Health Information Exchange Functionality and Technology Selection Criteria

Health Information Exchanges (HIEs) continue to evolve to provide a greater degree of architectural flexibility, functionality and breadth. We look at key HIE selection criteria from a functionality and technology perspective to help organizations choose solutions that will help them meet current and future needs.

Needs and Challenges

Health information exchanges are an evolving category of products and solutions that are designed to exchange health information between various applications, systems and users. Most HIEs are also able to locate, assemble, and transform information, both clinical and administrative/financial. Their ability to enable interoperability will be a key capability in improving care delivery and in enabling organizations to meet Meaningful Use stages II and III. With many HIEs having their functional roots as interface engines/integration brokers, they can also potentially provide some of the workflow, process coordination and business process management required as organizations drive towards becoming accountable care organizations (ACOs).

Choosing an HIE solution (or solutions) can be one of the most complex choices an organization can make. Although there are more than a dozen well known HIE-focused vendors that could likely do the job, selection can depend on an organization’s incumbent acute/ambulatory EMR vendor (and its interoperability capabilities), the presence of RHIOs and state-based HIEs (and the vendors and standards they may have chosen) and all the usual criteria for choosing any vendor (e.g., cost, support, financial strength, business model, number of clients, references, training, culture and partners). To make selection more confusing, there are many vendors entering the HIE space from other angles, such as communication/carriers, payers and e-prescribing network players. In some cases, some specialty vendors focus on offering just one or two capabilities (e.g., EMPIs, registries, or security). This note focuses on HIE functional and technical selection criteria.

Selection Criteria

Architectural Models and Data Source Integration – There are multiple architectural models that can support HIE. Point to Point models are transport-focused and best for ad-hoc push to known destinations. Infrastructure requirements are minimal with content often sent as e-mail-type enclosures. The ONC Direct Project is a prime example of this approach. Hub and Spoke models have interfaces, usually HL7, for each participating entity built once to the hub, not to every other node. This message-centric synchronous/asynchronous store-and-forward approach has been used extensively with IDSs and hospital systems to connect to ambulatory practices, labs, etc. Infrastructure requirements are
modest. Central Repository models add a repository, database, registry, or warehouse to improve information access and provide decision support and analytics. Infrastructure requirements are high, as there may be a requirement for an EMPI, RLS, and the database itself. Most vendors and users have migrated to a more hybrid type of approach where some of the participating entities hold some of the data in their own repositories/edge servers (e.g., a more federated approach). IHE/XDS models, based on an emerging set of standards for document exchange, offer considerable promise and is what is used for the NHIN and CONNECT. While still requiring an EMPI and RLS, repositories and registries are usually hung off the participating systems, and organizations only exchange the documents on an as-needed basis. Most organizations will require an HIE architecture that supports multiple, if not all, of these four types of models.

**EMPI and RLS** – Locating and determining which records belong to which patients is a crucial function in health exchange. EMPIs vary from providing simple deterministic matching on a few data fields (e.g., name, DOB, address, medical record number/SSN) to more sophisticated probabilistic matching using additional demographic and clinical information with the ability to tune these algorithms to certain populations (e.g., communities where many people have similar last names, change addresses often, do not have reliable social security numbers, etc). Being able to connect to other organization’s EMPIs (e.g., payers) and add additional data types and data fields is a plus. Record locator and directory services are also key for locating and assembling virtual patient records. Having access to emerging provider directories to filter or expand searches can also help. Indexes and directories can be and often are distributed.

**Data Exchange Standards and Terminology Management** – HIEs must support standards that address transport, content and media types. Organizations should be familiar with IHE (Integrating the Healthcare Enterprise), HL7 and ANSI (American National Standards Institute) protocols and support what is recommended by the HIT Standards Committee. Those front and center include PIX (Patient Identifier Cross-referencing), PDQ (Patient Demographics Query), XDS (Cross-Enterprise Document Sharing), CDA, CCD, CCR, HL7 V2 and V3, XDR (Cross-Enterprise Document Reliable Interchange), DICOM, ATNA (Audit Trail and Node Authentication), etc. In addition, a key capability for an HIE is terminology management and translation, which can include a terminology mapping environment and a terminology server that can bridge between terminology sets (e.g., translate from one drug database to another, such as from FDB to Medi-span). Some of the best known clinical and administrative standards include SNOMED-CT, LOINC, RxNorm, ICD-9 and ICD-10. The amount of support from an HIE solution for these terminologies will depend on the capabilities of source and target systems (e.g., if both systems use these standards, the HIE may not need to translate).

**Clinical Data Repository (CDR)/Operational Data Store (ODS)** – HIEs, through their connections to multiple source systems, have the potential to aggregate
information in a structured and normalized format such that it can be used in clinical decision support system (CDSS). The more relevant the information that can be accessed and the more complete a view created of the patient, the better that electronic systems can send the most relevant alerts and recommendations in support of clinician workflow. Such rule-based systems can reside within the HIE or in one or more connected systems that have access to the repository/data store. The CDR/ODS must be kept up-to-date depending on its use, which may include real-time (or near real-time) access. Caching can help ensure the right data is available when needed. An example of the use of CDSS in the context of an HIE would be ensuring that the right actions are taken in the right timeframes to prevent readmissions.

**Data Warehouse and Analytics** – The aggregation of health information across providers, organizations, patient populations, etc., can be a huge boon to evidence-based medicine, comparative effectiveness research, clinical trials and population health management. Organizations working towards being ACOs in particular will need this kind of capability to analyze length of stay, utilization, etc. States will also want this data, especially for their Medicaid populations. Techniques that can be used include data mining, predictive analytics, data modeling, statistics, data visualization and simulation. The ability to de-identify data is key to meet HIPAA, provider and consumer protections.

**User Access and Reporting**– HIE services and access needs to be made available electronically between systems and with clinicians and other end users in the formats desired (e.g., consolidated view or native viewing). Access via web-based portals/dashboards, directly from within applications, on a range of mobile devices, etc., may all need to be supported. Systems should also be able to electronically feed and report to registries, state and federal agencies, surveillance systems, etc., via auto-fax, email, etc., as required.

**Privacy and Security**– HIEs must be especially strong in support of privacy and security, employing such technologies as multi-factor authentication (more stringent for certain types of information, such as mental health or updating records vs. just viewing them), role-based security, opt-in/out, break-glass, VIP flags, auditing, single sign-on/context aware computing, de-/re-identification, and e-signature/non-repudiation. These capabilities need to support the right level of privacy and security without the process being too onerous or porous.

**Clinical Groupware**– Examples of clinical groupware that HIEs may provide include e-prescribing, a “lite” or fully certified EMR, a PHR, PACS viewing, and registries. HIEs will often offer these capabilities as a way to serve clinicians without their own electronic systems and deliver these applications via cloud/remote-hosted approaches that can keep costs and footprints low. They can also provide a revenue source for the HIE, although they may not be well received by incumbent vendors that wish to provide more of their own products and only have the exchange present for interoperability needs.
Action Items

- **Ensure support for push and pull** - push of information to known parties may help an organization achieve MU stage 1, but pull (search/locate) will be needed for the organization to function as an ACO to assemble a greater amount of information about patients and populations – check for support of interfaces (e.g., EMRs, labs, PHRs) and gateways and support for messages, transactions, media types and document exchange - ensure the HIE can support the Direct Project and NHIN CONNECT.

- **Determine what information is going to be shared with other entities and where it will reside** – ensure the HIE solution can support the degree of federation required with the proper availability, performance, load balancing, backup-recovery and security (many HIEs are remote hosted so the actual technology used in the data centers, such as OS platform and hardware, are less important than the service level guarantees in the contract). Recognize that this could change over time so SLA contract flexibility is critical.

- **Do a cross-system analysis/inventory of standards and terminologies used in applications and systems** – work towards recommended standards from ONC, and push vendors to support these standards.

- **Build out capabilities to aggregate information for clinical decision support and analysis** – ensure that the HIE solution can either provide or support a database model and/or repository structure that provides access for real-time and retrospective analysis as required.

- **Determine user and system needs for access and reporting** – support may be needed via portal, from within EMRs, from mobile devices, etc. Ensure the HIE is able to export in multiple formats to meet various requirements (e.g., performance reporting).

- **Ensure the HIE solution can support applicable HIPAA and MU requirements and provide the needed granularity of patient consent** - check state, regional and health system requirements.

- **Determine the need for clinical groupware** – will the HIE vendor provide too limited/immature a solution that providers will outgrow, or will it be too competitive to the organization’s incumbent vendors? Especially evaluate the potential to provide HIE-enabled Cloud-based storage/PACS as a cost-saving measure across an ACO.

- **Determine functionality fit with your current organizational plans.** HIEs may offer overlapping or duplicate functionality (e.g., registries, CDSS, or data warehousing) with your current systems. Think through the potential fit from a technical and from a user perspective (e.g. how many different systems used by a physician could be firing CDS alerts). Also evaluate it from a data security standpoint. The more repositories, the more chances for security failure.