Colorado
HEALTH
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**The Promise of
Health Information
Technology:
Improving the Quality
And Cost-Effectiveness
Of Patient Care in Colorado**

CHI

white paper

Colorado Health Institute

Denver, Colorado

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Foreword

During the summer of 2004, the Colorado Health Institute (CHI) convened a series of meetings with representatives from health care provider organizations, academic researchers, and community agencies involved in the development of Health Information Technology (HIT) projects in Colorado.[1] Attendees expressed a clear interest in exploring options, opportunities, and resources to collaboratively build and strengthen a Colorado HIT infrastructure for the purpose of improving the health and health care of Coloradans.

CHI volunteered to assist the group by identifying and categorizing the various HIT projects underway in the state and elsewhere for the purpose of setting a baseline of information about current and promising projects. To this end, the following white paper has been prepared to inform a broader discussion of health information exchange and statewide HIT infrastructure development.

In October 2004, the federal Agency for Healthcare Research and Quality (AHRQ) announced that Colorado, through its Colorado Health Information Exchange COHIE project, was one of five states awarded a $5 million grant to develop a regional health information network.[2] The discussants that came together with CHI agreed upon the importance of leveraging these significant resources along with other efforts throughout the state to ensure an inclusive infrastructure development process that would sustain the involvement of a diverse group of stakeholders committed to achieving the goal of a coordinated statewide health information system.

Shared Vision

The shared vision for a statewide health information system is one that will enable the sharing of clinical and demographic information at the individual patient level. With the goal of improving health and health care quality in Colorado, the stakeholder group asserts that investments in electronic health information sharing are essential to achieve:

- Improved quality of health care delivery by reducing redundancies and fragmentation of patient level information;
- Cost-efficiencies through integrated, uniform patient level information that can be shared electronically; and,

- Expanded access to health care for Coloradans.

Advances in information technology have made it possible to implement a virtual network of clinical information on a statewide basis. The particular character of this connectivity and the amount of information being shared on such a network should be determined based on the needs and characteristics of the diverse communities of the state. The timeframe and pathway to achieving this connectivity must be negotiated based on community readiness, shared leadership, resources, and collaborative partnerships.

Working Collaboratively to Achieve Success

Achieving a health information network that meets the goals of improved health care quality, efficiency, and access will be long range and presents challenges to the partners' usual ways of doing business. Our initial assessment of the current HIT landscape suggests that Colorado has a number of critical elements for success already in place including a strong base of private and public sector leadership and several promising demonstration projects upon which to build. Colorado is poised to leverage these current opportunities to achieve a sustainable statewide HIT network infrastructure through a collaborative use of resources.

Broad statewide engagement and collaboration will be necessary to achieve Colorado's goals for health information exchange. In addition to adopting an effective technology model that accommodates various types of users and levels of functionality, resource investments must be made to achieve a sustainable HIT infrastructure at the community and state levels. Business relationships between health-related entities must be redefined. Public policy issues must be addressed that ensure consumer privacy protections while removing unnecessary barriers to appropriate information sharing, as well as balance the interests of all Coloradans in the diverse regions of the state.

In partnership with the COHIE project, CHI will provide organizational leadership and staff support to facilitate community input during the project, respond to the diverse information needs of statewide constituents and collaborators, promote problem resolution and help to prioritize and address the broader policy, legal and ethical issues related to statewide health information system

development. CHI will play a role in helping to monitor emerging trends, issues and opportunities related to HIT development and sustain the engagement of a broad array of stakeholders. This work will include:

- Promoting public awareness about HIT and its implications, thereby leading to a shared vision for HIT infrastructure development.
- Providing an information clearinghouse to coordinate communications and access to resources for all interested stakeholders, including cataloging emerging HIT projects around the state; sharing promising practices and challenges encountered; and identifying state level and community-specific priorities to inform the development of HIT models.
- Assisting health care entities to access information and resources by which to evaluate emerging technologies, understand prevailing standards for information exchange, and make decisions regarding technology investments.
- Articulating a compelling and common sense business case for HIT infrastructure development in Colorado including documentable savings from HIT investments,

cataloging new and innovative HIT-related business arrangements, developing a model that forecasts need and best ways to mobilize resources, and identifying specific funding opportunities in the public and private sectors.
- Promoting policy solutions to statewide information exchange that enhances access, quality, cost, and the effectiveness of health services and systems in Colorado.

For additional information, please contact Lynn Dierker, R.N., Deputy Director for Community Initiatives, Colorado Health Institute at dierkerl@coloradohealthinstitute.org or 303-831-4200, ext. 212.

The Colorado Health Institute (CHI) was established in 2002 as a nonprofit corporation to serve as an independent source of objective, non-partisan health information for Colorado decision-makers in the public and private sectors. CHI was established and funded through a memorandum of understanding between The Colorado Trust, Caring for Colorado, and Rose Community Foundation.

The Promise of Health Information Technology: Improving the Quality and Cost-Effectiveness of Patient Care

Quality of Care

In 1999, the Institute of Medicine (IOM) released the first in a series of publications calling for major health system reforms. Documenting unacceptably low levels of quality and value produced through current health care system, the IOM focused on the need for fundamental system redesign at various interrelated levels. The report emphasized that information technology must play a central role in this redesign, citing the essential need to automate clinical, financial, and administrative transactions to improve quality, prevent errors, enhance consumer confidence, and improve the efficiency of the health care system.

Federal Policy Framework

Acknowledging the need to improve the delivery of health care, public and private sector leadership has led to the development of an aggressive agenda for transforming the delivery of health care through the use of HIT. In April 2004, the Bush Administration called for a U.S. health care system based on interoperable electronic health records within 10 years. The position of a National Coordinator for Health Information Technology was established and charged with establishing a strategic plan to be developed to meet this goal.[3] David Brailer, M.D., Ph.D. was appointed to this position. In July 2004, Dr. Brailer along with the heads of three federal agencies released a report that set forth a plan to diffuse health information technology widely throughout the nation's health care delivery system.

The report, "The Decade of Health Information Technology: Delivering Consumer-centric and Information-rich Health Care" synthesized much of the research and literature amassed over the past several years, with a particular focus on the privacy compliance issues contained in the 1996 Health Information Portability and Accountability Act (HIPAA). The report assessed the state of readiness for system change and laid out a strategic framework for action to include both public and private sector stakeholders. However, it did not address requirements for technology standards nor did it detail a timeframe for achieving these goals.

Framework for Strategic Action[4]

Goal	Strategies
Inform clinical practice Electronic patient health records should be available for use by providers and patients within clinical practice settings.	1) Provide incentives for electronic health record (EHR) adoption. 2) Reduce risks associated with EHR investments. 3) Promote EHR diffusion to rural and underserved areas.
Promote interconnectedness between clinicians Patient information should be portable so that clinicians at different points of care have access to patients' health information when clinical decisions are being made.	1) Form regional collaborations. 2) Develop a national health information network. 3) Coordinate federal health information systems.
Personalize Health Care Consumer-centric information that helps patients participate in their own health care decisions should be readily available.	1) Encourage the use of personal health records. 2) Enhance informed consumer choice. 3) Promote the use of telehealth systems.
Improve Population Health Improve capacity for public health monitoring, measuring quality of care, and quicker diffusion of evidenced-based medicine into medical practice settings.	1) Unify public health surveillance systems. 2) Streamline quality and health status monitoring to allow real-time monitoring of quality issues. 3) Accelerate research and dissemination of evidence-based medicine.

Emerging Resources for HIT Infrastructure Development

HIT infrastructure development is being encouraged through regulatory (e.g., HIPAA) and fiscal policies within numerous federal agencies and at various levels of government. Historically, the federal Health Resources and Services Administration (HRSA) has provided significant resources to rural hospitals through the Critical Access Hospital and Small Hospital Improvement Programs. In Colorado, these programs are administered by the Colorado Rural Health Center. In addition, HRSA's Office for Advancement of Telehealth and the U.S. Department of Commerce have made grants available for infrastructure and service expansion.

Additional infrastructure development initiatives include:

- A FY 2004 appropriation of $50 million to AHRQ for regional HIT demonstration projects, with a FY 2005 budget request for $100 million;
- The Medicare Modernization Act (MMA) included a $50 million authorization for FY 2007 that will provide grants to physicians to implement electronic prescription drug programs and a safe harbor to allow sharing of hardware, software and information technology between health care providers; and
- The Veteran's Health Administration (VHA) with funding and administrative support from the Centers for Medicare and Medicaid Services (CMS) will be modifying its VistA information management system to be available in physician offices as well as other health care providers. VistA, which includes an electronic medical record and computerized provider order entry capacity, will be modified to meet the needs of ambulatory clinics and physicians' offices.[5]

Innovative public-private partnerships have emerged to diffuse the advancement of electronic health information infrastructure into local health care systems. Connecting for Health: A Public-Private Collaborative was launched by the Markle Foundation in 2002 with the goal of identifying and removing barriers to electronic connectivity in health information sharing. Through an extensive collaboration of experts including senior industry and government leaders, and with an initial investment of $2 million, a roadmap was developed for achieving electronic connectivity among health care providers. The roadmap was developed using a consensus decision-making process for developing standards and model systems.[6] The preliminary roadmap recommendations included: creating a technical framework for connectivity; addressing financial barriers; and engaging the public.

To further refine and implement the roadmap, work groups are tackling important issues at a national and state level, including business and organizational challenges and technical barriers. The Robert Wood Johnson Foundation is partnering with the Markle Foundation to make additional resources available for this work. In addition, the Foundation for eHealth as part of its Connecting Communities for Better Health (CCBH) Initiative is providing seed funding and support for communities to develop health information exchange and information technology

tools. The Colorado Health Information Exchange (COHIE) project received one of nine CCBH grant awards.

HIT Defined

HIT is defined as "the application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of health care information, data for communication and decision-making purposes."[7] As a health systems building block, HIT has many and diverse components and terms that are used to describe a broad range of electronic functionality. When discussing efforts to expand HIT, it is important to have a common understanding of these terms and concepts. Appendix A includes a glossary of the most commonly used terms and provides a reference for their use in this paper.

HIT Infrastructure Development at the Community Level

During the last decade, efforts to build HIT infrastructure evolved in the context of health care business transactions, developing standards for electronic data interchange with the aim of administrative efficiency. The first target for this electronic interchange was claims payment systems. Early efforts to expand connectivity among business and health care delivery partners, including community health information networks experienced limited success due to conflicting missions, issues related to control and ownership of data, clarity about joint financing, and the technology itself.

HIPAA has become a catalyst for more widespread adoption of electronic functionality and connectivity. Health care quality improvement is growing as a priority system-level focus among government and private health sectors and, as a consequence, is driving development of HIT infrastructure. Health care purchasers, including employers, government, and increasingly the public at large, are calling for better information about value in the purchase and delivery of health care services. Obtaining actionable information about value requires the availability of reliable data and data systems including access to health records across the continuum of health care services.

Numerous quality improvement initiatives nationally and within Colorado are promoting the development of data systems to facilitate quality measurement and reporting. These initiatives range from electronic claims submission to computerized physician ordering systems, point-of-care decision support systems,

clinical service delivery or telemedicine, email between clinicians and patients, and the complete electronic automation of patient medical records.

There is currently a growing level of activity to promote connectivity among community health care partners in the context of an emerging national health information policy framework. Second generation community HIT models include various forms of information sharing that accommodate unique community needs and culture, existing business relationships, available resources, and individual preferences for transaction partners. Networks include Web-based interfaces and virtual database networks.

Examples of community networks from across the country that have successfully implemented "local health information infrastructures" (LHII) vary in scope and number of network partners. Nancy Lorenzi, PhD, from the Department of Biomedical Informatics at Vanderbilt University, analyzed past and current community HIT initiatives to identify key elements that have contributed to their successful implementation. She identified a tool kit of strategies for local initiatives that she refers to as the LHII Success Strategy Model. This model provides a workable template with which the proposed Colorado HIT Collaborative can promote a statewide effort that builds upon existing local initiatives. [8]

Key Elements Identified in the LHII Success Model

Adapted from the 2003 Lorenzi report, various themes related to leadership, engagement of key constituents, and organizational considerations include:

- Need for strong coordinating leadership and appropriate leadership groups that draw from key constituents.
- Establishing a shared vision that demonstrates community support and shared values among all project partners.
- Active engagement of key partners including strong physician involvement and participation of public health agencies.
- A neutral coordinating partner that is capable of facilitating consensus about technical issues, strategic planning, deploying strategies that focus on collaborative goals, and promoting effective communication strategies.
- Proactive responses to political issues, attention to legal issues, and development of a sustainable funding model.

Case Studies in Successful HIT Collaboratives

Two widely recognized examples of successful local HIT initiatives include the Santa Barbara County Care Data Exchange and the Indianapolis Network for Patient Care. These two case studies, along with other examples described below illustrate how organizational problems can be overcome and describe the key elements that define a successful collaboration.

The Santa Barbara County Care Date Exchange (SBCCDE) is a frequently cited example of a successful HIT collaborative to date. Santa Barbara County has been a pioneer in the development of peer-to-peer networking for clinical data sharing. The SBCCDE began in 1999 with a $10 million grant from the California Healthcare Foundation, which was matched by community organizations and an additional $5 million from CareScience, the software systems partner that was selected to implement the network.[9] CareScience built a comprehensive set of uniform Web service transactions including patient demographics, lab results, medical tests and pharmacy orders.[10]

By the beginning of 2004, SBCCDE had been successfully piloted by 60 physicians with 160 more trained. SBCCDE goals for 2004 include training 280 new clinicians and establishing a revenue model based on contributions from stakeholders.[11] The network solution Clinical Data Exchange (CDE) was released for general availability in May 2004. On July 2, 2004, SBCCDE received a Connecting Communities for Better Health Award that will support provider training, enhanced security verification and replication reports to assist other communities.[12]

The Indianapolis Network for Patient Care (INPC) began as an effort to make electronic medical records (EMR) available in hospital emergency departments (ED) at the point of care. It utilizes a Web-based electronic health record developed by the Regenstrief Institute, a neutral third-party organization. The project began more than 10 years ago when the city's public hospital decided to make its clinical records available to other hospitals to support the information needs of emergency room physicians. Project developers felt that starting with the ED would be a critical first step in mitigating the reluctance of physicians to share their patient data.[13]

The INPC project motto 'Resistance is futile, you will be assimilated' tells a lot about the project.[14] The INPC grew to include all major hospital systems in the Indianapolis area, 85 primary care physicians, 30 public

school clinics and every county and state public health department.[15] The sustainable funding model is based on charging 40 cents per testing facility transaction. This approach was taken when a study found that the average cost to the provider was 80 cents per lab result prior to electronic delivery, and it was calculated that the provider cost would be reduced by 50 percent. With 50 million lab results a year, this resulted in a significant source of funding.

The Indiana Health Information Exchange (IHIE) is a recent extension of the INPC, with the intent to create a statewide uniform and secure electronic data-sharing infrastructure for sharing clinical information. The IHIE received a Connecting Communities for Better Health Award on July 21, 2004.[16] The expansion of the Indianapolis project into a statewide effort demonstrates that a local initiative can spawn a statewide initiative.

The Pursuing Perfection Project in Whatcom County, Washington has taken another approach to revolutionizing their health care system. It chose to address electronic health information related to chronic care management, starting with diabetes and congestive heart failure. System changes include office redesign, outreach through clinical care specialists, and patient involvement at every level of the redesign. The project was funded by a two-year, $1.9 million grant from the Robert Wood Johnson Foundation, matched by $3 million in local provider funds. Perhaps the most significant and unique aspect of this project is its patient centeredness.[17]

The Whatcom Community Health Improvement Consortium developed a Shared Care Plan, which is a Web-based, patient-owned tool that lets patients build a partnership with their health care team online to help manage chronic conditions. Project developers maintain a strong commitment to the medical information system belonging to the community and patients, not to organizations. On July 21, 2004, Whatcom County received a Connecting Communities for Better Health Award to support their e-Prescribing Project.[18] Lessons learned will provide needed information for other communities that move forward with implementation of the e-prescription components of the Medicare Modernization Act of 2003 (MMA).

The Utah Health Information Network (UHIN) is working to "create a secure statewide clinical data network for exchanging discrete portions of the clinical record..."[19] There are currently two active working groups, one focusing on e-prescribing and the other on establishing a central repository for laboratory results. Rhode Island is another state where health care leaders have joined to create the Rhode Island Quality Institute.[20] E-prescribing is a significant focus of the Rhode Island project where SureScripts has created an interface between pharmacy computers and physicians' prescription writing tools. Approximately 70 percent of the state's pharmacies are now prepared to accept prescriptions directly on their computers rather than via fax. Rhode Island and Utah have both applied to AHRQ for funding support to continue building their HIT projects. Another nearby example is Wyoming, which has a legislative mandate (Enrolled Act 31) to study and develop a plan to establish a uniform statewide health information technology system. Wyoming's final report is due in September of 2005.[21]

Evolving HIT Projects in Colorado

A growing number of communities in Colorado are making significant progress planning and implementing HIT initiatives. Colorado has replicated some of these national models, but is also pursuing other home-grown innovations. Summaries of each initiative follow, with components of four projects described more fully in Appendix B.

1. The El Paso County Community Health Partnership has implemented HealthTrack which allows a range of independent health care providers to access a constantly refreshed uniform data store of health care information, as well as the ability to track enrollees through the public benefits programs to which they are entitled.[22] Current functionality includes patient medical visit summaries, community-level statistics, and interagency communication, with a focus on the medically underserved population in the county. Enhancement plans include a system for referring patients to volunteer providers, chronic disease management and, dependent on funding, a fully electronic personal health record.

    Current participants include the El Paso County Department of Health and Environment, Peak Vista Community Health Centers, both local hospitals, faith-based clinics and the El Paso County Department of Human Services. Development of *HealthTrack* began in October 2001. It is a HIPAA-compliant, Web-based system, and current funding is in place to support system enhancements through next year.

The El Paso County Medical Society (EPCMS) is working with Pharma Futures to implement a two-year e-prescribing pilot project.[23] The EPCMS Medical Information Technology committee has been preparing for this pilot for approximately two years. Pharma Futures has provided assistance in evaluating e-prescription vendors and systems, identifying targeted diseases for medication compliance, and soliciting funding for the pilot. Ten physician committee members have pilot-tested the system and are now completing the evaluation of potential vendors. The pilot will soon be implemented and will be conducted over two years with 100 physicians participating. Specific diseases and drug classes have been identified for the pilot that will be evaluated in cooperation with participating health plans and community hospitals.[23]

2. Mesa County is building a local health information infrastructure called the Mesa County Health Information Network (MCHIN). A new not-for-profit private 501(c) 3 organization is being formed to implement the project.[24] The goals of MCHIN are to build an information management system at the population level and to improve patient safety and clinical decision-making.

    Mesa County partners are exploring technology models and products to create a peer-to-peer (P2P) infrastructure that will enable sharing of clinical information without the creation of a single data store. MCHIN is exploring components that are available in modular form as a packaged product from various vendors with the expectation that by the first quarter of 2005 the initial exchange of data will be operational. MCHIN includes multiple participants, including the Mesa County Independent Physician Association (IPA), the local hospitals, pharmacies, health plans, diagnostic centers and more.[25]

3. Weld County is in the process of implementing a patient management and electronic medical record system as part of the Northern Colorado Health Alliance.[26] There are 12 partners involving six entities including Weld County Health Department and the Sunrise Community Health Center. The project will begin implementation this fall, after two years of collaborative planning. The

first phase of system training began on June 15, 2004. The project is implementing the Patient Management (PM) and Electronic Medical Record (EMR) components of GE's Centricity application. Lab interfaces are anticipated to be in place with the initial phase as well. The second phase of the project will expand the number of partners on the system as well as increase other electronic interface capabilities.[13]

4. The Colorado Health Information Exchange (COHIE) is a consortium of health care providers, delivery systems, academic health service researchers, and public and private health agencies (Denver Health, Kaiser Permanente, the University of Colorado Hospital, The Children's Hospital, and the University of Colorado Health Sciences Center (UCHSC)) that will enable clinicians to access patient level information from multiple clinical data repositories at the point of care.[27] This project is guided from the UCHSC Colorado Health Outcomes Program. COHIE recently received a five-year AHRQ grant under the State and Regional Demonstrations in Health Information Technology initiative. Products will include a robust data exchange platform with standard messaging protocols, security, a unified master patient index, and a Web browser. It is based on a peer-to-peer data exchange model that leverages local health information infrastructures already implemented. Deployment of the system is anticipated to begin in the second year of the grant. COHIE also received a Connecting Communities for Better Health Award on July 21, 2004 from the Foundation for eHealth.[28]

5. Several physician groups are entering into arrangements with for-profit vendors and other providers to implement electronic health information exchange networks of various sorts. RMD Systems has implemented the Rose Communication Network over the past year, which includes the Rose Medical Group, Rose Medical Center and Quest Diagnostics. RMD Systems is an example of a for-profit company that enables clinical care partners to join in collaborative information sharing networks including physicians, labs, hospitals, patients and other health care business entities.[29] The business model

provides revenue return to the network sponsor, as additional partners are added, allowing for the development of creative financial incentives. Implementation began this summer for MedSouth, a 300-plus member IPA. Other RMD-enabled networks in progress include the Boulder Valley IPA and the Roaring Fork Community Health Plan. Both of these projects are planning community-wide initiatives to enable interoperability of health information within their geographic regions.

Examples of the functionality included in these types of network solutions include interactions between physician practices, patients and other clinical partners, lab results delivery and exchange, fee schedule look-up, secure contract communications, requests for medical records, clinical follow-up messaging, online scheduling, referrals, medication refills, patient care management logs (e.g., diabetes and chronic heart failure), a patient- and provider-updated PHR. These interactions occur within a secure messaging environment supporting intra/interoffice workflow are being designed to interface with multiple EMR and/or E-prescription systems.

Financial Incentives for HIT Infrastructure Development and Sustainability

Savings and Costs
Implementing HIT involves initial and ongoing expense for all transacting partners. However, the benefits of HIT adoption are cumulative and dramatic. [30] EHR/EMR and computer physician order entry (CPOE) systems can generate substantial savings in health care costs while improving health care outcomes. Estimates of cost savings are as high as $44 billion per year in reducing inappropriate medication prescribing, and radiology, laboratory and inpatient hospital expenditures stemming from adoption of CPOE alone. The net benefit per provider from using EMR systems over a five-year period has been estimated to be at least $87,000 and $330,900 over a 10-year period. [31]

Aligning Incentives
Previous failures associated with community health information networks were, in part, due to the difficulties in making a business case for HIT investments among providers and systems adopting the new information technologies. Misalignment of financial incentives is one of the most often cited reasons for the slow adoption of HIT. For example, physician groups who incur the expense of implementing the EMR may experience net financial loss from the investment as the short and longer-term savings from use accrues to others in the chain of health care transactions (e.g., health plans).

Realignment of financial incentives is frequently posed as the best method for promoting the rapid adoption and dissemination of the EHR, CPOE, and other forms of HIT. A Foundation for eHealth study isolated the strategies different organizations used to provide economic incentives for adoption and use of HIT. [32] These strategies included paying higher rates directly to provider groups and hospitals that implement HIT and paying more for improved patient care outcomes, expanded communication and data exchange. The Connecting for Health: Achieving Electronic Connectivity in Healthcare initiative of the Markle Foundation and the Robert Wood Johnson Foundations proposes that strategies such as implementing fees per patient visit or per member per month can encourage widespread adoption of basic EHR technology even by smaller ambulatory care practices for a relatively low overall cost. [33]

These payment strategies may be particularly attractive for chronic disease management where substantial cost savings can be realized in a short period of time. The business case for HIT adoption may be better for incremental application of technology rather than full implementation of an EHR. Small and medium-sized practices may have greater potential to benefit from HIT but may require more support in order to achieve sustainability. [34]

Large employers who provide health coverage are currently experimenting with alternative incentive systems such as provider reimbursement structures and bonus programs aimed at increasing HIT use and health system efficiency. The current federal HIT initiative will investigate policy options aimed at encouraging the HIT incentives that include:

- Grants and contracts targeted at regions, states, and communities for EHR adoption and health information exchange;
- Making low interest loans available;
- Re-evaluating federal anti-kickback and self-referral rules in light of interoperable HIT that involves relationships among different providers of care; and
- Medicare reimbursement for EHR and other forms of HIT and Medicare "pay for performance" demonstration programs that

would pay providers for the best quality of care rather than for the most care.[35]

Legal, Ethical and Policy Considerations of HIT

Competition in regional markets and legal barriers to sharing confidential information across health care delivery systems remain significant hurdles to the diffusion of HIT. The secure and confidential treatment of patient information is a major concern that must be addressed in all aspects of technical design for new systems of health information exchange. It has implications for all health information transaction partners who will be sharing not only sensitive information about individuals, but also information about providers, quality of care, and financial and business aspects of health care relationships. A host of issues warrant public dialogue related to expectations, protections, policy formulation, and individual and collective behaviors in a new system.

Conclusion

Clearly, considerable momentum already exists within particular communities, and among major Colorado health care entities, to advance HIT infrastructure development. National HIT efforts offer guidance, create momentum, and can help to illuminate the potential roadblocks to HIT infrastructure development. However, significant political and system level hurdles must be overcome to achieve sustainable levels of infrastructure development that, in turn, will result in statewide (and national) health care system transformation, which is the ultimate goal. This is an important time for Colorado to take advantage of the flow of resources, technical assistance, and public policy support available at both the state and federal level.

End Notes

[1] Participants included representatives from the Colorado Medical Society, Colorado Health and Hospital Association, Centers for Medicare and Medicaid Services (CMS) Region VIII, CHI staff, two community-based HIT projects, the Mesa County Health Information Network (MCHIN), the El Paso County Community Health Partnership, El Paso County Medical Society, and Colorado Clinical Guidelines Collaborative. Additional participants included the *Connecting Colorado Communities Initiative – Health Information Collaborative* (C3-HIC), renamed as the *Colorado Health Information Exchange* (COHIE) after receiving a major contract with the Agency for Health Care Quality and Research to establish a local health information network in Colorado, and a Foundation for eHealth grant to connect four Denver area health systems through an Electronic Health Record project. Partners in COHIE include researchers from the Colorado Health Outcome Program and University of Colorado Hospital of the University of Colorado Denver Health Sciences Center, Denver Health, Kaiser Permanente Health Programs, and The Children's Hospital.

[2] The federal Health and Human Services Agency for Healthcare Research and Quality (AHRQ) recently announced up to $139.5 million in grants and contracts to promote use of health information technology. AHRQ earmarked $25 million for state or regional networks and funded the National Health Information Technology Resource Center.

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[24] Personal communication with Curt Hatch, Executive Director of Mesa County Independent Physician Association, Grand Junction, Colorado on June 10, 2004.

[25] Personal communication with Michelle Quigley, FOCUS Technology, Grand Junction, Colorado on June 23, 2004.

[26] Personal communication with Dr. Mark Wallace, President and CEO of North Colorado Health Alliance and Executive Director of Weld County Department of

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Appendix A

Glossary of Common Health Information Technology Terms

Continuity of Care Record (CCR)	The Continuity of Care Record (CCR) is a new standard for a core dataset to be shared when a patient is moving from one provider to another. The standard was created within the standards organization, ASTM International, with the support of the Massachusetts Medical Society, Health Information Management and Systems Society (HIMSS), American Academy of Family Physicians (AAFP), American Academy of Pediatrics (AAP), Patient Safety Institute (PSI), the American Medical Association (AMA), the American Health Care Association (AHCA) and others. The CCR will enable a provider to share a patient's most relevant data such as diagnoses, allergies, medications, etc., to reduce or eliminate "blind" care where the provider doesn't know the most important facts about a patient.[1]
Computerized Physician Order Entry (CPOE)	CPOE is a computer application that allows a physician's orders for diagnostic and treatment services (such as medications, laboratory, and other tests) to be entered electronically. The computer compares the order against standards for dosing, checks for allergies or interactions with other medications, and warns the physician about potential problems.[2]
Data Store	Data Store is a place in a system where data is stored, data at rest. This is a generic term that includes databases and flat files.[3]
Digital Communications and Imaging in Medicine (DICOM)	The DICOM Standards Committee exists to create and maintain international standards for communication of biomedical diagnostic and therapeutic information in disciplines that use digital images and associated data.[4]
E-prescription	Electronic prescribing systems are computerized systems that clinicians use to prescribe medications.[5] The Medicare Modernization Act (MMA) expects the adoption of e-prescribing standards by January 1, 2006. The following must be included:[6] ■ The drug being prescribed. ■ Other medications prescribed to the patient. ■ Information on drug interactions, warnings, or cautions. ■ Dosage adjustments if indicated. ■ Availability of lower-cost, therapeutically appropriate alternatives. ■ The patient's medical history related to the prescribed drug. ■ Drug labeling and listing information. ■ Other instructions related to the appropriate prescribing of drugs.
Electronic Health Record (EHR)	Interchangeable with Electronic Medical Record (EMR), Computerized Patient Record (CPR) and Electronic Patient Record (EPR) for this report. The EHR is a secure, real-time, point-of-care, patient-centric information resource for clinicians. The EHR aids clinician decision-making by providing access to patient health record information where and when it is needed. The EHR can incorporate evidence-based decision support into the patient encounter. The EHR automates and streamlines the clinician's workflow, closing loops in communication that result in delays or gaps in

	care. The EHR also supports the collection of data for uses other than direct clinical care, such as billing, quality management, outcomes reporting, resource planning, and public health disease surveillance and reporting.[7]
Health Information Technology (HIT)	HIT is the application of information processing involving both computer hardware and software that deals with the storage, retrieval, sharing, and use of health care information, data for communication and decision-making purposes.[8]
Health Language 7 (HL7)	Health Level Seven is one of several American National Standards Institute (ANSI) accredited Standards Developing Organizations (SDO) operating in the health care arena. Health Level Seven's domain is clinical and administrative data. "Level Seven" refers to the highest level of the International Standards Organization's (ISO) communications model for Open Systems Interconnection (OSI) at the application level. The application level addresses definitions of the data to be exchanged, the timing of the interchange, and the communication of certain errors to the application. The seventh level supports such functions as security checks, participant identification, availability checks, exchange mechanism negotiations and, most importantly, data exchange structuring.[9]
Logical Observation Identifier and Codes (LOINC)	The Logical Observation Identifier Names and Codes (LOINC®) database provides a universal code system for reporting laboratory and other clinical observations. Its purpose is to identify observations in electronic messages such as Health Level Seven (HL7) observation messages. For each observation, the database includes a code (of which 25 000 are laboratory test observations), a long formal name, a "short" 30-character name, and synonyms. The database comes with a mapping program called Regenstrief LOINC Mapping Assistant (RELMA™) to assist the mapping of local test codes to LOINC codes and to facilitate browsing of the LOINC results. Both LOINC and RELMA are available at no cost from www.regenstrief.org/loinc/. The LOINC medical database carries records for >30 000 different observations.[10]
National Council for Prescription Drug Programs (NCPDP)	The National Council for Prescription Drug Programs, Inc. (NCPDP) is a not-for-profit ANSI-Accredited Standards Development Organization. NCPDP has defined a standard for sending prescription information from pharmacies to payers, for prescription management service, and for receiving approval and payment information back in near real time. They are working on standards for adverse drug reactions and utilization review.[11]
Personal Health Record (PHR)	A PHR is an electronic application through which individuals can access, manage and share their health information, and that of others for whom they are authorized, in a private, secure, and confidential environment.[12] PHR attributes include:

- The individual controls the PHR and access to it.
- The PHR captures a lifelong health record from all sources.
- The PHR is private and secure.
- The PHR is accessible from any source.
- The PHR enables information to be exchanged among providers. |

- The PHR is transparent and contains an audit trail.

SNOMED
systematized
nomenclature for
medicine

SNOMED Clinical Terms (SNOMED CT), created by the College of American Pathologists, is an extensive clinical terminology (>344,000 concepts) that was formed by the merger, expansion, and restructuring of SNOMED RT® (Reference Terminology) and the United Kingdom National Health Service (NHS) Clinical Terms (also known as the Read Codes). It is the most comprehensive clinical vocabulary available in English (or any language), covering most aspects of clinical medicine. It is meant to be complementary to LOINC (Logical Observations Identifiers, Names, Codes), another clinical terminology important for laboratory test orders and results.[13][32]

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Appendix B

Background Information on Current
Health Information Technology Projects in Colorado

El Paso Community Health Partnership Initiative

Key Project Catalysts, Stakeholder and Community Engagement and Readiness

The El Paso Community Health Partnership Initiative has three objectives: 1) to provide more coordinated health care to the underinsured and uninsured population of El Paso County; 2) to allow various health care safety net providers to access and update a common pool of current care information from any of their facilities; and 3) to improve benefits enrollment processes.

Current Project Activities and Future Plans

Phase 1 is complete. Currently deployed are benefit enrollment tracking, medical visit summaries, community statistics, interagency communication, and pending charges information. Modules under development include Volunteer Tracking and Referral Assignment and an automated feed for demographic data. The next phase will include chronic disease management and enhanced security for protected diagnoses with authorization tracking. Discussions are underway to expand the visit summary to include more detailed pharmaceutical data (ideally through an electronic prescribing system) as well as for the visit history to expand to a personal health record (PHR) and/or a full electronic health record (EHR) integrated with Computerized Physician Order Entry.

Funding Source, Business Case Information

The partnership received three years of HCAP funding. Final negotiations are proceeding with the Department of Local Affairs for a short-term grant and discussions are underway with private foundations. Several partners are providing substantial in-kind support. The Partnership is exploring other short and long-term options for funding, but short-term funding is a major concern.

Scope of Community Involvement (Types of partners involved)
Seven partner agencies currently use HealthTrack, including El Paso County Health Department, Community Health Centers, both local hospitals, 2 faith-based clinics and El Paso County Department of Human Services. The full Community Health Partnership remains involved in strategic discussions. Other groups such as School District 2, the homeless coalition, and some agencies in Teller County are either actively pursuing involvement or have expressed interest in HealthTrack. Private offices providing chronic disease management to insured and uninsured clients will use the next phase. Other groups such as pharmacies will be involved as new functionality is designed and developed.

Functionality Included (E-Prescription, CCR Sharing, Billing Information etc.)
Current functionality includes medical visit summaries, community statistics, interagency communication, public benefit application tracking and approval status and some billing information. Custom reports are available to support community-wide decision-making. Volunteer Tracking and Referral Assignment and the ability to have automated feeds of demographic data will soon be functional.

Technical Overview (Data Base vs. Peer to Peer, Web based, Technical Vendors, etc.)
HealthTrack is a web-based application utilizing a SQL database. The server and system administrator are located at the Public Health Department. The Interlink Group, LLC (Englewood, CO) is the software vendor.

Standards Utilized – An interface is being developed that would allow an automated feed of demographic data via HL7 standard formats. Deployed but not used is an ICD/CPT tracking module.

Key Project Catalysts, Stakeholder and Community Engagement and Readiness

The Mesa County Health Information Network (MCHIN) is a combined initiative of Mesa County Physicians IPA (MCPIPA), Rocky Mountain Health Plans (RMHP), the county's two primary hospitals, and other key constituents in the Mesa County health care system.

Current Project Activities and Future Plans

Initial exchange of data is anticipated by 1st quarter 2005. Phase 1 is sharing of a patient clinical data record. This phase will focus on linking existing portals – specifically the Meditech systems from the two hospitals – and adding key data from three additional areas. Pharmacy data will be gleaned from two primary sources, RMHP claims and NDC Health, a transaction clearinghouse between pharmacies and payers. Together they are expected to provide immediate access to historical pharmacy data on nearly 90 percent of the patients in Mesa County.

A significant component of the diagnostic (primarily lab and radiology) data is already available through the Meditech portals. The MCHIN will immediately augment this using: a) claims data from RMHP (excludes clinical values), b) data obtained from Quest Diagnostics (who provides nearly 15 percent of the lab testing in the community, c) clinical information from the lab systems in the offices of key local physician practices, and d) diagnostic radiology and other testing (e.g., cardiology) data from Mesa County physicians' offices.

The final priority will be clinical notes. A variety of different data sources will be tapped to deliver this information including hospital clinical information systems and physician-based electronic medical records. Given that this form of information is much more diffuse and inconsistent in its formatting, accumulation of clinical notes from across the community will be a multi-faceted, multi-year undertaking. Phase 2 will include patient eligibility, and Phase 3 will allow patients to access their own record. Throughout each phase, primary care offices will be assisted in obtaining and implementing EMR systems.

Funding Source, Business Case Information

Rocky Mountain Health Plans (RMHP) and the Mesa County Physicians IPA (MCPIPA) reached an agreement late in 2002 that provided for the formation of what has now been deemed the "RMHP/MCPIPA Healthcare Development Fund." This fund was seeded with a contribution of approximately $2.5 million.

Scope of Community Involvement (Types of partners involved)
The Mesa County Quality Improvement Organization is a newly formed 501(c) 3, non-profit corporation with a mandate for advancing cooperative quality improvement projects in Mesa County. Its founding members include RMHP and MCPIPA, as well as both local hospitals, Hilltop Community Resources (residential care for the elderly), and the local Veterans Administration.

Functionality Included (E-Prescription, CCR Sharing, Billing Information)
Clinicians will have access to detailed patient history and medical conditions, lab results and pharmacy information to assist with clinical decision making. This project is strictly about the sharing of information, creating a countywide patient record that not only includes the information below, but also includes the diabetes registry, immunization registry, and asthma registry:
1. Pharmacy data – from NDC Health and Rocky Mountain Health Plans,
2. Hospital Clinical Data – from the MediTech systems at St. Mary's and Community Hospital,
3. Physician Clinical Data – from ambulatory EMR systems across the physician community (representing perhaps 60% of the PCPs and associated membership in Mesa County),
4. Diagnostic Lab Data – from Quest Diagnostics,
5. Transcription Data – from key providers of transcription services (partial)

Technical Overview (Data Base vs. Peer-to-Peer, Web based, Technical Vendors)
The system foundation is a peer-to-peer (P2P) architecture, which stresses the connection rather than the collection of data. Detailed clinical data will continue to reside on the individual servers of each data contributor (e.g. hospital, lab, physician EMR). This data will be updated in real time by their source systems, which may include billing, EMR, CIS

(Clinical Information Systems) and others in use at that site. These individual data "spokes" are in turn connected to a central "hub" on the Internet, which will be hosted by a vendor, and will house the various centralized applications. Individual users will remotely access the network by means of a secure user interface (UI) that runs through a standard browser.

The core applications that drive the distribution of data include three modules employing several interwoven technology layers. These are: A) the Identity Correlation Service (ICS) for patient identification, B) the Information Locator Service (ILS), and C) the Access Control Service (ACS) Security module. These modules are housed in an ASP format, meaning that the software and associated systems will reside on the Internet, with no local applications to develop and support. The network will be a combination of a peer-to-peer layout, that leaves data in the hands of the originating organizations as they "serve" it up to the MCHIN and a centralized model which will bring certain types of information together to enable more detailed analysis and population-based studies.

The UI is a key component determining the usability of the system and the quality of the physician's experience. It must be underscored that the UI is a "work in progress" that will adapt and evolve to meet the unique needs of Mesa County users. CareScience, for example, has already designed a first-generation UI that is configured to respond to point-of-care, patient-specific inquiries. It summarizes the range of available data elements according to: a) the category of service rendered (e.g. a lab test, a hospital admission, a physician office visit, a prescription), and b) the date of the event. The user must then select the event of interest in order to obtain the necessary detail. This presentation of data is somewhat cumbersome, especially in instances where there are many data elements available on the patient in question. It also suffers from a "one size fits all" approach that is not sensitive to the unique perspective or purpose of the user. The future development of the UI will be a primary focus of MCHIN going forward.

Standards Utilized – HL7 standard.

Northern Colorado Health Alliance Initiative

Key Project Catalysts, Stakeholder and Community Engagement and Readiness
The mission of the Health Alliance is "Expanding access, improving quality, eliminating disparities". The 12 stakeholders had previously come together to form the Health Alliance as a vehicle for formal collaborative projects that provide services to the region's underinsured.

Current Project Activities and Future Plans
PMIS (Patient Management Information System) implemented first and then the EMR. The Weld County Health Department and the main Sunrise Clinic will implement first, followed by Monfort Children's Clinic, the Loveland Sunrise site and laboratory interfaces. Phase 1 includes six sites. Implementation of PMIS began in September, with EMR being added starting in November. Phase 2 will add additional sites and partners to the network.

Funding Source, Business Case Information
Two HRSA grants have been received. Ongoing costs are being prorated between Alliance partners based on the number of patients in the database.

Scope of Community Involvement (Types of partners involved)
There are currently 12 participating agencies, including Weld County Health Department, community health clinics, the North Colorado Medical Center and clinical laboratories.

Functionality Included (E-Prescription, CCR Sharing, Billing Information)
GE Centricity's PMIS and EMR products are being implemented. It is a robust application providing a real time continuous care record (CCR), E-Prescription capability, billing and records management and much more.

Technical Overview (Data Base vs. Peer to Peer, Web-based, Technical Vendors)
GE Centricity PMIS and EMR products are being used. There is a single patient database on a remote server. Access to data will is by Internet for fully participating members with controlled e-mails to information only participants.

Standards Utilized – The GE product follows HL7 standards and has interfaces available to communicate with emerging national standards. An example is that the lab interfaces being deployed in Phase 1 are HL7 compliant.

Colorado Health Information Exchange (COHIE) Initiative

Key Project Catalysts, Stakeholder and Community Engagement and Readiness

The initial stakeholders Denver Health, Kaiser Permanente, The Children's Hospital, the University of Colorado Hospital, the Statewide Network of Colorado Ambulatory Practices and Partners (SNOCAP), the Colorado Community Health Clinic Network and the Mesa County Physicians IPA have a common goal. This is to overcome the unavailability of essential data for clinical decision-making. Each member brings prior knowledge and experience with eHealth to the collaborative.

Current Project Activities and Future Plans

A pilot project is in the contract negotiation stage and when initiated will demonstrate the design's capability by displaying a mock patient's EMR in web format. The data will not be linked, but the capabilities of the design will be demonstrated.

Funding Source, Business Case Information

COHIE received a five year AHRQ grant of approximately $1 million a year. This proposal builds on work from previous grants from AHRQ, the Foundation for eHealth Initiative and other sources. Formal development will begin when the grant is awarded. The grant application contains a detailed five-year project plan with initial deployment beginning in the second year.

Scope of Community Involvement (Types of partners involved)

Denver Health, Kaiser Permanente of Colorado, The Children's Hospital, University of Colorado Hospital, Mesa County HIN, Colorado Community Health Clinic Network and Statewide Network of Colorado Ambulatory Practices and Partners are the initial partners, with statewide expansion anticipated. Several work groups, and a Community Advisory Council will play integral roles to ensure ongoing engagement, input and sustainability.

Functionality Included (E-Prescription, CCR Sharing, Billing Information)

The deliverable is a comprehensive Electronic Health Record available to the health care practitioner at the point service is provided. Pharmacy, laboratory and radiology interfaces are planned.

Technical Overview (Unified Patient Demographic Data Base, Peer-to-Peer Clinical Data Access, Web based, Technical Vendors)

This is a comprehensive peer-to-peer design. A unified master patient index will be developed along with an interface and common vocabulary engines to allow the exchange of clinical information from existing data repositories across the state. The available information from multiple sources will be integrated using Web technologies into a single browser view of available electronic information.

Standards Utilized – HL7 messaging will be utilized whenever possible, as well as LOINC or SNOMED nomenclature. XML messaging will supplement HL7 as needed. NHII recommendations will be incorporated as well.