Improving Hospital Transitions and Care Coordination Using Automated Admission, Discharge and Transfer Alerts

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

May 2013

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, better care at lower cost. The Department of Health and Human Services, Office of the National Coordinator for Health IT (ONC) is providing $250 million over three years to 17 selected communities throughout the United States that have already made inroads in the development of secure, private, and accurate systems of EHR adoption and 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; and
- 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 http://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 http://www.beaconnation.org.

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The following individuals provided expert review, input, and advice on the development of this Learning Guide:

Irene Koch, Esq., Executive Director, Brooklyn Health Information Exchange

Jonathan Leviss, MD, Chief Medical Officer, Rhode Island Quality Institute, Rhode Island Beacon Community

Kristin Lyman JD, MHA, Associate Director, Health Systems Division, Louisiana Public Health Institute; Former Program Manager, Crescent City Beacon Community

Nancy A. Maloney, **MBA**, Senior Business Architect, Western New York Beacon Community

Trudi Matthews, Director of Policy and Public Relations, HealthBridge, Greater Cincinnati Beacon Collaboration

Chris Muir, MPA, Program Manager, State Health Information Exchange Program, Office of the National Coordinator for Health IT

Gaurav Nagrath, MBA, Lead Strategist, Crescent City Beacon Community; Chief Information Officer, Louisiana Public Health Institute

Diane Parrish, RN, Clinical Implementation Specialist Quality Assurance Manager, Western New York Beacon Community

Kerri Petrin, MPH, Project Officer, ONC Beacon Community Program, Office of the National Coordinator for Health IT

Rhonda Poirier, DrPH, Senior Advisor to the Deputy National Coordinator for Policy & Programs, Office of the National Coordinator for Health IT

Dan Porreca, Program Director, Executive Director, HEALTHeLINK, Western New York Beacon Community

John Rancourt, MPA, Program Analyst, Office of the National Coordinator for Health IT

Julie Schilz, BSN, MBA, Director, Primary Care Strategies, WellPoint

Barbara Sorondo, MD, Lead Evaluator, Eastern Maine Healthcare Systems, Bangor Beacon Community

Lee Stevens, Director, State Health Information Exchange Policy, Office of the National Coordinator for Health IT

Indu Subaiya, MD, MBA, Co-Chairman and CEO, Health 2.0

Micky Tripathi, PhD, MPP, President and CEO, Massachusetts eHealth Collaborative

Chuck Tryon, **MSKM**, Chief of Program and Knowledge Management, Tulsa Beacon Community Program, MyHealth Access Network

Jim Younkin, Program Director, Geisinger Health Systems, Keystone Beacon Community

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Background

The Affordable Care Act (ACA) provides incentives to reduce hospital readmission rates through accountable care organizations, shared savings programs, and penalties. These strategies promote improved care coordination, especially at the point of discharge[i], and encourage prevention of unnecessary utilization of hospital services. As a result, payers, hospitals and primary care practices have a strong business case to focus on improving care transitions and reducing avoidable readmissions and Emergency Department (ED) visits.

Reducing avoidable readmissions and improving care transitions continues to be challenging, despite increased national awareness through programs such as the Centers for Medicare and Medicaid Partnership for Patients. The Institute of Medicine report *Crossing the Quality Chasm: A New Health System for the 21st Century*, identified health information technology (Health IT) as a means of supporting care management and improving the quality of care.[ii] Communities have looked to health IT and health information exchange (HIE) systems for communication solutions to enhance and augment their care management and care transitions improvement programs. One approach involves sending automatic notifications or alerts from hospitals to primary care practices and/or care managers when a patient has a hospital admission, discharge or transfer. These notifications and alerts are designed to improve the timely flow of information so providers and case managers can quickly and effectively address the health care needs of their patients transitioning from inpatient facilities to community care. In addition to improved patient health status, these alerts and notifications are expected to facilitate a reduction in hospital readmissions.[iii]

Beacon Communities

The Health and Human Services (HHS) Office of the National Coordinator for Health IT (ONC) provided $250 million over three 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 making measurable improvements that benefit both individual and

Target Audience: This learning guide is designed for communities that have a stated goal to reduce avoidable ED visits, avoidable hospitalizations, and preventable readmissions and have identified the implementation of ADT-based alerts as a potential strategy to achieve the goals

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population health. Through these efforts, each community serves as 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 Hawai'i Island Beacon Community in early 2013, translated the experiences and lessons learned from the Beacon Communities into actionable information that can be adapted for use by interested communities. This information is presented in Learning Guides, which describe 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 for implementing automated alerts based on hospital admission, discharge, and transfer (ADT) events. It includes implementation objectives and supporting tactics for success, patient and community stories, resource and cost considerations, and other reference documents. Below, are a few items to keep in mind while reviewing the materials:

- Steps are laid out sequentially but could happen in parallel. An organization could begin creating use cases while performing a current-state systems assessment, for example.

- A Learning Guide is not an implementation manual with detailed checklists for installing a new system. Instead, the materials lay out the most important decisions and considerations for a community interested in this functionality.

- Governance, leadership, and goal setting take time and communities may have different levels of engagement and readiness when first referencing this Learning Guide. (See "Setting the Stage for Success" for more information.)

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

- Communities with both new and mature health information exchange capabilities can benefit from implementing ADT-based alerts. These alerts can serve as a gateway to other care coordination and care management health IT strategies. Depending on the community, ADT-based alert solutions can fit into other existing pieces of a health IT infrastructure with minimal modification.

- Not all decisions are created equal. While the Learning Guide includes many important decisions, some – like deciding how to integrate the ADT-based alerts into clinician workflows – have tremendous implications for both the success and cost of the implementation.

About ADT Alerts

ADT messages are the vehicle for communicating updates about a patient's care transitions. The messages provide each patient's personal or demographic information (such as the patient's

name, insurance, next of kin, and attending physician) and when that information has been updated. They also indicate when an ADT status (e.g., admitted, discharged) has changed.[iv]

- The alerts are triggered by an admission, discharge, or transfer (ADT) event in a hospital information system that sends a message to the health information exchange system.

- The HIE system processes the message and transforms it into an alert sent to the primary care practice or community-based care manager.

- This communication notifies the physician, care manager or care management team to initiate an intervention, improving the post-discharge transition, and supports management of patients with chronic conditions.

While this Learning Guide focuses on clinical use cases for ADT-based alerts between hospitals and physician practices or care managers, use of ADT information can assist other community partners with care coordination. For example, skilled nursing facilities can use alerting to better manage the transitions for the elderly frail to and from the hospital setting. Beyond the real-time alerting application, ADT information serves as the foundation for "hot-spotting," or identification of individuals who are disproportionately high users of hospital services. Popularized by Atul Gawande's New Yorker article[v], hot-spotting allows leaders to better understand the shared cost of these high utilizers, and direct supportive clinical and non-clinical services to prevent unnecessary utilization. For more information, please refer to HIE Bright Spots[vi], AHRQ's Patient Centered Medical Home Resource Center[vii], or other resources found on ONCs healthIT.gov website.

Greater Cincinnati Beacon Collaboration: Donnie and Nyree's story

Like any parent, Donnie was in a panic when his daughter Nyree, a lively five-year old with asthma, experienced an allergy-triggered exacerbation that sent her to the ED. Nyree responded well to her treatment and was sent home within a few hours. Also within a few hours' time, Nyree's primary care clinic received an alert from the hospital about her ED visit. News of an ED visit usually takes weeks or even months to reach primary care providers; Nyree's clinic was notified in the same night.

The hospital-based University of Cincinnati (UC) Med/Peds clinic participates in the innovative Greater Cincinnati Beacon Collaboration (GCBC) project, which combines health IT with QI to improve health outcomes. While Nyree was treated in the ED, an electronic notification or ED alert was sent from the hospital to UC Med/Peds through HealthBridge, the region's HIE system. Within hours the practice received the alert, identified a pattern of previous utilizations, and contacted Donnie to schedule a follow-up appointment for Nyree.

At the appointment, Donnie and Nyree worked with the practice to determine factors that contributed to the exacerbation and how to mitigate future episodes. Donnie learned that he could call the practice at any hour for questions and Nyree could be seen during their extended evening hours for acute issues. Donnie left equipped with new knowledge and strategies for providing the best care for his daughter.

For more information about GCBC, see: http://www.youtube.com/user/HealthBridgeHIE

Setting the Stage for Success

There are several items to consider before developing and initiating an ADT-based alert program including the quality improvement and patient safety **goals** of the community, the **interest** in ADT-based alerts, as well as the composition and **structure** of the community. At minimum, a "community" includes at least one hospital and an affiliated primary care practice. Communities with multiple hospitals, multispecialty practices, and other provider types—such as post-acute care facilities or behavioral health providers—have all benefited from ADT-based alert systems.

Communities that have been successful in implementing ADT-based alerts also have some formalized health IT governance and structure arrangements, health information exchange capability, and experience working collaboratively to drive health care improvement. Beacon communities with established leadership and governance infrastructure were well-positioned for a smooth and timely implementation having the right stakeholders at the table. Most Beacon communities had HIE capabilities in place at the start of ADT-based alert implementation, but not all. Communities without such capabilities worked to establish the system and develop the appropriate data use agreements (DUAs) for information exchange, as these are necessary for building an ADT-based alert system. For a snapshot of Beacon communities' experiences in planning for or implementing ADT-based alert systems, see Appendix B.

Goals for ADT-based Alert Programs

- Improve communication across care providers
- Improve chronic care patient management
- Reduce unnecessary hospital utilization

To get started with the implementation process, several structural elements are essential: leadership and governance, sustainability, quality improvement, performance measurement and evaluation, and health IT, and policy and security. Exhibit 1 summarizes these elements needed prior to implementing an ADT-based alert system.

Exhibit 1: Foundational Elements for Success

Element	Considerations
Leadership and Governance	- Is there a representative body empowered to make decisions, which includes management and clinicians representing both the hospital(s) and ambulatory practices? - Does a data use agreement (DUA) exist that can be amended for ADT-specific requirements?
Sustainability / Resources	- Are committed resources available (including people and funding) for implementation or a plan for identifying and obtaining the necessary resources? - Is there a clearly stated and accepted value proposition?

Element	Considerations
Quality Improvement	• Do the participating hospitals and practices have experience in implementing quality improvement programs using health IT?
Performance Measurement and Evaluation	• Does the community have experience conducting performance measurement and program evaluation—for example, establishing program objectives and measuring progress toward those objectives?
Health IT	• Does a basic health IT and exchange infrastructure exist that includes a master patient index (MPI) [viii], integration engine to take in data feeds, and rules engine that supports alerting?
Policy and Security	• Is there an established technical security infrastructure, including secure, HIPAA-compliant connections to community systems? • Are agreements in place on how to address patient consent issues and an understanding of how to comply with the state and federal rules and regulations governing patient consent (e.g., opt in, opt out)?

Lessons from Beacon Communities

Several Beacon communities set goals to reduce avoidable ED visits and prevent hospital readmissions through implementation of automated alerts as a means of improving care transitions, coordination, and management. Beacon Communities' ADT-based alert implementations vary depending on the intended goals, selected drivers for improvement, and the community's existing systems and infrastructure. Beacon Communities exist in a wide range of markets, including those with integrated health care delivery systems and those with loosely organized practices and hospital systems. Although communities with integrated systems have advantages (e.g., aligned financial incentives, organizational objectives), communities with a history of collaboration were also well-positioned to take on the goals of the Beacon program. Beacon communities with experience in ADT-based alert programs that contributed to the development of this Learning Guide include (see Exhibit 2): Bangor Beacon (Maine), Crescent City Beacon (Louisiana), Greater Cincinnati Beacon (Ohio), Keystone Beacon (Pennsylvania), Rhode Island Beacon, San Diego Beacon (California), Southeast Minnesota Beacon, Tulsa Beacon (Oklahoma), and Western New York Beacon.

Exhibit 2: Contributing Beacon Communities
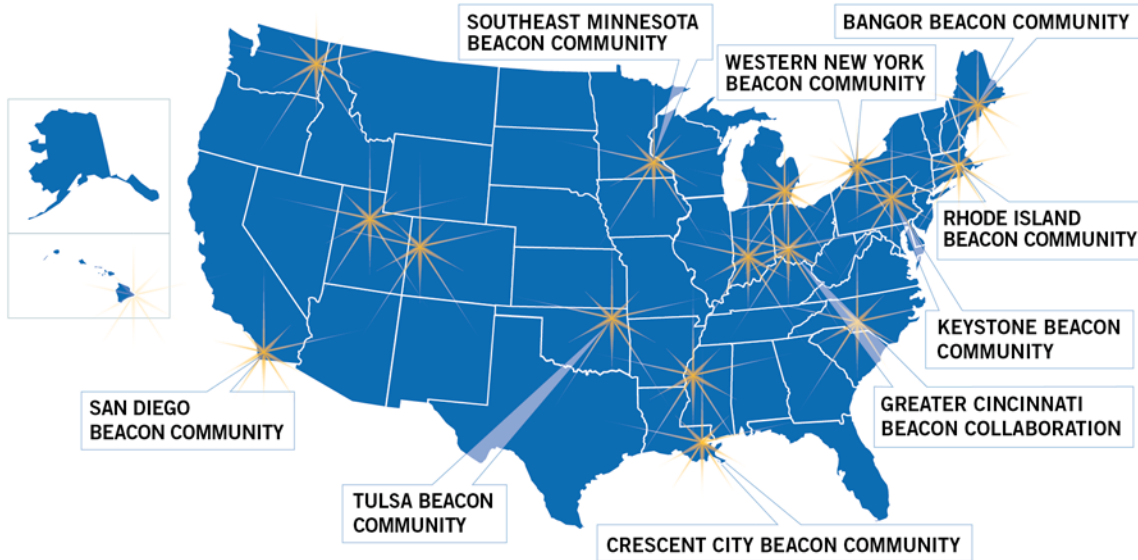
The experiences of these Communities are synthesized into five primary objectives (see Exhibit 3), which reflect the key steps for implementing an ADT-based alert intervention. Each objective is described in detail in the following sections.

Exhibit 3: Implementation Objectives

| 1. Confirm that an ADT System Supports the Community's Goals | 2. Establish Project Scope, Design and Implementation Plan | 3. Evaluate the Ongoing Performance and Impact of ADT-based Alert System | 4. Obtain ADT Information and Transform into Clinically Meaningful Alerts | 5. Integrate ADT-Based Alerts into Care Provider Workflows |
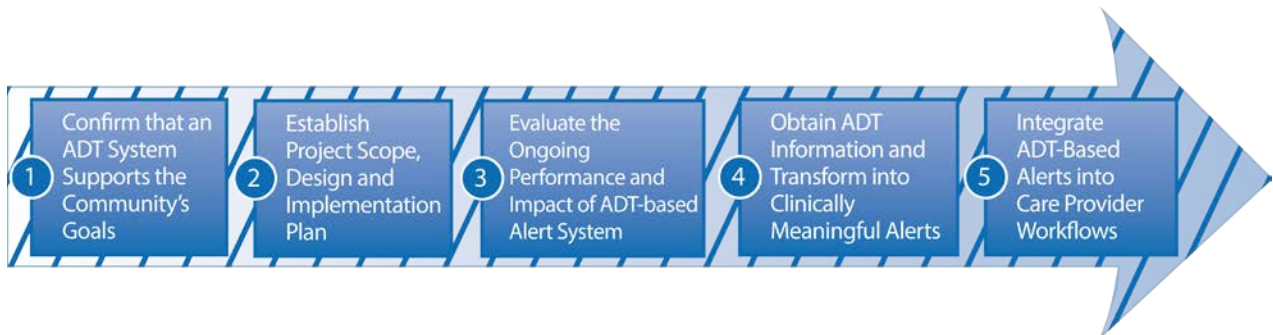
Implementation Objective #1: Confirm that an ADT System Supports the Community's Goals

The first implementation objective is to confirm that an ADT-based alert system supports the community's health transformation goals and is feasible within the technology and financial landscape. This begins with engaging partners and stakeholders, understanding the implementation costs and value proposition, assessing the existing technology landscape to inform the development of a project implementation plan, associated goals and selection of technology. This section describes the steps needed, including:

1. Engage support of appropriate partners and stakeholders
2. Clarify and articulate the local value proposition and funding requirements for ADT-based alerts
3. Assess the technology landscape for feasibility and develop a preliminary systems overview
4. Establish goals for the ADT-based alert system in driving clinical transformation

1.1 Engage support of appropriate partners and stakeholders

A community-level governance body is essential when making key decisions about the feasibility, long-term sustainability, goals, and implementation of an ADT-based alert system. While the composition of this body will vary across communities, Beacons have found that a strong governance body will include both clinical and administrative key stakeholders from hospitals, physician practices and other ambulatory care providers, care managers, and health information organization (HIO) leaders. While not discussed in detail in this document, a vital aspect of the work is the governance body's process for coming to agreement on goals and evaluating the feasibility of implementing ADT-based alerts. This is a significant task even in communities with exiting governance infrastructure and a history of collaboration. For communities new to collaborating, significant time (i.e., up to a year) should be anticipated for this step.

Each stakeholder group will have important considerations in deciding whether to support and whether to participate in the project. Exhibit 4 lists the main considerations needed by specific stakeholder groups.

Exhibit 4: Key Considerations by Stakeholder Group

Stakeholder Group	Key Considerations
All, as part of the governance body	• Market and landscape analysis to understand drivers and constraints • The value proposition for establishing ADT-based alerts in the community, including feasibility, long-term sustainability, costs, and financing plan • How the community will match patients with providers (e.g., will alerts be sent to care managers or physicians?) • Expected outcomes and measurement strategy • Delegation of roles and responsibilities

Stakeholder Group	Key Considerations
Community-based care providers and administrators	- Value - Necessary operational changes and workflow implications - Cost - Patient privacy and security - Alignment with other initiatives, including improvement projects focused on reducing readmissions and/or care management - Required resources, including potential changes to existing ADT feeds
HIO or organization managing the HIE system	- Technical vendor requirements (i.e., can the HIE vendor's technology support this, and if so, what is the cost? If not, what are the alternatives?) - Implications for privacy and security and other community policies - Delegation of roles and responsibilities - Overall evaluation of the ADT alerting system (process and outcome measures), including alignment with other evaluation activities already underway within the community
Patient and patient families	- Implications of privacy and security and other community policies - Assessment of utilization of hospitals services by patients and families, particularly those who might be using services at a higher level

1.2   *Clarify and articulate the local value proposition and funding requirements for ADT-based alerts*

Clearly articulating the value proposition to the various stakeholder groups will assist with obtaining buy-in and commitment from all levels of participating organizations. A strong value proposition for an alert system project explains how it aligns with other quality and performance improvement initiatives, how it will accelerate achievement of local goals, how the financial benefits outweigh the cost of start-up and ongoing operation, and potential funding and revenue sources. Understanding alignments, costs and benefits is necessary to develop a strong value proposition.

Align with existing quality and performance improvement initiatives.

At the community level, HIOs, practices, payers, and hospitals, may be involved in several concurrent quality and performance improvement activities. In order to align existing efforts, an important first step is to develop an inventory of community and practice-based quality and performance improvement initiatives. A subcommittee of an existing governance body or a quality improvement committee within the community may be tasked to conduct this inventory and assess existing quality programs, including the respective roles, resources, and required stakeholders' effort. This activity will help articulate the value proposition and benefits of implementing ADT-based alerts, building on existing efforts, and strategically aligning with community-wide goals to improve health and care at lower costs.

Physician and hospital providers will require an upfront description of how the alert system aligns with other national and local projects in which the practice may be engaged. For example, many practices are attesting for Meaningful Use projects, seeking Patient Centered Medical Home (PCMH) certification, or preparing for future changes brought on by implementation of the ACA or payment reform. Understanding how these programs align with the ADT-based alert system and articulating this message to participating practices will result in stronger buy-in at all levels within the practice, which will be critical for their participation. As an illustration, a PCMH model allows discharge planning to begin immediately after an alert is triggered because ED staff can coordinate directly with the PCMH provider team to schedule a follow up appointment.

Calculate and consider start-up costs, ongoing operational costs, and potential funding sources and revenue opportunities.

An explicit discussion of costs and potential sources of funding is necessary prior to beginning the project. Consider cost and resource drivers in the planning phase for ADT-base alerts program. Community decisions regarding the design of the system and the extent to which ADT-based alerts are integrated into the clinical workflow and customized for specific patient populations have a range of implementation costs. Costs can fall into several general technical and non-technical categories:

Technical

- Extracting data from the host system
- Sending data to repository
- Developing interface to receive data
- Translating data into a format requested by receiving vendor

Non-technical

- Revising workflow to support usability of alerts
- Training alert recipients on appropriate routing and follow-up
- Evaluating and reporting results for real time improvement

Some costs may need to be paid upfront while others may be amortized over time through revenue, and the governance body may consider several options for funding these expenses. Opportunities may exist to cover costs through grants, government funding sources, or requests that large hospitals – the early beneficiaries of the alerts – cover the expense. The funding sources may also change over time. For example, a community could start by funding most costs through grants and transition to a community-supported or revenue-driven model. The technical strategy chosen will be the main cost driver. Exhibit 5

Exhibit 5 illustrates the relative cost of various scope and intensity alternatives.

Exhibit 5: Relative Cost/Resource Use Considerations

Implementation Objective #3 | Evaluating the Ongoing Performance of an ADT-based Alert System

LOW ◉ ──────────────────────────────➤ ◉ HIGH

Monthly performance reports are manually extracted from systems for a few key operational and/or data completeness metrics by a part-time, low-to-medium level analyst

Performance management system automatically generates multiple types of reports by extracting data from multiple disparate systems; reports are based on clinical, financial, and administrative data that is risk-adjusted, if needed, by employing the appropriate, defined methodology included in source code and back end programming

COST DRIVERS/RESOURCES
1. Staff (or contractor) manually extracts data for a small set of metrics (Low) vs. statisticians for database system design and, configuration analysts and statisticians to develop automated reporting system (High)
2. Implementation of metrics that require simple numerator/denominator calculation (Low) vs. implementation of metrics requiring risk- or case-mix adjustments (High)
3. Data storage in a basic database for a small number of patients that an analyst extracts data from (Low) vs. build a large relational SQL server database from which many users/applications extract information to calculate metrics (High)

Implementation Objective #4 | Transforming an ADT Message into a Clinically Meaningful Alert

LOW ◉ ──────────────────────────────➤ ◉ HIGH

A care transition event at a single hospital creates a simple ADT message that is transformed to an alert by an HIE system and securely delivered to PCP attributed to patient

Multiple systems are integrated to create ADT messages; physicians and care managers manage patient attribution; sophisticated business rules are used to trigger alerts

COST DRIVERS/RESOURCES
1. Standard (Low) or Custom (High) Interfaces from Hospital Registration Systems to create ADT messages
2. ADT message content limited to ED or hospital admissions (Low) or ADT messages used for additional clinical content (High)
3. Simple message based approach (Low) or support multiple methods (High) to create and update patient and provider master tables and alert relationships
4. Simple message to ADT alert creation (Low) or complex filtering and evaluation logic (High) to create alerts
5. Single delivery endpoint (Low) or multiple destinations (High) for alert delivery
6. Single HIE vendor (Low) or multiple complex vendors to deliver HIE and alert functions (High)

Implementation Objective #5 | Integrating ADT-based Alerts into Care Provider Workflows

LOW ◉ ──────────────────────────────➤ ◉ HIGH

Redesigned workflow within the practice to accept and manage alerts and to provide appropriate follow-up care to patients

Tailored chronic disease management program for high risk patients based on analysis of alert data and patient stratification

COST DRIVERS/RESOURCES
1. Integration of a few step triage process by an administrative staff member into the clinical workflow (Low) vs. integration of a multi-step triage process by multiple members of the administration or clinical care team (High)
2. Alert management training of a few key administrative staff on minor workflow changes (Low) vs. training for all key clinical, clinical support, administrative, and technical staff within a practice for a high impact clinical workflow redesign (High)
3. Extraction of a few data elements from basic database by low level analysts once a day (Low) vs. hiring of additional technical, statistical, and/or clinical staff to manage alert triage process multiple times a day (High)
4. Decision to conduct outreach only to patients meeting a few specific parameters (Low) vs. conducting outreach to all patients for whom an alert is received (High)

Understand total cost of care and identify potential savings resulting from achieving quality and performance improvement goals.

Discussing the shared cost and expected savings from improving care transitions and chronic care patient management with each stakeholder group engaged in the project will also assist with gaining buy-in and support across the community. In recent years, more incentives are available to better coordinate patient care, particularly when patients are discharged from the hospital, such as through hospital readmission penalties and accountable care organization (ACO) shared savings programs. ADT Interventions enable providers, case managers and care coordinators to reach out to patients transitioning from inpatient hospital care to community-based care and provide the care and services needed to reduce the likelihood of a readmission, and the costs associated with readmission.

Consider potential impact in revenue resulting from payment reform.

Payment reform models, such as the Pioneer ACO Program, Advanced Payment ACO Program, and the Medicare Shared Savings Program, as well as other payment reform programs such as the Hospital Readmission Payment Adjustments and the Bundled Payments for Care Improvement Initiative, are all structured to reward the value of health care rather than volume of services delivered. Each of these programs has financial rewards or penalties that can affect hospital or provider revenue and bottom line. Hospitals, practices, and communities participating in these programs have strong incentives to consider alert systems to improve care transitions and manage care, thereby maximizing potential revenue from Medicare or commercial payers.

1.3   Assess the technology landscape for feasibility and develop a preliminary systems overview

Assessing and documenting the technology landscape will serve as a foundation for design, development, configuration, and testing of your ADT program. The document (the preliminary systems overview) will reflect system types, deployment constraints, and system guidelines and architectures to help determine and select technology options. A comprehensive and thoughtful assessment of the current systems and technologies in place will allow for more efficient and cost effective design and implementation.

The following are recommended steps for creating a comprehensive assessment of the technology landscape:

- **Determine System Types.** Identify the systems needed to send ADT messages and the systems that providers and care managers would use to receive them. This supports the design of the HIE system in a manner that supports delivery to the provider recipient.

- **Identify Deployment Constraints.** Capture technology options and constraints at the beginning of the project. For example, what capabilities do the participating health care practices, hospital and their vendors bring to the table? Identify if the capability already exists in the community to generate ADT -based messages. If the capability exists, the implementation and systems scope can focus on alert creation and delivery. Also gather

business requirements, policies, or procedures related to communicating with participating hospitals. Develop an implementation package that describes the system architecture to share with hospital IT departments, along with emphasizing the necessity to test and validate ADT-based messages before sending.

- **Identify System Guidelines and Define Architectures.** Document the performance guidelines and structure of the system. For example, if the health information exchange system currently has a service-oriented architecture (SOA).

- **Determine Technologies.** Finally, identify a set of technology options based on system guidelines and using selection factors such as:

  - *Potential for Reuse:* Consider systems already used by the community or other partners to avoid unnecessary rework and duplication. Most communities begin by working with existing HIE systems and infrastructure. Their goals may include replacing or augmenting some of those systems.

  - *Organizational Policies:* Keep in mind technologies previously approved according to community policy.

  - *Resource Skills:* Consider knowledge and experience with previously implemented technologies.

  - *Deployment Constraints:* Keep in mind the community's deployment constraints and limitations of existing systems needed to perform required functions.

After the systems overview has been documented the community is ready to set goals and move forward towards the design, development, configuration, and testing of an ADT-based alert system.

1.4 Establish goals for the ADT-based alert systems in driving clinical transformation

The community's specific goals for an ADT-based alert system will shape the implementation design, which will then determine the time and resources required during each phase of the project. Beacon Communities generally focused on improving communication between 1) hospitals and primary care providers or 2) hospitals and centralized care managers. For example, one Beacon Community's ADT-based alert system approach was to develop a message publishing platform to which authorized care managers could subscribe and then receive messages about their assigned patients. Another Beacon community focused on establishing a Direct[ix] protocol infrastructure to deliver alerts as secure email messages to community providers in the practice setting. Once the community identifies the system goals and documents the clinical and workflow scenarios (use cases), those will drive the alert process.

Rhode Island Beacon Community: Aligning Efforts for Successful Implementation

The Rhode Island Beacon Community (RIBC) is working to extend the reach of the state's HIE, known as CurrentCare. This innovation began by aligning efforts with the state PCMH organization whose members expressed the need for reliable, timely notice that their patients were hospitalized. Rhode Island Quality Institute (RIQI), the organization that was awarded the Beacon Community grant, had an established board of directors which was essential in achieving buy-in. With participation from major health systems and partners and representing payers, large employees, health systems, and chambers, the RIBC was able to gain the needed support.

The goal of the initiative is to promote the adoption of ADT-based alerts to reduce preventable hospitalizations and avoidable ED use. In addition to the ADT data, the goal of *Hospital Alerts* is to provide physicians with necessary clinical information to improve transitions of care as patients move from an ED or hospital to other care settings. RIBC began ADT-based alert implementation by adding a new functionality to the existing state HIE by building the *Hospital Alerts* service and then utilizing the Direct messaging services that had been deployed as part of the state HIE program. Because Rhode Island is an opt-in state, a patient must consent to and be enrolled in the system for an alert to be sent. Similarly, the provider must subscribe to the system. Patient-to-provider attribution is conducted at the hospital by asking the patient to name his or her primary care provider. Automated real-time notifications are sent to practices when patients are admitted or discharged from the hospital using Direct secure messaging.

The Hospital Alerts service offers a variety of options for providers throughout the continuum of care to be able to access health information on their patients, thereby improving care transition, care coordination, and care management. Messages sent in real time offer providers the ability to respond quickly at times when patients are most in need of support and care coordination, such as during care transitions. Because the ADT-based alerts represent an "interruptive technology," the Beacon continues to work closely with providers to generate efficient workflows, educate care teams, and identify any gaps. RIQI also manages the state's Regional Extension Center and leverages the existing relationships with community practices built by "Relationship Managers" who are trained to promote and support the use of the ADT-based alerts to providers.

RIBC encountered some challenges in the implementation strategy. Since RIBC leveraged the existing Direct messaging system rolled out across the state, the service was available to every enrolled provider. The service is based on both patient consent and provider enrollment, so adoption was dependent on provider engagement. RIBC found a slow uptake in provider participation. In addition, while many providers found their notifications to be adequate, data from CurrentCare showed that they were missing information from some hospitals and that the existing notification process was slow and unreliable. Changing this status quo or changing the way "things have always been done" was a challenge. Another challenge was the execution of legal agreements between practices and RIQI and determining the appropriate format and amount of information to include in messages to providers. *Hospital Alert formats* were revised to include the right level of detail and to allow providers to easily identify patient information. At the end of 2012, *Hospital Alerts* had been adopted by 54 practices representing almost 200 providers, with each provider receiving, on average, three messages per week. In addition to the successful increase in use of alerts, RIBC has increased the patient population enrolled and participating in CurrentCare. In the future, the Beacon plans to roll out "subscribe to patient" functionality, enabling providers to proactively identify patients for whom they wish to receive alerts.

Implementation Objective #2: Establish Project Scope, Design and Implementation Plan

To transition from community goals to an actionable plan, communities should consider the following steps:

1. Determine how the ADT alert project fits into the technical landscape

2. Enact or amend data use agreements to support ADT-based alerts

3. Select vendors to support the technical strategy

4. Develop an execution plan and begin with a pilot

With the value proposition, technology landscape, and program goals in mind, the community should scope the project and develop execution plans that minimize the amount of time required in each phase of the system implementation.

2.1   Determine how the ADT alert project fits into the technical landscape

Community-specific scenarios or use cases of ADT-based alerts will drive systems development. Identify use cases, or interactions between users and systems, to select and configure systems appropriately and effectively. Use cases help all stakeholders understand how information flows and helps identify the required system functionality, data elements, and needs for new systems or technology. Use cases also provide a framework for testing, privacy and security assessment, user acceptance, and evaluation of the alert system.

Establishing use cases helps providers, technologists, administrators, and other support staff to explore scenarios for how ADT feeds can be developed and used. Providers receiving ADT-based messages should be involved in identifying the information most useful to them, informing the development of ADT-based messages to create meaningful alerts, and selecting the candidate system that will provide access to this information. Providers should also be involved in defining shared data elements and alert functionality that support their workflow.

Considerations for developing use cases may include:

> **Use Case:** A means of clarifying system requirements, use cases show how a technology solution can meet the organization's goal by modeling interactions between systems and users. It organizes functional requirements and records scenarios from the triggering action to the goal. Use cases can include diagrams and narratives; diagrams can help capture and visualize the complexity of system/ user workflows.

- **How should ADT feeds be filtered?** A goal is that only clinically meaningful ADT feeds become events so distracting information is minimized.

- **Where will ADT-based alerts originate?** Some EHRs can send ADT alerts or notifications directly from the hospital system to a practice inbox or fax machine without help from an HIE. An HIE can provide additional value, however, as a central repository for physician contact information and preferences, and by creating a pool of provider contacts available in one place.

- **Will clinical data be sent?** Providers may request clinical information such as diagnosis or discharge summary information in addition to the ADT-based alert. Some communities found it effective to start with a minimum necessary data set (excluding the additional clinical data) and then expanded the message to include the clinical data.

- **Who will receive the alerts: a practice or a care manager?** Depending on the intended recipients, the HIE needs to be configured to send the alert to the appropriate destination for follow-up.

After developing the community specific use cases for ADT-based alerts, create a detailed system overview to guide the technology design process (see Exhibit 6).

Exhibit 6: Sample Systems Overview
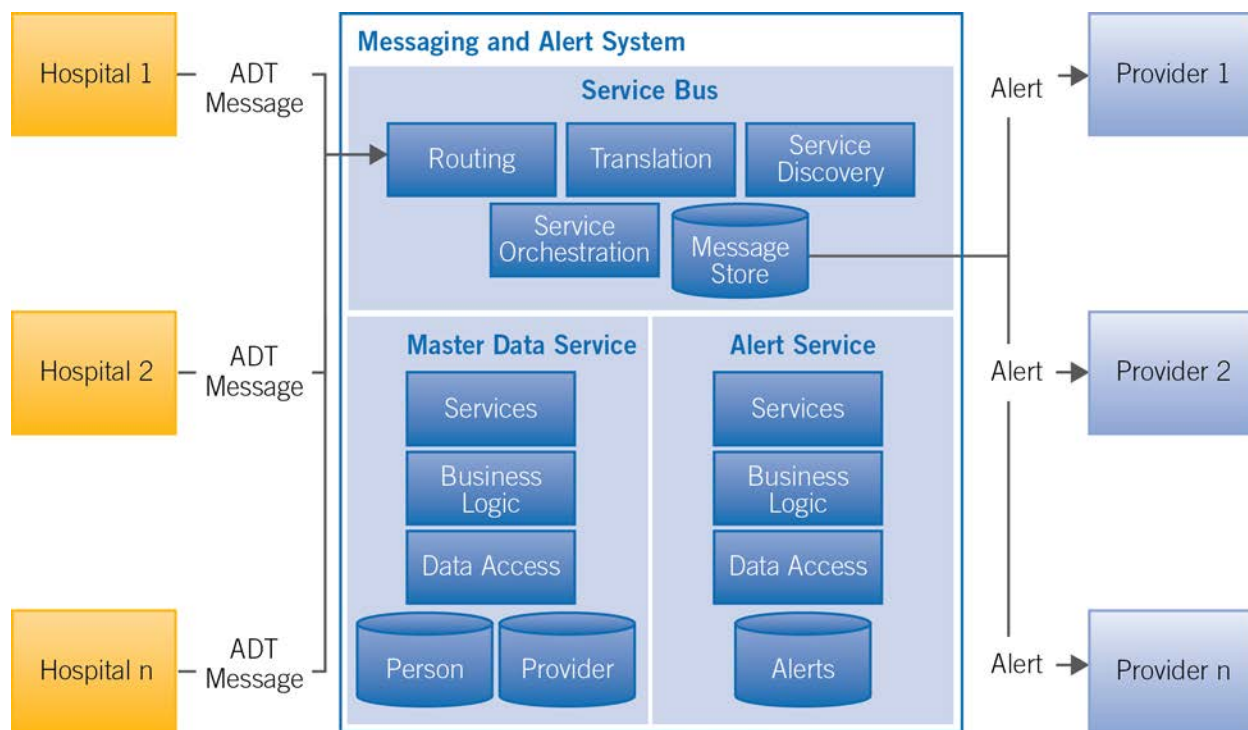
2.2   *Enact or amend data use agreements to support ADT-based alerts*

Similar to the magnitude of the investment required in convening a representative governance body to facilitate community-level decisions, developing, executing, and maintaining data use

agreements (DUAs) is a significant component of implementing ADT-based alerts. While this will not be discussed in detail in this document, those considering this work can expect to spend a considerable amount of time (e.g., up to a year) working through this step. Of note, DUAs and amendments preserve compliance with Health Insurance Portability and Accountability Act (HIPAA), as well as state laws. A sample DUA is included please in Appendix C.

Ideally DUAs are already in place between participating organizations. Even in this case, additional amendments may need to be established to cover the data shared through the alert system. Stakeholders must first determine what information will be contained in the alert, such as: patient demographic information, specific information about the ED/inpatient visit the recipient requested, and any additional information to append or send as a follow-on document. After the data needed in the ADT-based alert message is identified, the parties sharing the data determined, and the intended use of the data have been agreed to, a legal team reviews existing DUAs and determines whether amendments are required. If an amendment is required, the governance body creates, reviews, and accepts changes in language to the DUA, followed by obtaining signatures from all participating organizations. The principles in Exhibit 7 can serve as a framework for DUAs that require amendment.

Exhibit 7: Guiding Principles to Determine Whether a DUA Requires Amendment

Guiding DUA Principle	Reason To Modify for ADT Alerting
PURPOSE: Establish what the data will be used for, as permitted by applicable federal, state, and local laws.	If the original data uses will be modified by implementing ADT alerts, amendment might be necessary. If the original agreement was to share data among covered entities in support of treatment payment and operations, changes might not be needed for the ADT alert intervention. However, an expansion of uses beyond the original intended purposes of the DUA, such as access to information by health plan care/case managers, might require changes to the original agreement.
CONTENT: Data use must be limited to the amount necessary to accomplish specified purposes.	If the original DUA defined a limited data set or specific types of data permitted under the agreement, modifications may be required. One example is a DUA that has a defined minimum data set needed to support results delivery. ADT message content would probably fall under that umbrella; however, additional clinical information being sent to the practice might not.
RECIPIENT: Establish who is permitted to use or receive the limited data set.	If any intended recipients are added or were not covered under the original DUA (e.g., payer care managers), a modification might be required.

2.3 Select vendors to support the technical strategy

The final step is to select the vendors for the candidate system. A small pilot or prototype will allow for exploring specific design choices by testing various system models and validate new

concepts, especially where there are interactions with hospital information systems or with provider endpoints. This enables the community to continuously improve the system design as new business requirements are gathered or as the piloted systems inform the clinical transformation process. If using a rapid prototyping design and development process, ensure that each iteration includes design, architecture, and integration activities.

The following are typical steps that would accompany system selection:

- Verify business and functional requirements are complete with key stakeholders

- Define and prioritize system selection criteria. Some factors to consider include:

  - Ease of implementation

  - Usability, interoperability, cost, benefits, and maintainability

- Develop a functional prototype to answer any key questions or to further define system requirements

- Review and rank candidate systems against criteria

- Develop a systems selection recommendation

- Use existing system governance structures and processes to make a decision

Crescent City Beacon Community: A Program of the Louisiana Public Health Institute

The Crescent City Beacon Community (CCBC) is working to reduce health care costs by decreasing preventable ED visits and admissions through better care coordination for chronic disease patients. This improvement is fostered through a community-shared HIT infrastructure, the Greater New Orleans Health Information Exchange (GNOHIE). GNOHIE links EHRs and health information systems of community health clinics and hospitals to allow continuous, secure, and HIPAA-compliant exchange of information. Hospitals and clinics must sign a data sharing agreement to participate in this exchange.

Intervention and Implementation Strategy

The CCBC works to improve transitions of care by implementing ED and inpatient notifications. These notifications are alerts containing clinical information sent to primary care providers about patient ED visits and hospital admissions. In April 2011 a Transition of Care (TOC) workgroup was created to create a framework for the development and implementation of this notification system. Foundational components included a list of essential and "nice to have" elements, a minimum standard data element set, and the policy and protocol framework for hospital and clinic settings.

To take this to a user setting, the workgroup held interviews with primary care practice providers and leaders. Themes that emerged from these interviews included (1) the importance of having the new notifications be distinguishable from other messages in their EHR system, (2) the frequency of receiving the notifications (once vs. separate admission and discharge alerts), and (3) the options associated with routing and review of

notifications associated with clinical documents (i.e., adopting a model in which a nurse triages messages before sending them to providers). These interviews led to the development of two use cases: an ED Notification and Discharge Summary and an Inpatient Notification and Discharge Summary.

The workgroup conducted detailed workflow mapping sessions and follow-up interviews at both the participating GNOHIE hospital as well as with pilot primary care practices to understand the factors relevant in ED and inpatient settings. This laid the foundation for the ED/inpatient notification–related user interface (UI) enhancement and EHR configuration requests. Go-live readiness also required further data quality and notification testing, staff training, and UI operability testing.

Results

The intervention goals are to decrease preventable readmissions and ED visits, reduce medication errors and adverse events, decrease overutilization and duplication of resources, and increase patient and caregiver clarity as to overall plan of care. As of March 2013, two hospitals and 25 primary care practice sites are engaged in the ED/inpatient notification intervention. The hospitals and primary care practices are continuing to enroll and consent patients to enable the collection and incorporation of additional patient information.

2.4 Develop an execution plan and begin with a pilot

When implementing ADT-based alerting initiatives, start small and then expand. A small pilot effort that sends ADT-based alerts to a few recipients will enable implementers to test the system before expanding to include additional recipients. Working with a small, focused group of engaged participants provides an opportunity to clarify the alert use cases and alert content while informing data needs, system selection, and resource requirements before bringing the project to scale. The community will need to decide whether one or more hospitals will participate in the pilot, and which provider practices or care managers will be included. Pilot provider practices and hospitals sites typically have strong clinical leadership, technical resources and experience with quality improvement projects. Additionally, decisions need to be made about whether clinical information, such as a diagnosis, medication list, or discharge summary needs to be passed to providers.

An additional design consideration is the usability of the alert information. The usability of the alert will enhance provider satisfaction with and effectiveness of the ADT-based alerts program. Usability should be considered in the design phase and review during the pilot testing. Designing usable alerts depends on how and where the users receive alerts. The following considerations can create a more usable solution:

- **Counting clicks.** Providers will be more satisfied with a solution that is easy to access and review.

- **Amount of information.** Providers can be overwhelmed if receiving too much information, particularly during the initial pilot. While complete clinical information is valuable, communities may decide to gradually increase the amount of information to avoid overloading users.

- **Alert frequency.** Providers can be overwhelmed by receiving too many alerts, as well. For example, ADT-based alerts may be one of many types of alerts that the users receive in a clinical system. ADT-based alerts should be on an appropriate delivery schedule and take into account other alerting workflows.

- **Format and display.** In addition to being accurate, the alerts should be cleanly formatted for display in the source system. Examples of poor formatting can include confusing line breaks, unaligned columns, and excessive use of underline, italics, and bold.

- **Usability labs.** Testing alerts in the source system with users provides ample feedback on ways to make the alerts easier to interpret.

- **Performance.** Technical problems also impact usability, for example, a button that does not work, not having a way to delete or resolve an old alert so that the alert queue continues to grow, or system slowness. These small technical glitches annoy users or incentivize them to create workarounds that complicate the original workflow.

Different models can be used to guide pilot implementation efforts. One of the most commonly used approaches for quality improvement is the Model for Improvement and Plan-Do-Study-Act cycles[x], developed by Associates in Process Improvement. This method involves a 'trial and learning' carried out over a course of four repeated steps illustrated in Exhibit 8.

Exhibit 8: The Plan-Do-Study-Act Cycle[xi]

IV. ACT
- Determine what changes are to be made

I. PLAN
- State objectives
- Make predictions
- Develop plan to carry out rest cycle

III. STUDY
- Summarize what was learned

II. DO
- Carry out the test, document problems and unexpected observations
- Begin analysis of the data

- **In the Plan Phase**, the improvement strategy is detailed, tasks are assigned and expectations are confirmed with the testing team.

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- **The Do Phase** is the pilot implementation phase, and both problems and unexpected observations are documented for analysis.

- **In the Study Phase**, the results from the Do Phase are analyzed and decisions are made in terms of what components of the intervention need to be modified for the next cycle.

- **The Act Phase** incorporates lessons learned from the Study Phase and makes changes to the Quality Improvement plan. For the following cycle, the steps are then repeated.

Starting on a small scale using Plan-Do-Study-Act cycles, both in terms of the number of participants and the amount of content sent to the clinics or care managers, enables confirmation of the functionality of the alert system before broader implementation, and gives stakeholders an opportunity to understand what clinical information is helpful to alert recipients. Many factors impact and are incorporated into the ultimate size of the pilot, including:

- **Costs and budget.** How much support can the community afford to provide?

- **Number of providers.** How many care providers should the pilot include?

- **Amount of functionality.** How many new tools and workflows will be incorporated?

- **Expansion schedule.** How many phases will the pilot cover, and how long will the delay be between phases?

An ADT-Based Alert Program Targeting Patients with Asthma and Diabetes.

A major objective of the GCBC's activities in general, including the ADT-based alert system, is to improve coordination of care and quality of services for patients with asthma and diabetes. This is a focus because of:

- Expected reduction in reimbursements for hospital readmissions

- Improved health outcomes achieved by providing the right type of care for high risk patients

- Avoidance of unnecessary ED visits and hospitalizations

Measuring Success. There are separate programs in place for children and adults, and each of these has slightly different goals. The evaluation team is currently pulling data from the hospital association. The baseline period is 2010, and the intervention year is 2012. The evaluation will examine the impact of the program on readmission rates. The GCBC practitioners and staff noted that there were challenges in obtaining access to data because of the high volume of patients (i.e., 33,000 kids with asthma; 35,500 patients with diabetes).

The goal of the pediatric project is to get high-risk patients to meet utilization targets and other criteria after enrollment in care coordination programs. Performance metrics include—

- Number of children in care coordination

- Number that graduated from care coordination

- Number that remained out of ED while in care coordination.

Implementation Objective #3 Evaluate the Ongoing Performance and Impact of ADT-based Alert System

Evaluation is an essential aspect of any quality improvement activity, including an ADT-based alert system program. Initial conversations around program goals and design should include a discussion of how the program will be evaluated. This section describes several areas in which measurement may be valuable, notes particular measures that may be used for monitoring and evaluating, and highlights the importance of ongoing monitoring and reporting. Communities designing an ADT-base alert program should consider the following steps:

1. Understand potential measure types
2. Develop reporting mechanisms and ongoing monitoring and review processes

While it is important to discuss and determine an evaluation strategy early in the planning stages of implementing ADT-based alerting, as the system expands and more is learned, the approach will likely evolve.

3.1   *Understand potential measure types*

A comprehensive evaluation includes measures that describe the characteristics of the system, monitor the quality of information being transmitted, monitor the usage of alerts, and track progress on clinical outcomes as they relate to ADT alert system goals. Measures used to evaluate performance of ADT-based alerts capture performance in four distinct areas:

- **System Characteristics:** Who is participating in the program?
- **Data Quality:** How well is the system functioning?
- **Usage of Alerts:** How many providers and patients are using the alerts?
- **Patient Outcomes:** What is the impact on clinical outcomes?

To track and monitor **system characteristics,** consider capturing participating hospitals, clinics, and patients as a proportion of the overall population of the target region. This set of measures might also capture the proportion of hospital discharges that generate an alert. These measures provide community leadership with an understanding of the reach of the program.

Data quality measures of ADT alert systems address the quality of information being transmitted by the ADT-based alerting system. Understanding and maintaining high-quality data enables participating clinicians to use appropriate, patient-specific information to enhance patient care. Clinicians receiving incomplete, inaccurate, or irrelevant information are unlikely to find value in their participation. Key questions for assessing data quality may include: Is the information in the alert accurate? Do the data fields contain the expected data (e.g., name field does not include contact birth date)? Are all fields complete? What percent of patients are accurately attributed to the correct practice?

It is also important to capture the **usage of alerts,** or the degree to which participants act upon the information that they've received. Potential measures here might include the percent of daily

alerts reviewed and acted upon. EHRs, for example, may be able to track alert messages received by the system and how those messages were resolved. Data monitoring and feedback that shows clinically-valuable alerts are not being used could be an important finding that leads to reexamining key aspects of program design.

Finally, the overall goal of implementing ADT-based alerts is to improve **clinical outcomes**. Clinical outcome measures for consideration include:

- Emergency department utilization rate

- Hospital inpatient utilization rate

- Hospital readmission rate

- Ambulatory care sensitive readmissions

Further details regarding these measures are included in Appendix D.

3.2   Develop reporting mechanisms and ongoing monitoring and review processes

Tracking, monitoring, and evaluating key aspects of the ADT-based alerting program is essential for improving care coordination and chronic disease management and reducing the likelihood of unnecessary ED use and hospital utilization. To the degree possible, providing real-time information to key stakeholders, participating providers, and program administrators regarding the characteristics of the system, quality of information being transmitted, the usage of alerts, and progress on clinical outcomes will enable appropriate and important adjustments that will contribute to the successful implementation of the ADT-based alerting system.

Implementation Objective #4: Obtain ADT Information and Transform into Clinically Meaningful Alerts

This section provides an overview of the process for developing clinically meaningful ADT-based alerts from a community's existing HIE infrastructure, while preserving security and data quality, accuracy, and utility. This section describes the steps needed, including:

1. Consider security in data transport mechanisms

2. Execute a 5-step transformation process

4.1 Consider security in data transport mechanisms

A critical issue to address when planning an ADT-based system is the security of the information being transmitted. Systems must comply with hospital, state, federal, and endpoint delivery application security requirements and other constraints identified when creating or amending data use agreements (additional details on data use agreements are included in Section 2.2). Specifically, the technology should:

Confirm that the data is going to the correct systems, per the intended data use agreement

Ensure that the appropriate information is sent

Send the data to the appropriate recipients

Some technical strategies that Beacons have used to meet these requirements include:

- **Direct Messaging.** Many Beacons use the Direct protocol for delivery of alerts to a secure clinician inbox. One benefit of the Direct protocol is that it establishes a standard for secure exchange: secure/Multipurpose Internet Mail Extensions (S/MIME). In addition, Direct uses a Public Key Infrastructure approach to establishing trust between two organizations. With this, the receiver must trust the authority that issued the certificate to the sender.

- **Message Encryption.** Because sensitive data is contained in the messages between data sources and the HIE, encryption can protect the information in the message if it is not already done. Virtual private networks (VPN) are a common solution for encrypting the communication channel.

- **Deployment.** Some Beacons have deployed messaging systems on separate physical hardware and network layers. Any data stores or persisted data is encrypted, stored in a separate network layer and a separate database server that only allow access to the specific data access components that require access.

These mechanisms can help address the security requirements of ensuring that the communications are authentic (senders and receivers are who they say they are) and private (only the sender and receiver of the communication have the keys to open the message).

4.2 Execute 5-step process to transform ADT message into an alert

The process of triggering an alert is shown in Exhibit 6. While there may be differences across communities with regard to the size and scope of the ADT-based alert system, the specific data transmitted and the format of the alerts will always follow this five step process.

Exhibit 9: Process by Which an ADT Message Is Transformed into an Alert

- **Source Systems Create ADT Message.** Hospital registration systems trigger the alert process when the registrar or nurse updates a patient's ADT status

- **HIE Receives ADT Message.** The HIE fields ADT messages sent from the hospital systems so that the alert can be redirected to the appropriate care provider

- **HIE Processes ADT Message.** The HIE patient matching and provider matching functions identify the correct recipient for the alert

- **HIE Creates Alert.** Having matched the patient and provider, the HIE compiles the content for the alert into the appropriate format

- **HIE Sends Alert to Destination System.** The HIE sends an alert to the appropriate care provider system for follow-up

The following sections will walk through the alert generation process and identify key technical considerations for configuration and testing.

Step 1. Source Systems Create ADT Message

The most important technical component for automated ADT alerts involves mapping out the specific data elements required by clinicians to make informed decisions about a patient's treatment needs. The community will identify and select participating hospitals and will also determine whether alerts will be triggered by admissions, discharges, or both. This information bounds the implementation and tells the IT team which systems it will have to interact with.

Beacon Communities who have successfully implemented ADT messages to improve care transitions and manage chronic conditions have underscored the importance of robust and complete clinical data. One challenge is to obtain from hospitals data that are clean and contain information that can be easily understood and acted upon. Considerations to explore during system design that impact data quality, accuracy, and utility include:

- **Demographic vs. Clinical Data.** Both demographic and clinical data about patients are necessary to effectively determine the level and degree of intervention required by each patient. Adding more clinical data can increase the usefulness of the information, but also creates complexities in terms of interpretation.

- **Data Elements.** In general, trading partners involved in ADT-based alerts have predetermined agreements about the specific data elements contained in the alerts. In the context, trading partners generally refers to hospitals, practices, clinical care providers, and HIOs.

- **Data Format.** Alignment between partners also requires formal agreement, in advance, about the format in which the ADT alerts are provided. It is important for the data to be in a format that can be successfully loaded and stored in a system for future retrieval or analytics, such as an HIE.

- **Quality Assurance (QA) and Quality Control (QC).** Quality assurance and quality control processes provide structured mechanisms for the community to test the hospital messages for both message and semantic accuracy.

Decisions about specific clinical data elements to include in an ADT alert can be complicated by the electronic format in which the data are stored and transmitted. For instance, a continuity of care document (CCD) for a patient may contain important information, but the data are only useful to the provider practice if the practice has the capacity to receive, read, and store it. In addition, there may be limits to the amount and consistency of patient information collected by each source system. One hospital may regularly send a complete data set for each patient alert while others do not capture as much or even the same information.

A final, but critical consideration about clinical data in ADT-based alerts is the challenge posed by frequent changes in technology and its use across the community. This is a predictable part of the process and accommodation for these changes should be included in the plan. Expectations and standards about data volume, format, and quality provided by source systems must be spelled out clearly

Plan for Differences in Vendor Capabilities

HIT vendor strengths and weaknesses vary. The specific capabilities of existing community vendors will affect the level of effort and cost required to implement ADT-based alerts. The implementation plan will need to account for the differences in vendor capabilities.

The Western New York Beacon Community Learned Firsthand That Acquiring "Clean" Data from Hospitals Can Be Challenging

The chief complaint information in an admission-based ADT feed might be entered by registration staff (vs. clinical staff) who are not qualified to provide a patient diagnosis. While a hospital admission alert is useful for care coordination, clinicians should not rely on that information if no clear, systematic quality control and assurance processes are in place at the source of origin.

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from the outset to avoid confusion or disappointment by users.

Step 2. HIE Receives ADT Message

Before beginning implementation of an ADT-based alert system, it is important to validate the quality of ADT messages that come from hospitals. The quality of the data refers not only to the accuracy of the information, but also to the ability of users to interpret and understand it. It is vital for the recipients of the alerts to be able to make informed decisions and take appropriate action based on the alert information. Create a process flow map in order to understand the complex interactions resulting from receiving multiple data elements from multiple sources.

- Baseline data elements for improving transitions and chronic disease management include patient name, admission type, gender, date of birth, address, phone number, admitting diagnosis/chief complaint, and assigned case manager (Exhibit 10 for common challenging data fields.) In general, the items transmitted for all patients will be agreed upon in advance. For more information about core data elements that support electronic information exchange during care transitions, communities can refer to ONC's *Transitions of Care Initiative[xii]*.

Exhibit 10: Challenging ADT-Based Alert System Message Fields

Item	Definition	Problems
Patient Class	Typically, whether a patient is an inpatient or outpatient	• **Patient Class.** Validate the patient classes in use at each hospital and map patient classes across systems
ADT Status	Indicates a patient's admission, transfer, or discharge	• **Filtering Transfers.** Filter for only those actions that apply to the correct workflow (e.g., admission, discharge) • **ED Admissions.** Ensure they are not filtered out systems track admissions from the ED to an inpatient bed as a transfer • **ED to Observation.** Confirm that the system captures correct ADT event information for each observation-related ADT event
Diagnosis **Chief Complaint** **Principal Problem**	All three may refer to a patient's presenting condition(s) but may have varying degrees of clinical review and validation	• **Consistency.** Ensure that each hospital sends the same diagnosis field, whether it is entered by a clerk at registration or a doctor on the floor • **Recipient Training.** During training, ensure that the recipients know the clinical validity of the diagnosis they will receive

Step 3. HIE Processes ADT Message

When processing the ADT message, the HIE will match the incoming information on two dimensions: the patient and the relationship of the patient with the provider, also known as patient attribution. Appropriate design of the patient attribution methodology is vital to ensure that the correct practices and clinical staff receive alerts for their patients. To accomplish this, the HIE will:

- Match a patient to a common ID through the master patient index (MPI)

- Determine what to do if a patient does not exist in the MPI (e.g., create a new patient)

- Ensure that any providers addressed in the message are part of the provider directory

- Capture the relationship between the provider and patient

The community may decide to limit alerts to a specific patient population (e.g., those diagnosed with a particular chronic illness). In that case, the HIE system will be responsible for filtering messages so recipients receive alerts only for those patients. A patient's ED visit may trigger an automated alert, even if the patient is not part of a target population (for example, patients with a specific diagnosis or type of health condition). Accordingly, the HIE configures filters in the appropriate systems and validates that a process exists for addressing alerts for patients who are not already in the MPI (such as by creating a new patient ID).

Several options exist for managing patient attribution to the correct care providers. These options can include, for example:

- The provider listed in the hospital's HL7 ADT message (such as Primary Care Provider).

- The provider listed in other HL7 messages for the patient, such as prescribing physician (RXE messages), ordering physician (ORU messages), the payer's PCP of record, or a patient's clinician for outpatient encounters (ADT messages from the clinics).

- A community-level patient/provider table that allows care providers to review and modify their own patient lists.

Each community needs equitable and clear business rules for patient attribution to a care provider. In creating these

> ### Patient Identity Management at Tulsa and Rhode Island
>
> The Tulsa Beacon Community obtains a complete patient list from each participating institution including demographic information along with the patient ID/medical record number for its MPI. When ADT messages are received from the institutions, the Tulsa Beacon is able to accurately match the new information to the MPI using the local patient ID/medical record number of the institution. In contrast, the Rhode Island Beacon Community asks patients in the ED to identify the provider who should receive alerts. A limitation of this approach is that the accuracy of the information depends on the patient's ability to correctly identify the provider

rules, sustainability is an important consideration. Allowing providers to review and modify patient lists, for instance, can be highly time-intensive for the clinicians, especially if no automated support is available. Regular updates ensure appropriate attribution and ensure that the data remains useful to clinicians, which increases the overall effectiveness of and satisfaction with ADT-based alerts. The best updates are as close to real time as possible, but manual processes must balance that against burden to users, where weekly or monthly updates are more realistic.

For communities with an HIE that already manages patient attribution, it is important to validate its accuracy and identify any required modifications related to participants in the ADT-based alert system. As the patient index and provider directory are constantly changing, a governance and quality review process assures data accuracy and specifies a mechanism for tests to locate, address, and remove errors.

Step 4. HIE Creates Alert

After processing the ADT message, the HIE will evaluate the message against the business rules to determine whether an alert should be generated. Message triggers and alert evaluation logic must withstand frequent changes without affecting the other parts of the HIE system.

A successful alert message will contain correct and useful content as defined by the community, identify the appropriate patient and provider, and be in a readable format for the recipient system(s). Format standards specify the encoding, structure and semantics of a message or document for exchange. While community members may receive alerts in a variety of different systems and formats, the options typically fall to one of two broad buckets, with associated requirements:

- For recipients viewing alerts via Direct messaging, an EHR inbox, or community portal:

Include the minimally valuable data set: patient demographics, ADT status, hospital contact information, encounter date, and primary care provider.

Decide on additional optional data elements, such as diagnosis, hospital contact information, discharge summary, and medication list. This may require a query of the clinical data repository to add this information to the alert.

Use a format consistent with other messages sent from one organization to the destination system (such as HL7, if sending to another EHR).

Using an Analytics Database to Create an Alert

In some communities, alerts are sent through an analytics data repository instead of a direct response to an ADT message. There are several possible reasons for this, including vendor limitations, policy constraints, or the existence of a strong data repository. In these situations, the data repository is populated by data sent from the source system. The HIE then runs an analytics report on the data and creates a report based on recent admissions or discharges. The electronic report is then sent to a secure inbox or patient portal.

- For recipients viewing alerts via public email or text message:

Remove protected health information (PHI) and direct the recipient to check a secure location for more information, such as the Direct inbox, or to contact a hospital about the patient's recent ADT event.

Tell the recipient that they should not reply to the message (unless the system allows for replies).

Use a format compatible with popular public email systems or short message service (SMS) character limits.

Validate hospital contact information.

Other potential formats that can be considered for messages include Secure File Transfer Protocols (SFTP), portable document format (PDF), Virtual Private Network (VPN), and comma-separated values (CSV) files.

Step 5. HIE Sends Alert to Destination System

The best alert transmission method for a particular community depends on the recipient of the message. Regardless of the method used, it is important to test usability and consider long-term sustainability:

- **Direct Message.** If using Direct, which is email-based and allows attachments, consider including the alert information directly in the body of the email. Additional clinical documents, such as a CCD, can be included as attachments. Recipients may also need a reminder to check their Direct inbox, such as a notification to a personal email address.

- **EHR Inbox.** The alert goes to the inbox of a specific provider or to a "dummy" inbox, depending on the community's workflow. User testing with recipients ensures that the alert displays appropriately in the new system and has the expected functionality, if appropriate.

- **Community Portal.** The alert transmission method is defined by the community's portal configuration. Recipients may need a reminder to check the portal, such as a notification to a personal email address.

The San Diego Beacon Community: The message content is just as important as the message recipient

The San Diego Beacon Community began their intervention by targeting ADT-based alerts to 75-125 individual providers through the providers' Direct accounts. They found that this strategy was not successful and that a more efficient strategy is to send alerts to a designated Care Management team that could take responsibility for acting on the alerts, such as contacting a patient for follow up. San Diego has since shifted their efforts to working with three Care Management programs that are part of other funding efforts. They will begin their roll out and test with one Care Management group and deploy further based on the success of the initial group.

- **Email or Text Message.** If the HIE generates an email or SMS text message, it may be necessary to configure what appears to users, such as information in the message's *From: field.*

ADT alerts can trigger a message at the time of admission or discharge. Complete clinical summaries, however, can take a few days before they are available (often because doctors need to sign off on transcriptions for their discharge summaries). It is important for the HIE to send alert notifications and other reports at the appropriate frequency, taking into account the timeframe within which the data are available. Finally, the HIE requires configuration for an error queue to triage rejected messages (for instance, in the event a clinic removes a dummy provider without a verbal or system notification).

Crescent City Beacon Community Bridges the Communication Gap between Patients and Providers

Abigail, a nurse care manager at the Daughters of Charity Health System, a participating federally qualified health center (FQHC) network in the Crescent City Beacon Community in New Orleans, had a first-hand example of how the ADT-based alerts were able to improve communication and better coordinate patient care.

One morning, Abigail received a notification that one of her patients was admitted to the ED. After waiting a few hours to allow ED physicians and staff to stabilize the patient and conduct any needed tests, she contacted her patient by phone. He was excited and impressed to learn that his primary care provider already knew he was in the hospital! Abigail explained to him that, as part of the consent form he signed when he was admitted to the ED, the care team at the hospital was able to establish contact with his primary care provider's office and notify them of the event. The alert allowed Abigail, as the nurse care manger in the provider's office, to begin coordinating her patient's follow up care. It also gave her an opportunity to talk with the patient to find out what was going on and how he was doing.

Abigail set up an appointment for her patient to see his primary care doctor 72 hours after discharge from the ED. When the patient arrived at his appointment, the plan of care was ready. The physician already had the patient's chart with x-rays from the ED visit and knew what had been discussed as part of the patient's discharge planning. Abigail is happy to report that the patient not only followed up and attended the appointment, he has been doing well ever since!

Hear Abigail tell her story: http://www.youtube.com/watch?v=epvH0o8Ealc.

Implementation Objective #5: Integrate ADT-Based Alerts into Care Provider Workflows

Ultimately, the goal of ADT-based alerts is to provide timely, accurate, and comprehensive demographic and clinical information to a clinician who can act upon it. Revising workflows to incorporate and respond to this new information will be necessary to achieve the results desired in quality improvement and efficiency in patient care, especially to high risk chronic disease patients with high utilization of health care resources. Establishing a successful ADT-based alert program requires careful workflow planning by care managers and other clinical staff to ensure that alerts are used appropriately and effectively to improve care.

This section provides guidance on specific planning activities required to successfully integrate ADT-based alerts into care provider workflows, with particular emphasis on cost considerations, identifying roles and responsibilities for the alert triage process, providing training and coaching to clinical and support staff, and integrating the alert process into the care provider workflow.

- Identify roles and responsibilities for the alert triage process
- Provide training and coaching to clinical and support staff
- Tailor workflow to support clinically meaningful alerts

5.1   Identify Roles and Responsibilities for the Alert Triage Process

A clear understanding and definition of roles, expectations, and accountability of person(s) involved in triaging ADT-based alerts is fundamental to the integration of alerts into a care provider workflow. To accomplish this, provider practices can identify individual(s) or "Alert Process Owners" who are accountable for managing daily alerts, completing patient follow-up, and initiating quality improvement (QI) activities. These may be administrative or support staff or a designated care manager. The roles and responsibilities of the Alert Process Owners need to be clearly and formally established and understood ahead of time, along with decisions about appropriate delegation of responsibilities, including a timeframe for follow through on alerts during the triage process based on practice guidelines.

Process Owners and Quality Managers.

The Greater Cincinnati Beacon Community used two major types of staff in the use of ADT-based alerts to improve transitions from the hospital and to manage chronic diseases: A*lert Process Owners* and *Quality Managers*. Roles and responsibilities for both types of staff included clinical tasks and nonclinical tasks are shown to the right.

Roles and Responsibilities

Roles	C*	NC**	Responsibility
Alert Process Owner(s)	✓	✓	Work Alerts daily, preferably in the morning to allow time to set same day appointments
	✓	✓	Assure Patient Profile accuracy – verify alerts daily
	✓	✓	Triage alerts daily & make follow up appointments
	✓		Review alert details and clinical records
	✓		Discuss reason for ED visit and address patient concerns
Quality Manager(s)	✓	✓	Enter alert process follow up data into Alert Log daily
	✓	✓	Complete 1 Root Cause analysis daily
	✓	✓	Review/analyze monthly status report
	✓	✓	Uncover trends, identify and manage QI opportunities

*C = Clinical   **NC = Non-clinical

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5.2   *Provide Training and Coaching to Clinical and Support Staff*

Adequate training and education of clinical and support staff is critical to the integration of alerts into a care provider workflow, and engaging and empowering providers and staff.

The benefits of training and coaching include:

- Well-defined and understood user roles and responsibilities

- Improved workflow incorporating provider or administrative staff input

- Increased use of best practices for follow-up care

- More opportunities for clinicians to meaningfully use EHRs

- Increased effort by primary providers and staff in reducing ED/hospital readmissions

- Timely and automated updates of patient panels to ensure patients are assigned to the correct provider and practice

- Reduced instances of incorrect matches between patient and provider

- Increased patient engagement with regard to care planning and follow-up

- Improved integration between ED alert system processes and PCMH clinical transformation standards compliance

Effective training is comprehensive and role-specific focused on the new processes and program. It is designed for and delivered to care providers and staff, including technical staff. Collaboration among staff, some of whom may not usually work together (such as technologists, system design teams, and the clinical care team), is important to maximize the benefit of ADT-based alerts. Staff needs to coordinate across functions and fully understand how the alerts affect other staff (clinical, administrative, and technical) to provide high-quality care to targeted patients. Training for technical staff includes performance monitoring, triaging issues, and addressing errors during system implementation and for system maintenance (see Exhibit 11). If the provider practice has a dedicated help desk or team responsible for taking calls from clinics or care providers, these team members also require training about the new workflow and how to triage issues.

Exhibit 11: Training Recommendations for Technical Staff

System Administrators Training
- Performance monitoring   - System reliability (ADT message interfaces with source systems)   - Methods to tune key elements (e.g., patient matching, data flow) and change control process   - Plans to scale the system and integrate additional IT systems and content

System Operators Training
- Use and configuration of additional systems or message formats   - Monitor interfaces and addressing changes in the source systems   - Procedures to request additional information from the source systems   - Processes to contact clinics or other alert recipients   - Review and correct data validation errors on specific messages   - Review and address patient and provider matching errors   - Sequencing the go-live, documentation, and back-out processes

Clinical Care Team Training
- Standard processes to document alert, actions, and alert resolution in the system   - Role- and facility-specific workflow considerations (e.g., review of clinical information, procedures for patient contact)   - Accessing, reviewing, and verifying accuracy of alert content   - Standard processes to document alert, actions, and patient contact   - Reporting errors and problems (e.g., logging in, alerts received in error, data inaccuracies, missing alerts)   - Frequently asked questions, known issues, and plans for future scope

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Learning the Importance of Defining and Engaging Users of ADT-Based Alerts

Keystone's ADT-based alerts are generated by four participating hospitals, batched nightly, and sent to clinician offices or care management teams who are participating in the alert system. The information and type of alert sent are customized for the recipients based on their role and information needs. For example, case managers and physicians receive different types of alerts. As part of their internal analysis, however, Keystone determined that additional refinement based on user needs would further improve patient care and appropriate follow up.

For instance, Keystone learned that the person interacting directly with the patient, such as the primary care provider, may not actually be the best person to receive the alert. Rather, a care manager can determine what type of follow-up actions a patient may require and take the appropriate steps. Alerts can go to the individual care manager for each patient or to a pool of care managers to provide better coverage in the absence of the assigned care manager. Alternatively, an administrative staff member can manage and triage alerts.

Despite their efforts, Keystone is still challenged by determining the most appropriate and impactful recipient of the alert and the specific information they require. They note that it is extremely important to understand the value that the alert provides to each recipient and to demonstrate that the alert addresses those specific needs. They strongly recommend engaging with all users of ADT-based alerts to make these determinations.

5.3   Tailor workflow to support clinically meaningful alerts

Clinical staff training should be focused on identifying and implementing a process workflow to use the ADT-based alerts. To the degree possible, this process should be aligned with other practice workflows. Exhibit 12 provides a high-level summary of a sample ADT-based alert process workflow, beginning with the point at which an alert is generated through the completion of activities based on the clinical diagnosis and care needs of patients. See Appendix E for an example of how an ADT-based alert impacts the workflow and care management process.

Exhibit 12: ADT-based Alert Process Workflow

- **Review alerts:** The Alert Process Owner reviews alerts based on established protocols and verify the accuracy of the patient and provider information.

- **Review clinical information:** Appropriate staff reviews the clinical information to understand the clinical characteristics that resulted in the ED visit or hospital admission.

- **Contact patient:** Appropriate care team members contact the patient in a timely manner (e.g., to schedule a visit or follow-up on a treatment plan).

- **Ensure appropriate documentation:** Document all required information about the patient to help ensure that the right course of treatment is provided safely and effectively

- **Document call:** Document patient outreach, if appropriate, to provide confirmation and information about timing of outreach to the practice and the care management team.

- **Complete care coordination or other appropriate patient management activities:** Initiate care coordination and care management once information necessary to determine what actions should be taken is known.

Clinics may choose to standardize workflows across the community or to customize the ADT-based alert workflow to fit the needs of each unique practice. Factors that clinics may make decisions on include:

- Number of people who interact with the alerts

- Number of patients staff will respond to (e.g., all patients, some patients)

- Responsibilities of responding staff after receiving an alert (e.g., make a follow-up call, complete an assessment)

- Level of integration with an electronic health record or care management system

The Greater Cincinnati Beacon Community

Identified the continuum of activities within the clinical workflow impacted by ADT-based alerts. The table below provides additional detail on the major activities of the quality management process with ADT-based alerts integrated into the clinical workflow for the GCBC. In addition to establishing responsibility and a timeframe for each activity, the GCBC also identified the tools that would be used to support workflow activities.

Activity	Responsibility	Tool	Timeframe
Document call activity	Process Owner	EMR	Every Call
Root Cause Analysis	Process Owner/ Quality Manager	RCA Tool	1 Daily
Response Data Entry	Process Owner/ Quality Manager	ED Alert Response Log	Daily Entry
Pattern ID/Trending	Quality Manager	ED Alert Response Log, RCA Tools, Monthly Report	Monthly, Quarterly, Annually
Identify Process Improvement Opportunities	Quality Manager	PDSA or other QI Process	As Needed
Outcome Measure – Decreasing ED Utilization	Quality Manager	Unwarranted ED Visits Total ED Alerts	Monthly, Quarterly, Annually

- Integration with other new or existing care management or quality improvement processes

Staff input and health care best practices help communities and clinics to integrate the alerts into clinical workflows. These community design decisions and the extent to which ADT-based alerts are integrated into the clinical workflow and customized for specific patient populations have a range of implementation costs, as well (see

Exhibit 5 for cost and resource considerations).

Looking Ahead

ADT messaging has been used for decades to move information both across and within health systems. The ability to apply those messages within the broader context of a community to improve patient care transitions represents one of many steps toward interactive services rather than relying solely on transactional exchanges. Although many examples of using ADT-based alerts to notify recipients of patient admissions and discharges exist, more research is needed to analyze the value proposition of specific approaches. In keeping with the "pilot first" approach, communities will have multiple opportunities for evaluating current practices and enhancing steps based on lessons learned. A few key areas are ripe for further analysis and evaluation:

- **Message Delivery Models**. It is difficult to establish the extent to which a particular message delivery model is more effective in getting the right data to the recipient than other models, or whether the success of a delivery model is situation-dependent. Policy and governance constraints further narrow the possible options for a given community. Formal, rigorous analysis of message delivery effectiveness on clinical measures would help communities to implement ADT-based alerts and other notification models.

- **Workflow Impact.** The decision to send alerts directly to a care manager or other members of the care team within a practice tends to align best with existing care processes. As PCMH and other patient centric models become more prevalent, however, there may be more seamless ways to integrate alerts into the clinical workflow. More research and analysis is needed to assess the benefits, costs, and effectiveness of various workflow integration approaches. An example of such a decision is how to balance the need to alert a care manager or physician practice while minimizing alert fatigue (e.g., sending batch of alerts at end of day).

- **Benefit and Return on Investment.** Once communities evaluate the clinical and cost effectiveness of various alert methods and determine their ability to improve clinical outcomes, dissemination of that information will help other communities formulate their own systems. Currently, Beacon communities are testing a number of different methods to measure and evaluate their programs. As more data becomes available, communities can pool their knowledge into a core set of effective tools for creating and measuring impact.

- **Meaningful Use**. HL7 2.3.1 and 2.5.1 standards are still the workhorse of the health IT industry. As vendors' products shift toward new transport (Direct, SOAP) and content (CCDA) standards, communities will have the opportunity to evaluate new methods and models for delivering the same content as an ADT message but while also leveraging the new interoperability standards advanced under Meaningful Use Stages 2 and 3.

- **Alerting and the HIE Toolbox.** Clinical activities beyond ED and inpatient alerting need triggering and reminders (e.g., patient visit to PCP, medication adherence). Reusing the alerting capabilities built within the HIE system can provide other important alerts to the health care team. Advanced care models involve monitoring, not only of patients in a high risk category, but also of patients whose health status might make them the next at

risk. ADT alerts are currently based on events in which the patient is already in a high cost care setting. The next phase to support better care management extends alert notifications from an emergency context to a more proactive context, in which a notification, based on analytic criteria, can be triggered in time to avoid an ED or inpatient event.

- **Future Sustainability.** The value proposition for ADT-based alerts may change over time as new health care initiatives gain prominence (for a recent example, ACOs). Communities with health information exchange systems should continually evaluate the potential for overlap with new and newly prioritized care management initiatives.

Appendices

Appendix A: Implementation Objectives Summary

Use Exhibit A-1 as a guide to determine whether the community has the structural elements in place in begin implementation of an ADT-based alert system.

Exhibit A-1: Foundational Elements for Success

Element	Considerations
Leadership and Governance	• Is there a representative body empowered to make decisions, which includes management and clinicians representing both the hospital(s) and ambulatory practices? • Does a data use agreement (DUA) exist that can be amended for ADT-specific requirements?
Sustainability / Resources	• Are committed resources available (including people and funding) for implementation or a plan for identifying and obtaining the necessary resources? • Is there a clearly stated and accepted value proposition?
Quality Improvement	• Do the participating hospitals and practices have experience in implementing quality improvement programs using health IT?
Performance Measurement and Evaluation	• Does the community have experience conducting performance measurement and program evaluation—for example, establishing program objectives and measuring progress toward those objectives?
Health IT	• Does a basic health IT and exchange infrastructure exist that includes a master patient index (MPI) [xiii], integration engine to take in data feeds, and rules engine that supports alerting?
Policy and Security	• Is there an established technical security infrastructure, including secure, HIPAA-compliant connections to community systems? • Are agreements in place on how to address patient consent issues and an understanding of how to comply with the state and federal rules and regulations governing patient consent (e.g., opt in, opt out)?

Exhibit A-2 provides a high level summary of the Implementation Objectives and action steps described for implementation of an ADT-based alert system.

Exhibit A-2: Implementation Objectives Summary and Action Steps

Objective	Actions
Confirm that an ADT System Supports the Community's Goals	1. Engage support of appropriate partners and stakeholders 2. Clarify and articulate the local value proposition and funding requirements for ADT-based alerts 3. Assess the technology landscape for feasibility and develop a preliminary systems overview 4. Establish goals of ADT-based alert systems in driving clinical transformation
Establish Project Scope, Design and Implementation Plan	5. Determine how the ADT alert project fits into the technical landscape 6. Enact or amend data use agreements to support ADT-based alerts 7. Select vendors to support the technical strategy 8. Develop an execution plan and begin with a pilot
Evaluate the Ongoing Performance and Impact of ADT-based Alert System	9. Understand potential measure types 10. Develop reporting mechanisms and ongoing monitoring and review processes
Obtain ADT Information and Transform into a Clinically Meaningful Alerts	11. Consider security in data transport mechanisms 12. Execute a 5-step transformation process
Integrate ADT-Based Alerts into Care Provider Workflows	13. Identify roles and responsibilities for the alert triage process 14. Provide training and coaching to clinical and support staff 15. Tailor workflow to support clinically meaningful alerts

Exhibit A-3: High Level Duration and Overlap of Implementation Work

Confirm that an ADT system supports the community's goals	▨			
Establish project scope, design and implementation plan		▨		
Evaluate the ongoing performance and impact of ADT-based alert system		▨		
Obtain ADT information and transform into clinically meaningful alerts			▨	
Integrate ADT-based alerts into care provider workflows		▨	▨	▨

project duration
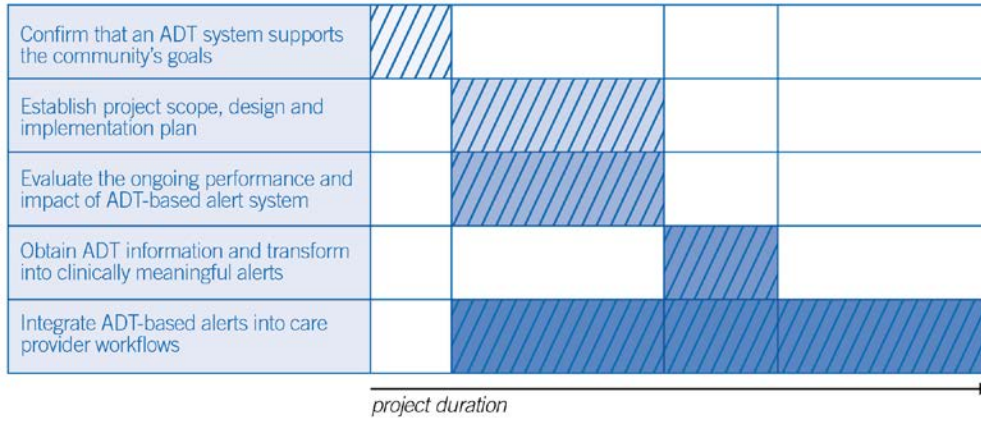
Appendix B: Beacon Community Experience with ADT-Based Alerts Implementation

The following exhibit provides a snapshot of Beacon communities' experience in planning for or implementing ADT-based alert systems. This list was informed through a combination of Beacon Communities' Annual Reports, collateral, and interviews with Beacon Community experts.

Exhibit B-1: Beacon Community ADT-Based Alerts Experience

Goals of Implementing ADT-Based Alerts	Key Drivers	HIT Infrastructure and Functionality	Delivery System Characteristics	Leadership & Governance Infrastructure	Current State of Progress
Bangor Beacon Community					
Real-time ED, hospital admissions, and hospital discharges alerts sent to primary care practice to facilitate transition of care by PCP care management. Future interoperability platforms will allow providers to receive alerts of patient ADT through HIE.	Alignment with other QI and performance improvement goals and strategy including PCMH

Payment reform

Support community-based care management program | Established an HIE with more than 1 million unique patient records

Improved adoption of HIE of providers

Established a Federally Qualified Health Center (FQHC) data warehouse

Established secure messaging with portal functionality

Promoted EHR installation | 2 acute care hospitals, 1 FQHC, 9 ambulatory practices, 1 acute care psychiatric hospital, 1 outpatient behavioral health center. Statewide HIE includes 28 hospitals, 5 FQHCs, and 240 ambulatory practices

Focus on primary care performance improvement and care management | Established 5 Communities of Practice: Clinical Transformation (care management and performance improvement), Meaningful Use and HIT, Leadership and Governance, Data and Performance, and Sustainability

Created a Patient Advisory Group, Care Management Forum along with a Statewide Advisory Committee to represent collaborative partners | 2 local hospitals provide primary care practices with list of discharged patients daily

Established a subscribe-to-patient functionality where providers can receive alerts for patients through HIE

Movement toward an interoperability platform that allows alerting of physicians when a patient has an ED visit |

Goals of Implementing ADT-Based Alerts	Key Drivers	HIT Infrastructure and Functionality	Delivery System Characteristics	Leadership & Governance Infrastructure	Current State of Progress
Greater Cincinnati Beacon Community					
Real-time ED/admission alert system to notify primary are practices when their patients with diabetes or asthma had an ED or inpatient visit at any of the 21 hospitals across the region.	Payment reform Alignment with PCMH certification Alignment with other QI and performance improvement goals and strategy Testing innovative approaches	Established shared HIE infrastructure Practices have certified EHRs, achieving Stage 1 of MU Developed Direct, secure mail system for provider communication and provider portal Established a robust MPI with identify match solution Developed a portal that presents all business intelligence tools Developed an ED alert algorithm	Working with 21 hospitals, 87 primary care practices, 2 post-acute providers	GCBC team includes HealthBridge, Cincinnati Children's Hospital Medical Center, University of Cincinnati, Greater Cincinnati Health Council, GE, and the Health Collaborative	Enabling rapid follow-up, risk stratification efforts, and patient education System has sent 27,000 alerts for admissions and plans to implement discharge alerts in the future

Goals of Implementing ADT-Based Alerts	Key Drivers	HIT Infrastructure and Functionality	Delivery System Characteristics	Leadership & Governance Infrastructure	Current State of Progress
Keystone Beacon Community					
Batched alerts sent nightly for consenting patients to the self-subscribing providers.	Payment reform Test innovative solutions Alignment with other QI and performance improvement goals and strategy Support community-based care management program	Established HIE serving 286 care sites and 4.4 million patients Established widespread EHR adoption Established a patient health record for individuals to access their own health information Established community data warehouse with analytics	4 participating hospitals, 36 care delivery organizations	Established DUAs with participating hospitals and providers Works with regional extension center (REC) Formed partnerships and alliances with GE and others	Information contained in message determined by role of recipient Alert can be accessed by entire care team (doctors, nurses, home health) System is sending alerts to case managers and plans to expand to home health and primary care practices

Goals of Implementing ADT-Based Alerts	Key Drivers	HIT Infrastructure and Functionality	Delivery System Characteristics	Leadership & Governance Infrastructure	Current State of Progress
Crescent City Beacon Community					
Decrease preventable readmissions and ED visits; reduce medication errors and adverse events, decrease overutilization, and duplication of resources; and increase patient and caregiver clarity as to overall plan of care. ADT messages sent to primary care practices.	Integration with current HIE Payment reform Caring for chronically ill in systematic manner	Established HIE EHR with MU Patient matching service Provider directory Provider portal Message engine Care management and disease registry REC	2 hospitals and 25 practices (per annual report)	Established CCBC Steering Committee Established a GNOHIE administrative committee Established subcommittees: Clinical QI, Sustainability, and HIT	Working to continue spread to other practices Alerts sent to practices (FQHCs) that use two EHR vendors that can support importing ADT messages Continued consent collection for opt-in patient information model Electronic specialty care referral in development

Goals of Implementing ADT-Based Alerts	Key Drivers	HIT Infrastructure and Functionality	Delivery System Characteristics	Leadership & Governance Infrastructure	Current State of Progress
Rhode Island Beacon Community					
To promote the adoption of ADT alerts to reduce preventable hospitalizations and avoidable ED use, Direct service ADT messaging to primary care practices.	Provide physicians with necessary clinical information Payment reform Aligned with PCMH initiative	Established HIE EHR with MU Message engine REC	7 inpatient health care organizations are sending ADT feeds to current care 60 practices representing more than 200 providers	Led by the RIQI Established board of directors	Sends three messages/week Working to roll out a subscribe-to-patient functionality where providers can receive alerts for particular patients Future work with providers

Goals of Implementing ADT-Based Alerts	Key Drivers	HIT Infrastructure and Functionality	Delivery System Characteristics	Leadership & Governance Infrastructure	Current State of Progress
San Diego Beacon Community					
Planned initiative to have ADTs gathered by the HIE and sent via secure message to outpatient providers	Payment reform Alignment with other QI and performance improvement goals and strategy	Established HIE Established immunization registry Practices using EHR and achieving MU Stage 1, preparing for Stage 2 Launching discharge notification system through Direct messaging Discharge notification linked to HIE	HIE includes 4 hospitals and 2 medical groups	Established a steering committee to provider oversight Established a board of directors to provide strategic direction, including bylaws, mission statement, and corporate policy	Primary care team can access discharge instructions Can query the HIE to receive additional patient information Launching notification system 2013

Goals of Implementing ADT-Based Alerts	Key Drivers	HIT Infrastructure and Functionality	Delivery System Characteristics	Leadership & Governance Infrastructure	Current State of Progress
Tulsa Beacon Community					
Basic ADTs sent through the HIE to providers, with a focus on clinical ADTs to provide information about allergies and patient visits.	Alignment with PCMH certification

Alignment with other QI and performance improvement goals and strategy | Established HIE

Established physician portal for information access

Established online referrals

Implemented Direct messaging

EHR adoption

Established HIPAA-compliant web-based auditing capability

Established an MPI

Use an open source tool called HL7 Workbench

Established a CDR

Patient attribution algorithm | Serves 2 million patients

Established a distinction between demographic ADTs and clinical ADTs

Engage the EHR vendor, if necessary

Focus on clinical portion of the ADT; priorities include allergies and patient visit | Operates as a "community-owned" nonprofit

Board of directors composed of stakeholders

Uses a committee structure for projects

Partnered with 200 health-related organizations

Staff comprised of professionals experienced in operations, finance, workflow analysis, industrial engineering, training, customer relations, project management, data integration, data quality, quality measurements and clinical analytics | System is currently sending ADT feeds through the HIE |

Goals of Implementing ADT-Based Alerts	Key Drivers	HIT Infrastructure and Functionality	Delivery System Characteristics	Leadership & Governance Infrastructure	Current State of Progress
Western New York Beacon Community					
Improving the quality of care of patients with diabetes. ADT messages sent to pharmacists and long-term facilities upon patient discharge.	Payment reform Improved medication reconciliation and compliance	Established HIE EHR with MU Patient portal Using Surescripts REC	6 of 15 practices engaged in medication pilot (1,012 patients) Received ADT messages from 16 of 24 data sources 3 long-term facilities signed up to receive alerts	Led by HEALTHeLINK and partnered with P2 Collaborative of Western NY and Catholic Medical Partners	Working to expand pilot to additional EHR providers Working to expand pilot to additional pharmacists

Source: Analysis of Communities' Annual Reports and collateral and interviews with Beacon Community experts, 2013.

Appendix C: Sample Data Use Agreement

SAMPLE BEACON COMMUNITY DATA USE AGREEMENT

Data Share

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

RECITALS

1. [BEACON COMMUNITY ENTITY] has been awarded a grant by the US 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 D: Potential Performance Metrics for ADT-Based Alert Programs

#	Category	Metric	Description	Implementation Considerations	Data Source(s)
1	**Data Quality**	Number and percent of all alerts with a data quality trigger	A measure of ADT alert data quality. Does the alert contain accurate information in data fields? Do the fields contain expected values?	A robust and comprehensive data quality assurance and control process should be in place to ensure that every feed goes through. Ideally, this process would occur at the source (i.e., hospital) so that the feed can be triaged before submission to the rest of the community	Administrative
2	**Data Quality**	Number and percent of all alerts with one or more missing key fields	A measure of alert data completion. Are all the necessary data fields complete, with no key fields having an omission of data?	Data completeness testing should be in place to ensure that every feed goes through. Ideally, this process would occur at the source (i.e., hospital) so that the feed can be triaged before submission to trading partners	Administrative
3	**Data Quality**	Percent of Patients Inaccurately Attributed to Practice	A measure of the accuracy of the patient attribution methodology	Invest a high degree of effort and attention in ensuring that the methodology used to attribute patients has a high degree of accuracy so that providers have confidence in the quality of the ADT feeds and are more willing to act on the information provided	Administrative Clinical

#	Category	Metric	Description	Implementation Considerations	Data Source(s)
4	**Alert Utilization**	Percent of Daily Alerts Triaged	The percent of all feeds received within a day that the accountable individuals review and triage	Need to identify accountable individuals and establish parameters for the timing of alert review and triage	Administrative
5	**Alert Utilization**	Number of Alerts per 1,000 Patients	The number of alerts received over a specified time period per 1,000 patients attributed to a practice	The accuracy and utility of the metric depend on the accuracy of the patient attribution methodology	Administrative
6	**Alert Utilization**	Percent of Hospital Discharges Represented by Participants	The percentage of hospital discharges within a defined community represented by hospitals that participate in the ADT-based alert program	Clearly define "Community"	Administrative Clinical
7	**Clinical Outcomes**	Emergency Department Utilization Rate	The number of ED visit per 1,000 population	The accuracy and utility of the metric dependent on the accuracy of the patient attribution methodology. Can parse population by patient demographics (e.g., age, gender) or clinical attributes (e.g., patients with diabetes, asthma)	Administrative Clinical Financial

#	Category	Metric	Description	Implementation Considerations	Data Source(s)
8	**Clinical Outcomes**	Hospital Inpatient Utilization Rate	The overall hospital utilization, number of hospital admissions per 1,000 population.	The utility of the metric depends on the accuracy of the patient attribution methodology. Can parse population by patient demographics (e.g., age, gender) or clinical attributes (e.g., patients with diabetes, asthma)	Administrative Clinical Financial
9	**Clinical Outcomes**	Percent of Patients Discharged from Hospital Readmitted within 30-days	The percent of patients who experienced unplanned readmission to a hospital after a hospital stay.	Can parse population by patient demographics (e.g., age, gender) or clinical attributes (e.g., patients with diabetes, asthma)	Clinical
10	**Clinical Outcomes**	Ambulatory-Care Sensitive Readmissions	The Prevention Quality Indicators (PQIs) are a set of measures that can be used with hospital inpatient discharge data to identify quality of care for conditions for which good outpatient care can potentially prevent the need for hospitalization or for which early intervention can prevent complications or more severe disease.	PQIs require consistent and complete inclusion of diagnoses codes. Results interpretation also requires understanding of factors that can lead to false positives and other variances.	Administrative Clinical

Appendix E: Sample Care Management Process Flow from the Greater Cincinnati Beacon Collaboration

Care Transitions: ED Alerts and Patient Management Flow Path

ED Alert Presents → Check EHR for patient information and clinical results

Not your Patient OR Patient Opt-Out → Call HealthBridge Helpline at 513.469.7222 (Select Option 4).

Make contact with ED/Medical Records Department for additional information about patient

Is Patient **High Risk**? (Ex: Multiple Comorbidities Frequent ED/Office visits Barriers to care Low adherence) Get f/u info from ED

— Not High Risk — / — High Risk —

Prioritize Timely Follow Up:
Example for Diabetes: (not limited to) Hypo/Hyper glycemia Influenza UTI/URI Syncopy/Fainting Abnormal Glucose Provider Discretion

Is a follow-up visit warranted? — NO / YES

If patient has a previously scheduled appointment and it's timely, keep that appointment. Otherwise, Schedule pt appointment per your policy: Recommendation for **Low Risk**: Call within **72 hours** for an appointment follow-up within **2 weeks**

Schedule pt appointment per your policy: Recommendation for **HIGH Risk**: Call within **24** hours for an appointment and follow-up within **72 hours**

Keep electronic or written log of summaries and when patient was notified for follow up. *NCQA requirement for applicable conditions*

Determine priorities for patient visit

Conduct Pre-Visit Planning _(Considerations Below)_
- Are all tests and assessments up-to-date?
- Is patient still expected to be high risk?
- Does patient have a documented self management goal?
- Does patient have barriers to care – and has patient been referred to community resources?
- Does patient have cultural barriers to care?
- When was patient's last comprehensive assessment?
Plan for other barriers that may affect patient's care

Document all care and follow up in standard EHR entry fields Ensure DC summary from hospital is recorded *NCQA requirement for applicable conditions*

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Appendix F: Acronyms and Key Definitions

Exhibit F-1: Acronyms

Acronym	
ACA	Affordable Care Act
ACO	accountable care organization
ADT	admission, discharge, transfer
BHIX	Brooklyn Health Information Exchange
CCBC	Crescent City Beacon Community
CCD	continuity of care document
CDR	clinical data repository
CMS	Centers for Medicare & Medicaid Services
CSV	comma-separated values
DUA	data use agreement
ED	emergency department
EHR	electronic health record
EMR	electronic medical record
FQHC	Federally Qualified Health Center
GCBC	Greater Cincinnati Beacon Collaboration
GNOHIE	Greater New Orleans Health Information Exchange
HIE	health information exchange
HIO	health information organization
HIPAA	Health Information Portability and Accountability Act
HIT	health IT
HITECH	Health Information Technology for Economic and Clinical Health
HL7	Health Level 7
Med/Pads	combined internal medicine and pediatrics
MPI	master patient index
MyHealth	Tulsa Beacon Community
MU	meaningful use
ONC	Office of the National Coordinator for Health IT
PCMH	Patient-Centered Medical Home

Acronym	
PDF	portable document format
PHI	protected health information
QA	quality assurance
QC	quality control
QI	quality improvement
REC	regional extension center
RIBC	Rhode Island Beacon Community
RIQI	Rhode Island Quality Improvement
SFTP	secure file transfer protocol
SOA	service-oriented architecture
SMS	short message service
TOC	Transition of Care
UC	University of Cincinnati
UI	user interface
VPN	virtual private network

Exhibit F-2: Definitions

Term	Definition
Alert	In health information systems, a message to users that necessitates, functionally or through policy, an action (e.g., schedule a follow-up visit with a recently discharged patient).
Clinical data repository	A central database of patient-centric health data.
Direct Project	Launched in March 2010 as a part of the Nationwide Health Information Network, the Direct Project was created to specify a simple, secure, scalable, standards-based way for participants to send authenticated, encrypted health information directly to known, trusted recipients over the Internet. Two primary Direct Project specifications are the Applicability Statement for Secure Health Transport and the XDR and XDM for Direct Messaging (for more information, see http://www.healthit.gov/policy-researchers-implementers/direct-project).
Master Patient Index	Part of an overall master data management strategy that focuses on matching the identities of individual patients scattered across many disparate care settings (for more information, see http://www.healthit.gov/sites/default/files/master_data_management_final.pdf).
Interface message specification	A document which lays out the format, structure, and guidelines for sending an interface message to another system.
Notification	In health information systems, an informational message to users that does not require action.
Patient attribution methodology	The process by which a system accepting messages from an external source matches the patient to other records in that system, often involving use of a master patient index (MPI).

Appendix G: References

Endnotes

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