports, and interpretation of reports. Three questions may help resolve this issue:

1. **Should current staff be trained (train the trainer)?** Are resources available (either through Regional Extension Centers, a third-party vendor, or other community resources) that a current staff member (or multiple staff for larger practices or community-wide initiatives) can receive so that they can then train other staff within the practice or community? How much would this approach cost? How long would it take to train staff within all practices? Practices can also bring in their EHR vendor for a short refresher that reinforces optimal workflow and configuration to streamline provider documentation.
2. **Should additional staff be hired?** Would it be more efficient and cost-effective to hire outside expertise that can quickly be deployed across practices to train staff? Will additional staff be needed over a longer term (1 year or more) to train practice staff? Outside staff can also be hired at the community or practice level to run reports and then report back to clinical staff. (Hiring additional staff will generally only be feasible for larger practices or communities with multiple stakeholders.)
3. **Should training be outsourced?** Can community resources with appropriate expertise be cost-effectively acquired to efficiently train staff across a larger number of practices? Does the community have the resources to hire outside expertise?

5.3 Finalize report delivery frequency, methods, and recipients

A key step in population health measurement is to determine performance reports distribution channels, reporting frequency, and report recipients. Report generation can be either automatic or ad hoc, or both, depending on the needs and sophistication of the community. The report recipients are the ultimate users of the information, and standardized processes can be created to ensure recipients receive reports consistently and in a timely manner. Key aspects of the finalized report delivery frequency, methods, and recipients include—

- **Report Recipients.** It is essential to identify the correct stakeholders to receive the reports. These individuals may be chief information officers, data champions, community and practice leaders (e.g., clinical leaders, finance leaders, administrative leaders), or IT and data management staff (or, for small practices, someone identified to assume this role). Individuals receiving the reports should at least include decision-makers and those directly involved in managing patient care and population health.
- **Report Delivery Mechanism.** Audience needs should determine how reports are delivered. For instance, if recipients can and prefer to receive reports electronically (i.e., by email or via an electronic interface), a process could be designed to deliver reports in that method (if not, this is not a cost-prohibitive option).
- **Report Frequency.** Establishing a report delivery schedule helps practices know when to expect reports. Delivery frequency depends on several variables, such as recipient preferences, resources required and available to produce reports, and urgency to receive performance feedback.

Looking Ahead

Population health measurement and analytics are essential for a future health care system that provides necessary, timely, and appropriate care to patients, particularly to patients currently living with or at risk for developing chronic conditions. A strong value proposition supported by a payment environment that rewards proactive, coordinated care will help to overcome implementation barriers of these tools. To date, research has demonstrated that effective interventions can be targeted using process-of-care data for patients who have one or more chronic conditions, such as diabetes and cardiac disease. There is still a need for continued demonstration of these interventions on broader patient populations, such as those living with depression.

One of the main considerations of data sharing is trust, for both patients and providers. Patients need to have trust in their provider while providers, having the legal and personal obligation to their patients, need to trust the policies and data systems. Further education and outreach are needed to ensure that HIPAA requirements are well understood to encourage robust data exchange under appropriate privacy and security requirements.

Cloud-based architecture is emerging as a useful application for health care organizations in managing population health. Data stored in cloud-based architecture allows organizations the flexibility in accessing and maintaining data. Hospital centers are finding the data storage volume expanding with the need to store an expanding archive of medical images and with advances in screening technologies. It is becoming less cost-efficient to manage, cool, and expand data centers than it is to put the data into the cloud. Especially with the need to aggregate data from EHR technologies in population health management, the cloud is becoming a favorable data storage method.

Four sample Beacon Community experiences in using IT to advance population health management are summarized in the following section, including:

1. Using IT to incorporate population health data into clinical workflow
2. Using IT to track patient outcomes across time
3. Using IT to identify high-risk Medicaid patients and those with chronic conditions
4. Using IT to manage care transitions.

Colorado Beacon Consortium Uses IT to Incorporate Population Health Data into Clinical Workflow

Working with the Advisory Board, Colorado has developed the CCR, a multiple provider registry that supplements data collected through the EHR to bring population health data and analytics closer to clinical workflow. The CCR allows providers and HIE administrators to record data on patients seen within Colorado and provides integrated alerts and clinical recommendations via the EHR at the point of care. As a population health management tool, it generates reports on overall population health and creates lists of patients who could potentially benefit from additional interventions.

Greater Tulsa Health Access Network Beacon Community Uses IT to Track Patient Outcomes Across Time

Tulsa has implemented Pentaho, a data visualization and business analytic platform to identify trends in patient outcomes. This tool can be used to analyze trends over time and provides a number of interface options for communicating information to clinical teams and public health officials. The array of tools available in Pentaho provides access to a variety of customizable reports, graphs, and other analytics. Pentaho is used to drive hypothesis testing by local teams by providing a set of defined algorithms to visualize whether interventions are more or less effective than alternatives. They also build off the pre-populated set in the tool to examine new hypotheses in a visual framework rather than engaging more comprehensive modeling.

Southern Piedmont Beacon Community (North Carolina) Uses IT To Identify High - Risk Medicaid Patients and Those with Chronic Conditions and Manage Care Transitions

Southern Piedmont has deployed the Treo population health analytics tool to better serve Medicaid beneficiaries who have chronic health needs and would benefit from more active disease management. The Treo tool identifies high-risk patients and provides clinicians with information they might need to intervene. The Treo reports are largely driven by health care utilization data (i.e., claims data) and help identify patients that may be over- or under-utilizing services based on their conditions. The system brings those individuals to the attention of a member of the care team.

The Community Care of North Carolina (CCNC) uses the Treo tool with stakeholders within the system to employ the tool for their organization's needs. As patients move through the care management system, Treo reports disparities in care, particularly among patients experiencing changes in care due to an admission, discharge, or transfer. Disease management teams receive regular reports generated by the CCNC Treo system; however, there is little formal interaction with the tool among care providers.

New technologies hold the promise to advance population health measurement by enabling the linking, aggregation, and integration of data from across the community and care continuum. Analytics can then be performed on these combined, cleansed data sets to assess the impact of the care delivery system and public health activities on the overall health and well-being of communities and populations of patients. These data sets can also be used to identify the social, environmental, behavioral, and demographic determinants of health for specific populations.

Appendices

Appendix A: Sample Crescent City Clinical Scenarios

Scenario 1: Emergency Department Notification and Discharge Summary (Draft)

Description: Provider discharges a patient from Emergency Department (ED) to patient's Primary Care Provider (PCP) and Community Integrator updates the ED and PCP's electronic health records (EHR) systems to reflect transition of patient care from Emergency Department setting to Primary Care Clinic (PCC).

Assumption: Patient consent for data sharing is obtained.

Risks:

- Identification of the message recipient (identification of PCP or PCC)
- Identification of patient who has no SSN

Flow of Events:

Step #	Setting	Actors	Systems	Event/Description	Inputs	Outputs
1.1	ED	ED Registration Staff	ED EHR System	Register patient into ED's EHR	**START**	Demographic Chief Complaint
1.2			ED EHR System	Trigger generation of ED electronic notification (ADT)	Demographic Chief Complaint	ADT
1.3			Community Integrator	Identify patient's PCP		List of patient's PCP(s)
		ED Registration Staff	Community Integrator	Select patient's PCP to send the notification to ***Note: Selecting PCP automatically requires rules to determine the PCP if there is more than 1 PCP identified.***	Selection of PCP to send the notification to	Confirmation of PCP to send the notification to
1.4			Community Integrator	Send ED electronic notification to PCC's EHR	ADT	ADT

Step #	Setting	Actors	Systems	Event/Description	Inputs	Outputs
1.5	Primary Care Clinic		PCC's EHR	Receive ED electronic notification	ADT	ADT
1.6		PCP and/or Designated Care Team Member	PCC's EHR	View ED notification	ADT	**END**

Exception 1: If PCC prefers to receive notification about patient's visit to ED after the patient is discharged, then steps 1–6 do not apply.						
Step #	**Setting**	**Actors**	**Systems**	**Event/Description**	**Inputs**	**Outputs**
1.7	ED	ED Provider	ED EHR System	Prepare ED discharge summary	**START**	ED Discharge summary[1]
1.8		ED Provider	ED EHR System	Sign off ED discharge summary	ED Discharge summary	ED Discharge summary
1.9			Community Integrator	Send ED discharge summary to PCC's EHR	ED Discharge summary	ED Discharge summary
1.10	Primary Care Clinic		PCC's EHR	Receive ED discharge summary	ED Discharge summary	ED Discharge summary
1.11		PCP and/or Designated Care Team Member	PCC's EHR	View ED discharge summary	ED Discharge summary	**END**

Requirements

Req #	Requirements
1.1	The solution shall provide the ability to transmit automatic electronic notification alerts and discharge summary from ED to the selected PCPs or designated staffs
1.2	The solution shall provide the ability to identify PCPs visited by the patient in the past **X** period of time
1.3	The solution shall provide the ability to display all identified PCPs along with the date of patient encounter with PCPs in the past **certain(?)** period of time
1.4	The solution shall provide flexible methods of message delivery (e.g. secured email, directly to EHR, etc.)
1.5	The solution shall provide the ability for PCPs or their designated staff to approve/disapprove integration of messages into their EHRs (for notification and discharge summary delivered directly into EHR)
1.6	The solution shall provide the ability for users with appropriate privileges to create rules for the ED notification and ED discharge summary (e.g. select who the notification/discharge summary will be sent to/received by, select method(s) of alert delivery, define how soon the message should be published, etc.)
1.7	The solution shall provide the ability for ED provider (or other designated ED user) to select PCPs or their designated staffs whom the ED notification and discharge summary will be sent to
1.8	The solution shall provide the ability to automatically route and store a copy of each notification and discharge summary into the Clinical Data Repository
1.9	The solution shall provide the ability to configure exception 1 at the clinic level

Scenario 2: Inpatient Notification and Discharge Summary (Draft)

Description: Provider discharges patient from Inpatient setting (IP) to patient's Primary Care Provider (PCP) and Community Integrator updates the IP and PCP's EHR systems to reflect transition of patient care from hospital's IP setting to Primary Care Clinic (PCC).

Assumption: Patient consent for data sharing is obtained

Risks:

- Identification of the message recipient (identification of PCP or PCC)
- Identification of patient who has no SSN
- Length of time in completing discharge summary at the Inpatient setting (place holder for how soon the discharge summary should be sent and/or how often the discharge summary should be updated)

Flow of Events:

Step #	Setting	Actors	Systems	Event/Description	Inputs	Outputs
2.1	Inpatient	IP Provider		Admit patient into inpatient	**START**	Demographic Diagnosis
2.2			Hospital's EHR System	Trigger generation of electronic notification (ADT)	Demographic Diagnosis	ADT
2.3			Community Integrator and ED EHR System	Identify patient's PCP		
2.4			Community Integrator	Send IP electronic notification to PCC's EHR	ADT	ADT
2.5	Primary Care Clinic		PCC's EHR	Receive electronic notification	ADT	ADT
2.6		PCP and/or Designated Care Team Member	PCC's EHR	View notification	ADT	**END**
2.7	Inpatient	IP Provider	Hospital's EHR System	Prepare IP discharge summary	**START**	IP Discharge summary[1]

Step #	Setting	Actors	Systems	Event/Description	Inputs	Outputs
2.8	Inpatient	IP Provider		Sign off IP discharge summary	IP Discharge summary	IP Discharge summary
2.9			Community Integrator	Send IP discharge summary to PCC's EHR	IP Discharge summary	IP Discharge summary
2.10	Primary Care Clinic		PCC's EHR	Receive IP discharge summary	IP Discharge summary	IP Discharge summary
2.11		PCP and/or Designated Care Team		View IP discharge summary	IP Discharge summary	**END**

Requirements:

Req #	Requirements
2.1	The solution shall provide the ability to transmit automatic electronic notification alerts and discharge summary from IP to the selected PCPs or designated staffs
2.2	The solution shall provide the ability to identify PCPs visited by the patient in the past **certain**[2] period of time
2.3	The solution shall provide the ability to display all identified PCPs along with the date of patient encounter with PCPs in the past **certain** period of time
2.4	The solution shall provide flexible methods of message delivery (e.g. secured email, directly to EHR, etc.)
2.5	The solution shall provide the ability for PCPs or their designated staff to approve/disapprove integration of messages into their EHRs (for notification and discharge summary delivered directly into EHR)
2.6	The solution shall provide the ability for users with appropriate privileges to create rules for the IP notification and IP discharge summary (e.g. select who the notification/discharge summary will be sent to/received by, select method(s) of alert delivery, define how soon the message should be published, etc.)
2.7	The solution shall provide the ability for IP provider (or other designated IP user) to select PCPs or their designated staffs whom the IP notification and discharge summary will be sent to
2.8	The solution shall provide the ability to automatically route and store a copy of each notification and discharge summary into the Clinical Data Repository

Scenario 3: Break-the-Glass (Draft)

Description: A patient shows up unconscious in the Emergency Department, and the ED provider needs to have access to his health records. Break- the-Glass provision is executed to give the ED provider a temporary access to the patient's health record in the data repository.

Assumptions:

- Patient is unable to provide consent.
- ED provider has sufficient permissions to execute break-the-glass provision (override consent directives).
- Only patient entries that have associated medical records available on the data repository will be displayed.

Risks:

Flow of Events:

Step #	Setting	Actors	Systems	Event/Description	Inputs	Outputs
3.1	ED	ED Providers	Community Integrator	ED provider searches for patient records	**START**	Patient available records and consent status displayed
		Note: If patient's consent is opt-in, no break-the-glass necessary; flow of event stops here and ED provider can access patient's records				
3.2			Community Integrator	Community Integrator notifies ED provider that patient consent is opt-out		Opt-out selection displayed
3.3		ED Providers	Community Integrator	ED provider assesses situation to decide if breaking-the-glass criteria are met		
3.4		ED Providers	Community Integrator	ED provider selects patient record/ record	Patient records selection	
3.5		ED Providers	Community Integrator	ED provider indicates his or her relationship with the patient	Selection of relationship	Relationship selected
3.6			Community Integrator	Community Integrator records provider-patient relationship	Relationship selected	Relationship selected
3.7			Community Integrator	Community Integrator displays reasons for breaking the glass	List of reasons for breaking the glass	List of reasons for breaking the glass

Step #	Setting	Actors	Systems	Event/Description	Inputs	Outputs
3.8	ED	ED Providers	Community Integrator	ED provider select reason(s) for breaking the glass	Selection of reason(s)	Selection of reason(s) confirmation
3.9		ED Providers	Community Integrator	ED provider views the selected records	Patient records	Patient records
3.10			Community Integrator	Community Integrator sends break-the-glass alerts to Security Officer(s)	Alert	Alert sent
3.11		Security Officer	Community Integrator	Security Officer audits break-the-glass process	Break-the-glass audit and log	Break-the-glass audited and logged
3.12		Security Officer	Community Integrator	Security Officer notifies the patient that the break-the-glass has occurred on her or his records	Break-the-glass notification	**END**

Requirements:

Req #	Requirements
	The solution shall provide the ability to set up a specialized role with appropriate permission to break the glass
3.1	The solution shall provide the ability to perform a patient search on all patient records, regardless of patient's consent selection
3.2	The solution shall provide the ability to display patient demographics and consent status within the patient search results
3.3	The solution shall prevent a user from viewing the list of clinical records available for patients with an opt-out status
3.4	The solution shall provide the ability for appropriate users to override a patient's consent selection by breaking the glass
3.5	The solution shall prevent users from breaking the glass if he or she does not appropriate privilege to break the glass
3.6	The solution shall provide the ability configure the break-the-glass reason list
3.7	The solution shall prevent users from breaking the glass if he or she does not provide a reason for breaking the glass
3.8	The solution shall provide the ability to configure and maintain a list of security officers/contacts
3.9	The solution shall send an automatic alert to the security officer for each break-the-glass event
3.10	The automatic alert to the security officer shall include the following info: Data of Event, Patient ID, Provider ID, Break-the-Glass Reason(s)
3.11	The solution shall provide a communication mean for security officers to notify patients about break-the-glass event executed on their records

Appendix B: Sample Beacon Community Data Use Agreement

Data Share

This Beacon Data Use Agreement is by and between the [Beacon Community Entity], [a/an] [State] not-for-profit corporation located at [address] and XXXXXX, [a/an] [State] not-for-profit corporation with principal offices at, [address], ("Hospital").

RECITALS

1. [BEACON COMMUNITY ENTITY] has been awarded a grant by the U.S. Department of Health and Human Services, Office of the National Coordinator for Health Information Technology ("ONC") funding three demonstration projects for the purpose of determining how to improve health care quality and costs with respect to pediatric asthma and adult diabetes patients ("Beacon Demonstration Projects").

2. Specific physician practices have been identified and have agreed to participate in the Beacon Demonstration Projects ("Beacon Practices") with respect to their patients who have been diagnosed with pediatric asthma in exchange for: (1) the provision of certain patient information, specified herein, which will aid in the treatment of their patients; and, (2) data aggregation and analysis services for quality assessment and improvement purposes.

3. The improvement initiatives proposed as part of the Beacon Demonstration Projects include the provision of Admissions, Discharge and Transfer data to the respective Beacon Practices when patients under their care are treated at a Hospital emergency department or an urgent care facility, or are admitted or readmitted to a Hospital ("Encounter Data"); and aggregation of Encounter Data to produce cost and quality metrics.

4. The Hospital data may contain Protected Health Information ("PHI") as defined in Health Insurance Portability and Accountability Act of 1996, as amended, including the American Recovery and Reinvestment Act of 2009 ("ARRA") and the Health Information Technology for Economic and Clinical Health Act ("HITECH"), and all implementing regulations (collectively "HIPAA").

5. HIPAA permits a Covered Entity, as that term is defined by HIPAA, to disclose PHI to another Covered Entity for the purposes of treating the patient. A Covered Entity may engage a Business Associate to disclose the PHI on behalf of the Covered Entity so long as a Business Associate Agreement has been executed between the Covered Entity and the Business Associate and the disclosure is in compliance with HIPAA. Further, HIPAA permits a Covered Entity to disclose PHI to its Business Associate to aggregate data belonging to multiple Covered Entities for the purpose of health care operations, including quality assessment and improvement activities of the Covered Entities. Hospital is a Covered Entity and [BEACON COMMUNITY ENTITY] is a Business Associate of Hospital, as those terms are defined in the

HIPAA Privacy Regulations.

6. [BEACON COMMUNITY ENTITY] has entered into a Business Associate Agreement with

Hospital under which the use of the Encounter Data is expressly limited. Under HIPAA, Hospital

may authorize [BEACON COMMUNITY ENTITY] to disclose the Encounter Data to the applicable Beacon Practices (which are also Covered Entities) for treatment or for quality assessment and quality improvement activities of the Beacon Practices provided the recipient has or had a relationship with the Hospital patient ("Shared Patients"). [BEACON COMMUNITY ENTITY] acknowledges and agrees that any data it discloses to the Beacon Practices for the purposes of quality assessment and quality improvement activities must meet the minimum necessary requirements of HIPAA.

7. Hospital desires to allow [BEACON COMMUNITY ENTITY] to disclose the Encounter Data to the Beacon Practices for purposes of treatment of the Shared Patients and to use the Encounter Data to aggregate and analyze the Encounter Data for the quality improvement initiatives described herein.

AGREEMENT

In consideration of the foregoing, and subject to the following terms and conditions, the parties to this Agreement mutually agree as follows:

1. Hospital authorizes the following in connection with the Beacon Demonstration Projects:

a. For purposes of treating the Shared Patients, Hospital authorizes [BEACON COMMUNITY ENTITY] to send notifications containing the Encounter Data to the applicable Beacon Practices when their Shared Patients, who have been identified by the Beacon Practices as having pediatric asthma, experience an emergency department encounter, an urgent care encounter, or a Hospital admission or readmission.

b. For the purposes of quality assessment and quality improvement, Hospital authorizes [BEACON COMMUNITY ENTITY] to aggregate and analyze the Encounter Data by physician practice for the Shared Patients, who have been identified by the Beacon Practices as having pediatric asthma and to provide the aggregated results to Hospital and the Beacon Practices.

c. Hospital authorizes resulting de-identified aggregated data to be provided to ONC on a quarterly basis.

2. Encounter Data will be used solely for the purposes described herein, and no further use will be made without the express written authorization by Hospital.

[BEACON COMMUNITY ENTITY] OBLIGATIONS

1. The Encounter Data used in the Beacon Demonstration Project will be housed by BEACON

COMMUNITY ENTITY in a secure environment. While under the control of BEACON COMMUNITY ENTITY, at all times, the Encounter Data will be kept confidential and secure, in compliance with the Security and Privacy Rules of HIPAA, as amended, and as provided in a Business Associate Agreement executed by the parties.

2. Ownership of Encounter Data provided by Hospital will at all times remain with Hospital.

3. The Encounter Data will be used solely for the purposes described herein, and no further use or disclosure of the data will be made without the express written authorization of [Hospital]. Any further use of the data for publication or research will be undertaken only upon satisfaction of appropriate regulatory compliance including IRB waiver or approval, as applicable, and express written authority of Hospital Practice.

TERM AND TERMINATION

1. This Agreement is effective beginning on the Effective Date and ending upon the expiration of the Beacon Demonstration Project, which is estimated to be September 30, 2013, unless terminated earlier in accordance with this Agreement.

2. If the term of the Beacon Demonstration Projects is extended, Hospital agrees to extend the term of this Agreement to allow the completion of the Beacon Demonstration Projects, provided that timely notice of the extension period is provided in writing to Hospital and written authorization of all parties is obtained.

3. Hospital may terminate this Agreement at any time upon thirty (30) days written notice to

BEACON COMMUNITY ENTITY at the address provided above.

MISCELLANEOUS

1. This Agreement will be governed by and construed in accordance with the laws of the State of [State's name] without reference to or application of its conflict of laws rules or principles.

2. Notices required or permitted under this Agreement must be in writing and shall be delivered by courier or certified mail, and, in each instance, will be deemed given upon receipt. All communications will be sent to the addresses set forth in the first paragraph above unless another address is specified in accordance with this paragraph. Notices sent to [Hospital] will be sent to the attention of XXXXXXXXX.

EFFECTIVE DATE

This Agreement is effective this [Date].

[Beacon Community Entity]. XXXXXXXXX:

By:_____ By:_____

Its_____ XXXXXXXXX:

Date:_____ Date: _____

Appendix C: Sample Greater Cincinnati Beacon Collaboration and Crescent City Beacon Community CDR RFPs

Introduction

The Greater Cincinnati Beacon Collaboration (GCBC) is a partnership of leading technology and quality experts from the following organizations: HealthBridge, Cincinnati Children's Hospital Medical Center, the Health Improvement Collaborative of Greater Cincinnati, Cincinnati Aligning Forces for Quality, the Greater Cincinnati Health Council, and the University of Cincinnati. The partners are committed to the following long-term goals: (1) achieving meaningful and improved health care quality, safety, cost efficiency, and reduced health disparities; (2) optimizing the use of secure common technologies for interoperable health information exchange; and (3) achieving optimal population and coordinated health care services through the use of electronic data and advanced EHR adoption.

Greater Cincinnati Beacon Collaboration has been awarded a Beacon Community Grant from the Office of the National Coordinator for Health Information Technology (ONC). This grant will allow GCBC to accelerate meeting these goals by enhancing its existing remarkable health information technology (HIT) and health information exchange (HIE) infrastructure in concert with the work of the Tri-State Regional Extension Center and together will prepare the entire region for advanced HIT/HIE capabilities including powerful real-time patient data drawn from across the continuum of care. GCBC will test its capabilities through two quality improvement initiatives including more than 60 physician practices focused on improving quality, efficiency, and population health objectives in the delivery of pediatric asthma and adult diabetes care. Through these two initiatives, the partner organizations will demonstrate improved quality of care, and decrease the cost of diabetes and asthma related health care.

Greater Cincinnati Beacon Collaboration Partners

The following partners comprise the Greater Cincinnati Beacon Collaboration:

- Greater Cincinnati HealthBridge
- Cincinnati Children's Hospital and Medical Center
- Greater Cincinnati Health Collaborative
- Health Improvement Collaborative of Greater Cincinnati
- Aligning Forces for Quality
- The University of Cincinnati
- GE Aviation

Purpose of the RFP

One of the identified infrastructure components that will enhance the existing community health information technology (HIT) and health information exchange (HIE) infrastructure is a Clinical Data Repository with advanced Business Intelligence and Data Analytics capabilities referenced collectively herein as a CDR/BI. HealthBridge has prepared and is releasing this formal Request for Proposal to assist

in the identification, evaluation, selection, and implementation of such a CDR/BI solution. Vendors may submit proposals for one or more of the CDR/BI solution components included in this RFP. These components include: 1) Transaction Repository, 2) Data Warehouse, 3) ETL Tools, 4) OLAP Cube Creation, and 5) Data Presentation Tools. The balance of this RFP will provide the relevant statistical and volume information, the functional requirements, contractual requirements, and other information needed by Vendors to prepare a concise, complete, accurate, and practical solution response to this RFP.

Statistics & Volumes

The following information is provided to assist the Vendor in properly scaling the proposed solution to meet the current and projected needs for HealthBridge.

Factor	Current	Future
Regional Population Served	2.3 Million	4 Million
# of Operational HIEs	5	7
# of Hospitals	29	70
# of Physicians	5700	7000
# of Physician Practices	750	1100
# of Commercial Labs	6	10
Total # of Annual Patient Admissions	1 Million	1.75 Million
Total # of Annual ADT records received	4.8 Million	6.0 Million
Total # of Annual Clinical messages received	36 Million	50 Million

Key Dates & Deliverables

- RFP released — May 10, 2011
- Vendor's Questions & Intent to Respond Due — May 20, 2011
- Written Responses to Vendor Questions Due — May 27, 2011
- Vendor's Proposal Due & Received at HealthBridge — June 17, 2011
- Vendor Finalists Notified & Presentations Scheduled — July 1, 2011
- Vendor Presentations Conducted — July 18 - 20, 2011
- Final Vendor Selected & Notified — July 29, 2011
- Best & Final Offers Received — August 5, 2011
- Contract Awarded — August 12, 2011

- Implementation Planning & Project Begin — August 15, 2011
- Installation of all hardware & software Complete — September 23, 2011
- Initial data load and verification Complete — November 18, 2011
- Implementation Compete & Solution Accepted — November 21, 2011

Important NOTE: Due to performance requirements related to the Beacon Grant the vendor implementation plans and the actual completion of all work must be based upon the above time line. Work plans that are not responsive to the above schedule will be considered non-responsive and will result in the vendor's RFP response being rejected.

Submission Instructions & Accompanying Documents

This RFP consists of two documents, as follows:

1. Greater Cincinnati Beacon Collaboration CDR/BI RFP – Contains the full RFP document which includes background narrative as well as CDR Requirements. Read this document in its entirety FIRST.
2. Greater Cincinnati Beacon Collaboration CDR/BI RFP – RESPONSE TEMPLATE – Contains only the sections to which the vendor must respond. After reading the full RFP, enter your RFP responses directly into this response template document.

Please do the following:

1. Review the CDR/BI RPF document in its entirety.
2. Send your Intent to Respond and any questions you may have regarding the CDR/BI RFP to cdrvendor@healthbridge.org by 5PM ET on May 20, 2011. Questions received after May 20, 2011 will not be answered.
3. Enter your vendor responses directly into the CDR/BI RFP RESPONSE TEMPLATE document, not into the RFP document itself.
    a. Ensure your response is NO MORE THAN 70 pages total (including the CDR/BI RFP Response Template, which has 32 pages)
    b. BE SURE to update the Table of Contents at the beginning of the document BEFORE you submit it.
4. Save your RFP response document in both Word and PDF formats and title them as follows:
    a. ***<VENDOR-NAME>*** GCBC CDR RFP RESPONSE, where ***<VENDOR-NAME>*** is the name of your company
5. Send your MPI RFP response an attached detailed work plan to cdrvendor@healthbridge.org by **5:00PM ET June 17, 2011**.

General Terms & Conditions

1. This RFP process is intended to provide information to HealthBridge Greater Cincinnati Beacon Collaboration. The issuance of this RFP does not imply an offer to do business with any respondent. The RFP is designed to provide respondents with the information necessary for the preparation of informative responses.
2. HealthBridge reserves the right not to review or otherwise to reject, in whole or in part and at any time, any or all responses received in response to this RFP. Issuance of the RFP in no way constitutes a commitment by HealthBridge to award any contract for the goods and services described in the RFP.
3. HealthBridge is subject to strict accountability and reporting requirements as a recipient of funds from public sources. Any response or other information submitted by a respondent to HealthBridge is subject to disclosure by HealthBridge as required by law, including but not limited to, the American Recovery and Reinvestment Act of 2009 (Public Law 111-5). In the performance of its duties under its proposal, the vendor will be required to comply with all federal statutes, regulations and policies associated with the Beacon Communities Cooperative Agreement Program, including provisions of the American Recovery and Reinvestment Act (ARRA), and any provisions that are applicable to the vendor as a subcontractor under the Beacon award.
4. Sources for applicable Federal statutes, regulations and policies:
   - American Recovery and Reinvestment Act, 2009 (P.L. 111-5).
   - Funding Opportunity Announcement for the American Recovery and Reinvestment Act of 2009, Funding to Beacon Communities (#HHS-2010-ONC-BC-004)
   - Department of Health and Human Services Grants Policy Statement
   - 45 CFR Part 74 – Uniform Administrative Requirements for Awards and Subawards to Institutions of Higher Learning, Hospitals, Other Non-Profit Organizations and Commercial Organizations
   - OMB Circular A-122 – Cost Principles for Non-Profit Organizations
   - OMB Circular A-133 – Audits of States, Local Governments and Non-Profit Organizations
5. Program Information to disclose to Subcontractors:
   - Program Description: Greater Cincinnati Beacon Collaborative
   - Award Number: 90BC0016/01
   - CFDA Number: 93.727
6. By submitting a response, the respondent agrees that HealthBridge may copy the response for purposes of facilitating HealthBridge review or use of the information. The respondent represents that such copying will not violate any copyright, license or other agreement with respect to the materials submitted.

7. By submission of a response, respondent certifies that respondent has not paid or agreed to pay to any employee or current contracting consultant of HealthBridge any fee, commission or any other thing of value that is contingent upon HealthBridge contracting with respondent.
8. HealthBridge reserves the right to modify this RFP at any time. HealthBridge reserves the right to contact respondents after the submission of responses for the purpose of clarifying any response. Respondent understands that any and all information provided in response to the RFP is subject to validation. By submitting a response each respondent agrees that it will not bring any claim or have any cause of action against HealthBridge or any agent of HealthBridge based on any misunderstanding concerning the information provided in the RFP or concerning HealthBridge failure, negligent or otherwise, to provide the respondent with pertinent information as intended by this RFP.
9. HealthBridge is not responsible for any costs incurred by a respondent which are related to the preparation or delivery of the response or any other activities of respondent related to this RFP.
10. The laws of the State of Ohio, Kentucky, and Indiana, and the United States of America shall apply to and govern the interpretation, validity and effect of this RFP. HealthBridge contractors and subcontractors may be subject to federal or state laws or regulations applicable to recipients of funds from public sources. Respondents are responsible for determining the applicability of these laws to their activities and for complying with applicable requirements.
11. HealthBridge will not be responding to phone or email inquiries about the selection process or identifying vendors still under consideration, or releasing information about the proposals or results until contracts for the MPI RFP have been awarded, and HealthBridge determines, in its sole discretion, that the release of such information will not unduly prejudice this or future RFP processes.

Company Information

The following information regarding your organization is required to be considered for selection. This information must be submitted via the CDR/BI RFP Response Template; it does not need to be entered here.

COMPANY INFORMATION	
Company Name	
Address	
Phone Number	
Website	
COMPANY CONTACTS	
Business Contact Name	
Title	
Phone Number	
Email	
Technical Contact Name	
Title	
Phone Number	
Email	

Company Resources

The following information regarding your organization is required to be considered for selection. This information must be submitted via the CDR/BI RFP Response Template; it does not need to be entered here.

RESOURCES	In OH, KY, IN	Outside OH, KY, IN
Total Employees		
▸ # of CDR/BI employees in sales and marketing		
▸ # of CDR/BI employees in product development		
▸ # of CDR/BI employees in implementation/training		
▸ # of CDR/BI employees in product support		
▸ # of CDR/BI employees in administrative roles		

Product & Installation Information

The following information regarding your organization is required to be considered for selection. It is only necessary to complete those items which related directly to your product offerings. **This information must be submitted via the CDR/BI RFP Response Template, it does not need to be entered here.**

PRODUCT INFORMATION	
Product Name/Version Number	
Describe the major modules of the product	

INSTALLATIONS			
	HIEs	**Health Systems**	**Other**
Total # of new complete CDR/BI installations over the last three years			
Total # of complete CDR/BI installations nationally			
Total # of new component-only **Transaction Repository** installations over the last three years			
Total # of component-only **Transaction Repository** installations nationally			
Total # of component-only **Data Warehouse** installations over the last three years			
Total # of component-only **Data Warehouse** installations nationally			
Total # of new component-only **ETL Tools** installations over the last three years			
Total # of component-only **ETL Tools** installations nationally			
Total # of new component-only **OLAP Cube Creation** installations over the last three years			
Total # of component-only **OLAP Cube Creation** installations nationally			
Total # of new component-only **Data presentation Tools** installations over the last three years			
Total # of component-only **Data Presentation Tools** installations nationally			

Financial Information

The following information regarding your organization is required to be considered for selection. This information must be submitted via the CDR/BI RFP Response Template; it does not need to be entered here.

FINANCIAL INFORMATION FY 08, 09, & 10			
Total Revenue (by year):			
Revenue from CDR/BI products or services:			
CDR/BI Revenue per CDR/BI employee:			
% of CDR/BI Revenue spent on R&D:			
Revenue from other products or services			
Cash:			
Net Income:			
Net Margin %:			
Total Assets:			
Total Liabilities:			
Compound Annual Growth Rate (CAGR):			
FTE Growth (annual, previous FY):			
Publicly traded: Yes / No	Symbol:		
Private: Yes / No	Investors:		
Ownership structure (specify who is the owner and what is the % ownership):			

CDR/BI Requirements

The minimum CDR/BI requirements listed in this section are baseline requirements we believe all vendors should satisfy and we expect all vendors to respond thoroughly to that section. **This information must be submitted via the CDR/BI RFP Response Template, it does not need to be entered here.**

General CDR/BI Functional Capabilities

	Requirement	Provided (Yes / No / Partially)	Description of Capability
General CDR/BI Functional Capabilities and Vendor Qualifications			
1.	Does the CDR have the ability to store data from a wide variety of sources, including bi-directional interfaces with the following: a) Clinical data from Electronic Health Records (EHR), including Lab results, Radiology results, Transcription/Notes, Admit/Discharge/Transfer (ADT), Pathology, Procedures b) Clinical data from Elysium Clinical Messaging System c) Billing data from Practice Management Systems d) Billing data from Hospital Billing Systems e) Billing data from Claims Clearing Houses and Payers f) Payer Subscriber Lists and Eligibility g) Chronic Disease Registries h) User-defined data elements Please list the products that the solution can provide bi-directional interfaces for out of the box.		
2.	Please describe your company's demonstrated experience, capacity, and knowledge developing and implementing **Clinical Data Repositories**, and your solution's suitability for a Health Information Exchange to serve communities with large patient and physician populations, and data from numerous EHRs and organizations.		
3.	Please describe your company's demonstrated experience, capacity, and knowledge developing and implementing **Financial Data Repositories**, including payer claims and reimbursement, practice/hospital billing data, and operational data.		
4.	Please describe your company's demonstrated experience, capacity, and knowledge developing, implementing and utilizing messaging and interoperability standards such as Health Level Seven International (**HL7**) and Healthcare Information Technology Standards Panel (**HITSP**). What standards does your product support?		

	Requirement	Provided (Yes / No / Partially)	Description of Capability
5.	Please describe your company's demonstrated experience, capacity, and knowledge developing and implementing **semantic normalization** and utilizing standard clinical code sets including: • International Classification of Diseases ICD-9 and ICD-10 • Logical Observation Identifiers Names and Codes (LOINC) • Systematized Nomenclature of Medicine Clinical Terms (SNOMED) • Current Procedural Terminology (CPT) • Diagnosis-Related Group (DRG)		
6.	Does your company comply with the Health Insurance Portability and Accountability Act (**HIPAA**) and Health Information Technology for Economic and Clinical Health Act (**HITECH**) security requirements? Please describe.		
7.	Does your company have experience developing and implementing secure service-oriented architectures to provide bi-directional interfaces to data? Can HealthBridge extend these services and/or develop additional web services to request, insert, update, and delete data? Please describe.		
8.	Can data be queried or extracted from your repository? What are the technical options for accessing data in the repository (e.g., web services, ODBC, JDBC, native drivers)?		
9.	Please describe your company's demonstrated experience and ability to provide training, technical expertise, project management, and consultative resources to **successfully implement** the proposed solution.		
10.	Have previous installations been de-installed or customers changed to another vendor or competing product? How many times and for what reasons?		
11.	Please describe your company's demonstrated experience and resources to implement the proposed solution within the **project timeline** and related milestones.		
12.	Have there been cost overruns or missed implementation milestones in previous installations? What has caused cost or time overruns (if applicable)? Over the past 2 years, what was the quickest, average, and longest implementation timeline?		
13.	Does the proposed solution integrate with third-party Master Patient Index (**MPI**) systems and Master Provider Index systems? Please list the MPI systems that the solution can integrate with, and which products/versions have been successfully integrated in previous installations.		
14.	Will the proposed solution be physically implemented within HealthBridge's data center? We are not seeking a vendor-hosted solution.		

Transaction Repository

	Requirement	Provided (Yes / No / Partially)	Description of Capability
Transaction Repository			
1.	Does the proposed solution provide a patient-centric ability to store the breath of clinical data commonly found in hospital and practice Electronic Health Records, including but not limited to: a) Physician and Nurse documentation of patient encounters (e.g., Medical History, Surgical History, Social History, Family History, Impressions, Treatment Plans) b) Medical problems, diagnoses c) Allergies (medication, environmental, food) d) Transcription/Notes e) Lab orders and results f) Radiology results g) Pathology results h) Procedures (CPT codes) i) Medication and prescription history j) Encounter-based information (e.g., vital signs and anthropometrics) k) Birth record/certificate information Does the solution have the ability to track the source of information of specific data elements?		
2.	Has the proposed solution integrated with Axolotl's Elysium system in previous implementations?		
3.	Does the proposed solution have the ability to store HL7 and HITSP clinical messages, such as Admit/Discharge/Transfer (ADT), lab results, and Coordination of Care Documents (CCD): a) In their raw, unmodified form as received from the organization that sent the message to the Health Information Exchange (HIE) b) Original (raw) message, parsed into all columns and data elements that are available and described in HL7 and HITSP standards c) Link and maintain lineage that identifies the organization that provided specific records to the CDR tables d) Ability to retrieve, access, search, and use the raw and discrete data		

	Requirement	Provided (Yes / No / Partially)	Description of Capability
Transaction Repository			
4.	Does the proposed solution provide a patient-centric ability to store the breath of data commonly found in **Chronic Disease Registries**, including but limited to: a) Clinical (e.g., diagnoses, medications, allergies, lab results) b) Functional (ability to perform activities such as work, exercise, attend school) c) Quality of Life d) Preventative care (immunizations, procedures such as foot exams) e) Patient surveys f) Patient self-reported data (e.g., peak flow meter values, HgA1C values, ability to participate in exercise) g) Encounter-based information (e.g., vital signs and anthropometrics)		
5.	Does the proposed solution provide the ability to store Pharmacy and Prescription data, including: a) Medication orders b) Prescription fulfillment c) Medication Administration Record d) Medication Reconciliation e) Medication adherence f) Medication contraindications		
6.	Does the proposed solution provide the ability to store Payer, Claims, and Billing data, including: a) Payer subscriber lists and eligibility, including the line of business (payer product), plan description b) Maintain history of member/subscriber enrollment in payer plans c) Tracking of primary and secondary insurances d) Member assignment to primary care physicians, with historical accuracy e) Individual patient encounter claims, including diagnoses (ICD-9/10), procedures (CPT codes), Charges, and Amount paid f) Billing data from Practice Management Systems g) Billing data from Hospital Billing Systems h) Clearing houses for Practice Management Systems		

	Requirement	Provided (Yes / No / Partially)	Description of Capability
Transaction Repository			
7.	Does the proposed solution provide the ability to store Custom or Specialized data, such as: a) Clinical Trials and Research data, including applicable FDA regulations (e.g., 21 CFR Part 11) b) Clinical and Coding classification systems (e.g., AHRQ Clinical Classification System, Unified Medical Language System) c) Electronic patient-monitoring devices		
8.	Does the proposed solution provide a comprehensive, common data model that encompasses the breadth of Clinical, Financial, Registry, and Specialized data described in this section? Is the data model flexible and extensible to allow customization and addition of new data domains (e.g., additional columns in existing tables, new tables and relationships)? What steps are needed to add new data elements or sources? How does this affect the existing data structure and prior reports, trending, etc.?		
9.	Is the proposed solution's data model compliant with the HL7 Reference Information Model (RIM), and/or can it be mapped to the RIM model? Which versions of HL7 and RIM are supported?		
10.	Does the proposed solution present a consistent, longitudinal, patient-centric view of medical history and health information? Please provide an example of a summary record, screen shots of what a provider might see if using in practice. Total "document" view of the patient.		
11.	What is the existing ability or existing plans to support ICD-10 coding? Will the solution simultaneously support ICD-9 and ICD-10?		
12.	Describe the solution's recommended implementation of production, testing/quality assurance, and development environments; include drawings if available. How many environments do you propose, what are they, how are they used and related? Which components are virtualized and which are physical?		
13.	Is there a limit to the number of instances of the repository that can be installed and used by HealthBridge?		
14.	Does the proposed solution use an enterprise-level relational database management system that provides high-availability features such as clustering, parallelism, failover, etc.? What database management system, version, and edition are used?		

	Requirement	Provided (Yes / No / Partially)	Description of Capability
Transaction Repository			
15.	What scheduled and unscheduled downtimes have clients experienced? How long are they? What are the main causes of unscheduled downtimes?		
16.	How is the system optimized for performance? What are the recommended procedures for maintaining and optimizing? How do you measure response time? What is the min, max, and average ideal response time? How does report generation, data uploads, and translations volumes affect performance?		
17.	Does the solution support simultaneous access by 200+ users/systems and have the ability to store 50+ Terabytes of data? What are the maximum numbers of simultaneous users/systems? What is the maximum size (file size and number of records) for a database instance?		
18.	Describe your solution's SLAs associated with the following: a) System Availability b) Security c) Disaster Recovery d) Backup and Restore e) System Performance f) Issue Response Time g) Issue Resolution Time		
19.	What is the recommended backup retention policy? Please describe which components require full/differential backups and estimates for the related storage requirements (how much space is required and how long are backups retained on the storage array). Is special hardware/software required for backup management of your database and, if so, is it included in your proposal?		
20.	Are credits or other considerations provided for SLA violations? Please describe.		

Data Warehouse

	Requirement	Provided (Yes / No / Partially)	Description of Capability
Data Warehouse			
1.	*Does the proposed solution, upon initial installation and data load, provide a consistent, longitudinal, patient centric view of medical history and health information? Please describe.*		
2.	Does the proposed solution have the ability to track historical changes over time? For example: a) Hospitals merge, form systems, break systems apart b) Patients change payer plans c) Patients change primary care providers Does the system support type 2 and type 3 changes? Please describe.		
3.	*Does the proposed solution have a process to conform source data to common data models, metadata definitions, and terminology?* What are the tools and processes for crosswalk mapping, management and attribution to a data standard?		
4.	*Does the proposed solution have the ability to normalize terms by using look up tables/cross-walks, including?* a) LOINC b) SNOMED c) Medications (RxNorm or NDC) d) ICD-9 e) ICD-10		
5.	*Does the data warehouse utilize a relational database with a dimensional model? What is the primary subject areas of the dimension and fact tables delivered with the solution?* *Which dimension tables, if any, accommodate slowly changing dimensions (e.g., patient changes her last name as of a particular date or encounter)?*		

ETL Tools

	Requirement	Provided (Yes / No / Partially)	Description of Capability
ETL Tools			
1.	*Does the solution include a metadata tool for existing components, as well as the ability to use the tool to document customizations and new, HealthBridge developed tables and services?*		
2.	*Does the proposed solution include robust auditing functionality to track all Extract Transfer Load (ETL) processes, including:* a) Source (sender) of data b) Date and timestamps for data loads c) Transformations to source data d) Additions of fields to source data (e.g., LOINC codes and MPI identifiers) Does the tool have the ability to "undo" changes loaded into the repository?		
3.	*Does the proposed solution have the ability to utilize a third party Master Patient Index (MPI) to match existing patients, update the MPI, and add (insert) to the MPI?*		
4.	*Does the proposed solution have the ability to normalize terms by using look up tables/cross-walks, such as?* a) LOINC b) SNOMED c) Medications (RxNorm or NDC) d) ICD-9 e) ICD-10		
5.	Does the proposed solution provide translation dictionaries or functions to assist in maintaining consistent data across multiple medical facilities with disparate systems? Does the solution include terminology mapping tools?		
6.	*Does the proposed solution include strategies, processes, and tools to identify and manage data that do not match common terms/codes? Please describe.*		
7.	*Does the proposed solution include ETL templates to map source data to logical data models? Can these templates be customized for similar data from disparate sources?*		
8.	*Can the ETL processes be versioned? Can multiple versions simultaneously run in production for the different versions of the same data source (e.g., a data source is modified to include additional fields, or data in existing fields migrate to new lookup/translation values)?*		

	Requirement	Provided (Yes / No / Partially)	Description of Capability
ETL Tools			
9.	*Does the proposed solution include the ability to use web services to load data into the repository? Are there services to query or extract data from the repository?*		
10.	*Does the proposed solution include ETL tools with the ability to support multiple/simultaneous interface technologies, including?* a) VPN b) LLP c) SFTP d) SSL Tunnels e) SNMP f) Web Service (calls to data sources and hosted listening services) g) ODBC h) JDBC i) OLEDB j) Database connectors (native drivers) k) Text (CSV, Fixed Width, Ragged Right, Delimited, etc.) l) XML		
11.	*Does the proposed solution include tools to extract, consume, and parse data from common data sources, particularly those standards related to health care information exchange such as HL7, HITSP, ANSI X12N, etc.?*		
12.	*Does the proposed solution include tools to capture and manage errors and exceptions in the ETL process?*		
13.	*Does the proposed solution include tools to provide real-time monitoring capabilities to manage data sources and ETL process status and results?* Are there automated messages/alerts of processing problems?		
14.	*Does the proposed solution include tools to perform data profiling on data sources to assess data quality and field value frequency and variation?*		

OLAP Cube Creation

	Requirement	Provided (Yes / No / Partially)	Description of Capability
OLAP Cube Creation			
1.	Does the proposed solution include online analytical processing (OLAP, MOLAP, HOLAP) capabilities?		
2.	Can the "cubes" from these systems be extended to include additional measures, calculations, dimensions, and hierarchies?		
3.	*Can HealthBridge develop new cubes from the data warehouse and other data sources, and integrate them with the vendor provided cubes? What tools are included in the solution to create and extend cubes?*		
4.	*Does the OLAP engine support partitioning? What is the system's approach for managing large volumes of data and scaling?*		
5.	*Does the OLAP engine support perspectives or another method to filter content to what is relevant to a user role?*		
6.	*Does the OLAP engine use a common security model with the database, warehouse, and CDR? Is user and role security centrally managed?*		

Data Presentation Tools

	Requirement	Provided (Yes / No / Partially)	Description of Capability
Data Presentation Tools and Applications			
1.	*What analytic functionality (predefined reports, dashboards, KPIs, and ad-hoc reporting) are provided with the system related to medical and pharmacy claims/payer data? (e.g., Healthcare Effectiveness Data and Information Set (HEDIS) measures and reporting)*		
2.	*What analytic functionality (predefined reports, dashboards, KPIs, and ad-hoc reporting) are provided with the system related to clinical (EHR) data? (e.g., National Quality Forum (NQF) Endorsed Standards reports)*		
3.	*Does the proposed solution include tools to assess patient propensity scores and population risk?*		
4.	*Does the proposed solution include functionality related to predictive patient outcomes (e.g., probability of a patient readmission within 30 days, determined by patient clinical and medical history factors)*		
5.	*Does the proposed solution have special capabilities to support the management or administration of an Accountable Care Organization (ACO)?*		
6.	*Does the proposed solution have the ability to provide analytic reports of Episodes of Care at the patient/condition level? Describe the solutions approach to episode of care definition and reporting.*		
7.	*What report development tools are included in the solution? Do the tools have the ability to produce tabular and graphical data displays based on OLAP cubes, data warehouses, and other data sources? Could the developed reports have user interactive capabilities, such as sorting, drill down, links to related reports, and the ability to save/export data in various formats (i.e., Excel, PDF)?*		
8.	*Does the proposed system include a report delivery system (such as a web-based portal)? Does the system provide security trimmed access to reports? Can users subscribe to reports? What are the options for report delivery?*		
9.	*Does the proposed system include a dashboard development and presentation tool? What features and functionality do the dashboard tools provide?*		

Security, Privacy, & Confidentiality

	Requirement	Provided (Yes / No / Partially)	Description of Capability
Security, Privacy, & Confidentiality			
1.	*Does the proposed system provide security controls and infrastructure present to limit access to the data as appropriate for users, roles, rights and/or as applicable for regulatory compliance such as HIPAA and as necessary to comply with Data Use Agreements (DUA) as created between the HIE, data users, and Covered Entities?*		
2.	*Is the security role based? Can roles inherit permissions from other roles and apply additional restrictions or privileges?*		
3.	*Does the proposed solution support context based security trimming (i.e., a community physician may request all available data in the HIE repository if he or she is currently treating the patient in an emergency department)?*		
4.	*Does the proposed solution support enforcement of enterprise security policies (e.g., viewing of specific database table columns can be limited based on user membership in an Active Directory account, and the content in the column/row?*		
5.	*Does the proposed solution include detailed auditing functionality which tracks all access to data by applications, users, or other methods?*		
6.	Does the proposed solution provide reporting tools to facilitate review of auditing data? Are there tools and/or reports of system use by user, role, applications, entities, and other data access methods?		
7.	Does the proposed solution maintain an audit trail of unsuccessful login attempts by credentials, system, date and time?		
8.	How long can audit data and usage statistics be maintained in the system before they must be archived?		
9.	Does the proposed system provide transport-level security via secure socket layer (SSL), transport layer security (TLS), or equivalent encryption?		
10.	Does the proposed system implement web services-related security according to the Web Services Security Framework and corresponding specifications, such as: a) Content Security (XML Encryption, XML Signature) b) Message Level Security (WS-Security) c) Secure Message Delivery (WS-Addressing, WS-Reliable Messaging, WS-Reliable Messaging Policy Assertion) d) Metadata (WS-Policy, WS-Security Policy) e) Trust Management (SAML, WS-Trust, WS-Secure Conversation)		

Administration & Support

	Requirement	Provided (Yes / No / Partially)	Description of Capability
Administration & Support			
1.	*What documentation is included with your solution (e.g., data integration guide, API specifications and guide, HL7 specifications, CCD specifications, User guide)? List all.*		
2.	*What are the backup and recovery options for the solution?*		
3.	*Does the solution have disaster recovery, fault tolerance, and failover functionality? Please describe the architecture and general processes related to this question.*		
4.	*What is your approach for training the HIE's staff to implement and maintain the solution? How will your company participate in the training and implementation process? What are the related timelines?*		

Data Ownership Expectations

The Greater Cincinnati Beacon Collaboration has the following data ownership expectations. Please provide any comments or identify any issues or exceptions you may have with each item.

1. Ownership of Data – all data will be the property of the originator of that data, will be stored in the HealthBridge data center, and the vendors responding to this RFP will have nor make any claims or representations of ownership, nor will the vendors make or retain any copies of the Data.
2. Access to Data – must not be restricted except as needed for data security and patient confidentiality; rather all data, summaries, reports, aggregated data, and statistical summaries thereof, etc. must be available, without restriction.
3. Transition Data – must be in nationally recognized standard formats such as HL7 or CCD.
4. Security of Data, Patient Confidentiality – These controls must be in compliance with all statutes and in keeping with contemporary technology, appropriate data use, and any threats to the security of patient confidentiality and data now known or that may arise in the future. This should include a statement of how the vendor monitors and reviews its data security and any actual or attempted breaches thereto.

Pricing, Finances, and References

The quoted cost of the CDR/BI solution will be an important factor in determining which vendor is selected. Pricing must be comprehensive and include all hardware, software and services associated with a comprehensive CDR/BI solution. Quoted costs must reflect the total implementation costs, including but not limited to the following categories.

- **Server hardware / software.** The vendor must supply or recommend and price all necessary servers. The server specification must include minimum and recommended hardware configurations, operating system software versions and appropriate tools or utility software to manage/maintain the server environment. The vendor must also provide the growth assumptions that would trigger the need to upgrade or replace the proposed server.
- **Network infrastructure.** The vendor must supply or recommend and price any specific hardware and software that may be necessary to link to the HealthBridge local-area and wide-area networks.
- **Client hardware / software.** The vendor must supply hardware recommendations and price any specific workstations necessary to operate, support, and maintain their solution, including minimum and recommended hardware configurations, and operating system software and versions.
- **Application software.** The vendor must identify and price the CDR/BI software applications including all of the modules, components, and data schema necessary to achieve the CDR/BI functionality described in other sections of the proposal.
- **Third party software.** The vendor must identify and price any third party software, dictionaries, databases, or services required to achieve the CDR/BI functionality described in other sections of the proposal.
- **Implementation.** The vendor must include the cost and number of days of consulting, project management, training and other professional services necessary to successfully install the CDR/BI solution.
- **Interfaces.** The vendor must detail the price to develop and implement each of the required interfaces.
- **Data conversion.** The vendor must include the cost and number of days of assistance that will be required to convert key data from the current Axolotl Elysium and Mirth Results CDRs.
- **Product maintenance and support.** The vendor must specify the price of the product maintenance and technical support services described in the proposal. If maintenance and support are priced separately, please make note of that fact.
- **Other.** The vendor must specify the price of any other item or service which may not be represented by the above categories required to implement and/or support the operation of the proposed CDR/BI solution.

Cost Quote

The following table is to contain the total costs of all items for each of the listed CDR/BI Components. It is required that an attachment be included which provides a complete description (see the following list) of each item included for each component. **This information must be submitted via the CDR/BI RFP Response Template; it does not need to be entered here.**

Item Descriptions Required:

- Vendor name,
- Type of item (server, router, operating system software, etc.)

- Item product name
- Item model and/or release number
- Quantity required
- Unit price
- Extended Price (Quantity * Unit price)
- Annual Maintenance Cost (if 3-year or 5-year maintenance is quoted, please note such)

	CDR Components				
Infrastructure Components	**Transaction Repository**	**Data Warehouse**	**ETL Tools**	**OLAP Cubes**	**Presentation Tools**
Server Hardware & Software					
Network Hardware & Software					
Client Hardware & Software					
Application Software					
Third-Party Software					
Implementation					
Interfaces					
Data Conversion					
First-Year Maintenance & Support					
5-Year Maintenance & Support					
Other (specify)					

Client References

Please supply a minimum of three (3) client references. If possible, the client list should include at least one Health Information Exchange. **This information must be submitted via the CDR/BI RFP Response Template; it does not need to be entered here.**

Organization Name:	
Contact Name & Title:	
Contact Telephone:	
Product(s) Installed:	
Organization Name:	
Contact Name & Title:	
Contact Telephone:	
Product(s) Installed:	
Organization Name:	
Contact Name & Title:	
Contact Telephone:	
Product(s) Installed:	

Appendix D: Sample Crescent City Beacon Community RFP

GENERAL INFORMATION

PURPOSE

This RFP is being issued by Louisiana Public Health Institute (LPHI) on behalf of the Crescent City Beacon Community (CCBC). The purpose of this RFP is to solicit proposal responses regarding the development of health information technology infrastructure as platform for solutions to support CCBC's clinical interventions. LPHI is a statewide, 501(c) (3) nonprofit organization founded in 1997 that serves as a partner and convener to improve population-level health outcomes.

RFP SUBMISSION GUIDELINES

CCBC Contact

During the RFP process, all vendor contact with CCBC and its employees shall be directed only through the staff named below. Communication of any form made to anyone other than the designated contact will be considered unofficial and non-binding on CCBC.

All questions, and the RFP submission, should be directed to the following:

Haley Goshert

Louisiana Public Health Institute 1515 Poydras Street

New Orleans, LA 70112, (504) 301-9827

hgoshert@lphi.org

Key Dates

Date	Event
Release of RFP	June 27, 2011
Vendor Questions Due	June 29, 2011 5 PM CST
Release of Clarifications Based on Vendor Question	July 1, 2011 5 PM CST
Vendor RFP Responses Due	July 7, 2011 5 PM CST
Vendor Onsite Presentation	July 11–12, 2011 CST
Contract Awarded	August 2011
Implementation Begins	August 2011
Completion of Emergency Department Notification Pilot	December 2011
Completion of Electronic Referral Management Pilot	January 2011

RFP Revisions

CCBC reserves the right to amend the RFP requirements at any time prior to contract signing in response to changing regulatory or governmental requirements. If the RFP is amended, addenda to the RFP will be communicated directly to the vendors via email or phone by the designated contact above.

Proposal Rejection and RFP Cancellation

CCBC reserves the right to reject any or all proposals and to cancel the RFP process, any time in the process, at its discretion.

ABOUT THE CRESCENT CITY BEACON COMMUNITY

In April 2010, the U.S. Department of Health and Human Services' Office of the National Coordinator for Health Information Technology (ONCHIT) chose the Greater New Orleans area as one of 17 Beacon Communities. The goal of the Beacon program is to demonstrate and accelerate the role of health information technology (HIT) in population health improvement across the continuum of care in two-parishes, Orleans and Jefferson. CCBC was awarded $13.5 million over three years to complete the project. As lead partner, LPHI is responsible for administration of the funds. The project focuses on reducing the burden of chronic disease, mainly diabetes and cardiovascular diseases, by accomplishing the following goals:

- Improving quality of care at the population level in measurable ways;
- Implementing HIT as enabler for efficiency and scalability;
- Creating community-level, chronic disease standards of care;
- Implementing sustainable quality improvement efforts; and
- Enhancing information and process linkages across health systems and other state and federal QI and HIT activities to support quality and efficiency.

Currently, the Crescent City Beacon Community is working with the following providers in the Greater New Orleans area:

- Interim LSU Hospital
- Ochsner Health System
- Tulane Medical Center
- Children's Hospital & Touro Infirmary
- Office of Public Health
- Community Health Clinic Representatives:
  - Daughters of Charity
  - NO/AIDS Task Force
  - Tulane Community Health Center

Louisiana Department of Health and Hospitals, City of New Orleans, Blue Cross & Blue Shield of Louisiana and Louisiana Public Health Institute form the Steering Committee provide overall guidance to the program.

CCBC aims to improve the health of population of those currently suffering from diabetes and cardiovascular disease conditions. To achieve this aim, CCBC has designed clinical interventions focused on improving care coordination between emergency, primary, and specialty settings. These interventions will be supported by the implementation of health information technology to enable relevant patient information sharing among care providers using standard communication formats.

The initial priority population for CCBC's interventions is defined as individuals in Orleans and Jefferson parishes diagnosed with diabetes and/or cardiovascular disease (CVD), or who are at risk for developing these chronic conditions.

There are approximately 620,000 (619,845) adults 18 years of age and older residing in these two parishes according to the American Community Survey's 2009 population estimates. Approximately 93,000 adults suffer from CVD and diabetes, not including those at-risk for developing those conditions. Exhibit D-1 below shows estimates of the population with Diabetes, with CVD, and with both CVD and Diabetes.

Exhibit D-1: Estimates of Diabetes, CVD, and both Diabetes and CVD in the Jefferson and Orleans parishes.

% with Diabetes	% with CVD	% with BOTH CVD and Diabetes
8.9% (55,166)	9.2% (57,026)	15.0% (92,976)

Data Source(s): 2009 BRFSS, CDC

GOVERNANCE AND IMPLEMENTING PARTNERS

CCBC's governance structure includes a Steering Committee responsible for oversight and strategic direction. Steering Committee membership comprises leadership from the Louisiana Department of Health & Hospitals, City of New Orleans Health Department, Blue Cross Blue Shield of Louisiana and the Louisiana Public Health Institute. An Operating Board, with representation from partner institutions, is involved with implementation and monitoring of the CCBC initiative. Workgroups around specific types of interventions bring together partners for discussion and recommendation-making related to the design, implementation and evaluation of interventions within the context of targeted clinical settings.

PREPARING AND SUBMITTING PROPOSALS

GENERAL INSTRUCTIONS

1. Please include executive summary in your response.
2. Vendor response must be structurally composed as per outline in the Exhibit D-2, Response Format below.

3. Content of the vendor must follow the outline in section 3 (Vendor Response).
4. By submitting a response, the vendor agrees that the specifications are accurate and accepts the terms and conditions herein. Any exceptions should be noted in the vendor's response.
5. CCBC and any of its partners shall not be held liable for any expenses incurred by any vendor responding to this RFP.
6. Any questions concerning this RFP must be submitted in writing on or before 5:00 PM Central Time on the question due date (June 29, 2011 5 PM CST)
7. Please submit response in one (1) copy in PDF format and one (1) copy in WORD format to enable cut & paste functionality, with any relevant attachments.
8. Please send response via email to the designated contact above.
9. Response must be received by 5 PM Central Time on the response due date (July 7, 2011 5 PM CT.)
10. Vendors submitting responses are required to participate in on-site presentation to demonstrate their products (see Key Dates for on-site presentation). Each vendor will be given 3 hours, which will include presentation, product demo and Q&A session. Specific schedule and venue will be communicated by the designated contact directly to the vendor's contact person.

Exhibit D-2: Response Format

Section Number	Section Title
None	Executive Summary
None	Table of Contents
Section 1	Company Information
Section 2	Core Requirements
Section 3	Privacy and Security
Section 4	Service Requirements
Section 5	Training and Documentation
Section 6	System Support
Section 7	Implementation Strategy and Timeline
Section 8	Cost
Section 9	Staffing/Resource Requirements
Appendix 1	References
Appendix 2	Standard Contract – Vendor's Standard Contract Template

PROPRIETARY INFORMATION

As a private 501(c)(3) organization representing the interests of many stakeholders, LPHI is committed to principles of transparency, accountability, and openness in its activities. LPHI recognizes that in the case of vendor procurement activities, vendors are unlikely to provide detailed information in a public process. Therefore, information gathered from vendors through a procurement process shall be considered closed records exempt from public disclosure until an agreement is executed or all proposals are rejected at which time, only the selected vendor's non-financial, non-proprietary information will be subject to disclosure.

LPHI is subject to strict accountability, reporting requirements, and state laws as a recipient of funds from public sources. Any response or other information submitted by a respondent is subject to disclosure as required by law, including but not limited to, the American Recovery and Reinvestment Act of 2009 (Public Law 111-5).

The Vendor understands that any and all responses submitted will be distributed or made available to appropriate LPHI and CCBC personnel and consultants involved in this project. CCBC proposal evaluators will be briefed on the disclosure rules for the procurement process and will sign non-disclosure agreements prior to reviewing vendor responses. Proprietary information should be marked "Proprietary," not "Confidential."

PROJECT SCOPE

The HIT goal of this project is to develop a community health network that will connect disparate health information systems in the Greater New Orleans area. The development of this infrastructure will advance secure connectivity and serve as ***interoperable data exchange platform for enabling emergency department/inpatient notification and communication to primary care providers and electronic specialty referral coordination between specialty and primary care***.

The vendor will be asked to explain their ability to provide and implement data exchange services including but not limited to: Master Patient Index, Record Locator Service, Integration Engine, Data Repository, Provider Directory, and Standards and conventions to support trusted and efficient exchange. The vendor will also be required to show their ability to interface with other state-level HIE infrastructure and services.

The project will be implemented in the following phases shown in Exhibits D-3 and D-4.

Figure D-3: Intervention Scaling and Rollout Plan

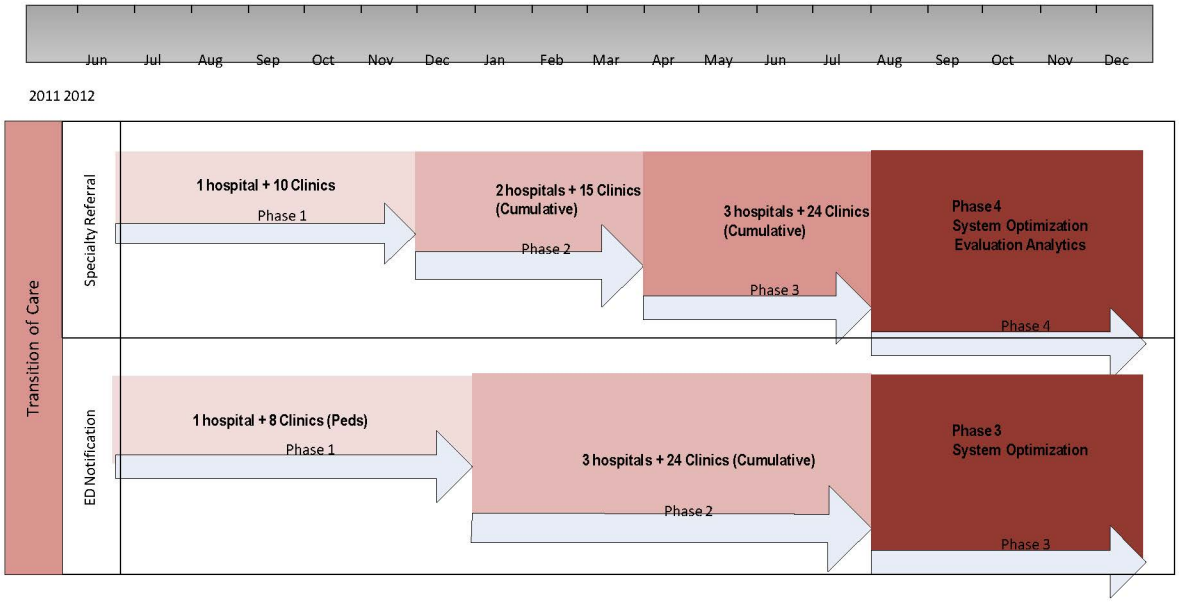


Table D-4: Implementation Phases

	Health IT Functions	No of CCBC Partners	Go Live Date
Phase 1	ED Notification	Hospital: 1 Community Health Centers: 8	December 11, 2011
	Electronic Referral Management	Hospital: 1 Community Health Centers: 10	January 15, 2012
Phase 2	ED Notification	Hospital: 3 Community Health Centers: 24 (Cumulative)	August 30, 2012
	Electronic Referral Management	Hospital: 2 Community Health Centers: 15 (Cumulative)	April 30, 2012
Phase 3	ED Notification	Systems Optimization Evaluation Analytics	August 30, 2012
	ED Referral Management	Hospital: 3 Community Health Centers: 24 (Cumulative)	August 30, 2012

Data elements to be exchanged include but not limited to:

- Patient demographics
- Medications
- Allergies
- Problem list
- Immunization
- Information on previous and/or current providers including mental health
- Test and/or procedure results
- Visit history
- Discharge summary
- Advanced directives

VENDOR RESPONSE

COMPANY INFORMATION

The purpose of this section is to identify the general requirements of a viable vendor.

General Overview

Organization Legal Name	
Address	
Company Ownership (public or private)	
Legal Structure (e.g., corporation, LLC, partnership)	
Year Founded	
Number of Employees Dedicated to the Proposed Products and Services	

Contact Person

Contact Person Name	
Contact Telephone Number	
Contact Fax Number	
Contact Email Address	

Experience

The vendor must provide the following information regarding its experience:

Years of Experience

How many numbers of years do you have experience in providing the types of goods and/or services sought by the RFP?

Number of Clients

How many numbers of clients do you have where the solutions proposed in the response are operational?

Existing Contracts

Please list any existing contract with sub-contractors or other vendor(s) of different sub-modules of your proposed solution(s).

Qualification and Experience with HIPAA, NHIN, and ONC

Please describe your qualifications and experience of implementing HIPAA compliant solutions and of working with NHIN, ONC and Regional Health Information Organizations (RHIOs).

History of the Proposed Solution

Please describe the history of your proposed solution. Was the solution developed by your organization or acquired from another organization? When was the solution developed?

Responding to Regulatory Changes

Please describe your ability to respond in a timely manner to governmental or regulatory changes. Include your turnaround response time and procedures for responding to such changes.

References

Please provide references from at least three (3) clients knowledgeable of the vendor's performance in providing goods and/or services similar to the goods and/or services described in this RFP. Also please provide the references' contact information in the space provided below. Add more rows if more than 3 references are provided.

Reference 1	**Response**
Organization	
Organization Address	
Date signed/operational	
Contact Name	
Contact Telephone Number	
Contact Email Address	
Reference 2	
Organization	
Organization Address	
Date signed/operational	
Contact Name	
Contact Telephone Number	
Contact Email Address	
Reference 3	
Organization	
Organization Address	
Date signed/operational	
Contact Name	
Contact Telephone Number	
Contact Email Address	

Financial Overview

Financial Statements

Please provide information on audited financial statements for the last three (3) years.

Financial References

Please provide a minimum of three (3) financial references.

CORE REQUIREMENTS

The core requirements shall be evaluated based on the availability, robustness, and flexibility of the following criteria:

Technical Architecture

Please describe your system's technical architecture. Please elaborate on the flexibility of the data model (centralized, federated, hybrid) and implementation model (internally hosted, externally hosted, SaaS, "Cloud", etc.)

Master Patient Index and Record Locator Service

Please describe your Master Patient Index and Record Locator Service, including record matching techniques such as rule base, statistical or a hybrid, how matching rules and probability levels are set and who establishes them, how matching conflicts are handled, and ability to merge records.

Provider Directory

Please describe how the system operates to identify and locate the correct partner providers, for example how the system identifies patient's primary care provider when the patient is being seen in emergency room.

Integration Engine

Data Integration

Please describe how your system integrates data from disparate data sources, including mapping capabilities.

Supporting Additional Feed

Describe how your system supports additional feed from provider offices, pharmacy, labs, emergency department, inpatient settings, etc.

Transactional Standards

Describe the transactional standards (such as HL7, X12, NCPDC, DICOM, etc. including CCD, CCR, and CDA) your system uses to support health data exchange.

Semantic Standards

Describe the semantic standards (such as ICD, CPT, HCPCS, LOINC, SNOMED, RxNorm, etc. or proprietary approaches) your system uses to support health data exchange.

Connectivity Management

Describe how your system manages the connectivity, start, re-start, send and re-send transactions.

Backup

Please describe the system backup process including automated backup features that allow rapid and unattended system and data backup operations on a user-scheduled basis, data archiving and restoration, disaster plan for operations, safety and security of data, and client service ramifications.

Hardware, Software, and Connection Requirements

For each type of solution proposed (if more than one, such as hosted or SaaS), please layout (in a table if possible) the hardware required for implementation and operational phases. Also, please indicate which pieces of hardware will be included and which are required to be procured separately from a third party. Please include what connection speeds are required to make the system run as intended (T1, T2, etc.) and what software, browsers, or OS the system is compatible with. It is assumed that each provider using the system will need an internet connection and PC or other device to connect.

Analytics and Reporting Tools

Please describe your analytics and reporting capabilities, including available built-in reports, scheduled routine reports, ad-hoc reporting writer capability, customized data dashboards, statistical modeling capabilities, data mining features, and using 3rd party report writer capability.

Interfaces with EMRs

Electronic medical records (EMR) that currently operate in the CCBC environment are: MEDITECH, Aprima, SuccessEHS, Siemens Invision, Siemen Soarian, CLIQ (legacy system), eClinicalWorks and Allscripts. Please describe your system's capabilities and flexibility in interfacing with these various electronic medical records (EMR); however, other EMR vendors may be added as CCBC scales up.

Interfaces with other exchange infrastructures

Please describe the system's capabilities to interface with existing or future exchange infrastructure, such as Louisiana Health Information Exchange (LaHIE), or NHIN.

PRIVACY AND SECURITY

Consent Management

Please provide the level of granularity and flexibility of consent management provided in the solution, including how system collects patient consent, how it responds when patient opts in or opts out, how system stores patient's choices over time, and the ability to handle opt-out of sharing of *specific information*.

User Authentication & Access Management

User Security System

Please describe the user security system and address the following: centralized maintenance capabilities (CCBC administrator's ability to setup/reset accounts), CCBC partner organization's administrative capabilities to setup and reset accounts and access, and user's capabilities to reset passwords without administrative involvement.

Access Restore Process

Please explain the process for restoring access if a user is accidentally locked-out.

Additional Features

If the system supports the following, please describe how.

- Does your authentication and access management allow partner organization-level to determine password expiration and format requirements?
- Does it allow end users to be associated with multiple organizations (specialty clinics, hospitals) for role-based access?
- Are reports that detail authorized user inventory, active accounts list, along with roles and access rights available?

Audit Log & Monitoring

Please describe how system's audit log and monitoring operates.

Security & Breach Policies

Potential Intrusion

Please describe how vendor would respond upon discovery of potential intrusion incident until resolved.

Break-the-Glass

Please describe how system provides for Break-the-Glass functionality, i.e., how the system allows authorized users to access special restricted information with some effort while alerting key personnel of the event.

SERVICE REQUIREMENTS

Please complete table below to summarize service requirements you are able to offer.

Functions	System Capable (Y/N)	Existing Example
ED/Inpatient Notification		
Electronic Referral Management		
Community-Wide Registry		
Medication Reconciliation		
Community-wide Shared Care Plans		

Clinical messaging for emergency department/inpatient notification

Please describe how infrastructure can provide clinical messaging for emergency departments or inpatient settings. Address specifically the ability to push and pull patient information between emergency department, primary care, and inpatient settings and the ability to push automated notification and discharge summary from emergency department or inpatient settings to primary care provider.

Please describe how your proposed solutions would work for each of the use cases:

John Doe is a patient at Medical Home A. He has been diabetic for 8 years. One day John Doe is being seen at emergency department of Hospital X. Later on that day John Doe is admitted into inpatient, but he is discharged the following day.

a. How would your proposed solution identify John Doe's primary care provider at Medical Home?
b. How and how soon would your proposed solutions notify John Doe's primary care provider at Medical Home A about his visit to emergency department?
c. How would your proposed solution push this information into the patient's Medical Home electronic medical record system?

d. How and how soon would your proposed solutions notify John Doe's primary care provider at Medical Home A that John Doe is being admitted?

e. What data fields or documents (such as discharge summary) and in what format will your proposed solution send this encounter information to John Doe's primary care provider at Medical Home A?

f. How would your proposed solutions support John Doe's medication reconciliation between current medication orders at the time of admission and medication history prior to being admitted?

g. How does your proposed solution allow John Doe's care plan to be shared between the patient's Medical Home and the emergency department?

Electronic referral management

Please describe how the system provides electronic referral management service; address the following in your description:

- Ability to send necessary documentation from primary care provider to specialist.
- Ability to send consultation report from specialist to primary care provider
- Ability to support electronic communication between primary care and specialty care.
- Ability to electronically schedule, triage, and manage referral between primary care provider and specialty care.
- Ability to allow users to customize rules for triaging referrals.

Please describe how your proposed solutions would work for each of the use cases:

John Doe's primary care provider at Medical Home A wants him to see Endocrinologist at Specialty Clinic Y.

a. How would your proposed solutions support Referral Coordinator at Medical Home A requesting appointment with Specialty Clinic Y for John Doe?

b. How would your proposed solutions electronically triage John Doe's appointment request?

c. How would your proposed solutions inform Referral Coordinator that the appointment has been confirmed by Specialty Clinic Y?

d. How would your proposed solutions notify Referral Coordinator at Medical Home A that John Doe has come for his appointment to the Specialty Clinic Y?

e. How would your proposed solution push this information into the patient's Medical Home A's electronic medical record system?

f. How would your proposed solutions send result/report from Endocrinologist back to John Doe's primary care provider at Medical Home A.

Community-Wide Registry

Additionally, please describe how your proposed solutions can provide community-wide registry function, such as disease management registry that can be used by all CCBC partners and that may house care plans developed for patients by their medical home that can be shared across care settings. Also, describe what clinical messaging and decision support features are included in this registry function.

Value-Added of Solutions

Please explain to the CCBC the value-added proposition that your solution will bring to our community, what makes this solution unique, how your solution proposes to measure that value-added, and why it is the most appropriate for the Crescent City Beacon Community. Your answer should address at a minimum the following key criteria.

- How the solution goes beyond other market solutions, what makes it unique.
- How the solution is uniquely appropriate for our community.
- How the solution will aid our community in meeting the project goals , to:
  - improve quality and efficiency of care
  - improve coordination of care
  - lower the cost of care
  - improve population health outcomes
- How the solution will enable measurable improvement or benefits that can be measured following implementation.
- What is the timing of the customer's costs and investment vs. payback period?
- Anticipated business improvements in quantifiable terms.

TRAINING AND DOCUMENTATION

Training

Please describe the types, lengths, locations, costs, approaches (e.g. classroom, one-on-one, webinar, etc.) of training offered for various personnel (e.g. end user, system administrator, etc.); training materials, as well as any regularly held seminars, user group meetings, and online forum available to users of the system.

Documentation

Please describe the general documentation (system and training) provided as part of standard installation and implementation and how often your documentation is updated. Please include table of contents screenshots of a few documentations.

SYSTEM SUPPORT

Description of System Support

Please describe system support that you provide, including:

- Normal support hours (specify time zone)
- Dedicated help desk
- Location of support staff
- How to reach support staff
- Methods of troubleshooting (e.g. remote, site visit, etc.)
- 24/7 support
- Support for any 3rd party applications in your system

Response Time

Please also describe response time for problems reported, including during regular business hours, off hours, prioritization for fixing different levels of problems, and any performance guarantees for correcting system and application errors.

Problem Reporting

Describe your problem reporting process, including for problems with software and tools and for evaluating and fixing *bugs* or problems in your system and applications, including how you coordinate problem analysis and resolution with other 3rd party products.

Also, please provide a guideline for the type of our internal support that will be required to support the system, including the types of skills, the expected time commitment, and the local hardware/software that will be expected.

IMPLEMENTATION STRATEGY AND TIMELINE

Implementation Strategy

Please describe your implementation strategy to meet CCBC's timeline (**see 1.2.2. Key Dates**).

Project Plan

The vendor will be responsible for creating and maintaining a project plan for development and implementation of the system. Please describe your project plan, including the following but not limited to:

- Pre-Implementation Assessment
- Project Management:
  - a detailed work plan outlining activities required to develop and implement the system,

  - a description of project management methodologies,
  - risk management plan,
  - quality control processes,
  - project communication methods,
  - and other project tools used to monitor and document the project's status and deliverables
- System Analysis, Architecture and Design
- System Integration and Testing
- System Development
- Business Process Redesign
- Post Implementation Assessment and Optimization
- Performance Management

Timeline

Please provide draft detail timeline for phase 1 of the project (from the date of contract executed to January 2011).

Scaling Strategy

As pointed out in the 'Intervention Scaling and Rollout Plan' graphic (**Section 2.3**), CCBC's implementation will occur in a scaled manner as the system gains momentum and users in the community. CCBC partners are part of the (already planned) rollout strategy, but it is the intention of CCBC for the scaling will continue beyond the conclusion of the Beacon Program. Beyond the initial timeframe, how do you advise scaling would best be consumed in the proposed solution? This might also affect the cost, and if it does, please detail that.

Role of 3rd Party

Please describe the roles of required 3rd party during implementation and identify who they are.

TOTAL COST OF OWNERSHIP

Please use the template below for your cost proposal.

Cost Breakdown

Item	One-time Cost (Acquisition)	Annual Fees (Maintenance or Recurring License)	Annual % Increase	Total for 2 Years	Beyond 2 year period	Necessary Assumptions
MPI						
Provider Directory						
Integration Engine						
Interfaces						
Analytics Tools						
3rd Party Infrastructure						
3rd Party Content						
3rd Party Tools						
Hardware						
Hosting						
Implementation						
Consulting						
Upgrades						
Internal Staff						
Training						
Disaster Backup and Recovery						

Cost Summary

	Initial Investment	Year 1	Year 2	Subsequent Years	Total Cost of Ownership
Total*					

*Costs should include staffing, licensing, support, and envisaged hardware or hosting costs beyond the 2-year Beacon funding period.

SUSTAINABILITY STRATEGY

In exploring many different strategies, sustainability still remains a challenge to efforts such as CCBC. While the summative costs will always be the hardest part of this challenge, CCBC is open to different strategies for sustaining operations beyond the CCBC program period. Please elaborate on any innovative strategies—tried or untried—that would support sustainability and adoption of the solution.

STAFFING/RESOURCES REQUIREMENTS

Please describe your proposed plan for required staffing requirements that must be provided by CCBC to implement and maintain the infrastructure. Elaborate the number of resources, job title and description, and skill sets required.

VENDOR EVALUATION

CCBC has identified the following high level requirements as priorities in the development of the infrastructure: ***core requirements, service requirements, implementation timeline, flexibility, costs, and staffing/resource requirements***. Vendor responses will be evaluated based on the following scoring criteria:

CORE REQUIREMENTS (SCORE: 20%)

The core requirements shall be evaluated based on the availability, robustness, and flexibility of the following criteria:

- Technical Architecture, including but not limited to flexibility of data model (centralized, federated, hybrid) and implementation model (internally hosted, externally hosted, SaaS, “Cloud”, etc.).
- Master Person Index and Record Locator Service.
- Provider Directory, including how the system operates to identify and locate the correct partner providers.
- Integration Engine, including but not limited to, how your system integrate data from HL7 and non-HL7 compliant sources, mapping capabilities, how your system will support additional feed from provider offices, pharmacy, labs, emergency rooms and hospital ADT, system ability to adhere to standards such as HL7, DICOM, NCPDC, ICD, CPT, HCPCS, etc..

- Backup, including automated backup features that allow rapid and unattended system and data backup operations on a user-scheduled basis, data archiving and restoration, disaster plan for operations, safety, and security of data, and client service ramification.
- Reporting Tools, including any ad-hoc reporting writer utility, capability to use 3rd party report writer, and available built-in reports.
- Ability to interface with existing or future exchange infrastructure, especially State of Louisiana Health Information Exchange platform.
- Security and Privacy, including consent management, identity management, compliance with HIPAA privacy and security rules, and compliance with fair data sharing practices set forth in the nationwide privacy and security framework.

PRIVACY AND SECURITY (SCORE: 5%)

- Consent Management
- User Authentication and Access Management
- Audit and Log Monitoring
- Security and Breach Policies

SERVICE REQUIREMENTS (SCORE: 15%)

The vendors will be evaluated on whether and how they can meet the following service capabilities required by CCBC:

- Clinical messaging for emergency department and inpatient notification, including
  - Ability to push and pull patient information between emergency department, primary care, and inpatient settings.
  - Push of automated notification and discharge summary from emergency department or inpatient settings to primary care provider.
- Electronic referral management, including:
- Ability to send necessary documentation from primary care provider to specialist.
- Ability to send consultation report from specialist to primary care provider
- Ability to support electronic communication between primary care and specialty care.
- Ability to electronically schedule, triage and manage referral between primary care provider and specialty care
- Ability to allow users to customize rules for triaging referrals.

DOCUMENTATION AND TRAINING (SCORE: 5%)

SYSTEM SUPPORT (SCORE: 5%)

Evaluation will be on how the vendor provides support, problem reporting process, and response time.

IMPLEMENTATION STRATEGY AND TIMELINE (SCORE: 20%)

CCBC has set forward an aggressive implementation timeline in order to deliver technical solutions to support its clinical interventions. Meeting these deadlines is vital to the overall success of the CCBC and Beacon grant program. Vendors must be able to deliver solutions for emergency department notification by December 11, 2011, and electronic referral coordination by January 15, 2012.

Vendors will be evaluated on how they strategize and match the CCBC's timeline that is outlined in **Key Dates**.

COST AND SUSTAINABILITY STRATEGY (SCORE: 20%)

Vendors must follow the format as provided in section **3.8 (Cost)**. The cost proposal shall include one-time cost for acquisition, annual fees, annual % increase, and total for 2 years.

STAFFING/RESOURCES REQUIREMENTS (SCORE: 10%)

Vendors will be evaluated on their model for required staffing requirements that must be provided by CCBC to implement and maintain the infrastructure.

TERMS AND CONDITIONS

Note this is a request for proposal only, and **not** a request for service. The vendor must bear all costs of preparing this RFP. Respondents are acknowledging agreement to these terms and conditions with submission of a response.

a. The RFP will be used for the sole benefit of Louisiana Public Health Institute, and its partners in CCBC, and responses will be used to provide information to CCBC as part of the procurement process.

b. All responses, inquiries, or correspondence relating to or in reference of this RFP, and all other materials, reports, charts, displays, schedules, exhibits, and other documentation submitted by the vendors shall become property of Louisiana Public Health Institute, and its partners in CCBC, upon receipt.

c. Louisiana Public Health Institute and its partners in CCBC, are subject to strict accountability and reporting requirements as a recipient of funds from public sources. Any response or other information submitted by a respondent to Louisiana Public Health Institute, and its partners in CCBC, is subject to disclosure by CCBC as required by law, including but not limited to, the American Recovery and Reinvestment Act of 2009 (Public Law 111-5). Louisiana Public Health Institute and its partners in CCBC make no agreements or representations of any kind, and expressly disclaim any requirement to maintain the confidentiality of any information provided to CCBC in response to this RFI.

d. LPHI reserves the right to make or not make an award based solely on the proposals, or to discuss further with one or more of the Vendors. The solution selected will be chosen on the

basis of that which is most advantageous to LPHI, taking into consideration price and the other evaluation factors set forth in this RFP or allowed by law.

e. A response to a RFP is not a bid and does not commit LPHI to accept a proposal. The RFP process provides the opportunity to negotiate with prospective Vendors. This RFP is not an order and does not commit LPHI to pay for any costs incurred in the preparation or submission of any quotation or proposal or to procure the materials or supplies hereunder. Quantities used herein to estimate responses may or may not reflect actual quantities used or needed, and do not commit LPHI to order specified estimated quantities. Any offers accompanied by terms and conditions that are in conflict with this RFP may be considered unacceptable.

f. Any costs incurred by the vendor in preparing, submitting, or presenting responses are the sole responsibility of the vendor. Louisiana Public Health Institute and its partners in CCBC shall not be responsible or reimburse any costs incurred, including, but not limited to, travel, lodging, or supplies.

g. The services to be provided under the contract shall commence and terminate on mutually agreed upon dates. Terms for early termination shall be included in the final agreement as negotiated by the parties.

h. The Vendors agrees to indemnify and hold the Louisiana Public Health Institute, its partners, agents and employees, harmless from and against any and all actions, suits, damages, liability or other proceedings that may arise as the result of performing services hereunder. This section does not require the Vendor to be responsible for or defend against claims or damages arising solely from errors or omissions of LPHI, its partners, agents and employees.

i. The Vendors will comply with all federal, state and local laws, regulations, ordinances, guidelines, permits and requirements applicable to providing services pursuant to the RFP and final negotiated agreement, if applicable, and will be solely responsible for obtaining current information on such requirements.

j. All other prior discussions, communications and representations concerning the subject matter of the RFP are superseded by the terms of the RFP.

k. The Vendors may not use subcontractors to perform the services described in the RFP without the express prior written consent of LPHI. The Vendors will include provisions in its subcontracts requiring its subcontractors to comply with the applicable provisions of the RFP, to indemnify LPHI and its partners, and to provide insurance coverage for the benefit of LPHI in a manner consistent with the RFP. The Vendor will cause its subcontractors, agents, and employees to comply, with applicable federal, state and local laws, regulations, ordinances, guidelines, permits and requirements and will adopt such review and inspection procedures as are necessary to assure such compliance.

l. The RFP may be withdrawn at any time by LPHI prior to execution of an agreement.

m. Any agreement depends upon the continued availability of appropriated funds and expenditure authority from the Legislature for the intended purpose. If for any reason the Legislature fails to

appropriate funds or grant expenditure authority, or funds become unavailable by operation of law or federal funds reductions, the agreement will be terminated by LPHI. Termination for any of these reasons is not a default by the State nor does it give rise to a claim against LPHI.

n. Vendors may be disqualified for situations or conditions as determined appropriate by LPHI, in its sole discretion, including, but not limited to the following:

- Collusion between a LPHI employee or CCBC RFP Evaluator and the Vendor.
- The Company, any sub-provider or Vendor, is in litigation with LPHI or CCBC partners.
- Vendor in arrears on any existing contract or having defaulted on previous contract.
- Lack of competency as revealed by pertinent factors, including but not limited to, experience and equipment, financial statement and questionnaires.
- Incomplete work that in the judgment of LPHI will prevent or hinder the prompt completion of additional work awarded.
- Vendor has failed to perform in a satisfactory manner on a previous contract.
- Vendor communicates with LPHI staff or management regarding this RFP or proposals, other than the persons listed as exception in this RFP.
- Conflict of interest with LPHI or CCBC Partners.
- Offerings of gifts and/or bribes to any LPHI employees or CCBC Partners.
- Non-compliance with LPHI rules for Vendors/visitors.
- Failure to respond to all or part of the RFP's stated requirements, request for information, or other data required by LPHI within this RFP.
- Identified on the Federal Government Health and Human Services (HHS) List of Excluded Individual / Entities (LEIE); Identified on any of the 50 States Medicaid Excluded Provider List; or the federal government terrorist list.

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Appendix E: Acronyms and Key Definitions

Acronyms	
ACA	Affordable Care Act
ACO	accountable care organization
CCNC	Community Care of North Carolina
CCR	Crimson Care Registry
CDR	clinical data repository
CMMI	Center for Medicare and Medicaid Innovation
CPT	common procedural terminology
DOHMH	Department of Health and Mental Hygiene
DRG	diagnosis-related group
DUA	data use agreement
ED	emergency department
EHR	electronic health record
ETL	Extract Transfer Load
FDA	Food and Drug Administration
HHS	Department of Health and Human Services
HIE	health information exchange
HIO	health information organization
HIPAA	Health Information Portability and Accountability Act
HITECH	Health Information Technology for Economic and Clinical Health
HL7	Health Level Seven International
IndiGO	Individualized Guidelines and Outcomes
LOINC	Logical Observation Identifiers Names and Codes
MPI	Master Patient Index
MU	Meaningful Use
NQS	National Quality Strategy
ONC	Office of the National Coordinator for Health IT
PCP	primary care physician
PHI	protected health information
QIO	Quality Improvement Organization
RFI	Request for Information
RFP	Request for Proposal

Acronyms	
RIM	Reference Information Model
SNOMED	Systematized Nomenclature of Human Medicine Clinical Terms
SOW	Statement of Work

Appendix F: References

Endnotes

[11] Kaiser Family Foundation, "U.S. Healthcare Costs," background brief, accessed at http://www.kaiseredu.org/Issue-Modules/US-Health-Care-Costs/Background-Brief.aspx.

[2] Institute of Medicine, Crossing The Quality Chasm: A New Health System for the 21st Century. (Washington, D.C.: National Academies Press, 2001, 3).

[3] U.S. Department of Health and Human Services. http://www.hhs.gov/opa/affordable-care-act/index.html.

[4] Institute for Healthcare Improvement. http://www.ihi.org/offerings/Initiatives/TripleAim/Pages/default.aspx.

[5] Stoto M. *Population Health in the Affordable Care Act Era. AcademyHealth*. February 21, 2013.

[6] Beacon Nation Learning Guides. http://www.healthit.gov/policy-researchers-implementers/beacon-community-program/learning-guides

[7] Beacon Nation Learning Guide. *Strengthening Care Management with Health Information Technology.* Strategic Objective 1.1; p. 11. http://www.healthit.gov/policy-researchers-implementers/beacon-community-program/learning-guides.

[8] Achievement on the D5 occurs when all of the following five goals are met:

1. Blood pressure is less than 140/90 mmHG.
2. Bad cholesterol, LDL, is less than 100 mg/dl.
3. Blood sugar, A1c, is less than 8%.
4. Patient is tobacco free.
5. Patient takes an aspirin as appropriate.

[9] National Quality Forum. http://www.qualityforum.org/Projects/e-g/eMeasures/Electronic_Quality_Measures.aspx.

[10] Beacon National Learning Guide. *Capturing High-Quality Electronic Health Records Data to Support Performance Improvement.* Implementation Objective 2.2; p. 17. http://www.healthit.gov/policy-researchers-implementers/beacon-community-program/learning-guides.

[11] Beacon Nation Learning Guide. *Strengthening Care Management with Health Information Technology*. Strategic Objective 1.2; p. 13. Strategic Objective 3.3; p. 27. http://www.healthit.gov/policy-researchers-implementers/beacon-community-program/learning-guides

[12] Buck M., Anane S., Taverna J., et. al. *The Hub Population Health System: distributed ad hoc queries and alerts*. Journal of American Medical Informatics Association 2012; 19:e46–e50. Doi:10.1136/amiajnl-2011-000322.

[13] New York City Department of Health and Mental Hygiene. *Developing an Electronic Health Record-Based Population Health Surveillance System*. July 2013. http://www.nyc.gov/html/doh/downloads/pdf/data/nyc-macro-report.pdf.

[14] Buck M., Anane S., Taverna J., et. al. *The Hub Population Health System: distributed ad hoc queries and alerts*. Journal of American Medical Informatics Association 2012; 19:e46–e50. Doi:10.1136/amiajnl-2011-000322.

[15] Ibid.

[16] In the decentralized model, updates and access to health care records are only provided when needed. This model allows the initiator of a health record, such as a provider, to maintain ownership and control over the record while providing access to the record for agreed-upon analytic purposes.

[17] Beacon National Learning Guide. *Capturing High-Quality Electronic Health Records Data to Support Performance Improvement.* Implementation Objective 4.3; p. 33. http://www.healthit.gov/policy-researchers-implementers/beacon-community-program/learning-guides

[18] Beacon National Learning Guide. *Capturing High-Quality Electronic Health Records Data to Support Performance Improvement.* Implementation Objective 4.2; p. 33. http://www.healthit.gov/policy-researchers-implementers/beacon-community-program/learning-guides