

HIT AND HSR FOR ACTIONABLE KNOWLEDGE: DESCRIPTION OF PARTNERING HEALTH SYSTEMS

PARTNER: Denver Health (DH)

History, Structure, and Size

Denver Health is the principal safety-net provider in Colorado. Founded in 1860 as a single municipal hospital, Denver Health is now an integrated health system comprising 477 hospital beds (~26,000 annual admissions), 8 outpatient clinics, a broad spectrum of subspecialty clinics, 12 school-based clinics (~450,000 annual outpatient visits), and other public health and emergency services. The system employs 700 physicians as well as 3,000 trainees, and it serves 150,000 patients (about 25 percent of Denver's population). Forty-four percent are uninsured. It operates as a part of Denver's municipal government.

HIT Systems

Denver Health operates primarily on a HIT system using Siemens software that supports a single electronic medical record (EMR) for each patient that can be accessed by any Denver Health provider. The full range of data collected by Denver Health are patient demographics, clinical results (laboratory, radiology, pathology), medications (including lists, dispensed, administered), vital signs, immunizations, document form types, and ancillary services studies, patient satisfaction results, and financial and billing information. All data sources get leveraged for research and quality improvement efforts. These data are captured from individual facilities and housed in both a clinical data repository (EMR) and a centralized data warehouse. Other important features of Denver Health's HIT capabilities include the ability to provide point-of-care decision support primarily through the use of computerized provider order entry, and a robust EMR. The data warehouse has improved care through the utilization of comprehensive disease management registries, point-of-care decision support, near real-time clinician alerting for surveillance monitoring, in addition to the use of sophisticated reporting capabilities for operational and financial management needs.

Organization of Research Functions

Denver Health currently maintains a single health services research department that conducts both traditional, grant-supported health services research (especially demonstrations) and supports internal data and information requests. The department reports directly to the Chief Quality Officer and has had strong support from the CEO and CMO since its inception in 1999. In fact, the CEO managed this department for the first 6-7 years. In addition, various clinical departments (Emergency, Surgery, Medicine, Public Health, and others) have active clinical research agendas with specific health services research skill sets to support their efforts. Further, the Department of Patient Safety and Quality which leads quality improvement efforts also participates in health services research and responds to internal operational needs of the organization. In addition, a Decision Support Services team provides the ability to produce many internal management reports and provides adhoc HIT data inquiry services. In addition, a lead

physician (with extensive informatics and biostatistics training) in the Department of Patient Safety and Quality works directly with the HIT data warehouse team.

The HSR staff is made up of professionals with the following background and experiences:

- Director, Health Services Research (full funded by hospital operations)
- Assistant Director, Health Services Research
- 2 Research Project Coordinators
- Part-time administrative support
- Research Staff (varies dependent upon number of grants, but averages ~5 FTE's)

In addition, there are other staff that are involved in the use of HIT in health services research and quality improvement efforts on an adhoc basis. Further, there are departmental specific resources involved in similar efforts.

The total annual budget for HSR is currently about \$150,000. External grants and contracts fund an additional ~\$1,000,000 annually. The process for making requests for analysis is centralized through a web-based data request and prioritization process.

Applications of HIT (i.e. ways your organization describes utilization of electronically generated data)

Current applications of HIT at Denver Health include:

- Providing appropriate data, information, and knowledge at the point of care through the use of many clinical applications, including:
 - ELECTRONIC MEDICAL RECORD- called EDM (Enterprise Document Management) (1995)
This is an online, complete, and up to date, “scanned medical record” where hand-written information is scanned into the system and other reports/results are imported electronically. This record is accessible from all computers and is available 24 x 7 x 365. This is a client-server application.
 - VAXTRAX- Immunization Registry Application (1994)
This application provides a registry of all Denver Health patients to facilitate efforts to provide appropriate vaccinations to all groups. This is a client-server application that is integrated with the Lifetime Clinical Record.
 - PATIENT MANAGEMENT/PATIENT ACCOUNTING SYSTEM- called INVISION (1997)
This is the core hospital information system for registration, patient master index, and billing activities.
 - SCHEDULING (1997)
This is a computerized appointment system for scheduling outpatient visits and radiology exams, and provides capabilities for the management of consults.

- **COMPUTERIZED PATIENT RECORD-** we call it LCR (Lifetime Clinical Record) (1999)
 This application is the source application for some elements such as outpatient vital signs, weights, BMIs, medication reconciliation lists and also displays elemental data from laboratory, pharmacy, radiology, other ancillary services systems.
- **DATA WAREHOUSE-** comprehensive, multidimensional database used for reporting, research, and management (~2000)
 This application provides a robust data warehouse with information from many sources and includes patient related information such as demographics, utilization, billing, laboratory, pharmacy, radiology results. It is used for reporting, research, quality improvement, disease management, and operations management.
- **SINGLE SIGN-ON PORTAL-** called the Clinical Dashboard or Portal (2002)
 This is a web-based application that provides an integrated view of the various clinical applications. Physicians/providers use a “smart card” with an embedded “smart chip” and once authenticated, they have access to the clinical applications like Med Rec Imaging, LCR, CPOE etc., without signing on to each application individually. Deployed SUN solution to provide rapid logon with session persistent technology.
- **E-LIBRARY-** electronic medical references (2002)
 This is an Intranet site, and with collaboration with the University of Colorado Health Sciences Center, it offers physicians access to more than 6,000 full-text journals online, ~100 e-textbooks, and multiple other electronic references used in the daily care of patients.
- **COMPUTERIZED PROVIDER ORDER ENTRY-** called CPOE (2002)
 This is an application that allows physicians/providers to enter orders into the computer. The major ancillary departments like laboratory, radiology, and pharmacy have bidirectional interfaces which allow for rapid communication of orders, and much less transcribing and reentering of data (i.e., fewer errors, improved efficiency). This application is run on an Application Service Provider (ASP) model. The rollout of the application is summarized below:
- **PICTURE ARCHIVING COMMUNICATION SYSTEM (PACS) -** called PACS (2006)
 This application digitizes radiology exams and makes them available for viewing on computers throughout the hospital and clinics.
- **NAVICARE BED MONITORING SYSTEM** (2006)
 This application provides a detailed approach the management of beds on the inpatient areas.
- **MAK- Medication Administration Checking-** bar coding (2007)
 This application provides support for medication administration with the use of decision support at the point of care utilizing bar coding technology with integrated clinical software.

- Reporting quality measures. In particular the central data warehouse that receives data from numerous other systems is used.
- Meeting demands for actionable operational data to improve internal clinical and administrative processes. In particular, as described above Denver Health uses point-of-care solutions and more traditional reporting and analysis functions to assist executives, managers, and practitioners in improving health care for a variety of conditions.
- Benchmarking. Denver Health participates in benchmarking services with University Health System Consortium and Colorado Hospital Association to assist management in better understanding our care practices. These databases have also been used to help guide research activities.

Plans for the future include expansion of data available in the data warehouse, online documentation by nurses and physicians, and use of business process management software to improve standardization or clinical workflow.