



Advance Interoperable Health Information Exchange Program Admission Discharge and Transfer (HIE-ADT) Supplemental Award

**OVERVIEW, AWARDEE DESCRIPTIONS, TAKEAWAYS, CHALLENGES,
BEST PRACTICES, AND REFLECTIONS**

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Executive Summary

In July 2015, the Office of the National Coordinator for Health Information Technology (ONC) awarded \$29.6 million to 12 states and state-designated entities to participate in the Advance Interoperable Health Information Technology Services to Support Health Information Exchange (HIE) Program.¹ Under this program, awardees received funding to expand adoption and use of health information exchange technology, tools, services, and policies to facilitate the interoperable exchange of health information. In September 2016, ONC also awarded \$2.5 million to four of these selected states and state-designated entities to expand use of inter-state admission, discharge, and transfer (ADT) notifications to support care coordination and enhanced communication across provider networks.

ADT-based 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 in and out of care settings. These alerts support coordination across disparate care providers and other stakeholders, including eligible hospitals and professionals, as well as non-eligible professionals such as long-term and post-acute care (LTPAC), behavioral health (BH), and emergency medical services (EMS) providers. In addition to improving care coordination, use of ADT alerts is expected to improve the quality and efficiency of healthcare, resulting in reduced hospital readmissions, improved patient health status, and a decrease in health care costs.²

This white paper provides an overview of the Advance Interoperable HIE Program ADT Supplemental Award. It begins by describing the purpose and goals of the program, followed by brief descriptions of each of the four program awardees and their program-funded activities. It then summarizes the key takeaways from the one-day, in-person workshop held in April 2017, during which 11 Advance Interoperable HIE awardees discussed governance and infrastructure approaches to inter-state ADT data sharing. Subsequently, this paper discusses the findings, challenges, and best practices—as shared by the awardees—that emerged throughout the HIE-ADT Supplemental Program. The white paper concludes with awardee reflections on the program.

¹ Office of the National Coordinator for Health Information Technology. “Advance Interoperable Health Information Technology Services to Support Health Information Exchange Program.” Updated June 22, 2017. Available at <https://www.healthit.gov/newsroom/advance-interoperable-health-information-technology-services-support-health-information>.

² “Enhancing Patient Care and Care Coordination Using Event Notification Systems.” Alice Noblin, Kendall Cortelyou-Ward, Steven Ton, Victor Nunez. *Journal of Cases on Information Technology*, Volume 18 Issue 1 pp 17-27: January 2016. 10.4018/JCIT.2016010102

Overview of the HIE-ADT Supplemental Program

Purpose

In July 2015, the Office of the National Coordinator for Health Information Technology (ONC) awarded \$29.6 million to 12 states and state-designated entities to participate in the Advance Interoperable Health Information Technology Services to Support Health Information Exchange (HIE) Program.³ Under this program, awardees received funding to expand adoption and use of health information exchange technology, tools, services, and policies to facilitate interoperable exchange of health information. In September 2016, ONC also awarded \$2.5 million to four of these selected states and state-designated entities to expand use of inter-state and regional admission, discharge, and transfer (ADT) notifications to improve care coordination. These notifications and alerts aim to facilitate the timely flow of information so providers and case managers can quickly and effectively address the health care needs of their patients transitioning from care settings. The ultimate goal is to establish a learning health system in which accurate and evidence-based information helps ensure that patients receive the right care at the right time, to improve the quality of health care while lowering health care costs.⁴

Under the Advance Interoperable HIE Program ADT Supplemental Award, four Health Information Organizations (HIOs) received supplemental funds from ONC to support care coordination and enhanced communication across provider networks through:

- Adoption, use, and routing of a standard Health Level 7 (HL-7) ADT message for use across two or more state jurisdictions;
- Establishment of a common set of standards, services, policies, and trust agreements to enable widespread routing of ADT messages across varying existing networks; and
- Development and implementation of a provider directory for use across two or more state jurisdictions.

As part of the HIE-ADT Supplemental Program, the four awardees participated in several ONC-facilitated events and activities, including:

- Six webinars, each an hour in length, held from January to June 2017
- One full-day, in-person workshop in April 2017
- An interactive online gathering place via Basecamp, which provided interactive discussion boards, a community calendar, a member directory, and document- and file-sharing capability
- An email listserv

HIE-ADT Supplemental Program Awardees

- Delaware Health Information Network
- Reliance eHealth Collaborative and the Oregon Health Authority
- Rhode Island Quality Institute
- Utah Health Information Network

³ Office of the National Coordinator for Health Information Technology. "Advance Interoperable Health Information Technology Services to Support Health Information Exchange Program." Updated June 22, 2017. Available at <https://www.healthit.gov/newsroom/advance-interoperable-health-information-technology-services-support-health-information>.

⁴ Office of the National Coordinator for Health Information Technology. "A Shared Nationwide Interoperability Roadmap version 1.0." Updated December 22, 2015. Available at <https://www.healthit.gov/policy-researchers-implementers/interoperability>.

Through the ONC-facilitated events, the HIE-ADT Supplemental Program addressed key implementation, quality, technical, workflow, and financial issues involved in executing program requirements and supporting critical building blocks (such as the provider directory, trust framework, and standard ADT messages) to help expand ADT messaging. The program events facilitated the exchange of collective knowledge and experience among the four ONC awardees, enhancing their capacity to share relevant and meaningful information, create tools, and develop documents to efficiently disseminate ideas across the nation. The HIE-ADT Supplemental Program drew upon existing health information technology (IT) standards and ONC certification criteria. Participants were encouraged to share expertise, best practices, and lessons learned, as well as define and address barriers in expanding ADT messaging.

Goals

During a ten-month period from September 2016 to July 2017, the HIE-ADT Supplemental Program aimed to identify the most effective and sustainable methods for exchanging ADT notifications across state lines, and to share best practices and lessons learned for expanding the use of ADT notifications and provider directories by clinical organizations across the care continuum. The awardees participating in the HIE-ADT Supplemental Program identified two primary objectives to aid in achieving this goal:

- Define governance and legal models for interstate exchanges
- Identify scalable and sustainable infrastructure models for interstate exchange

The HIE-ADT Supplemental Program also addressed key issues involved in executing program requirements and overcoming barriers to achieve expansion of ADT messaging. During the program, awardees discussed how to effectively operationalize cross-state and regional ADT exchange, compared trust frameworks for HIO-to-HIO exchange, and documented the challenges and successes encountered in expanding the use of ADT messaging to facilitate nationwide exchange.

Delaware Health Information Network

The Delaware Health Information Network (DHIN) is expanding its event notification service to include notifications related to admissions and discharges within nontraditional settings of care. In Delaware, DHIN established connections with two types of organizations: telehealth and provider organizations. DHIN's connections with telehealth organizations enable the organizations to send DHIN an ADT notification representing a remote encounter—to be used as part of the network's event notification—and a continuity of care document that summarizes the encounter—to be placed into DHIN's community health record. DHIN's connections with provider organizations, such as nursing homes, home health agencies, urgent care facilities, and accountable care organizations, enable the organizations to send the network ADT notifications with care summaries so that DHIN can notify providers and other participating organizations on events in these locations. DHIN worked with its HIO customers, contributors, and a consultant to determine the standardized ADT message content.

In its activities with other states, DHIN increased the number of organizations from which it is receiving data. Through CRISP, DHIN is now able to receive and transmit ADT notifications with 46 Maryland hospitals and 22 West Virginia facilities. The NJSHINE interface allows DHIN to receive and transmit notifications from 21 New Jersey organizations. DHIN is also setting up an exchange through southeastern Pennsylvania's HIO, HealthShare Exchange of Southeastern Pennsylvania (HSX), to send ADT notifications resulting from emergency department visits. In addition, DHIN created an event notification to send to patients as a simple text message void of any personally identifiable information when new information is available (for example, new laboratory test or imaging results) or when a health community user accesses the patient's data. DHIN is also planning to establish a registry for end-of-life orders to communicate patients' end-of-life wishes to the ambulatory care unit, enabling first responders to access information that is typically not available during an emergency. In addition to these activities, DHIN is tracking the number of times non-eligible professionals view ADT data. Over the course of the award period, DHIN reported that the incidence of non-eligible professionals viewing ADT messages increased by more than 49 percent.

DHIN has faced several challenges in expanding data exchange with neighboring HIOs. Specifically, some HIOs have more restrictive agreements in place that limit data sharing to certain hospital

Program Goals and Objectives

Intrastate. Expanding ADT notifications among eligible providers, eligible hospitals, and consumers within Delaware.

Interstate. Already connected to and exchanging data with Maryland and the District of Columbia, through the Chesapeake Regional Information System for our Patients (CRISP). Adding connections to New Jersey (NJSHINE), HealthShare Exchange of Southeastern Pennsylvania (HSX), and West Virginia (via CRISP).

Provider directory. None.

ADT Program Outreach and Training

Outreach. DHIN staff visit and service the Delaware practices that use the DHIN system. Contractors help engage additional practices, long-term and post-acute care facilities, and behavioral health organizations.

Training. The DHIN provider relations team train eligible providers, including those who send ADTs, on how to use DHIN's notification service.

settings, types of providers, and patients. Some agreements limited future use and aggregation of data by prohibiting DHIN from storing any data received from a notification. As a result, DHIN can only use the ADT notifications received from those HIOs to drive its event notifications and they cannot retain the data. One of the HIOs partnering with DHIN required that DHIN demonstrate that the users of the event notification clearly have a relationship with the patient for whom data are sent. To meet this requirement, DHIN built new technology to proactively query Delaware providers' National Provider Identifier (NPI) numbers to verify active patient-provider relationships (defined as a patient having a face-to-face encounter with a provider within the previous 18 months).

Reliance eHealth Collaborative and the Oregon Health Authority

Reliance eHealth Collaborative (Reliance) is expanding its ADT notification services through connectivity with the Emergency Department Information Exchange (EDIE) and PreManage via Collective Medical Technologies (CMT). EDIE has ADT connections with all hospitals in Oregon and Washington, and some hospitals in California. Reliance provides CMT with a report of patients in the Reliance system and CMT provides Reliance with ADT transactions from any participating hospitals from which those patients receive care. This information populates the Reliance Community Health Record, and supports notifications, alerts, and reporting. Reliance has developed standardized content for the ADT messages and trains participating organizations on how to set up and receive ADT notifications and alerts. The Oregon Health Authority is expanding its statewide Flat File Directory to include providers in Washington and California. When needed, Oregon will adopt the trust agreement already in place between neighboring states to support data exchange. This agreement is based upon the nationally recognized Data Use and Reciprocal Support Agreement (DURSA) for eHealth Exchange.

Reliance combines a broad and deep set of data to provide valuable, real-time insight for managing high-risk patients. Notifications can be created based on medical events, clinical, behavioral and social information, and gaps in care. For example, to more effectively manage their consumers' rehabilitation, behavioral health providers would like to receive alerts immediately upon an individual's arrival at the emergency department or another point of care for a relevant care need. Meanwhile, to manage follow-up care, primary care providers may prefer to receive a daily report that lists at-risk patients. Reliance is expanding the ADT message content to include social determinants of health, such as housing and nutrition services. Reliance alerts and notifications may also enhance care coordination with non-traditional organizations, such as child advocacy groups, the

Program Goals and Objectives

Intrastate. Expanding Reliance notifications within target populations in Oregon.

Interstate. Expanding Reliance notifications across Washington and northern California by interfacing with the EDIE and PreManage programs via CMT.

Provider directory. Expanding the Oregon Health Authority's statewide Flat-File Directory across participating providers in Washington and northern California.

Stakeholder Engagement

Reliance engages stakeholders with which it has direct relationships. It also engages stakeholders through EDIE and PreManage, which has established connections with hospitals in Oregon, Washington, and parts of California.

prison health system, and tribal clinics.

Reliance encountered a few challenges in expanding notifications within and outside of Oregon. The process for expanding these notifications took longer than expected because of the complexity involved in developing alerts that are derived from clinical concepts versus those based on a single event (for example, hospital admission). Another barrier stemmed from the limited capabilities and resource constraints of EHR vendors. This is especially problematic when working with vendors that support behavioral health providers. Reliance reported that it might have been able to alleviate some of the challenges of working with behavioral health EHRs had it started working with these vendors earlier in the program.

Rhode Island Quality Institute

The Rhode Island Quality Initiative (RIQI) is reestablishing and expanding an ADT feed to Yale New Haven Health System in Connecticut. Through the eHealth Exchange, RIQI's HIO CurrentCare and Lawrence + Memorial Hospital will share Continuity of Care Documents summarizing available patient data (with the exception of behavioral health) and establish care management alerts for transitions of care, both using a point-to-point interface that is query-based. To ensure the care management alert and affiliated CurrentCare Services could be easily incorporated into Lawrence + Memorial Hospital's existing processes, specialists on RIQI's workflow redesign observed and reviewed the hospital's workflow and advised on how to restructure the workflow. RIQI also is working with ambulatory sites that are associated with the Lawrence + Memorial Hospital to adopt and use some of the HIO services. In addition, RIQI is integrating provider data from Yale New Haven Health System into its statewide common provider directory.

Program Goals and Objectives

Intrastate. None.

Interstate. Expanding care management alerts for transitions of care and adoption of HIO services with Lawrence + Memorial Hospital, part of the Yale New Haven Health System in Connecticut.

Provider directory. Expanding RIQI Statewide Common Provider Directory to the Yale New Haven Health System.

RIQI's ADT messages use standardized content and follow a customized notification process to foster consistency across partner organizations, which use different interfaces to deliver and receive ADT messages. To standardize both ADT message content and the process by which ADT notifications are sent, RIQI and partner organizations pilot tested the ADT notification process, reviewing incoming data, determining accuracy and situational appropriateness of messages, and adapting the message content and notification process as appropriate.

Developing Trust Agreements

RIQI uses existing trust agreements as standard contracts for ADT messaging and service adoption. Partner organizations' legal teams review and suggest changes to the agreements, after which the organizations work together to finalize the trust agreements.

Over the course of the ADT award, RIQI faced challenges related to stakeholder engagement. Initially, RIQI planned to expand ADT messages to a Massachusetts healthcare delivery system. However, after RIQI had invested significant time in

coordinating and planning these efforts, the organization underwent changes in leadership and withdrew from the project due to a shift in priorities. Consequently, RIQI utilized an existing connection with Yale New Haven Health System in Connecticut, and although the efforts are still in the early stages, RIQI expects the ADT message and provider directory expansion to move forward without further impediments.

Utah Health Information Network

Through its ADT award, the Utah Health Information Network (UHIN) is broadening the reach and scope of data exchange, expanding its event notification program to more organizations within Utah and expanding its interstate reach to Idaho, Nevada, and Nebraska. The content of the exchanged ADT messages includes information on when the patient was admitted and the observed symptoms at the time of admission. The network plans to eventually add risk scoring and predictive algorithm capabilities. In addition, UHIN developed and implemented a robust provider directory exchange that is shared with HIOs in Colorado, Arizona, Idaho, Nevada, and Nebraska in which physician Direct secure messaging address contact information is exchanged across these states and within Utah. The network has designed an in-house provider directory, building on its current interface. UHIN's ADT message system is flexible and adaptable to the technological capabilities of an organization or practice. Small practices, which might not be technologically advanced, can receive ADT notifications via email or through an Excel workbook attachment. Larger organizations, with a more developed infrastructure, can receive HL7 notifications, parse the data out, and store the data in their system. While developing and implementing ADT messaging across stakeholders, UHIN is committed to assisting practices ease their workflow burden. This simplifies training, as UHIN representatives sit down with staff from each practice and organization to explain how the information will be received and how the ADT message will fit into—or will need to be adapted to—the organizational workflow. UHIN representatives then follow up with the organization and practice staff to provide ongoing technical assistance, as needed.

UHIN has faced several challenges in expanding data exchange. Efforts to expand interstate exchange were hindered by challenges coordinating with states with different consent models, collaborating with HIE vendors with varying levels of experience, and managing the various and sometimes competing priorities of partner institutions. UHIN also faced challenges in persuading some stakeholders to send more complete data; at least one hospital systems continues to send only the minimum required data

Program Goals and Objectives

Intrastate. Expanding use of ADT notifications use among small clinics in urban and rural areas, as well as in long-term post-acute care facilities.

Interstate. Already connected to and exchanging data through HIOs in Arizona and western Colorado. Added connections to Idaho, Nevada, and Nebraska.

Provider directory. Implemented a Fast Healthcare Interoperability Resources (FHIR)-based provider directory.

Developing Trust Agreements

UHIN holds regular meetings with legal, business, and technical stakeholders from organizations participating in the HIO to discuss policies and procedures and data governance approaches that should be included in trust agreements with new participants.

(often without diagnosis codes), in part because of a recent change to its EHR system. In addition, UHIN spent more time and effort than originally anticipated to encourage participation in the provider directory exchange among states and clinics. Initially, some state and clinical staff did not understand the benefit of such a directory. However, through continued outreach and education with these staff, UHIN has been able to add valuable provider information to the ADT alerts that are currently sent, providing the right data at the right time.

Key Takeaways from the April 2017 HIE-ADT One-Day, In-Person Workshop

On April 3, 2017, ONC convened 11 awardees from the Advance Interoperable Health Information Exchange Program for a one-day, in-person workshop to support program activities related to the HIE-ADT Supplemental Program. During the workshop, ONC facilitated several break-out sessions on governance and infrastructure approaches to inter-HIO ADT data sharing. Discussions focused on the following key topics:

- Opt-in and opt-out approaches for consent, processes for entering into agreements with states with different approaches, barriers to agreements, and potential solutions;
- Processes for adding and terminating network members, and whether membership is—or should be restricted to—specific organizations, such as vendors, HIOs, and for-profit and nonprofit organizations;
- Permissible purposes for data sharing, as defined under the Health Insurance Portability and Accountability Act of 1996 (HIPAA) Privacy Rule⁵ and the extent to which data sharing among HIOs may be limited by treatment, payment, and operations (TPO);
- Approaches to expanding permitted purposes, and ways that permissible purposes clauses limit or prevent the ability to implement specific use cases;
- Limitations on data aggregation and storage;
- Development of interstate trust agreements and a nationwide trusted exchange framework and common agreement for interstate exchange, as required by the 21st Century Cures Act⁶;
- Competition among vendors and HIOs;
- Current and proposed infrastructure models for interstate ADT exchange, the sustainability of those models, and strategies for advancing toward nationwide exchange; and
- Innovative and unique use cases for ADT exchange and ADT notification content.

During the workshop, ONC separated the participants into small groups to discuss current and desired policy and program activities. Each group was comprised of awardees from at least four different states, providing the participants the opportunity to engage with awardees that have differing approaches to data exchange. ONC encouraged open discussion among all participants and offered participants in each of the groups the opportunity to make policy recommendations. Throughout the day, and at the end of the workshop, the awardees found common ground in multiple governance and infrastructure approaches for interstate ADT exchange. This section describes the awardees' key takeaways from the workshop.

⁵ U.S. Government Publishing Office. "HIPAA Privacy Rule." 45 C.F.R 164.502(a). Available at <https://www.gpo.gov/fdsys/pkg/CFR-2007-title45-vol1/pdf/CFR-2007-title45-vol1-part164.pdf>.

⁶ U.S. Congress. "H.R.6 - 21st Century Cures Act." 114th Congress (2015-2016). Available at <https://www.congress.gov/bill/114th-congress/house-bill/6>.

Governance Discussion

- **Respective governance.** Most HIOs have opt-out consent policies, and when exchanging ADT notifications with another opt-out HIO, generally do not face significant challenges around consent. When exchanging data with an opt-in HIO, each HIO follows its respective consent and data routing processes. Interstate exchange agreements should explicitly state that consent should occur at the local level and which party should accept liability in case of an error.
- **Consent registry maintenance.** Each state should maintain its own consent registry, using a simple framework to guide participation and consent checks.
- **Audits.** HIOs should conduct frequent, regularly scheduled audits to ensure they know where and to whom they send data.
- **Membership processes.** Processes to determine membership include the following: asking applicants the reason they would like to join the network; using a point-to-point referral process to determine enrollment; conducting a readiness assessment of applicants; and asking applicants to draft a statement of work.
- **Membership suspension or termination.** If an audit determines inappropriate data access, HIOs reported that their practice is to either terminate or suspend membership. During a suspension period, suspended members can provide HIOs with information that proves they have achieved better data security.
- **Permissible purposes.** Most HIOs follow the guidelines on permitted purposes for data exchange set forth in the HIPAA Privacy Rule, which allows data to be exchanged for TPO.⁷ However, some HIOs have limited the permitted purposes for which they allow data to be exchanged to treatment only. The HIOs agreed that, although TPO is broad, it limits or excludes certain use cases, including social services and community-centered programs, public health, research, and certain care coordination activities.
- **Data aggregation and storage limitations.** HIOs can face several limitations when aggregating and storing data. Examples include the following: data storage can pose a security risk; integrating data can be challenging because of differing organizational workflow techniques; federal and state agency data may be hard to match; and reporting standards may be inadequate. When determining the best approach for data sharing, HIOs should consider whether the receiving HIO is allowed to centrally store an ADT notification and use it for future use cases.
- **Data reciprocity.** In order to ensure all parties in the agreement both send and receive data, it is important to add data reciprocity provisions to the agreement that require bidirectional exchange across networks. Data reciprocity provisions should prohibit “free riders” from only receiving data and not reciprocally sharing data with the providing HIO. There was broad

Awardees’ Governance Approaches and Agreements

Approaches. Of the in-person meeting participants, nine HIOs use an opt-out approach, one uses an opt-in approach, and one uses both opt-in and opt-out approaches for consent.

Agreements. HIOs reported that they often use both a master agreement and a local agreement that can be tailored to use case or stakeholder type. It is important that the master agreement clarify consent practices as HIOs begin to exchange data across state lines.

⁷ U.S. Government Publishing Office. “HIPAA Privacy Rule.” 45 C.F.R 164.502(a). Available at <https://www.gpo.gov/fdsys/pkg/CFR-2007-title45-vol1/pdf/CFR-2007-title45-vol1-part164.pdf>.

consensus among HIOs that they would continue to send data to other entities even if those entities cannot reciprocate, as any exchange benefits patients.

- **Suggestions for ONC.** HIOs felt it would be helpful if ONC could share a road map for the future of health information exchange to help hospitals and payers see the value in becoming HIO members and conduct an environmental scan to understand the ways in which ADT notifications are being used nationally and what types of use cases they support. They further suggested that creation of a standardized business associate agreement and nondisclosure agreement for interstate connectivity would be valuable.

Infrastructure Discussion

- **Recommended models.** HIOs discussed four possible models to facilitate ADT exchange across HIOs⁸:
 - **Point-to-point model.** This is the most basic and simplified approach to enable geography-based ADT exchange. In this model, one HIO in a given state or region reviews the state or zip code value in a received ADT message. If the value corresponds with an HIO with which there is an already established relationship, the message will be routed to the partner HIO. Both visiting and home HIOs establish rules at the interface engine level when they are first negotiating their relationship.
 - **Hub model.** This model aims to address the scalability issues that hinder the point-to-point approach by introducing a lightweight engine to facilitate the processing and routing of ADT messages. The hub model is the inverse of the point-to-point model. If the HIO receives a message with a state code that does not correspond with the state or region it serves, the HIO transmits the message to the hub. The hub includes a table of HIOs and the geographic areas they cover, as well as information about how to relay messages to each HIO. If there is a match, the ADT is routed to the appropriate HIO and no data are stored centrally. Unlike the point-to-point model, the hub model simplifies the process for other HIOs to join, as participants do not need to modify coverage rules.
 - **Master patient index (MPI) query model.** This model creates a more targeted method for routing ADTs based on knowing a patient identity within a given HIO. Unlike the other models, the starting point for the MPI query model is not a geographical area. Each of the participating HIOs sends a patient identity feed to a centralized MPI. When a visiting HIO receives data from a source, it sends a query to the centralized MPI. If the patient has enterprise identifiers (EIDs) from other HIOs, the visiting HIO routes the ADT message to those HIOs, essentially pushing data back to the locations at which the patient has previously had encounters.
 - **Patient-centered data home (PCDH) model.** The PCDH model combines aspects of the technical models described above to enable inter-HIO data sharing. The PCDH model, like the point-to-point and hub models, relies on underlying geographic data. The visiting HIO receives an ADT message from the source and evaluates the state or zip code within the message. The visiting HIO then assigns its own unique identifier to the message for the patient and sends it to the home HIO. The home HIO sends confirmation of receipt of the ADT and also sends a notification of its own identifier. The visiting HIO adds the patient to its MPI with the home HIO's EID assigned as an alias.

⁸ Regional ADT Exchange Network Infrastructure Models. Office of the National Coordinator for Health Information Technology. March 2017. Available at https://www.healthit.gov/sites/default/files/regionaladt_exchange_network_infrastructure_models.pdf.

- **Standardized data elements.** HIOs suggested identifying a common, standardized set of basic elements that they could use to match identity, such as provider name, national patient identifier, address, and practice or organization name.
- **Organization directory.** HIOs suggested creating a map or directory of connected organizations, so that they can identify overlap in zip codes, thereby helping to improve the accuracy and effectiveness of patient-matching algorithms.
- **ADT use cases.** HIOs discussed several innovative use cases for ADT exchange, including: fraud management and detection; emergency medical services; quality measurement; risk scores; patient paneling and auto-subscribe; advanced directives; home health/visiting nurses association; behavioral health results delivery; patient consent; designee alerts; discharge planning; readmission report; long-term and post-acute care LACE (length of stay, acuity of the admission, comorbidity of the patient, and emergency department use) scores; syndromic surveillance, patient proxies; post-discharge follow-up; frequent users; triggering referrals to a preferred provider; and linking prescription drug monitoring program data to HIOs. Awardees also reviewed an analysis of the required and non-required data elements for HL-7 ADT exchange, and discussed which elements would be useful to exchange for each use case. An analysis of the data fields and the use cases they support, developed by Audacious Inquiry, is in Appendix A.
- **ADT message content.** HIOs recommended that content of ADT messages include the following: patient identification (date of birth, sex, and zip code); diagnosis information; event type; discharge date and time; allergy; procedures; insurance; patient visit (admission reason, entire visit, patient class, assigned patient location, admission type, referring doctor, admission source, and admission date and time); and medications.
- **Report cards.** HIOs suggested that other HIOs create report cards to distribute to participant provider organizations to improve the quality of data they submit.

Additional Takeaways

- **Concern about vendor competition.** HIOs are concerned about increased competition from vendors providing health information exchange services. HIOs are committed to and operate for the public good, and many have multi-stakeholder boards that represent multiple public interests.
- **Patient education.** HIOs would like patients to receive more education and outreach about the value of HIOs, data exchange, and the data the HIOs share.

Challenges and Best Practices

The awardees participating in the HIE-ADT Supplemental Program identified several challenges related to infrastructure models, governance approaches, use cases, and sustainability. They also recommended best practices to alleviate these challenges. This section describes some of these challenges and best practices.

Challenges

- **Inconsistent policies and requirements to support data sharing across state lines.** Each HIO requires slightly different language in its legal and trust framework for interstate exchange.
- **Variability in message content and poor or missing data.** Asking a hospital to meet a very rigid specification for the content of an ADT message can be a barrier to HIO participation. There is a difficult balance between having uniform data and maintaining HIO network growth. The manner in which hospitals send ADT messages to HIOs is often related to the EHR system the hospital is using, not the clinical setting; therefore, content for the diagnosis and other components of the ADT message are often incomplete. Some hospital registration systems lack bidirectional communication with the EHR's clinical information. As a result, an ADT message the hospital transmits might be missing some necessary clinical information, rendering it difficult for HIOs to determine the usefulness of the message content.
- **Incomplete patient panels.** Although HIOs can use patient panels to route notification, these panels are often incomplete, making it difficult to determine whether all patients are included and whether these patients are receiving active care.
- **Different model preferences across states.** States currently use different infrastructure models. Establishing point-to-point interfaces with multiple HIOs can be a significant effort.
- **High level of effort required to develop and execute legal agreements.** Agreements with states are variable, do not include standard language, and take a long time to develop.
- **Limited information transmitted between HIOs.** Certain HIOs can have strict agreements that only allow HIOs to use ADT messages for specific use cases, such as event notifications. In these circumstances, ADT messages cannot be aggregated or placed in a repository for any other purpose.
- **Difficulty standardizing interstate legal agreements.** When HIOs develop legal agreements, it can be challenging to reach a standard agreement if some entities are reluctant to share information. In addition, attorneys developing the agreements are concerned about the risk associated with sharing data (for example, from prescription drug monitoring programs) with other parties, such as managed care organizations.
- **Significant costs associated with establishing ADT feeds.** When HIOs implement point-to-point connections with one another, there is a significant added cost, particularly when an HIO contracts with a vendor to establish the ADT feeds.
- **Significant costs associated with reporting utilization and key metrics.** HIOs can face significant costs when reporting metrics such as the number of messages received from and sent to other HIOs, the number of messages that match in an HIO's MPI query model, and the number of queries conducted.

Best Practices

- **Develop multi-party agreements that allow for flexibility.** As the number of HIOs that are exchanging ADT notifications with one another continues to expand, it is important to develop

scalable approaches to governing inter-HIO data exchange. Developing and maintaining point-to-point agreements with multiple partners comes at a high cost; thus, these types of agreements are not practical at a nationwide-exchange level. Instead, HIOs may want to consider leveraging existing trust frameworks or developing multi-party agreements that reduce the governance and legal costs associated with each connection. If HIOs decide to pursue the multi-party agreement pathway, they should develop a model that allows them to add modular use cases over time to respond to evolving market needs and enable a subset of participants to adopt new use cases.

- **Establish and then enhance inter-HIO exchanges.** To reduce barriers to launching inter-HIO exchanges, participants should consider the minimum governance and technical requirements necessary to begin sharing ADT notifications. After inter-HIO exchanges are established, participating organizations can incrementally add use cases and develop policies to address new issues as they arise. HIOs should plan for the future by developing technical and governance approaches that can adapt to evolving needs. At the same time, they should move ahead with current plans to share data with participating organizations.

Conclusion: Awardee Reflections on the HIE-ADT Supplemental Program

Based on feedback from awardees, the HIE-ADT Supplemental Program provided a useful forum in which to acquire strategies to expand on and standardize ADT messages, and to share and gather insights from the approaches other states use. The awardees highlighted the following activities and discussion topics as being particularly valuable:

- **ADT message content and quality.** Several awardees reported benefiting from the in-depth discussions about ADT message content and quality. After attending HIE-ADT Supplemental Program events, UHIN used the information shared to expand its ADT message content to provide end users more detailed and useful information, such as facility location and relevant communication. DHIN particularly valued guidance that ensured the quality of the ADT message content. RIQI commented that “the end result of the meeting was a greater understanding (both for the ONC and for state and regional HIOs) for which foundational elements need to be laid and/or enforced for national governing standards, in order for HIOs to be able to communicate via HL-7 ADT transactions. Several important topics were discussed in addition to the original ‘baseline’ message types, including merges, moves, and updates which may contain valuable information for post-discharge analysis, such as diagnosis.”
- **Potential use cases.** Awardees commented that the program events provided them with valuable information about potential use cases, many of which they had not previously considered. As a result, UHIN said it will “keep an eye out for unusual use cases.” The Oregon Health Authority will use the information gathered about potential use cases to further develop its strategy for expanding ADT messaging.
- **PCDH model.** DHIN remarked that the presentation on the PCDH model helped introduce what it views to be “a terrific vehicle” to help achieve nationwide health information exchange. DHIN found the focus on ADT-required content and standardization efforts to support this model particularly useful.
- **Building ADT message capacity.** Through participation in the program events and recent experience expanding ADT messages within and outside of Utah, UHIN realized the importance of flexibility when building capacity and adding to existing technology.

- **Interstate expansion.** Participating in the program events enabled RIQI to better understand how its approach differs from those of the other three awardees in connecting to a hospital/provider network in another state. RIQI plans to leverage the insights shared by the other organizations. In addition, the program events helped generate consensus regarding governance approaches for consent.
- **Peer-to-peer learning.** RIQI thought “the workgroup was very productive and was a great opportunity to swap challenges and solutions at a technical level, as well as discuss issues around governance. Hearing everyone’s different methods for utilizing their data and partners definitely has provided some inspiration to bring back to CurrentCare. The best practices we discuss will hopefully help the ONC in providing a more unified set of guidelines for implementation in the future.”

Given the awardees’ perceived value of the HIE-ADT Supplemental Program in their efforts to further expand their ADT messaging, several indicated that a longer award period would have been helpful. A few awardees indicated that a longer award period would have enabled them to expand their use of ADT messages (for example, by developing standardized trust agreements).

Overall, the awardees were grateful for the opportunity to engage with ONC and their peers through the HIE-ADT Supplemental Program events. RIQI commented that it was “thrilled and enthusiastically engaged with each opportunity provided.” The awardees appreciated learning from ONC and one another about how to adjust their approaches, develop and deepen partnerships with organizations participating in their HIOs, and enhancing data exchange as a way to ultimately help improve the health care system.

Appendix A: ADT Use Cases

During the April 2017 HIE-ADT one-day, in-person workshop, participants discussed innovative use cases for inter-state ADT exchange. The table below, developed by Audacious Inquiry, provides an analysis of the required and optional data fields for a standard HL7 ADT message, and it compares the percentage of messages containing each data field for four common types of ADT messages—A01, A03, A04, and A08. This table further analyzes which data fields are useful or not useful to include when exchanging information for each of the 18 applicable use cases discussed in the ADT Workshop.

Field	Percentage of Messages with Data by Message Type				Applicable Use Cases																		
	A01	A03	A04	A08	Notifications	Discharge Planning/ Follow-Up	Advance Directives	EMS (ex. Billing)	Home Health/VNA	ED Admit Notifications	Death Notifications	Readmission Report	High Utilizers	Behavioral Health Results Delivery	LACE/Risk Scores	Referral Triggers	Patient Consent	Syndromic Surveillance	PDMP/HIE Linking	Patient Paneling	Designee Alerts	Patient Proxies	
AccountNumber	98.3	100.0	100.0	98.0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
ActualLOS	5.2	10.6	8.3	9.4																			
AdmitReason	19.0	29.0	31.6	38.1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	
AdmitSource	63.8	83.3	74.3	82.3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
AdmitSourceInValueSet	6.9	20.5	11.1	11.1																			
AdmitTimeStamp	98.3	95.4	96.9	94.2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
AdmitType	91.9	85.7	80.1	85.0	x	x	x	x	x	x	x		x	x	x		x	x	x	x	x	x	x
AssigningAuthorityCode	100.0	100.0	100.0	100.0																			
AssigningAuthorityCodeQuality	100.0	100.0	100.0	100.0																			
AssociatedDiagnosisCode	0.0	0.0	0.0	0.0																			
BedStatus	1.5	2.3	1.0	1.9					x														
BedStatusQuality	0.0	0.0	0.0	0.0																			
ContactRole	68.4	41.4	69.9	75.9																			
CountyCode	60.6	38.2	44.0	37.0																			
CreatedTimeStamp	100.0	100.0	100.0	100.0																			
DeathDateTime	0.0	0.2	0.0	0.1							x												
DeathIndicator	70.2	46.0	53.3	40.9							x												
DiagnosisAttestDate	0.0	0.0	0.0	0.0																			
DiagnosisClassification	1.1	0.0	1.8	2.0																			
DiagnosisClinician	0.0	0.1	0.0	3.7																			
DiagnosisCode	28.9	19.5	14.5	31.3	x	x	x	x	x	x		x	x	x	x		x						
DiagnosisCodeDescription	61.5	25.7	30.5	39.1															x				
DiagnosisCodeSystem	23.4	13.2	12.3	25.4																			
DiagnosisCodeSystemQuality	1.3	2.6	1.9	9.4																			
DiagnosisCodingMethod	12.5	23.8	18.7	30.4																			
DiagnosisConfilIndicator	0.0	0.0	0.0	0.0																			
DiagnosisDate	16.3	6.0	16.4	15.0																			
DiagnosisDescription	62.7	32.4	36.8	43.4	x	x	x	x	x	x			x	x	x		x						
DiagnosisDRGApprovalFlag	0.0	0.0	0.0	0.0																			
DiagnosisDRGReviewCode	0.0	0.0	0.0	0.0																			
DiagnosisGrouperVersionType	0.0	0.0	0.0	1.2																			
DiagnosisMajorCategory	0.0	0.0	0.0	0.0																			

Field	Percentage of Messages with Data by Message Type				Applicable Use Cases																		
	A01	A03	A04	A08	Notifications	Discharge Planning/ Follow-Up	Advance Directives	EMS (ex. Billing)	Home Health/VNA	ED Admit Notifications	Death Notifications	Readmission Report	High Utilizers	Behavioral Health Results Delivery	LACE/Risk Scores	Referral Triggers	Patient Consent	Syndromic Surveillance	PDMP/HIE Linking	Patient Paneling	Designee Alerts	Patient Proxies	
DiagnosisRelatedGroup	0.0	0.0	0.0	0.1																			
DiagnosisSegment	64.6	32.9	41.5	50.2														x					
DiagnosisSetId	64.6	32.9	41.5	50.2														x					
DiagnosisType	19.9	14.4	17.0	29.1														x					
DiagnosisTypeQuality	9.0	6.3	9.6	12.7																			
DischargeDisposition	1.4	90.0	7.4	22.1	x	x	x		x	x				x	x	x		x					
DischargeLocation	0.0	10.4	0.1	3.2	x	x	x		x	x			x	x	x	x	x	x	x		x	x	
DischargeTimeStamp	1.3	99.9	0.7	18.8	x	x	x		x	x			x	x	x	x	x	x	x		x	x	
DOB	99.9	100.0	100.0	99.6	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
DOBQuality	99.9	100.0	100.0	99.6																			
DriverLicense	3.0	3.7	5.8	5.8																			
DriverLicenseQuality	0.3	0.6	0.5	0.7																			
Email	24.3	16.0	26.2	23.2																			
Ethnicity	75.3	81.5	74.2	65.8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
EventFacility	0.3	2.3	1.7	2.1																			
EventReasonCode	59.3	41.9	51.5	43.1																			
EventTimeStamp	98.0	95.6	97.6	97.9																			
EventType	100.0	100.0	100.0	100.0											x								
EventTypeQuality	100.0	100.0	100.0	100.0																			
ExternalPatientId	29.7	15.3	25.0	18.4																			
FinancialClass	95.8	83.7	90.5	88.1																			
FirstName	99.9	100.0	100.0	100.0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Gender	100.0	100.0	100.0	99.6	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
GenderQuality	100.0	100.0	100.0	99.6																			
GuarantorAddress1	26.8	16.4	30.6	33.5			x														x	x	
GuarantorAddress1Quality	26.8	16.4	30.5	33.5																			
GuarantorAddress2	3.3	1.6	3.4	3.6			x															x	x
GuarantorAddress2Quality	3.3	1.6	3.4	3.6																			
GuarantorCity	26.8	16.4	30.6	33.5			x															x	x
GuarantorCityQuality	26.8	16.4	30.5	33.5																			
GuarantorCountry	14.1	6.7	13.8	13.5			x															x	x
GuarantorName	28.2	16.4	31.4	33.7			x															x	x
GuarantorNameQuality	28.2	16.4	30.8	33.6																			
GuarantorRelationship	24.3	14.9	28.4	32.2																		x	x
GuarantorRelationshipQuality	0.0	0.0	0.0	0.0																			
GuarantorSegment	28.2	16.4	31.7	35.0																			
GuarantorState	26.9	16.4	30.5	33.5			x															x	x
GuarantorStateQuality	26.9	16.4	30.5	33.5																			
GuarantorZip	26.8	16.4	30.5	33.5			x															x	x
GuarantorZipQuality	26.8	16.4	30.5	33.5																			
HospitalService	97.1	73.8	46.8	70.8	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
HospitalService	97.1	73.8	46.8	70.7	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
InsuranceCompanyID	56.4	25.6	51.2	44.2																			
InsuranceCompanyName	68.1	31.6	70.6	60.7	x			x															
InsuranceCompanyNameQuality	68.1	31.6	70.6	60.7																			

Field	Percentage of Messages with Data by Message Type				Applicable Use Cases																		
	A01	A03	A04	A08	Notifications	Discharge Planning/ Follow-Up	Advance Directives	EMS (ex. Billing)	Home Health/VNA	ED Admit Notifications	Death Notifications	Readmission Report	High Utilizers	Behavioral Health Results Delivery	LACE/Risk Scores	Referral Triggers	Patient Consent	Syndromic Surveillance	PDMP/HIE Linking	Patient Paneling	Designee Alerts	Patient Proxies	
InsuranceCompanyNameTypeCode	0.4	0.1	1.2	1.9																			
InsuranceCoverageType	63.8	31.5	65.7	56.2				x								x							
InsuranceGroupName	5.0	1.9	9.0	10.6																			
InsuranceGroupNameQuality	5.0	1.9	9.0	10.6																			
InsuranceGroupNumber	28.4	15.1	28.7	23.0				x								x					x		
InsuranceGroupNumberQuality	28.3	15.1	28.7	22.9																			
InsurancePlanEndDate	3.9	5.7	8.2	5.8																			
InsurancePlanID	65.4	31.0	69.8	58.9				x								x					x		
InsurancePlanIDDesc	49.2	21.2	43.7	28.6												x							
InsurancePlanMedicaidPlanName	0.0	0.0	0.0	0.0																			
InsurancePlanStartDate	41.7	26.3	41.2	34.3																			
InsurancePlanType	29.9	16.2	30.5	23.6				x															
InsuranceSegment	68.2	31.6	71.1	61.2																			
InsuranceSetID	68.1	31.6	71.1	61.1																			
InsuredId	2.7	4.7	7.1	5.0																			
InsuredIdPrefix	0.0	0.0	0.0	0.0																			
Language	76.4	82.2	76.9	66.3																			
LastName	99.9	100.0	100.0	100.0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
LivingArrangement	0.2	1.0	0.6	0.5																			
MaritalStatus	88.9	95.1	96.1	91.8																			
MaritalStatusQuality	50.5	65.1	63.4	62.3																			
MessageControlID	100.0	100.0	100.0	100.0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
MessageSendingApp	98.3	99.9	99.9	100.0																			
MessageType	100.0	100.0	100.0	100.0																			
MiddleName	57.6	69.9	66.8	67.1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
MRN	100.0	100.0	100.0	100.0	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
MsgTimeStamp	100.0	100.0	100.0	100.0																			
NextKinAddress1	49.2	29.3	55.0	60.1																			
NextKinAddress2	5.1	2.4	6.1	7.8																			
NextKinBusinessPhoneNumber	10.2	5.5	10.7	14.4																			
NextKinCity	49.4	29.4	55.5	60.3																			
NextKinCountry	43.7	27.9	36.2	32.0																			
NextKinEndDate	0.0	0.0	0.0	0.0																			
NextKinFname	71.8	44.8	73.0	76.2																			
NextKinLname	72.4	45.0	75.7	79.7																			
NextKinMarital	1.6	0.6	0.8	0.7																			
NextKinMaritalQuality	0.0	0.0	0.0	0.0																			
NextKinMname	8.1	3.3	6.9	8.2																			
NextKinPhoneNumber	64.1	39.9	70.3	74.6																			
NextKinRelationship	70.7	44.4	73.3	78.8																			
NextKinRelationshipQuality	0.5	0.3	1.4	1.6																			
NextKinSetId	73.3	45.4	76.8	81.6																			
NextKinStartDate	0.1	0.0	0.8	0.7																			
NextKinState	49.5	29.4	55.5	60.3																			
NextKinSuffix	0.3	0.2	0.4	0.5																			

Field	Percentage of Messages with Data by Message Type				Applicable Use Cases																		
	A01	A03	A04	A08	Notifications	Discharge Planning/ Follow-Up	Advance Directives	EMS (ex. Billing)	Home Health/VNA	ED Admit Notifications	Death Notifications	Readmission Report	High Utilizers	Behavioral Health Results Delivery	LACE/Risk Scores	Referral Triggers	Patient Consent	Syndromic Surveillance	PDMP/HIE Linking	Patient Paneling	Designee Alerts	Patient Proxies	
NextKinZip	48.9	29.2	54.9	59.2																			
NextOfKinSegment	73.3	45.4	76.8	81.7																			
Note	3.6	3.0	11.6	3.6																			
OtherGeoDesignation	2.8	14.3	7.7	7.1																			
PatientAddressCity	95.3	99.1	97.9	97.1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
PatientAddressCountry	76.2	72.0	64.4	51.2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
PatientAddressState	95.4	99.1	97.9	97.2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
PatientAddressStateQuality	95.4	99.1	97.9	97.2																			
PatientAddressStreet1	95.4	99.1	98.0	97.1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
PatientAddressStreet2	11.1	11.9	11.4	13.4	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
PatientAddressZip	94.8	99.0	98.0	96.9	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
PatientAddressZipQuality	93.7	87.4	93.5	94.7																			
PatientAssigningAuthority	79.5	81.2	76.0	74.5																			
PatientAssigningFacility	0.7	5.6	4.3	4.9																			
PatientBirthOrder	5.5	18.8	8.2	4.9																			
PatientClass	100.0	100.0	100.0	99.9																			
PatientMultipleBirthInd	5.7	1.8	2.8	2.8																			
PatientVisitSetId	95.8	86.6	91.9	91.8																			
PCPeffectiveDate	0.0	0.0	0.0	0.0																			
PCPfname	46.1	48.0	42.4	35.9			x									x			x	x			
PCPfnameQuality	46.1	48.0	42.4	35.9																			
PCPIname	47.7	50.4	45.8	41.5												x			x	x			
PCPInameQuality	47.7	50.4	45.8	41.5																			
PhoneNumberBusiness	29.9	27.3	34.9	32.2																			
PhoneNumberHome	92.0	95.2	95.3	92.2	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
PhoneNumberHomeQuality	91.8	95.0	95.1	92.0																			
PrevAccNo	0.0	0.0	0.0	0.0																			
PrevMRN	0.0	0.0	0.0	0.0																			
ProcedureCode	0.0	0.0	0.0	0.6																			
ProcedureCodeDescription	0.0	0.0	0.0	0.3																			
ProcedureCodingMethod	0.0	0.0	0.0	0.6																			
ProcedureDateTime	0.0	0.0	0.0	0.6																			
ProcedureSegment	0.1	0.0	0.8	1.4																			
ProcedureSetId	0.0	0.0	0.0	0.6																			
PtLocation	97.2	85.6	79.0	68.2	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x			
PTType	45.9	77.0	65.1	74.6																			
Race	88.3	97.0	92.8	86.3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
ReadmissionIndicator	2.0	2.1	0.8	2.2							x			x									
Religion	83.4	79.8	81.6	71.6	x																		
ReligionQuality_In_Valueset	24.9	28.7	27.4	26.8																			
SSN	84.3	80.7	80.8	69.1	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
SSNQuality	72.1	75.3	75.1	63.8																			
Suffix	3.2	4.0	3.8	4.3	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
VisitAlternateld	39.1	18.9	15.3	16.1																			
VisitDescription	5.7	5.7	9.6	5.6																			

Field	Percentage of Messages with Data by Message Type				Applicable Use Cases																		
	A01	A03	A04	A08	Notifications	Discharge Planning/ Follow-Up	Advance Directives	EMS (ex. Billing)	Home Health/VNA	ED Admit Notifications	Death Notifications	Readmission Report	High Utilizers	Behavioral Health Results Delivery	LACE/Risk Scores	Referral Triggers	Patient Consent	Syndromic Surveillance	PDMP/HIE Linking	Patient Paneling	Designee Alerts	Patient Proxies	
VisitDoctorAdmitting	43.5	37.4	30.2	51.4					x														
VisitDoctorAttending	49.9	80.9	82.8	84.4	x	x	x	x	x	x				x		x		x	x	x	x	x	x
VisitDoctorConsulting	4.3	7.1	4.8	13.0																			
VisitDoctorConsultingQuality	4.3	7.1	4.8	13.0																			
VisitDoctorReferring	21.1	40.9	54.7	48.0																			
VisitIndicator	0.4	4.0	4.1	2.8																			
VisitIndicatorQuality	0.3	2.8	3.5	1.4																			
VisitNumber	80.4	82.3	81.3	77.5																			
VisitServiceFacility	15.4	47.0	45.7	48.7	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x
VisitTotalAdjustments	0.1	1.3	0.8	1.6																			
VisitTotalCharges	12.1	27.5	6.7	21.4																			
VisitTotalPayments	0.1	1.3	0.8	1.7																			
VisitTransferReason	0.0	0.3	0.2	0.3																			
Use Case Data Score					82.26	82.41	70.73*	79.60*	79.36*	82.64	74.86	81.80	79.99	82.64*	80.70*	75.31	81.16*	77.53*	80.10*	80.01	67.93*	67.93*	

*Use case requires further analysis to confirm data score.

Message Type	Total Message Count
A01	3,0759
A03	139,192
A04	255,122
A08	1,430,213