

## **Introduction**

The Center for Healthy Communities [www.med.wright.edu/center/](http://www.med.wright.edu/center/) in the Boonshoft School of Medicine [www.med.wright.edu](http://www.med.wright.edu) at Wright State University [www.wright.edu](http://www.wright.edu) administers the HealthLink RHIO, which is a state and regional health information exchange with the capacity to implement and test the NHIN specifications across networks. The applicant entity, Wright State University, is a public nonprofit organization, and the HealthLink RHIO meets the second special eligibility criteria as

"a dedicated geographic health information exchange that demonstrates an open and participatory governance process supporting state, and regional interoperable health information exchange with involvement from a broad and representative range of health care-related organizations representing at least 50,000 consumers."

HealthLink RHIO includes representation from hospitals, providers, Medicaid managed care, labs, state and local public health, public schools, social services and safety net providers, and Clark and Champaign County Health Information Exchange.

[www.med.wright.edu/healthlink/](http://www.med.wright.edu/healthlink/)

The HealthLink RHIO, initially established in 2002 as the HealthLink Network, serves as the application service provider for both an electronic shared community health record, and health information exchange and has existing functionalities to support the four core services of the NHIN: 1) Patient lookup and information retrieval; 2) Secure information routing and delivery (including but not limited to a defined summary patient record); 3) Provision of data for population uses; and 4) Consumer managed access to appropriate information. The electronic shared community health record, HIE<sup>TM</sup> (HealthLink Information Exchange) built to the Continuity of Care Record standard, provides a common record in a central data repository, accessed across the internet by multiple providers. For some HIE<sup>TM</sup> users, this is the only electronic data system they use. For others, the HIE<sup>TM</sup> system is integrated with existing electronic record keeping systems; and for other HIE<sup>TM</sup> users, they can send information to and receive information from HIE<sup>TM</sup> using clinical messaging. Additionally, the HIE<sup>TM</sup> system provides a patient portal, currently being used to provide a fully electronic enrollment process for the Ohio Children's Buy-In Program, calculating eligibility and premium payment level determinations in real time on-line. Information typically available through the health information exchange managed through the HealthLink RHIO includes demographic and eligibility information, social services utilization information and clinical information typically found in an EHR.

We propose to participate in a network of networks, to test and demonstrate successful implementation of the NHIN specifications for NHIE to NHIE exchange including the implementation of these specifications demonstrating their connectivity to others specifically production ready systems, and from NHIE to provider organizations, consumer organizations, specialty networks and other non-NHIE entities necessary to carry out the activities and objectives of health information exchange. Additionally, we are prepared to work collaboratively with the Health Information Technology Standards Panel, the Certification Commission for Healthcare Information Technology, the Health Information Security and Privacy Collaboration, the State Alliance for eHealth, the State-

level Health Information Exchange Consensus Project and participating federal agencies and the Federal Health Architecture. Once funded Center for Healthy Communities staff, members of the HIEx™ development team and current business partners will participate in meetings and related activities of the NHIN Cooperative, work with NHIN contractors and other awardees to produce and refine the technical specifications and legal agreements for the production of the NHIN, develop, test and demonstrate the implementation of technical specifications of the NHIN, accept and execute a Data Use and Reciprocal Support Agreement for the NHIN trial implementations and assist the Project Officer in developing reports, briefings and other analyses as requested.

## **Narrative**

### **1. Approach, Work Plan and Quality of Proposed Staffing**

The NHIN project will provide an opportunity expand the local, state and national level work already underway through HealthLink RHIO. HealthLink RHIO meets monthly to conduct the business of the organization. Focus of current work is threefold. First, HealthLink RHIO serves as the application service provider for health and human services organizations interested in using the HIEx™ system, and the health information exchange. Ongoing development and modifications are constantly underway in response to customer's collective understanding of needed functionalities and tools. An example of an identified functionality which is currently being developed is in response to the national concern about patient identifiers. To address the disambiguation issue, faculty from the Kno.e.sis Center at Wright State University are developing an ontology of identify using the semantic web, with an expectation of developing a set of rules which would successfully match data elements from multiple sources to insure accurate patient identify associated with data coming into a common electronic record. While the majority of the HIEx™ customers are local, we are also working with projects on a state-wide level through the Department of Job and Family Services (state Medicaid), and the Ohio Department of Health, as well as with a couple of projects outside of Ohio. HIEx™ customers enter into Information Sharing and Business Associate Agreements which stipulate appropriate HIPAA, and other federal and state privacy and security protections of data for collection, storage, access and exchange.

Second, HealthLink RHIO is an active participant in state level work groups and activities related to health information technology and exchange in Ohio. As one of three operational RHIOs in the state, HealthLink RHIO co-sponsors the annual HIT/HIE Summit in Ohio, and CHC staff, who are members of HealthLink RHIO serve on the leadership team for Ohio's Health Information Security and Privacy Collaborative, and in the third phase of the HISPC project will work on two of the national teams addressing role based access and a common consent form. CHC staff who are members of HealthLink RHIO also serve on the recently established Ohio Health Information Consortium Advisory Board. Additionally, HealthLink RHIO is working with the Ohio Department of Health, HealthBridge RHIO and Clark and Champaign County Health Information Exchange on efforts to coordinate routing information such as vital statistics, immunizations, and reportable diseases through regional hubs using RHIOs. In an extensive Medicaid Transformation proposal submitted but not funded by the Ohio

Department of Job and Family Services, HealthLink RHIO was slated to provide health information exchange across the state through a coordinated network of networks in Ohio involving Medicaid claims and encounter data for Medicaid recipients. Beginning April 1, 2008, the HIEx™ system will host a patient portal to facilitate a fully paperless on line application and enrollment process for the Children's Buy In program, a state-wide premium based program for children with medical handicaps. All eligibility and premium payment level determination will be done electronically in real time, and program participants will use HIEx™ to manage and update information for the duration of their enrollment in the program.

The third focus of the work of HealthLink RHIO is as an active participant at the national level through work groups, professional associations and national and international conferences and meetings related to health information technology and health information exchange. HealthLink RHIO is regularly included in the survey conducted through the eHealth Foundation, and was recently cited as one of only a handful of currently operational RHIOs across the country in a study conducted at Harvard and published in the Health Affairs (Vol. 27, no. 1 (2008): w60–w69 (published online 11 December 2007; 10.1377/hlthaff.27.1.w60)). HealthLink RHIO is regularly represented and frequently a presenter and/or exhibitor at the annual HIT/HIPAA Summits in Washington, D.C., Agency for HealthCare Research and Quality HIT conferences and CDC, AMIA, HIMSS, APHA and Connecting Communities for Better Health conferences. Additionally, CHC staff who are members of HealthLink RHIO serve on ASTM, Microsoft, and HL-7 work groups, and proposals submitted by HealthLink RHIO and Wright State University have been ranked for funding for a number of national level projects including most recently the FBO opportunity through the CDC, Accelerating Public Health Situational Awareness Through Health Information Exchange—2007-N-09275.

Wright State University brings considerable resources to this project to test and demonstrate the national health information network trial implementations. The NHIN project is aligned with the mission of the larger institution, and will draw on the expertise of a number of resources that are a part of Wright State University including but not limited to: technicians, applications development and network engineers from Computer and Telecommunications Services; faculty from the College of Engineering and Computer Science, and the Kno.e.sis Center; clinicians from the Boonshoft School of Medicine; attorneys from the Office of General Counsel and the Office of Commercialization and Technology Transfer; and the HIEx™ development team and the leadership team from the Center for Healthy Communities. Additionally, through the HealthLink RHIO, current HIEx™ organizational customers and users including a public school system, local hospital systems, county level welfare and children's protection organizations, outreach and referral networks, geriatricians, the state Medicaid department, other developing and operational RHIOs in the state, and our commercial partners, HTP, Inc., and Teradata, Inc. will all contribute to the work of the project. Finally, work on this project will be informed by multiple potential HIEx™ customers and users with whom we are currently in negotiation including laboratories, county and state level public health departments, and additional provider and payer organizations.

Currently, the collaborative work of the HealthLink RHIO, all of which is documented on the public website cited above, is conducted through regular meetings of task forces and committees. In addition, specific projects which span multiple organizations are monitored and managed through Microsoft SharePoint and various project planning tools. These processes will be used to ensure objective, credible, timely and high quality work on the testing and demonstration of the nationwide health information network trial implementation project. The approach for accomplishing the proposed work will involve developing specific work teams related to the tasks of the project as follows:

- **Communication and Dissemination Team**—this group will support the project by participating in meetings and related activities of the NHIN, developing reports, briefings and other analysis as requested, and reporting the findings and recommendations of the project through national presentations, technical reports and peer reviewed journal articles. Additionally, ongoing communications with the NHIN Cooperative will be coordinated through the Communications and Dissemination Team. Members of this team will include Kate Cauley, PhD, Director of the Center for Healthy Communities and the HealthLink RHIO, who will serve as the team leader, and be the primary contact point with NHIN, and Mary Crimmins, MA, CPEHR, CPHIT, Project Director for the HIEx™ system, Bill Spears, PhD, Associate Professor, Boonshoft School of Medicine, Carla Clasen, RN, MPH, Evaluation Coordinator for HealthLink RHIO, and Carla Lachecki, MA, Program Manager for the Center for Healthy Communities, all from Wright State University (WSU).
- **Legal and Documentation Team**—this group will focus on refining the technical specifications and legal agreements for the production of the NHIN as well as managing the execution of the DURSA for the NHIN trial implementation (this will also involve coordination with the WSU Institutional Review Board). The team leader for this group will be Mary Crimmins, and team members will include Connie Dudley, JD, Director, Technology Transfer, Gwen Mattison, JD and Sally Clayton, BA, Office of General Counsel, Carla Clasen, and Carla Lachecki all from WSU.
- **Technical Implementation Team**—this group will work specifically with developing, testing and demonstrating the implementation of technical specifications of the NHIN to support NHIE to NHIE exchange and NHIE to other provider organization and specialty groups exchange. The team leader will be David Roberts, BS, Systems Engineer and Chief Developer of the HIEx™ system and the health information exchange, Paul Hernandez, PhD, Director, Computing and Telecommunications Services, Larry Fox, MS, Associate Director, Computing and Telecommunications Services, Salam Ahmed, BS, Programmer/Analyst, Suchita Dhawan, MS, Programmer/Analyst, and Carla Lachecki, all from WSU.

Each of the work teams identified above will meet regularly and team leaders along with the Program Manager will come together on a regular basis for project coordination. All work of the project will be documented and monitored using MicroSoft SharePoint and Project. The entire project team from HealthLink RHIO and Wright State University will be available to assist as needed with various aspects of the project.

### Key Personnel

Kate Cauley, PhD, will serve as the Principal Investigator on the project, and as team leader for the Communications and Dissemination Team. Dr. Cauley is an Associate Professor in the Boonshoft School of Medicine and School of Professional Psychology as well as the director of the Center for Healthy Communities, the unit within Wright State University which administers the HealthLink RHIO. Dr. Cauley has been working with the HIEx™ project since 2002, and serves as the director of the HealthLink RHIO. She is a member of the leadership team for the Health Information Security and Privacy Collaborative in Ohio, and serves on the Ohio Health Information Consortium Advisory Board. Dr. Cauley will dedicate a 20% level of effort to the project (416 hours), 10% of which is requested (208 hours) in the first budget period of the project.

Mary Crimmins, MA, CPHIT, CPEHR, will serve as the team leader for the Legal and Documentation Team. Ms. Crimmins is the Project Manager for the HIEx™ project and Business Manager for HealthLink RHIO. She serves as a member of the leadership team for the Health Information Security and Privacy Collaborative in Ohio, and is the Principal Investigator for a current contract with the Ohio Department of Job and Family Services developing a patient portal for the Children's Buy In Program. Ms. Crimmins has made multiple presentations about her work at state and national conferences. Ms. Crimmins will dedicate a 20% level of effort to the project (416 hours) in the first budget period of the project.

David Roberts, BS, will serve as the team leader for the Technical Implementation Team. Mr. Roberts, is the systems engineer and chief developer of the HIEx™ system and brings a wealth of experience to the area of health information exchange, data security and systems design. Mr. Roberts will dedicate a 20% level of effort to the project (416 hours) in the first budget period of the project.

Carla Lachecki, MA, will serve as the Program Manager for the project. Ms. Lachecki manages all databases for the Center for Healthy Communities, coordinating projects across multiple organizations and managing the electronic tools used to monitor project progress. Ms. Lachecki will dedicate a 10% level of effort to the project (208 hours) in the first budget period of the project.

Carla Clasen, RN, MPH, will serve as the evaluator for the project. Ms. Clasen is a faculty member in the Boonshoft School of Medicine and co-director of the Center for Healthy Communities. She provides program oversight and evaluation services for HealthLink RHIO as well as all aspects of the HIEx™ project. She also coordinates all Internal Review Board applications related to research for the work of HealthLink RHIO and the Center for Healthy Communities.

Please see Attachment 4 for a Project Plan and Timeline

2. Value to the NHIN Cooperative

The data currently available in the HIEx™ system includes information related to demographics, eligibility, services utilization and clinical information such as immunizations, medications, diagnosis, and procedures. Data are stored by household and individual. Data are available to health and human services providers who have been assigned specific role based, password protected access that determines which parts of the electronic shared community health record they can access for their clients/patients across the internet behind a VPN. All views and entries into the system are time, date and user stamped and all data are sourced. Currently, active users include thirty public school nurses, three geriatricians, two hospital systems--one using the system to document screening results for patients participating in free or low cost programs, one using the system to document uncompensated care patients--and six community health workers providing outreach and Medicaid enrollment services to health uninsured in the greater Dayton area. Negotiations are underway to include four community health centers, three additional public schools, the Ohio Department of Health, and Compunet Laboratories, as well as to coordinate clinical messaging with HealthBridge RHIO and Clark and Champaign County Health Information Exchange. To date there are over 56,000 individuals in the system. Health information exchange occurs primarily through the electronic shared community health record. HIEx™ provides a common record in a central data repository and users access the same record, adding information from the care setting where they are seeing the client/patient.

Data in the HIEx™ system is primarily from health uninsured patients. The system was designed to provide an electronic health record for people who typically receive care in multiple locations but for whom there is not payer record, documenting a comprehensive picture of care provided. Montgomery County uses data in the HIEx™ system to report the percentage of uninsured members of the community on an annual basis. The particular value of the data in HIEx™ is that the majority of the clients/patients are uninsured, and we have been able to begin to monitor and assess service utilization patterns of health uninsured in the community.

Organizations that become members of the HealthLink RHIO and HIEx™ users enter into Information Sharing and Business Associate Agreements which delineate responsibilities for insuring privacy and security of data as well as compliance with all relevant federal and state law. Each organization takes responsibility for notifying clients/patients that for purposes of treatment, payment and operations, their protected health information will be stored and accessed through HIEx™. Additionally, any use of the data in the aggregate or de-identified formats for reporting or development purposes will be encrypted and no identifying information made available without the express permission of the client/patient. In terms of sharing data with the NHIN Cooperative, HealthLink RHIO would submit a plan for the use of the de-identified, encrypted data to the Wright State University Internal Review Board, and notify organizations using HIEx™ that data resident in the system may be used in a de-identified, encrypted form for testing purposes with the NHIN project. This process has already been tested successfully, when creating the annual report for Montgomery County documenting the percentage of health uninsured in the community using data from the HIEx™ system.

### 3. Technical Approach

The Office of the National Coordinator has lead well publicized opportunities for public input and understanding of the evolving NHIN architecture and functional requirements. The objective of these discussions has been to produce a vetted set of business requirements that Regional Health Information Organizations (RHIOs) and other building blocks of the national infrastructure must meet. If all of the building blocks have all of the appropriate “wiring” the vision of a plug and play network will be achieved. The challenge with this approach is that existing sources of electronic health information are predominantly focused on payer records with ICD-9 and CPT codes, and HL-7 2.x messages exchanged inside of enterprise systems and public health. The value of these data elements to clinical applications has been questioned. However the adoption of electronic health records, personal health records and other methods for collecting clinical data are growing.

Anticipating the need for standards based exchange of health information, in 2005, the HealthLink RHIO adopted the Continuity of Care Record (CCR) as the standard that it would use in its health information exchange. The seventeen components of the CCR were vetted through the American Society for Testing and Measurement (ASTM) and were later adopted as an ANSI standard. Agreements between HL-7 and ASTM were established to harmonize the two standards. As an XML based standard with a specific messaging component added, our technical advisors recommended it as the gold standard for construction. The CCR permits interface with existing electronic health records and creation of the CCR message is included in the standards put forward by CCHIT. In order to interface with the older systems, an HL-7 translator is planned in the development cycle for the shared community health record called HIEx™ that the HealthLink RHIO has used in the greater Dayton area.

The shared community health record resides in a central data repository and can be accessed from any care setting. Data in the record are gathered in four primary ways (1) direct human input; (2) import of batch legacy data; (3) web services updates using the Continuity of Care Record messaging standard from other EHRs and PHRs; and (4) translation of HL-7 messages from providers routed by HTP Inc. into the Continuity of Care Record message standard format.

#### Privacy and Security Protection

For Mapping and Translations the HealthLink RHIO with HIEx™ uses specified standardized terminology, the Unified Medical Language System, from the National Library of Medicine that ties together all of the concepts of medicine. The primary key is to the SNOMED®CT codes as specified in the Continuity of Care Record standard. The data structure complies with the Continuity of Care Record clinical and messaging standard assuring compliance with HITSP. Data transport is done using either a Cisco VPN client, often a b2b VPN, by secure FTP or through SSL encryption. Data auditing and access control of cross organization data access is done at the server level in the central data repository through HIEx™. Security standards are enforced through data sharing agreements with all healthcare entities and regular audits of data access logs. Access to the system is done through a VPN connection and data are encrypted in the

database. Data mappings and translations from HL-7 and other standards that are not XML based is done utilizing translator services.

To provide record locator services HIEx™ supports retrieval of patient data through web services from other organizations participating in the RHIO by including a table of multiple reference numbers by system. The design includes near real time updates from systems using secure connections across and established web services interfaces. For example with Dayton Public Schools updates from their system are automated and with disambiguation routines so that only new information is updated in the record. To provide push vs. pull functionalities HealthLink RHIO with HIEx™ supports data queries by individual healthcare providers through the system (pull) and supports the routing of data (push) through web services to and from other systems.

Each health care organizational member of HealthLink RHIO using the HIEx™ application is responsible for auditing the specific provider of care requesting the retrieval as these entities control who can access the system and assign a level of role based access to each user. Within the central data repository HIEx™ maintains a full HIPAA log table as all access and data entry is recorded and sourced permitting auditing of cross organizational data access at the provider of care level. HealthLink RHIO with HIEx™ provides a report of all individuals who have viewed any patient’s record and patients can opt out or lock out any individual user from their record. Alerts to unusual usage patterns and inappropriate data retrieval can be monitored in real time. All healthcare providers certify that they are treating a patient prior to accessing any patient record. Data management routines support patient-to-provider registry and access control.

Please see Table 1 below for greater detail about health information exchange.

Table 1

Health Information Exchange Services	
Core Services	Method
<b>Data Services</b>	
<ul style="list-style-type: none"> <li>Secure data delivery, and confirmation of delivery, to EHRs, PHRs, other systems and networks</li> </ul>	Web services through b2b VPNs
<ul style="list-style-type: none"> <li>Data look - up, retrieval and data location registries</li> </ul>	Central data repository functionality in HIEx™
<ul style="list-style-type: none"> <li>Support for notification of the availability of new or updated data</li> </ul>	Triggers sent automatic e-mail notifications for the HIEx™ server
<ul style="list-style-type: none"> <li>Subject - data matching capabilities</li> </ul>	Disambiguation routines
<ul style="list-style-type: none"> <li>Summary patient record exchange                             <ul style="list-style-type: none"> <li>- Data integrity and non-repudiation</li> </ul> </li> </ul>	Healthcare provider and patient review of information through HIEx™ and the patient portal.

<ul style="list-style-type: none"> <li>- checking</li> <li>- Audit Logging and error handling for data access and exchange</li> <li>- Support for secondary use of clinical data including data provisioning and distribution of data transmission parameters</li> <li>- Data anonymization and re-identification as well as HIPAA de-identification</li> </ul>	Data anonymization is performed as needed with routines and reports through HIEx™.
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<b>Consumer Services</b>	
- Management of consumer identified locations for the storage of their personal health records	HIEx™ and the patient portal associate sources with patients
- Support of consumer information location requests and data routing to consumer identified personal health records	HIEx™ and the patient portal capture and store information
- Management of consumer-controlled providers of care and access permissions information	HIEx™ sources all information and sets permissions for role based access
- Management of consumer choices to not participate in network services	HIEx™ permissions and control of data element access
- Consumer access to audit logging and disclosure information for PHR and HIE data	HIEx™ provides reports on access through the log table
- Routing of consumer requests for data corrections	HIEx™ and the patient portal capture and store information. No information is written over and patient's requests are sourced as such.
<b>User and Subject Identity Management Services</b>	
- User identity proofing, and/or attestation of third party identity proofing for those connected through that HIE	HealthLink RHIO members and the patient registration module in HIEx™
- User authentication, and/or attestation of third party authentication for those connected through that HIE	HealthLink RHIO members through the terms of the Data Sharing Agreement
- Subject and user identity arbitration with like identities from other HIEs	HIEx™ implementation of the NPI query
- Management of user credentialing information (including medical credentials as needed to inform network roles)	HealthLink RHIO members through the terms of the Data Sharing Agreement
- Support of a HIE-level, non-redundant methodology for managed identities	Central identity management through active directory in HIEx™
<b>Management Services</b>	

- Management of available capabilities and services information for connected user organizations and other HIEs	Computing and Telecommunication Services at Wright State University for network support of HIEx™
- HIE system security including perimeter protection, system management and timely cross – HIE issue resolution	Computing and Telecommunication Services at Wright State University for network support of HIEx™
- Temporary and permanent de-authorization of direct and third party users when necessary	Network Administrators for HIEx™ manage the active directory
- Emergency access capabilities to support appropriate individual and population emergency access needs	HIEx™ is planning an emergency over -ride to be activated by public health

Business Operations:

Wright State University is a comprehensive doctoral, research institution of approximately 17,000 students and more than 2,200 faculty and staff. One of 13 state assisted universities in Ohio, Wright State offers, through its eleven colleges and schools, educational opportunities leading to more than 200 associate, pre-baccalaureate, and baccalaureate degrees, and over 50 graduate and professional degree programs including Ed.S., M.D., Psy.D. and Ph.D degrees.

In addition to the support provided by the larger university, (please see page 3 above) overall management and supervision of the project will be through the Center for Healthy Communities, (CHC) established in 1991. CHC works with partners Wright State University College of Nursing and Healthy, Schools of Medicine and Professional Psychology, Sinclair Community College Division of Allied Health Technologies, Public Health Dayton Montgomery County, Dayton Metro Housing Authority, Dayton Public Schools, citizen advocacy groups, the Greater Dayton Area Hospital Association, city, county and state government, faith based organizations, and dozens of health and human services organizations. The CHC works at the level of systems and policy change to improve the health of the community and has gained authority as a *trusted third party* with local stakeholders, a key factor in facilitating the successful health information exchange through the HealthLink RHIO. With a staff of 20 and an annual budget of \$1.6 million, the CHC manages federal and state contracts, provides direct service to community members through Community Health Workers, develops state-wide curricula for health professions colleges and schools, provides program development, evaluation and technical assistance across a six state regional area, and has been operating the only RHIO in Ohio actually exchanging clinical data since July, 2005.

Modeled on the governance structure typically used by state and national standards setting organizations, where all objections have to be satisfied before the standards can be advanced, the governance structure of HealthLink RHIO is based upon consensus. HealthLink RHIO operates with open and consensus driven meetings with new members regularly coming on board. All meeting minutes, reports, funding applications, etc. are

documented on a public website where the full history and current proceedings of the organization are available [www.med.wright.edu/healthlink/](http://www.med.wright.edu/healthlink/). This has provided full transparency regarding the work of HealthLink RHIO. Questions of quorum and voting rules are moot as consensus of all members, not just those who attend meetings, is required to move forward with issues that require full organizational review and approval. All members have veto power and that power has been exercised. There is no separate governing board, and the data system administered through HIEx™ is non-proprietary, housed in the non-profit environment of a state institution, and offered to providers using a public utility model so conflicts of interest are at a minimum. However, commercial partners providing components of HIEx™ which then become part of the package of services provided, enter into conflict of interest and intellectual property sharing agreements prior to engaging in business operations.

### Technical Operations

HealthLink RHIO provides HIEx™, **H**Health**L**ink **I**nformation **E**xchange. HIEx™, developed as a robust web based integrated health information data system that captures demographic and clinical data at point of care, and organizes the data by household and by individual in a central data repository, supporting a shared community health record, is designed as a “public information utility” using current industry standards and best practices. The timing of early project development coincided with the emergence of national standards including the Continuity of Care Record (CCR), and the HL-7 messaging standard. The only national standard for clinical health information exchange (ASTM E2369-05), the CCR is the model for the HIEx™ core data set. The purpose of the CCR is to provide accurate clinical, demographic and administrative data for a specific patient. Housing the CCR in a secure central data repository with role based access security and a full HIPAA audit trail, offers a best practice community solution for sharing individually identified health and human services data. HIEx™ uses the HL-7 messaging standard, which in combination with the web services tool facilitates interoperability with most other systems. Additionally, to provide a standard language to populate the clinical data elements specified by the CCR the National Library of Medicine’s Unified Medical Language System (UMLS) is fully imbedded into HIEx™. This permits presentation and integration of SNOMED-CT®, ICD-9 codes, RXNORM and other standards to represent the concepts that provide meaning to the language of biomedicine and health. In addition to the use of these and other national standards, the HIEx™ system operates in conjunction with relevant state and federal laws and regulations including but limited to HIPAA, and sections of the Ohio Revised Code pertaining to sharing of identifiable data with Medicaid providers and sharing of identifiable sensitive data related to specific diseases, and/or alcohol and substance abuse. Patient identification is achieved through multiple data point matching and when necessary user determination, and data integrity is monitored at both the organizational and database levels to insure accuracy of data. User authentication and access is role and password protected. Accessed through a single electronic portal available from multiple sites, health care providers can access HIEx™ through a VPN. Use of .NET and other Microsoft technologies provides a secure solution for authorized users in health and human services.

Wright State University currently hosts the HIEx™ application on SQL servers in the main server room on campus. The server room is monitored 24/7 and tape back up is automated with off site storage. Failover redundancy is designed into the server configuration. The HIEx™ application has imbedded within the system a full HIPAA log table that records any view of data including who viewed, what they saw, at what time and on what date data was accessed, and what stored procedures were accessed during any update of information. Supported by appropriate privacy notifications provided by organizational users, HIEx™ assumes an opt in choice for data in the record. However, consumers can direct any part of the record to be further protected and available only to designated providers. Additionally, consumers can request and receive a full HIPAA audit report through their provider, and a patient portal is planned. Data are never written over; they are written again. The view of the record always presents the most recent entry, and all data is sourced such that multiple users may be in a record simultaneously and see new information within milliseconds.

Standards are the lynchpin for interoperability. The development team has been working with the Health Information Management Systems Society (HIMSS) and the MS-HUG, Microsoft Healthcare Users Group. the ASTM (American Society for Testing and Measurement) E-31 Committee on Electronic Health Records, which passed the Continuity of Care Record (CCR), the only currently approved standard, and the HL-7 DSTU Community Based Care Committee.

To facilitate HIEx™ development, the Microsoft SQL® platform has been used for development tools, facilities and support that have extended the development team's knowledge base and has reduced the research and development time that might otherwise have been required to implement such a robust data system and software application.

HealthLink RHIO has been exchanging demographic and eligibility data since November of 2004, and clinical data since July, 2005. Over the past three years data from consumers accessing over thirty documented safety net organizations have been managed through HIEx™ and records currently exist for over 56,000 individuals in over 20,000 households. These records account for ten percent of the population in the service area. Data include demographics, self-report of disease states, referrals to health and human service resources, and medical data including immunizations, medications, diagnoses, allergies and procedures.