Utah Network for Electronic Public Health Information (UNIFY) Project Report and Implementation Plan

Utah Department of Health

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Executive Summary

"eHealth = Utah" as proclaimed by Utah Department of Health (UDOH) Executive Director Dr. David Sundwall summarizes Utah's enthusiasm for embracing and promoting the appropriate use of information technology to improve quality and decrease costs of public health and health care services. The UNIFY project helped Utah define what this means in more concrete and operational terms.

The InformationLinks project provided an opportunity for Utah Department of Health and local health department staff to learn about electronic exchanges of clinical health information for public health purposes, and to enter into discussions that shared perspectives, requirements and a vision. Three local health departments, Salt Lake Valley Health Department, Weber-Morgan Health Department and Tri-County Health District, representing two urban counties and four rural counties, partnered with us throughout this journey. Our project report attempts to document and summarize the information and knowledge gained throughout the experience.

The vision for the Utah Network for Electronic Public Health Information (UNIFY) project embraces many several important goals:

- To enhance the potential for more complete sharing of aggregate and individual clinical data,
- To improve timeliness of data exchange,
- To decrease the administrative burden and costs of sharing data,
- To identify significant challenges and concerns and develop strategies for addressing them, and ultimately,
- To improve public health services, quality of health care and the health and wellness of those in our communities.

This report provides a description of the project including the current national, Utah and UDOH environment and a more detailed discussion of the vision for UNIFY. It explores the rich opportunities for public health in Utah to exchange clinical data focusing on four programs: immunizations, newborn screening, notifiable disease surveillance and management, and electronic birth certificates linking with prenatal records. The report also explores the challenges and the business or mission-driven value (value proposition) associated with data exchange for each of these programs.

An implementation plan is presented that offers, at a high level, information on creating the necessary infrastructure and involvement of potential trading partners and other significant stakeholders. Operational issues are identified and debated including:

- The importance of privacy and security and methods to protect them,
- Issues relating to data ownership and stewardship,

- The need for data standards and standardized vocabularies,
- Questions related to building a centralized data repository,
- Strategies for creating a Master Patient Index (MPI) and deduplication of current databases and searching for patient records,
- Processes for exchanging data and necessary infrastructure, and
- The need for short-term and long-term approaches and solutions.

Project milestones provide objectives to guide and facilitate future implementation efforts. These objectives include:

Objective 1: Bi-directional interfaces for the Utah Statewide Immunization Information System (USIIS)

Objective 2: Unique health plan member identifiers shared through Utah Health Information Network (UHIN)

Objective 3: Vaccine order management module

Objective 4: Systems for Electronic Laboratory Results (ELR) Reporting

Objective 5: Electronic birth certificate prenatal record

Objective 6: Statewide Public Health eHealth Planning

We hope that this reports illuminates the many and complex issues surrounding the great opportunities for public health to engage in Utah's activities to share the clinical information that can be used to enhance the quality and cost-effectiveness of health care services. We believe that for many essential activities, electronic information exchanges for public health make sense and will provide a benefit both to public health programs and the populations they serve.

The report concludes by describing the momentum that has already started moving public health programs in this direction. Among these are continuing our involvement with UHIN in the development of methods for clinical data exchange, adopting necessary health information technology (HIT) legislation, creating a new UDOH Office for Public Health Informatics, exploring ways to promote the use of personal health records, and implementing recommendations developed through the work of the UNIFY-PS Privacy and Security group.

We wish to thank the Robert Wood Johnson Foundation for their vision and leadership embedded in the creation of this program, the Public Health Informatics Institute for their assistance and inspiration, the Executive Leadership Team and staff of the Utah Department of Health for supporting and participating in this project, the Local Health Officers and their staff who enthusiastically embraced the exploration of these concepts, and the many stakeholders who continuously show commitment to working with public health agencies to provide health care services and to protect and improve the health and wellness of our citizens.

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1. Project Description

1.a. Overview

The UNIFY project (Utah Network for Electronic Public Health Information), so called because of the collaboration required to achieve interoperable electronic health records, was sponsored by the Robert Wood Johnson Foundation, InformationLinks grant program, through an agreement with the Public Health Informatics Institute.

The overall goal of the project has been to contribute substantively to planning for ongoing, statewide public health participation in electronic exchange of clinical data in selected areas. The InformationLinks project has helped us assess the best candidates for public health participation.

Four applications of clinical information exchange were evaluated for the potential to benefit public health and patient care in Utah 1) disease reporting and case management, 2) newborn screening and follow-up, 3) querying the immunization registry forecast module, and 4) vital records links to the Electronic Health Record (EHR). The opportunities to inform practitioners and improve the efficiency of surveillance data reported to public health are very near the surface in these applications, so we investigated the business case for each of these applications in detail. Project findings with regard to these four areas are described in detail in Section 2. of this report, Current Public Health Opportunities. It was our intent to examine and clarify opportunities for public health clinical information exchanges in the four focus areas, to promote dialog among key stakeholders, and secure a "place at the table" for public health in the fast-moving world of health information technology in Utah.

This project report reviews key influences, initiatives, and issues relating to clinical electronic exchanges for public health in Utah. It documents perspectives of key stakeholders, and proposes milestones to achieve the identified public health information exchanges.

Methods

Utah Department of Health (UDOH) project staff planned and executed the project activities. A kick-off meeting was held in January 2006. Key informant interviews were conducted with over 30 individuals across Utah, including state and local public health staff and other clinical exchange partners and potential partners. Interviews were conducted between February and June 2006. A Web-based data entry system was implemented to record systematically the results of the key informant interviews.

Initial findings of key informant interviews identified a need to employ consulting services from an external, impartial consultant. HLN Consultants was employed in late Fall and Winter of 2006 to review Utah's immunization registry systems and issues.

The following individuals played key roles in the success of the project.

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1.b. Background and Environment

National Environment

There have been several national initiatives to encourage interoperable electronic health systems since 2000. The following reports and initiatives are some of the more relevant and influential.

Key Federal Initiatives

The 2001 report from the National Committee on Vital and Health Statistics. NHII—Information for Health.[1] National Health Information Infrastructure (NHII) is a "standards-based architectural framework to enable more seamless sharing of person-specific health information."[2]

Presidential Executive Order Creating ONC – April 27, 2004. The Office of the National Coordinator for Health Information Technology (ONC) was created and charged with development of a strategic plan that would, "guide the nationwide implementation of interoperable health information technology in both the public and private health care sectors that will reduce medical errors, improve quality, and produce greater value for health care expenditures," and advance the development of technology and standards for interoperable health information.[3]

"Framework for Strategic Action," Proposed the National Health Information Network (NHIN).[4] In July 2004, the Office of the National Coordinator for Health Information Technology (ONC) published the Framework for Strategic Action. The stated objectives of the

Framework were to accelerate the use of EHRs, interconnect clinicians, provide better information for consumers, and improve public health surveillance.

American Health Information Community (AHIC). The AHIC is a federal advisory body, chartered in 2005 to, "accelerate the development and adoption of health information technology," and "help advance efforts to achieve President Bush's goal for most Americans to have access to secure electronic health records by 2014."[5] While the AHIC addresses primarily the private healthcare industry, the group's activities have the potential to influence standards for healthcare data exchange, and public health operations.

Public Health Information Network (PHIN). PHIN is the Centers for Disease Control and Prevention (CDC)'s initiative for advancing interoperability of public health information systems across local, state, and national government entities and the organizations that work with them. PHIN is addressing a variety of functional needs in public health. "PHIN targets the support and integration of systems for disease surveillance, national health status indicators, data analysis, public health decision support, information resources and knowledge management, alerting and communications and the management of public health response."[6] PHIN standards are also intended to facilitate integration with efforts to exchange health information with clinical care providers to help create a national health information infrastructure (NHII).

State Alliance for eHealth. The National Governors' Association, Center for Best Practices created the State Alliance for e-Health to improve collaborative among states to, "…increase the efficiency and effectiveness of the health information technology (HIT) initiatives they develop."[7] Utah's Department of Health Executive Director, Dr. David N. Sundwall, was appointed as an advisory member of the Alliance.

Other National Initiatives.

The Markle Foundation's Connecting for Health[8] project addresses policy and technical challenges to connectivity in health care, including correctly matching patients with their records, patient privacy, and data standards for electronic healthcare records. The Markle Foundation is a private philanthropic organization committed to improving health and health care and advancing technical and communications innovations toward that end.

The Public Health Informatics Institute (PHII)'s, Public Health Opportunities in Health Information Exchange: A resource for public health agencies and their health information exchange partners identified key ways in which health information interoperability could facilitate reporting to public health. "The most obvious immediate benefit … to public health lies in improving mandated public health reporting." [9] (p. 8) The PHII identified a number of public health reporting systems that would be improved by better electronic information system interoperability, including the following.

- Notifiable disease reporting
- Electronic birth and death certificate data
- Immunization records
- Newborn screening data
- Public health registries (e.g., birth defects, cancer, injury, etc.)

The Utah Environment

Utah, an eHealth Pioneer

Industry leader 3M Health Information Systems was established in Salt Lake City in 1983. Intermountain Healthcare pioneered the use of computerized patient records in hospitals and the EMR in clinical practice. Utah has long been a leader in biomedical informatics research since the founding of the Department of Medical Informatics in 1972 at the University of Utah.

Public/private eHealth Partnerships

Data standards are the key infrastructure for computerizing health information. In sustaining the Utah Health Information Network (UHIN), Utah has provided the business model for the nation in public/private collaboration to achieve consensus standards that permit free-flowing commerce in electronic health information.

Market Leadership in Health Information Technology

Utah is committed to staying on the leading edge of Health Information Technology (HIT) development, both in public health and the Utah health care industry. HIT initiatives have enabled Utah companies to provide efficient, low-cost health care. Our public/private partnerships bring federal and foundation resources into the state that help seed future improvements in HIT.

Utah Center for Excellence in Public Health Informatics (CoE-PHI)

This Center was established in 2006 at the University of Utah supported by a three-year CDC grant submitted jointly by researchers at the University of Utah Department of Biomedical Informatics, Intermountain Healthcare and UDOH staff. An organization chart for the project is attached to this report (Attachment 1). Collaborative projects funded through the Center include:

- Real-time clinical electronic notifiable disease reporting (RT-CEND).
- Using linked data to enhance public health analysis and practice regarding fatal adverse events due to prescription narcotics.
- Improved accuracy of probabilistic record linkage and deduplication for patient immunization records in the statewide registry (USIIS).
- Improved decision making for communicable disease surveillance and management through scenarios, data visualization tools and event simulation.
- Electronic communication between public health and clinical providers: Development and evaluation of a web portal

Diffusion of Electronic Medical Records (EMR)

A critical success factor for many HIT initiatives is widespread adoption of EMR use by physicians, currently estimated to be about 25% in Utah, with higher rates among primary care providers. Though not a budgeted UDOH program, we actively support a variety of EMR diffusion activities in the community, including:

- Utah Digital Health Services Commission (UDHSC) educational activities.

- Utah Medicaid has applied for two CMS transformation grants, one of which is to introduce EMR's in long-term-care settings.
- Other initiatives include HealthInsight's DOQ-IT project to encourage EMRs and pay for performance, and a joint project between HealthInsight and the Utah Medical Association to increase provider awareness of nationally certified EMR vendor systems.

Utah Department of Health

RHIO Expansion: State and Regional Demonstrations of Health Information Exchange (HIE).

The U.S. Department of Health and Human Services, Agency for Healthcare Research and Quality (AHRQ), awarded contracts to Utah and five other states to facilitate clinical health information exchanges. This funding is enabling UHIN to leverage its systems for the exchange of claims data to also support the exchange of clinical data. Pilot projects are underway for the exchange of:

- Discharge summaries between hospitals and physicians.
- History and physical between physicians and hospitals.
- Laboratory results between labs and physicians.
- Medication histories among health plans, physicians, pharmacies and hospitals.

Utah Digital Health Services Commission (UDHSC)

In 2004, the Utah legislature changed the name of the Utah Telehealth Commission to the Digital Health Services Commission (Utah code, Title 26-9f-103) and broadened its duties and responsibilities to include encouragement of electronic medical records among rural providers.

Health Information Security and Privacy (HISPC)

Utah is participating in a National Governors Association privacy and security collaboration, sponsored by AHRQ and contracted through Research Triangle Institute, to ensure that electronic exchange of health information occurs under uniform security and privacy practices. Internally called the UNIFY Privacy and Security (UNIFY-PS) project, UDOH is collaborating with HealthInsight, UHIN, and the Utah Digital Health Services Commission (UDHSC) to review statewide clinical practices on key privacy and security issues, conduct a legal review of these practices, and develop solutions to security and privacy problems associated with electronic information exchange.

Utah Medicaid Contributions to Utah's eHealth Capacity

The Utah Medicaid program was among the founders of UHIN in the early 1990's. Medicaid processes electronic claims from health care providers and supports eight other HIPAA standard electronic transactions, making the program a national leader in electronic data interchange. Other Medicaid support for eHealth includes:

- All Medicaid providers are USIIS users, and Medicaid funds support and maintenance of the USIIS software.

- Medicaid data links with public health data through inclusion of the vital records in the Medicaid Data Warehouse.
- Medicaid data go in the statewide health plan pharmacy database.
- Medicaid has also applied for a Transformation Grant proposal for an electronic surveillance system for pharmacotherapy risk management.

In sum, UDOH promotes "eHealth=Utah" to support Utah's HIT innovations, to sustain statewide private/public partnerships, and to facilitate Utah's market leadership in health.

Centralization of Technology Services in Utah State Government

The Department of Technology Services (DTS) was established when the Information Technology Governance Act (House Bill 109) was passed during the 2005 state legislative session. HB109 centralized all information technology services in Utah state government. The change has caused considerable upheaval in IT functioning, including the transfer of all IT staff from their former positions to new positions in DTS. Some argue that, while the consolidation of networking and helpdesk functions would likely save money and improve customer service, centralizing application development and IT project planning serves primarily to weaken decision-making authority of the public health program manager/business manager, and that the transfer to DTS of accountability for information technology projects in state agencies has led to overall lack of accountability and poor assurance for continued funding, especially during the transition.

The managers of public health programs have traditionally, and will continue to provide leadership for development of new surveillance and other public health information systems. Examples of public health information systems include Utah's Statewide Immunization Information System (USIIS), Utah's Indicator-Based Information System for Public Health (IBIS-PH), and Utah's instance of the National Electronic Disease Surveillance System (UT-NEDSS). It is the public health program staff and managers whose decision making is supported by information from these systems, however it is the information technology staff who now work for DTS who will program and support the information systems.

As the following excerpt from the DTS Strategic Plan[10 (p. 13)] demonstrates, HB109 was

> Excerpt from State of Utah Department of Technology Services Strategic Plan
>
> - Coordinate an executive branch strategic plan for all agencies
> - Identify best practices from agencies and other public and private sector entities
> - Develop and implement processes to replicate IT best practices and standards throughout the executive branch
> - Oversee the expanded use and implementation of project and contract management principles as they relate to IT projects within the executive branch
> - Serve as general contractor between the state's IT users and private sector providers of IT products and services

vague in its application, and leaves room for interpretation. Two years after passage of HB109,

state agencies such as the UDOH still struggle to ensure that public health information systems needs are met, and to define precisely how they will be met.

Public health informatics is the, "systematic application of information and computer science and technology to public health practice, research, and learning."[11] Now that former UDOH technical staff report to a separate organization, the informatics role of public health managers is even more critical. Vision, resources, priorities, contracts and expectations, and oversight of information systems development will require that public health managers have sufficient understanding of the technical side of the activities to hold DTS accountable for fulfilling its technical support role. Utah is currently trying to adapt to the new, centralized structure.

1.c. Vision for Utah Public Health Systems

Utah's vision for public health information systems is best summed up by Dr. David N. Sundwall's statement, "eHealth = Utah." But, what does that mean for Utah? What does it mean for public health and its supporting information systems?

We define eHealth as "the use of emerging information and communications technology . . . to improve or enable health and healthcare."[12] It is an emerging field of medical informatics that refers to the organization and delivery of health services and information. It uses the Internet and related technologies, and characterizes not only a technical development, but also a new way of working; an attitude and a commitment for networked, global thinking that is expected to improve health care locally, regionally and worldwide.[13]

Thus, Utah's vision is for the state to provide national leadership in this arena, and for the Utah Department of Health to facilitate Utah's leadership position. This vision, while lofty, in the long run means linked or integrated information systems that provide accurate, understandable information to support public health and health care services where needed and when needed in a secure and reliable manner.

Public health, in Utah and across the nation, needs to take a leadership role in eHealth. We need to be not only a passive recipient of secondary data, but an active participant in helping fund, build and support the required technology and infrastructure, data exchange capabilities, relationships, policies and trained staff required to make eHealth a reality. Public health agencies should establish partnerships in the private health care industry with regard to the development of data standards and the protection of confidential patient information. We have demonstrated such leadership in limited programs such as electronic birth records, outbreak detection and registries for immunizations and birth defects.

Public health leaders, program managers, and data stewards must understand their current and future roles in the bigger Health IT arena as active producers, collectors, and users of clinical data and therefore as primary trading partners, not merely secondary data recipients. Examples of such clinical data produced by public health programs include records associated with child and adult immunizations, WIC nutrition counseling, HIV/AIDS and cancer screening, TB intervention and treatment, smoking cessation classes, healthy heart and other chronic disease prevention programs, prenatal care and services to children with special health care needs, to list only a few. Much of this information would be very useful to primary care providers, emergency departments, long term care facilities or home health services.

The vision of eHealth = Utah would be a smooth and transparent exchange of information between agencies such as clinics, labs, hospitals and public health agencies who routinely exchange health care data. Such a system would facilitate prompt exchange of information to detect a bioterrorism event, respond more effectively to a natural disaster, identify and manage a restaurant-based food-borne *E. coli* outbreak, or a cooling tower associated legionella outbreak. (You could substitute any number of illnesses.) The detection and response to outbreaks of Hepatitis B, norovirus, RSV, rotovirus, or salmonella, could all be supported by an easy and transparent exchange of health care data among health care services and public health agencies.

In addition, public health has a special responsibility to assure the protection and confidentiality of personal health data by advocating for the adoption of appropriate legislative mandates and agency policies. The general public relies on public health to protect their interests in health and health care. Many do not understand how electronic health information systems work. We all worry about our private information falling into the wrong hands and thus becoming subject to employment discrimination, cancellation of insurance policies, and possibly even being denied financial credit.

Public health also needs to continue leading the way in using health care data to better understand health care access and quality issues, and to encourage the improvement of patient safety. Continued development of information systems and system integration should help provide better information and better tools for these purposes.

On a shorter timeframe and closer to home for public health agencies, eHealth will also decrease and eventually eliminate duplicate data collection and data entry, providing an ability to share demographic and clinical data across public health programs. With proper authorization it will enable us to carry out program mandates in a manner that better utilizes providers' time and tax payers dollars.

2. Current Public Health Opportunities

2.a. Immunization Registry: Utah Statewide Immunization Information System (USIIS)

Description of Opportunity

The Utah Statewide Immunization Information System was one of the pioneer immunization registries in the United States. It began on software developed by a federal contractor (NISE West) and provided by CDC to the states in 1994. Initially, USIIS simply consolidated childhood immunization records, accepting batch loads from most of Utah's 12 local health departments (LHD) immunization clinics, and providing LHDs the capability to look-up immunization records and forecast needed vaccinations for individual children. Utah's WIC system at that time included an immunization tracking module, so during the mid 1990's Utah Department of Health software developers built what was known as the "WIC Bridge," which linked WIC and USIIS, updating immunization records back and forth between the two systems.

The development of a Web-based USIIS interface in the late 90's (initially called "WebKids") constituted a major change of focus for USIIS both in architecture and the user base. The USIIS interface is a fully functional, Web-based immunization tracking system primarily oriented to direct provider entry of immunizations. The USIIS interface was the first Web-based public health registry put into production in Utah, the first public health application in Utah to really take advantage of the Internet connectivity emerging in the private provider community. Utah health plans saw the promise of improved accounting for member immunization rates through use of consolidated immunization records, and the Department of Health was able forge a public-private partnership for the financial support of USIIS. Intermountain Healthcare clinics, the largest health plan in Utah, already used an electronic medical recorded (EMR) that was in need of immunization tracking capability, so IHC became a primary user of USIIS and the Web-based interface, which was engineered to fit more or less seamlessly into the EMR used in IHC clinics.

USIIS has achieved for Utah health plans much of the success it promised. All the partner health plans have improved their Health plan Employer Data and Information Set (HEDIS) measures of adequate immunization, and time studies have shown productivity gains at the clinic level from the use of the USIIS Web-based interface over manual charting of immunizations. The penetration into the private provider sector that USIIS has achieved over the last ten years (about 30 % of private provider sites in Utah) has been exemplary, though not unique, among American immunization registries. There is some belief, however, that USIIS is approaching the limit of provider utilization possible under it's current focus. Reasons for this include:

- Local health departments, where about one-half of childhood vaccinations in Utah are administered, all share data with USIIS, but actually use the system very little. There are no LHD clinics that enter data directly into The USIIS Web-based interface. The LHD clinics send data batch one-way to USIIS and have look-up capability into the database

using the USIIS Web-based interface. Many records submitted in batch submissions end up in suspense files because of poor matching with existing children, and so look-up use of the USIIS Web-based interface provides unreliable immunization forecasting. Many LHD providers do not find USIIS to be useful overall.

- Opportunities for USIIS to expand utilization among non-IHC providers is increasingly thwarted by the adoption of electronic systems that already record immunizations for clinical and billing purposes. Providers have no interest in entering immunizations into their own systems in addition to the USIIS Web-based interface.
- Some large providers, such as the University of Utah Clinics have full EMR capability, including the ability to transmit HL7 messages. These users are requesting interoperability and electronic messaging with USIIS rather than The USIIS Web-based interface access.
- Health Information Technology continues to evolve at Intermountain Healthcare, including a planned migration over a five year period to a new EMR co-developed by Intermountain and GE Healthcare. The manner of integration of the new technology platform and USIIS is still an open question, but simple integration with the existing, somewhat dated The USIIS Web-based interface seems highly unlikely.

For all these reasons, the opportunities to sign up users of a USIIS immunization tracking application will decline in the future, while the demand for interoperability between key USIIS functions and both public and private immunization providers will increase.

Recommendations of HLN Consulting

The Utah Department of Health contracted with nationally recognized immunization registry consultants, HLN Consulting, in late 2006 to conduct a program evaluation and make strategic recommendations for the future development of the immunization registry in Utah. HLN conducted a thorough review of organizational, technical and environmental factors affecting the success of USIIS and provided over 100 recommendations for improvements to the registry and its administration. Key recommendations that would enhance USIIS' ability to participate in clinical exchanges include:

- Utah should work aggressively to enable bi-directional data transfer between key data partners, including IHC, local health departments using either KIPHS or CDP software, and others. Emphasis should be placed on standards-based, HL7 data exchange, but not to the exclusion of other techniques (such as ASCII file transfer) should they be necessary. At any rate, a *limited* number of techniques should be supported.
- As part of strategic planning, the Utah Immunization Program (UIP) and USIIS staff should determine the feasibility of developing a Vaccine Order Management module, to enhance current inventory and vaccine accountability features, for all Vaccine for Children (VFC) providers to be able to place vaccine orders through USIIS and for the UIP to monitor and track vaccine distribution.
- Priority should be placed on implementing the Orion Rhapsody HL7 Gateway with help from the Utah Department of Technology Services. This should replace any custom HL7 messaging connections currently in place.

- Initiate contact with the Office of Primary Care and Rural Health and the Utah Telehealth Network to explore a possible partnership to enhance registry recruitment, participation, and technical readiness in rural and frontier areas.
- Develop and implement strategies to partner more effectively with the local health departments. The Public Health Services Delivery Planning process[14] is a start. It is recommended that the local health departments become priority partners and customers.
- Collect data on electronic systems schools use to track immunization data. Interfaces may play a key role here in the future or, alternatively, schools may elect to use the registry as their primary system for immunizations.

Value Proposition

Based on the assessments of HLN and of the UNIFY project staff of the opportunities for USIIS to participate more effectively in the exchange of clinical information, the USIIS program is due for a course correction. While some challenging strategic planning is necessary for the USIIS program at the program level and across the Department, from the point of view of the top of the Utah Department of Health, these should be the mandate for the new direction for USIIS.

Bi-directional Interfaces With Local Health Department Systems

The UNIFY project provided a new opportunity for dialogue among the State and local health departments about immunization coordination. Discussions that were opened under UNIFY were continued through the Public Health Service Delivery Plan Initiative. From these discussions, we feel that there is value for the state, LHDs and the health information technology suppliers for LHDs in developing bi-directional interfaces between USIIS and the local systems. Options for these interfaces include data sharing using HL7 based messages, custom interfaces along the lines of the WIC Bridge, and local queries of the USIIS forecast module. UDOH staff should explore the feasibility of each of these approaches with the technology vendors that currently support the local systems. If the more desirable approach of HL7 integration is not feasible, the number of additional custom interfaces will be small, so the individual interface approach should be evaluated as well.

Implementation of HL7 Interfaces with Private Provider EMR's

During the period of this review USIIS staff have proceeded with development work on data exchange using the HL7 Version 2.3 standard with several clinics and we feel implementation of these exchanges should be among the highest priorities of the program. These exchanges will serve as templates for HL7 integration with other providers and serve to move the community in this direction, an approach which holds higher value for providers than use of the USIIS Web-based interface.

Unique UHIN Member Identifier

The UNIFY-PS project, Utah's implementation of the National Governors Association (NGA) sponsored Health Information Privacy and Security Collaboration, has proposed that UHIN work with health plans to uniquely enumerate all the members of health plans that submit claims through their system. This would require the cooperation of health plans, but is something they are interested in as well. The proposal was favorably received by the UHIN Board and

assigned to a technical committee to determine feasibility. While the enumeration would not cover 100% of immunization clients, it would create a master patient index (MPI) of enormous value to the immunization registry.

EMR Query of the USIIS Forecast.

Automated query of the USIIS forecast module through EMRs was one of the proposals we wanted to evaluate through UNIFY, and we did interview providers and technologists regarding the value of this approach. While people (including the HLN consultants) agreed that this concept could have great value eventually, implementation seems remote at this time. The providers with EMRs that currently want to integrate with USIIS want bi-directional data exchange, not just query ability.

2.b. Newborn Screening and Follow-up

Description of Opportunity

Child Health Advanced Records Management (CHARM) is a data integration effort within UDOH that links child health information from several programs.[15] Those programs include:

- Vital Records (birth and death certificates),
- USIIS (Utah's immunization information system), and
- Newborn Hearing Screening and Baby Watch/Early Intervention.

Plans are underway to include, in addition, the Newborn Screening (heelstick) program and the Birth Defects Network. CHARM provides access to information that is stored in specific program databases to track and monitor child health status, such as screening results, immunization status, referrals, assessment, treatment and outcomes for children and their families.

CHARM acts as an electronic broker (middle-ware). It does not have a central data repository nor does it replace existing UDOH databases. The participating programs are fitted with their own front-end "agent" that interfaces with the CHARM infrastructure.

CHARM is taking a modular approach to integrating systems, beginning with a core of programs and leveraging funding and incremental successes to achieve a long-term vision for a statewide integrated system. CHARM is primarily a public health resource that allows sharing of information among public health clinical programs for children. However, it could presumably provide information to additional providers who are serving the same children.

With CHARM, health-care providers and programs can be alerted about a child's medical needs and provide information to assist in the provision of appropriate follow-up and treatment in a more timely manner than ever technically possible before. Only authorized and authenticated health-care professionals will have access to a child's health information.

Value Proposition

The intended benefits of CHARM include: [16]

- Reducing the fragmentation of data and health care services.
- Advancing health care providers knowledge about children with health, developmental, and genetic conditions.
- Improving services to children and families by providing complete information to the medical home.
- Reducing or avoiding redundant data entry.
- Increasing accountability .
- Saving time – health providers no longer need to track down a child's health information from multiple sources.
- Ensuring the timely sharing of critical data with the medical home.
- Enabling coordinated service delivery.
- Enabling stakeholders to make better public health policy decisions.
- Ensuring the security and confidentiality of medical information.
- Enhancing the overall effectiveness of child health care services in Utah.

There are additional benefits to families and children. These include:

- Linking together data and health care services so that important health information about a child is accessible for use.
- Helping parents and public health workers know what services their child has had or still needs.
- Improving follow-up health care for a child.
- Making sure that a child's health information is complete and up-to-date.
- Ensuring continued security of health information.

2.c. Notifiable Disease Surveillance, Reporting and Case Management

Description of Opportunity

Staff in Utah's Bureau of Epidemiology have been working to implement an instance of the National Electronic Disease Surveillance System (NEDSS) in Utah. Realizing that implementation will move Utah toward electronic clinical exchange of notifiable disease information. In our experience and discussions with staff, we believed that a good description of the notifiable disease information exchange business process would be of value. In this section, we have taken the opportunity to describe disease reporting in some detail.

Definitions

Epidemiology. The study of the distribution and determinants of health-related states or events in specified populations, and the application of this study to the control of health problems.[17]

Surveillance. Public health surveillance is the ongoing systematic collection, analysis, and interpretation of epidemiologic data for use in planning, implementation, and evaluation of public health practice.[18]

Current Workflow

It is difficult to describe a "typical" data flow for communicable disease reporting. The flow of information, the actors and activities involved and the information itself, are all dependent on the suspected disease and the actions required of public health in reaction to the specific situation, including the implied risk to the public, mode of disease transmission, and so forth. For most notifiable diseases, state law requires reporting of individual incidents, whereas for others such as Vancomycin-Resistant *Enterococcus* (VRE) infection and methicillin-resistant *Staphylococcus aureus* (MRSA), summary information is batch reported to the state health department monthly by healthcare facilities and labs as only a count of cases.

Morbidity Report

This "Morbidity Report" section is a general description of the data flow for a report of a single case of a communicable disease. It contains with little or no reference to the countless variations and exceptions that occur on a regular basis. As such, this general description is an oversimplification, but serves to provide a basic overview of the public health epidemiology process.

For many cases, the event that triggers the public health response is receipt of a morbidity report by a local or state public health department, often by phone or fax. When complete, the following information is provided on the morbidity report:[19]

- Patient's name
- Patient's address
- Patient's phone number
- Patient's age or date of birth
- Patient's sex
- The diagnosed or laboratory confirmed disease or injury
- Date of onset for disease or date injury occurred
- Event reporter's name
- Event reporter's phone number
- The laboratory results if available and the laboratory that is processing clinical specimens for this case
- All other information requested by the health department employee taking the report

Event reporters include laboratories, hospital infection control practitioners (ICPs), schools, clinics, doctors, hospitals, day care centers, nursing homes, home health care agencies, blood banks and others. Many of these entities are required by Utah code and rule to report certain diseases and conditions to a state or local health department.[20] The morbidity reports come in by fax, courier, standard mail, Email, phone or other means. A generic morbidity report form[21] is attached (Attachment 2).

Once the morbidity report has been received by either the local or state health department, an initial assessment is made regarding 1) the urgency of public health response (event prioritization), and 2) the appropriate jurisdiction for further case investigation, processing and follow-up treatment. Cases that require urgent public health response are those that pose an immediate health threat to the patient or the public, and for which a public health intervention is deemed effective. Such cases include measles, meningitis, rabies, potential acts of bioterrorism, and cases in which a patient is at substantial risk of death or disability.

At the state level, all cases are assigned to a Responsible State Epidemiologist (RSE) in the UDOH. The RSE is charged with ensuring that complete and accurate information is reported to the CDC, and may also provide technical assistance to local health departments, providers and others. UDOH RSEs are organized into approximately 10 specialties, such as zoonotic or vector borne diseases, vaccine-preventable diseases, enteric diseases, hospital infection control, sexually transmitted diseases, HIV/AIDS, tuberculosis, and other bacterial diseases. The RSEs have several years of practical experience in public health disease response and control, either at the state or local health department level. Some have specific laboratory or clinical training and experience as well.

At the first notification of a case to UDOH, initial case report data (the information from the morbidity report) is entered into the UDOH disease-reporting database by a surveillance system event recorder. Disease reporting databases include the following:

- National Electronic Telecommunications System for Reporting (NETSS)
- HIV/AIDS Reporting System (HARS)
- Tuberculosis Information Management System (TIMS)
- Sexually-Transmitted Disease Management Information System (STD-MIS)

Initial case report data are shared back and forth between the state and the relevant local health department(s), usually by faxing information to the agency that did not receive the original report. The case is then assigned an RSE in the UDOH. The Responsible State Epidemiologist is charged with ensuring that complete and accurate information is reported to the CDC, and may also provide technical assistance to providers and others.

At the local health department, the responsible local epidemiologist (or public health nurse) is responsible for conducting the case work-up, or investigation. Case investigation forms for 72 diseases appear on the UDOH Website.[22] Investigation consists of collection of additional demographic and epidemiologic information from the hospital ICP, school nurse, patient, his or her doctor, and/or other sources in the local community. The case investigation information is used to evaluate disease risk factors as well as exposure and risk to the community, and to determine appropriate intervention (treatment and disease control) measures. The responsible local epidemiologist will also assign a case status (confirmed, probable, suspect, or not a case).

The case investigation information is entered into a disease reporting database system at the local health department. Each local health department has local instances of each of the disease-reporting databases, listed above. Once the investigation is complete, the local health department will typically print the case investigation data (a completed form that looks similar to the data entry screen), and then hand-deliver, fax, or mail a hardcopy to the UDOH. Some local health departments send batches of case investigation information as an Email attachment.

A UDOH event recorder enters the case investigation data from the local health department into the UDOH instance of the disease reporting database and refers the case to the appropriate Responsible State Epidemiologist. The RSE will review the case investigation information, including the laboratory and clinical findings. He or she will manually match up the case investigation information with the laboratory report (if there is one), and look for any additional laboratory results that may have been received. He or she will review all the information to ensure completeness and to decide whether the appropriate case status (confirmed, probable, suspect, or not a case) has been applied.

The disease investigation process is complete when the following information is obtained and confirmed:

- Lab results
- Morbidity report data
- Case investigation form data

The UDOH sends a notifiable disease data file to the CDC weekly. The file is created by analytic programs in *EpiInfo*, written by the CDC. The programs create a variety of tables, such as case counts by week, by county, and by disease status.

Generally, interventions for an individual case are referred to a case manager (usually a local health department public health nurse). If it appears as though the case is part of an outbreak or disease cluster, it is usually referred to the responsible local epidemiologist to assist with outbreak investigation and containment. These processes (outbreak investigation and containment) require data systems that go beyond the functionality of the disease reporting database. The disease reporting system functions to collect basic surveillance data elements, but does not have the ability to capture specific risk factor or other information necessary for an outbreak investigation.

In any instance of disease case, cluster, or outbreak investigation or intervention, epidemiologists from the state and/or CDC may be invited to provide assistance, including technical expertise and/or staff resources to assist local health departments. In rare instances, in high-risk or multi-jurisdictional situations, UDOH and CDC epidemiologists may intervene without invitation.

Coordination of activities with other (non-public health) agencies is common. For instance, vector-borne diseases (West Nile virus or plague) and food-borne diseases require coordination with the Utah Department of Agriculture. Influenza reporting involves coordination with the schools. Suspicion of certain diseases or exposures, especially those associated with bioterrorism, such as anthrax, require coordination with law enforcement (including the Federal Bureau of Investigation), the Health Alert Network (HAN), the state public health laboratory, and the media.

Laboratory Periodic Batch Submissions

While receipt of a morbidity report is perhaps the archetypal disease reporting scenario, the vast majority of disease reports actually derive from batch submissions of positive laboratory test results, primarily from commercial laboratories, but also from the state public health laboratory. Laboratories report to the UDOH Bureau of Epidemiology or a local health department the instances in which a specimen (e.g., blood, spinal fluid, or sputum) tests positive for an infectious agent indicative of the presence of a notifiable disease.

The following is general description of the laboratory report submission process. It should be noted that many deviations occur, depending on the specific disease and other aspects of the situation. The state public health laboratory sends batch information daily as text files via state Email. Commercial laboratories, including ARUP, Quest, and LabCorps, use a variety of methods to transmit the information, usually weekly. Methods include posting them to a secure Web page, fax, ordinary mail, courier and phone. Lab results may also be received from physicians, hospitals or other community sources. UDOH Epidemiology staff receive the results and review and prioritize them. All cases are entered into the disease reporting database and referred to the Responsible State Epidemiologist for follow-up and to share with the LHD, or, in the case of low-priority events, are simply entered into the database by the surveillance system event recorder.

Special Considerations for Laboratory Results Reporting

Partial Identifying Information. The batch information typically comes directly to the UDOH, with LHD notification accomplished after receipt of the lab reports. A typical lab result contains only partial case information, and not all the information that one finds on a complete morbidity report. An individual patient can often not be identified with certainty. Phone calls and other data collection activities must be performed by the RSE, other staff in the UDOH Bureau of Epidemiology, or local health department staff. This sometimes necessitates entry of the case into the disease reporting database before there is sufficient information to link it to an existing individual in the database, or to establish minimum information needed to begin an investigation.

Not a Diagnosis. A positive laboratory result is not necessarily a disease diagnosis. Laboratory tests are performed for a variety of reasons, including confirmation of a previous result, to rule out a competing diagnosis, and others. A diagnosis may only be made by a health care provider who has access to an individual's medical record and history, in addition to the lab result. However, the laboratories report positive findings to the UDOH when they believe they do indicate a case of a notifiable disease. The laboratories feel obligated (by law) to report the notifiable disease, while they also know that they do not have all the information they need to define it as a "case."

Not Machine Readable. Laboratory results for notifiable diseases are typically not provided in uniform, coded, standardized reports. There currently is not a complete "crosswalk" between laboratory test results and the notifiable diseases they signify. Laboratory staff must remember which tests might indicate a notifiable disease. The notifiable disease information is often not standard coded data, but narrative text in a "miscellaneous" text field from the laboratory data system. Text requires manual handling and interpretation by staff in the UDOH Bureau of Epidemiology.

Some reporting systems, for instance, Indianapolis, Indiana and Intermountain Health Care (IHC) in Utah have developed business logic that identifies and codes laboratory results from electronic medical records for notifiable disease reporting purposes. The logic is complex. The maintenance of the logic is hampered by the rapid development of new laboratory tests, and the lack of standardization of test result metrics (e.g., one company's positive result score might equal 3.3 or higher, while another's might instead be 1500 or higher for the same test).

Local Health Department Perspective

Exchange System Goals & Vision

Vision. The long term vision for local health department disease surveillance systems to exchange health data among trading partners would be the efficient, secure and interoperable exchange of relevant standardized, coded and semantically interoperable data. These data would be able to be shared between and among local health departments and state health departments, and with physicians, clinics, hospitals, and other health care facilities and providers where cases may be identified such as long term care facilities and home health care agencies. This would also include laboratories and pharmacies. In addition schools and day care centers would be able to provide and receive data as needed to help report cases and identify and manage outbreaks.

Goals for the exchange of disease surveillance for local health departments are not unlike those for other public health systems.

Nature of the Exchanges. Much of the time and effort expended to report and follow up to acquire additional data by telephone, fax, Email and mail could be replaced through electronic data exchange systems. In addition, decision support could be built in to electronic medical record systems and communicable disease databases to assist health care staff and public health staff in identifying and managing cases and outbreaks.

Since much of the health care that is provided in Utah is supported by electronic medical records, much of the information needed for reportable disease management is already in an electronic format. Much of the demographic and medical data required for reportable disease epidemiology could conceivably be reported electronically if such communications systems were developed. This could save time both for local health department staff and for those reporting. In addition, electronic reporting systems may even help identify and report cases sooner, possibly decreasing risks to the individuals who have the illness and to those who may become exposed.

Furthermore, the number of times reported information is entered into public health systems at the state and local levels could be reduced if data could be exchanged in a more interoperable manner.

Requirements

Requirements (Must Do). The system would need to be secure and protect confidential medical information. It would need to make reporting and managing cases more efficient, not more difficult. Information must be able to be shared across local and state jurisdictions as needed. All the information for case reporting, investigation and case management must be able to be entered and retrieved as needed.

In addition to facilitating surveillance and case or outbreak management, in the long run, a local public health disease surveillance system should be able to provide geo-spatial

information and other decision support to help identify the source of an outbreak and target intervention strategies. It should also be able to assist epidemiologists in easily identifying the immunization status of individuals who have been identified as having or possibly having a vaccine preventable disease and the immunization status of those who may have been exposed. In the case of food borne illnesses, the system should be able to provide restaurant and other facility inspection information that could be used to identify additional individuals for follow up and provide data for difficult decisions like employee case management or facility closure.

Requirements (Must Not Do). Electronic reporting must not increase the burden of reporting on health care providers and it must not increase the time required by local health department staff to conduct investigations and report the information on to the State. The system must not erode the confidence that the public has in the health department's ability to protect their health and their sensitive and confidential health care information.

Value Proposition

Because of the large volume of information required for notifiable disease management, the greatest value for electronic exchange of communicable disease information likely exists for the periodic batch submissions from laboratories or another means of daily electronic reporting.

Ideally, the UDOH would receive daily submissions from laboratories that provided the following information in coded HL7 transmissions:

- Patient's name
- Patient demographic identifying information (where available)
- Ordering physician
- Identification of the disease that is implied by the lab result
- Quantified lab result according to a standard metric

Additional value will be created by having a centralized information system that would allow access by both local and state epidemiologists. The UDOH had contracted with a local developer to develop Utah's implementation of the National Electronic Disease Surveillance System (UT NEDSS), using the logical data model produced by the CDC.[23] Although the system had promising features and functions, it was foiled by some major limitations, including the CDC's logical data model, itself (it was very difficult to extract the highly normalized data from the database in a meaningful form), and failings of the vendor to deploy the system successfully in the UDOH. The UDOH Bureau of Epidemiology is currently looking to purchase an existing NEDSS system, and plans to pilot electronic laboratory exchanges in 2007 with selected laboratories serving Utah.

2.d. Electronic Birth Certificate and Prenatal Record

Description of Opportunity

The Utah birth certificate has been a purely electronic record since 1999 when paper birth certificates were discontinued as source documents for the registration of births. Certified copies of birth certificates since that time have been issued as abstracts, essentially print-outs of key

facts of birth from the official electronic record. Legal, as well as perinatal health information are maintained in a single birth registry database.

Birth registration is an electronic process, however, only from the point of view of the health department. The process of assembling the birth record in the hospital involves abstraction of a variety of paper records and is fairly un-standard across, and even within some Utah hospitals. The Office of Vital Records and statistics provides three worksheets to facilitate a uniform collection of prenatal, parent, and newborn information. All parents fill out the same worksheet statewide, but many prenatal and newborn care attendants do not use the state worksheets, or fill them out partially. In the end, the data collection process is highly dependent on hospital birth clerks who piece together the information from the prenatal record, the hospital chart, available worksheets and face-to-face interviews with parents. Birth clerks key the information abstracted from these sources into the Birth Registration System application provided by the state health department.

So, from the perspective of Utah hospitals, birth registration is a fairly resource-intensive process furnished to the state by the health care delivery system. Birth clerks themselves are typically dedicated to their jobs, enjoy the public service aspect of what they do, but are poorly trained and not highly compensated. Some of the predictable results of the current data collection process are:

Underreporting of Health Risks and Outcomes

Legal information on Utah birth certificates is adequate (although approximately 10 % of birth certificates require minor amendments, such as corrected name spellings) since it can be verified by parents. Perinatal health data, however, such as Medical Risk Factors for the Pregnancy, Abnormal Conditions of the Newborn, and Congenital Malformations are unreliable and generally underreported, simply because birth clerks are unable to identify positive indications in the source documents they abstract. Quantitative information, like birth weight and gestation, and information coded by medically trained staff, on the other hand, are generally regarded as quite accurate.

Underreporting of the Amount of Prenatal Care

Utah measures date of entry into prenatal care and the number of prenatal care visits using the information are abstracted by the hospital birth clerk from the prenatal record. This is the national standard method to measure prenatal care for the birth record, but in practice many states obtain prenatal care visit information from the mother. It turns out that insisting that hospitals report prenatal care only from the prenatal record results in underreporting of visits. One of the reasons for this is that in some cases the paper prenatal care record is still not available to the birth clerk at the hospital at the time the birth certificate data are being assembled. In other cases there has been a discontinuity in prenatal care providers and visits to an earlier provider are not reported by the final prenatal care provider. These systematic errors cause missing and incorrect data for amount of prenatal care on the birth certificate.

Infant Outcomes Measured Too Soon

The assembly and entry of the birth data by the birth clerk is a temporally discrete event. The measures taken at that point in time often fail to capture health outcomes for the infant that take a few days to be diagnosed and recorded. For example, birth certificate data are notorious

for their omission of all but the most grave and obvious birth defects. It is crucial for civil registration purposes that births be registered with the vital records office in a timely fashion, but this often results in a truncated record of the health outcomes that are reported to the Department of Health along with the legal facts of birth.

Data Quality Degradation From Duplicate Transcription

Birth data, especially prenatal care data, are often transcribed several times in the creation of the birth certificate database. In cases of prenatal care providers who use electronic medical records, the data are printed out of the EMR, sent to the hospital, then re-entered by the birth clerk into the Birth Registration System. Obviously, the current system suffers from a lack of efficiency as well as data quality.

The vision that emerged from the UNIFY project is to improve birth data collection through interoperable systems that support health care delivery on the one hand and perinatal health statistics on the other. Prenatal care data recorded in prenatal visits should arrive timely as standard electronic messages at the delivery hospital. The data should be imported into the hospital EMR to serve as a reference for the provision of labor, delivery and newborn care. The prenatal care data should be integrated with data collected at the hospital, including data collected in the care delivery and data necessarily collected by the birth clerk from parents. Finally, hospitals should use standard electronic vital event messages to report the birth data to public health.

Clearly, opportunities exist for improvements to data as well as reduced cost through re-engineering of systems currently in use in this state for public health reporting of perinatal data. If existing and emerging electronic systems that support prenatal care, labor and delivery can interoperate with the birth certificate system public health would have access to source data rather than duplicate transcription of the data and would be more likely to obtain the entire perinatal data set we are trying to capture.

Value Proposition

Interoperability of public health and health care information systems in the area of perinatal data has value for both public health and the health care industry. Clearly, opportunities exist for improvements to data as well as reduced cost through re-engineering of systems currently in use in this state for public health reporting of perinatal data. If existing and emerging electronic systems that support prenatal care, labor and delivery can interoperate with the birth certificate system public health will have access to source data rather than duplicate transcription of the data, and will be more likely to obtain the entire perinatal data set we are trying to capture.

On the industry side, hospitals have an incentive to reduce the amount of data transcription required to produce birth certificate data for the state. An important, but often overlooked value of interoperability for a hospital is the elimination of “foreign” applications being maintained on hospital computers. Prenatal care providers see value simply in automating the process of ensuring that prenatal care data are available at the hospital as appropriate to support labor and delivery care.

There is much evidence that Utah stakeholders recognize these values and are committed to achieving interoperability among health care providers and public health for the collection and

use of electronic perinatal information. Critical factors to achieve success in this endeavor are adoption of standards and diffusion of EMR systems among obstetrical care providers.

Perinatal Data Standards

A lot of the groundwork for the development of perinatal data standards has been done at the national level. Utah has for many years used the U.S. Standard certificate of live birth. This standard is developed and maintained through a collaborative effort of professional associations in public health and health care convened by the National Center for Health Statistics, Division of Vital Statistics. Periodic revisions of the standard data set are accomplished through the active participation of representatives of these groups:

- American College of Obstetrics and Gynecology
- American Pediatric Society
- American Medical Association
- National Association for Public Health Statistics and Information Systems
- Schools of Public Health

As a result of long collaboration on perinatal data issues there exists a hard won consensus between public health practitioners and perinatal care providers about the proper content and format of the information that comprises the birth data set to be collected for each birth throughout the country.

A second consensus seems to exist, in Utah at least, that the EMR systems used for prenatal care and hospital perinatal care should be able to produce the US Standard Birth Certificate items coded in the required format. Toward that end, potential developers of EMR software have included public health representatives in requirements definition sessions. More recently, UHIN has convened the Perinatal Subcommittee, a technical workgroup comprised of clinicians, informaticists and vital records specialists from major stakeholder organizations in Utah. The subcommittee is currently reviewing perinatal data elements with the goal of defining an electronic message to convey perinatal care information that would encompass the 2003 US Standard Certificate of Live Birth.

3. Implementation Plan

3.a. General Exchange Infrastructure

The general proposal for Utah's clinical exchanges with public health are depicted in Figures 1 a and b below. Figure 1a depicts the nature of the connections that would be required without a community strategy. If the expansion of data exchange continues on a point to point basis, interfaces will need to be developed and maintained at an unsustainable level. The "community" approach that UHIN offers, utilizing the "single portal in, single portal out" philosophy not only decreases the costs associated with interface development, but also has the advantage of providing a forum for developing community supported, consensus standards and implementation guides. Figure 1b depicts all exchanges being routed through Utah's Regional Health Information Organization, the Utah Health Information Network (UHIN), described in Section 1 of this report.

3.b. Trading Partners and Stakeholders

Trading Partners

The Utah Department of Health acquires information from a variety of partners (see Table 1). In addition to data flowing to the UDOH, data also flows from UDOH to our trading partners.

Table 1. Trading Partners Providing Data to UDOH for Four Functions

	UT-NEDSS	USIIS Immunization Registry	Electronic Prenatal Records	Newborn Screening, Follow-up, CHARM
Local Public Health	●●●●	●●●●	●●●●	●●●
Private physicians' offices	●●	●●●●	●●	●●●
Hospitals	●●●	●●	●●	●●
Laboratories	●●●●			●●●●
Health plans		●●	●	●
Community Health Centers	●●	●●●	●	●
Consumers	●●●	●●●	●●●	●●●

●●●● Primary partner
●●● Significant Partner
●● Partner
● Possible Partner

Figure 1a. Partners Maintain Independent Connections

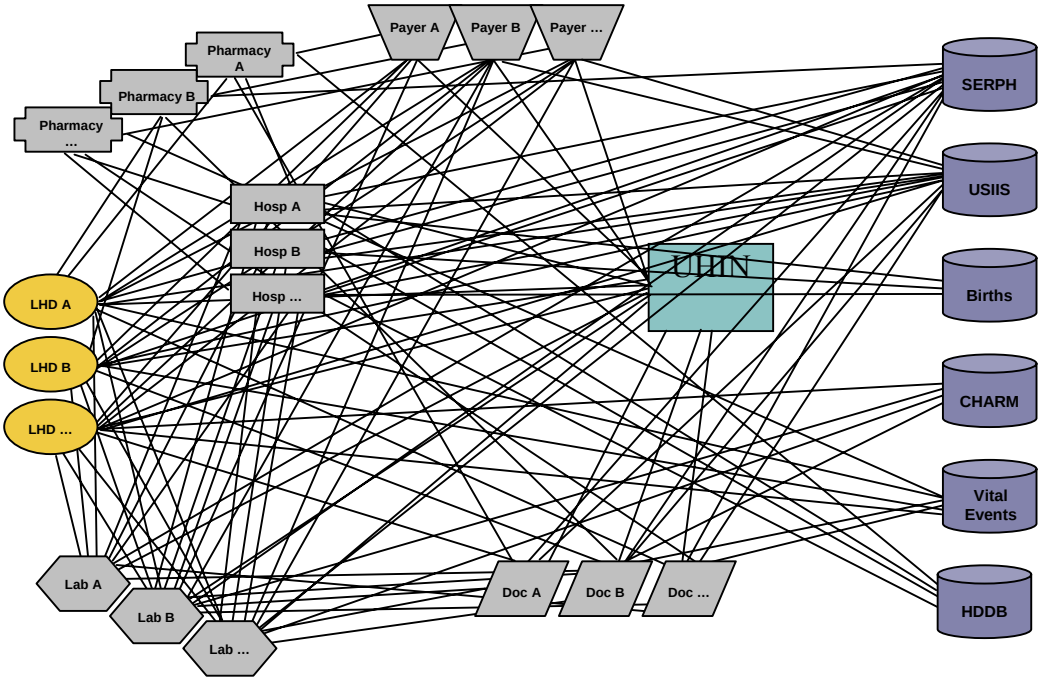
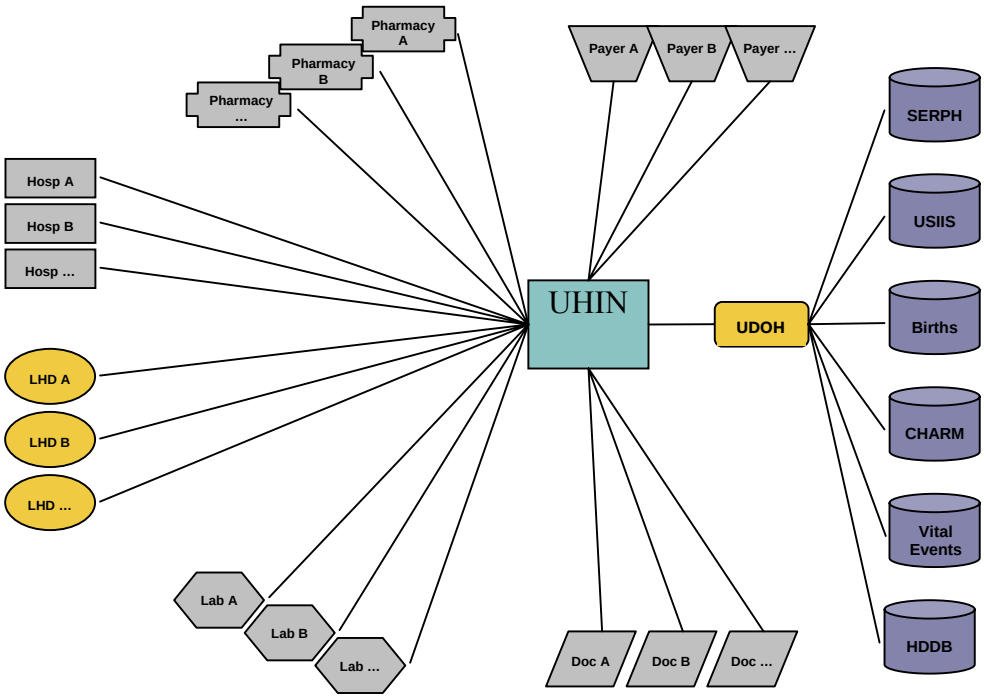


Figure 1b. Connections Streamlined Through UHIN



Other Stakeholders

Table 2. Other Stakeholders in Public Health Clinical Exchanges

Stakeholder	Description	Priority Exchange Requirements
Utah Dept. of Technology Services (DTS)	New Utah Department of Technology Services, result of legislated IT centralization in Utah state government	We must communicate our needs clearly and ensure that adequate planning is made for use of DTS resources
State public health laboratory	In addition to the capabilities of commercial laboratories, the state public health laboratory is also qualified to test for additional pathogens of public health significance, such as bioterrorism agents and avian influenza N5H1, and performs other tests (e.g., toxicology for the medical examiner, water quality and EPA testing) with a public health focus.	Keep the state laboratory in the loop as we devise solutions for electronic laboratory reporting
Health Care Financing	Utah's UDOH, Division of Health Care Financing manages the state Medicaid Program. Medicaid was an early adopter of electronic claims processing and requires that providers submit claims electronically through the UHIN switch.	Reduce administrative costs of program, improve quality and access to care for enrollees, maintain provider base
Office of Health Care Statistics	One of three office in the UDOH Center for Health Data, the Office of Health Care Statistics was created by statute to collect and disseminate information on Utah's health care system.	Would like to receive hospital discharge data and other standard administrative data directly through UHIN
Office of Public Health Assessment	One of three office in the UDOH Center for Health Data, the Office of Public Health Assessment analyzes, interprets, and disseminates information on the health status of Utah's population.	Would like to use clinical data for public health assessment, that is, to answer important questions about the health status of Utahns
Office of Vital Records and Statistics	One of three office in the UDOH Center for Health Data, the Office of Vital Records and Statistics manages the certification of births, deaths, fetal and infant deaths, issues certificates, and manages several vital events databases. Has developed multiple Web-based electronic reporting systems, including birth and death certificates.	Would like to use eHealth to improve quality and timeliness of reporting for vital events data, and to reduce the workload for partners in the community
Medical examiner's office	Investigates all sudden and unexpected deaths. Such deaths have implications for public health and safety.	Maintain ability to process bodies, reduce administrative costs
Private providers	All private providers of health care, including stand-alone providers, partnerships, and clinics	Improve patient outcomes, reduce administrative costs, limit medical malpractice and other liability

Hospitals	Hospitals in Utah	Provide quality emergency and inpatient medical services, improve patient outcomes, reduce administrative costs, reduce adverse medical surgical, and drug events, minimize liability, comply with state and federal laws and regulations
Utah Medical Association	Professional organization for Utah healthcare providers (including MD, OD, DDS, PA, PharmD)	In addition to requirements of private providers, assist providers with purchase of EMR systems, and workflow and eHealth processes in general. Protect income stream, patient records. Avoid unnecessary costs
Patients / Consumers	All individuals receiving medical care	Improve health status, protect personal health information from inappropriate access/release, decrease healthcare costs
Employers	All Utah companies who employ workers	Improve quality and patient outcomes, reduce costs of health care and health insurance coverage so that they may afford to offer health care coverage to their workforce
Health insurance carriers	Private insurance companies that charge a premium to provide healthcare coverage to individuals or groups	Improve, expand risk pool, improve efficiencies, reduce administrative costs, limit liabilities
Pharmacies	An enterprise that sells prescription drugs.	Improve efficiencies, reduce costs, limit liabilities
Commercial laboratories: ARUP, Lab Corp, Quest	An enterprise that tests specimens for various constituents (e.g., white blood cells, glucose) and pathogens (e.g., viruses, bacteria, fungus, etc.)	Improve efficiencies, reduce costs, limit liabilities, comply with state and federal laws and regulations, maintain provider customers
UHIN	A private, not for profit organization that allows exchange of electronic healthcare (e.g., X12) messages among entities (e.g., providers, payers, public health, etc.)	Provide secure exchanges of standardized healthcare messages, spread costs proportional to value provided to partners
HealthInsight	Utah's private, non-profit Medicare Quality Improvement Organization (QIO)	Improve quality of healthcare for all consumers, with focus on Utah's Medicare recipients
EMR system vendor	A software company that sells an electronic medical records system	Build market share, sell software, may want to perpetuate proprietary systems instead of use existing standards for data storage, interchange

3.c. Operational Issues

There are several administrative and operational issues that affect the day-to-day functioning of health information interoperability. We have selected to report, here, those issues that recurred most often in our discussions and research.

Privacy and security issues

Description of Issue

Utah is participating in the Health Information Security and Privacy Collaboration (HISPC) National Governor's Association initiative. The goal of the initiative is to ensure that electronic exchange of health information can occurs under uniform standards of security and privacy, thereby facilitating appropriate intra-agency, inter-agency and inter-state exchange. Internally called UNIFY-PS, the project has convened several dozen stakeholders from the provider, payer, and public health communities to identify current privacy and security barriers to electronic exchange of clinical health information, and to recommend and vet solutions and implementation strategies for those solutions.

The Health Insurance Privacy and Accountability Act (HIPAA)[24] authorizes exchange of personal health information for certain purposes, including patient treatment, payment and healthcare operations (TPO), and public health. While HIPAA provisions are fairly clear, they are not the only source of guidance for exchange of patient information. The UNIFY-PS project findings included the following.

Consent for Release of PHI. A provider operating within the conditions outlined by HIPAA is still vulnerable to legal action by a patient who desired to sue him or her. In such a case, legal precedent and common law would be brought to bear on the case. Perhaps as a result of this, providers uniformly seek patient consent for release or transfer of records, regardless of whether the release is authorized under HIPAA.

Security of Transmission. The most common means of information transmission is currently facsimile. Transmission of encrypted information in coded records would be more secure.

Authentication. There is a need for authentication of the requesting provider. Often, protected health information is released to a requesting provider who faxes a request on letterhead. Such a method is vulnerable to forgery.

CFR 42 Part 2. Certain health information, specifically drug abuse treatment and mental health information, falls under a federal statute, CFR 42 Part 2, which has does not allow re-release of the information without first gaining patient consent for each specific release. In effect, providers do not request substance abuse or mental health information on their patients, and in fact will not accept it, so that they will not be saddled with the administrative burden of tracking its re-release.

The following solutions regarding privacy and security were proposed by the UNIFY-PS project.

Authentication. Establish system or standard protocol for authentication and verification of provider authority to access PHI.

Patient Identifier. Establish a patient identifier that is unique and recognizable. Initially started within the payer community with healthcare entities ultimately having the option to utilize this unique patient identifier.

Structure for Locating Existing Information. Establish a structure to assist in locating the patient-specific health information contents. This can include a record locator, patient record bank, or other type of central patient repository.

Improve Infrastructure. Establish an electronic 'pipeline' to all areas of the state.

System Integration. Integrate state public health data systems to 1) facilitate the monitoring of the health of communities, 2) assist in ongoing analysis of trends and detection of emerging threats, and 3) provide information for setting public health policy. Work together to breakdown cultural barriers and facilitate the sharing of data across programs by establishing practical administrative procedures for information sharing between state programs.

First Responders. Establish general protocols for first responders and enhance awareness regarding what information can be shared in various situations, and the need for universal precautions.

Consumer Awareness. Increase consumer awareness of the benefits to accessible health information. Start getting the word out to consumers that there are some very real benefits to making their own health information, especially the continuity of care record contents, available and easily accessible.

Different Privacy Practices for Different PHI. All health information should be treated with the same standard for privacy and security when used and/or disclosed for the purpose of providing treatment and obtaining payment for such treatment.

Implications for Planned Public Health Exchanges

Although most clinical exchanges for public health purposes are not covered under HIPAA, having clear processes for exchanging PHI in Utah will smooth the transition from paper to electronic reporting.

Data ownership

Description of Issue

Proponents of eHealth tout consumer access to personal health information, and use of thumb drives and "smart cards" for consumers to use to store their medical records. However, for this to happen, someone will need to convince providers that the consumers own their medical record. Providers believe that the information in their patient charts is their intellectual property. Consumers are likely to claim ownership, because they paid the provider to create and maintain the information. In a recent article in *Health Affairs*, David Brailer listed, "providers' ceding control of clinical information to patients…"[25] as one of the environmental changes critical to realization of the benefits of the HIT movement.

An associated issue regarding consumer ownership of electronic healthcare information is whether to allow consumers to control access to the content versus modify the content. One can think of cases in which a consumer may not want certain facts to be available to his or her healthcare provider. For instance, cases in which a consumer has filled prescriptions for narcotic

drugs with several different providers. It is important that "ownership" is defined, and that it is clear whether it means control over access to the data or control over the actual content of the data record.

Implications for Planned Public Health Exchanges

Physicians are generally forthcoming with information for public health purposes. Defining greater consumer control over the flow of information may actually be neutral for public health. Consumers might be surprised to learn how much information is already shared with public health entities. To the extent that consumer buy-in is necessary for healthcare information interoperability in general, and to the extent that general interoperability will facilitate public health reporting, consumer buy-in and control over access to their personal health information will facilitate public health reporting.

Data Standards

Description of Issue

A variety of different types of standards are required to achieve information technology interoperability. Fortunately, most of the information standards are already in widespread use. For instance, we can consistently and accurately exchange text files because the I.T. industry has defined text file formats such as the American Standard Code for Information Interchange (ASCII). We can consistently and accurately exchange files over the Internet with Hypertext Markup Language (HTML) and Hypertext Transfer Protocol (HTTP).

However, the information exchange standards listed above are too general to accomplish exchange of machine-readable healthcare information. The operant construct is "machine readable." For most everyone in business and government today, the electronic exchange of information using Email and the Internet is routine. But the real savings in healthcare information exchange can only be reaped through exchange of standardized, machine-readable files to support important functions such as clinical decision support and outcomes and quality improvement research.

National standards setting organizations coordinate the development and use of voluntary consensus information exchange standards. The X12 standard, currently used in healthcare to transmit healthcare claims and approval for payment, has been in service for quite some time. ANSI ASC X12 is the official designation of the US National standards body for the development and maintenance of electronic data interchange (EDI) standards for the United States. ANSI ASC stands for the American National Standards Institute, Accredited Standards Committee. X12 is a specific standard. Another national standards group engaged in health information electronic interchange standards is the American Society for Testing and Materials (ASTM).

Transmission of clinical healthcare data requires a unique set of standards. Health Level Seven (HL7) is a Standards Developing Organization (SDO) that is accredited by ANSI. It was founded in 1987 to produce a standard for hospital information systems, and is currently the standard used in most institutions for exchange of clinical data. The HL7 version 2.x standard (see box, HL7 Example Message) includes specification of the data format, such as the order of the data fields, the data field separators, but does not specify the vocabulary, or the definitions for each of the data fields. For instance, in the HL7 example message, below, the vertical pipe character, "|," is used as a field separator. But the content of each field must also be defined. For instance, does the MSH in the HL7 example message stand for Mount Sinai Hospital, Medical Subject Headings, or Microsoft Shell? Data definitions are provided by other national standards systems, such as the Logical Observation Identifiers Names and Codes (LOINC), and Systematized Nomenclature of Medicine (SNOMED) and can be inserted into the HL7 message to facilitate semantic interoperability, but are not required for syntactic interoperability.

HL7 Example Message

```
MSH|^~\&||MA0000||GA0000|199705221610||VXR^V03|19970522MA53|T|2.3.1|||AL
MSA|AA|19970522GA40|
QRD|199705221605|R|I|19970522GA05|||25^RD|^KENNEDY^JOHN^FITZGERALD^JR|VXI|^SIIS
QRF|MA0000||||256946789~19900607~MA~MA99999999~88888888~KENNEDY^JACQUELINE^
LEE~BOUVIER~898666725~KENNEDY^JOHN^FITZGERALD~822546618
PID|||1234^^^^SR^~1234-12^^^^LR^~3872^^^^MR~221345671^^^^SS^~430078856^^^^MA^
||KENNEDY^JOHN^FITZGERALD^JR^^^L|BOUVIER^^^^^^M|19900607|M|KENNEDY^BABY
BOY^^^^^^ B|W^WHITE^NY8 RACE CODES^W^WHITE^HL70005|123 MAIN ST^APT
3B^LEXINGTON^MA^00210^ ^M^MSA CODE^MA034~345 ELM
ST^^BOSTON^MA^00314^^BLD~^^^^^^BR^^MA002| |(617) 555-1212
^PRN^PH^^^617^5551212^^||EN^ENGLISH^HL70296^^^|||||||WN^NOT HISPANIC^LOCAL
CODE SET^NH^NOT OF HISPANIC ORIGIN^HL70189|CHILDREN=S HOSPITAL
PD1|||CHILDREN=S HOSPITAL^L^1234^^^^XX~LEXINGTON CLINIC^^1234A^^^^FI
|12345^CARE^ PRIMARY^^^DR^MD^^^L^^^DN|||||||03^REMINDER/RECALL - NO
CALLS^HL70215|Y|A|19900607. . .
```

Implications for Planned Public Health Exchanges

HL7 standards are still being developed. In cases where standards are missing or in flux, or where multiple standards exist, electronic reporting of healthcare information is delayed. HL7 V 2.3 standards exist for the prenatal care record, and also for immunizations. The Version 2.3 message for laboratory reporting exists, and a Version 2.5 message is currently under public health review. The Health Information Technology Standards Panel (HITSP) has recommended that public health use the Version 2.5 message, but that message is still pending some vocabulary definition.[26]

Central Repository

Description of Issue

Some RHIOs, such as Indiana's Network for Patient Care[27] function with the use of a central (federated) data repository for all electronic medical records. Having a central repository

is one solution to the problem of finding a patient's record and searching for all relevant information (see "Searching for Patient Records, below). In Utah, however, from our earliest conceptions of eHealth information exchanges, it has been postulated that a central repository would not be acceptable to consumers because of concerns regarding data security and access control. Furthermore, if consumers were not agreeable to the central repository, it would be incomplete, and its utility would be questionable. In addition, there was no entity willing to maintain a central data repository. Some partners have suggested that the UDOH would be a logical place for a central repository. While the UDOH must maintain certain public health databases, UDOH executive managers believe that Utahns would not favor a governmental, "big brother," solution.

An alternative solution, and one among the solutions being proposed by Utah's UNIFY-PS project, includes having a "record locator" that provides the requesting healthcare provider with a list of other providers who are known to have information on the patient.

Some are advocates of a health record banking approach.[28] One proposal that has been made in Utah is to have a central repository of only a subset of patient information may be easy to justify and commercially viable. The subset of information for the central repository in this proposal is that which would be most useful in an emergency care-giving situation. Progress has been made nationally in defining a "continuity of care" record (CCR).

According to ASTM, the CCR is,

> …a core data set of the most relevant and timely facts about a patient's healthcare. It is to be prepared by a practitioner at the conclusion of a healthcare encounter in order to enable the next practitioner to readily access such information. It includes a summary of the patient's health status (e.g., problems, medications, allergies) and basic information about insurance, advance directives, care documentation, and care plan recommendations.[29]

The CCR that is currently being developed by ASTM and others would include a core set of required information, including financial and patient identifying information, diagnoses, problems, and conditions, drug and other allergies, current medications, recent laboratory results, advance directives, and other information deemed necessary to provide adequate care to a new medical patient.[30] One of the recommendations of Utah's UNIFY-PS project is to provide consumer education on the importance and nature of CCR content and prepare the public for storage and use of this important information.

Implications for Planned Public Health Exchanges

The majority of public health reporting will likely not come from a central data repository, although if there were one, it would improve reporting, such as case ascertainment for notifiable diseases and reporting of immunizations. In addition, there are times when public health would like to pose a question to the healthcare system. It doesn't happen now, but if there were a central data repository, it could be extremely valuable for public health assessment, to answer person-centric questions, such as the following:

- What happens to patients after they disenroll from Medicaid? Do they find other healthcare coverage? Does their health status decline?

- How many suicide victims saw a medical provider in the months prior to their death? What kind of a provider was it? What medications were they on?
- How many children seen in the Emergency Department for asthma had been prescribed an asthma medication? Which medication was it? In which areas of the state do they live?
- What proportion of the population has been diagnosed with diabetes? What proportion of those have their blood sugar under control? How many have experienced sequelae of uncontrolled diabetes, such as lower extremity amputation, heart disease, or blindness?

Master Patient Index, Deduplication

Description of Issue

An important challenge for interoperable health information systems is to ensure that one has linked the patient with the correct health record. On the one hand, the results of linking the patient to the wrong record could be disastrous, especially in an emergency situation when the patient is not conscious or is not a dependable source of information for some reason. Fear of misidentification might lead one to provide access to records only when certain very stringent criteria have been met. For instance, if one knows the patient's name, current address and date of birth, is that enough to release a patient's record with confidence that it is the correct one?

On the other hand, when an information system uses matching criteria that are too strict, it provides challenges to the requester. How much administrative burden may be placed on the requester before he or she refuses to use the system at all? In which case, the information system would have no value at all. The problem of accurate identification of a patient calls for the creation of a patient identifier. As mentioned in Section 2, Utah's HISPC project proposed that UHIN create a master patient identifier and this would be of enormous value to the immunization registry, and potentially other public health data systems as well.

Implications for Planned Public Health Exchanges

The issue of correctly linking patient records is important for any healthcare enterprise, whether paper-based or electronic. Any data system that desires to main person-centric information must grapple with this issue. Development of a probabilistic record linking and patient identification algorithm is one of the research activities in Utah's Center of Excellence in Public Health Informatics.

Searching for Patient Records

Description of Issue

The issue of searching for a patient record is related to the issue of the Master Patient Index (MPI) and deduplication in that both concern the ability to link the patient correctly to his or her medical record. If all records are uniquely identified and stored in a central data repository, the task is relatively simple. Without a central repository, the requesting provider's computer system would be required to search through existing records stored in disparate systems. This would require a sequential versus a binary search technique (see box, *Searching for Patient Records*).[31]

The problem with both searching techniques is that they assume one has a list to search against. In the case of patient medical records, that may or may not be true. If there is a central repository for electronic medical records information, even if it is just the CCR, either a binary or sequential search would be possible. But even if we assume that all providers have an EMR system, and that we have a record locator that identifies the location of each patients' medical record data, the following conditions would still have to be met:

- The requester would require access to the provider's EMR system. This is extremely unlikely. Not only does the requester not need access to the patient's entire medical record, they most likely would not want it, nor should they be allowed to have access to it.
- The provider's EMR system would have to be up and available 24/7. Also extremely unlikely. There will always be outages, especially in a system as distributed as the one we are talking about, here.
- The provider's EMR system would need to allow for searching on patient identifiers, or would have to use a standard common patient identifier.

If those conditions are not met, the requester would have to contact the provider and request that the provider access, duplicate, and transmit the requested information.

Searching for Patient Records

There are two types of computer searching techniques, Sequential and Binary.

Sequential Search. The simplest algorithm to search a list for a given person's name is to test successively against each element. The sequence is as follows:

1. Retrieve the first name on the list.
2. Compare that name to the target name.
3. If it's equal, stop. If it's not equal, proceed to next name on list, etc.

Sequential searching works correctly regardless of the order of the elements in the list. However, in the worst case all elements have to be tested.

Binary Search. Binary Search is a technique for searching an ordered list. It is familiar to everyone who uses a telephone book. The basic algorithm is to find the middle element of the list, compare it against the key, decide which half of the list must contain the key, and repeat with that half.

Two elements are required to support binary search:

1. Random access of the list elements, so we need arrays instead of linked lists.
2. The array must contain elements in sorted order by the search key

Implications for Planned Public Health Exchanges

In public health we typically do not request patient records. We rely on healthcare providers to report information to us. But as we develop data systems and move toward more patient-centric data storage, the issue of identifying a patient with his or her record becomes more relevant to public health.

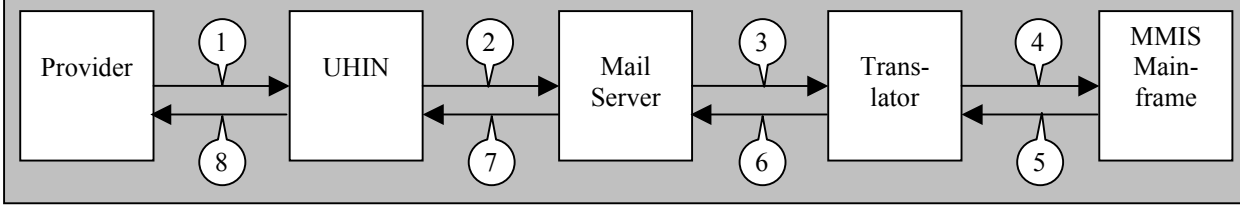
Exchange Process and Infrastructure

Description of Issue

The technical infrastructure required for transmission of electronic clinical messages is largely in place in the UDOH, although with varying levels of depth and support. Currently, Utah's Medicaid program has an infrastructure in place for transmission of HIPAA X12 Transactions. The diagram in Figure 1. depicts those Medicaid transactions.

For all Medicaid standard transactions, the healthcare provider transmits an X12 standard message to the Utah Health Information Network (UHIN). For instance, an X12 837 message is

Figure 1. Medicaid HIPAA Standard X-12 Transactions Through UHIN



the standard X12 message for claim submission for professional services (a provider encounter / claim for payment). Several other standard HIPAA message formats exist for administrative transactions, such as eligibility (270), claim status (276), and premium payment (820). Each provider business office, referred to as a UHIN partner, has a unique trading partner identification number with UHIN. If the message has an incorrect or missing partner ID number, UHIN will send back an error message to the partner.

1. In the above example (Figure 1.), a physician sends a Medicaid claim through UHIN.
2. UHIN sends the X12 837 transaction to the Utah Department of Health's Medicaid claims mail server at the State capitol. The mail server has a mailbox for UHIN messages for UHIN partner ID HT-000-004-001, the partner ID for the UDOH. Medicaid receives thousands of these messages every business day.
3. The X12 837 messages for Medicaid are then transmitted to Medicaid's translator. The translator is a software program in a powerful computer that reads the X12 837 message and translates it into the format used by the UDOH Medicaid claims processing data system. The translator also validates that the trading partner ID of the provider is an eligible Medicaid provider, and that all the required fields have been completed and are within range.

4. The translator sends the message in Medicaid UDOH format to the Medicaid Management Information System (MMIS) for processing. The MMIS verifies the eligibility of the patient to receive covered services through Utah's Medicaid program. If the services are eligible for payment, the MMIS sends a message to the translator indicating that the provider is eligible to receive payment for the services rendered.
5. The translator reads the "OK to pay" message from the MMIS and translates it into an X12 835 approval for payment message.
6. The translator sends the X12 835 message to the Medicaid mail server. The message is stored on the mail server until someone picks it up.
7. UHIN checks the Medicaid mail server periodically for messages. UHIN downloads the X12 835 approval for payment message, and…
8. …stores it in the mailbox for the appropriate provider ID until the provider retrieves it form the UHIN mailbox.

Medicaid's mail server has already been used for selected HL7 transactions. For instance, HL7 messages for immunizations provided by area providers may be transmitted through UHIN to the UDOH through Medicaid's mail server. However, Medicaid is not able to maintain translator services for all the various types of messages that are currently needed or being considered in UDOH. The HL7 immunization messages are sent to UDOH's partner ID number on the Medicaid mail server, but those messages must then be sent to a different translator in UDOH. Maintaining the translator software is labor-intensive. It would not be appropriate for Medicaid to maintain the translator software for all UDOH programs.

Medicaid is not the only UDOH program with a mail server for exchange of healthcare messages. The Division of Epidemiology and Laboratory Services also has a mail server for laboratory and notifiable disease transactions.

The UDOH has a relatively powerful, general use translator in the Cannon Health Building. The software is called Rhapsody™ Integration Engine, from Orion Health, a company out of Santa Monica, CA that specializes in healthcare information interoperability. The UDOH is currently evaluating the feasibility of staffing the Rhapsody system. At present, the translator is not being supported for general UDOH program use. UDOH programs must find the means to program their own message translations.

Implications for Planned Public Health Exchanges

Having a robust transaction process and infrastructure is central to successful clinical exchanges for public health reporting. The infrastructure and activity must be supported. Statewide strategic planning and working with healthcare stakeholders will facilitate the transition to level 4 interoperability.

The Need for Short-Term and Long-Term Solutions

Description of Issue

All four of the public health opportunities described in this report have immediate and ongoing needs. While a long-term solution that uses standardized, coded, interoperable health data is ideal, we will need to identify short-term solutions to meet our immediate needs.

As our solutions evolve, they will likely evolve along a continuum of healthcare data interoperability, described by the Center for Information Technology Leadership.[32]

1. Non-electronic data, including paper, mail, and phone call.
2. Machine transportable data, such as fax, Email, and unindexed documents.
3. Machine organizable data (structured messages, unstructured content). Examples include indexed (labeled) documents, images, and objects.
4. Machine interpretable data (structured messages, standardized content). Examples include the automated transfer from an external lab of coded results into a provider's EHR. Data can be transmitted (or accessed without transmission) by HIT systems without need for further semantic interpretation or translation.

As a provider moves from one level to the next higher level, there are stricter requirements for data standardization, and greater cost savings to be achieved by the provider. In Utah, most providers are operating at Levels 1 and 2. There is a need for a long-term strategy to be communicated so that the necessary short-term solutions can work toward the long-term solutions, and at the very least, not conflict with them. The risk is that the short-term solutions will define a different direction, and will spawn workflows, standards, or other interchange processes that may be resistant to change once the long-term solution is ready.

Implications for Planned Public Health Exchanges

Each of the four public health projects, immunization, prenatal records, CHARM, and laboratory reporting of notifiable diseases, has ongoing commitments, and has been required to develop short-term, stop-gap solutions to meet those commitments while they work on better, more interoperable HIT solutions.

3.d. Project Management

The following milestones were identified for public health clinical data exchanges. Specific action items will need to be developed by the "lead agent" for each milestone, in cooperation with their respective program staff.

Project Milestones

Objective 1: Bi-directional Interfaces for USIIS	
Milestones:	Lead Agent
1.1 Bi-directional Interfaces with Local Health Department Systems	UDOH
1.2 Implementation of HL7 Interfaces with Private Provider EMRs	UDOH
1.3 EMR Query of USIIS Forecast	UDOH

Objective 2: Unique UHIN Member Identifier	
Milestones:	Lead Agent
2.1 Convene Utah payers to discuss concept	UHIN

Objective 3: Vaccine Order Management Module	
Milestones:	Lead Agent
3.1 Convene Utah payers to discuss concept	UHIN

Objective 4: System for Electronic Laboratory Results Reporting	
Milestones:	Lead Agent
4.1 Develop connections for exchange	UDOH
4.2 Develop reportable disease integrated data repository	UDOH
4.3 Develop SNOMED/LOINC mapping tables	UDOH
4.4 Develop data sharing policies across epi programs	UDOH

Objective 5: Electronic Birth Certificate Prenatal Record	
Milestones:	Lead Agent
5.1 Define Perinatal Data Elements	UDOH
5.2 Define Information Flow and Connections	UHIN

Objective 6: Statewide Public Health eHealth Planning	
Milestones:	Lead Agent
6.1 Identify resources for UDOH translator services (Orion Rhapsody Integration Engine)	UDOH

Other potential milestones:

* Continue training and marketing of Utah's Indicator-Based Information System for Public Health to local health departments and stakeholders.
* UDOH leadership training on their role of public health business managers for informatics (with IT professionals from DTS on the other side of the "bright yellow line")

* Create a vision and roadmap for a UDOH and Utah public health "Enterprise Architecture"
* Reconvene the data stewards group. Consider local health department representation in UDOH data stewards group. Have data stewards group explore ways to increase department-wide and local health department understanding of national data standards and vocabularies, and explore ways to move all public health data systems to comply with these standards to improve data exchange opportunities.
* Expand UHIN involvement with pilots for exchanging data between clinical medicine and public health
* Build a single gateway from clinical medicine to public health through UHIN. Identify ways to have data flow both ways.
* Consider an internal UDOH-wide central data repository or databank with single client id, record locator, MPI, etc.
* Public health programs participate actively in developing requirements for new Medicaid Management Information System to assure optimum opportunities to share data among Medicaid and public health programs.
* Work with Medicaid to build on sharing of data between Medicaid and other public health programs.
* Explore ways to link Medicaid long term care Transformation project to other UDOH data exchange activities.
* UDOH will work with the Utah Digital Health Services Commission to encourage vendors of electronic medical records systems to build in capacity to exchange clinical data with public health agencies, possibly through the Utah Health Information Network, or other Regional Health Information Organizations, using national standards and vocabularies. The HL7-EHR clinical standard provides a starting point for compatibility complying with minimum functional standards. This will also help vendors stay competitive in the national marketplace.

4. eHealth in Utah – Looking Ahead

A great deal of momentum exists at this time for expansion of the use of health information technology in the Utah health care industry. The major federal HIT initiatives through the Office of the National Coordinator for Health Information Technology and the Association for Healthcare Research and Quality have captured a great deal of attention from the media and industry leaders in this community. Many of these leaders are self-conscious of the state's pioneering role in the introduction of health informatics and want to continue to be innovators.

UHIN, the Health Information Exchange Network

UHIN, which already functions as a state-level RHIO, will likely continue to be the focus of electronic health information exchange in Utah. This bodes well for the inclusion of public health in clinical information exchange, since public health has a well established seat at the UHIN table that represents both Medicaid and the interests of traditional public health. The UHIN clinical exchange pilot projects in history and physical messages, laboratory results, medication history and now prenatal records all include representatives of public health in the standards development process.

Attesting to the sort of "first mover" advantage that UHIN enjoys in the Utah HIT arena is the prominence of UHIN in the just completed implementation plan of Utah's Health Information Security and Privacy (HISPC) initiative. This nationwide AHRQ-NGA initiative probably had it's desired effect in Utah, that of fostering a wide ranging dialogue among a large number of stakeholders in the health care industry about health information privacy issues. In the end many of the key solutions to eliminating barriers to health information exchange were seen to be improved UHIN infrastructure items mentioned earlier in this report, such as a unique Member Identifier, standards for provider authentication, and Master Patient Index.

Health Information Technology Related Legislation

The momentum building in Utah for expanded use of HIT was evident, to a limited extent, in the just completed 2007 Session of the Utah Legislature. The legislature appropriated a small amount of funds to the Center for Health Data in the Utah Department of Health to promote the use of electronic medical records in private clinics. While this will enable support for EMR adoption in only 20-30 clinics, the appropriation of state funds to promote EMR use is a significant indication of public support for informatics initiatives in Utah. The Utah Digital Health Services Commission intends to build on the legislature's interest in expanding health information technology in Utah by developing a proposal for more thorough legislation in the 2007 Session.

A second important item of legislation in the 2007 Session was the passage of House Bill 9, Health Care Cost and Quality Data. Designed to be health care transparency legislation, the act allows the Utah Health Data Committee to collect cost and reimbursement data for "episodes of health care." Funds were not appropriated to support the actual collection of the data, but will

permit planning this year for what promises to be a major public health data resource, integrating data from many health care providers and payers around episodes of patient care. The focus will likely be administrative data, but such data have in the past afforded new opportunities for surveillance and epidemiology as well as increased transparency.

Public Health Informatics Office

In an effort to coherently organize the various eHealth initiatives with which Utah public health is now involved, the Executive Director of the Utah Department of Health has directed the Center for Health Data to establish a Public Health Informatics Office by July, 2007. The initial charter for the new office will be, "to research and promote the systematic application of information, statistics, and computer technology for UDOH public health surveillance, health care improvement, and learning." The primary source of funds for the office is the existing grant through the University of Utah Center for Excellence in Public Health Informatics. The office will implement the COE projects (described earlier in this report), but will also help define and provide direction for the broader informatics mission of Public Health in Utah. In addition, the ongoing biomedical informatics collaboration between UDOH and China's Sichuan Provincial Department of Health will be housed in the Public Health Informatics Office.

As much as any other Utah institution, the Utah Medicaid Program has been a prime mover of health information technology in Utah. Medicaid leaders were among the UHIN founders, and Medicaid is now leading UHIN in the direction of clinical exchanges. Collaboration between traditional public health and Health Care Financing will be crucial for the future of eHealth in Utah. The Informatics Office will advance that collaboration by participating in the recently awarded CMS/HCF contract (Transformation Grant) on developing a Utah electronic pharmacotherapy management system. While Utah's application to CMS for funding for EMR support in long term care settings was not funded, we will continue to look for opportunities to leverage Medicaid funding to promote health care quality through EMR adoption.

Personal Health Records

Our UNIFY interviews and planning sessions revealed a great deal of consensus that electronic personal health records are a key eHealth technology. On the one hand, the existence of personal health records, especially if they are under the control of patients, diffuses many the health information security an privacy concerns that threaten to derail the whole clinical information exchange movement in the United States. On the other hand, the existence of voluntarily banked consumer personal health records could actually create a demand among providers for the technology to read and write electronic personal health records. At least one Utah company (Health Data Security) has been formed to take advantage to the potential market for personal health records.

Opportunities for Utah public health to participate in the development and use of personal health records are apparent. On the policy side, the Digital Health Services Commission has resolved to make exploration of the legal issues surrounding the ownership of health care information an aspect of developing a legislative agenda over the next year. As envisioned here, public health could be both a supplier and a user of personal health records. That is, public health services could be added to an individual's health records, and population level analysis

conducted for that set of individuals who consent to use of their data for that purpose. So, personal health records constitute a frontier for public health participation in clinical exchange.

Attachments

Attachment1: Center for Excellence in Public Health Informatics Organization Chart

Utah Center of Excellence in Public Health Informatics (COE)
PI: Matthew Samore

Scientific Core:
Enhanced Research and Public Health Capacity via Data Integration

Major Research Projects

RT-CEND
Real Time Clinical Electronic Notifiable Disease Reporting

Principal Investigator: Scott Evans

Collaborators:
University of Utah
Intermountain Healthcare
Utah Department of Health
Local Health Departments

Narcotics Project

"Using linked data to enhance public health analysis and practice: Fatal adverse events due to prescription narcotics."

Principal Investigator: Wu Xu/Robert Rolfs

Collaborators:
University of Utah
Utah Department of Health

Record Matching Project

"Improving the accuracy of probabilistic record matching: Evaluating methods for the efficient use of the Utah Statewide Immunization Information System (USIIS)."

Principal Investigator: Wu Xu/Robert Rolfs

Collaborators:
University of Utah
Utah Department of Health

DSIDE
Decision Support for Infectious Disease Epidemiology

"Enhancing communicable disease decision-making through scenarios, data visualization tools and event simulation."

Principal Investigator: Matthew Samore

Collaborators:
University of Utah
Utah Department of Health
Virginia Bioinformatics Institute (VBI)
University of Michigan
Local Health Departments

INTERACT
Information, New Technology Exchange for Rapid Action, Compliance and Treatment

"Electronic communication between public health and clinical providers: Development and evaluation of a web portal."

Principal Investigator: Carrie Byington

Collaborators:
University of Utah
Intermountain Healthcare
Utah Department of Health
Local Health Departments

Chair of Advisory Committee: Reed Gardner
Project Manager: Amy Wuthrich-Reggio

Attachment2: Notifiable Disease Morbidity Card Example

UTAH CONFIDENTIAL MORBIDITY REPORT FORM				Report Date:
INDIVIDUAL CASE REPORT OF DISEASE				
Parent or Guardian (if minor child)				ID #
Patient Name	Date of Birth	Age	Gender	Home Phone
Address, City, State, Zipcode		County		Work Phone
Race: White ☐ Black ☐ Asian ☐ Native American ☐ Pacific Islander ☐	Hispanic Yes ☐ No ☐			
Disease				Date of Onset
Laboratory Results/Serotype	Specimen Source			Date of Lab Test
Name of Laboratory				Phone
Name of Attending Physician				Phone
Name of Person Reporting				Phone
Hospitalized? Yes ☐ No ☐	Where?			Date Hospitalized
Died? Yes ☐ No ☐	Date Expired?	Cause of Death		
Food handler? Yes ☐ No ☐	Where?			
Health Care Provider? Yes ☐ No ☐	Where?	Position/Title:		
Day Care Center? Yes ☐ No ☐	Attend? Yes ☐ No ☐	Associated With? Yes ☐ No ☐		
	Day Care Name: Address:			Phone
SEXUALLY TRANSMITTED DISEASE (STD)				
Syphillis: Primary ☐ Secondary ☐ Congenital ☐ Early Latent (<1 year) ☐ Other ☐				
Gonorrhea: Uncomplicated ☐ Ophthalmia ☐ Other ☐				
Chlamydia ☐ Pelvic Inflamatory Disease (PID) ☐				
Treatment given:		Dosage		Date
REPORT BY NUMBER OF CASES ONLY				

DISEASE	# OF CASES	Comments regarding disease reported on this form:
Chickenpox		
Influenza-Like Illness		
MRSA		
Pneumonia		
RSV		
Staphylococcal Disease		
Streptococcal Disease		
VRE		
Other		

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