
**FINAL REPORT TO THE
WYOMING HEALTHCARE COMMISSION,
INFORMATION TECHNOLOGY
TECHNICAL MANAGEMENT SUBCOMMITTEE
ON DEVELOPING A WYOMING
ELECTRONIC HEALTH RECORDS NETWORK**



John Snow, Inc.

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GLOSSARY

ADC	Administrative Data Clearing House
AHRQ	Agency for Healthcare Research and Quality
ASTM	American Society for Testing and Materials
ATP	Administrative Transaction Processing
AVR	Analysis, Visualization, and Reporting
CCD	Common Client Directory
CCHIT	Certification Commission for Healthcare Information Technology
CCR	Continuity of Care Record
CCOW	Clinical Context Object Workgroup
CDA	Clinical Document Architecture
CDC	Centers for Disease Control and Prevention
CDR	Central Data Repository
CHI	Consolidated Health Informatics
CITL	Center for Information Technology Leadership
CMS	Center for Medicare and Medicaid Services
CNS	Centralized Network Services
CORBA	Common Object Request Broker Architecture
CPOE	Computerized Provider Order Entry
CPR	Computerized Patient Record
CPRS	Computerized Patient Record System
CPT	Current Procedural Technology
DHHS	Department of Health and Human Services
DICOM	Digital Imaging and Communications in Medicine
DMR	Digital Medical Record
DNA	Distributed interNet Applications Architecture
DOH	Department of Health
DOQ-IT	Doctor's Office Quality -- Information Technology Initiative
DSL	Digital Subscriber Line
EHR	Electronic Health Record
EJB	Enterprise JavaBeans
EMR	Electronic Medical Record
EPR	Electronic Patient Record
ETL	Extract, Translate and Load
FHA	Federal Health Architecture
GUI	Graphical User Interface
HCPCS	Health Care Procedural Coding System
HDR	Health Data Repository
HIE	Health Information Exchange
HIPAA	Health Insurance Portability and Accountability Act of 1996
HIS	Health or Hospital Information System
HIT	Health Information Technology
HL7	Health Level 7
HPP	Health Passport Project
ICD-9	International Classification of Diseases, Version Number 9
IHE	Integrating the Healthcare Enterprise
IOM	Institute of Medicine
ISA	Internet Security and Acceleration
IT-2	Information Technology Technical Management Subcommittee
JDBC	Java Database Connectivity
JSI	John Snow, Inc.
LAN	Local Area Network

LDAP	Lightweight Directory Access Protocol
MPQHF	Mountain -- Pacific Quality Healthcare Foundation
NCPDP	National Council on Prescription Drug Programs
NDC	National Drug Code
NHII	National Health Information Infrastructure
NHIN	Nationwide Health Information Network
ODBC	Open Data Base Connectivity
ONCHIT	Office of the National Coordinator for Health Information Technology
PDF	Portable Document Format
PHIN	Public Health Information Network
PHR	Personal Health Record
QIO	Quality Improvement Organization
QNET	QualityNet Exchange
RFP	Request for Proposals
RHIO	Regional Health Information Organizations
RLF	Revolving Loan Fund
RPMS	Resource and Patient Management System
SDN	Secure Data Network
SQL	Structured Query Language
SSL	Secure Socket Layer
SSO	Single Sign-on
TSO	Technology Support Organization
URL	Uniform Resource Locator
VA	Veterans Affairs
VHA	Veterans Health Affairs
VistA	Veterans Health Information Systems and Technology Architecture
VPN	Virtual Private Network
WAN	Wide Area Network
WDOH	Wyoming Department of Health
WHCC	Wyoming Healthcare Commission
WTC	Wyoming Telecommunications Council
WWAMI	Washington, Wyoming, Alaska, Montana, and Idaho Center for Health Workforce Studies
WYHIO	Wyoming Health Information Organization

I. EXECUTIVE SUMMARY AND OVERVIEW

A. INTRODUCTION

The State of Wyoming presents a unique blend of geographies that encompass wide-open rangeland, towering mountains, monumental national parks, and weather extremes to match. Due in part to this unique geography, Wyoming, with approximately 500,000 people spread over a little under 100,000 square miles,¹ is one of the most sparsely populated states in the nation. As such, access to needed medical services in the local community can be a significant challenge outside of the major metropolitan areas like Cheyenne, Laramie, and Casper. The State has made an effort to create a new model for providing health care to a largely rural or frontier population, based not on other states' models, but on its own unique dynamics.

The 1990s saw a tremendous shift nationally toward managed care in an effort to stem the tide of rising health care costs, driven largely by the health insurance industry. The last several years have seen a different approach to the problem. In tandem with the opportunity to reduce medical errors and improve safety, traditional approaches to managing health care costs have given way to a *revolutionary* approach to managing health information through the use of technology. Efforts have been made across the country to improve patient safety and quality of care through technology-based solutions that make patient information available at the point of care. With the stated objective of utilizing technology to exchange health care information, collaborative health care partners have sought to achieve such goals as:

- Fewer hospital admissions from the emergency department
- Fewer readmissions
- Reduction in medical errors
- Shortened hospital length of stay
- Enhanced revenue from proper coding
- Test duplication avoidance.²

B. THE WYOMING ELECTRONIC HEALTH RECORDS STUDY

In an effort to accomplish similar goals, the state of Wyoming has sponsored a study that will formalize plans to develop an Electronic Health Records Network. This network will support data exchange among health care constituents across the state. To evaluate the feasibility of such an effort, John Snow, Inc. (JSI), a public health consulting firm with expertise in developing plans for implementing Health Information Technology (HIT), was contracted by the state of Wyoming. JSI conducted a study leading to recommendations for planning, implementing, and sustaining an Electronic Health Records (EHR) network in Wyoming. JSI's work has been guided and informed by the Information Technology Technical Management Subcommittee (IT-2) of the Wyoming Healthcare Commission. This EHR Planning Document (the Report) presents JSI's findings and detailed recommendations for supporting and sustaining an EHR Network in Wyoming.

As used in this discussion, JSI has defined an Electronic Health Record as:

*A comprehensive, historical file of personal health information stored electronically that is compiled from the multiple health care providers treating a patient or evaluating their conditions over the course of that patient's health history. The components of the EHR include, but are not limited to, such things as known allergies, immunizations, laboratory or other diagnostic tests and images, clinical evaluations, diagnoses, current and past medications, procedures history, and treatment plans. These data elements are stored in a secure electronic format that allows **ONLY** authorized providers to access them from a variety of locations at the time needed to make the most effective use of the information.³*

Throughout the study, feedback has been sought from the consumer, provider, payor, and research and academic components of the health system across the state of Wyoming. In collaboration with the IT-2, JSI identified and

¹ United States Census Bureau (<http://quickfacts.census.gov/qfd/states/56000.html>), accessed August 4, 2005.

² Santa Barbara County Care Data Exchange Fact Sheet, February 24, 2005.

³ In contrast to the EHR, an electronic medical record (or EMR) will be used here to mean "an electronic system storing primarily clinical information on patients in a single health care provider office or location."

spoke with over 40 key stakeholders throughout the health sector in Wyoming. In addition, JSI conducted 34 focus groups with more than 110 participants and hosted eight public comment meetings to discuss preliminary recommendations in seven Wyoming communities. The information gathering process consisted of site visits, paper surveys, phone interviews, and group meetings held in various hospitals. From this information gathering process, the following themes have emerged:

- Most patient health information across the state is captured and stored on paper, making access to and exchange of that information difficult.
- There is a wide and significant variation across the state with regard to use of HIT.
- There is a very limited pool of HIT technical staff resources available to support providers.
- Opinions differ with regard to opportunities and the potential benefits of HIT.
- Expectations exist that incentives should be provided (mainly financial) to support the cost of implementing and sustaining HIT.
- Health care groups are looking to the state for guidance with regard to HIT strategy and solutions.
- Broad resistance exists to the idea of any mandated HIT implementation or utilization requirements.
- Consistent, high-speed (broadband) Internet access is a preliminary requirement for electronic health information exchange to take place.
- There is considerable resistance to the idea of creating a *centralized database of personal health information*.
- Moving forward with HIT efforts in the state will require the constant and consistent attention of a central coordinating organization.

These findings suggest that there is both a need to implement and expand the utilization of health information technology throughout Wyoming and that the state of Wyoming will have to actively push and support that effort for it to take place. Today, provider communities across Wyoming do not share a common understanding of HIT and its value relative to improving the quality and effectiveness of health care. Considering this fact, there is little chance that they will adopt HIT rapidly on their own.

C. NATIONWIDE HEALTH INFORMATION TECHNOLOGY CONTEXT

There has been an on-going push in the health care field nationally to improve access to health care information by means of systems interoperability. On July 21, 2004, the National Coordinator for Health Information Technology, David J. Brailer, M.D., PhD, outlined the broad steps needed to achieve ***“always-current, always-available electronic health records for Americans.”***⁴ In doing so, he identified four main goals with a host of recommended attainment strategies and with overlapping spheres of impact:

- Inform Clinical Practice
- Interconnect Clinicians
- Personalize Care
- Improve Population Health

The Office of the National Coordinator for Health Information Technology (ONCHIT) is supporting these guiding principles through the development of a private sector commission to certify health information technology (HIT)

⁴ *The Decade of Healthcare Information Technology: Delivering Consumer-centric and Information-rich Healthcare; Framework for Strategic Action*, July 21, 2004, Department of Health and Human Services.

products, by providing guidance and funding to regional health information organizations (RHIOs) currently developing around the country, and facilitating the development of interoperability standards for HIT. These efforts are part of a larger, long-term plan by ONCHIT to guide the creation of a Nationwide Health Information Network (NHIN). The NHIN envisions connecting with the local and regional health information exchange efforts, which would in turn support the sharing of health information on a national level.

D. THE PROPOSED EHR PLAN

The EHR Study conducted by JSI was initiated and funded by Enrolled Act 31, which was passed by the Wyoming Legislature during the 2004 Budget Session.⁵ In order to accomplish that legislation’s vision – establishment of a uniform statewide health care information and communications system – JSI is recommending a five-year strategic plan which is described in detail in the Report and represented in summary form in Table 1 below. The five-year EHR strategic plan will:

- Establish the leadership required to ensure the EHR project’s success
- Define a set of principles to guide the project
- Ensure that the technology is in place to connect the health care community
- Provide value-based services to maximize participation of health care providers and their partners in electronic health information transactions
- Ensure the long-term viability of the EHR Network.

Leadership	The Wyoming Health Information Organization (WYHIO)			
Principles	<u>Enable</u>	<u>Share</u>	<u>Promote</u>	<u>Manage</u>
	The Wyoming health care community through technology	Health information electronically	Value-based Focused Initiatives	The health information network effectively
Projects	<ul style="list-style-type: none"> • Expand EMR use in private practices • Improve Hospital Information Systems • Enhance Wyoming network infrastructure 	<ul style="list-style-type: none"> • Provide Central Network Services as the hub to connect the Wyoming health care community 	<ul style="list-style-type: none"> • ePrescribing • Continuity of care record • Hospital Portal Gateway • Administrative Transaction Processing 	<ul style="list-style-type: none"> • Technology Support Organization (TSO)

Table 1: EHR Network Strategic Approach Summary

1. The EHR Principles

In order to leverage the potential of the EHR Network in Wyoming and, from a more practical perspective, the success of the initiative, there are several basic principles that must be implemented:

- **Enable:** Provide doctors, hospitals, pharmacies, and other participants in health care delivery with an opportunity to deploy or develop electronic records and care systems within their own practices or institutions. These systems will enable providers to collect and manage health care information more effectively within their organizations.
- **Share:** With internal electronic systems in place, a health care technology network will enable data sharing across health care entities.

⁵ Enrolled Act 31, Fifty-Seventh Legislature of the State of Wyoming, 2004 Budget Session, <http://www.wyominghealthcarecommission.org/pdfs/SF0029.pdf>.

- **Promote:** Sponsor, develop, and deploy Focused Initiatives that serve the needs of patients, providers, public health agencies, and the state. These HIT initiatives will provide opportunities for health care providers to improve patient care and improve the efficiency of their organizations, as well as take advantage of shared services offered through the EHR Network.
- **Manage:** Provide an organization that will support the technology infrastructure of the EHR Network and will manage the administration of the services offered through the network.

These principles, if embraced and implemented as the underpinnings of an EHR Network, provide the opportunity to transform the provision of health care services in Wyoming. They are built on the backbone of the Internet and on uniform agreements between organizations in the way that information will be collected, stored, and shared. JSI believes and recommends that these principles can best be implemented if the state pursues and supports the following EHR Network projects:

2. The EHR Network Projects

a. Implement Enabling Technologies

In order to enable doctors, hospitals, pharmacies and other health care stakeholder organizations to collect and share information electronically, certain enabling technologies must be implemented.

- **Expand Wyoming's network infrastructure:**
Statewide broadband Internet access will allow health care organizations to access and exchange information rapidly. Upon the completion of the Wyoming Telecommunications Council's study (being conducted independent from the EHR Study) on the availability of broadband access throughout the state, Wyoming should evaluate the funding and implementation models presented and quickly determine the most effective means for achieving 100% rapid Internet access.
- **Expand hospital health information system capabilities:**
Wyoming should expand the use of HIT within hospitals to enhance the capture and storage of complete patient health information in a uniform manner. Although the 26 acute care hospitals in Wyoming currently utilize an electronic information system, they range from electronic billing to dictation systems and the data being captured is frequently fragmented throughout the hospital.
- **Enhance the use of EMR systems in community-based practices:**
In order for patient health information to be useful, it must be captured electronically at the point of care. Achieving the proliferation of EMR systems in provider organizations requires formalizing a statewide approach to setting EMR standards, developing a program to implement and support these systems, and providing financial incentives to promote their adoption and use.

b. Develop Centralized Network Services for Sharing Health Information

The Centralized Network Services (CNS) is specifically designed to enable health care entities to share patient information with their colleagues in a uniform, secure, and efficient manner. The CNS performs a critical set of functions that enable the EHR Networks, and consist of:

- A statewide data network for connecting health care organizations and their systems.
- A portal gateway that provides an integrated view of patient data, access to integrated systems, and additional services.
- A master statewide index of health care organizations, providers and patients.
- A data translation and mapping utility that collects, translates, and routes data to and from various systems.
- A data management utility for coordinating data integrity and data access.
- Consistent database architecture for representing data in a standard format.
- An integrated set of privacy and security standards to protect patient confidentiality.

c. Promote the EHR Network through Focused Initiatives

While implementing the Enabling and Sharing projects described above, JSI recommends that Wyoming pursue Focused Initiatives that will provide specific value to health care entities using the EHR Network. JSI recommends pursuing the following Focused Initiatives in this order:

- **Statewide Electronic Prescribing (ePrescribing) Initiative:** Enabling prescribers to write electronic prescriptions and have them rapidly sent to pharmacies.
- **Continuity of Care Record:** Creating an electronic summary of patient health information that would be immediately available to providers in any setting.
- **Local Provider Access to Hospital Information Systems:** Providing easy electronic access by local providers to information kept in hospital information systems.
- **Administrative Transaction Processing:** Provide a claims processing and eligibility checking service for providers that want to process insurance transactions electronically with their payors.

d. Develop a Technology Support Organization (TSO) to Manage the EHR Network

The enormous challenge of implementing an EHR Network across Wyoming indicates the need to sponsor an organization that will support health care professionals, the technology infrastructure of the EHR Network, and the administration of the services offered through the network. The TSO is envisioned as that support organization.

E. THE WYOMING HEALTH INFORMATION ORGANIZATION (WYHIO)

On a very broad level, organizational leadership is required to develop and implement the vision of the EHR Network while also managing the relationships and partnerships among statewide health care organizations that will be necessary to sustain it. As of the date of this project, a number of the key state health care stakeholders have already come together to begin creating the Wyoming Health Information Organization (WYHIO) to meet this obligation. The WYHIO organized as an independent, non-profit corporation, will be a partnership of the multiple entities within the state that have an interest in and responsibility for the EHR Network. As such, the WYHIO will not be beholden to a single group's interests.

The WYHIO will also create and oversee the TSO that will be responsible for maintaining the EHR Network. Options for creating the TSO as a division of the WYHIO with employed staff, or through outsourced vendor relationships should be considered.

F. EXPECTED COSTS AND FUNDING SOURCES OF THE EHR NETWORK

The expected costs of the EHR Network can be considered in two separate categories: specifically, startup costs (implementation) and ongoing support costs (operations). Startup costs will be substantial and the state of Wyoming should expect to make a significant investment in supporting that effort.

Every effort should be made by the WHYIO, however, to pursue supportive grants from federal government and private foundation sources that have been identified by JSI in an ongoing effort to locate resources throughout the EHR Study. In order to sustain the ongoing support costs of the initiative, the enterprise must be supported by a continuing revenue stream that is established through the value based services provided by the EHR Network. **As compiled by JSI through a detailed review of expected initiatives, participation, costs, and timing, the three-year startup costs for a Wyoming EHR Network are estimated at \$77 million, with operational costs of approximately \$13 million per year thereafter.**

1. Startup

The startup phase of the EHR Network will involve the projects described for Enabling, Sharing, Promoting, and Managing the network (see Table 1 above). The startup phase consists of years one through three of a five-year plan. Given the absence of immediately available large grants to support HIT implementation and the resistance of the Wyoming provider community to invest up-front for a return on investment they are likely to realize only in later years, JSI anticipates that the primary responsibility for funding the startup phases of the EHR Network will rest with the state. Every effort should be made by the WYHIO, however, to pursue supportive grants from the federal and

private foundation sources that have been identified by JSI in an ongoing effort to locate such resources during the EHR Study.

2. Ongoing Support

The ongoing support phase of the EHR Network development is where the WYHIO will mature organizationally, particularly in the technical support arena. A key responsibility of the WYHIO will be to ensure that the revenue stream provided by the EHR Network and associated services is adequate to support the EHR Network for the long-term. From a cost perspective, the WYHIO must aggressively pursue a program of cost containment by looking to create economies of scale. Key considerations in those efforts include:

- Utilize existing resources (human and technology) where practical
- Utilize outsourced staff where appropriate
- Commit to enabling technologies to minimize ongoing support costs
- Develop and implement the EHR Network in strategic phases

Establishing and maintaining a consistent and adequate revenue stream to sustain the WYHIO and the Technology Support Organization (TSO) will be a significant challenge. Where many other EHR efforts have stalled is in transitioning from planning and implementation grants and/or subsidies to sustainable revenue streams. It is impossible to predict with a high degree of certainty the speed or level of HIT adoption that will take place among Wyoming providers, which will have an impact on both the cost and revenue sides of the equation. Detailed planning must be undertaken by the WYHIO in order to assess the viability of proposed revenue models. Potential revenue models for consideration in this assessment may include:

- Membership fees for EHR Network users
- Transaction based fees for transaction processing
- Service fees for access to Central Network Services
- Subsidies from payors and/or the state

The following table provides a summary estimate of the costs and expected timing for various components of the EHR plan proposed by JSI:

Initial Summary Estimate of Projected Wyoming EHR Network Costs							
				Enable	Share	Promote	Manage
	Time-frame	Combined	WYHIO	Enabling Technologies	Centralized Network Services	Focused Initiatives	TSO
Start Up Costs:	Year 1	\$ 50,836,680	\$ 486,680	\$ 39,635,000	\$ 2,227,000	\$ 8,488,000	N/A
	Year 2	\$ 14,004,829	\$ 459,829	\$ 9,765,000	\$ 2,003,000	\$ 1,777,000	N/A
	Year 3	\$ 12,386,348	\$ 459,829	\$ 9,765,000	\$ 43,240	\$ 1,777,000	\$ 341,279
Total Start Up Costs:		\$ 77,227,857	\$ 1,406,338	\$ 59,165,000	\$ 4,273,240	\$ 12,042,000	\$ 341,279
Ongoing Costs:	Year 4	\$ 12,751,964	\$ 590,341	\$ 9,765,000	\$ 181,480	\$ 1,777,000	\$ 438,143
	Year 5	\$ 12,614,526	\$ 590,526	\$ 9,765,000	\$ 43,720	\$ 1,777,000	\$ 438,280

As noted above, the revenue picture is more difficult to predict beyond the startup phase of the EHR Network development. Although there are significant resources that are likely to be available from private foundations and federal grant programs to support the EHR Network, it should be recognized early on that the majority of the startup costs will likely be borne by the state of Wyoming. Presented below is a sample representation of likely sources of revenue, based on the assumption that the state will provide a decreasing portion of revenue as the value of the EHR Network services are demonstrated and other sources of revenue are incorporated:

Sample Projection of Wyoming EHR Network Revenue Sources			
	Years 1 - 3	Year 4	Year 5
State	\$ 69,505,071	\$ 6,375,982	\$ 3,153,631
Private Foundations	\$ 3,861,393	\$ 3,187,991	\$ 1,576,816
Federal Grants	\$ 3,861,393	\$ 1,912,795	\$ 1,576,816
Transaction Fees	\$ -	\$ 637,598	\$ 3,153,631
Membership Fees	\$ -	\$ 637,598	\$ 3,153,631
Total Revenue:	\$ 77,227,857	\$ 12,751,964	\$ 12,614,526

The main body of the report provides additional detail on the basis for these cost and revenue estimates.

G. NEXT STEPS IN THE PROCESS

As noted above, organizational leadership is a critical component for the successful development of an electronic health records network in Wyoming. The WYHIO’s development will be a critical factor in determining the success of the subsequent steps taken to build, finance, and sustain the EHR Network. At a meeting in Casper on August 11, 2005, the WYHIO was endorsed by a group of key stakeholders from across Wyoming and an Interim Board of Directors was selected. The next key step for the WYHIO is to identify an Executive Director/Chief Information Officer to become the project’s champion, the public face of the initiative, and to implement the recommendations proposed in the Report. The state should continue to support this to the fullest extent possible in order to maintain the momentum that has been gained.

The State of Wyoming should also review the fully described and documented recommendations provided in the main body of the Report. The Report contains detailed discussions of the Wyoming and national HIT contexts, provides comprehensive yet incremental recommendations on building and sustaining the components of the EHR Network, defines the functional specifications for the network to be built, and includes further discussion and documentation on the methods for developing the budget estimates for creating and sustaining the Wyoming EHR Network.

II. THE GOAL OF INTEROPERABLE HEALTH RECORDS

In the worldwide banking sector it has become commonplace for an individual consumer to be able to access an ever-increasing spectrum of personal financial information from multiple sources, including ATM machines, the telephone, and the Internet. While an individual consumer might reside in a small town such as Pinedale, Wyoming, that individual can travel to Cheyenne, Casper, Laramie, or Denver, Colorado, or even Santiago, Chile, and still be able to withdraw funds from a local ATM and immediately find out what the current resulting balance is in their checking account. Such interconnectedness and real-time information access is commonplace in the banking and financial sector, but far from feasible in the health care sector today. One reason for that is the relatively low level of spending on IT in health care, which is approximately 2.2% of annual revenue, while the financial services industry invests over 11% of annual revenue in IT.⁶

A recent news story presented the case of a 40-year old woman in Indianapolis who was rushed to the local hospital emergency department. All that the attending physician in the ED knew about her was that she'd lost consciousness while waiting to see a provider in the outpatient clinic. Using identifying information from her driver's license the attending physician was able to retrieve an electronic record within 30 seconds that detailed her recent hospital visits and determine that she was a patient with a seizure disorder and had not been taking her prescribed medication. Based on this information, the physician was able to avoid a number of invasive procedures (e.g., inserting a breathing tube), unnecessary medications, and potential harm by providing counterproductive treatment.⁷ This real-life situation of providing effective medical care with real-time health care information at the point of care was facilitated by the on-going efforts of Indianapolis area hospitals and physicians to create links between electronic medical records and to share medical data over secure information networks. It has been an evolutionary process in Indianapolis, which began in 1994 and initially focused on five hospital emergency rooms but has expanded to eventually encompass an additional eight hospitals in the region and over 1,300 community-based physicians. It is just one of many examples abounding across the country in the effort to utilize electronic medical records, build electronic health networks, facilitate the electronic sharing of information (ranging from lab results to x-rays to medical histories), and expanding the opportunity to improve the continuity of care. This is the ultimate objective of creating an interoperable electronic health records network in the state of Wyoming and across the nation.

A. Availability of Personal Health Information Today

In today's health care world, personal health information is typically available in, at best, a fragmented way. For each individual, the likelihood exists that pieces of their personal health information are maintained in the distinct and separate locations where services are provided. For example, when someone visits their primary care physician for a sore throat, a portion of their health record is developed and maintained as a medical record with the doctors' notes on the review of problems, complaints and any tests, surveys or other diagnostic services that are performed as part of the visit, diagnoses, medications currently used or subsequently prescribed, and a recommended plan of care. However, that same medical record will not likely contain the information from the same patient's recent visit to, for example, the dentist, psychiatrist, or even the pharmacist if the prescription was obtained from another provider. This additional health information, while relevant to the patient's total health record and continuum of care, is maintained in a paper form by the service provider, generally at a single location. That record is typically only available during the provider's normal business hours, which frequently do not coincide with the time and location that the health care information is needed.

B. Vision of Electronic Health Records in the Future

In 1991, the National Academy of Sciences' Institute of Medicine joined a chorus of *early adopters* and articulated a vision that called for nationwide implementation of computer based patient records. In 1997, the Institute of Medicine (IOM) updated its report, entitled *The Computer-Based Patient Record: An Essential Technology for Health Care*,⁸ reviewing some of the reasons for the slow adoption of electronic systems in medicine, and reiterating its cost saving

⁶ *Spending Our Money Wisely: Improving America's Healthcare System By Investing in Healthcare Information Technology*, Molly Joel Coye, M.D., M.P.H., et. al., Health Technology Center and Manatt, Phelps and Phillips, LLP, April 2003, p. 12.

⁷ *Sharing Data, Saving Lives*, CIO Magazine, March 1, 2005.

⁸ The Institute of Medicine, 1991 (Revised Edition, 1997). Richard S. Dick, Elaine B. Steen, and Don E. Detmer, Editors. *The Computer-Based Patient Record: An Essential Technology for Health Care*. National Academies Press, Washington, D.C.

and care improvement conviction that such systems would improve health care quality significantly. There are different views of what comprises an electronic medical record. Some of these have been labeled:

- Computerized Patient Record (CPR)
- Electronic Medical Record (EMR)
- Electronic Health Record (EHR)
- Personal Health Record (PHR)
- Electronic Patient Record (EPR)
- Digital Medical Record (DMR)

These are not simply different labels for the same thing, but involve meaningful differences in the type of information they contain, or the way it is stored, formatted or transmitted. In this Report, the term *EMR* is being used to refer to electronic records mostly used in medical offices and other facilities, chiefly created by and for the benefit of health care providers carrying out patient care. The term *PHR* will refer to personal records chiefly created and used by patients to help manage their own care or that of a family member. The term Electronic Health Records (EHRs) is being defined more broadly to refer to records used across organizations involving multiple providers and geographic sites and generally covering multiple episodes of care in a diverse patient population (see initial EHR definition on page 6).

There are a multitude of benefits anticipated for using computerized information systems in health care that can be generalized for any data-driven enterprise. Some of these include:

- Legibility
- Security
- Disaster recovery
- Ease of storage
- Ease of transmission
- Speed and accuracy of data entry
- Speed in searching, sorting and retrieving data
- Access at multiple sites
- Access by multiple, simultaneous users
- Reduction in many types of human errors
- Embedded rules, prompts, calculations, error checking, standards and guidelines
- Display and transmission of graphical information and images
- Ability to organize large amounts of information in retrievable form
- Ability to format reports in numerous ways for different purposes
- Ability to merge data from different sources
- Ability to support complex decision making

More specific health care safety, quality and efficiency issues have been documented and the body of evidence continues to grow. A bibliography of studies evaluating the benefits of electronic medical records and implementing HIT is provided in **Appendix A**.

C. Challenges of the Current System

The potential of a statewide and ultimately a nationwide electronic health record faces a series of challenges that are rooted in the structure of the current health care system in the United States. While these challenges are significant, they will be overcome in time. The Nationwide Health Information Network, as envisioned by ONCHIT, is expected to take ten years or more to develop. Of paramount importance to the success of the Wyoming EHR initiative is ensuring that the incremental development process is implemented to meet defined local needs rather than purely broad national agendas – the value must be defined by the needs of Wyoming. The WYHIO must also ensure that their strategic plan is flexible and adaptable to meet the constantly changing HIT landscape. Sources of the challenges to be faced include:

- **Fragmentation**

The health care system today is extremely fragmented, from both a clinical practice perspective and technological perspectives. Considering the private nature of health care, clinicians are able to define and implement clinical workflows that may be significantly different from their peers. Similarly, Health Information Technology (HIT) systems supporting clinical practice are frequently proprietary from both workflow and technology perspectives. Integrating these systems, or alternatively, offering new HIT standards compliant solutions, will entail an overhaul of today's extremely heterogeneous health care environment.

- **Provider changes required to adopt HIT**

Many providers today, especially those involved in smaller practices, are reluctant to adopt HIT-based systems into their practices. Perceptions are that these systems provide limited value and add a significant amount of overhead to the cost of running a practice. Indeed, HIT systems typically introduce changes to clinical workflow and associated business practices that are particularly disruptive to smaller provider practices. The WYHIO will need to make the case that, over time, the HIT systems will increase efficiencies, reduce the risk of medical errors, and ultimately, enable providers to better concentrate on improving patient care.

- **Costs to implementing EHRs**

Recently published estimates compiled by an expert panel of the cost of attaining a nationwide health information network through technology adoption within 5 years put the collective price tag at \$156 billion.⁹ While these estimates make a host of assumptions that may not be directly relevant to the state of Wyoming and are likely to be widely debated, this estimate bears witness to the magnitude of challenge and the changes in technology adoption required to accomplish a nationwide health information network. From a more local perspective, cost estimates for implementing an EMR system in a physician practice, which would in turn support connectivity to the broader network, is estimated at approximately \$50,000 per provider -- \$25,000 for the hardware and software purchases and an equivalent amount for implementation, training and support. This represents a financial and time investment that many physicians are not willing or able to make without additional incentives.¹⁰

- **Sharing proprietary data**

Health information is stored in a wide range of formats and codes representing diseases, procedures, diagnoses, and other detailed patient information. The proprietary structure of this information relative to the systems in which it is stored complicates the ease with which this information can be shared across systems. While health information technology standards suggest a consistent set of rules for defining, storing, and sharing health information, these rules are not implemented consistently today. Providing methods for exchanging electronic health information utilizing non-standard systems (i.e., that do not comply with relevant HIT standards) is one of the critical components of JSI's recommendations for implementing and achieving the Wyoming EHR Network and should not be underestimated.

- **Data sharing and privacy concerns**

The Health Insurance Portability and Accountability Act (HIPAA) of 1996 provides a consistent framework for sharing electronic health information and protecting patient privacy. That legislation, however, is widely misunderstood and misinterpreted throughout the health care realm. While HIPAA is embraced by some as providing an opportunity to share information through consistent policy and practice, others see it as prohibitive to sharing health information.

⁹ *The Costs of a National Health Information Network*, Kaushal, Rainu, David Blumenthal, MD, MPP, et. al., *Annals of Internal Medicine*, pp. 165 – 173. 2005.

¹⁰ Stand-alone EMR estimate for a 3-physician practice was \$49,837 per provider in the *Partners for Patients Health Record Market Survey*, American Academy of Family Physicians, Center for Health Information Technology, March 2005.

D. The Federal and National HIT Movements

An electronic health or eHealth movement in the health care industry has formed and is driven by several private, public, and private-public initiatives and consortiums seeking improvements in health care through technology. The *eHealth Initiative* and the Markle Foundation's *Connecting Communities* initiative are two prominent examples of public-private collaboratives that have focused attention, funding and resources toward addressing gaps in the electronic health network nationally. They have helped to build the consensus that it's time to establish universal clinical vocabulary and messaging standards to enable technology development that better supports exchange and sharing in a secure environment, that incentives need to be provided on the local level to spur HIT adoption and that collaborative efforts across local and regional communities are the most effective way to pursue interoperable electronic health records and a nationwide health information network.¹¹

Many champions for technology in the health care industry have communicated how important the federal government's leadership role is in the adoption of standards, particularly because the federal government is involved in providing and paying for a large component of the health care services provided in the United States. For example, the Centers for Medicaid and Medicare Services (CMS) accounted for 32% of the \$1.7 billion spent for health care in the United States in 2003.¹² This spending gives the federal government significant influence on the decisions on standards made by the rest of the health care marketplace. An important example of the role that the federal government has played in pushing the secure and private exchange of electronic health information are the Administrative Simplification regulations of the Health Insurance Portability and Accountability Act of 1996 (HIPAA). The mandates under HIPAA for using specific electronic messaging standards for claims submitted to CMS has been almost single-handedly responsible for shifting those claims from paper to electronic format over the last five years.

That said; the federal government has worked to move in the direction of HIT standards by consensus, rather than mandating HIT standards across all segments of the industry. Unlike national health systems being supported in the United Kingdom or Australia, the United States federal government is not anticipating making the primary investments in infrastructure and HIT that will be required to develop the Nationwide Health Information Network (NHIN). It should also be noted the United States government has both an internal role and an external role relative to HIT. For its internal role it has been responsible for standardizing the electronic formats used within and between federal agencies (see details of federal initiatives below). On the external side, (that is in the health care sector) the role has been to promote and encourage innovation, best practices, and consensus. The following quote highlights the federal perspective on the importance of health care information technology and the anticipated role in its expansion:

*"The role of the federal government is to not only set the strategy, but to spend grant money, to encourage the development of regional hubs, and to really get the process started. There will be a certain momentum that will be achieved once the cost benefit becomes aware to everybody that's a practitioner. But the government's role is to help **best practices** get started."*¹³ (Emphasis added)

The federal government's selection of standards and promotion of initiatives has the potential to increase the ubiquity and clarity of standards, a key requirement for developing an EHR in the state of Wyoming. Further, these developments will shape the commercial health information technology markets. Vendors will compete to provide the best value for standardized data collection and exchange, rather than the heterogeneity that currently exists in the private market. A prime example of this approach can be seen in the recent Request for Proposals (RFP) from the Office of the National Coordinator for Health Information Technology (ONCHIT) for *technology architecture demonstration projects* and the ONCHIT-endorsed development of the Certification Commission for Health

¹¹ See The eHealth Initiative's "Connecting Communities for Better Health (CCBH) Resource Center" at <http://ccbh.ehealthinitiative.org/default.mspx> and the Markle Foundation's "Connecting for Health" initiative at <http://www.connectingforhealth.org/>.

¹² *Snapshot: Healthcare Costs 101, 2005*, pp. 7-8, California HealthCare Foundation.

¹³ Source: President George W. Bush discussing the benefits of health care information technology, Cleveland, OH, January 27, 2005.

Information Technology (CCHIT) as “A Voluntary, Private-Sector Initiative to Certify HIT Products” (see additional discussion on these initiatives below).¹⁴

Nevertheless, caution on expectations is in order. Standardization of health information technology is still in a very early stage relative to such industries as banking and finance. The activities of the federal government, though certainly beneficial, do not provide a cookbook that can easily direct any project in Wyoming toward a finished product. Reliance on the federal government’s leadership, without due diligence on each standard selection and promotion activity in Wyoming, may not provide the information required to create a truly interoperable EHR in Wyoming.

More specifically, the involvement of the federal government as an HIT Coordinator is both new and uncertain. Many lofty goals have been put forth, but it remains to be seen how these goals will be achieved. In his 2004 State of the Union address, President Bush called for the creation of an electronic health record for all Americans within ten years. Additionally, ONCHIT was created as a federal agency in the spring of 2004 to implement this vision. Funding for ONCHIT that was promoted by the President early in 2004 on the order of \$100 million was reduced to \$50 million by November 2004 in the Federal Fiscal Year 2005 budget submission to Congress, and then eliminated altogether in the final approved budget.¹⁵ The \$50 million in federal funding to support ONCHIT’s efforts nationally by default limits the potential impact that it can have.

That said, there is a wide scope of federal government standards and initiatives for health information technology that do contain relevance for the Wyoming EHR initiative and they are discussed further below:

- **Consolidated Health Informatics (CHI):** Sponsored by ONCHIT, this initiative is a collaborative effort to adopt health information interoperability standards, particularly health vocabulary and messaging standards, for implementation in federal government systems. About 20 departments/agencies, including the Department of Health and Human Services, the Department of Defense, and the Department of Veteran’s Affairs are active in the CHI governance process. CHI is an integral element of the Federal Health Architecture (FHA) Program.
- **Federal Health Architecture (FHA):** Sponsored by ONCHIT, the FHA is working to create a consistent federal framework to facilitate communication and collaboration among all health care entities to improve citizen access to health-related information and high-quality services. It will link health business processes to their enabling technology solutions and standards to demonstrate how these solutions achieve improved health performance outcomes. It will also provide the ability to identify cross-functional processes, redundant systems, areas for collaboration, and opportunities to enhance interoperability in critical information systems and infrastructures.
- **National Health Information Infrastructure (NHII):** Coordinated by the National Committee on Vital and Health Statistics, this initiative specifies a set of technologies, standards, applications, systems, values, and laws that support all facets of individual health, health care, and public health. The results of this initiative will be embraced and promoted by the CHI and FHA initiatives outlined above.
- **Nationwide Health Information Network (NHIN):** In late 2004 ONCHIT coordinated a request for information to learn how widespread interoperability of health information technologies and health information exchange could be achieved through a Nationwide Health Information Network. Based on the review of the RFI, several federal agencies have recently released RFPs for demonstration projects in these areas:
 - Six 1-year contracts for HIT vendors to develop and evaluate a prototype *Nationwide Health Information Network Architecture*.

¹⁴ See “Strategic Framework” reference at <http://www.os.dhhs.gov/healthit/> and CCHIT at <http://cchit.org/about.htm>

¹⁵ “Healthcare Technology Is a Promise Unfinanced,” Steve Lohr, New York Times, Section 3, page 5, December 3, 2004.

- One 3-year contract to develop, test and evaluate a process to harmonize standards that would make health care IT systems, particularly EHRs, interoperable.
- Forty 1-year contracts to evaluate state laws and business policies on privacy and security that can be roadblocks to health care IT adoption.¹⁶
- **Public Health Information Network (PHIN):** Sponsored by the Centers for Disease Control and Prevention, this initiative defines organizational and staff role definitions, public health database standards, messaging standards, and vocabulary standards to promote the consistent exchange of health information and health-related communications between public health partners. In most respects, the PHIN can be viewed as the public health equivalent of the Nation Wide Health Information Network. It is ONCHIT's expectations that these demonstration projects will provide a number of replicable models that can be adapted elsewhere for facility development of the NHIN.

E. Health Information Exchange (HIE) Initiatives across the country

As part of the EHR Study, JSI reviewed numerous health information exchange initiatives currently underway across the country. In particular, JSI reviewed the scope of these initiatives, organizational structures supporting them, sources of funding, successes, and failures. Some of these initiatives and supporting organizations have been in existence for many years but until recently many have worked in isolation relative to similar efforts across the country; more recent national focus on health systems interoperability has spurred numerous discussions and collaborations. It is incumbent upon the WYHIO to keep apprised of and open to a dialogue with other EHR efforts regionally, such as those in Montana and Colorado, which present the opportunity to expand the impact of an EHR Network.

In the relatively short period of HIE development, the successful HIEs have been marked by a number of factors. A successful HIE has enabled a patient to go to any provider within the geographic region of the HIE and have their historical health information available to the provider that they're seeing at that moment. A key aspect of these successful initiatives is that they have focused on specific data sets, such as discharge summaries or medication histories, thereby minimizing the complexity of the project.

These successes would not be possible without a number of factors. The first is that there has been broad participation of institutions, be they hospitals, providers, specialists, laboratories, pharmacies, and imaging centers. In designing the HIE, the members have ensured that the right people and institutions are involved, while at the same time they have set realistic goals and kept on that focus in order to drive the progress of the organizations.

In support of the HIE, there are organizations that have developed called Regional Health Information Organizations (RHIOs). It appears that the major challenge to RHIO success is being able to demonstrate real value to health care providers. This challenge takes a number of forms. In some cases, a RHIO may have formed, but was simply unable to manage the execution of an actual HIE project. In other cases, a RHIO may have formed and was able to start data exchange in one or more areas, but was not able to achieve growth among a sufficient number of data partners in order to demonstrate to potential partners that there is real value in joining the RHIO. There have also been technical challenges in achieving scalability of a project from a small number of data providers and data users up to a much larger number.

JSI's research also indicates that it is risky to over-reach in what a RHIO can achieve. Grand visions and ideas without the concomitant development of real and useful projects can damage the credibility of a development effort. Having a clear and realistic vision of what will be accomplished is critical to the success of a RHIO. Goals should be developed that are realistically attainable within the specified timeframe and available resources. The goals should focus on projects that no single institution or small set of organizations could achieve alone. In developing the RHIO and a schedule of projects to undertake, early successes are extremely critical in order to demonstrate the viability of the RHIO and its legitimacy in executing larger and more complicated projects. Based on the review of RHIOs that JSI has conducted, achieving measurable progress quickly appears to be very important, as it builds momentum and participation for larger projects.

¹⁶ Presolicitation Notices AHRQ-05-0015, ONCHIT-1, and ONCHIT-2, *Federal Business Opportunities*, posted May 25, 2005 at <http://www1.epls.gov/spg/HHS/PSC/DAM/>.

III. CURRENT STATE OF HIT IN WYOMING

JSI has developed the recommendations provided under the Electronic Health Records Study in the context of the existing health care system in the state of Wyoming. This section of the report reviews the existing HIT supporting infrastructure, the use of technology by the State Department of Health, community-based health care providers and hospitals, as well as other health information exchange initiatives already underway in Wyoming.

One of the key infrastructure considerations for any project exchanging health information in Wyoming is the availability of and access to broadband (high-speed) Internet connectivity. The rapid exchange of high volumes of health care data among partners in Wyoming without access through high-speed connections would not be practical. It is highly likely that any HIE utilizing dial-up or other limited bandwidth access lines would face significant resistance from the users if they were forced to wait for information. Therefore, the work of the Wyoming Telecommunications Council (WTC) under the Broadband Initiative is doubly important for the explorations under the Wyoming EHR Study. The WTC has developed a RFP, selected a vendor, and is beginning to identify the gaps in existing broadband service in Wyoming; delineating alternative broadband services in close proximity to those gaps; and will develop cost models that will facilitate preparing budget estimates for closing the existing broadband gaps around the state. This process will allow the state to make an informed set of recommendations for broadband expansion to support business and economic development across the state as well as to evaluate the recommendations put forth in the Report more effectively.

A. Current Wyoming HIT Capabilities and Initiatives

In order to review the usage of HIT among health care providers across Wyoming and to simultaneously engage key healthcare stakeholders in the EHR study process, JSI worked with the Data Gathering and Research Work Group of the IT2 to develop an effective and time-efficient data gathering approach. While surveys (distributed via mail or e-mail) were considered as an option, it was felt that the availability of accurate and reliable contact information for the state's providers, as well as the expectation that few providers would fill out and return a survey received by mail/e-mail, would result in minimally useful information. An approach that involved a combination of key stakeholder interviews, focus groups and additional outreach to the public was decided upon as the appropriate approach. An overview of the Data Gathering Process and the summary statistics is provided in **Appendix B**.

In January, February and March of 2005, JSI conducted 40 extensive key informant interviews with stakeholders identified by the IT2 and several members of the WHCC. Based on these interviews and further discussions with the Data Gathering and Research Work Group, focus group locations throughout Wyoming were selected that would allow the JSI project team to gather information from a combination of rural and urban communities, large and small hospitals, and across multiple geographic regions in the state. Working with contacts at the hospitals in the selected communities, the Wyoming Medical Association and with the Data Gathering Work Group, invitations to the focus groups were mailed or e-mailed to approximately 492 physicians for whom contact information could be obtained, as well as 477 hospital staff and ancillary providers (including pharmacists). Prior to each of the focus groups, additional outreach to invitees was made via telephone in an effort to increase participation. A total of 35 focus groups with 114 participants were held in the following locations across Wyoming:

Buffalo – Johnson County Memorial Hospital	April 12, 2005 (1 focus group)
Jackson – St. John's Hospital	April 12, 2005 (4 focus groups)
Sheridan – Memorial Hospital of Sheridan	April 12, 2005 (4 focus groups)
Afton – Star Valley Medical Center	April 13, 2005 (1 focus group)
Gillette – Campbell County Memorial Hospital	April 13, 2005 (3 focus groups)
Casper – United Medical Center	April 14, 2005 (5 focus groups)
Riverton – Riverton Memorial Hospital	April 14, 2005 (4 focus groups)
Rock Springs – Memorial Hospital of Sweetwater County	April 14, 2005 (4 focus groups)
Cheyenne – Wyoming Medical Center	April 15, 2005 (5 focus groups)
Cody – West Park Hospital	April 25, 2005 (4 focus groups)

Following completion of the focus groups and a review of the findings by JSI, the project team met with the IT2 in an open forum public meeting in Casper, Wyoming on May 3, 2005. At that meeting, a series of preliminary

recommendations compiled by JSI based on the information gathered to date were presented, discussed and feedback from those in attendance gathered. It was decided during that meeting that it was highly desirable to solicit further input on these recommendations from the public and an additional six public comment meetings were across the state held during May and June of this year with the following details:

PUBLIC COMMENT MEETINGS HELD BY JSI FOR THE EHR STUDY			
Location	Date and Time(s)	Facilitators	Number of Attendees
Casper – Wyoming Oil and Gas Conservation Commission	May 3, 2005 10:00 am - 12 noon; 5:00 p.m. – 7:00 p.m.	Michael P. Rodriguez, JSI Dr. Geoffrey Smith, IT-2	42
Cody – Old Law Library	May 16, 2005 5:30 p.m. – 7:30 p.m.	Michael P. Rodriguez, JSI Steve Mossbrook, WHCC	12
Buffalo – Johnson County Public Library	May 18, 2005 10:00 am - 12 noon	Ann Keehn, JSI Laurie Hansen, IT-2	2
Gillette – Campbell County Public Library	May 18, 2005 5:00 p.m. – 7:00 p.m.	Ann Keehn, JSI Carol Jenkins, IT-2/WHCC	6
Rock Springs – Sweetwater County Library	May 18, 2005 5:00 p.m. – 7:00 p.m.	Michael P. Rodriguez, JSI Dr. Robert Fagnant, IT-2	6
Cheyenne – Laramie County Public Library	May 19, 2005 5:00 p.m. – 7:00 p.m.	Ann Keehn, JSI David Squires, IT-2	12
Jackson – Teton County Library	June 12, 2005 1:30pm-3:30pm	Michael P. Rodriguez, JSI Dr. Joy Lewis, IT-2	2

In an effort to validate the more qualitative findings of the data gathering process, JSI reviewed prior efforts that have been done in the area of identifying the utilization of health information technology among healthcare providers in Wyoming. Over the past few years, several surveys of electronic clinical information systems and/or electronic medical records usage by healthcare providers have been conducted to meet different purposes.¹⁷ While not meant to be scientific, the results of each do provide additional support for the information gathered during the EHR Study and are telling. As the Wyoming Healthcare Commission prepared to launch the EHR Study it conducted a survey in late 2003 to evaluate providers and facilities across the state. It found that approximately 26% of respondents were “currently using Electronic Medical Records (EMR) in [their] office” although their definition of an EMR ranged from ‘electronic patient billing systems’ to ‘dictation’.¹⁸

Another study was conducted by the Wyoming Department of Health as part of its efforts to examine the ability of providers to transmit information electronically to the Immunization Registry it was developing. This survey, conducted in 2004, found that many providers who were currently using electronic information systems were reluctant to participate in the Immunization Registry (discussed further below) due to either the requirement for duplicate data entry or due to the high cost of building an interface between their existing systems and the registry.¹⁹ Thus, while there are electronic health information systems in use across Wyoming, the purposes for which they are used vary widely and barriers identified by providers to their expanded use frequently point to cost. The Mountain-Pacific Quality Health Foundation conducted a survey in the spring of this year in their efforts to identify potential physician practices to target for assistance in implementing EMRs under the Doctors Office Quality – Information Technology program. The preliminary results of this survey indicated that about 15% of the primary care physician practices surveyed in Wyoming are utilizing electronic clinical records systems of some type.²⁰ Each of these results is

¹⁷ It should also be noted that the definitions used between the surveys were also not necessarily equivalent (e.g., “clinical information systems” versus “electronic records.”)

¹⁸ *Doctor IT Survey Results*, Wyoming Healthcare Commission, January 2004.

¹⁹ *AIRA Survey Response*, Wyoming Department of Health, September 15, 2004.

²⁰ *Electronic Discussion with Ms. Jan Bloom*, Wyoming Office Director, Mountain-Pacific Quality Health Foundation, May 26, 2005.

consistent with findings from studies conducted nationally on the level of HIT penetration within primary care practices, which typically cite a range of 10% to 15% of respondents utilizing such systems.²¹

Through its data gathering efforts, JSI has discussed and reviewed HIT initiatives across a variety of health care entities in Wyoming, including, but not limited to, private physician offices, community and rural health centers, hospitals, the Wyoming Department of Health, the Veterans Administration, and Indian Health facilities. Summarized here are some of the key HIT initiatives that have been reviewed through document reviews, interviews, and on-going discussions with key stakeholders.

1. The State Department of Health HIT Initiatives

There are a number of projects that have been initiated by The Department of Health (DOH) over the last five years that provide some important lessons learned for the EHR Study. One of those initiatives was the Health Passport Project (HPP) which sought to distribute and utilize smart card technology – plastic cards containing personal health information on an embedded electronic chip – for social services benefits and for eligibility verification for clients in five key programs: WIC, Immunizations, Head Start, EqualityCare (a blanket name for several programs), and Food Stamps. Following the completion of pilot projects in Wyoming and in spite of significant political support from within Wyoming and through the Western Governors’ Association, for a variety of reasons relevant to the present EHR effort the HPP did not proceed to implementation.

An independent evaluation of the HPP by The Solutions Consulting Group in 2002 found that there were several key risks faced by the project should it move forward. Despite a technology model that had demonstrated its utility, the report noted that certain infrastructure elements need to be developed statewide for the [smart] cards to work effectively. Not surprisingly, they were some of the same factors called out by JSI in the Draft Executive Summary Public Comment document: telecommunications, training and a common client directory.²² Discussed below are some of the ways that these issues are being addressed in Wyoming:

- **Wyoming Health Information System:** For several years, Wyoming has been involved in an initiative that has focused on providing DOH with “better strategic planning and data analysis capabilities through the development of a dedicated system for data collection and reporting.”²³ While attempting to implement the HPP, the DOH ran into the common data integration roadblock of having a significant number of health databases for the many programs that it manages, each containing relevant information on the same client population, without a method for uniquely identifying individuals. In an effort to mitigate this issue, the DOH inventoried its existing databases, found that there at least 84 such databases in existence, prioritized which of these were the most feasible to start with and has proceeded with the development of a process to readily identify and positively correlate clients across programs.
- **Common Client Directory:** Wyoming DOH has been addressing the absence of a unique client identifier through the development of a Common Client Directory (CCD). After prioritizing the databases to begin the cross-referencing process, DOH has conducted an RFP process to select a vendor to build, test and deploy a CCD system. The CCD will cross-reference the different identification schemes for each of the DOH programs so that instances of the same client can be reconciled across systems. This system is being developed by an outside software vendor under a contract with DOH. The CCD vendor has completed the initial phase of the project, with DOH staff training completed, user acceptance in process, and the next phase being the development of the first interface with a DOH database. This initiative is viewed by JSI as an important demonstration project for health information exchange projects in Wyoming and its progress should be monitored by the WYHIO as it proceeds.

²¹ See, for example, *Brief Report of the AAFP’s EHR Pilot Project: Key Learnings from Six Small Family Practices*, American Academy of Family Physicians, Center for Health Information Technology, p. 4, March 8, 2005.

²² *Wyoming Department of Health, Health Passport Project: Assessment and Risk Analysis Report*, Solutions Consulting Group, LLC, p. 4, July 1, 2002.

²³ *Wyoming Health Information System Business Case and Information Technology Plan (Final)*, Wyoming Department of Health, March 19, 2004.

- **Wyoming Integrated Database:** JSI has conducted interviews with Dr. Hank Gardner, President of Human Capital Management Services, who has been engaged by the state of Wyoming in a cross-departmental initiative. Dr. Gardner's mandate is to aggregate and evaluate data provided by the Departments of Family Services, Workforce Services, Employment (including Unemployment Insurance and Worker's Compensation), Health, Corrections, and Administration and Information. The goal of the Wyoming Integrated Database is to evaluate where recipients of services funded by the state are geographically located and to assess cross silos of information to identify when clients are receiving services from multiple agencies. The database is de-identified and being used as a population health management tool to inform and guide the policy making process at the state level.
- **Wyoming Network for Telehealth (WyNETTE):** The Wyoming Network for Telehealth (WyNETTE) is a project funded through a \$1.5 million grant from the Office for the Advancement of Telehealth. The Wyoming DOH is working in collaboration with the Center for Rural Research at the University of Wyoming to jointly manage the program. There are several objectives under this grant, including:
 - Develop distance learning opportunities for physicians
 - Designate and fund telemedicine demonstration sites (e.g., remote consults, home health care monitoring, etc.)
 - Develop a web portal to be an informatics/telehealth resource for the state's physicians, and
 - Provide seminars on medical errors (a component that was added after the grant was funded).

One of the projects that WyNETTE is working on is to bring advanced technology to the clerkship program (residency rotation) at the Washington, Wyoming, Alaska, Montana, and Idaho Center for Health Workforce Studies (WWAMI) in order to encourage physicians to return to rural Wyoming upon completion of their training. The WyNETTE project coordinators have also been involved in facilitating discussions between potential telehealth partners, such as Veterans Affairs and community mental health providers for the provision of telepsychiatry services. Based on JSI's discussions across the state, there is ample opportunity to greatly expand the utilization of telemedicine across Wyoming to facilitate the reduction in gaps of services, particularly regarding access to specialty services.

2. Federally Funded HIT Initiatives

There are a number of HIT initiatives taking place in Wyoming under federal sponsorship. These initiatives present opportunities to combine efforts that have implications for both the Wyoming and national context. Described below are the main initiatives that JSI reviewed as part of the EHR Study:

- **Doctor's Office Quality – Information Technology:** Sponsored by the Mountain Pacific Quality Healthcare Foundation (MPQHF), the Doctor's Office Quality–Information Technology (DOQ-IT) project focuses on improving processes and selecting and implementing HIT, in particular EHRs. Under a contract with the Centers for Medicaid and Medicare Services (CMS) in what's referred to as the *8th Scope of Work*, MPQHF is targeting approximately 5% of Wyoming's primary care practices for assistance in reporting a set of quality indicators back to CMS. The key method for capturing and reporting these quality indicators is viewed as the adoption and utilization of EMRs. In this regard, MPQHF is working to identify 4-6 physician practices in Wyoming, per year, to evaluate for current work flow issues, identify opportunities for changes when implementing an EMR, and to work with them on a consulting basis to encourage and facilitate the implementation of EMRs. The program also provides practitioners with a list of EMR vendors who have agreed to voluntarily ensure that their products meet the quality indicators reporting requirements of CMS. These EMR vendors do not, however, certify that their products currently meet these reporting requirements. It should also be noted that the scope of the DOQ-IT program does not include the distribution of financial incentives nor subsidies to facilitate the HIT adoption process in physician practices.

The primary focus of the DOQ-IT program is to facilitate the collection and reporting to CMS a series of quality indicators that have been defined by CMS. Each DOQ-IT provider participant will be required to report the data elements directly from their EMRs into a centralized data warehouse through the QualityNet

Exchange (QNET), which is the only CMS-approved site for secure communications and data exchange between, for example, providers and QIOs (see www.qnetexchange.org for additional detail). In order to transmit data into DOQ-IT, the EMR system must transmit data pursuant to the Health Level Seven (HL7) Version 2.4 standard. The data consists primarily of patient Observational data related to a physician's practice. From this information, Coronary Artery Disease (CAD), Heart Failure (HF), Diabetes (DM), Hypertension (HTN) and Preventive Care (PC) measures are computed. (See DOQ-IT listing of quality indicators in **Appendix F**.)

- **Department of Veterans Affairs Initiatives:** There are a variety of Veterans Affairs (VA) initiatives that are taking place in Wyoming that are relevant to the EHR Study. These involve national initiatives that the VA is undertaking as well as state-specific initiatives. One of the existing HIT initiatives is the VistA EMR system, known formally as the Computerized Patient Record System (CPRS) of the Veterans Health Information Systems and Technology Architecture (VistA). Rolled out in 1997, this system was developed to provide VA facilities nationwide with an integrated EMR for veterans who receive medical care. The system provides a single interface for health care providers to review and update a patient's medical record and to place orders for such items as medications, nursing orders, special procedures and tests, and diets. A significant limitation and frequent complaint of the system as it is implemented in Wyoming is that patient records are only accessible from within a VA facility and only to VA health care employees. This limits access to information on VA patients who may present in hospitals or other provider locations not connected to VistA.

The VA facilities in Wyoming actually operate as two separate database systems – Sheridan and Cheyenne. Both Wyoming systems report to the regional office in Denver and both are linked to the national VA system, but their electronic patient systems are not directly linked to one another. The Sheridan VA System includes the inpatient facility and approximately 34 providers (MDs, DOs, PAs, and NPs) in five outpatient locations: Sheridan, Powell, Riverton, Casper, and Gillette with plans to add a center in Rock Springs. All Wyoming VA medical centers are on the same version of VistA. The national VA plans to migrate to a centralized health data repository, or HDR. VA users would login directly to the HDR rather than the local networks. Currently each VA system maintains its own local database with access provided through the VA wide-area network.

Sharing patient data between the VA and community providers is currently provided through VistA-produced reports that are printed and sent to the community provider via fax, mail, or hand delivered. Patient reports sent to the VA are scanned into VistA. Almost all prescriptions are filled within the VA health care system, either on-site or through mail order. Prescriptions sent to community pharmacists are usually for short-term supply until mail ordered supplies arrive. The VA is not subject to state laws and therefore is not affected by restrictions on electronic signatures for pharmacy or hospital charts.

Although not being piloted in Wyoming, it is worth noting that an Office EHR version of VistA is being developed and piloted at the present time. Through the VistA-Office Electronic Health Record (EHR) project, CMS is working with the Veterans Health Affairs (VHA) to transfer health information technology to the private sector. CMS is funding and collaborating with VHA and other key federal agencies on the development of a VistA-Office EHR version of the VHA's hospital VistA system for use in clinics and physician offices. An overriding goal of VistA-Office EHR is to stimulate the broader adoption and effective use of EHRs by making a robust, flexible EHR product available in the public domain. VistA-Office EHR was expected to be available August 1, 2005, in order to support the Quality Improvement Organization activities aimed at improving quality in physician offices, but the official release has been delayed. The system will be made available for use by commercial EHR vendors or to be installed directly by health care providers.²⁴ VistA-Office EHR is likely to be widely evaluated on a side-by-side basis with commercial EMR packages for consideration by private practice providers.

While VistA is the most widely known HIT initiative at the VA, there are other significant efforts taking place in Wyoming. Based on discussions with a number of VA technologists, JSI found that the VA facilities in Wyoming have undertaken initiatives that provide linkages of health information outside of VA walls. In

²⁴ Detailed information is available from CMS at: <http://www.cms.hhs.gov/quality/pfqi.asp#Contract>

collaboration with the WyNETTE initiative described above, the VA maintains a telemedicine program to link physicians at the Cheyenne facility with patients physically in Laramie in the presence of a nurse who facilitates the examination. The providers utilize a dermascope for dermatology exams, an electronic stethoscope, and otoscope for ear exams. Another initiative underway is the utilization of a Health Buddy biometric monitoring device which is mailed out to veterans with chronic conditions. The Health Buddy device conducts patient vital signs monitoring and electronically feeds the information back into a central VA database (in Texas), which then feeds the information via an HL-7 interface into the local VistA system. VA providers can then monitor the patients remotely via a web-interface case management system. There are currently about 750 VA patients in Colorado, Utah, and Wyoming (Veterans Integrated Service Network 19) participating in a program to evaluate the system's efficacy in reducing costs and improving quality of care.

- **Indian Health Services (IHS) Initiative – Wind River Indian Reservation:** The Wind River Indian Reservation, the only Indian Reservation in Wyoming, covers an area of more than 2 million acres and serves the populations of the Arapahoe and Eastern Shoshone tribes. Health care services for the Wind River Service Unit are overseen by the Billings Area IHS office and are provided through two outpatient Indian Health Centers staffed by the Public Health Service at Fort Washakie and in Arapahoe. Inpatient and specialty services are provided at off-reservation facilities in the local area.

The Indian Health Service has been using computer technology to capture clinical and public health data for many years. The IHS clinical information system is called the Resource and Patient Management System (RPMS) and its development began nearly 30 years ago in MUMPS, the same programming language as used in VistA. RPMS has long been considered a robust database system, although its user friendliness has been widely debated. Many IHS facilities have access to decades of personal health information and epidemiological data on local populations. The primary clinical component of RPMS, Patient Care Component (PCC), was launched in 1984. The IHS-EHR, which began pilot rollouts in 2004, represents the next phase of clinical software development for the IHS and is an adaptation of the VA's CPRS. While the IHS is frequently compared to the VA as an integrated or closed health care delivery network, they differ in significant ways. The IHS system is comprised of primarily outpatient facilities, versus the mainly inpatient facilities of the VA. In addition, the connectivity for the exchange of patient information between IHS facilities is not nearly as broad as the VA's.

The IHS-EHR graphical user interface application was certified as an official RPMS software application in January 2005 and the Wind River Service Unit has become one of the pilot implementation and testing sites. The system is being rolled out to 40 facilities within IHS per year, with a mandate for all sites to be utilizing it by 2008.

3. Community-Based Health Care Provider HIT Initiatives

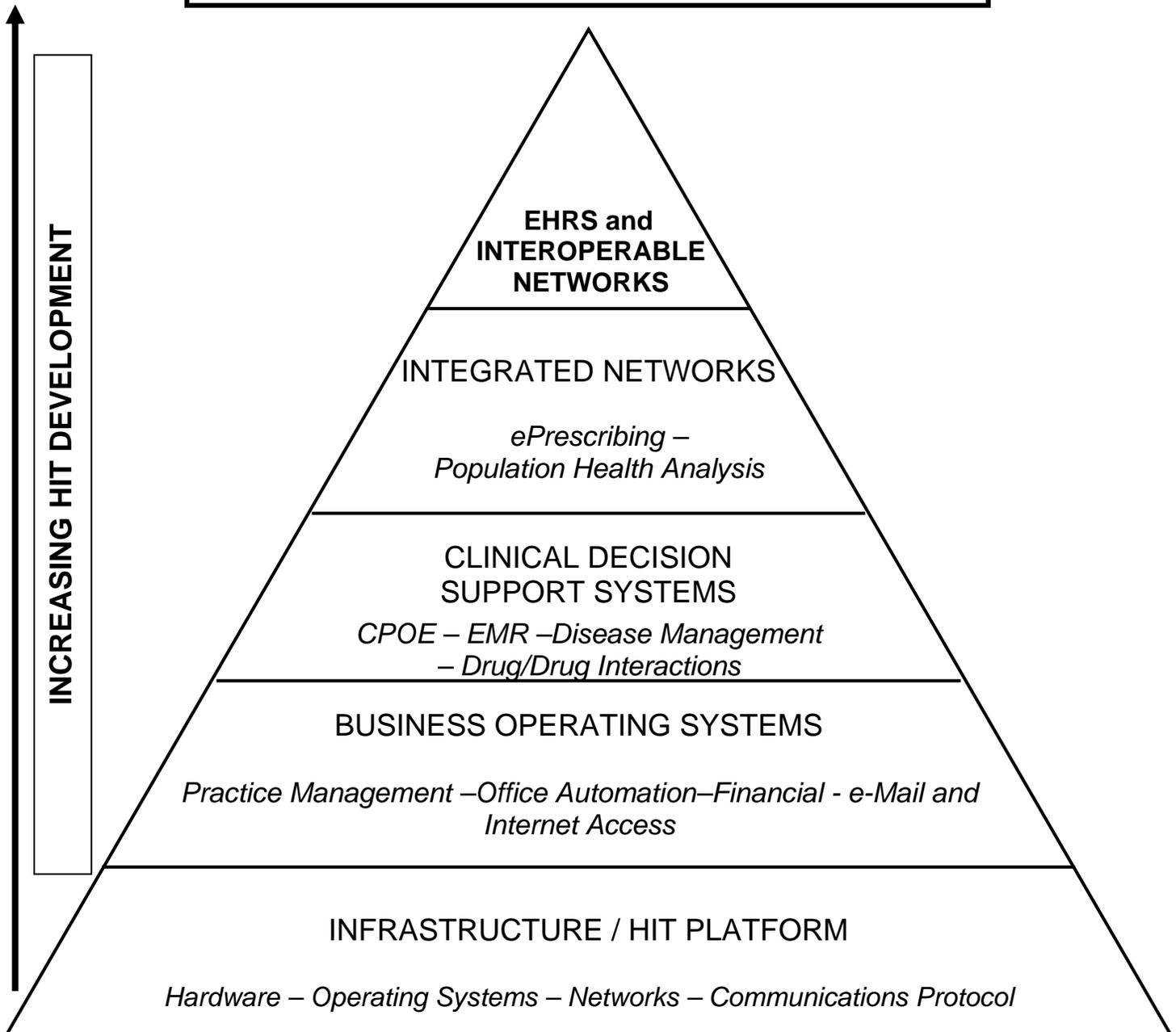
Perhaps the broadest access to health information and potential sources of electronic health information is among community-based providers, private physician practices, community health centers, rural health clinics, and the like. In an effort to identify and evaluate the community-based provider HIT initiatives, JSI relied on numerous key stakeholder interviews, focus groups, and information from other surveys across this sector in Wyoming. As noted below, the push to expand adoption of HIT within this sector provides one of the more significant challenges in achieving an EHR Network in Wyoming.

- **Current Private Physician EHR Capabilities:** In an effort to evaluate the current status of private physician HIT and EHR capabilities in Wyoming, JSI conducted a number of focus groups and individual interviews with physicians, which were supplemented by the surveys referenced above (e.g., WHCC, WDOH, and MPQHF). The physician providers in the state were found to generally fall into four camps regarding awareness and interest in implementing HIT:
 - those that want to implement an EHR and understand their benefits but cannot afford to do so
 - those that would implement an EHR because they believe it is the right thing to do but don't have the time to investigate systems

- those that would implement an EHR if they were told to do so, but do not believe that they improve patient care and/or their practice's efficiency, and
- those that would leave the state or the practice of medicine if forced to use an EHR.

Meanwhile, with regard to their HIT abilities or the abilities of their practices to sustain, support and/or expand HIT, there was also relative uniformity in terms of their distribution across the Interoperability Pyramid, which is presented below as Figure 1. The majority of the state's physician practices fall into the lower sections of the pyramid, with a limited number reaching the higher levels of interoperability.

FIGURE 1: THE INTEROPERABILITY PYRAMID



JSI has found that community-based physicians in Wyoming can generally be placed on a broad continuum of ability, understanding and willingness to implement health information technology tools that will further their missions of providing quality health care services to all patients. They fall into the following broad categories:

- **Level 1 – Slow to Adopt HIT**
- **Level 2 – Stable Infrastructure with Some HIT Adoption**
- **Level 3 – Early Adopters of Technology**

While no two health care provider organizations in Wyoming are exactly alike in terms of infrastructure and technical capabilities, there are a number of common features that allow for these distinct groupings to be made.

Level 1 - Slow to Adopt HIT: JSI has identified an initial group that is very much in need of support and is barely making it into the first level of the Interoperability Pyramid. This is mainly due to their need to make substantial changes to their HIT and/or organizational infrastructure in order to consider planning for new technologies, let alone implementing such systems. JSI has found that each of the organizations in this category has multiple major issues to address before they could focus on planning for HIT. Typically, these health care provider organizations faced some combination of the following issues:

- **Major HIT infrastructure deficiencies and unstable networks:** Computer equipment operating on different program versions is the norm for this group. If they have a local area network (LAN) in place, there are frequent interruptions that result in intermittent loss of data. Backup systems and data recovery programs are non-existent for the physician practices in this realm.
- **In need of significant on-site HIT support:** Generally the HIT support provided in these practices is through an outside help desk on an as-needed basis. There are usually no dedicated HIT support staff; the duties are frequently assigned to the individual in the office who has the most experience/interest with computers, though possessing little, if any, formal technical training. There is typically little, if any, quality assurance done on a routine basis, as gathering the required information is reliant on paper-based systems and is quite time consuming. Data requests without long lead times cannot easily be accommodated in these practices.
- **Very limited experience with and exposure to IT:** Large-scale changes such as system conversions (e.g., moving from a completely manual appointment system to a Windows-based practice management system) can expect to be met with significant organizational resistance. The old way of doing things will be frequently cited as the best way and new technologies will be seen as threatening to staff job security. These provider practices also frequently suffer from the absence of a technology champion.
- **Substantial financial investments in HIT infrastructure required in the short-term:** This group of health care provider organizations is frequently putting out fires rather than planning for the long-term operations of their organization. In order to consider implementing any new HIT system, investment in existing systems requires substantial capital or may require a completely new HIT infrastructure.

Level 2 - Stable Infrastructure with Some HIT Adoption: The largest groups of health care provider organizations that can be found across the state are those who fall into the mid-range of technology savvy. While each of these organizations could begin planning for the implementation of new HIT tools within the next year, it would not be without making adjustments along the way. For the most part, this group will require at least some assistance before they are able to begin implementing new technologies or systems and, in some cases, may require capital investments as well. For the most part, however, the second tier of health care provider organizations does not have major HIT infrastructure issues and are operating on relatively stable local and/or wide area networks (WAN). The middle tier of health care provider organizations typically has the following:

- **Minor HIT infrastructure deficiencies and relatively stable networks:** The LANs, WANs, and information systems at these health care provider organizations typically have better than 90% uptime, can

add new users, workstations, and servers and can connect new provider locations to the existing systems, although delays or disruptions in service are to be expected.

- **Likely to require additional on-site HIT support:** The health care provider organizations in this group have at least some part-time HIT support staff (although not usually more than 1.0 FTE dedicated staff) that are responsible for everything from hardware and software, to training and data gathering. In order to take on new technology, they are likely to need additional HIT staffing and/or outside consulting assistance.
- **Limited experience with and exposure to cutting edge technologies:** Although the HIT staff have had some technical training, they are not likely to have the time to research new technologies or trends, nor to explore new opportunities for the practice. The rest of the staff and providers in this group of physician practices typically have not worked in an institution where EMRs or PDAs were part of the clinical norm.
- **Moderate financial investments required in the short-term:** The health care provider organizations in this group generally have reliable HIT systems and hardware/software that is a few versions behind, thus their infrastructure will require some investments to bring capacity (e.g., data storage capacity, processor speed, etc.) up to the level required for any additions of new HIT.

This group of health care provider organizations is typically found in the second level of the Interoperability Pyramid, but is making an effort to get to the third level. While each of the organization types in the first two classifications has a unique set of circumstances, they typically do not make major annual commitments to investing in HIT, as indicated by the minimal HIT commitments in their operational budgets. Most of the health care provider organizations in these two groups only consider, for example, purchasing new computers when the old ones no longer function, rather than having a plan and budget in place to remain current with the latest technology.

Level 3 - Early Adopters of Technology: The final group in terms of HIT ability is those practices that have embraced information technology and actively seek to incorporate HIT tools into their daily work processes and to leverage them for the improvement of their operations. This group has been designated by JSI as early adopters of technology. Members of this group have relatively few organizational issues that would impede their adoption of new HIT (such as EMRs), save for financial incentives. These early adopters, which make up perhaps 7% to 10% of the total physician practice population, are characterized by having:

- **Solid HIT infrastructures and stable networks:** The information systems at these practices typically have better than 99% uptime; can easily add new users, workstations, and servers and can connect new provider locations to the existing systems.
- **Long-term, stable organizational leadership:** The practices in this category are not typically solo practitioners, but collaborating physicians or group practices. The leadership teams of this group of practices have usually been in place for more than five years or have demonstrated the ability to go through a smooth leadership transition. Practice management is usually delegated to a professional administrator rather than a physician, and there are clear lines of responsibility and accountability.
- **Experience with implementing systems and extensive exposure to IT:** Most of the practices in this classification have gone through either a successful conversion of their practice management systems, upgraded their LANs/WANs and workstations, or implemented other system changes that have required comprehensive project management skills, are actively exploring the adoption of new technologies (e.g., reviewing PDAs or EMRs for applicability to their organization), and have a technology champion somewhere in the organization who sees the future.

- **No major financial investments required to begin a new implementation:** Although there is likely to be some investment required during a new product/system implementation, the majority of these practices do not typically need to make major investments in basic equipment, software or technology support personnel in order to take on a new HIT implementation.

The early technology adopters have usually advanced to the third level of the Interoperability Pyramid and are taking advantage of decision support tools in their daily operations. They may even be involved in sending or receiving health information electronically, such as receiving laboratory results electronically or utilizing hospital systems linked to the local hospital that allows them to view patient charts or test results. Unlike the two previous groups, these organizations are likely to make more robust operational allocations of funds in their annual budgets in the range of 3% to 5% of the total agency budget, while seeking to stay current with their information systems. These are the practices to seek out for piloting projects proposed under the EHR Study.

4. Current Hospital HIT Systems

In addition to the private physician discussions during the focus groups discussed above, JSI worked to evaluate the goals, interests, and current or planned HIT projects at the hospitals throughout Wyoming. These focus groups were supplemented by conducting follow up calls to each of the hospitals in the state that were not host to the focus groups to discuss their HIT systems and projects in more detail. Of the 30 hospitals contacted by JSI, including the 26 freestanding acute care hospitals, the VA Medical Centers, and the specialty care hospitals, only 4 declined to provide information or did not respond to inquiries. A summary overview of the information gathered from these focus groups and telephone surveys is provided in **Appendix C**.

The following discussion provides highlights from the hospital data gathering efforts. Compared with physician practices throughout the state, hospitals generally have more robust health information systems. Based on the focus groups and the follow up telephone discussions facilitated by JSI with the hospitals, all of the hospitals in the state utilize electronic health information systems of some sort. The major issue with these systems is that they are frequently stand-alone systems that do not integrate data from within the hospital, keeping x-ray, pharmacy data, and laboratory tests, for example, in separate databases. While all hospitals reviewed maintained a patient financial management system, which allows them to track patient demographics and financial information (e.g., insurance eligibility and billing information), this information is likely to be disconnected from the other major systems in the hospital, making retrieval of complete patient records significantly more difficult. Typical health information systems that can be found throughout Wyoming include: Admission/Discharge/Transfer (ADT) systems and billing modules; ancillary systems (such as laboratory, radiology, pathology, pharmacy, etc.), bedside monitoring systems, and various departmental systems.

Implementation of Clinical Information Systems varied among the hospitals. Most, but not all hospitals have automated Laboratory Information Systems and Radiology Information Systems, but the systems were often stand-alone systems without a direct interface to each other nor to other existing clinical information, inpatient floor and/or physician office systems. JSI found that the hospitals' Laboratory Information Systems were sometimes connected to their outside reference labs using an interface provided by the reference lab. However, the benefits of electronic connectivity were not fully utilized as lab and radiology results are frequently printed to paper - one copy is faxed to the ordering physician's office and another copy sent to the inpatient floor nursing station.

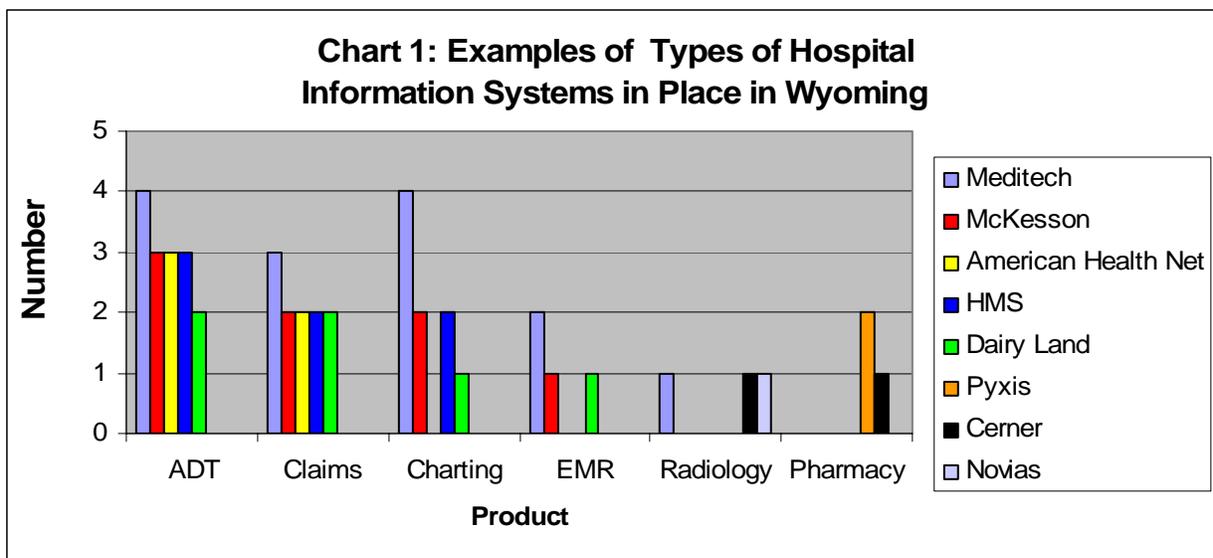
In a classic case of system *non*-integration, one hospital reviewed by JSI contracts with an outside vendor for pharmacy management services but maintains its own pharmacy system for ordering and dispensing inpatient medications. Physicians handwrite orders for medications that get typed by a nurse into the pharmacy dispensing system at the nursing station. The paper order is sent to the pharmacy where it is re-entered into the pharmacy's prescription entry system. Because the pharmacy system is not integrated into the hospital's electronic financial system, patient name and admission number as well necessary clinical information (e.g., weight, blood pressure) must be entered into both systems. The order is checked by the hospital pharmacist for correct dosage, drug interaction, and currency on the formulary, and contacts the ordering physician if there are any issues with the order. The pharmacy system then sends the order back to the nursing station, where the medication number is entered into the dispensing machine (which is like a vending machine) and the appropriate package of medications drops down for

dispensing to the patient. Once the order has been filled the information is sent back through the pharmacy system for billing.

Most hospitals reviewed also offer their hospital staff some sort of an Internet-based portal where physicians can look up results on their sets of patients. In a telling example of the limited vision of HIT’s role in hospitals in Wyoming, not one situation was found by JSI where the local, community hospital could access information electronically from the doctors’ offices, although they had patients in common and the community physicians could access the hospital’s system electronically. Hospital staff that participated in interviews and focus groups saw reaching the top of the Interoperability Pyramid as good and, for the most part, a realistic goal. Cost was identified as the primary constraint for hospitals in moving up the Interoperability Pyramid. Most of the hospitals were working on moving up their own Pyramid, or getting their hospital systems to communicate with one another.

The ability for hospitals to participate in a statewide EHR will be improved if their own systems are integrated or seamlessly interfaced. Currently, patient information typically must be extracted from multiple systems within the hospital and any data sharing utility implemented would need to be cross-mapped to each of these systems. The business plan developed by JSI for a statewide EHR take the hospitals’ ability to share information within and outside of their own organizations into consideration. Investment in hospital systems may be necessary to bring some hospitals in Wyoming up to a baseline of interoperability for all hospitals.

An example of the variety of information technology products that were reported as implemented in Wyoming hospitals to JSI through questionnaires and during discussions with the hospitals is provided in Chart 1 below:



This chart is not meant to be a complete inventory of the hospital systems in Wyoming, merely to convey the breadth and heterogeneity of the hospital information systems reported to the JSI project team. A more detailed summary can be reviewed in **Appendix C**.

B. Takeaways for the Wyoming EHR Study

The findings from the information gathering within Wyoming conducted by JSI show that the state as a whole is in the early stages of HIT adoption and development, both in public sectors and private health care entities. That said, there are a number of HIT initiatives throughout Wyoming that should be highlighted as the state proceeds with the proposed EHR Network initiative. These initiatives will provide demonstrable results for the majority of the state’s health care providers. Included in this category is the IHS-EHR implementation on the Wind River Indian Reservation. There are significant challenges that the state of Wyoming will face as it works to influence HIT adoption across the state. As expressed by the small physician practices in Wyoming, in particular (solo and/or two-physician practices), there will be significant continued resistance to EMR adoption based on the absence of readily-

available capital financing, the required work-flow changes to implement such systems, limited perceived benefits of such a system, and the overriding privacy concerns about electronic health systems.

Some of the statewide initiatives currently being pursued have the potential to provide a greater understanding and adoption of HIT. The CCD project at the Wyoming Department of Health (WDOH) and the Wyoming Integrated Database are poised to demonstrate the practicality and advantages of utilizing HIT to facilitate information exchange for broader purposes than primary care service delivery. While these initiatives are separate and distinct projects, they have the same goal: to allow relevant information stored in disparate databases to be merged, cross-referenced to unique users or clients, and then evaluated for the purpose of improving patient care, identifying patterns, trends, and ultimately a more informed health policy decision-making process. They are working towards many of the same goals as the Wyoming EHR Network: linking disparate silos of relevant health information on the Wyoming population, that when connected, provide significantly more value than when isolated. Continuing coordination with these initiatives will be an important part of developing the Wyoming EHR Network and suggests a key role for the WYHIO.

The Wyoming Immunization Registry through the Wyoming Immunization Program discussed earlier also has relevance to the challenges of the Wyoming EHR initiative. The system was developed for the WDOH on a contract basis and provides the ability for clinicians to query the database for a patient's immunization history, add immunization information on a patient to the system, and to evaluate populations of patients specific to a provider. While there has been widespread acceptance of the utility of the system among provider practices across the state, WDOH found several themes that emerged and which are notably consistent with JSI's findings from the data gathering process:

- The vast majority of the providers are very eager to participate in the reporting process
- Providers with existing robust electronic clinical systems are resistant to the idea of paying for high priced interfaces that would allow systems to electronically share health information, and
- Most providers are strongly opposed to having separate electronic reporting systems requiring duplicate data entry.

Thus, while overall system design and relevance to task at hand are appropriate, the absence of clear financial or other incentives provided by WDOH to Wyoming providers to invest in HIT is a clear challenge that will not be easily overcome. It also provides a warning for the EHR Network initiatives, as the use of HIT adoption incentives will clearly be a key success factor in moving the initiative forward.

IV. PROPOSED HIT PROJECTS

A. Overview

JSI recommends taking a modular approach to building the Wyoming EHR Network. The proposed projects are discussed below and are categorized for discussion purposes in the following manner:

- **Enabling Technologies:** Basic technology functionalities that need to be in place in order for Wyoming health care stakeholders to capture and potentially exchange patient health information.
- **Centralized Network Services:** The centralized utilities that will facilitate many types of data capture, evaluation, and exchange.
- **Focused Initiatives:** Incremental health information projects that will provide value on their own, but also build the Wyoming EHR Network.

B. Enabling Technologies

Patient data must be captured electronically, must be stored in a relatively consistent manner, and a network must be available for interoperability (sharing information across multiple systems) to begin.

1. Extend Wyoming Network Infrastructure

The geography and population of Wyoming have limited the development of a comprehensive, statewide broadband (i.e., high-speed) telecommunications network infrastructure to date. A network infrastructure that will have the capacity to provide high-speed network connectivity across the state to transmit large volumes of health care data is a minimum requirement for the EHR Network project to succeed. In parallel to JSI's work, the Wyoming Telecommunications Council is working under the Broadband Initiative toward identifying the gaps in existing broadband service in Wyoming and delineating options for the state to support redressing those gaps. The recommendations are expected to be completed by September 1, 2005 with the state reviewing options during the 2006 legislative session. As much as is feasible, JSI will cooperate with the Wyoming Telecommunications Council to ensure that network infrastructure requirements for the EHR initiative are met by the recommendations of the Broadband Initiative. A more detailed discussion of JSI recommended minimum bandwidth for various health care providers is provided below.

2. Hospital Information Systems (HIS) enhancements in hospitals

In order to have interoperable electronic health records, patient health data must be collected and stored electronically at the point of care. JSI found that although many hospitals do have electronic information systems, they are not frequently integrated (nor interfaced); creating situations where patient health information is extremely fragmented and duplicate data entry is frequent. In order to address this, public sector and commercially available HIS systems must be assessed relative to the needs of the hospital community and Wyoming's EHR initiative, and a plan must be developed to implement these systems to support the broader initiative. These HIT products must also meet the certification criteria currently being established by the Certification Commission for Healthcare Information Technology (CCHIT), which will include "functionality, interoperability, and security and reliability" standards.²⁵ Providing HIS systems in hospitals at the point of care is a necessary condition for the entire project to succeed.

3. EMR diffusion among community-based providers

As with the hospitals, JSI has reviewed a representative group of ambulatory health care providers in Wyoming and found that the use of Electronic Medical Records (EMR) systems is limited and extremely fragmented. In order to address this, public sector and commercially available EMR systems specific to the needs of ambulatory care providers must be assessed and a plan must be developed to implement these systems to support the broader EHR initiative. Additionally, JSI recommends that the state of Wyoming implement an incentives plan for the

²⁵ See <http://cchit.org/publiccomment1.htm>, Phases I and II Public Comment material on CCHIT's work to date.

adoption of EMRs' in order to spur adoption. The details of this recommendation are outlined in a later section of the report.

C. Centralized Network Services

An integrated set of health systems interoperability utilities is required to optimize the efficient build out and operation of an EHR Network in the state. These utilities must be consistently implemented, sustained, and utilized by the projects throughout the state if the eventual deployment of a statewide EHR is to occur. These utilities will promote interoperability in that they will serve as best practices for health care interoperability projects across the state. Key components include a **web portal gateway utility** to provide single sign-on to integrated systems and associated services, a **data translation and routing utility** for sharing data between systems, a **data management utility** to coordinate the integrity and availability of transactions across the EHR Network, and a **central data repository** that will serve as the standard bearer for EHR content specifications. Further detail of the CNS is provided below in Section V, Centralized Network Services.

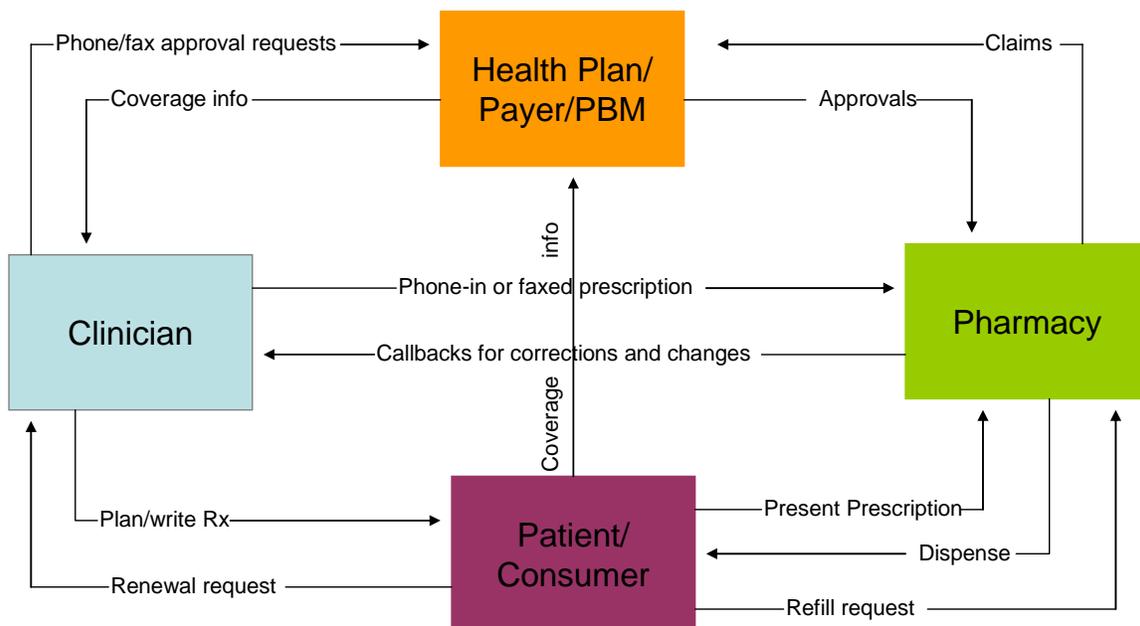
D. Focused Initiatives

JSI recommends that Wyoming implement four specific projects in order to accelerate the utilization of electronic health information and rapidly add value for health care providers and their patients.

1. A Statewide ePrescribing Initiative

According to the Wyoming Board of Pharmacy, there are 139 registered pharmacies in the state of Wyoming. Of the thousands of prescriptions filled every month, many require direct contact between the pharmacy and the provider who signs the prescription for clarification, confirmation or to complete missing information. In addition, thousands of refill requests need to be processed by pharmacies and physician offices, requiring another round of communication. As shown in the diagram from the eHealth Initiatives below, the overall prescribing process can be cumbersome and time consuming.

**Diagram 1: The Overall Prescribing Process:
More Complex than Writing the Prescription and Dispensing²⁶**



²⁶ Source: "Electronic Prescribing: Toward Maximum Value and Rapid Adoption." A Report of the Electronic Prescribing Initiative, eHealth Initiative, April 14, 2004.

With the appropriate electronic infrastructure in place, these communications could be facilitated by automated systems. Based on the feedback from the key stakeholder interviews and from focus groups held throughout the state, Wyoming physicians view electronic prescribing as the single most popular and acceptable medical computing application. Many of them also view it as potentially the most valuable first step toward medical practice automation. Even providers who do not see any immediate value for a full-scale electronic medical record in their practice tend to be enthusiastic about the advantages of electronic prescribing because it promises to reduce some of their office workload.

Sponsoring an ePrescribing initiative will integrate payers, pharmacies, and providers across the country to maximize the availability of medication history at the point of care. ePrescribing is widely implemented through regional initiatives and is supported by accepted HIT standards. An ePrescribing system represents a low risk/high reward opportunity relative to other initiatives that may be considered. The Center for Information Technology Leadership (CITL) estimated that \$154 billion was spent nationally on prescription drugs in 2003. CITL also estimated that as a result of adverse drug events (ADEs), approximately \$2 billion was spent nationally in adverse drug event-related hospitalizations and visits.²⁷

Transmitting drug prescriptions electronically to pharmacies has been shown to reduce errors caused by handwriting and reduce the considerable time currently expended between pharmacies and prescribers in clarifying prescription information.²⁸ In addition, with the cumulative electronic collection of prescription information, it is possible to develop a history of all medications that have been dispensed for an identified patient. This permits automated checking of interactions between drugs – a vitally important patient safety process. Moreover, accurate medication lists can be time and even lifesaving at the point of patient care.

While significant technical, legal and operational issues need to be resolved before a national electronic prescribing plan goes into effect, developing such systems for electronic prescribing is a national priority. The Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (Public Law 108-173) specifies the development of national standards for enabling the exchange of basic prescription data to and from prescribers and pharmacists, as well as standards for information exchanged about a patient's drug utilization history, possible drug interactions, the drug plan (including information about the formulary and cost-sharing), and information about lower-cost therapeutically appropriate alternatives.²⁹

Further, drug utilization data can be valuable for tracking the quality of disease management for some conditions, and is indispensable information for measuring costs of care. Other uses of accurate patient medication lists include facilitating drug alerts and recalls, and identifying abusers. Payers (e.g., Medicaid) who administer formularies with different coverage for different drugs can expect greater compliance when coverage information is available at the time of prescribing. As part of the EHR study, JSI has received positive feedback on ePrescribing from groups of physicians and pharmacists in Wyoming, who tend to view electronic prescribing as potentially delivering significant efficiencies for their daily practices.

Further, recognizing the high value of ePrescribing, a national group of experts has produced a report which provides detail on the value of electronic prescribing, the different levels of systems that can be implemented, optimizing physician acceptance, and potential incentives for adoption. ³⁰ The report also contains guidance for system designs, procurement and implementation steps. ePrescribing should be a high-priority initiative for Wyoming given the high number of real-world models demonstrating an excellent return on both monetary and physician time investments.

²⁷ *The Value of Computerized Provider Order Entry in Ambulatory Settings*, Douglas Johnston, MA; Eric Pan, MD, MSc, and Jan Walker, RN, MBA, *Journal of Healthcare Information Management*, Winter 2004, 18:1.

²⁸ *Impact of PDA-Based ePrescribing Adoption on Medication Safety in Ambulatory Care*, Kimberly A. Galt, James D. Bramble, Ann M. Rule, Mark V. Siracuse, and Wendy Taylor, Creighton University, Omaha, NE, 2005.

²⁹ Medicare Prescription Drug, Improvement, and Modernization Act of 2003, 108th Congress of the United States of America, January 7, 2003.

³⁰ *Electronic Prescribing: Towards Maximum Value and Rapid Adoption*, Electronic Prescribing Initiative, eHealth Initiative, 2004, Washington, DC

2. Continuity of care record

The State of Wyoming and its citizens should jointly encourage their physicians to facilitate the creation of a summary of critical health information for each family member. The continuity of care record (a minimum data set) would primarily be useful to facilitate referrals between providers, but would also be available in emergencies, ensure consistency upon transfer between health care facilities, and for accessing critical health information while traveling. The content of a continuity of care record should be readable by a wide variety of electronic devices (e.g., web browser, word processor, text reader, etc.), be available in printed format.

A summary health record of this kind would *not* be equivalent to a portable EMR, Personal Health Record, or other complete repository of lifetime clinical data. It would only be released at the patient's discretion and would contain limited information relevant to the most recent episodes of care. JSI's recommendations for the basic contents are:

- Information about the primary or referring clinician, and the purpose for creating the document.
- Information that would identify the patient throughout the referral process, transitioning to and from a hospital, clinic, physician's office, or other care setting. There could also be information on next of kin and advance directives.
- Insurance and financial information from which eligibility for insurance coverage might be determined.
- Health information, such as Diagnoses and Conditions; Family History; Social History; Adverse Reactions/Alerts; Current Medications; Immunizations; Vital Signs (e.g., height, weight, blood pressure, temperature, head circumference for infants, etc.); recent Laboratory Results; Procedures; Functional Assessments; as well as other relevant information that the patient and physician choose to include.

If patients and providers are aware that a snapshot of their critical information is available, confusion can be avoided about from where the most recent information needs to be uploaded and where the latest version can be obtained. An electronically stored summary record would also simplify compliance with the HIPAA privacy protections for many providers.

A national effort that has made a great deal of progress in this direction is the *Continuity of Care Record (CCR)* standard. Sample data sets offered through this standard include patient and provider information, insurance information, patient's health status (e.g., allergies, medications, vital signs, diagnoses, recent procedures), recent care provided, as well as recommendations for future care (care plan) and the reason for referral or transfer. The Wyoming continuity of care record data recommended above conforms to the CCR standard, which would ensure that it could potentially be available nationally should the CCR become a national model that is utilized by other health record exchange projects around the country. Individuals are also able to maintain and control their own health summaries as Personal Health Records and should be encouraged to do so.

3. Local Provider Access to Hospital Information Systems (Electronic Hospital Portals)

One of the most ubiquitous HIT initiatives throughout the nation is the provision of easy electronic access by local providers to inpatient information kept in hospital information systems. Common examples of information accessed by physicians include electronic charting, discharge summaries, patient care orders, and laboratory test results. This electronic access saves providers enormous amounts of time and facilitates patient care, as access to the systems is not bound by the need for a provider to physically get to the hospital.

This type of project has been shown to be of value to both physicians and hospitals in Wyoming and across the United States. Technology that can easily enable access to hospital information systems through the Internet currently exists. JSI recommends that Wyoming encourage the expansion or implementation of hospital portals in all hospitals that have clinical information systems. The EHR Network should facilitate the installation of clinical systems for those hospitals that will obtain EMRs, as suggested in Recommendation IV.b.2 above. The

primary task needed to accomplish this recommendation is the discussions between the hospitals and community providers that will result in the identification of specific health information needs and development of system user agreements.

A key consideration for the implementation of this project is: a) the scope of services that the hospital will offer through the portal and b) the number and complexity of hospital information systems that will be integrated onto the portal. JSI has specified two types of portals for consideration. A hosted portal available through the Centralized Network Services would provide a cost-effective solution for smaller hospitals. A stand-alone portal would be implemented and supported by each of the larger hospitals and could provide more services and better systems integration capabilities. For the purposes of this study, JSI assumed that half of the hospitals would implement the hosted solution and the other half would implement the stand-alone solution. A secondary task, discussed further below in Section IV E, is to conduct a detailed review of Wyoming's 30 hospitals to specify their ability to implement such a project. Additional detail beyond that initially gathered by JSI during the EHR Study is required to pursue this initiative.

4. Administrative Transaction Processing

According to the information gathered from interviews with health plans in Wyoming, as much as 30% of all health care claims submitted to all health plans by Wyoming physicians are done by paper-based systems. Within the Medicaid program, about 23% is paper-submitted, representing only 22% of the payments.³¹ By creating and managing an electronic network linking health care providers and payors, Wyoming would provide enormous benefits to both sets of entities by further automating their health care administrative processes. Benefits would include increased business efficiency, increased accuracy, decreased manual inquiries, and increased timeliness of payments and information. Although the primary beneficiaries would be providers and payors, patients, employers, and government insurance programs (as the actual payors for health care) would be secondary beneficiaries. Their benefits would include reduced costs, improved processing timeliness, and the ability to have statewide analytical capability of health care claims.

JSI proposes that the following administrative transactions be included as part of this initiative:

- **Eligibility verification:** Enable providers to check insurance eligibility and manage exceptions before a patient shows up to their appointment. Where appropriate, providers can integrate this transaction into their existing A/D/T and practice management systems.
- **Claims submission:** Submit claims to a single entity, which will route claims to the appropriate payers. Acknowledgements of claims received would be included. This transaction reduces the need for both providers and payers to manage multiple point-to-point interfaces between their business partners.
- **Claims status inquiry:** Enable a single point of inquiry as to claims status. This can also be integrated into providers' billing systems.
- **Electronic remittance advice:** Saves costs for both payers and those providers that can support this transaction, as it reduces mailing costs for payors and saves providers administrative costs by enabling automatic posting of payments in accounts receivable systems.

A single network to support electronic administrative transactions would also provide the opportunity to create a separate and distinct single claims and enrollment repository that could potentially be used by public health researchers and others to investigate, among many issues, health care utilization and costs, relative effectiveness of treatment modalities, and to provide surveillance capabilities on the health of Wyoming citizens in a form not currently available.

The increase in electronic administrative transaction volume in Wyoming would result in reduced manual inquiry and processing costs for payers and providers, allowing reallocation of financial resources to actual health care. By centralizing the processing of administrative transactions, compliance with standards, such as HIPAA transactions, is eased through an expected single uniform implementation of standards throughout the state.

³¹ State Fiscal Year 2005 Data, Wyoming Office of Medicaid, August, 2005.

This initiative has the potential to move Wyoming forward in the overall development of an electronic health record for patients in the state. By providing a strong link between providers and payers, this network would provide an experiential foundation for health care entities to collaborate and develop a single set of goals and standards for processing health care transactions. Wyoming can leverage the expected success in administrative transactions to processing clinical transactions which will lead toward the eventual development of an electronic health record. JSI recommends that this initiative include not only private payors, but self-insured plans, Medicaid and Medicare within the state as well.

The Administrative Transaction Processing (ATP) focused initiative is meant to provide a network service that provides immediate value to the users of the network, prompts providers to establish a network connection to the EHR Network, and just as importantly, provides a consistent revenue stream for the WYHIO. Today, it is estimated that less than 30% of providers process eligibility and claims transactions electronically. JSI recommends a coordinated approach to the EMR Diffusion project, the CNS project, and the ATP focused initiative to maximize the potential of offering eligibility and claims processing services.

In evaluating the viability of this recommendation, specific concerns have been raised by Wyoming constituents. Outlined and discussed below are the specific concerns raised and justifications that JSI has compiled for addressing them:

- *Would this initiative be considered unfair competition with commercial vendors that perform this service?*

As with any business, the WYHIO must implement a valuable service and manage it effectively in order to be successful. Considering the technical nature of the WYHIO's TSO and the breadth of network services being offered, supporting this initiative should be a fairly straightforward endeavor. That said, what competitive advantage might this initiative have over commercial offerings? In the context of the EHR Network, the competitive advantage might be considerable. Ultimately, providers on the network will want to minimize the number and complexity of network connections and vendors they have to manage. Should the WYHIO provide a more complete network connection which in turn provides access to a complete set of EHR Network services, JSI believes that the statewide value proposition will be compelling.

- *Considering the fragmented nature of the payor environment across the state, how can an efficient ATP system be implemented?*

Fragmented certainly describes the current state of the health information systems on a national and even local level. HIPAA has had an immediate impact on the capacity of health care providers and their business associates to share health information (especially claims and eligibility transactions) in a consistent manner. The health information technology standards promoted by this report and national standards setting organizations are other indicators that suggest that the fragmentation issue will be moderated and that integrated systems will be more prevalent in the coming years. Considering the pervasive nature of claims processing across health care entities of all types, it is reasonable to expect this issue will be resolved most quickly in the claims processing and eligibility verification environment.

- *Are there legal issues with the WYHIO providing this service as a non-profit (as opposed to the for-profit competition)?*

While the WYHIO is strongly encouraged to solicit a legal opinion on this issue, JSI's experience has been that a non-profit entity can offer services in direct competition with for-profit counterparts as long as services are priced competitively.

- *Could the WYHIO, as a single provider of eligibility and claims processing services, be seen as a monopoly?*

The ATP service will not be in the position to become a monopoly. Specifically, the WYHIO will implement a set of business practices to *promote* the likelihood that competing vendors would connect through the EHR Network in order to offer their services, if that approach improved the capacity of the EHR Network to process and/or capture health care data. The WYHIO should offer to route

transactions through the EHR Network from the provider to their claims processing or other vendors if the provider wants to utilize a third party vendor's service. The benefit of the EHR Network to the entire public is that the transactions can be captured for other purposes. The benefit to the provider is that it minimizes the number of network connections they have to support. The benefit to the vendor is that they may offer services to a group of clients whose integration requirements are made more consistent through the EHR Network.

While these are valid concerns that may ultimately restrict the scope or even discount the viability of this focused initiative, they should be addressed by the WYHIO as the project is reviewed and considered for implementation. Minimally, if offering administrative transaction processing services is impractical, the WYHIO should still take steps to capture administrative transactions as they represent a dataset that contains valuable health information on patients and is most often relative to other datasets that are shared electronically by health care providers today.

F. Constraints to be Addressed

The data gathering conducted by JSI has facilitated the compilation of a number of constraints that must be addressed by the recommendations put forward above and during the coming phases of this project. The constraints have been categorized into: cultural constraints, financial constraints, systemic issues, technological issues, and legal and privacy concerns.

1. Cultural Constraints

The citizens of Wyoming may be characterized as fiercely independent, with a strong desire for privacy and minimal intrusion from state and federal agencies. This collective personality of both the citizens of Wyoming and the health care professionals working in the state will have a significant impact on how and if the EHR Network is considered and eventually adopted. An example of this is the limited number of collaborative efforts that JSI has found through the focus groups and interviews. While there are several examples of robust HIT initiatives that focus on pushing health information into electronic formats where it can be utilized from remote locations (e.g., Casper Radiology) there are few examples of multiple provider practices engaging in the electronic exchange of health information.

From a project perspective, the concerns that providers have with engaging in such collaborations must be specifically addressed through a series of initiatives that minimize the risk associated with this constraint.

- Ongoing public engagements that solicit opinion from the public as well as health sector professionals.
- Implementation of structured information-sharing with both the public and health sector professionals, including documented health care benefits of electronic health records, as well as missed opportunities and risks for maintaining current manual paper medical records.
- Adoption, promotion, and strong accountability of and to applicable health care standards associated with patient privacy and security.

2. Financial Constraints

The potential benefits of an Electronic Health Record Network from a valued services perspective will not be felt for several years. Furthermore, the ultimate goal will only be obtained through having a critical mass of providers, as well as a series of overlapping health information exchange initiatives working collectively toward information sharing. These considerations suggest the need for significant capital funds to support the individual projects, the build-out of the infrastructure, and potentially the ongoing support of the network components. Collectively, the entire project will certainly cost several million dollars to implement and sustain. As with any complex, long-term project, this suggests a significant demand for processes associated with obtaining and managing funds, but more importantly, the effective allocation and use of those funds to ensure that the goal is attained in a cost-effective manner.

From a project perspective, these concerns can be addressed through a series of organizational initiatives that minimize the risk associated with financial constraints:

- An organizational body that is responsible for the network must be created.
- A strategic business plan must be developed and maintained.
- A team responsible for soliciting and managing funds must be formed and sustained.
- A technology plan describing the technology infrastructure, support requirements, and phased build-out through iterative steps must be defined and supported.
- Cost and revenue models for all initiatives must be defined, approved, and implemented.
- A financial incentives model must be developed to encourage the further adoption of HIT in both the ambulatory care and inpatient provider settings.

These aspects will be addressed in detail in Section VI, Business Plans.

3. Systemic Issues

There are a significant number of systemic issues that Wyoming must overcome in order to implement an EHR Network. These issues must be incorporated into the plans developed and recommendations put forth. Outlined here are the issues brought to JSI's attention during the information gathering process of the EHR Study and which are most salient for the project:

- Majority of medical practices are small
Regardless of the survey source, all indications are that the vast majority of Wyoming physicians operate in small practices of one or two physicians. As noted earlier in the summary of Wyoming provider settings, the primary implications of this dynamic for the EHR Study are that these providers have significantly less working capital for major information systems purchases, have less time to evaluate and pursue any desired HIT applications and tools, and are supported by fewer and less technology-savvy support staff. Any implementations are likely to have a significant impact on practice workflow in terms of lost productivity, particularly in beginning of implementations, making it much less likely that these providers will want to pursue the adoption of HIT on their own. This hurdle must be addressed through the expansion of technology support to such practices, provision of educational opportunities around HIT (in particular through distance-learning modalities), and financial incentives to spur adoption.
- Majority of hospitals have fewer than 100 beds
As with the small provider practice dynamics, the small size of the hospitals in Wyoming has a significant impact on the availability of capital for investment in hospital information systems. Additionally, most of the hospitals in the state are not part of a national hospital chain and are thus not supported by a central technology team.
- Relative physician shortage and high out-migration for care
As noted earlier, the rural nature of Wyoming and issues such as low population density have contributed to a physician shortage relative to other parts of the country. According to data compiled by the Henry J. Kaiser Family Foundation, Wyoming had approximately 195 physicians per 100,000 population in 2003 – third lowest in the country – compared to a national rate of more than 280 physicians per 100,000 population.³² This physician shortage has a significant impact on the rate of patient out-migration for care, particularly for specialty services. During the information gathering process, JSI was frequently told of several month wait times in many communities to see high-demand specialists, particularly urologists, cardiologists, and psychiatrists, leading patients to seek care in neighboring states. This anecdotal information was supported by data from the Wyoming Integrated Database which indicated that up to 19% of both inpatient and outpatient health care services received by Wyoming residents are provided in locations outside of the state.³³ This out-migration for care also indicates that a significant portion of the health information on Wyoming patients resides in health care organizations outside of the state.

³² *State Health Facts: Rate of Nonfederal Physicians per 100,000 Population, 2003*, Henry J. Kaiser Family Foundation, July 1, 2003.

³³ *JSI Summary of Data Analysis from the Wyoming Integrated Database*, June 7, 2005, provided by Health Capital Management Services.

- **Market considerations for HIT vendors**
With the low numbers of physicians and hospitals in Wyoming and the absence of concentrated groupings, the marketing costs for HIT vendors is significantly higher. There are a limited number of opportunities for HIT vendors to market to large numbers of providers. The annual Wyoming Medical Society meeting and Wyoming Hospital Association meeting provide the primary venues to reach more than a single potential client at a time. In general, HIT vendors tend to concentrate their marketing efforts on higher-impact opportunities making opportunities for Wyoming providers to review HIT systems more difficult.
- **HIT training and education gap**
Significant feedback was received by Wyoming focus group and interview respondents on the limited opportunities for HIT training and education opportunities in the state of Wyoming. Not surprisingly, this was correlated with an expressed shortage of available HIT support staff among providers in the state.

4. Technological Issues

Ultimately, the effective implementation of an Electronic Health Record Network requires the pervasive – and just as importantly – consistent use of technology across the health care environment. Specific concerns identified through the information gathering process found a relatively low penetration of HIT in physician practices, limited electronic exchange of health information, low level of integrated HIT models, provider frustration with technology-based systems, extremely fragmented or inconsistent software applications such as EMRs even within specific focus areas, and finally, fragmented network infrastructure across the state. The following is needed to ameliorate these technical issues.

- A technology plan that describes the proposed technology infrastructure, support requirements, and phased build-out through iterative steps must be defined and supported.
- A technology champion or architect of the network should promote the ultimate potential impact of the EHR Network, but more importantly, understand and promote the process of creating the network.
- Redundant technology infrastructure and support requirements must be identified and if not eliminated, at least minimized.
- Opportunities to take advantage of established solutions must be favored.
- Collaboration with similar organizations must be considered, whereby technology-centric planning, software development, and project management costs can be shared.
- Relationships with established health care institutions must be cultivated to promote cost sharing relative to the development of the network.
- Varying HIT standards that have been adopted within the state among the participating stakeholders must be evaluated in detail and harmonized.
- Health information exchange initiatives within the state, particularly those that are funded independently of the EHR project, should be embraced.

5. Legal and Privacy Concerns

On a national level, there are significant concerns from the public as well as health care professionals regarding the potential of an electronic health record network. Specific concerns include fear of liability, unresolved privacy and security issues, identity authentication, and inconsistent interpretations of some relevant privacy statutes. Although there has been a benefit to national regulations concerning health care patient privacy and security through HIPAA, there have also been multiple interpretations of HIPAA rules as they have begun to be implemented. These issues are further complicated in the state of Wyoming by the cultural and systemic issues discussed above. These challenges will be resolved by engaging in at least the following tasks:

- Establishment of comprehensive and consistent interpretations of HIPAA and other relevant patient privacy and security statutes.
- Formalization of data sharing agreements among providers within specific initiatives.
- Implementation of robust system security monitoring and auditing protocols for all technology solutions.

F. Project Timing and Dependencies

JSI recommends that the enabling technology and centralized network services projects be implemented prior to the Focused Initiatives. The justification for this is fairly obvious given that the Focused Initiatives won't be available to network users if these prerequisite technologies are not in place.

One exception to this approach will be the timing and scope of the HIS diffusion-enabling technology project. Considering the potential cost of this project, the assessment of hospital HIT capabilities and any subsequent recommendations for enhancements should be made within the specific context of the centralized network services and the Focused Initiatives. This approach will ensure a cost-effective and appropriate enhancement to hospital systems based on the specific requirements of the EHR Network.

In terms of focused initiative priorities, JSI recommends that ePrescribing, continuity of care record, and the Administrative Transaction Processing initiatives be implemented concurrently as part of the Years One through Three build-out of the EHR Network. These initiatives should be scoped, designed, and implemented in a consistent manner with the enabling technologies and centralized network services (CNS).

Just as with the hospital HIS diffusion project, the fourth focused initiative (hospital portal gateway) should be pursued following a detailed assessment of the 30 Wyoming hospital HIT capabilities relative to the other three Focused Initiatives and the capabilities of the CNS. Specific recommendations for the hospital portal gateway focused initiative can be made by the WYHIO following the detailed assessment.

V. CENTRALIZED NETWORK SERVICES (CNS)

The collection of HIT standards, widely accepted technology solutions, and the experiences of similar HIE initiatives across the United States call for a comprehensive architecture (referred to as the CNS in this report) that will improve the potential for success of the Wyoming Electronic Health Records Network. While it is understood that the CNS being proposed won't be completely delivered in the early stages of the EHR project, it is critical that the ultimate architecture is documented and used as a reference point for both planning purposes and architectural design considerations of individual HIE initiatives. This planning document refers to the technology architecture as the centralized network services or CNS.

A. Introduction

As with any information technology implementation, it is critical that a set of functional requirements and technical design specifications be defined, documented, and agreed to before commitments for the funding and creation of the system are made. This section of the report provides a high-level reference to the CNS that will enable the Wyoming Electronic Health Records Network. The CNS is presented here (see Figure 2) in a comprehensive representation as a single-system architecture. However, the various modules that are represented must be considered as they relate to prioritized initiatives to be approved by the facilitating organization (see discussion below under Section VI) as the network evolves. The recommended approach is that the modules and relevant subcomponents of the modules are implemented incrementally over time, as required to support prioritized initiatives. Key points for consideration include:

- The technical specification and eventual creation of the CNS serves as the interoperability benchmark for all sponsored initiatives.
- The CNS will apply to distinct health information exchanges in different ways; that is, each of the initiatives will take advantage of different modules and subcomponents of the architecture based upon their needs.
- The **web portal module** serves as the point of access to the integrated environment but also as the point of administration of services and staff that have access to these services.
- The **extract/translate/load (ETL) module** serves as a data translation utility for all sponsored initiatives. Ideally, this module will interface with currently implemented third party solutions, such as payer clearinghouses, in order to minimize the intrusiveness to provider environments.
- The **central data repository module** (CDR) is intended to serve as a data content/structure benchmark for all health information exchange initiatives. The CDR may be used as a centralized data resource for specific initiatives as deemed appropriate by the WYHIO. The CDR is not intended to represent a single comprehensive database for all health care transactions across the state. The expectation is that certain health care interoperability requirements will dictate that data for that function be centralized in order to promote the most effective interoperability model.
- The **data management module** is responsible for organizing and managing access to health information stored across the network that will be implemented in a phased approach. Initial implementations may be redundant based on the needs of a specific project. However, if the vision of an integrated and comprehensive electronic health record is to be realized, the data management module must coordinate data across the entire environment.

More detailed discussions of the architecture and associated modules follows in the next several sections of this report. While Figure 2 represents the schematic methods for accessing information, Figure 3 below presents a sample representation of the technical layout for a proposed Wyoming Electronic Health Records Network System Architecture. Technical specifications provided here are only intended to serve as examples and do not necessarily specify an appropriate technical configuration for Wyoming's specific needs.

Figure 2: Sample Wyoming Electronic Health Records Network Architecture

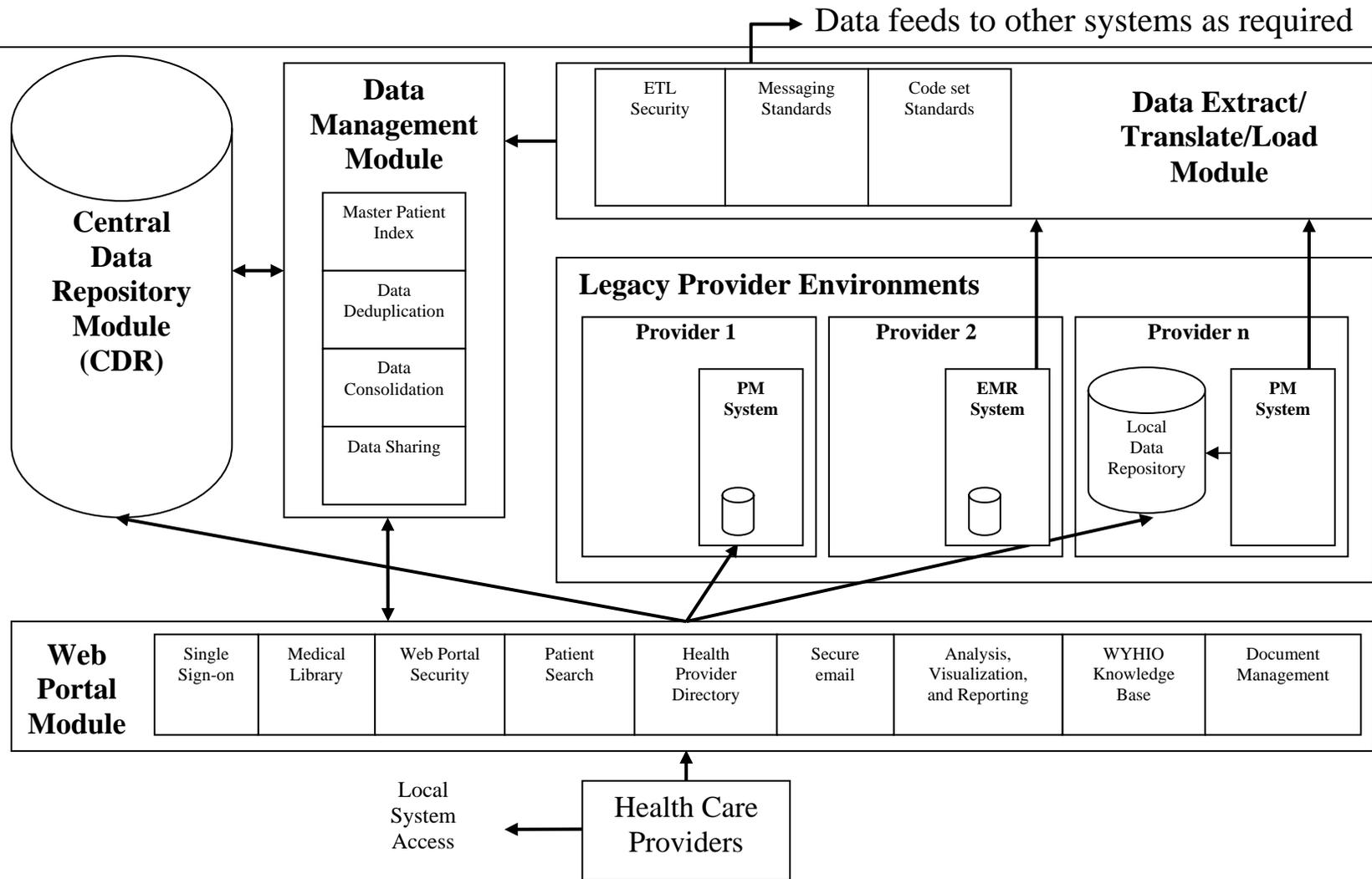
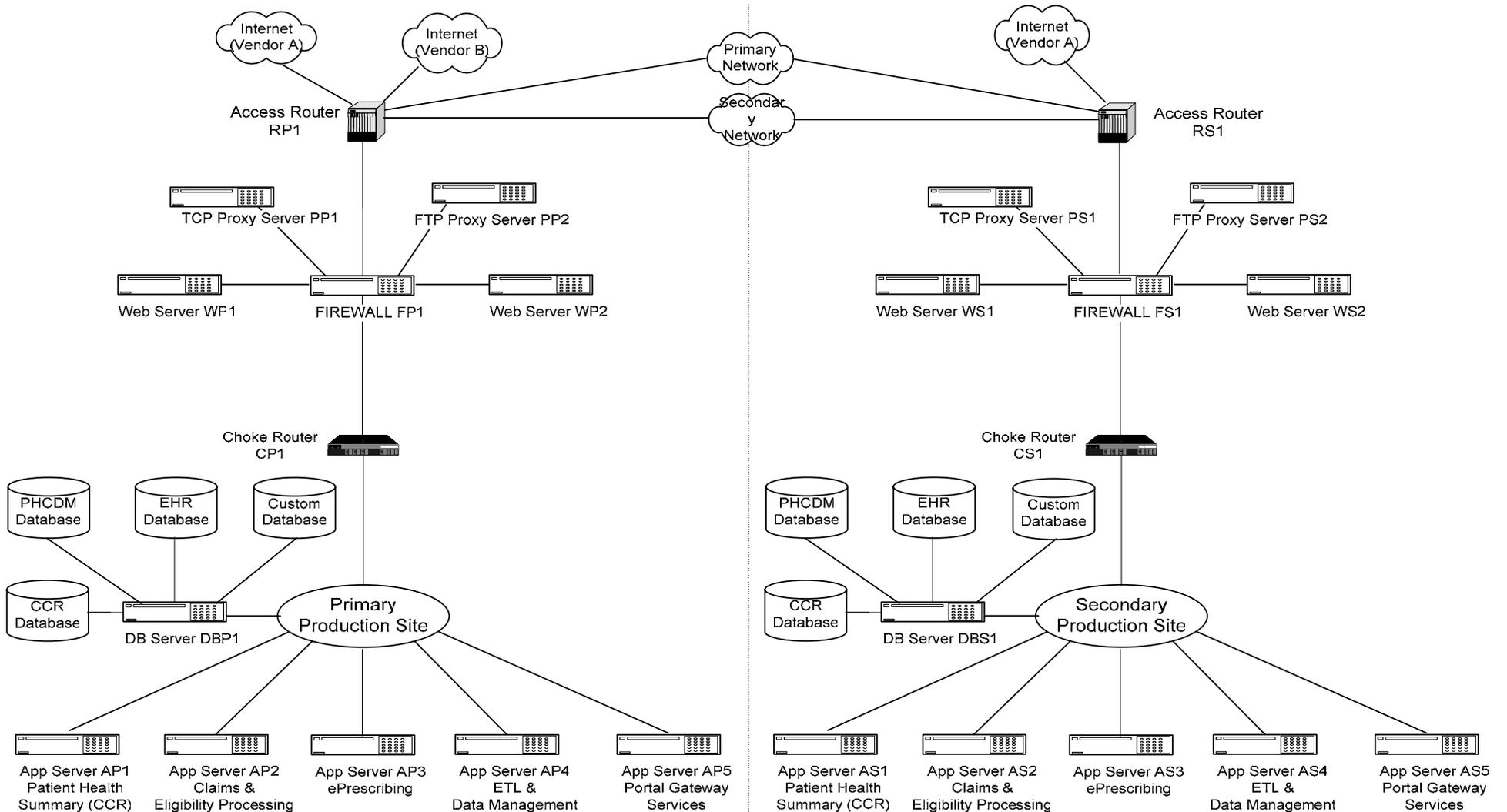


Figure 3: Sample Wyoming Electronic Health Records Network Systems Architecture



B. Centralized Network Services Modules

1. Web Portal Module

The web portal module will provide authorized users access to multiple applications and services, but just as importantly, will provide system administrators an effective means for managing the network. The portal provides a single point of access to the integrated environment and serves as a single point of coordination for user administration, security, and provision of services. Key features of the portal include:

- **Access to Patient Care Systems:** As the primary application, access is provided to various information systems used by providers as they support the health care delivery process. These may include hospital information systems, outpatient records, electronic prescribing, order entry, administrative systems, etc.
- **Analysis/Visualization/Reporting:** This is a set of tools that facilitate statistical analysis of data, and production and distribution of reports.
- **Document Management:** The majority of health information today is captured on paper. Document management solutions today provide the ability to digitize these documents, and relate them to electronic medical records.
- **Health Provider Directory:** A central directory of health care provider organizations, organization types, staff, their health care roles, and areas of expertise is provided by this component. The health provider directory impacts all modules as the one consistent reference to organizations and staff in the integrated environment.
- **Medical Library:** Medical library web sites are widely available on the Internet and provide a host of features and services for health care providers. This web portal feature would summarize and link to those Internet resources.
- **Patient Search:** Interoperability, especially in the context of the comprehensive electronic health record, suggests that patient data, regardless of its location, will be found and presented to a health care provider in a timely manner, with an adequate level of certainty that the data is complete and accurate.
- **WYHIO Knowledge Base:** A centralized library of information relative to the development and maintenance of the electronic health records network must be provided. This would include promotional, organizational, operational, and technical information.
- **Secure email:** Health care providers across the extended enterprise require the ability to share sensitive health information between each other and eventually with patients. Standard health care applications provide this ability within the confines of their secure environments. The integrated health care enterprise requires a more flexible yet secure utility to support communications between health care providers.
- **Single sign-on:** Will allow users to access integrated systems without having to repeatedly sign in and manage user accounts on multiple systems. While the overall approach to single sign-on must be considered relatively early in the project, access to individual systems will be provided as required in support of prioritized initiatives.
- **Web Portal Security:** Because the portal will be the single point of access to the integrated environment, a comprehensive security scheme that ensures the protection of data made available through the network must be provided through this gateway.

- **Portal Administration:** Technical support personnel must have tools that enable them to support users of the CNS as well as to configure and monitor the network as required to ensure optimal performance in line with established protocols.

WEB PORTAL MODULE	
STANDARDS CATEGORY	APPLICABLE STANDARDS
General Infrastructure	<ul style="list-style-type: none"> • T1/T3 Internet Access • Microsoft Internet Information Server • Microsoft Internet Explorer (user desktop) • Compaq server platform • Secure access HTTPS • MS-SQL Server Database • LDAP Directory Services
Medical Terminology and Code Sets	N/A
Messaging	N/A
Database and Content	<ul style="list-style-type: none"> • Public health directory for organization, user, and role definitions. • IHE personnel white pages for user and role definitions.
Data and Systems Security	<ul style="list-style-type: none"> • Two-factor authentication • Security tools • Security policies and procedures • Standard system and database backups
Patient Privacy, Clinical Workflow, and Data Sharing	<ul style="list-style-type: none"> • To the degree that the portal controls data access, the public health directory and associated algorithms are required to restrict access to patient data • CCOW for application integration, single sign-on, and single patient view • HIPAA serves as foundation for data sharing rules • Data definitions and health provider directory serve as foundation for detailing who can see what data • IHE integration standards for information retrieval and display, patient synchronized applications, enterprise user authentication, and patient ID cross referencing for MPI
Software Development and Implementation	<ul style="list-style-type: none"> • Utilize accepted software development methodology • IHE as required to support clinical systems integration • HL7 to support software development practices

1. Central Data Repository Module

Many health care systems are supported by the centralized storage of health care data. These systems store patient data received from multiple systems in a single unified location, in order to enable access to an integrated view of the specified data set. A good example of this type of system is the various registries that support disease management in public health.

Considering the complexity of integrating the wide variety of health care systems in use today in hospital, private practice, community health, public health and payer environments, a centralized approach to collecting, storing,

and managing health care information is the logical choice in many cases. While not promoting the creation of a centralized and comprehensive electronic health record, this approach is the most effective for certain health care information systems. Specifically, those health care systems that provide a consistent set of functionality across a diverse group of users (utility driven systems) are the strongest candidates for consideration. Key features of the central data repository include:

- **Commercial:** Utilizes a widely-accepted and scalable database platform such as Oracle, DB2, or MS-SQL and is configured to ensure optimal performance, scalability, and availability.
- **Standards based:** Conforms to widely accepted HIT database standards such as American Society for Testing and Materials (ASTM) continuity of care record, HL7 electronic health record, and HL7 reference information model.
- **Integrated:** Provides an integrated view of patient data across the extended enterprise.

CENTRAL DATA REPOSITORY MODULE	
STANDARDS CATEGORY	APPLICABLE STANDARDS
General Infrastructure	<ul style="list-style-type: none"> • Microsoft Internet Information Server • Compaq server platform, with MS-SQL Server Database or Oracle Enterprise Server
Medical Terminology and Code Sets	<ul style="list-style-type: none"> • Ability to accept and load code sets as required to promote integration
Messaging Standards	<ul style="list-style-type: none"> • Ability to accept and load messages as required to promote integration
Database and Content	<ul style="list-style-type: none"> • Continuity of Care Record • Electronic Health Record • Health Level 7 Reference Information Model (HL7 RIM)
Data and Systems Security	<ul style="list-style-type: none"> • Physical systems security • Standard system and database backups
Patient Privacy, Clinical Workflow, and Data Sharing	<ul style="list-style-type: none"> • To the degree that the database controls data access, stored procedures and triggers may be used • HIPAA serves as foundation for data sharing rules that may be supported through database utilities • Data definitions and health provider directory serve as the foundations for detailing who can see what data
Software Development and Implementation	<ul style="list-style-type: none"> • Utilize accepted software development methodology (HL7, IHE) as required to support clinical systems integration

2. Data Management Module

The concept of an Electronic Health Record Network suggests that clinical data records will be stored, accessed, transformed, and routed across an environment consisting of a variety of disparate health care systems.

Considering the obligation that health care providers have to uphold the integrity, security, and confidentiality of that data, one of the most critical modules of the electronic health record network is that of records management.

While records management is most often a supported function for individual legacy systems in the health care world, it is several times more complex when considered as part of an integrated health care environment. The ability of this module to receive, identify, and manage transactions with multiple identifiers, which are in turn used for a variety of purposes, requires a tremendously robust software application. Key features of this module include:

- **Unique Identifier Index:** A central index, by patient, providers, and other health care related organizations, that contains limited information to uniquely identify health care-related entities and patients, and can point to the health care data locations where additional health care information can be found.
- **Data de-duplication:** A utility which assesses transactions relative to other similar transactions and ensures that redundant transactions do not corrupt the integrity of the database or associated service capabilities.
- **Data consolidation:** A utility which merges like-transactions, most often as they relate to a single patient, to ensure the integrity of the database or associated service capabilities.
- **Data sharing:** A utility that manages a predefined set of relationships between health care data, function, and entity (organization and staff) and ensures that health information is only used for authorized purposes by authorized parties.

DATA MANAGEMENT MODULE	
STANDARDS CATEGORY	APPLICABLE STANDARDS
General Infrastructure	<ul style="list-style-type: none"> • Microsoft Internet Information Server • Compaq server platform • MS-SQL Server Database or Oracle Enterprise Server
Medical Terminology and Code Sets	N/A
Messaging	N/A
Database and Content	<ul style="list-style-type: none"> • Continuity of Care Record • Electronic Health Record • Health Level 7 Reference Information Model (HL7 RIM).
Data and Systems Security	<ul style="list-style-type: none"> • A robust utility that provides record consolidation, data aggregation, and other features to ensure data integrity must be provided.
Patient Privacy, Clinical Workflow, and Data Sharing	<ul style="list-style-type: none"> • HIPAA serves as foundation for data sharing rules • Data definitions and health provider directory serve as foundation for detailing who can see what data
Software Development and Implementation	<ul style="list-style-type: none"> • Utilize accepted software development methodology (HL7, IHE) as required to support clinical systems integration

3. Extract/Translate/Load Module

The principle of interoperability requires a network with the ability to share information between widely varying health care systems. Although the HIT standards reviewed in this document suggest the potential that these systems will eventually speak the same language, that goal may never be attained considering the evolving nature of HIT and clinical systems. Therefore, the network must provide a module that serves as the translator between these systems not yet using standard transactions and codes. The module will use the various HIT standards to normalize all data, and subsequently translate it to and from various non-standard formats used by the other systems.

While the availability of this module suggests the risk for continuous non-conformance to standards due to the flexibility it provides, that is not the case. The network must promote adherence to standards and use this module to link existing systems and promote the eventual acceptance of these standards, as part of a long-term strategy. This is highlighted later in the section on the role of the WYHIO and will be accomplished by providing flexibility for HIE partners to integrate their systems onto the network through the use of this module.

First, the module will improve the ability of systems to integrate when they don't meet the standards. Subsequently, as the integrated systems continue to evolve; this module will promote transition by minimizing the potential negative impact that system enhancements will have to the other systems on the network. This will be accomplished by isolating each system from the others on the network. As they implement enhancements that use accepted standards, the ETL module provides a buffer so that other systems aren't affected by those changes.

- **Data Exchange:** This module will provide integrated systems with the ability to exchange health care information with other nodes on the network.
- **ETL Security:** This module will be responsible for retrieving, translating, and delivering sensitive health information across an extended network. It is imperative that secure methodologies and utilities are employed to ensure the security and integrity of that data.
- **Message Translation:** While integrated systems on the network may not all have singular use of messaging standards, it is imperative that this module embrace defined standards and use them as the hub of integration requirements. This module will serve as a *many-to-one-to-many* interpreter with accepted HIT messaging standards serving as the one from a messaging perspective.
- **Medical Terminology and Code Set Translation:** While integrated systems on the network may not all have singular use of medical terminology and code set standards, it is imperative that this module embrace defined standards and use them as the hub of integration requirements. As previously stated, this module will serve as a many-to-one-to-many interpreter with accepted HIT medical terminology and code set standards serving as the one from a medical terminology and code set perspective.

EXTRACT/TRANSLATE/LOAD MODULE	
STANDARDS CATEGORY	APPLICABLE STANDARDS
General Infrastructure	<ul style="list-style-type: none"> • Microsoft Internet Information Server • Compaq server platform • MS-SQL Server Database or Oracle Enterprise Server • Secure FTP • Secure Socket Layer

EXTRACT/TRANSLATE/LOAD MODULE	
STANDARDS CATEGORY	APPLICABLE STANDARDS
Medical Terminology and Code Sets	<ul style="list-style-type: none"> Ability to manage translation of proprietary and outdated terminologies and code sets to accepted terminology standards
Messaging	<ul style="list-style-type: none"> Batch file transfer capability Real time message transfer capability Ability to manage translation of proprietary and outdated message formats to accepted messaging standards
Database and Content	<ul style="list-style-type: none"> ODBC Interface
Data and Systems Security	<ul style="list-style-type: none"> Provides secure interfaces to integrated systems to ensure data integrity
Patient Privacy, Clinical Workflow, and Data Sharing	N/A
Software Development and Implementation	<ul style="list-style-type: none"> Utilize accepted software development methodology

4. Client Level Interoperability

The CNS modules described here provide an integrated set of functionality for collecting and managing data shared across the EHR Network. However, the CNS does not provide the technical integration functions that are needed at the provider sites to connect to the network. Considering the high degree of variability from one provider environment to another, no single set of technologies can be provided to meet everyone's needs. For that reason, JSI recommends a multi-faceted approach to provider system interoperability. The recommended solutions vary considerably in terms of cost and functionalities; however, no single solution is expected to meet the needs of all network users.

- Batch File Transfer:** This method of data exchange is the least expensive, but also the least timely, least accountable, and provides for data flow in only one direction. Providers are expected to extract data from their systems and create a batch file of the extracted data. Providers then log into the CNS and initiate a batch file transfer to the CNS. The CNS is configured to receive, translate, and route the data to its destination. Implementation costs for this approach are confined to creation of the file extract from the base system and a web browser and Internet connection for transferring the file. Integration costs are typically in the range of \$5,000 to \$15,000 per system; however, for those sites using *standardized* solutions, the file extract capability will be a required utility and therefore, bring integration costs to virtually zero.
- Batch Data Exchange Utility:** This method of data exchange is the next least expensive, and is appropriate for providers that require bi-directional data exchange and therefore, a higher degree of accountability. The CNS will provide a data exchange utility that will enable the bi-directional exchange of batch files between the CNS and the provider. The utility will track and report on file processing activity and give the provider a tool for managing their data exchange activities. This solution may be relevant to a larger scale provider or a provider who is processing data from/to multiple systems in their environment. Costs would be restricted to the cost of the utility and integration costs between the utility and provider systems. As with the batch file transfer option, integration costs are typically in the range of \$5,000 - \$15,000 per system, but again standardized systems will significantly reduce costs.
- Peer-to-Peer Network:** This method of data exchange provides a dedicated systems interface between provider systems and the CNS. The interface is stored on a server on the provider's network. The interface collects data from the local systems and stores it on the server. As needed by providers

elsewhere on the EHR Network, the CNS will query the server for patient data and the server will transfer patient data to the CNS. Two key benefits to this approach are that patient data is not stored on the CNS and patient data is more readily available to the network in relation to the batch file transfer approach. Two key shortcomings to this approach are the cost (several orders of magnitude more than the batch oriented solutions) and the requirement for technical support at the provider site.

- **Virtual Private Network Open Data Base Connection:** This method of data exchange supports a direct database connection (ODBC) between the provider system and the CNS. This approach provides the highest degree of accessibility to data but is also the most expensive to implement. This option requires a virtual private network (VPN) between the provider system and the CNS. Also, software programs called *triggers* and *stored procedures* are required to initiate data exchange between the systems. This approach to data exchange is only appropriate for large-volume trusted partners.

As part of its approach to the EHR Network development, JSI recommends that these interoperability options are specifically considered when EMR, EHR, and HIS solutions are implemented. By specifically integrating these data exchange capabilities into the solutions, interoperability costs will be minimized.

C. Summary Considerations for Implementation

As previously mentioned, the CNS shown here represents a comprehensive architecture that will support the overall Wyoming Electronic Health Records Network. It is critical for the WYHIO to take the steps necessary to ensure that the vision of the network is defined, communicated, and accepted, and that ownership and accountability for its development and operation is established and maintained for the long-term. JSI's expectations are that the EHR Network will evolve over time and will require extensive commitments of capital and human resources to build and sustain.

In traditional health care environments where technology is used extensively, such as hospitals, Chief Information Officers (CIOs) are responsible for defining the vision relative to the use of technology, creating an organization staffed to deliver on the vision, and ultimately defining and executing business plans to deliver technology-based systems in support of the organizations goals and objectives. Considering the complexity that the CNS suggests and the *ownership* of the vision that it requires, it is imperative that this type of leadership is established at the early stages of Wyoming's effort to develop an EHR Network. It will become more and more difficult to recruit an Executive Director/CIO the further along the decisions are relative to the establishment of the CNS. A sample job description for an Executive Director/CIO is provided in **Appendix D**.

VI. BUSINESS PLAN FOR BUILDING AND SUSTAINING THE EHR NETWORK

The following material outlines a plan of the essential steps to developing an Electronic Health Record Network in Wyoming. The plan specifies the creation of an organization that will take the lead in building statewide support (WYHIO Development) and executing the specific tasks for making an EHR a reality in the state. Beyond the formation of the WYHIO, which is the critical first step in the process and is described in Section A below, the plan has been structured to follow the key principles for the successful development of an EHR Network (Enable, Share, Promote, and Manage). The plans for these steps include descriptions of the initiatives to be pursued, timelines and budgets, expected staffing, and suggested incentives to improve the likelihood of HIT adoption across the state.

A. Create a Wyoming Health Information Organization (WYHIO)

Organizational leadership is required to develop, implement, and sustain any activity and tasks in the state for an EHR. JSI proposed and initiated a process to the IT-2 subcommittee that calls upon the key health care stakeholders in Wyoming to create the Wyoming Health Information Organization (WYHIO), which will be the vehicle charged with bringing the EHR plan to fruition. This entity is discussed here at the outset because of its central role throughout the process. The WYHIO will be a partnership between the multiple entities within the state that have an interest in and responsibility for an EHR. It will include representatives from government agencies, health care providers, hospitals, payors, and others. The WYHIO will represent these entities in developing a mission and vision, will develop and prioritize specific goals, will obtain funding and identify long-term financing mechanisms for the EHR activities, and will oversee implementation and maintenance of the EHR infrastructure and organizational relationships. JSI recommends that the WYHIO be an independent non-profit organization. The following describes the steps required for building the WYHIO.

- **Assemble an Interim Board of Directors**

In order to jumpstart the WYHIO and move forward deliberately, JSI recommend in an earlier report appointing committed stakeholders to an Interim Board of Directors as soon as possible. The board will serve in the interim phase (3-6 months) and initialize organizational development of the WYHIO. It should be comprised of representatives from the major entities in the state (e.g. hospitals, ambulatory care providers, payors, public health, and patients) yet be small enough to work effectively in developing the WYHIO as a legal entity. JSI recommends that the Interim Board consist of five to ten individuals in the categories established by the IT-2 Subcommittee: three-fifths public/consumer/employee representatives, one-fifth provider representatives, and one-fifth state representatives. These individuals must be willing to prioritize the establishment of a permanent board and the WYHIO's organizational structure.

In line with these recommendations, an Interim Board was created along the lines of the JSI suggested representation at a WYHIO organizing meeting on August 11, 2005, in Casper.

- **Mission, Vision, and Organizational Statements**

The Interim Board should work with the key stakeholders to adopt mission and vision statements. The mission statement provides a concise description of the needs the WYHIO was created to fulfill, explains why the WYHIO exists, and is approximately one paragraph in length. The vision statement is a more detailed description of the future state that the WYHIO will attempt to create and is typically no more than one page in length. It will describe the scope and consequence of an interoperable electronic health record, the types of health care entities that will be participating, and the expected improvements in health care and public health to be achieved. Mission and vision statements have been drafted by JSI and the IT-2 Subcommittee to help facilitate this process for the new board.

The Interim Board should also create and adopt a written organizational statement that describes how the WYHIO will be organized and includes board positions and corresponding roles and responsibilities, a description of standing committees, methods for creating ad hoc committees, and the authorities and responsibilities of these bodies. The methods for membership selection for each of these bodies are also

included. The organizational statement serves as a working basis for a non-profit organization's articles of organization and by-laws.

- **Board of Directors and Officers**

The Interim Board will work with the key stakeholders to select a long-term Board of Directors for the WYHIO, which in turn, will elect a set of officers. It is this body that will take overall responsibility for developing and maintaining the initiatives for an EHR in the state. JSI recommends a board of ten to fifteen members. Board members should be prepared to meet on a regular basis and perform a fair amount of work in between meetings, especially in the first six months to a year of the WYHIO organization. Board members will work collaboratively and serve in the interest of all citizens and consumers of health care in Wyoming, while maintaining neutrality in the face of conflicting interests of the various stakeholders, are recommended.

- **Legal Incorporation**

It is essential that the WYHIO become incorporated in order to constitute itself as a non-profit legal organization. It will then have the standing and legal ability to negotiate arrangements and contracts with other entities, solicit and receive funds, hire staff, and be recognized in the state as a legitimate body for the EHR initiatives.

- **Non-profit IRS ruling**

JSI recommends that the WYHIO non-profit corporation obtain an Internal Revenue Service ruling as a charitable 501(c)(3) corporation. This will enable the corporation to obtain foundation grant and government funding and be relatively free of payment of taxes on revenue and purchases. The Interim Board should also register as a charitable organization with the state of Wyoming.

- **Obtain startup funding**

Early in the process, the WYHIO must obtain initial funding for a period of one-to-two years. The purpose of this funding is to sustain the organization, and begin to finance the actual technological infrastructure necessary for an EHR. JSI estimates that approximately \$500,000 will be required and recommends that this funding come from some combination of the following sources: state government, private foundation grants, and federal government grants targeted to WYHIO development. This step is not to develop the actual long-term funding necessary to sustain the EHR over the long-term. However, this step does include the process of outlining financing sustainability models.

The state government will need to make a substantial investment at this stage in order to demonstrate its seriousness in developing an EHR Network. Until there are actual systems in place that provide benefit to providers, it is unlikely that providers themselves would be willing to provide initial investments.

Prior to receiving this funding, it may be necessary to have large stakeholders willing to provide seed money just to enable the WYHIO corporation to conduct business. JSI believes that \$50,000 to \$100,000 would be required to cover the first six months of business operations and recommends that the state government, Wyoming private foundations, and payors be solicited for donations of approximately \$10,000 each.

- **Hire staff**

An Executive Director/Chief Information Officer, hired by the Board of Directors, should be hired as soon as practical. This person will be the chief executive officer of the WYHIO, responsible to the board, and will be the single-most key person for moving the EHR initiatives along. He/she must have a variety of high-level skills in organizational development and leadership, communications, decision-making, and health information technology, and have the ability to be an effective HIT champion both within the state

of Wyoming and to outside parties. JSI also recommends that the following be part of a staffing plan to be hired incrementally over the first year:

- Project Manager (one in number; reports to Executive Director/CIO): Charged with developing and executing technical, organizational, and financial plans for the EHR initiatives. He/she must be skilled in managing complex organizational relationships.
- Systems Analyst (one in number; reports to Project Manager): Charged with research, and assisting in developing plans, specifications, RFPs, and other documents for the EHR initiatives.
- Support Staff (one in number; reports to Executive Director/CIO): Charged with providing administrative and secretarial support to the WYHIO staff, Board of Directors, and Committees.

Provided below in Figure 4 is representation of the proposed organizational for the WYHIO.

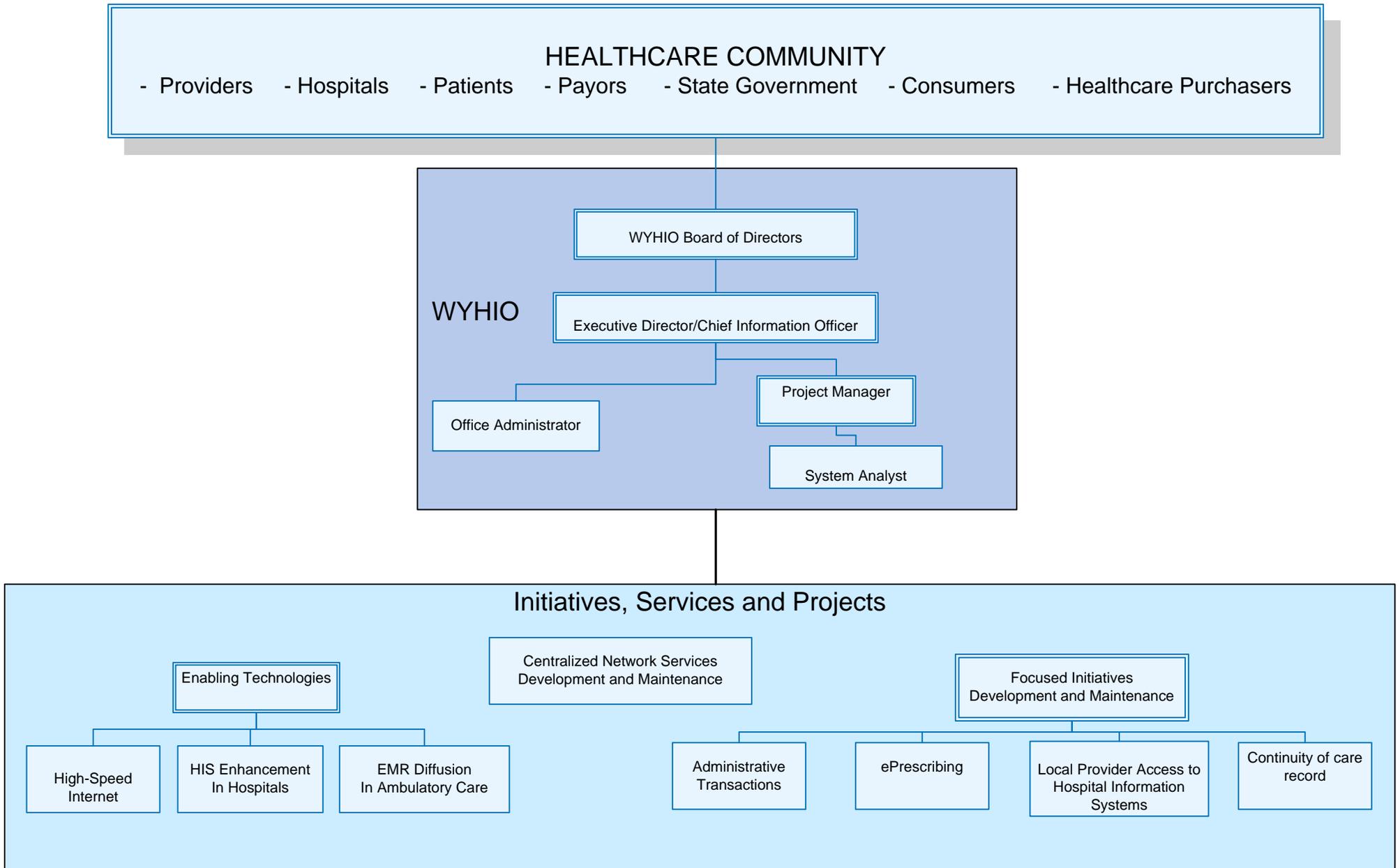


Figure 4: Proposed WYHIO Organizational Structure

B. ENABLE - Pursue Enabling Technologies

As a foundation for a statewide EHR, specific technologies must be pursued and implemented. These technologies constitute both centralized and decentralized components and have been discussed in detail earlier in this report. This section will outline the steps for implementing these technologies, which should be pursued and implemented simultaneously rather than sequentially.

- **Network Infrastructure Development**

High-speed Internet access (with data transfer rates of 300 kbps* or greater) is a minimum requirement for private practice sites. There are larger bandwidth requirements for institutions with more users and greater data exchange needs.

The ability of the statewide network infrastructure to provide broadband network access to organizations in the state is currently being assessed by the Wyoming Telecommunications Council (WTC). The WYHIO must work with the WTC to assess the current infrastructure of high-speed access, perform a gap analysis to identify where access is required, prioritize connectivity, and complete the infrastructure enhancements to support the EHR Network infrastructure requirements. The prioritization of network infrastructure enhancements, from an EHR Network perspective, will be planned in conjunction with the Focused Initiatives. Specific considerations include:

- Dial-up connections (typically providing 30kbps speed) are inadequate for connecting to the EHR Network.
- DSL/Cable network connectivity will meet the connectivity requirements of smaller organizations (typically providing up to 1.2 mbps speed; however, it should be noted that many factors may limit bandwidth on these types of connections) and specific to DSL, geographic limitations in the technology may limit its deployment outside of urban areas.
- Focused initiatives are primarily text-based which requires more limited network bandwidth for private practices in the near term (years one to three).
- As new Focused Initiatives are considered, particularly those that share images, the network infrastructure and provider connectivity must be reassessed for faster connections.
- Hospital bandwidth requirements are faster than other entities' due to the complexity of the systems, more extensive data exchange requirements, and the number of users that may connect over the Internet at one time. Hospitals will typically require T1 connectivity, which typically provides 1.5 mbps data transmission speed.
- As the use of hospital portal gateways expands, and the services offered through those gateways increases, expansion of network bandwidth beyond T1 may be required.

- **EMR Diffusion at Ambulatory Care Sites**

JSI recommends that the WYHIO engage in a process to deploy EMR products to all ambulatory care sites in the state of Wyoming that are willing to participate in this endeavor. Although exact figures are not available, it is generally accepted that there are an estimated 700 physicians practicing medicine in the state of Wyoming. JSI has utilized this estimate of physicians to build following recommendations. Because it is currently impossible to define or agree upon the exact nature of the practice situations for all providers in the state – i.e., what percentage or numbers are in solo practice, multi-provider practices or community health centers, or even hospital-based – JSI has also utilized a number of assumptions regarding practice dynamics in building the budget models and implementation plans. Accurate documentation of provider practice dynamics in the state of Wyoming subsequent to the completion of the EHR Study may significantly alter the models utilized and the outcomes reached relative to costs and timing. The budget models developed by JSI, however, are designed to be flexible enough to allow for rapid modifications of such factors as numbers of participating providers are adjusted.

*kbps = kilobits per second; kBps = kiloBytes per second; 1 kBps = 8 kbps; mbps= megaBytes per second

Based on the physician surveys from the WHCC, WDOH and MPQHF and national statistics on EMR penetration among provider practices cited earlier in this report (see page 22), JSI estimates that between 10% and 13% of Wyoming physicians (or between 70 and 91 physicians, using the overall 700 physician base) currently use an EMR system of some type in their offices. JSI has worked with the assumption that it is highly likely that the providers currently using an existing stand-alone EMR will remain on those systems in the short-term after having made the time, financial, and operational investment in those systems, rather than switching to a new EMR offering. Furthermore, in order to build the most conservative cost estimates, JSI has assumed that the remaining providers will pursue one of the other three options defined below and that a portion of the remaining 609 providers (700 baseline minus the estimated 91 with EMRs and assumed to be in a combination of one-to-two provider practices and five-to-20 provider practices) would be equally distributed across the options recommended. In addition, JSI believes that an EMR diffusion model must provide options for those providers who do not have and will not implement an EMR, but have relevant patient health information needs and would benefit from the ability to access electronic health information on their patients.

Consistent with the findings of the key stakeholder interviews and focus groups conducted throughout the state, JSI recommends an approach to EMR diffusion that enables from one to three products or solutions; additionally, there should be no mandates that all providers participate and the state will provide some method of incentives to adopt, implement and utilize EMRs. The EMR diffusion effort must keep in mind the findings on the state of HIT adoption among community-based providers, with significant numbers of providers and practices to be found at the first level of the Interoperability Pyramid. Defining multiple opportunities for providers at different levels of the pyramid will be crucial to the EHR Network effort's success.

The first step will be to specify ambulatory care EMR capabilities and functionality using the functional requirements in **Appendix E** as a starting point. The second step is to develop a Request for Proposals for vendor products for each of the options. The RFP specifications will be consistent with the specifications of the DOQ-IT program for the capture and reporting of quality indicators (see DOQ-IT listing of quality indicators in **Appendix F**) and, if relevant and finalized, those of the Certification Commission on Healthcare Information Technology (CCHIT) as well (see details of the Phase II CCHIT Certification Criteria in **Appendix G**). The VistA Office EHR product currently be tested should also be reviewed against the specifications set forth in the RFP as an option for Wyoming providers. Specific products chosen by Wyoming providers will be entirely practice-specific and cannot be anticipated accurately in advance of the review and selection process.

After soliciting proposals, evaluating products, and contracting with approximately one to three vendor products per option, the WYHIO will establish a distribution and support/maintenance infrastructure for these products. This infrastructure may include arranging to make use of the vendors' own capabilities or it may include Wyoming-centric support structures as well. The WYHIO will arrange to have EMR products installed at ambulatory care sites in the state. Lastly, the WYHIO will monitor use of the EMR products and facilitate *user groups* and other forms of assistance for communicating enhancement requirements to vendors.

a) Existing stand-alone EMRs

These are the sites with existing EMR software products currently installed locally in the providers own offices. The WYHIO's activity for these sites will be to perform a gap analysis of those products relative to the functional requirements specified in **Appendix E**, with additional consideration given to the functional requirements of the prioritized Focused Initiatives. The purpose of this analysis will be to identify additional functionality required in those systems or functionality in centralized systems that will be necessary in order to enable these providers to interoperate within the state.

b) Newly purchased stand-alone EMRs

Stand-alone EMR solutions will be new products installed in providers' offices. They will be the solution of choice for larger physician practices that require a greater range of functionality and flexibility than is available with the other three options. The complete set of functional requirements, including the DOQ-IT and CCHIT-related specifications, will be considered as these solutions are assessed and selected.

c) Newly purchased hosted solution EMRs

Hosted EMR products take the form of a vendor operating a centralized system providing customer access over the Internet to that system. The provider does not need to install any specific software in their office other than a web browser or some other small client piece of software. The data and the application exist remotely at the vendor's facilities, yet give the individual provider the ability to manage information on only their own set of patients. There may be limited customization of the EMR product available. Hosted EMR solutions are widely available in the marketplace today and a sampling of such providers can be found on the DOQ-IT website (www.doqit.org).

d) View-only EHR Network content

This option is similar to that of the option detailed in subsection VI.B.c) above, in that the only required software installed locally at a provider's office is a web browser or similar thin client. This option is available for those providers who do not want to manage their own patients' information electronically, but nevertheless want some form of access to information from external sources. One example is to have access to the continuity of care record; another example is use of an ePrescribing system where medication history on that provider's patients is available from a remote central application.

- **Health Information System (HIS) Enhancement in Hospitals**

JSI has established that the use of information systems technology in Wyoming's 30 hospitals is extremely fragmented. To remedy this fragmentation and enable hospitals to participate in a statewide EHR Network, the WYHIO needs to specify hospital EMR capabilities and the functionality required, develop a gap analysis based on an assessment of current capabilities versus baseline future functional requirements (see **Appendix E**) and develop an HIS enhancement plan built around the future requirements. The requirements should be prioritized relative to the initiatives selected by the WYHIO.

JSI's expectation is that hospitals will be assigned to one of two categories – those that can implement existing systems onto the CNS network, and those that require significant upgrades to participate on the network. Within these two categories, there are likely to be highly varying amounts of electronic patient data available as well. For these reasons, the WYHIO HIS enhancement plan should utilize the Integrating the Healthcare Enterprise (IHE) recommended functional requirements as a basis.³⁴

Similar to the process for enabling EMR diffusion in ambulatory care sites, the WYHIO should engage in an RFP process to solicit vendor solutions to fill the information and connectivity gaps of hospital information systems. It is expected that some of the CNS components may be utilized by the hospitals to minimize costs.

JSI estimates that of the 30 hospitals, 12 will initially participate in the EHR Network. Of those 12, nine will integrate existing system capabilities into the EHR Network and four will require significant enhancements to existing systems to participate in the EHR Network. The gap analysis will detail the enhancements required within each of the 12 hospitals' health information systems.

³⁴ *Integration Profiles: The Key to Integrated Systems, 2002 – 2003, Integrated Health Enterprise.*

- **Incentives to spur HIT adoption**

It has been repeatedly noted by JSI throughout the EHR Study that a financial incentives model is likely to be a minimum requirement for the state accomplishing its goal of implementing an EHR Network. Both marketplace specific and national studies have documented the need to provide some mechanism for incentivizing providers to adopt HIT, noting that incentives for adoption are frequently misaligned, with providers predominantly bearing the cost of adoption while benefits accrued to the payers in terms of such things as population health management, formulary compliance improvements, and reduced transaction costs.³⁵ Given the barriers noted earlier, Wyoming hospitals and provider practices are particularly likely to require such incentives.

There are a number of different types of financial incentives structures that have been developed and examined for applicability in motivating providers to adopt HIT. Based on the literature reviewed, HIT incentives generally fall into the following categories:

- **Pay for HIT**

Incentives for HIT adoption reward the provider groups or hospitals that implement technology directly.

- **Pay for outcomes**

Providers receive payments for improved health outcomes, improved communications or for participating in data exchanges.

- **Pay for both**

Under a hybrid incentives model, providers are compensated for both implementing HIT and for improved health outcomes and/or performance.

The primary providers of these incentives have been the large health plans who have either directly purchased HIT for a variety of providers – ranging from personal digital assistants [e.g., Palm pilots] with prescription formularies, to equipment to support telemedicine, to EMRs – or have reimbursed providers adopting technology for reporting improved quality outcomes or meeting predefined quality benchmarks.

One of the national studies completed on creating financial incentives to spur HIT adoption was able to quantify the approximate dollar amount that appears to be a sufficient starting point for encouraging the widespread adoption of EHR technologies by small, primary care provider practices. The Connecting for Health Working Group on Financial, Organizational and Legal Sustainability of Health Information found in its study that financial incentives of approximately \$3 to \$6 per patient visit over a three-year period, based on 4,000 patient visits per year would be required to foster the adoption of EHR technology. Using an average of \$4.50 per patient visit, that equates to an incentive payment to providers of \$54,000 over three years, which also equates to the typical cost for an EMR package implementation.³⁶

One of the other significant recommendations of the Connecting for Health study was the emphasis on interoperability of the HIT systems. They noted that the “**greater the interoperability among IT systems, the better the business case for the ambulatory care practice purchaser**, which means that providing incentives to adopt piecemeal technology that cannot support increased levels of connectivity and information sharing will lead to insufficient progress.”³⁷ This recommendation is particularly relevant to the recommendations made by JSI in that a comprehensive approach to interoperability is the favored

³⁵ *Financial Incentives: Innovative Payment for Health Information Technology*, Sheera Rosenfeld, Emily Zeitler, and Dan Mendelson, The Health Strategies Consultancy for the Foundation for eHealth Initiatives, March 2004.

³⁶ *Achieving Electronic Connectivity in Healthcare: Summary of Financial Incentives Recommendations*, Connecting for Health Working Group on Financial, Organizational and Legal Sustainability of Health Information, July 2004.

³⁷ *Ibid*, page 5.

means of developing the EHR Network. Technologies that accomplish only piecemeal opportunities for capturing and utilizing electronic health information but do not provide the broader requirements of exchanging data or incorporating information from other HIT systems, are not endorsed by the model recommended by JSI.

In order to address the constraints identified within Wyoming, JSI has developed an outline of several potential mechanisms for incentives:

- **Offsetting grants programs**

Under this model, provider organizations that are pursuing the adoption of HIT tools consistent with the structure and participation in the recommendations for the EHR Network would be eligible to apply for grants to offset the cost of technologies purchased and implemented. Grants could be structured to prorate eligible amounts based on factors such as annual patient visits, volume of Medicare or Medicaid claims, or other sliding scales to account for different practice sizes and expected HIT needs.

Grant distributions could be made on a *thirds model* whereby the initial one-third of the grant amount would be disbursed upon the signing of a contract between the grantee and its selected HIT vendor, one-third upon successful implementation of the selected system, and the final third after the third year of continuous system operation in order to account for *failed installations*. Depending on the direct funding source and exact nature of the program, the grants program could be administered by either a department of the state, such as the Department of Health or the Medicaid Office, or through an outside organization, such as a community foundation. It is assumed that only HIT products that have been reviewed and found to be consistent with the functional specifications laid out in the EHR Study would be considered for offsetting grants.

- **Revolving loan funds**

Two years ago the HealthTech Information Technology Working Group, which at the time included among its advisors Dr. David J. Brailer, called for the development of a “Health Information Technology Revolving Loan Fund (RLF) Program.” Based on a model from previously established federal RLFs for clean water and state infrastructure projects, the proposal called for creating a federally-funded program on the order of \$800 million per year for five years, with states matching the contribution with an additional \$200 million per year for five years. This proposed \$5 billion over five years’ investment was deemed sufficient to “jump-start information technology infrastructure development significantly.”³⁸

Considering the estimated amounts required to launch the Wyoming EHR Network development process (approximately \$120 million over 5 years), the state could reasonably create a RLF to fund HIT adoption across the physician practice and hospital provider settings. Eligibility requirements for the RLF would be similar to those laid out under the grants program above.

- **Enhanced reimbursement program**

A third option for implementing a financial incentives program driven by the state would be to provide enhanced reimbursements to providers who adopt or have adopted interoperable HIT systems. As noted above, a national study found that enhanced reimbursements on the order of \$4.50 per patient visit over the course of a three-year period were sufficient to promote a significant level of HIT adoption. The benefits of such an approach are that it could be structured through existing state managed reimbursement programs, such as Medicaid, and that it could be applied to both new and existing HIT adopters with relative ease. Both groups could be guided on the documentation required in order to receive reimbursement and staggered or increasing payments up to a predefined maximum could also be developed in order to bring about long-term utilization of such systems.

³⁸ Op.cit., Coyle, et. al.

Based on feedback gathered from health care stakeholders throughout Wyoming, JSI would not recommend that an enhanced reimbursement program be tied to quality indicators. Such *pay for performance* programs were not well-received among Wyoming providers and appeared to be more often a disincentive to participating in such programs. In line with the recommendations for the EHR Network, JSI would also suggest that an enhanced reimbursement program could be structured to provide, for example, \$2 dollars per visit in enhanced reimbursement for adopting a partially interoperable HIT system, \$3 dollars per visit for adopting the technology **and** utilizing the CNS to exchange data, and \$4.50 per visit for implementing a system that is interoperable, exchanging data through the CNS, **and** for allowing data to be extracted from its system for population health studies. The more involved in promoting the EHR Network objectives, the greater the enhanced reimbursements would be.

All three of the incentive models for HIT adoption would have to be structured to be consistent with the functional specifications detailed in the report, support the goals of interoperability envisioned with the EHR Network, and provide the greatest possible accountability for the funds being distributed. None of the models is envisioned as a *give away*. Each is intended to provide the requisite incentives to advance the adoption of HIT in Wyoming, improve care by promoting the use and exchange of electronic health information, and to further the opportunity to provide information to care providers at the point of care.

C. SHARE - Develop Centralized Network Services (CNS)

The development of the Centralized Network Services (the network) is one of the more complicated endeavors that the WYHIO will pursue, but is its priority. Decisions must be made relative to the build out and support of the network through a WYHIO-sponsored organization or alternatively, outsourcing the network (or portions of its development) to one or more vendors that will provide the required functionality and potentially host the network. For the purposes of this plan and associated budget models, JSI recommends that the WYHIO utilize outsourced third-party vendors to develop the network. The first steps of this approach will be to develop one or more RFPs and assess vendor proposals for the outsourcing approach for the entire network or for the outsourced development of specific components of the network. The outsourced vendor(s) will be responsible for managing the network for the first three years of the project with WYHIO options to extend the contract(s) beyond the initial three-year period.

Furthermore, JSI recommends that, for the first three years of the project, functional requirements of these modules be formalized as required to support the approved Focused Initiatives, not necessarily the broader comprehensive standards. This approach will minimize costs and complexity of these modules. To ensure eventual compliance with more comprehensive HIT standards, contracted vendors must demonstrate how their solutions will migrate to these standards. The WYHIO will ensure that the following components are put into place:

- **Build-Out Hosted Infrastructure**

The network itself will consist of a set of server computers housed in an existing data center such as an Internet services provider hosting facility, a transaction-processing vendor's facilities, or in a new facility dedicated to the Wyoming EHR. The only incremental costs beyond hardware/software purchases and installation fees are expected to be hardware maintenance and software licensing fees. The infrastructure components are listed below and are covered in more detail in **Appendix E**.

- Production systems environment
- Backup production systems environment
- Development/test environment
- Network environment
- Software
- High-speed Internet connectivity

- **Build Out Portal Gateway**

The portal gateway will be developed to meet the specific access requirements of the users of the EHR Network. This approach will be based on the WYHIO vision, the prioritized Focused Initiatives, and the overall functionality anticipated for the EHR Network. Functional requirements specified in **Appendix E** will serve as key inputs to the portal development cycle. The WYHIO will develop an RFP detailing portal gateway specifications necessary to meet the EHR Network requirements for the first three years of the project. Vendor proposals must specify how their proposed solution will meet the needs of the network in the short-term (years one to three) but will also specify how their solutions will be positioned to ensure compliance with the strategic vision of the EHR Network. The following set of requirements, referenced in more detail in the functional specifications in **Appendix E** of the report must be met:

- Utilize commercial solutions where practical, as specified by the General Technology Requirements
- Utilize the Systems Environment provided
- Provide a Health Provider Directory which will be configured to support user access and security requirements
- Support single sign-on
- Provide access to patient care systems
- Provide patient search functionality across local and remote environments
- Provide a secure email function
- Integrate with the Data Management Module in support of data access and data sharing
- Provide an EHR Network administration utility to manage all user access, security, and network configuration requirements
- Provide access to a WYHIO knowledge base.

- **Build Out Extract/Transfer/Load (ETL) Module**

The ETL module will be built to manage the exchange of data among health care entities integrated on the network. It serves as the core component of the entire network and is developed to meet the specific requirements of the EHR Network. Functional requirements specified in **Appendix E** will serve as key inputs to the ETL development. The WYHIO will contract with a vendor to detail all of the requirements, build this module, implement, and manage the module for the first three years of the project. The WYHIO will develop an RFP detailing ETL module specifications necessary to meet the EHR Network requirements for the first three years of the project. Vendor proposals must specify how their proposed solution will meet the needs of the network in the short-term (years one to three) but will also specify how their solutions will be positioned to ensure compliance with the broader strategic vision of the EHR Network. The following set of requirements, referenced in more detail in **Appendix E**, must be met:

- Utilize commercial solutions where practical, as specified by the General Technology Requirements
- Utilize the Systems Environment provided
- Support updates between health provider directories
- Support data exchange requirements of the prioritized Focused Initiatives
- Support data translation from and to proprietary and standardized message types
- Support data translation from and to proprietary and standardized code sets
- Meet security requirements associated with data exchange between health care organizations
- Interface with the Data Management Module as required to support transaction processing and routing requirements
- Interface with the Central Data Repository as required to store transactions in support of Focused Initiatives

- Interface with the Portal Gateway as required for supporting the management and administration of the ETL Module.
- **Build Out Central Data Repository and Data Management Modules**
 The central data repository and data management modules will manage the availability of data across the EHR Network. The functional requirements specified in **Appendix E** will drive the development of these modules. The WYHIO will develop an RFP detailing the Central Data Repository and Data Management module specifications necessary to meet the EHR Network requirements for the first three years of the project. The WYHIO will contract with a vendor to detail all of the requirements and will build, implement, and manage the modules for the first three years of the project. Vendor proposals must specify how their proposed solution will meet the needs of the network in the short-term (years one to three) but will also specify how their solutions will be positioned to ensure compliance with the strategic vision of the EHR Network. The following set of requirements, referenced in more detail in the functional specifications appendix, must be met:
 - Utilize commercial solutions where practical, as specified by the General Technology Requirements
 - Utilize the Systems Environment provided
 - Provide unique identifiers for organizations, staff, and patients
 - Support data management and storage requirements of the prioritized Focused Initiatives
 - Meet security requirements associated with data exchange between health care organizations
 - Interface with the Portal Gateway as required to support the management and administration of the Data Management Module
 - Provide data sharing to support authorized data exchange between organizations
 - Provide data de-duplication and record consolidation merge functionality
 - Provide access to data stored on remote systems.

D. PROMOTE - Pursue Focused Initiatives

With the Enabling and Sharing technologies in place, the WYHIO can pursue those specific initiatives identified in Section IV. As recommended in that section, JSI would expect the WYHIO to pursue the Focused Initiatives in this order:

- Statewide ePrescribing Initiative
- Continuity of care record
- Administrative Transaction Processing
- Local Provider Access to Hospital Information Systems

1. Focused Initiatives Project Cycle

For each of the independent Focused Initiatives represented earlier in Section IV.D., the following is the process that the WYHIO will require to bring the initiatives to implementation.

- **Design scope and specifications of project:** The WYHIO will utilize an advisory group and focus groups to determine the goals, scope, and detailed specifications of each specific initiative. The process will include a combination of one or more of the following: meetings, key informant interviews, existing system reviews, document reviews, and will culminate in a statement of work for the project.
- **RFP for statewide system:** The WYHIO advisory group will develop an RFP, solicit vendor response, review proposals, select one or more vendors (as appropriate to the initiative), and contract with the vendor(s) to implement the project.

- **Identify pilot test sites:** Depending on the project, it is recommended that the WYHIO identify pilot sites (e.g., entire communities, providers or groups of providers, hospitals, pharmacies, etc.) for testing the initiative. For some of the initiatives, the opportunity to pilot projects across an entire community with multiple components (e.g., ePrescribing, continuity of care record, and hospital portals) will be actively pursued in order to combine those components that can demonstrate the viability of an EHR, particularly in rural communities.
- **Pilot project:** With a limited set of pilot sites, a test of the initiative will be conducted to determine whether the project meets the goals of the initiative and what elements of the project must be changed before proceeding with full implementation.
- **Modify system for statewide rollout:** Prior to full state implementation, the results of the pilot test will identify the fixes and enhancements required of a vendor.
- **Establish training program:** Each initiative will have specific training requirements. This stage entails developing a curriculum and training program specific to the initiative. Training modalities may include one or more of the following: mailed CD-based training, web-based training, on-site training, or group training at centralized sites.
- **Establish support/maintenance infrastructure:** Each initiative must contain a support and maintenance infrastructure. This can be a component of the WYHIO itself or it can be contracted and managed by the WYHIO with other organizations.
- **Rollout initiative statewide:** The initiative is rolled out to entities statewide. This will occur in stages and, for each initiative, may occur on the basis of geography, organizational size, or other factors.

2. Vendor Engagement

The WYHIO will develop an RFP for each focused initiative detailing the specifications necessary to meet the EHR Network requirements for the first three years of the project. The WYHIO will contract with a vendor to detail all of the requirements, build, implement, and manage the system for the first three years of the project. Vendor proposals must specify how their proposed solution will meet the needs of the network in the short-term (years one to three) but will also specify how their solutions will be positioned to ensure compliance with the strategic vision of the EHR Network. In support of the business plan, the following specifications must be met:

- Utilize commercially available hardware and software technology where practical, as specified by the General Technology Requirements
- Utilize the Systems Environment provided
- Support unique identifiers for organizations, staff, and patients as required
- Interface with other EHR Network components as required to eliminate redundancy and support the development of a fully integrated EHR Network
- Meet EHR Network-specified security requirements associated with data exchange between health care organizations

- Interface with the Portal Gateway as required to support the management and administration of the Administrative Transaction Processing Service
- Provide customer service, operational, and technical support as required to support the service for years one to three
- Provide a plan that specifies the process for transitioning support of the service from the outsourced vendor to the WYHIO support organization at the conclusion of year three
- Provide a WYHIO-executable option for extending vendor support of the Initiative for years four to five of the project.

E. MANAGE – Create the Centralized Network Services Technology Support Organization (TSO)

1. General assumptions

A permanent and evolving Technology Support Organization (TSO) is required to support the technology infrastructure of the EHR Network and the administration of the services offered through the network. JSI recommends that the TSO be outsourced for years one to three of the project. All vendor contracts should support this strategy and should contain specific plans for the ongoing support of contracted services through year three of the project and eventual migration of technical support to a WYHIO sponsored TSO at the start of year four. There are several critical factors associated with the development of the EHR Network that justify this strategy:

- **Innovative:** There are very few organizations today that have formally defined and created an organizational capacity to provide support for an EHR Network as described in this document. The concept of a *Statewide EHR Network* is relatively new and the support requirements for such a network are extensive. However, considering the potential opportunity that a Nationwide Health Information Network presents to technology vendors, JSI expects that RFPs associated with the EHR Network project will receive many qualified responses.
- **Complex:** The project represents a tremendously complex technology infrastructure. This infrastructure will require a substantial technology support staff across several technical disciplines. Furthermore, as the network and offered services expand, staffing requirements and skill sets will increase.
- **Evolving:** Although HIT standards serve as the foundation of the EHR Network, many of these standards continue to evolve. Formalized and approved standards have yet to be released for several critical network components. Further complicating this issue is the fact that various influential public and private standards-setting organizations are pursuing different strategies for the evolution of the Nationwide Health Information Network (NHIN).
- **Customized:** As mentioned, while it might appear to be a contradiction relative to the HIT standards that serve as the foundation of this and national efforts, the services offered through the EHR Network depend on the needs of the users. This assumption is supported by the regional strategy endorsed by the federal office driving the development of the national EHR strategy (i.e., ONCHIT).

Collectively, these issues suggest that the Centralized Network Services technology support organization will be outsourced for the first three years of the project. The WYHIO will have a central role however, in managing the contracted relationships and ensuring that broader strategic goals are considered. A key assumption of this approach is that the three-year timeframe represents the bulk of the time required for

network development. The contracted support organization will consist of a prime contractor that is responsible for the overall project as well as sub-contractors that will be engaged as required to provide support for certain network modules and focused initiatives.

As the business plan develops and vendors are engaged, two compelling issues that must be specifically considered and incorporated into the broader EHR Network build-out strategy will repeatedly arise. Specifically, these issues include *build versus buy* and *host versus outsource*. These issues must be aggressively managed by the support organization as RFPs are developed, vendors are engaged, and the EHR Network evolves.

- **Build vs. Buy:** The support organization will pursue established solutions at every opportunity. This approach is ideal for components that meet the needs of the project without requiring any special customization. These *out of the box* solutions ensure a degree of consistency and stability in that they are established market leaders that meet specific demands. Key examples include network and systems hardware, database engines, directory services, the ETL module, portal gateway software, etc.

Other components, especially those that support specialized features of the network, will require more extensive development efforts. These modules will require detailed requirements gathering, software design and development, and implementation cycles. Key examples include the data management module, some Focused Initiatives, and software that integrate the various modules into the comprehensive EHR Network.

- **Outsource vs. In-house:** The WYHIO organization must make several determinations relative to outsourcing or hosting various elements of the EHR Network. This issue is relevant to the build-out of the network but also to the implementation and ongoing support of the network and Focused Initiatives. Generally speaking, the more complex the network modules or supported services, the more likely that those elements must be supported by staff who have a detailed understanding of those elements. Typically, this means that outsourcing is used in the earlier phases of the project with transition to in-house support as the EHR Network evolves and eventually stabilizes. Key considerations through the evolutionary phases of the network include:
 - **Development:** Software development and integration of the various modules will be outsourced. The technical and management skill set required to build and implement the network is both deep and broad, and it is impractical to suggest that a newly developed support organization will be able to provide these capabilities given initial time and budgetary constraints.
 - **Implementation:** Technical and operational implementation of the various modules will be outsourced. There may be opportunities to use in-house staff as the support organization evolves but this approach will be used following further evaluation after year three.
 - **Ongoing support:** Technical, operational, and customer support staff must be prepared to maintain the network and associated services following implementation. A key strategy of this project is to provide adequate service to the customer while minimizing support costs. The support organization itself will support as many elements of the network as possible in order to minimize these costs. However, due to complexity or efficiency, some support requirements may be outsourced in the long-term.
 - **Transition:** For all modules and support services that comprise the EHR Network, detailed assessment and decisions must be made relative to the timing for transition from outsourced to in-house support, and whether or not the transition should even occur. As previously stated, due to complexity, efficiency, or other factors, it may make more sense for support to be outsourced for the long-term. However, in those cases where the transition is necessary, the support organization must

be appropriately staffed and engage with the vendor for training as required to ensure that quality of service does not diminish following transition.

2. Considerations for Leveraging Existing IT Resources

The formation and ongoing management of the Technology Support Organization represents a significant challenge from both development and cost perspectives, eclipsed only by the build out and maintenance of the EHR Network itself. JSI recommends that the state give careful consideration to leveraging existing technical support organizations, their staff, and their technology resources to support the creation and maintenance of the EHR Network. Specific organizations that have been reviewed for consideration include the Department of Health and the state of Wyoming Department of Administration and Information. This approach offers considerable savings in the areas of both capital and operating costs. Potential opportunities associated with this approach include:

- Existing staff resources could be augmented to support the EHR Network
- Existing support infrastructure would not have to be duplicated
- Already established revenue streams would support the organization, thereby reducing the need for incremental revenue
- Established technology resources (systems, network, database, software applications) could be leveraged and/or enhanced through the EHR Network project.

3. TSO Organizational Responsibilities

The Technology Support Organization (TSO) will function in many respects like the Information Technology group of a large health care organization. The WYHIO should consider the responsibilities outlined below as contracts are developed with vendors in years one through three of the project. Similarly, these responsibilities and the associated organizational structure should be used to plan for the build out of the TSO in year four.

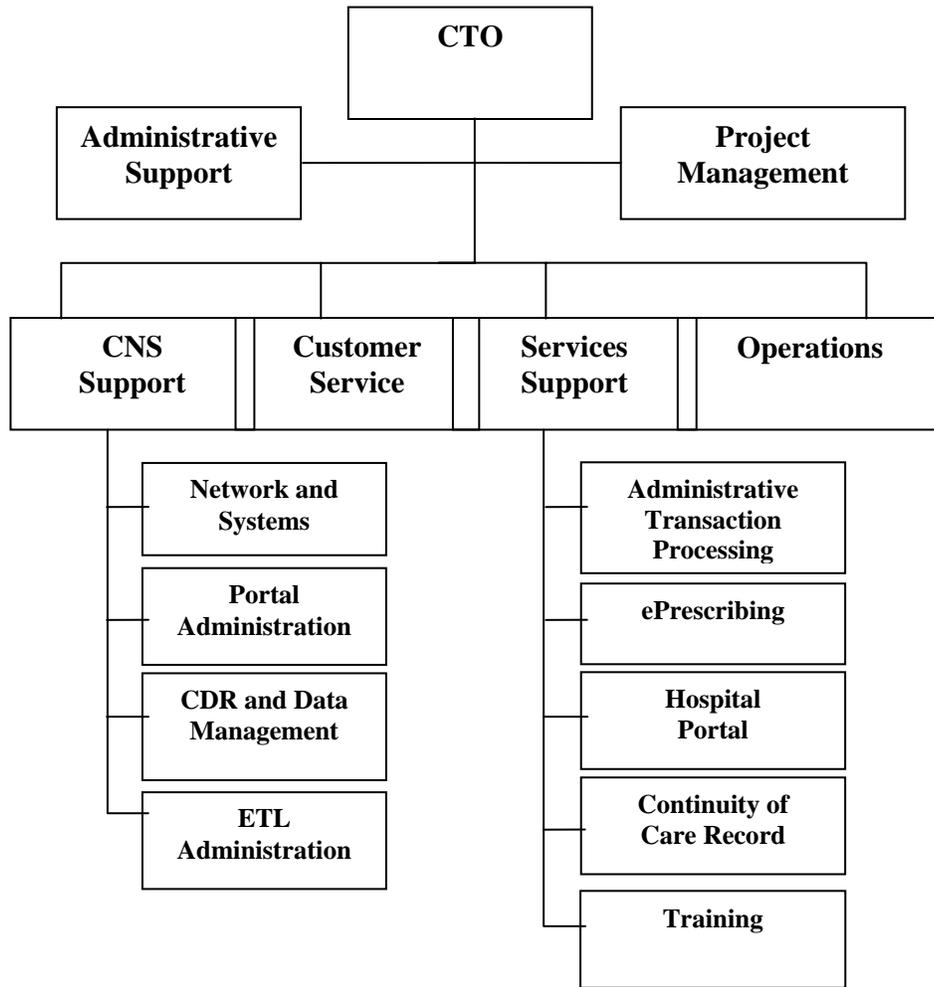
It should be noted that there is some overlap between the TSO and the WYHIO staffing models. Initial plans for WYHIO staffing specify roles for an Executive Director/Chief Information Officer, Project Manager and Systems Analyst. These roles are also represented in the TSO model (IT Manager, project manager, and support staff). This apparent redundancy is necessary in the short-term as the WYHIO will be formed immediately while the TSO will not be formed until approximately mid-year during year three of the project. At that time, the WYHIO will have to review staffing requirements for both organizations and determine appropriate staffing levels and placement of staff.

- **Chief Technical Officer (staff=1):** This person is a senior level manager with responsibility for management of IT staff and general availability of the network and quality of services. Additionally, this person is responsible for maintaining the approach to HIT standards as well as the strategy for evolving the EHR Network from a strategic perspective (in conjunction with the WYHIO).
- **Project Management (staff=2):** These persons are senior level project managers that have the capacity and skill set to manage multiple technical projects with outsourced vendors, remote customers, and a diverse technical staff.
- **Administrative Support (staff=2):** These persons have administrative responsibilities for the support of the organizations' personnel.
- **CNS Support (staff=6):** These persons include a supervisor and a highly skilled technical support team. Key skills include a senior database architect with a background in CCR, EHR, and PHCDM

architectures; a senior data mapping analyst for data integration; and a network engineer for integrating remote sites and systems onto the network.

- **Customer Service (staff=2):** These persons will serve as the primary contacts for network users. The staff will provide a professional customer service center front for the Technology Support Organization.
- **Services Support (staff=3):** These persons include a supervisor and a highly skilled clinical services support team. These persons will serve as administrators and trainers for the various services offered through the network. Staff may be required to travel to sites around the state to provide training.
- **Operations (staff=2):** These persons will be responsible for ensuring that all scheduled activities such as file processing, backups, network and systems availability, and services availability are maintained on the EHR Network.

An organizational chart for the proposed TSO is provided below:



4. EHR Network Training Requirements

In the short-term, the WYHIO will be responsible for coordinating training of support staff, EHR Network users, and users of enabling technologies implemented at provider sites. JSI recommends that the bulk of this training be outsourced to contracted vendors responsible for implementing the various solutions that are parts of the EHR Network. Longer term, the TSO will be staffed to provide this training as part of ongoing responsibilities. Even with the transition of training responsibilities to the TSO, outsourced vendor support should be considered to the degree that is more effective and/or financially feasible to support training through an outsourced vendor. Key training issues are reviewed below:

- **Enabling Technologies:** Training requirements for enabling technologies will be addressed at the outset of the plan. Expectations are that the WYHIO will be responsible for organizing and coordinating the various aspects of the training program. Specific considerations include:
 - **EMR Diffusion**

As reviewed in earlier sections of the plan, EMR diffusion will be accomplished through one of three methods; specifically, hosted solutions, stand-alone EMR, and through the provision of a *read-only* continuity of care record (see Focused Initiatives section). Each of these solutions requires a different training approach and will therefore be reviewed separately.

 1. **Hosted EMR:** Preliminary expectations are that the vendor of the hosted solution(s) will provide training on their products for system users and WYHIO/TSO support staff. A hosted EMR requires a fair amount of consistency in the feature/functionality of the solution. Therefore, expectations are that the Services Support group of the TSO will provide training to users in the long-term.
 2. **Stand-alone EMR:** The project will support one to three vendors of stand-alone EMR solutions. Expanded and custom feature/functionality available in stand-alone solutions suggests that these systems will be customized to a significant degree and therefore, a centralized approach to training may not be practical. Further complicating this issue is the fact that up to 90 physicians are currently using a stand-alone EMR solution that has not been reviewed for consistency with the recommendations of this report. These issues suggest that training for Stand-alone EMRs will be provided by the vendors that offer these systems.
 3. **EHR Read-only (Continuity of care record):** Similar to the hosted EMR solution, the high amount of consistency in this application will enable the vendor to provide training in the short-term with transition to TSO-provided training over the long-term.
 - **HIS Enhancements**

As reviewed earlier in the report, HIS enhancements must be preceded by a detailed review of Hospital HIT capabilities relative to this project. Expectations are that several hospitals will integrate existing systems onto the network, that several others will require enhancements to existing systems, and that still others will require new systems. Considering the complex and highly variable nature of these systems and their required enhancements, training for HIS enhancements will be provided by the vendors that offer these systems.

- **Network Infrastructure**
Enhancements to the statewide network infrastructure will be provided by existing network vendors. There is no project-specific training requirement for this section. Network infrastructure support for EHR Network-specific components will be addressed in the Centralized Network Services section below.

- **Centralized Network Services:**
 - **Network and Systems Support**
As the EHR Network evolves, technology standards recommended in this study will provide a foundation for developing a consistent training protocol for users of the EHR Network as well as CNS technical staff. While the Network and Systems support requirements may be outsourced in both user and CNS environments, a formalized training program for network and systems technologies should be developed and supported. This program will be outsourced in the short-term but may be supported by the TSO in the longer term. See statewide training requirements below.

 - **Portal Administration**
The EHR Network Portal consists of a series of commercially available software products, but also consists of custom-designed and implemented solutions to support the management of the EHR Network. CNS Staff training will require a mix of training on vendor products and custom-developed software. Training requirements will be outsourced in the short-term and supported by outsourced vendors as services are added to the network. However, CNS support staff must develop operational and training programs to support the in-house training of CNS staff.

 - **Central Data Repository and Data Management**
Database training is the most complex and critical component of the EHR Network. As network services evolve, the potential that multiple database architectures will be used concurrently is highly likely. Furthermore, the data management module of the EHR Network will be a custom and highly complex solution. The database strategy for the network suggests that standard databases will minimize the risk associated with multiple customized architectures. That being said, the short-term reality is that there is a strong potential for custom databases being introduced on the network in the near-term. This suggests that database staff must be senior level and capable of being trained on multiple platforms. Database training for CNS staff will be provided by outsourced vendors in both the near and long-term.

 - **ETL Support**
Data translation is a critical utility of the EHR Network. As the number of connected systems expands, the need to translate multiple message types and code sets expands. The ETL strategy for the network suggests that standard message types and code sets will minimize the risk associated with multiple customized data formats. Nevertheless, the short-term reality is that there is a strong potential of custom message types and code sets being introduced on the network in the near-term. This suggests that ETL staff must be senior level and capable of being trained on both standardized messages and code sets but also on the full capabilities of the ETL module to support translation of custom data types. ETL training for CNS staff will be provided by outsourced vendors in the near and long-term.

 - **Operations Support**
The EHR Network will consist of a series of commercially available software products and also consists of custom-designed and implemented solutions to support the ongoing processing of data and availability of services on the EHR Network. CNS Staff training will require a mix of

training on vendor products and custom-developed software to ensure that daily processing activities are maintained. Training requirements will be outsourced in the short-term and supported by outsourced vendors as services are added to the network. However, CNS support staff must develop operational and training programs to support the in-house training of CNS staff.

- **Focused Initiatives:**

Focused initiatives will be provided by commercially available software products when possible, but also may be provided through customized software applications that will be built to meet WYHIO- developed specifications. In both cases training will be provided by outsourced vendors in the short-term and possibly the long-term, depending on the complexity of the solution and other factors. The TSO will take steps to develop training programs for TSO support staff and EHR Network users, as appropriate.

- **Statewide Technical and Service Training:**

The TSO should take steps to ensure that certain EHR Network user training requirements are provided on a statewide or regional basis. Training requirements that involve standardized technology or widely used software applications typically fit this training category. The TSO should review training programs offered by area colleges and universities, third-party vendors, as well as those being developed under the auspices of the Public Health Information Network and National Health Information Network. Where practical, the TSO may develop these programs directly and offer them on a statewide or regionalized basis. Key focus areas include:

- **Network and Systems Administration**
EHR Network users will install and/or upgrade technology environments at their local sites. HIT standards suggest a standardized hardware, operating system, and network environment.
- **HIT Database Design and Administration**
As the EHR Network and commercial third-party HIT applications continue to evolve, the NHIN strategy suggests that they will migrate toward the standardized database architectures of the Continuity of Care Record, Electronic Health Record, and Public Health Conceptual Data Models. Larger organizations such as hospitals, public health agencies, and those using *compliant* applications will require training on these database platforms.
- **HIT Messaging and Code Sets**
As the EHR Network and commercial third-party HIT applications continue to evolve, the NHIN strategy suggests that they will migrate toward the standardized messaging and code set formats. A consistent approach toward the understanding, implementation, and maintenance of these formats is critical for the support of the network.
- **Patient Privacy and Security**
While HIPAA is one of the most critical components of the EHR Network in support of data sharing, it remains one of the most widely misunderstood policy guidelines in health care today. Further complicating this issue is that many policies adopted by health care institutions in support of HIPAA are somewhat subjective in nature. Finally, while the technology based guidelines established through HIPAA are consistent, the specific technology requirements are not. Collectively, these issues suggest the need for a statewide program that details the patient privacy and security guidelines, policies, procedures, and technical specifications that will be adopted and supported by the EHR Network. While privacy and security training is a responsibility of individual health care organizations (i.e. HIPAA covered entities), JSI recommends that training

on privacy and security issues related specifically to the EHR Network be the responsibility of the WYHIO.

- EHR Centralized Network Services
See the Focused Initiatives section above. To the degree that the number of users of these services warrants a statewide approach to training, a program should be developed and supported to meet that need.

F. Budget Assumptions and Expectations

The full potential of the Wyoming Electronic Health Record Network is predicated on a substantial capital investment. The discussion below follows a specific path from the most comprehensive and costly type of EHR Network to one that is practical for Wyoming given reasonable timelines for implementation. The first two plans are purposely provided as points of reference. This is followed by presentation of a realistic plan, in terms of both effort and budget for the first five years, and is the plan that JSI believes should be the focus of the WYHIO for its initial efforts. More detail on assumptions and scope of the plans is presented below.

1. The *Comprehensive* Wyoming Electronic Health Record Network

JSI has reviewed a number of cost-related resources in order to build its budget assumptions and expectations. A listing of these reference sources can be found in **Appendix I**. *The Costs of a National Health Information Network*, published in the Annals of Internal Medicine was primarily used for developing an approach to costing the ‘comprehensive’ Wyoming Electronic Health Records Network.³⁹ Key assumptions of the study are provided below:

- According to the *model* Nationwide Health Information Network (NHIN), defined as achievable and desirable, would require \$156 billion in capital investment over five years and would incur \$48 billion in annual operating costs.
- By using referenced data and published cost estimates, the authors determined the cost of achieving this model NHIN in five years, given the current state of health information technology infrastructure.
- The set of critical functional domains for the model NHIN include inpatient and ambulatory results viewing (lab and radiology), inpatient and ambulatory EHR, inpatient and ambulatory Computerized Physician/Provider Order Entry (CPOE), electronic claims submission, electronic eligibility verification, secure electronic patient communication, and electronic prescription acceptance by pharmacies.
- The interoperability model that they adopted suggests a brokered peer-to-peer network approach. This approach suggests that health information is stored within provider environments and that the central hosting facility provides security and linking functions, but does not store any data.
- The total costs to construct a brokered peer-to-peer communication network nationwide are projected to be \$53 billion in capital investment and \$21 billion in ongoing annual operating costs (approximately half of the overall estimate).

Using the same approach offered by this study, JSI estimates that the development of the Wyoming Electronic Health Record Network will cost \$271 million in startup costs and \$82 million in annual support costs.

³⁹ Kaushal, op. cit.

2. A *Practical* Approach to the Wyoming Electronic Health Record Network

While not discounting the findings of the study referenced above, JSI believes there is considerable risk associated with a project that would attempt to build a regional network to the specifications outlined in the study. Specific concerns are:

- The study suggests a five-year timeline for the implementation of the NHIN. JSI contends that this timeframe is overly aggressive considering the relatively conservative HIT adoption rates in health care, particularly in private practice settings. In addition, the ten-year estimate suggested by ONCHIT is more realistic for achieving the NHIN and is consistent with JSI's recommendation of a more conservative Focused Initiative implementation over the next five years.
- The study suggests that the health care system will spend \$24 billion on functionalities over the next five years, or about one-quarter of the cost for functionalities of a model NHIN. Serious questions exist as to funding sources for the remaining capital and operating costs specified. This suggests that functionality will be prioritized based on cost, value, or other criteria.
- While the interoperability approach specified in the Kaushal study (brokered peer-to-peer) may be practical for larger institutions that have the technical staff to support this model, JSI contends that this approach would be prohibitive to smaller institutions.

For the purposes of this study, JSI has made a series of assumptions that will reduce the risk associated with the project relative to the concerns outlined above. Furthermore, JSI's approach will significantly reduce the overall cost of the project. While the approach minimizes risks and costs, it does not compromise the long-term potential of the network. Specific assumptions include:

- The EHR component of the project will depend on the capabilities of existing systems and user requirements rather than the implementation of a comprehensive EHR.
- The project will promote an aggressive EMR diffusion plan which will minimize integration costs with physician practices.
- The project will prioritize HIS enhancements and the development of hospital portal solutions as reviewed within the context of the Focused Initiatives.
- Large health care institutions may use brokered peer-to-peer technology but smaller institutions will use less expensive batch file transfers.
- Interoperability requirements will be defined and incorporated into system requirements of physician (EMR) and hospital systems (HIS), thereby minimizing interoperability costs.
- The Wyoming EHR Network will attempt to integrate with existing data streams, for example, through claims processing and eligibility verification.

Using the approach offered by “*The Costs of a National Health Information Network*” study, but with the modifications outlined above, JSI estimates that the development of the Wyoming Electronic Health Record Network would cost \$119 million in startup costs and \$27 million in annual support costs.

3. An *Incremental* Approach to the Wyoming Electronic Health Record Network

The Kaushal study “conservatively estimated that all providers must purchase all components to achieve connectivity.”⁴⁰ Considering the difficulty in obtaining funding previously mentioned, as well as some degree of skepticism in health care circles regarding the practicality and value of a NHIN, JSI questions an approach that specifies the participation of 100% of the health care community. As an alternative approach, JSI has

⁴⁰ Kaushal, p. 167.

provided budget templates that will allow WYHIO leadership to *plug-and-play* numbers of participants as well as other assumptions in order to determine the most practical path of implementation. Specifications provided in this report, for the first five years, include:

- 233 of 700 provider organizations will participate.
- 12 of 26 acute care hospitals will participate
- One-fourth of participating sites each use one of the four EMR solutions
- One-third of participating hospitals will each use one of the three HIS solutions
- For each of the Focused Initiatives, assumptions have been made regarding the number of users using custom versus standard interfaces

Using the approach offered by “The Costs of a National Health Information Network” study, but with the modifications outlined above, JSI estimates that the incremental development of the Wyoming Electronic Health Record Network will cost \$77 million in startup costs and approximately \$13 million in annual support costs.

4. The Wyoming EHR Network Budget Model

This section will document the assumptions utilized in building the cost models, revenue models, and summary budgets for all major components of the EHR Network plan. Critical assumptions include:

- The build-out of the EHR Network (including Enabling Technologies, Centralized Network Services, and Focused Initiatives) will take place in years one to three of the project.
- The project will be fully capitalized in years one to three through a state funding mechanism.
- Cost models assume that WYHIO support staff will manage the overall project and vendor contracts.
- Cost models assume that years one to three of the project will be supported by outsourced staff with transitions as appropriate to in-house staff beginning in year four.
- Cost models for years four to five assume that existing resources in the state will be utilized to limit ongoing support costs.
- Revenue models will be defined to provide the required significant revenue in years four to five and beyond, to support the EHR Network, including formalized relationships with payors, purchasers, and/or the state (subsidies or pay for service).

5. Cost Model Components

Project costs are defined as *start-up expenses* and *operating expenses* categories. Project costs are further broken down by the cost categories represented below:

- **MIS Equipment:** Desktop computers, servers, network hardware, etc.
- **Office Equipment:** Printers, furniture, fax machines, copiers, phones, etc.
- **Office Expense:** Utilities, leases, rent, supplies, etc.
- **WYHIO and TSO Salary and Fringe:** Staff salaries and benefits for the WYHIO as well as the Technology Support Organization.

- **Organizational Costs:** Business development costs such as lawyer fees, consulting fees, accounting fees, and other administrative costs associated with starting a business.
- **Contracted Vendors:** The bulk of start-up costs will be paid to contracted vendors who will be responsible for building and implementing the various components of the network.
- **Hosting Fees:** System hardware and applications may be hosted at a third-party vendor's facilities.
- **Licensed Software:** Commercially available software will be used to the degree possible.
- **Maintenance Fees:** Hardware and software provided by third-party vendors typically have maintenance fees to ensure that vendors are available to support their products.
- **Travel and Miscellaneous:** WYHIO and TSO staff will be required to travel throughout the state to some degree to promote and support the EHR Network.

6. Budget Models

The budget model represented in **Figure 4** below will be used for the analysis and planning of each sub-project as well as the overall EHR Network project. Worksheets for each sub-project will roll up into the overall project budget model for a comprehensive representation of the project. The various templates will be integrated to provide a plug and play feature for financial analysis.

**FIGURE 4: PRO FORMA ELECTRONIC HEALTH RECORD NETWORK
FIVE-YEAR EXPENSE PROJECTIONS**

	Year 1 Total	Year 2 Total	Year 3 Total	Year 4 Total	Year 5 Total	
EXPENSES:						
1. Office Equipment	13,300	2,060	25,730	43,690	12,320	WYHIO and TSO
2. Recruiting Costs	19,205	-	17,535	-	-	
3. Staff Salary & Fringe	346,875	409,500	598,260	801,466	833,524	
4. Organizational Costs	75,000	15,000	75,000	15,000	10,000	
5. Hardware Maintenance	2,760	2,843	2,926	3,008	3,091	
6. Staff Travel	9,600	9,888	27,984	57,552	59,136	
7. Occupancy (w/ M&R)	14,400	14,832	41,976	86,328	88,704	
8. Utilities	2,800	2,884	8,162	16,786	17,248	
9. Telephone	140	144	408	839	862	
10. Office supplies/postage	200	206	583	1,199	1,232	
11. Copier	2,400	2,472	2,544	2,616	2,688	
12. EMR Diffusion	4,775,000	1,275,000	1,275,000	1,275,000	1,275,000	Enabling
13. HIS Enhancements	32,000,000	8,000,000	8,000,000	8,000,000	8,000,000	
14. Provider Interoperability	2,220,000	330,000	330,000	330,000	330,000	
15. Provider System Integration	640,000	160,000	160,000	160,000	160,000	CNS
16. CNS Build Out	1,960,000	1,960,000				
17. Hosting Fees	41,000	41,240	41,480	41,720	41,960	
18. CNS Hardware	138,000			138,000		
19. Licensed Software	88,000	1,760	1,760	1,760	1,760	Focused Initiatives
20. ePrescribing	874,000	252,000	252,000	252,000	252,000	
21. Continuity of care record	650,000					
22. Hospital Portal Gateway	4,140,000	825,000	825,000	825,000	825,000	
23. Claims and Eligibility Processing	2,824,000	700,000	700,000	700,000	700,000	
24. Total Expenses before depreciation	50,836,680	14,004,829	12,386,348	12,751,964	12,614,526	
25. Interest and Depreciation	-	-	-	-	-	
26. Total Annual Expenses	50,836,680	14,004,829	12,386,348	12,751,964	12,614,526	
Total Project Cost over 5 Years					102,594,347	

7. Revenue Model Components

A critical consideration for the project is where it will obtain a long-term revenue stream to sustain the Technology Support Organization and CNS infrastructure. As part of the EHR Study, JSI reviewed several examples of organizations similar to the WYHIO and the TSO that obtained funding to build-out their network and services, but failed due to the inability to identify long-term revenue streams needed to sustain the organization, the technology infrastructure, and the services provided.

Patients, purchasers, payers, and providers constitute the primary beneficiaries of an electronic health network. Once deployed and used, the network is expected to provide improvements in the quality and efficiency of health care delivery for all of these beneficiaries. As such, they are the logical entities that would need to provide the capital investment for developing the EHR Network and the ongoing payments for operating the network.

JSI cannot be proscriptive as to exactly which of these entities should pay what proportion of the total costs given that each organization must calculate the benefit expected to accrue to their organizations. Such contingencies are too far removed at this juncture for JSI to make useful global projections. JSI recommends that the WYHIO engage in a sensitive statewide discussion with all of these entities to

determine the most feasible approach for establishing a long-term, sustainable revenue stream. This discussion should include documentation of the benefits to accrue to the participating stakeholders from the EHR Network's components, as well as an understanding of the feasibility for different entities to provide revenue. Additionally, JSI recommends that the WYHIO engage in a focused review of the following revenue opportunities as part of the project development process for each focused initiative. These are the most common forms of revenue to be expected for the EHR Network.

- **Membership fees:** While not necessarily a viable option in the near-term, as the EHR Network matures and service offerings provide value to stakeholders, a membership fee structure by organization type may be a practical consideration. Such a model would likely be based on a relative size metric for each participant.
- **Transaction-based fees:** The administrative transaction processing project is the most likely candidate for this model in the short-term; however, this model may be considered for other large-volume, value-based services.
- **Service fees:** Access fees may be considered for services that aren't transaction-based, particularly if their value is evident to users. This may include sub-components, depending on the nature of the service provided.
- **Training fees:** The WYHIO and TSO will develop an extensive technical knowledge base over the years. Packaging that knowledge into a set of program offerings may provide a revenue opportunity.
- **Maintenance fees for hosted services:** Certain standardized services may ultimately be hosted and supported by the TSO. Certain users that don't have to maintain computer facilities and support staff in-house may pay for hosted services.
- **Grants:** There are numerous public and private funding sources that will be pursued (please see Summary Funding Matrix attached as **Appendix I** for more detail).
- **Subsidies from payors:** Serious consideration should be given to engaging payors and identifying opportunities to collaborate through the EHR Network. Payors may be willing to subsidize certain network activities if benefits to their organizations can be quantified.
- **State revenue:** Serious consideration should be given to engaging state offices, particularly in the areas of public health and identifying opportunities to collaborate through the EHR Network. State agencies may be willing to pay for network services and suggestions for in-kind contributions.

As noted throughout the report, JSI expects that the state of Wyoming will be required to make substantial contributions to the start-up costs of the EHR Network given the likely requirement to *prove the concept* of the CNS prior to other WYHIO members being willing and able to support the on-going cost of the initiative. The projected allocation of revenue sources has the potential to remain skewed toward the state, however (as shown in the example summary below), unless a significant effort is made by the WYHIO to develop sustainable, value-based revenue sources:

Sample Projection of Wyoming EHR Network Revenue Sources			
	Years 1 - 3	Year 4	Year 5
State	\$ 69,505,071	\$ 6,375,982	\$ 3,153,631
Private Foundations	\$ 3,861,393	\$ 3,187,991	\$ 1,576,816
Federal Grants	\$ 3,861,393	\$ 1,912,795	\$ 1,576,816
Transaction Fees	\$ -	\$ 637,598	\$ 3,153,631
Membership Fees	\$ -	\$ 637,598	\$ 3,153,631
Total Revenue:	\$ 77,227,857	\$ 12,751,964	\$ 12,614,526

8. Other Considerations

JSI recommends that the WYHIO and TSO take active and ongoing steps to minimize costs and maximize revenue. Key considerations include:

- **Utilize Existing Resources:** To the degree practical, the WYHIO should consider using established resources and organizations for the hosting of infrastructure, provision of centralized network services, and provision of training and other support services.
- **Outsourced support:** As called out in prior sections of the plan, it may be financially viable to maintain long-term relationships with third-party vendors who will host and/or manage various elements of the EHR Network.
- **Commit to enabling technologies:** A strong commitment in the one to three year build-out of the EHR Network will significantly reduce ongoing support costs in the long-term. For example, a strong proliferation of *standards-enabled EMRs* in physician practices will ease the complexity of integration to the network.
- **Phased implementation:** A key element of the implementation strategy has been to identify those EHR Network components that are required for the 5-year plan and to create the support organization necessary to meet those requirements.
- **Value-based services:** The Focused Initiatives identified in this plan represent those services that have the greatest potential of providing value to EHR Network users. As the project progresses and other services are considered, value statements must be made and specific revenue streams identified for those services.

G. Funding Sources for Planning and Pilot Projects

The opportunity to pursue funding for HIT projects across the country has never been better than it is today. With the tremendous national attention focused on improving quality indicators in health, reducing medical errors, enhancing patient safety, and the emphasis on making health care information available at the point of care, many organizations across the country have recently developed or expanded funding for such projects. This bodes well for the state of Wyoming which has several factors working in its favor: its significant number of rural communities, its multiple designations as having underserved health care populations (e.g., based on limited availability of providers or limitations in insurance coverage), and its demonstration of commitment to HIT initiatives as evidenced by its funding and support of the Wyoming EHR Feasibility Study.

As part of the initial work that JSI performed on the EHR Study, the project team compiled and presented to the IT-2's Funding Work Group a summary of funding opportunities to support planning and implementation of HIT projects. As part of that summary, it was noted that a primary wave of funding of the HIT planning initiatives around the country took place from 2002 to 2004, particularly from the Agency for Healthcare Research and Quality, which committed funding of over \$139 million in 2004 to HIT projects. A significant portion of those funds were specifically earmarked for rural communities. A secondary wave of funding that began in 2005 appears to be more focused on initiatives that support health information exchanges within and across communities, specifically geared toward state-designated regional health information organizations. In this realm, Wyoming is also well-positioned with the recent kick-off of the WYHIO as a state-designated organization to facilitate HIT initiatives.

JSI has recommended that one of the first orders of business for the WYHIO should be the pursuit of grant funding from among the sources identified during the EHR Study. A *Funding/Development Work Group* was established as part of the WYHIO business meeting that took place on August 11, 2005 in Casper and this group is actively pursuing both federal and private foundation grant funds to support the WYHIO and specific HIT initiatives to be supported by the WYHIO. (For further detail on potential funding sources for HIT initiatives, please see **Appendix I**)

H. Work Plan and Milestones for Implementation

The Microsoft Project Work Plan that is attached as **Appendix J** outlines the key steps described for the initiatives above, with the appropriate tasks and work steps for each. In addition, the Work Plan describes which components of the plan are contingent on other components, thus maintaining the consistency of the expected project rollout. The version of the Work Plan presented here details the tasks and order of the tasks to be undertaken, but does not accurately reflect the changing start and end-dates for specific tasks as this is a dynamic process. The Work Plan file will be made available to the WYHIO for use in updating the necessary modifications as the decision-making process proceeds.

VII. COMMUNICATIONS STRATEGY FOR EHR STUDY AND PLAN

A. Strategy for Communicating the Plan:

For an endeavor that will involve substantial coordination across organizations as well as changes in operations and processes for conducting business, the WYHIO will have to engage in marketing its activities and having a continual dialogue with the public and the health care community. Communications are therefore a necessary part of its activities. Major components of the communications plan are suggested below.

1. For the general public:

A well thought out press strategy is required for reporting back to Wyoming and communicating the results of the EHR Study and Plan to the general public.

- Prepare a press release(s) to announce results of the EHR Study and Plan. Include important milestones that have already been accomplished and the next steps. Distribute the press release(s) to the Wyoming media and HIT news sources.
- The position of the WYHIO, in the health care market of Wyoming should clearly be communicated in the press release. The Interim Board should anticipate areas of overlap, or competition, with other organizations and be prepared to respond to these concerns.
- Identify one, or perhaps two, spokesperson(s) who are prepared to respond to questions from the media and general public.
- Mail press releases to those who participated in the key informant interviews and focus groups and include a note of gratitude for their contributions to the project. Encourage them to continue their participation and reference the letter of commitment and support.
- Establish a WYHIO Webpage for updates, general information and resources and include the EHR Study and Plan as downloadable documents.

2. For the private health care sector and the public health sector:

The most effective tool will be individual and small group discussion between current partners and other stakeholders.

- Prepare a list of talking points which anticipates some of the questions likely to arise as a result of the media attention to ensure that there is a consistent and accurate message to help reinforce key themes.
- Prepare a list of target stakeholders who have not already signed the letter of support and commitment and assign responsibility to current partners for contacting them. Partners should communicate the results of the EHR Study and Plan and invite these stakeholders to participate in the process. Partners will also want to identify any real or perceived barriers to participation and report these back to the Interim Board.
- Request assistance from health care associations, licensing boards, and hospital medical staff offices (via the CEO) with distributing press releases to their membership and/or staff. Request copies of their mailing lists to avoid duplicating contacts.
- Prepare talking points to help providers and health care professionals answer questions which may be posed by patients or others in their community.

- As plans develop and become clear, prepare a one-page WYHIO fact sheet that describes the WYHIO and presents the benefit and value of participation. Post the fact sheet as both content on the WYHIO web site and as a downloadable document. Describe opportunities for involvement, including service on committees.

3. To the Academic and Research Sector:

- Mail press releases, along with a forecast of employee and skill demands related to the WYHIO, to health and information technology education and training programs. Request their involvement in the WYHIO and their ideas about education and training trends.
- Invite appropriate academic and research organizations to help identify key themes and messages for consumer outreach, involvement and engagement.

4. To Potential Funders:

- Mail press releases and request that the WYHIO be added to their contact list for RFPs and other announcements of funding opportunities.
- Identify policy maker and elected official colleagues that can be contacted for collaboration and to obtain additional information.

The state of Wyoming has taken a major step in investigating the feasibility of providing an electronic health record for all of its citizens. With the results of this study, as well as the availability of actual health information capture and exchange technology, the state is well positioned to move ahead and make such a record a reality. With able leadership, sufficient financial resources, collaboration with the critical partners in the state, clear focus, and public support, the benefits of an electronic health record can accrue both patients and providers throughout the state.

B. Long-Term Strategy

Maintain the WYHIO web site with:

- Continual updates on progress, milestones, and successes in implementing the Plan.
- Additional content on major achievements, including downloadable copies of press releases.

Host an annual open public meeting in order to continue publicity, gather support, and enable networking of interested stakeholders across the state. The meeting should consist of:

- Discussions on significant achievements and operations achieved in implementing the statewide EHR Network.
- Discussions on any concrete work that links WYHIO activities to those occurring both in other states and at a national level.
- Discussions on any research that demonstrates patient care improvement or cost savings from implementing the EHR Network.
- Workshops for health care entities; examples are:
 - Successfully Implementing an EMR System in Ambulatory Care
 - Managing the Referral Process Through Use of the continuity of care record
- Topical networking events for sets of health care entities:
 - Hospital clinicians

- Practice managers
- Specialists.

The communications plan will continue to evolve further as the WYHIO takes on a greater role in the EHR Network and as it becomes recognized more broadly throughout the state as the conduit for HIT information, as the guide for health information initiatives, and as a resource for community-based HIT efforts. The WYHIO will also continue to look for and take advantage of opportunities to do informal marketing in a variety of venues.

VIII. CLOSING SUMMARY

The planning, development, and implementation of Enabling Technologies, Centralized Network Services and Focused Initiatives recommended in this Report represents an aggressive, but ultimately attainable, approach to building an EHR Network in Wyoming. The recommendations present an approach that considers the findings from an extensive information gathering and engagement process with Wyoming providers; the national HIT context for the development and promotion of standards, the impending certification of HIT products for interoperability, security and work flow; the feasibility of identifying and securing sufficient funding for both startup and on-going costs; and the need for developing an effective and efficient harmonizing organization, the Wyoming Health Information Organization.

JSI believes that the plan presented is feasible for the state of Wyoming to achieve based on the research that was conducted to evaluate the supporting elements and based on the assumptions noted throughout the Report regarding the allocation of resources – human, financial and technical – in an incremental approach. In evaluating the recommendations presented here, JSI would like to reiterate the guiding principles for the EHR Network initiative:

- **Enable** the Wyoming health care community through technology
- **Share** health information electronically
- **Promote** value-based Focused Initiatives: ePrescribing, continuity of care record, hospital portals, and administrative transaction processing
- **Manage** the health information network effectively through the WYHIO and the TSO.

In a similar fashion to federal endorsement by ONCHIT of a *regional approach* for developing the nationwide health information network, so to should the WYHIO approach the EHR Network. The use of hospitals as anchors to promote regional implementations of HIT will ensure that the rural nature of Wyoming's population and dynamics is effectively incorporated into the EHR Network, while also providing a more manageable number of connection points throughout the state.

IX. APPENDICES

- A. BIBLIOGRAPHY OF HIT ADOPTION VALUE STUDIES**
- B. DATA GATHERING PROCESS OVERVIEW AND SUMMARY STATISTICS**
- C. SUMMARY OF HOSPITAL INFORMATION SYSTEM SURVEYS**
- D. SAMPLE JOB DESCRIPTION FOR WYHIO EXECUTIVE DIRECTOR/CIO**
- E. DOQ-IT LISTING OF QUALITY INDICATORS**
- F. PHASE II CCHIT SAMPLE CERTIFICATION CRITERIA**
- G. FUNCTIONAL REQUIREMENTS**
- H. REFERENCES FOR HEALTH INFORMATION TECHNOLOGY COSTS**
- I. SUMMARY MATRIX OF HIT FUNDING OPPORTUNITIES**
- J. HTML VERSION OF MICROSOFT PROJECT WORK PLAN**
- K. CRITERIA FOR EVALUATING PROJECTS**

APPENDIX A: BIBLIOGRAPHY OF HIT ADOPTION VALUE STUDIES

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APPENDIX B: DATA GATHERING PROCESS OVERVIEW AND SUMMARY STATISTICS

Phase I. Key Informant Interviews

Key informant interviews will have four major objectives:

1. Engage leaders within the various stakeholder groups by a) providing a safe forum for them to provide input into the EHR design and formation and b) inform them about the process (we will have a “script” about the EHR study process for consistency).
2. Obtain input into moving up the “interoperability pyramid” or long-term clinical connectivity vision for the state of Wyoming, i.e., where are we currently, how best to move along the continuum, what will be the barriers, what will be the enablers, etc.
3. Obtain general consensus around forming a RHIO for Wyoming and obtain input on how this can be done most effectively.
4. Identify specific topics for focus groups of constituents and obtain names of potential focus group participants.

Key informant interviews will be conducted with identified leaders within each of the stakeholder groups listed above with the exception of IT vendors. IT vendors will not be included in the initial interviews to avoid any potential conflict of interest. Key informants should have the “broader picture” but also be able to articulate potential concerns of their constituencies. Members of the Wyoming Healthcare Commission and IT2 Subcommittee are not excluded from serving as key informants. A list of potential key informants will be developed by the members of the Data Acquisition and Research Subgroup as well as other members of the IT2 Subcommittee and the Wyoming Healthcare Commission. The list of invitees to the January 22, 2005 meeting in Casper and other lists provided to JSI may be used as a starting point for selecting key informants. It is assumed that 15-20 key informant interviews will be conducted.

Key informant interviews will be conducted as one-on-one interviews. Most of the interviews will be conducted via telephone; however, selected interviews can be conducted in person if desirable. Ann Keehn, Debra Olesen, and other senior members of the JSI project team will conduct the key informant interviews using an interview protocol developed by JSI with input from the Data Acquisition and Research Subgroup. A draft outline for the key informant interview protocol is included in the appendix; the protocol will be modified as needed to match the various stakeholder interests.

In general, the topics for discussion will be 1) formation of a statewide electronic health record and 2) creation of a RHIO for Wyoming. Specific questions and probes will vary depending upon the stakeholder group of the key informant. Examples of questions by stakeholder group are also included in the appendix following the more general outline.

Findings from the key informant interviews will be used to frame the specific questions for the focus groups. In addition, the key informant interviews will be used to identify potential participants for the focus groups (specific individuals).

Phase II. A. Focus Groups

Focus groups will be used to gather input from the individual constituents within each of the stakeholder groups with the exception of the general community and patients. Input from this stakeholder group will be obtained through open, town hall style meetings. (See below.)

The objectives of the focus groups are similar to those of the key informant interviews and are as follows:

1. Engage the stakeholders by a) providing a safe forum for them to provide input into the EHR design and formation and b) informing them about the process.
2. Obtain input into moving up the “interoperability pyramid” or long-term clinical connectivity vision for the state of Wyoming, i.e., where they are currently, how best to move along the continuum, what will be the barriers, what will be the enablers, etc. Participants will talk about their specific organization.
3. Obtain general consensus around forming a RHIO for Wyoming and obtain input on how this can be done.

Focus groups will be conducted across the state to ensure participation from all geographic areas. It is anticipated that 10 – 12 focus groups will be conducted. Each focus group will be limited to 8-10 participants and participants within a focus group will be from the same or related stakeholder groups. For example, one focus group may include physicians while another focus group will include hospital administrators and staff. Participation in focus groups will be by personal invitation.

There are two major topic areas for all of the focus groups, 1) statewide electronic health record and 2) establishment of a Regional Health Information Organization for Wyoming. However, the specific questions asked of the participants will be tailored based upon which stakeholder group the participants belong.

Ann Keehn, Debra Olesen, and other JSI staff experienced in conducting focus groups will serve as focus group moderators. Moderators’ guides will be produced by JSI with input from the Data Acquisition and Research Subgroup.

Phase II. B. Town-Hall Style Meetings

Consumer input will be obtained through several open, town hall style meetings held in specific locations across the state. The meetings will be advertised and open to the public.

Focus groups and town hall meetings will be taped and the tapes transcribed for analysis. The analysis will look for common themes, potential barriers or pitfalls, and areas needed further investigation.

Phase III. Written Surveys (if needed)

One or more written surveys will be used in this phase of the data gathering only if considered necessary to 1) obtain additional information around a specific question that arose from the focus groups, or 2) obtain additional input around critical areas where there was not consistency in the focus group results.

Surveys may be used later in the project to solicit information around specific issues/projects.

Time line and Work Plan

Time line

Key informant interviews and focus groups will be conducted during the months of February and March. Most likely, public meetings will take place in early April.

The general work plan is outlined below. More specific tasks and specific dates will be added as the work progresses.

Work Plan

Task 1. Conference call with Data Acquisition and Research Subgroup to a) review and review and revise, as needed, stakeholder data gathering work plan, and b) produce a proposed list of key informants, and c) draft email to other IT2 Subcommittee members and Wyoming Healthcare Commission members requesting names of potential key informants. (A list of invitees to the January 22, 2005, meeting in Casper will be provided for reference.)

Task 2. Send emails to broader IT2 Subcommittee and Wyoming Healthcare Commission requesting names of potential key informants and best method of introduction to key informants. Follow up with telephone calls, as needed.

Task 3. Finalize key informant list and interview protocol (draft outline is attached).

Task 4. Draft and send correspondence (letter, email) to potential key informant interviews asking for their willingness to participate and process for responding.

Task 5. Schedule key informant interviews. Carl Olson, JSI, will coordinate this activity from the Denver office with assistance from Emily Genoff, Wyoming Healthcare Commission.

Task 6. Conduct key informant interviews.

Task 7. Prepare summary of key findings and, based upon those key findings, create plan for focus groups, including a) determine how focus groups will be organized, b) identify locations for focus groups, c) prepare list of potential participants for each focus group, and d) develop recruitment plan

Task 8. Prepare focus group moderator's guide for each of the focus groups. (JSI)

Task 9. Recruit participants for each of the focus groups using telephone call, letters, and other means as appropriate. Work with key informants to obtain high participation rates.

Task 10. Schedule and plan focus groups and town hall meetings, including identifying suitable locations. (Carl Olson and Emily Genoff)

Task 11. Conduct focus groups and town hall meetings.

Task 12. Analyze results and prepare summary of key findings.

Task 13. Prepare final report on data gathering process and outcomes with specific recommendations regarding the formation of a statewide electronic health record and RHIO for Wyoming.

SUMMARY STATISTICS FROM WYOMING FOCUS GROUPS

Town/Community	Gillette	Sheridan	Buffalo	Cody	Jackson	Afton	Rock Springs	Riverton	Casper	Cheyenne	
County	Campbell	Sheridan	Johnson	Park	Teton	Lincoln	Sweetwater	Fremont	Natrona	Laramie	
Location in State	NE corner	NE corner	North central	North Central	NW corner	W central border	SW corner	Central	Central	SE border	
Hospital	Campbell County Memorial Hospital	Memorial Hospital of Sheridan County	Johnson County Healthcare Center/Memorial Hospital	West Park Hospital	St. John's Medical Center	Star Valley Medical Center	Memorial Hospital of Sweetwater County	Riverton Memorial Hospital	Wyoming Medical Center	United Medical Center	
Staffed Beds	75	62	65	154	108	40	99	59	205	198	
2004 Avg Census	34	32	55	105	77	28	19	13	103	116	
2004 Avg Occupany %	45%	52%	85%	68%	71%	70%	19%	22%	50%	59%	
Governance/Control	Hospital District	County	Hospital District	Hospital District	Hospital District	Hospital District	County	Investor-owned/ for profit corp	Private, Not-for-profit	County	
											Totals
Number of Focus Groups	3	4	1	4	4	1	4	4	5	5	35
Physicians	6	3	4	4	3	0	0	2	4	8	34
Hospital	13	6	0	8	7	7	6	3	9	1	60
Ancillary	0	5	0	0	4	0	2	1	4	4	20
Total Participants	19	14	4	12	14	7	8	6	17	13	114

APPENDIX C: SUMMARY OF HOSPITAL INFORMATION SYSTEM SURVEYS

Summary of Hospital Management and Clinical Information Systems															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Major IT Vendor	Did not respond to inquiries by JSI	Did not respond to inquiries by JSI	VISTA/CPRS	HMS	Meditech	Meditech, Image Now	CPSI	Dairyland Healthcare Solutions	McKesson	None	Siemens	American Healthnet	McKesson	Various	None
Hospital Information System (HIS)			VISTA/CPRS	HMS	Meditech	Meditech	CPSI	Dairyland	McKesson	Paper	Siemens	American Healthnet	McKesson		Paper
Admit/Discharge/Transfer (ADT)			VISTA/CPRS	HMS	Meditech	Meditech	CPSI	Dairyland	Paragon		Med Series 4	American Healthnet	McKesson	HMS	Paper
Claims Processing/Billing				HMS	Meditech	Corporate (in-house)	CPSI	Dairyland	Paragon		Med Series 4	American Healthnet	3M	HMS	Done out of Greeley
Submit Claims Electronically				74%	75%	100%	65%	75%	100%		< 100%	90%	100%	75%	% not available
Clinical Systems															
Clinical Charting			VISTA/CPRS		Meditech PCS	Meditech		Looking into Dairyland clinical package	Paragon (testing)		OB only, GE OS	Possibly by end of current fiscal year	McKesson		Yes (Transcription with electronic signature)
EMR			VISTA/CPRS		Meditech PCS	No (just starting to install)		Looking into Dairyland clinical package	Paragon (planned)			Possible upgrade at end of fiscal year	McKesson		
Lab (LIS)			VISTA/CPRS	Yes	Meditech	Yes		Yes	Yes Integrated		Novias	Yes	Yes		
Radiology (RIS)			VISTA/CPRS	Yes	Meditech/Novarad	Yes	Yes		Yes Integrated		Novias	Yes	Yes		
PACS						Yes			Yes Integrated						
Pharmacy			VISTA/CPRS	Yes	Yes	Yes		Yes (Quadramed)			Pyxis/Omega, not interfaced to HIS	Yes	Yes		
Bedside Monitoring				Yes	MDE	Yes			Yes						
Other					PT-Iserhegen										
Hospital Portal			VA network physicians only	Yes		Yes, for physicians and IT staff	Yes, T1 connect		Yes, HIS users		Yes, limited by ethernet size		Yes		
CPOE			VISTA/CPRS		Meditech (not implemented)	Meditech (Rarely Used)			Paragon (planned)						
Interface(s)			Fully Integrated	One system Blueware	Vendor interfaces, Meditech Data Responsibility w/Crystal Reports	Integrated (use Cloverleaf system)	Integrated System		Homegrown, moving to full McKesson integration		HL7				
Other systems			Intranet connectin to other VA hospitals	Novelle	Various department						MS4 Central Responsibility, dictaphone, Sextant, HLC				

	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Major IT Vendor	McKesson	Dairyland Healthcare Solutions	Meditech	HMS in Nashville, TN	American HealthNet/Unix	HIS Oamerica Health Net	Meditech	McKesson	Keane, Pyxis, McKesson	Siemens	Unicare (will be changing service to Universal Health Systems)	Did not respond to inquiries by JSI	Creative Socio Medics	Did not respond to inquiries by JSI	VISTA/CPRS
Hospital Information System (HIS)	McKesson	Dairyland	Meditech	HMS	American HealthNet/Unix	HIS Oamerica Health Net	Meditech (Magic)	McKesson	Keane	Siemens	Unicare				VISTA/CPRS
Admit/Discharge/Transfer (ADT)	McKesson	Dairyland	Meditech	HMS	American HealthNet/Unix	Healthnet Omaha	Meditech (Magic)	McKesson	First Coast	Siemens	Unicare				VISTA/CPRS
Claims Processing/Billing	McKesson	Dairyland	Meditech	HMS	American HealthNet/Unix	Physician billing	Meditech (Magic)	McKesson	First Coast	Siemens	Unicare		PCAcas		
Submit Claims Electronically	70%	90%	70%	65%	100% use clearing house	100%	% not available	70%	85%	100%	60%		% not available		
Clinical Systems															
Clinical Charting	For Nursing (with Care-Manager)	MedQuist (Transcription)	Meditech	HMS		Have Clarus, not charting yet	Meditech (Magic)	McKesson	First Coast (not implemented)	No (will be implementing with Cerner)			Creative Socio Medics		VISTA/CPRS
EMR							Meditech (Magic)			No (will be implementing with Cerner)			Yes		VISTA/CPRS
Lab (LIS)	Yes		Yes	Yes			Yes Integrated	Yes	Yes	Yes			Yes		VISTA/CPRS
Radiology (RIS)	Yes	Yes (Teleradiology)	Yes	Yes		Yes	Yes Integrated	Yes	Yes	Cerner (not implemented)					VISTA/CPRS
PACS								Yes							
Pharmacy			Yes	Yes			Yes Integrated	Yes	Yes	Cerner (not implemented)			Yes		VISTA/CPRS
Bedside Monitoring		Yes (Cardiac telemetry)						Yes	Various	Cerner (not implemented)					
Other							Yes Integrated								
Hospital Portal		Yes	Yes, for radiology	Yes			Yes, for lab and x-ray		Yes, all HIS users	Yes					VA network physicians only
CPOE	Working on CPOE						Meditech (not implemented)								VISTA/CPRS
Interface(s)		Facility network server, Unix system		TCP-IP internet based			Integrated system	Integrated system	Moving to HL7	Written Interface HL7					Fully Integrated
Other systems								Various							Intranet connection to other VA hospitals

APPENDIX D: SAMPLE JOB DESCRIPTION FOR WYHIO EXECUTIVE DIRECTOR/CIO

POSITION: Executive Director/Chief Information Officer

REPORTS TO: Board of Directors

CLASSIFICATION: Exempt

POSITION SUMMARY:

The WYHIO is a new state-wide organization that will act as a facilitating, enabling and endorsing organization for sharing of health care information. The first person to be hired is the Executive Director.

The Executive Director is responsible for implementing the policies of the board and the overall administration and management of the WYHIO. Areas of responsibility include planning and evaluation, policy development and administration, personnel and fiscal management, and public relations. This is a full-time position, hired by and directly accountable to the board of directors through its elected board chair.

The Executive Director also serves as the Chief Information Officer (CIO) and will provide technology vision and leadership in the development and implementation of the enabling technologies, centralized network services and Focused Initiatives. Additionally, the Executive Director/CIO:

- Provides strategic and tactical planning, development, evaluation, and coordination of the information and technology systems for the health care network.
- Facilitates communication between staff, management, vendors, and other technology resources within the organization.
- Oversees the back office computer operations of the affiliate management information system, including local area networks and wide-area networks.
- Responsible for the management of multiple information and communications systems and projects, including voice, data, imaging, and office automation.
- Designs, implements, and evaluates the systems that support end users in the productive use of computer hardware and software.
- Develops and implements user-training programs.
- Oversees and evaluates system security and back up procedures.

RESPONSIBILITIES:

1. Management and Administration
 - a. Develop and facilitate an active planning process.
 - b. Develop organizational goals and objectives consistent with the mission and vision of WYHIO.
 - c. Develop and administer operational policies.
 - d. Oversee all programs, services and activities to ensure that program objectives are met.
 - e. Oversee business development.
 - f. Ensure compliance with funding sources and regulatory requirements.
 - g. Provide information for evaluation of the organization's activities.
 - h. Serve as liaison between all of the participating organizations/stakeholders.
 - i. Negotiate with vendors, contractors, and others.
2. Fiscal
 - a. Prepare and submit grant applications and funding proposals, as appropriate

- b. Develop, recommend, and monitor annual and other budgets.
- c. Ensure effective audit trails.
- d. Approve expenditures.
- e. Provide for proper fiscal record-keeping and reporting.
- f. Submit monthly financial statements to the board of directors.

3. Human Resources

- a. Administer board-approved personnel policies.
- b. Ensure proper (legal) hiring and termination procedures.
- c. Oversee any and all disciplinary actions.
- d. Provide for adequate supervision and evaluation of all staff and volunteers.

4. Board Relations

- a. Assist the board chair in planning the agenda and materials for board meetings.
- b. Initiate and assist in developing policy recommendations and in setting priorities.
- c. Facilitate the orientation of new board members.
- d. Work with the board to raise funds from the community.
- e. Staff board committees as appropriate.

5. Community/Stakeholder Relations

- a. Serve as chief liaison with specific community groups and stakeholders.
- b. Ensure appropriate representation of WYHIO by all employees.
- c. Coordinate representation of WYHIO to legislative bodies and other groups.
- d. Coordinate and schedule visits to the WYHIO project.

6. Chief Information Officer

- a. Manage the implementation of information systems, as needed.
- b. Relate to all levels of the user community.

IT Budget/Contracts

- a. Approve, coordinate and control all projects related to selection, acquisition, development and installation of major information systems. Provide advice on evaluation, selection, implementation and maintenance of information systems, ensuring appropriate investment in strategic and operational systems. Evaluate systems to measure their success.
- b. Review all hardware and software acquisition and maintenance contracts, soliciting involvement and participation of other management team members as appropriate.
- c. Develop and maintain corporate policies and standards aimed at maximizing effectiveness and minimizing costs related to the acquisition, implementation and operation of IT systems.
- d. Develop, when possible, master purchase or lease agreements for hardware, software, maintenance and telecommunication services.
- e. Develop and monitor the approved annual operating and capital budgets for information and technology systems.
- f. Maintain contact with IT suppliers and maintains knowledge of current technology, equipment, prices and terms of agreements to minimize the investment required to meet established service levels. Evaluate alternatives, performs appropriate cost benefit analysis, and recommend solutions that maximize effectiveness and minimize costs commensurate with acceptable risks.

- g. Manage relationships with vendors for sales, service and support of all information systems and technology. Maintain problem logs, documenting system errors or defects. Serve as the primary contact to software, hardware and network-related vendors, consultants, and partners.

Planning/Policy Development

- a. Responsible for the technology vision and planning process that will regularly evaluate existing technology, information systems, and staffing, research new solutions and technologies and recommend changes.
- b. Responsible for planning, development, evaluation, coordination and management of the information and technology systems for the affiliate. This includes telephones, data imaging, practice management systems, and office automation.
- c. Develop and enforce policy and procedures to ensure the protection of the members' IT assets and the integrity, security and privacy if information entrusted to or maintained by the affiliate.
- d. Oversee the linkage between external technology systems (e.g., government, vendors and other health care organizations) and the members' IT resources; including systems for electronic data exchange.
- e. Recommend changes to software applications based on analysis of their impact to all users requirements.
- f. Gather and analyze changing requirements of users and develop effective and feasible ways to satisfy user requirements.

System Administration/Reporting

- a. Promote and oversee relationships between the health care network's IT resources and external entities (e.g., government, vendors, researchers, and other health care organizations).
- b. Ensures that all information systems and networks operate according to internal standards, external accrediting agency standards, regulatory agencies and legal requirements, including HIPAA.
- c. Develop and maintain the systems architecture, defining standards and protocols for data exchange, communications, software and interconnection of health care network information systems.
- d. Coordinate and manage reporting needs and data analysis for the affiliate. Ensures that the gathering, processing, distribution and use of pertinent information required by management to make decisions occur in a timely, accurate and cost effective manner.
- e. Manage the system that provides training and support to end users.
- f. Ensure that data systems are capable of provision of all patient data and statistics as required by federal, state and local agencies. Supports the development of patient reports as requested.
- g. Develop and maintain system recovery plan in the event of power failure, damage to system, etc.
- h. Facilitate correction of any system failures, contact point for computer problems.
- i. Oversee the development, maintenance, and communication of systems documentation, policies, and procedures.

Training

- a. Supervise the development and maintenance of user documentation, including complete user manuals, FAQs and help files.
- b. Communicate IS/IT plans, policies and technology trends throughout the organization, including management groups and professional staff.
- c. Develop, implement and maintain comprehensive user training program. Provide directly or arrange new user training and advanced training for existing users.
- d. Update documentation and on-line help facilities.

KEY COMPETENCIES:

- 10-15 years business or information technology management experience in the health care industry
- 5+ years strategic consulting experience

- Demonstrated understanding of the NHIN/PHIN strategies
- Demonstrated understanding of health care software applications across hospital, public health, and private practice domains
- Demonstrated understanding of health information technology standards
- Comfortable navigating administrative, technical and clinical issues
- Ability to link and apply complex technologies to business strategies
- Knowledge of technology and information systems planning to support business goals in a health care setting.
- Conceptual thinker and practical implementer
- Demonstrated leader
- Strong management skills
- Ability and willingness to travel, when necessary
- Familiar with both shared and outsourced solutions, as well as, support of in-house information and communication systems in a multi-site client-server environment.
- The ideal candidate will also have:
 - Familiarity with desktop, notebook, handheld, and server computer hardware.
 - Familiarity with local and wide area network design, implementation, and operation.
 - Familiarity with operating systems such as Windows, Unix, and Linux.
 - Knowledge of various office productivity software programs such as word processing, databases, spreadsheet programs, and communications software.
 - Familiarity with various computer peripherals such as printers, monitors, modems and other equipment.
- A Bachelor's degree is required (business or computer science); MBA, MHA, MPH, or equivalent preferred
- Direct management of a major IT operation is preferred.
- Experience with practice, financial and clinical management information systems a plus

SUCCESS BENCHMARKS:

- Sustainability and local growth of the WYHIO membership
- Increased adoption and utilization of HIT among key health care Wyoming stakeholders
- Ability to continue leading the WYHIO and its stakeholders
- Satisfaction of participating organizations in the WYHIO

PERSONAL CHARACTERISTICS:

Rural Understanding	Effectively grasps the distinctions between urban and rural lifestyles, economics, and health care delivery.
Health Information Technology	Comprehends complex technical subjects and can translate technical language to lay audiences.
Strategic Planning Skills	Identifies major strategic issues and translates them into opportunities.
Deep Industry Knowledge	Utilizes a variety of knowledge sources to discuss issues and respond effectively to customer specific issues and challenges.
Influencing	Uses a variety of techniques and information to lead people in desired directions.
Facilitation Skills	Leads interactive sessions to achieve agreed upon outcomes.
Out of Box Thinking	Looks for and proposes a variety of opportunities and solutions for a unique and innovative approach.
Effective Change Agent	Embraces change - doesn't get flustered with changing priorities and quickly adapts.
Mentoring	Takes the time to train, explain and bring people up to speed.
Results oriented	Demonstrates the ability to set and manage to achieve goals.

Presentation Skills	Creates and delivers compelling, targeted presentations that compel senior business executives to action.
Efficient Manager	Demonstrated self starter. Drives projects to completion and delegates tasks appropriately to complete deliverables.
Resourcefulness	Does more with less. Can produce results without relying on administrative resources or support organizations.
Customer Oriented	Makes decisions based on the best mutual interests of customers/ stakeholders.
Quick Study	Masters new subject matter quickly without requiring extensive training.
Flexibility	Handles multiple initiatives simultaneously.
Problem-Solving Skills	Sees opportunities and implications beyond those of industry analysts and stakeholders. Has a track record of generating thought provoking ideas.
Ability to Think and React Rapidly	Disaggregates complex problems into constituent components; analyzes each component and drives answer(s) for each; synthesizes total findings into the fundamental insights, answers, possibilities, implications

APPENDIX E: EHR NETWORK FUNCTIONAL REQUIREMENTS

The technical requirements for the Wyoming EHR Network will be enabled through the following general technologies.

- **Web browser-based data entry and data management:** Web browser-based systems and data access will be developed using commercial application server technology as part of a multi-tiered web development system using open-platform web servers (e.g., Apache, Microsoft's IIS, Netscape) running on Windows NT / 2000, LINUX or UNIX and supporting generic web browsers (HTML 3.0+ / Java). The web server, the application server and the database server will be separate tiers of this system.
- **Contemporary application programming practices:** Component development will involve EJB, CORBA or DNA (DCOM). Database access will use SQL and ODBC or JDBC connectivity. Application server development surrounding the data repository will apply business rules and initiate integration broker activity. Data repository stored procedures will need to initiate application server functions.
- **Develop data reporting and visualization capability:** Commercial reporting systems (e.g., Crystal Reports or Actuate, statistical analyses software such as SAS, and GIS software (e.g., ArcView or MapInfo) will be integrated using ODBC and JDBC data access. Security and access control will be applied for remote access over public networks using SSL and Certificate or Token-based authentication with appropriate authentication and authorization.
- **Implement a shareable directory of health care personnel:** Directories will be maintained using the Light Weight Directory Access Protocol (LDAP) services. Data fields in the directory will use X.500 standards for field type and length. Public and non-public field division, standard Object Classes and their attributes and definitions as well as methodologies for replication, will be implemented following Centers for Disease Control and Prevention (CDC) and Department of Health and Human Services (DHHS) standards and directories.
- **Implement a security system and appropriate security policies:** Security policies will be implemented with authentication based on industry standard X.509 certificates, secure tokens, and other applicable means as identified; access and control of data via selective integrated repository authorization; an encryption engine and appropriate use of encrypted data; and access control through a firewall by data routing to programs and other organizations.
- **Data Repository and Data Management:** Commercial database management software such as Oracle, DB2, or MS-SQL will be utilized. Database schema such as HL7 Electronic Health Record, ASTM Continuity of Care Record, and HL7 Public Health Conceptual Data Model/HL7 Reference Information Model will be utilized as required to support various initiatives.

The messaging, data exchange, database replication, and web capabilities of the proposed system must be modular and scalable, such that the system can be expanded for use as the Wyoming EHR Network evolves. The system must be standards-based to facilitate the highest degree of flexibility and interoperability with similar systems operating in other regions of the state and beyond. Additionally, if and when the proposed system is expanded to other health care organizations across the state, it must provide the capability to be hosted at alternative sites (including the expanded sites) to support mission critical redundancy requirements.

A. Systems Environment Requirements

The Wyoming EHR Network will consist of four environments to support system development and testing, user training, and production implementation, as well as provide a backup site in case of failure of the production system. EHR Network environments will be shielded from unauthorized access and intrusion by Internet IT

firewalls and a cluster of ISA (Internet Security and Acceleration) servers. The production and backup systems will be housed in separate, secure facilities designed to safeguard the physical components of these systems and to restrict access to only authorized personnel.

1. Primary System

The primary system will be constructed of three tiers: the web server tier, the application tier, and the data server tier.

- **Web Server Tier**
The Web Tier houses two parallel web servers in a secure environment (DMZ) as the primary point of access for remote system users. Authentication of the user is controlled at the portal (in concert with an external LDAP server). Once authenticated, the web server(s) establish a secure path from the remote user to the server using SSL encryption. Incoming messages are in HTTP protocol. Requests for dynamic HTML pages are forwarded to the application server. Static HTML pages (if any) are served directly from the web server.
- **Application Tier**
The application tier will consist of three servers, which are functionally specific. These servers are intended to improve performance by segmenting the business logic (applications) onto multiple servers (a limited type of load balancing). Components for this tier will be:
 - **Application Server(s):** This server(s) is the primary link for interaction between the web server(s) and the data server and database. The primary responsibility is to host any centralized applications that provide services to EHR Network users.
 - **Extract/Translate/Load (ETL) Server:** This server runs the integration broker packages used to transform health-related messages to/from standard message formats (e.g., HL7, X12N, NCPDP) and an internal system. The integration server will do the bulk of the work of managing data exchange across the network.
 - **Non-Web-Enabled User Interface Server:**
This server will host the Citrix Metaframe (or a similar server) and will provide the interface to any non-web-enabled systems that may be integrated onto the EHR Network. It will allow network users to connect to a non-web-enabled application residing on some other server within the network.
 - **Data Server Tier**
This server isolates the physical databases from the application layer to allow higher performance and easier maintenance of business logic by decoupling the business logic from the database access. This server accepts data requests from the application server and puts/gets the data as required. It hosts the database engine that does all the real work in satisfying persistent data needs.

2. Backup System

The EHR Network backup system is an exact copy of the primary system. The backup system will serve as the hot site that will allow continuity of network operations should the primary system fail for any reason. All modifications to hardware and application/system software within the primary system will be applied to the backup system.

3. Development/Testing System

The development and testing environment will also have a three-tier architecture to simulate the primary system environment, but on a smaller scale.

4. Training System

The training system will be an exact copy of the development/testing system with the exception that the training environment will include workstations to be used for training sessions.

5. Performance and Scalability

The systems environment must be designed to ensure adequate performance and scalability:

- Capacity for adding additional hosted applications at the central EHR Network facility.
- Capacity to integrate with additional remote systems/applications as required to support the network.
- Capacity to store and/or manage access for additional health care data records across the extended network.
- Capacity of the system to facilitate an increase of additional concurrent users with no degradation in performance.
- Capacity for messaging and routing of data with a transaction throughput providing for less than 2 seconds delay in system response for users.

6. Disaster Preparedness

A secure backup hardware environment must be provided in the event of the failure of one or more of these servers or the data network that connects it to the Internet. This environment must:

- Be located within a secure location,
- Have its content routinely synchronized with the production servers,
- Must be able to be activated as a primary production server within 4 hours, and
- Have capacity to store all data and software backups on removable media,

7. Network Security

The security for the EHR Network will comply with the checklist established by National Institute of Standards and Technology. This will ensure that EHR Network information is protected in ways that meet or exceed HIPAA and state standards. The checklists cover the following:

- Perimeter Defense (Routers, Firewalls, etc.),
- Intrusion Detection

- Web Server Security and Administration
- System Fault Tolerance
- Virus Detection
- Security Policies, Procedures and Training

8. Physical and Network Security

To prevent unauthorized physical access to various hardware servers hosting the EHR Network, these servers will be protected in a locked facility provided by the state. In addition to the physical security, the EHR Network will provide network security through the use of firewalls and DMZ. A firewall may be either a hardware device or a software program running on a secure computer. It is designed to protect internally networked computers from either accidental or intentional hostile intrusion that could compromise their integrity or result in data corruption or denial of service.

B. Enabling Technology

1. Network Infrastructure

Key functional requirements of the statewide network infrastructure that will be necessary to support health care organizations and their use of the EHR Network include:

- The EHR Network Infrastructure must provide a wide area network backbone that will provide data, voice, and video connectivity to organizations across the state.
- Provide wide area network connectivity (up to T3 bandwidth) to the local area network router of organizations connected to the statewide network where land lines support this type of connectivity.
- Support cable modem and/or DSL connectivity to organizations where this type of connectivity meets network bandwidth requirements.
- Provide technical support staff that will monitor the network for outages, performance degradation, security violations, network utilization, capacity planning.
- Provide 24x7x365 network availability.
- Allow commercial third-party vendors such as Internet Service Providers, application service providers, transaction processing clearinghouses, and other Internet-based businesses to offer their services to member organizations.

2. EMR Diffusion in Ambulatory Care

JSI recommends a set of minimal standards for EMR integration to the EHR Network after which a separate set of DOQ-IT sponsored recommendations is provided:

a. EMR Minimal Functional Requirements

- The EMR system must be connected to the Internet via a permanent open port connection if the provider system will receive and/or provide EHR Network data without human intervention.
- The EMR system may be supported by a batch file download and/or batch file upload utility that will extract and/or load data into the provider EMR system database as required.
- The EMR must meet the minimal data set requirements for any EHR Network initiative within which the provider may participate. Data set requirements may be flexible to the degree that the ETL module can support custom data sets and record formats.
- The EMR must provide a unique patient identifier scheme to support the proper management of patient data records within the local EMR system as well as those records shared through the EHR Network.
- The provider network must support a 300kbps connection to the Internet as required to allow provider staff to connect to the EHR Network portal and access health information provided by the network.
- Provider staff will enroll onto the EHR Network and be assigned roles and privileges. Users will follow predefined user roles and operating procedures in support of the effective and proper utilization of the network and associated personal health information accessible through the EHR Network.
- Providers will be responsible for the quality and content of the data that they provide to the EHR Network.
- Providers are responsible for the receipt of information from the network and the application of that data to their internal EMR systems.
- The EHR Network will provide data exchange utilities to provide the required support to minimize the burden to provider staff.

b. DOQ-IT Recommendations [www.doqit.org]

The DOQ-IT project offers an integrated approach to improving care for Medicare beneficiaries in the areas of diabetes, heart failure, coronary artery disease, hypertension, osteoarthritis, and preventive care. Key measures include:

Coronary Artery Disease

Antiplatelet Therapy	Lipid Profile
Drug Therapy for Lowering LDL Cholesterol	LDL Cholesterol Level
Beta-Blocker Therapy-Prior MI	ACE Inhibitor Therapy
Blood Pressure	

Diabetes Mellitus (DM)

HbA1c management	Lipid Measurement
HbA1c management control	LDL Cholesterol Level
Blood Pressure Management	Urine protein testing

Eye exam	Foot exam
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Heart Failure (HF)

Left Ventricular Function (LVF) Assessment	Patient Education
Left Ventricular Function (LVF) Testing	Beta-Blocker Therapy
Weight Measurement	ACE Inhibitor Therapy
Blood Pressure Screening	Warfarin Therapy for Patients with Atrial Fibrillation

Hypertension (HTN)

Blood Pressure Screening	Blood Pressure Control
Plan of Care	

Preventive Care (PC)

Blood Pressure Measurement	Pneumonia Vaccination	Tobacco Use
Colorectal Cancer Screening	Lipid Measurement	Tobacco Cessation
Influenza Vaccination	LDL Cholesterol Level	Breast Cancer Screening

In support of the DOQ-IT project, this study recommends that the following functional specifications are met by EMR systems that are considered for integration onto the EHR Network. These specifications may be embraced to the degree required as they support the overall strategy of the EHR Network:

- EMR systems will meet all functional requirements outlined in the section above.
- EMR systems will support DOQ-IT quality measures associated with coronary artery disease, hypertension, heart failure, diabetes, and preventive care as required to support EHR Network sponsored initiatives.
- EMR systems will support DOQ-IT approved terminology code sets including LOINC, SNOMED, CPT4, ICD9, and NDC. Code set translation capabilities offered through the ETL module of the EHR Network may lessen the burden of this requirement.
- EMR systems will support HL7 message formatting of DOQ-IT approved messages including patient registration, patient visit, observations, pharmacy/treatment orders, and vaccination messages. Message format translation capabilities offered through the ETL module of the EHR Network may lessen the burden of this requirement.

3. Health Information System (HIS) Enhancement in Hospitals

JSI recommends a set of minimal standards for HIS integration to the EHR Network, followed a separate set of IHE sponsored recommendations.

a. HIS Base Functional Requirements

- The HIS must be connected to the Internet via a permanent open port connection if the provider system will receive and/or provide EHR Network data without human intervention.
- The HIS may be supported by a batch file download and/or batch file upload utility that will extract and/or load data into the HIS database as required.
- The HIS must meet the minimal data set requirements for any EHR Network initiative within which the hospital may participate. Data set requirements may be flexible to the degree that the ETL module can support custom data sets and record formats.
- The HIS must provide a security framework to ensure that patient data will be protected and is only accessible by authorized users.
- The hospital network must support a minimum 384 kbps connection to the Internet, approved by the hospital and supported by technical staff, to:
 - allow hospital staff to connect to the EHR Network portal and access health information provided by the EHR Network.
 - allow constituents to access health information stored on HIS.
- Hospital staff will enroll onto the EHR Network and be assigned roles and privileges. Users will follow predefined user roles and operating procedures in support of the effective and proper utilization of the network and associated personal health information accessible through that system.
- Hospitals will be responsible for the quality and content of the data that they provide to the EHR Network. Similarly, hospitals are responsible for the receipt of information from the network and the application of that data to their internal HIS. The EHR Network will provide data exchange utilities to provide the required support to minimize the burden to hospital staff.

b. IHE Recommendations

These specifications may be embraced to the degree required as they support the overall strategy of the EHR Network. [www.ihe.org]

- HIS will meet all functional requirements outlined in the section above.
- HIS will meet IHE scheduled workflow specifications for patient registration, ordering, scheduling, and imaging workflows.
- HIS will meet IHE patient information reconciliation specifications for admissions/discharge/transfer (ADT) and radiology department scheduling and imaging management.
- HIS will meet the IHE consistent presentation of images (CPI), presentation of grouped procedures (PGP), access to radiology information, key image note, simple image and numeric report, and post-processing

workflow (PWF) integration profiles as required to support EHR initiatives most typically associated with PACS and RIS systems implementations.

- HIS will meet the IHE charge posting integration profile specifications as required to support charge processing between interdepartmental systems.
- HIS will consider the basic security integration profile specifications as part of the broader security strategy suggested throughout this report.
- HIS will comply with EHR general technical and systems standards (browser, web server, application server, database, operating system).

D. Centralized Network Services

1. Web Portal Module

The EHR Network will provide a web-based user interface that serves as a single point of entry into the integrated systems environment. The portal will provide the following features:

- The portal will serve as an entry point for all users of the EHR Network.
- The portal area may be accessed directly by its own URL or from links on other sites.
- This secure web portal will be an application accessible only to permitted users.
- Permitted users will hold different roles and security levels within the site, allowing certain individuals to perform different tasks based on their roles.
- The portal will allow users to login and gain access to areas of the site for which they have been authorized.
- The portal will be structured to function as a single sign on authentication application for future integrated health care applications.
- The portal will provide a user interface to non web-enabled systems.
- The portal will support Clinical Context Object Workgroup (CCOW) context management functions.
- The portal will be web-based and require no custom software on user desktops.
- The portal will utilize a centralized master patient index for coordinating access to patient data across multiple systems.
- The portal will comply with EHR general technical and systems standards (browser, web server, application server, database, operating system).

The design of the portal must be based on scalable architecture to facilitate implementation that will support a base that can expand from several simultaneous users to several hundred. Functional requirements of other portal features include:

a. Access to Patient Care Systems

The portal will provide a web-based user interface that serves as a single point of entry into the integrated subsystems. After the user logs into the portal successfully, the portal application will manage their interactions with integrated systems on the EHR Network. Specific functional requirements include:

- The portal will provide a security scheme that specifies which systems the user is authorized to access.
- After the user logs in, the navigation bar will dynamically represent only those systems to which the user is authorized to access.
- The portal will support single sign-on functionality to minimize the need for users to log in repeatedly as they move from system to system.
- The portal will track user access to systems for auditing purposes.

b. Analysis, Visualization, and Reporting (AVR)

The portal will provide commercial utilities to support the analysis and reporting of data as required by Focused Initiatives implemented on the network, as well as providing support for other reporting requirements that may be associated with maintaining the network and associated services. Specific functional requirements include:

- Provide a user interface to provide users access to the AVR environment.
- Provide access to AVR features in accordance with established security policies.
- Integrated access with the health provider directory and single sign-on features.
- Provide access to a series of canned reports and associated AVR functionality that may be developed through various Focused Initiatives.
- Provide access to a custom query development utility that may be developed in support of various Focused Initiatives.
- Provide a data backup and archival function for all reports.

c. Document Management

The technical specification of the document management module is based on the HL7 Clinical Document Architecture (CDA). Key functional requirements of the document management module include:

- Documents will be encoded in such a way as to be easily shared with other entities on the EHR Network.
- Documents are defined as complete information objects that can include text, images, sounds, and other multimedia content.
- Documents will be persisted, which is to say, maintained in an unaltered state, for a time period defined by local and regulatory requirements.
- Documents will be maintained by specific organizations on the EHR Network, most typically those organizations that created the document.

- The document management module will provide the ability to authenticate documents including source, creation date, links to related documents, and links to related entities.
- The document management module will provide users the ability to read stored documents via a standard web browser.
- The document management module will utilize HL7 V3 data classes and attributes.
- The document management module will utilize HL7 vocabulary domains. These include HL7-defined concepts or can be drawn from HL7-recognized coding systems such as LOINC or SNOMED.
- The document management module will utilize the HL7 CDA hierarchical description in support of tabular representations of data elements that make up message specifications.
- The document management module will utilize the HL7 CDA Schema for storage and retrieval of document content.

d. Health Provider Directory

The health care provider directory will provide critical contact information and other data about health care professionals to support several staff related functions of the EHR Network. The health care provider directory will provide the following functionality:

- A central application for common directory lookup activities –white pages.
- A security control mechanism for access to web-based information systems integrated onto the EHR Network.
- The directory must be easily maintained by EHR technical support staff or authorized contractors and should be administered through a secure web-based utility.
- The directory must provide authentication services through a strong encryption process.
- Administrator changes to the directory must also be logged.
- User authentications will be logged for security purposes and the date of the last login must also be reportable.
- Authorized users will be able to update their organizations information in the role-based directory through the secured portal area.
- The solution must provide a web interface to a site administrator, for assignment and management of role-based access to information. This interface will allow assignment of staff to roles at the individual or group level, with group assignment information included as part of the user directory.
- The directory will provide options for additional functionality and services such as single sign-on, secure messaging between other public health directories using open standards, and other directory and application management functions. The directory must support both the services required today and be scalable to support the directory and application integration of future systems.

- The directory will be shareable, maintained at the state or local level, and could be combined with directories from other state and local health departments and from CDC to function as a directory of public health personnel.
- The directory will capture information about the roles and expertise of personnel for the use by public health communication and notification systems.
- The directory will be based on industry-standard technologies and support interfaces based upon Vendor's APIs, XML formatted messages, as well as vendor integration tools for interfacing to mainstream external directory and application sources such as Microsoft ADS, Novell NDS, MS Exchange, MS SQL Server, Oracle DB, and other conventional interfaces/systems.
- The directory will support the creation of new application objects and application roles within the directory for the purpose of providing application authentication services and appropriate application rights.

e. **Medical Library**

The web portal will provide access to Internet-based medical libraries as required to support EHR Network constituents.

- **ClinicalTrials.gov**: Source for patient studies for drugs and treatments.
- **NLM Gateway**: Provides the ability to search multiple National Library of Medicine retrieval systems.
- **Entrez**: Provides the ability to search the biomedical databases of the Entrez Molecular Biology system.
- **PubMed®/MEDLINE®**: Provides references to abstracts from thousands of medical journals.
- **LocatorPlus**: Catalog of books, journals, and audiovisuals with holdings, availability, MARC 21, and more.
- **PubMed Tutorial**: Interactive instruction tool.
- **MedlinePlus®**: Health information for patients, families and health care providers.
- **TOXNET®**: Network of databases on toxicology, hazardous chemicals, and environmental health.
- **MeSH Browser**: Medical Subject Heading look-up tool.
- **Unified Medical Language System® (UMLS®)**: Electronic Knowledge Sources and associated lexical programs including SNOMED CT®.
- **NLM Catalog**: An alternate way to search books, journals, audiovisuals, electronic, and other materials with links to LocatorPlus holdings and availability.
- **Visible Human Project®**: Three-dimensional representations of the human body.

f. **Patient Search**

EHR Network users require the ability to search for and consistently find patient health information across the extended network. The patient search module will provide this functionality.

- To access the Patient Search module of the EHR Network, a user must have successfully logged into the system and have rights to access the Patient Search module.
- User access privileges are set by the administrator while setting or changing access privileges using the user administration module.
- The patient search will be conducted against the Central Data Repository from where the system retrieves subsystem-specific patient identification number(s) for creating contextual hooks/links to those subsystem(s).
- By applying the user's access privileges on the result set, the system will make sure to display only patients' records from the subsystems for which the user has authorized access.
- When the user clicks on the subsystem links, the data management module opens the subsystem's patient-specific page in a new browser window.
- The patient search function will support the CCOW and IHE standards for presentation of integrated patient data.

g. Knowledge Base

The portal will provide access to a knowledge base of information in support of the EHR Network and constituents that utilize network services. Functional requirements include:

- The knowledge base will provide external and internal links to other sites and content as required.
- The knowledge base will provide internally generated fact sheets, protocols, guidelines, static form printing, and HTML-based form completion and submission as email messages.
- The portal may also include downloadable PDF, video and audio files.
- The web site must include a content search and retrieve function.
- The knowledge base will contain relevant policies, procedures, technical specifications, and other materials that will be provided to support the development and ongoing maintenance of the EHR Network.

h. Secure e-mail

The portal will include a secure email service that will provide for secure communications between health care providers and their constituents. Specific functional requirements include:

- The secure email service will provide for a secure channel for sharing patient health information in full compliance of HIPAA provisions.
- The secure email service will integrate with the health care provider directory.

i. Single Sign-on (SSO)

The portal will provide single sign-on functionality to systems that are integrated onto the EHR Network and are configured to support single sign-on functionality. Functional specifications for the SSO include:

- The SSO implementation will utilize the health partner directory for storing and accessing access privileges of users.
- The SSO implementation will provide a time-out feature that will disconnect users from integrated systems following a defined period of inactivity.
- The SSO implementation will need to accept four basic parameters: user name, password, second factor, and resource.
- The user name and password parameters will hold the most basic information required for authentication, the user's system name and corresponding password.
- The second factor field will be made available for use by those subsystems that require a second factor of identification for a successful authentication.
- The resource field will hold information that will allow the portal to retrieve the information that the user was attempting to reach without forcing the user to manually navigate to that information within the portal.
- The SSO function will support the (CCOW) and IHE standards for presentation of integrated patient data.
- Systems integrated through SSO functionality will be responsible for maintaining adequate security over the resources made available through their systems.

j. Portal Security

The security for the EHR Network will comply with the checklist established by National Institute of Standards and Technology. This will ensure that personal health information is protected in ways that meet or exceed HIPAA and state standards. Functional specifications for portal security include:

- EHR Network users will be stored and authenticated against the health care provider directory.
- The health care provider directory will also store the access rights for each subsystem or component (such as reporting and querying, etc.) the user can access.
- Once the user navigates into the subsystem through the portal, the subsystem will take over security for the access rights to the data based on each user's role as defined in that subsystem.
- Access rights to the Central Data Repository (CDR) will be stored in the health care provider directory.
- Based on the user's role in the CDR, a separate security model will be used to control the access over the data residing in the CDR.
- There shall be a security system with appropriate security policies. Such policies will make use of standards and operating procedures and infrastructure to enable secure data transmission, processing and storage of sensitive or critical data. This will include secure Internet exchange of information based on secure Internet connectivity and data transmission standards.
- Security policies will be defined, implemented, and supported, with authentication based on industry standard digital certificates of security, secure tokens, and other applicable means as identified.

- System will provide user defined authorization tables for add, change, delete and view functions. Tables will be easily accessed by administrative personnel for assigning permission or denial of access to all or parts of the system.
- Solution will operate so that users denied access to certain portions of the portal do not see links, access areas, screens, etc. to restricted areas.
- Administrative staff must have the ability to assign and manage passwords and identification numbers through an easy to use Graphical User Interface (GUI).
- Security levels will be assignable by person and/or by group or department.
- Users with inactive sessions will be automatically terminated after a mutually agreed upon amount of time to be determined during the requirements development phase.

k. Portal Administration

A portal administration interface will be provided that:

- Provides the ability to add/change/delete EHR Network users.
- Provides the ability to relate users to workgroups, departments, and/or organizations as required to maintain system driven security policies.
- Provides the ability to enable/restrict access to systems based on user role or organizational relationships.
- Provides the ability to control type of access provided to integrated systems such as add, change, delete, and view functions.
- Integrates with the data management module in support of maintenance of data sharing privileges.
- Integrates with the health provider directory for the storage and management of user identities and security related privileges.
- Provides the ability to assign and manage passwords and identification numbers for all entities associated with the network.
- Provides monitoring and auditing features to allow support staff to track network activity and respond to outages and other performance related issues.

2. Central Data Repository (CDR) Module

The Central Data Repository will utilize multiple database designs as required to support the specific health care applications used by the EHR Network users. Where practical, the database design will follow widely accepted database design specifications but there may be instances where custom database design considerations are warranted. Other functional requirements of the EHR Network Central Data Repository include:

a. Commercial

The data repository will utilize a widely accepted commercial grade database engine that will support all EHR Network projects as required.

- The data repository will support database replication across multiple sites in support of disaster recovery planning efforts.
- The data repository will support established software development practices through the use of stored procedures and triggers as required.
- The data repository will contain database monitoring and maintenance utilities as required to support the maintenance of the database to meet EHR Network availability and performance requirements.
- The data repository will support database backup and restore strategies developed in support of disaster recovery planning efforts.

b. Standards based

The data repository will adopt HIT database standards where practical. Currently, there are four database standards that must be reviewed and considered for this project. The database standards are relevant to different types of health care constituents as well as being applicable to different types of HIT projects. They include:

- Health Level 7 Reference Information Model (HL7 RIM)
- Public Health Conceptual Data Model (PHCDM)
- Continuity of Care Record (CCR)
- HL7 Electronic Health Record

c. Integrated

The central data repository will serve as a key point of integration for data shared across the EHR Network. Functional specifications include:

- Data will be made available to commercial products for reporting, statistical analysis, geographic mapping and other third-party applications in support of the needs of EHR Network users.
- The data repository will be able to associate incoming data with appropriate existing data so that data integrity can be maximized.
- The data repository will accommodate, to the degree possible, the database requirements of the other integrated systems.
- The data repository will maximize data sharing between integrated systems by supporting data sharing rules implemented through the CDR and other associated modules such as the web portal gateway and data management module.
- The data repository will minimize the need for redundant data entry across systems.

3. Data Management Module

The data management module of the EHR Network qualifies, tracks, and provides reference to health care data stored centrally as well as data that is maintained on remote systems. Specific functionality includes:

a. Unique Identifier Index

- Provide unique identifiers for patients, providers, their staffs, and other health care related organizations.
- The module will be able to reference patient data stored on remote systems that are integrated onto the EHR Network.

b. Deduplication

- Provide patient, provider, and organization de-duplication functionality will ensure that all entities in the network are uniquely identified.
- Provide the ability to analyze transactions and eliminate duplicate transactions.
- Provide a user interface that provides access to authorized patient data records and supports the record de-duplication function.
- De-duplication of remote systems data will be the responsibility of those systems.

c. Consolidation

- Provide patient record merge functionality will be ensure that data for unique entities will be consolidated in order to provide a single integrated dataset for all entities defined on the system.
- Provide a user interface that provides access to authorized patient data records and supports the record merge function.
- To access the record consolidation section of the EHR Network, a user must have successfully logged into the system and have permissions to access these sections.
- The candidate lists for merging will be generated using a batch process. Using data management module interfaces, the user will be able to compare two entities at a time and merge two or more entities. Prior to merging, the user may want to compare the candidates.

d. Data Sharing

- Provide organizations integrated onto the EHR Network the ability to specify the organizations with which they will share patient data.
- Provide references to patient data by data type, by source organization, and by unique identifier to support the privacy and security policies of the EHR Network.
- Define staff resources on the network with role definitions that relate to specific data types in order to control access to different types of information.

4. Extract/Translate/Load Module

The EHR Network will contain an extract/translate/load (ETL) module that will share data between the many integrated systems. The ETL module will provide many functions that will ensure the continuous, secure, and accountable exchange of information between systems. Key functions of the ETL module include:

a. Data exchange

- Provide a batch file upload/download feature that allows health care entities to share data on the network.
- Provide an open database connectivity capability that will allow health care entities to share data on the network directly from their integrated systems.
- Provide data routing capabilities that will allow entities to specify the destination of data sent to the network.
- Provide an integrated set of message and code set translation capabilities that will support data translation from/to any supported data sets.
- Provide operational monitoring and auditing features that will ensure that all data sets are received, processed, and routed correctly.
- Provide job scheduling capabilities that will allow data exchange to occur on a predetermined basis.
- Provide the ability to exchange data between health care provider directories in order to maintain current information on EHR Network providers.

b. Security

Provide a highly secure approach to routing transactions between health care organizations. The system will use widely accepted security standards and apply them consistently across the EHR Network in order to ensure that these standards are established and maintained. Functional requirements include:

- Utilization of secure socket layer (SSL) and/or public/private key encryption.
- Utilization of proxy server, and firewall capabilities locally and with remote network environments.
- Provides unique user identification and password security for data submission and data retrieval.
- Meets HIPAA security specifications.
- Meets Secure Data Network (SDN) standards and procedure requirements.

c. Message translation

Provide the ability to capture, translate, and route health care transactions between the various EHR Network systems in order to promote data exchange between health care entities. Transaction formats include but are not limited to:

- **Digital Imaging Communications in Medicine (DICOM):** standards that enable images (such as x-rays and MRIs) and associated diagnostic information to be retrieved and transferred from various manufacturers' devices as well as medical staff workstations.

- **Health Level 7 v2.x, v3.x (HL7):** Standards for order entry, scheduling, medical record/image management, patient administration, observation reporting, financial management, and patient care.
- **HIPAA Transaction Standards:** HIPAA requires the use of the American National Standards Institute X12 standard for electronic transactions including enrollment and disenrollment in a health plan, eligibility for a health plan, health care payment and remittance advice, health plan premium payments, health claim status, referral certification and authorization, and coordination of benefits.
- **Institute of Electrical and Electronics Engineers 1073 (IEEE1073):** The scope of this family of standards is to provide for open systems communications in health care applications, primarily between bedside medical devices and patient care information systems, optimized for the acute care setting.
- **National Council on Prescription Drug Programs (NCPDP)** standards for ordering drugs from retail pharmacies to standardize information between health care providers and the pharmacies.

d. Code set translation

Provide the ability to capture and translate health care related data terminology codes and translate those codes to standardized code sets in order to promote data exchange between health care providers. These standards include but are not limited to:

- **Digital Imaging Communications in Medicine (DICOM):** standards that enable images (such as x-rays and MRIs) and associated diagnostic information to be retrieved and transferred from various manufacturers' devices as well as medical staff workstations.
- **Health Level 7 v2.x, v3.x (HL7):** Standards for order entry, scheduling, medical record/image management, patient administration, observation reporting, financial management, and patient care.
- **HIPAA Transaction Standards:** HIPAA requires the use of the American National Standards Institute X12 standard for electronic transactions including enrollment and disenrollment in a health plan, eligibility for a health plan, health care payment and remittance advice, health plan premium payments, health claim status, referral certification and authorization, and coordination of benefits.
- **Institute of Electrical and Electronics Engineers 1073 (IEEE1073):** The scope of this family of standards is to provide for open systems communications in health care applications, primarily between bedside medical devices and patient care information systems, optimized for the acute care setting.
- **National Council on Prescription Drug Programs (NCPDP)** standards for ordering drugs from retail pharmacies to standardize information between health care providers and the pharmacies.

F Focused Initiatives to Promote the EHR Network

1. Administrative Data Clearinghouse (ADC)

Through this study, JSI has found that administrative transactions processing between providers and payers represent a tremendous opportunity to establish the EHR Network and to potentially provide a revenue stream for ongoing support and enhancement of the EHR Network. The functional requirements of such a system include:

- The ADC will provide data receipt, translation, and routing services for member organizations.
- Will provide reporting features to support tracking and managing processing activity.

- Will be fully HIPAA compliant.
- Will provide an interface to provider systems for sending claims files and receiving response files.
- Will provide a data entry interface for manually entering information.
- Will provide indices for tracking activity by individual patient, provider, or payor.
- Will provide management reports to enable providers to manage billing activity.
- Will support data backups, purge, and restore requirements to support management of the database.
- Will support the processing of the following set of standard transactions:
 - Health care claim and equivalent encounter submission – ASC X12N 837
 - Dental claim - ASC X12N 837 Dental
 - Professional claim - ASC X12N 837 Professional
 - Institutional claim - ASC X12N 837 Institutional
 - Enrollment and disenrollment in a health plan - ASC X12N 834
 - Eligibility for a health plan - ASC X12N 270 and (request) - ASC X12N 271 (response)
 - Health care payment and remittance advice - ASC X12N 835
 - Health plan premium payments - ASC X12N 820
 - Health claim status - ASC X12N 276 (request) - ASC X12N 277 (response)
 - Referral certification and approvals - ASC X12N 278
- Will support the set of transaction and code sets as defined under HIPAA which include codes from the Medical Data code sets defined in the rule and the Non-Medical Data code sets listed in the X12N implementation guides. These code sets include:
 - Internal Classification of Diseases, 9th Edition, Clinical Modification -Volumes 1, 2, and 3 (ICD-9- CM)
 - Code on Dental Procedures and Nomenclature (CDT)
 - Healthcare Financing Administration Common Procedure Coding System (HCPCS)
 - Current Procedural Terminology, Fourth Edition (CPT-4)
 - Non-Medical Code sets named in the X12N implementation guides include codes such as the Claim Adjustment Reason codes, Place of Service codes, and Member Status codes.

2. Hospital Portal

Hospitals represent an excellent opportunity for the development of the EHR Network. Firstly, hospitals generate a significant number of health care transactions that could be made available to other institutions on the EHR Network. Secondly, hospitals are typically more likely to use and support automated information systems that may be integrated onto the EHR Network. The components of hospital portals will include the following:

- Access to internal hospital information systems or access to a consolidated view of patient data for authorized providers.
- An enterprise medical record or patient index to correlate patient information stored in multiple HIS within their environment.

- A patient search function that will find and retrieve patient data stored in multiple HIS.
- A security structure that will ensure that established HIPAA privacy and security guidelines are maintained.
- A mechanism to identify and track entities on the system as necessary to track user activity and support communications among entities.
- Data analysis, visualization, and reporting as available on the individual hospital information systems.
- Messaging interfaces to other systems as required to share data among integrated systems.

3. ePrescribing

ePrescribing is one of the more widely implemented integrated health information technology applications in use today. There are many examples of successful implementations of ePrescribing systems. The primary reason for the success of these initiatives is the relative consistency in the associated workflows, and secondly, the clear value that these systems provide to all constituents that use them. Specific functional requirements will minimally include:

- Enable providers to send individual prescriptions or batch files of prescriptions to pharmacy affiliates on the EHR Network
- Ability to receive updates of prescription status from affiliates on the network
- A user interface for entering prescriptions manually
- A user interface to check on prescription processing and fill status
- Secure email facility for sending pharmacy orders
- An interface for integration into existing pharmacy order entry systems
- A security scheme to ensure that HIPAA security and privacy guidelines are met.
- A more extensive ePrescribing application will support the following features to improve prescription care and patient safety:
 - An interface with one or more drug interactions databases and report alerts automatically to system users, based on databases containing patient medication history;
 - An interface for assessing patient drug-allergy alerts, based on databases containing patient allergy information;
 - An interface to medical libraries that can provide drug information to clinicians at the point of order entry;

4. Continuity of care record

Patient health summaries represent a relatively concise set of health care data relative to the broad array of data that is represented by a more comprehensive electronic health record. For this reason, the likelihood of a

successful implementation is high relative to the more comprehensive (and complex) implementation of a complete electronic health record system. Beyond its relative simplicity, a key benefit of a continuity of care record initiative is that the modules and components are all reusable for the more comprehensive EHR project that will be subsequently implemented. Key functional requirements include:

- The continuity of care record will collect, store, and manage an integrated set of patient health information;
- The EHR Network will provide users web-based access to an integrated set of patient health information;
- A core dataset that follows standards set through the ASTM sponsored continuity of care record. Data elements include:
 - Identifying information (from/to/date/purpose)
 - Patient demographics
 - Patient insurance/financial information
 - Advance directives
 - Health status
 - Care documentation
 - Care plan recommendations
 - Practitioners
- The ability to push a continuity of care record to a referred provider or other scheduled entity of care
- An enterprise medical record or patient index to correlate patient information retrieved or received from multiple health information systems within the EHR environment
- A patient search function that will find and retrieve patient data stored in multiple health information systems
- A security structure that will ensure that established HIPAA privacy and security guidelines are maintained
- A mechanism to identify and track entities on the system as necessary to track user activity and support communications among entities
- Data analysis, visualization, and reporting as required
- Messaging interfaces to other systems as required to share data among integrated systems.

This section has detailed the *specific functional requirements* of the modular technology components that will help the state of Wyoming build toward the development of the EHR Network. The modularity provided by this approach will support both project goals and objectives while simultaneously allowing for the development of business plans and work plans following an equally component-based approach.

APPENDIX F: DOQ-IT LISTING OF QUALITY INDICATORS

This list represents the approved measures as of June, 2004. Additional measures may be adopted as deemed appropriate. The patient registration messages and observational data messages will be used to determine if the patient has met the measurement criteria and the accompanying results. *Source: DOQ-IT Data Element Technical Specification Guide, June 2004.*

1.4.1 Coronary Artery Disease (CAD)

1.4.1.0 CAD-1: Antiplatelet Therapy

Description: Percentage of patients with CAD who were prescribed antiplatelet therapy

Source of Measure: CMS/AMA Physician Consortium/ACC/AHA

1.4.1.1 CAD-2: Drug Therapy for Lowering LDL Cholesterol

Description: Percentage of patients with CAD who were prescribed a lipid-lowering therapy (based on current ATP III guidelines)

Source of Measure: CMS/AMA Physician Consortium/ACC/AHA

1.4.1.2 CAD-3: Beta-Blocker Therapy-Prior Myocardial Infarction (MI)

Description: Percentage of CAD patients with prior MI who were prescribed beta-blocker therapy

Source of Measure: AMA Physician Consortium/ACC/AHA

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1.4.1.3 CAD-4: Blood Pressure

Description: Percentage of patients who had a blood pressure measurement during the last office visit

Source of Measure: AMA Physician Consortium/ACC/AHA

1.4.1.4 CAD-5: Lipid Profile

Description: Percentage of patients receiving at least one lipid profile during the reporting year

Source of Measure: AMA Physician Consortium/ACC/AHA

1.4.1.5 CAD-6: LDL Cholesterol Level

Description: Percentage of patients with most recent LDL cholesterol < 130 mg/dl

Source of Measure: CMS

1.4.1.6 CAD-7: ACE Inhibitor Therapy

Description: Percentage of patients with CAD who also have diabetes and/or LVSD who were prescribed ACE inhibitor therapy

Source of Measure: AMA Physician Consortium/ACC/AHA

1.4.2 Hypertension (HTN)

1.4.2.1 HTN-1: Blood Pressure Screening

Description: Percentage of patient visits with blood pressure (BP) measurement recorded

Source of Measure: CMS/AMA Physician Consortium/ACC/AHA

1.4.2.2 HTN-2: Blood Pressure Control

Description: Percentage of patients with last BP < 140/90 mm Hg

Source of Measure: CMS/NCQA

1.4.2.3 HTN-3: Plan of Care

Description: Percentage of patient visits with either systolic blood pressure \geq 140 mm Hg or diastolic blood pressure \geq 90 mm Hg with documented plan of care for hypertension

Source of Measure: AMA Physician Consortium/ACC/AHA

1.4.3 Heart Failure (HF)

1.4.3.1 HF-1: Left Ventricular Function (LVF) Assessment

Description: Percentage of patients with HF, who have quantitative or qualitative results of LVF assessment recorded
Source of Measure: AMA Physician Consortium/ACC/AHA (NQF endorsed)

1.4.3.2 HF-2: Left Ventricular Function (LVF) Testing

Description: Left ventricular ejection fraction testing during the current year for patients hospitalized with a principal diagnosis of HF during the current year
Source of Measure: CMS

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1.4.3.3 HF-3: Weight Measurement

Description: Percentage of HF patient visits with weight measurement recorded
Source of Measure: AMA Physician Consortium/ACC/AHA

1.4.3.4 HF-4: Blood Pressure Screening

Description: Percentage of patient visits with blood pressure (BP) measurement recorded
Source of Measure: CMS/AMA Physician Consortium/ACC/AHA

1.4.3.5 HF-5: Patient Education

Description: Percentage of patients with HF who were provided with patient education on disease management and health behavior changes during one or more visit(s) within a six-month period
Source of Measure: AMA Physician Consortium/ACC/AHA

1.4.3.6 HF-6: Beta-Blocker Therapy

Description: Percentage of patients with HF who also have LVSD who were prescribed beta-blocker therapy
Source of Measure: AMA Physician Consortium/ACC/AHA

1.4.3.7 HF-7: ACE Inhibitor Therapy

Description: Percentage of patients with HF who also have LVSD who were prescribed ACE inhibitor therapy
Source of Measure: AMA Physician Consortium/ACC/AHA (NQF endorsed)

1.4.3.8 HF-8: Warfarin Therapy for Patients with Atrial Fibrillation

Description: Percentage of patients with HF who also have paroxysmal or chronic atrial fibrillation who were prescribed warfarin therapy
Source of Measure: AMA Physician Consortium/ACC/AHA

1.4.4 Diabetes Mellitus (DM)

1.4.4.1 DM-1: HbA1c management

Description: Percentage of patients with one or more A1c test(s)
Source of Measure: NDQIA (NQF endorsed)

1.4.4.2 DM-2: HbA1c management control

Description: Percentage of patients with most recent A1c level > 9.0% (poor control)
Source of Measure: NDQIA (NQF endorsed)

1.4.4.3 DM-3: Blood Pressure Management

Description: Percentage of patients with most recent BP < 140/90 mm Hg
Source of Measure: NDQIA (NQF endorsed)

1.4.4.4 DM-4: Lipid Measurement

Description: Percentage of patients with at least one low-density lipoprotein (LDL) cholesterol test

Source of Measure: NDQIA (NQF endorsed)

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1.4.4.5 DM-5: LDL Cholesterol Level

Description: Percentage of patients with most recent LDL cholesterol < 130 mg/dl

Source of Measure: NDQIA (NQF endorsed)

1.4.4.6 DM-6: Urine protein testing

Description: Percentage of patients with at least one test for microalbumin during the measurement year, or who had evidence of medical attention for existing nephropathy (diagnosis of nephropathy or documentation of microalbuminuria or albuminuria)

Source of Measure: NDQIA (NQF endorsed)

1.4.4.7 DM-7: Eye exam

Description: Percentage of patients who received a dilated eye exam or evaluation of retinal photographs by an optometrist or ophthalmologist during the reporting year, or during the prior year if patient is at low risk for retinopathy. A patient is considered low risk if all three of the following criteria are met: (1) the patient is not taking insulin; (2) has an A1c < 8%; and (3) has no evidence of retinopathy in the prior year

Source of Measure: NDQIA (NQF endorsed)

1.4.4.8 DM-8: Foot exam

Description: Percentage of eligible patients receiving at least one complete foot exam (visual inspection, sensory exam with monofilament, and pulse exam)

Source of Measure: NDQIA (NQF endorsed)

1.4.5 Preventive Care (PC)

1.4.5.0 PC-1: Blood Pressure Measurement

Description: Percentage of patient visits with blood pressure (BP) measurement recorded

Source of Measure: CMS/AMA Physician Consortium

1.4.5.1 PC-5: Breast Cancer Screening Measurement

Description: Percentage of women 50-69 years who had a mammogram during the measurement time period (24 months)

Source of Measure: CMS/AMA Physician Consortium

1.4.5.2 PC-6: Colorectal Cancer Screening

Description: Percentage of patients screened for colorectal cancer during the one-year measurement period

Source of Measure: AMA Physician Consortium

1.4.5.3 PC-7: Influenza Vaccination

Description: The percentage of patients 50 years and older who received an influenza vaccination from September through February of the year prior to the measurement year

Source of Measure: NCQA/CMS (NQF endorsed)

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1.4.5.4 PC-8: Pneumonia Vaccination

Description: The percentage of patients 65 years and older who ever received a pneumococcal vaccination

Source of Measure: NCQA/CMS (NQF endorsed)

1.4.5.5 PC-9: Lipid Measurement

Description: Percentage of patients with at least one low-density lipoprotein (LDL) cholesterol test

Source of Measure: NDQIA

1.4.5.6 PC-10: LDL Cholesterol Level

Description: Percentage of patients with most recent LDL cholesterol < 130 mg/dL

Source of Measure: NDQIA

1.4.5.7 PC-11: Tobacco Use

Description: Percentage of patients who were queried about tobacco use one or more times during the two-year measurement period

Source of Measure: AMA Physician Consortium

1.4.5.8 PC-12: Tobacco Cessation

Description: Percentage of patients identified as tobacco users who received cessation intervention during the two-year measurement period

Source of Measure: AMA Physician Consortium (NQF endorsed)

APPENDIX G: PHASE II CCHIT SAMPLE CERTIFICATION CRITERIA

<p align="center">CCHIT Certification Criteria for Ambulatory EHR Products FUNCTIONALITY Work Group Phase II DRAFT for Public Comment - 7/11/05 © 2005 The Certification Commission for Healthcare Information Technology</p>																	
Line #	WG	Category and Description	Specific Criteria	Source or References	Priorities (L,M,H)					Availability			Recommend			Discussion / Comments	
					Providers	Vendors	Payers or Purchasers	Public Health	Patient	2005	2006	2007	Certify in 2005	Roadmap for 2006	Roadmap for 2007		
1	F	Identify & maintain a patient record: Key identifying information is stored and linked to the patient record. Both static and dynamic data elements will be maintained. A look up function uses this information to uniquely identify the patient	1. The system shall create a single patient record for each patient.	DC.1.1.1	H	H	H	H	H	H			X				
2			2. The system shall associate (store and link) key identifier information with each patient record. (e.g. the system ID or medical record number)	DC.1.1.1	H	H	H	H	H	H				X			Key identifier information must be unique to the patient record but may take any system defined internal or external form.
3			3. The system shall facilitate the ability to store at least one additional identifier for each patient record.	DC.1.1.1	H	H	M	H	M	H					X		For interoperability, practices need to be able to store additional patient identifier.
4			4. Using the key identifying information, the system shall allow a user to identify (look up) the unique patient record.	DC.1.1.1	H	H	H	H	H	H				X			
5			5. The system shall provide more than one means of identifying (looking up) a patient.	DC.1.1.1	H	H	H	H	H	H				X			Examples could be to look up by date of birth, phone number, social security number...
6	F	Manage patient demographics: Contact information including addresses & phone numbers, as well as key demographic information such as date of birth, gender, and other information is stored & maintained for reporting purposes and for the provision of care.	1. The system shall capture and maintain demographic information as part of the patient record.	DC.1.1.2	H	H	H	H	H	H			X				
7			2. The system shall provide the ability to include demographic information in reports.	DC.1.1.2	H	H	H	H	M	H				X			
8			3. The system shall maintain historic information for prior names and addresses.	DC.1.1.2	H	H	H	H	M	M	H				X		Providers need this for look up and contact purposes.
9			4. The system shall allow a user to modify demographic information about the patient.	DC.1.1.2	H	H	H	H	H	H				X			
10			5. Demographic information shall be stored in the patient medical record in separate data fields, such that data extraction tools can be used to retrieve this data.	DC.1.1.2	H	H	H	H	L	H					X		

APPENDIX H: REFERENCES FOR IT COSTS FOR THE WYOMING EHR STUDY

eHealth Initiative, Working Group for Connecting Communities Discussion Document, Working Group Meeting, Washington, DC, August 8, 2005.

Kaushal, R., Blumenthal, D., et. al. The costs of a national health information network. *Annals of Internal Medicine*. 2005, 143:165-173.

U.S. Department of Health and Human Services, Standards for Electronic Transactions and Code Sets: Final Impact Analysis, *Federal Register* 65, no. 160 (2000): 50311–50372.

Walker J, Pan E., et.al. The Value of Health Care Information Exchange and Interoperability, *Health Affairs* (Web Exclusive), January 19, 2005.

Weissman, J. S. MGH/Harvard Institute for Health Policy, *AHRQ Conference: Patient Safety and Health Information Technology: Making the Health Care System Safer through Implementation and Innovation*. June 9, 2005.

APPENDIX I: SUMMARY MATRIX OF HIT FUNDING OPPORTUNITIES

Funding Agency FEDERAL AGENCIES	Program Areas	Project Categories Supported (Planning, Implementation, Research, Education)	Funds Available	Funding Cycle
Department of Agriculture:				
The Distance Learning and Telemedicine Grant Program.	Supports projects to encourage and improve the use of telecommunications, computer networks, and related technologies for rural communities to improve access to education and/or health care services.	Implementation	\$24.6 million in 2004	2005 applications due February 1
Department of Commerce:				
The National Institute of Standards and Technology's Advanced Technology Program (ATP).	The National Institute of Standards and Technology's Advanced Technology Program (ATP) supports research in cutting-edge technologies through a public- and private-sector partnership program. Through its healthcare informatics efforts, ATP supports research in the development of key information technologies to: simply and reliably gather complex, multimedia medical information from healthcare providers; store and retrieve that information securely; and make that information available over secure and reliable national information networks for use by medical personnel in making informed medical decisions.	Research	\$80 million in 2004	April 14 was the due date for FY 2004, 2005 funding not yet announced
The Public Telecommunications Facilities Program (PTFP) (http://www.ntia.doc.gov/otiahome/otiahome.html)	Awards matching grants to non-commercial entities to purchase telecommunications equipment with the stipulation that the equipment be used for educational or cultural purposes. PTFP also provides smaller grants to assist these entities in planning for the purchase and use of telecommunications equipment.	Implementation	\$19.8 million in 2005	No sooner than February 15, 2005
Technology Opportunities Program (TOP).	The Technology Opportunities Program (TOP) is a competitive, merit-based grant program that has given matching grants for model projects demonstrating innovative uses of network technologies that demonstrate how digital networks support lifelong learning for all Americans, help public safety officials protect the public, assist in the delivery of health care and public health services, and foster communication, resource sharing, and economic development within rural and urban communities.	Planning, Implementation	\$14.4 million in 2004	April 27 was the due date for FY 2004, 2005 funding not yet announced
Department of Health and Human Services:				
Agency for Healthcare Research and Quality (AHRQ).	AHRQ sponsors and conducts research that provides evidence-based information on health care outcomes, quality, and cost, use, and access. As part of its 1999 reauthorization, AHRQ also creates effective linkages between health information sources to enhance health care delivery and coordination of evidence-based health care services. In FY 2004, AHRQ has four instruments to support health information exchanges: (1) Demonstrating the Value of Health Information Technology; (2) Transforming Healthcare Quality Through Information Technology (THQIT)—Implementation Grants; (3) Transforming Healthcare Quality Through Information Technology (THQIT)—Planning Grants; and (4) Statewide Data Sharing and Interoperability contracts.	Planning, Implementation, Research	2) Funding for Implementation announced, but only for those funded for planning in Round 1 are eligible. 2) Proposals were due April 2004. AHRQ is expecting to issue more HIT grants in 2005. 4) Proposals were due June 2004. However, AHRQ is expecting to issue more HIT grants in 2005.	
Office of the National Coordinator for Health Information Technology (ONCHIT)	Support of state designated RHIO organizations to conduct planning for healthcare information exchange across the state.	Support of state designated RHIO for planning.	No amounts yet announced.	Announcements pending.
National Institutes of Health:				
National Library of Medicine (NLM) Office of External Programs (OEP).	NLM OEP provides funding for health information tools through the Resource Support for Information Management's three grant programs: (1) Internet Access to Digital Libraries (IADL) Grants, (2) Information System Grants, and (3) Integrated Advanced Information Management Systems (IAIMS) Grants.			
Integrated advanced information systems (IAIMS) are organization-wide or trans-organizational mechanisms that use computer networks to link and relate the published biomedical knowledge base with individual and institutional databases and information files, within and external to an institution.	Planning Grants: required result is a written plan for action in one or more of the fundamental IAIMS activity areas (i.e., context-appropriate information, standards-based information management, digital libraries). An IAIMS planning process should involve an appropriate set of stakeholders in a comprehensive analysis of the stated information problem. Planning should include a review of existing information resources and systems, pertinent information management policies, costs and benefits, and other organizational issues.	Planning	Up to \$150,000 per year for up to 2 years in direct costs, with optional infrastructure supplement.	March 1, July 1, and November 1, 2005.

Funding Agency	Program Areas	Project Categories Supported (Planning, Implementation, Research, Education)	Funds Available	Funding Cycle
FEDERAL AGENCIES				
Health Resources and Services Administration (HRSA).				
Bureau of Primary Health Care (BPHC), Healthy Community Access Program (HCAP)	HCAP provides grants to increase access to health care by eliminating fragmented service delivery, improving efficiencies among safety net providers, and by encouraging greater private sector involvement. These grants can be used to deploy health information systems that help coordinate and streamline care delivery.	Planning, Implementation	\$9.8 million in FY05, 10 grants of about \$980,000.	March 2, 2005
BPHC, Shared Integrated Management Information Systems (SIMIS), Integrated Services Development Initiative (ISDI)	SIMIS/ISDI supports planning activities that will result in the establishment of a network to enhance the operations of collaborating health centers, and integration of functions within a core area among network members	Planning, Implementation	\$1 million in FY04.	April 2005
The Office of the Advancement of Telehealth (OAT).	The Office of the Advancement of Telehealth (OAT) supports a wide range of telemedicine projects including (a) clinical telemedicine networks that address chronic conditions in a variety of settings, such as patient homes, schools, and other community settings; (b) projects designed to improve health care outcomes as well as improved quality of services; (c) clinical telemedicine networks that include distance-learning education for health professionals, and patients and their families, if such activities are in conjunction with the delivery of health services; and (d) clinical telemedicine networks that integrate their telemedicine information system into overall electronic clinical information systems.	Planning (?), Implementation	In fiscal year 2004, Congress did not appropriate sufficient funds for new grants under the Telehealth Network (THGP) or the Telehealth Resource Center Cooperative Agreement Programs (TRCCP). As a result, the Office for the Advancement of Telehealth is not soliciting NEW applications for these programs.	
Small Business Innovation Research (SBIR) (Through National Library of Medicine)	Each federal agency that supports research must set aside a certain portion of external funding for U.S. small businesses that seek to undertake informatics research and development leading to commercialization. The Department of Health and Human Services National Library of Medicine SBIR Office and the Department of Defense's Office of Small and Disadvantaged Business Utilization (SADBU) are good places to search for funding opportunities.	Research, Implementation	\$100,000-\$400,000	April 1, August 1, Decemeber 1 on a yearly basis
Universal Service Fund, Rural Health Division	The Universal Service Fund Rural Health Division provides subsidies for not-for-profit healthcare providers, in both rural and urban areas, for network connectivity and Internet access assistance.	Implementation	Needs specific	7/1-6/30 on a yearly basis

Funding Agency	Program Areas	Project Categories Supported (Planning, Implementation, Research, Education)	Funds Available	Funding Cycle
FEDERAL AGENCIES				
FOUNDATIONS				

Foundation of Research and Education of the American Health Information Management Association.	Provides financial and intellectual resources to sustain and recognize continuous innovation and advances in health information management for the betterment of the profession, healthcare, and the public.	Research	Awards and loans for projects	
Henry J. Kaiser Family Foundation.	The Henry J. Kaiser Family Foundation has funded research and surveys on such topics as the public's perception of medical errors and the use of the Internet to locate health information.	Research	\$9.7 million in 1999	Grant applications are reviewed on a continuing basis. Awards are granted yearly
Joseph H. Kanter Foundation.	The Joseph H. Kanter Foundation acts as a catalyst and broker to encourage others to undertake outcomes research projects, and it promotes efforts to foster public understanding that better treatment outcomes data will improve quality of care by reducing unnecessary treatments and medical errors.	Research		
Markle Foundation.	The Markle Foundation works to realize this potential and to accelerate the use of these technologies to address critical public needs. The Markle Foundation's health program seeks to accelerate the use of information and communication technologies by patients and consumers to improve their health and healthcare.	Research, Education, Implementation	Funds specific initiatives that it develops.	N/A
Robert Wood Johnson (RWJ) Foundation.	RWJ seeks to improve the health and health care of all Americans by supporting training, education, research (excluding biomedical research), and projects that demonstrate the effective delivery of health care services. Rather than paying for individual care, RWJ concentrates on health care systems and the conditions that promote better health. The Health e-Technologies Initiative is a National Program Office (NPO) of The Robert Wood Johnson Foundation that supports research which evaluates the effectiveness of interactive eHealth applications (i.e., Internet, interactive TV and voice response systems, kiosks, personal digital assistants, CD-ROMs, DVDs) for health behavior change and chronic disease management.	Research, Implementation, Education	Average award: \$550,000	RFP specific or unsolicited
The W.K. Kellogg Foundation's Health Program.	The W.K. Kellogg Foundation's Health Program supports new ways to improve the design, delivery, and oversight of systems and services that promote and maintain access to quality health care, as well as ways to encompass policies and practices affecting the determinants of health. Successful grants emphasize new uses of communications and information technologies. Specific programming approaches have included, among others, creating systems for consumer-centered care, rather than maintaining current systems that are organized around financing, and for the convenience of providers and institutions.	Planning, Implementation.	No set limit	On-going basis
WYOMING FACILITATED SOURCES				
Wyoming Community Foundation	Provides financial resources to initiate innovative approaches to public and social issues in the State of Wyoming. Has served as "incubator" for newly created programs in Wyoming.	Implementation	Open for further discussion.	Ongoing.
Wyoming Business Council	The Wyoming Business Council focuses on providing financial support to communities to improve their business opportunities. Facilitates federally funded programs that drive community level investments. Of particular note are Business Ready Communities Grant (BRCG), Community Development Block Grants (CDBG), and Community Facilities Grants. Funding support is limited to local municipalities and for 'hard infrastructure,' not operations.	Planning, Implementation, Education	BRCG: up to \$1.5 million; CDBG: \$300k max; CFG: 75% of project cost	Varies by program.

APPENDIX J: HTML VERSION OF MICROSOFT PROJECT WORK PLAN

Task #	Outline Level	Task Name	Duration	Start Date	Finish Date	Predecessor Task(s)
1	A	RHIO Governance Body	167 days	Thu 8/11/05	Fri 3/31/06	
2	A.1	Assembly Interim Board of Directors	1 day	Thu 8/11/05	Thu 8/11/05	
3	A.2	Mission, Vision, and Organizational Statements	3 wks	Mon 10/3/05	Fri 10/21/05	
4	A.3	Board of Directors & Officers	4 wks	Mon 10/3/05	Fri 10/28/05	
5	A.4	Legal Incorporation	2 wks	Mon 10/31/05	Fri 11/11/05	4
6	A.5	Non-profit IRS ruling	5 mons	Mon 11/14/05	Fri 3/31/06	5
7	A.6	Obtain initial funding	3 mons	Fri 8/12/05	Thu 11/3/05	2
8	A.7	Hire staff	120 days	Fri 8/12/05	Thu 1/26/06	2
9	A.7.a	Hire Executive Director	2 mons	Fri 8/12/05	Thu 10/6/05	
10	A.7.b	Hire Support Staff	3 wks	Fri 10/7/05	Thu 10/27/05	9
11	A.7.c	Hire Project Manager	2 mons	Fri 10/7/05	Thu 12/1/05	9
12	A.7.d	Hire 2 Systems Analysts	2 mons	Fri 12/2/05	Thu 1/26/06	11
13	B	Pursue Enabling Technologies	435 days	Fri 12/2/05	Thu 8/2/07	
14	B.1	Statewide Communications Infrastructure Development	320 days	Fri 12/2/05	Thu 2/22/07	
15	B.1.a	Specify broadband capabilities (Speed & data volume)	10 days	Fri 12/2/05	Thu 12/15/05	
16	B.1.a)1	Calculate data volumes	2 wks	Fri 12/2/05	Thu 12/15/05	11
17	B.1.a)2	Specify minimal network response time	2 wks	Fri 12/2/05	Thu 12/15/05	11
18	B.1.b	Assess current infrastructure	1 mon	Fri 1/27/06	Thu 2/23/06	15,12
19	B.1.c	Gap analysis	1 mon	Fri 2/24/06	Thu 3/23/06	18
20	B.1.d	Complete broadband infrastructure build	12 mons	Fri 3/24/06	Thu 2/22/07	19
21	B.2	EMR diffusion at ambulatory care sites	435 days	Fri 12/2/05	Thu 8/2/07	
22	B.2.a	Specify ambulatory care EMR capabilities & functionality	1 mon	Fri 12/2/05	Thu 12/29/05	11
23	B.2.b	Assess current EMR capabilities	1 mon	Fri 1/27/06	Thu 2/23/06	11,12
24	B.2.c	Gap analysis	2 wks	Fri 2/24/06	Thu 3/9/06	22,23
25	B.2.d	RFP for one to three products per 4 options	115 days	Fri 3/10/06	Thu 8/17/06	
26	B.2.d)1	Complete specifications and statement of work	1 mon	Fri 3/10/06	Thu 4/6/06	24
27	B.2.d)2	Complete & distribute RFP	1 wk	Fri 4/7/06	Thu 4/13/06	26
28	B.2.d)3	Obtain proposals	6 wks	Fri 4/14/06	Thu 5/25/06	27
29	B.2.d)4	Evaluate proposals and select vendors	6 wks	Fri 5/26/06	Thu 7/6/06	28
30	B.2.d)5	Contract with vendors	6 wks	Fri 7/7/06	Thu 8/17/06	29
31	B.2.e	Establish product(s) distribution infrastructure	2 wks	Fri 8/18/06	Thu 8/31/06	26,30
32	B.2.f	Establish support/maintenance infrastructure	2 wks	Fri 8/18/06	Thu 8/31/06	26,30
33	B.2.g	Deploy EMRs in ambulatory care	12 mons	Fri 9/1/06	Thu 8/2/07	30,31,32
34	B.3	Health Information System (HIS) Enhancement in Hospitals	345 days	Fri 12/2/05	Thu 3/29/07	
35	B.3.a	Specify hospital EHR capabilities & functionality required	6 wks	Fri 12/2/05	Thu 1/12/06	11

Task #	Outline Level	Task Name	Duration	Start Date	Finish Date	Predecessor Task(s)
36	B.3.b	Assess current EHR capabilities	6 wks	Fri 12/2/05	Thu 1/12/06	11
37	B.3.c	Gap analysis	6 wks	Fri 1/27/06	Thu 3/9/06	36,35,12
38	B.3.d	RFP for multiple products	145 days	Fri 3/10/06	Thu 9/28/06	
39	B.3.d)1	Complete specifications and statement of work	6 wks	Fri 3/10/06	Thu 4/20/06	37
40	B.3.d)2	Complete & distribute RFP	1 wk	Fri 4/21/06	Thu 4/27/06	39
41	B.3.d)3	Obtain proposals	6 wks	Fri 4/28/06	Thu 6/8/06	40
42	B.3.d)4	Evaluate proposals and select vendors	8 wks	Fri 6/9/06	Thu 8/3/06	41
43	B.3.d)5	Contract with vendors	2 mons	Fri 8/4/06	Thu 9/28/06	42
44	B.3.e	Establish product(s) distribution infrastructure	2 wks	Fri 9/29/06	Thu 10/12/06	39,43
45	B.3.f	Establish support/maintenance infrastructure	2 wks	Fri 9/29/06	Thu 10/12/06	39,43
46	B.3.g	Deploy enhanced EHRs in hospitals	6 mons	Fri 10/13/06	Thu 3/29/07	43,44,45
47	C	Develop Centralized Network Services (CNS)	200 days	Thu 2/2/06	Wed 11/8/06	
48	C.1	Develop specifications for CNS	2 mons	Thu 2/2/06	Wed 3/29/06	11
49	C.2	Obtain CNS vendors	4 mons	Thu 3/30/06	Wed 7/19/06	12,48
50	C.3	Build-Out Hosted Infrastructure	1 mon	Thu 7/20/06	Wed 8/16/06	49
51	C.4	Build Out CNS Portal Gateway	2 mons	Thu 8/17/06	Wed 10/11/06	50
52	C.5	Build Out CNS Extract/Transfer/Load (ETL) Module	3 mons	Thu 8/17/06	Wed 11/8/06	50
53	C.6	CNS Central Data Repository and Data Management Module	3 mons	Thu 8/17/06	Wed 11/8/06	50
54	D	Pursue Focused Initiatives	896 days	Thu 9/1/05	Thu 2/5/09	
55	D.1	Eprescribing	544 days	Fri 12/2/05	Wed 1/2/08	
56	D.1.a	Design scope and specifications of ePrescribing project	20 days	Fri 12/2/05	Thu 12/29/05	
57	D.1.a)1	Determine nature / level of ePrescribing application	1 mon	Fri 12/2/05	Thu 12/29/05	11
58	D.1.b	RFP for statewide system	95 days	Fri 1/27/06	Thu 6/8/06	
59	D.1.b)1	Complete specifications / statement of work	4 wks	Fri 1/27/06	Thu 2/23/06	57,12
60	D.1.b)2	Complete & distribute RFP	1 wk	Fri 2/24/06	Thu 3/2/06	59
61	D.1.b)3	Obtain proposals	6 wks	Fri 3/3/06	Thu 4/13/06	60
62	D.1.b)4	Evaluate proposals and select vendor	1 mon	Fri 4/14/06	Thu 5/11/06	61
63	D.1.b)5	Contract with vendor	1 mon	Fri 5/12/06	Thu 6/8/06	62
64	D.1.c	Obtain pilot test sites: Entire communities or selected providers and pharmacies	1 mon	Fri 12/30/05	Thu 1/26/06	56
65	D.1.d	Pilot ePrescribing project	2 mons	Thu 11/9/06	Wed 1/3/07	64,63,47
66	D.1.e	Modify system for statewide rollout	1 mon	Thu 1/4/07	Wed 1/31/07	65
67	D.1.f	Establish training program	1 mon	Thu 1/4/07	Wed 1/31/07	63,65
68	D.1.g	Establish support/maintenance infrastructure	1 mon	Thu 1/4/07	Wed 1/31/07	60,63,65
69	D.1.h	Rollout ePrescribing statewide	12 mons	Thu 2/1/07	Wed 1/2/08	66,67,68,14
70	D.2	Hospital Portals	485 days	Fri 3/30/07	Thu 2/5/09	
71	D.2.a	Design scope and specifications of Hospital Portals	60 days	Fri 3/30/07	Thu 6/21/07	
72	D.2.a)1	Determine contents of portals	20 days	Fri 3/30/07	Thu 4/26/07	

Task #	Outline Level	Task Name	Duration	Start Date	Finish Date	Predecessor Task(s)
73	D.2.a)1.1	Internal hospital clinical information systems	1 mon	Fri 3/30/07	Thu 4/26/07	34,11
74	D.2.a)1.2	Internal hospital administrative information systems	1 mon	Fri 3/30/07	Thu 4/26/07	34,11
75	D.2.a)1.3	Knowledge base & bibliographic resources	1 mon	Fri 3/30/07	Thu 4/26/07	34,11
76	D.2.a)2	Determine connectivity requirements	60 days	Fri 3/30/07	Thu 6/21/07	
77	D.2.a)2.1	Assess current systems' connectivity capabilities	2 mons	Fri 3/30/07	Thu 5/24/07	12,34
78	D.2.a)2.2	Specify technical requirements to web-enable applications	1 mon	Fri 5/25/07	Thu 6/21/07	77
79	D.2.b	RFP for hospital portal products	115 days	Fri 6/22/07	Thu 11/29/07	
80	D.2.b)1	Complete specifications / statement of work	6 wks	Fri 6/22/07	Thu 8/2/07	71
81	D.2.b)2	Complete & distribute RFP	1 wk	Fri 8/3/07	Thu 8/9/07	80
82	D.2.b)3	Obtain proposals	6 wks	Fri 8/10/07	Thu 9/20/07	81
83	D.2.b)4	Evaluate proposals and select vendors	6 wks	Fri 9/21/07	Thu 11/1/07	82
84	D.2.b)5	Contract with vendors	1 mon	Fri 11/2/07	Thu 11/29/07	83
85	D.2.c	Obtain pilot test sites: Hospitals & care-networked providers	1 mon	Fri 6/22/07	Thu 7/19/07	71
86	D.2.d	Pilot Hospital Portals	2 mons	Fri 11/30/07	Thu 1/24/08	84,85
87	D.2.e	Modify portal(s) as needed	6 wks	Fri 1/25/08	Thu 3/6/08	86
88	D.2.f	Establish training program	1 mon	Fri 1/25/08	Thu 2/21/08	84,86
89	D.2.g	Establish support/maintenance infrastructure	1 mon	Fri 1/25/08	Thu 2/21/08	81,84,86
90	D.2.h	Rollout Hospital Portals statewide	12 mons	Fri 3/7/08	Thu 2/5/09	89,14,87,88
91	D.3	Patient Health Summary	541 days	Thu 9/1/05	Thu 9/27/07	
92	D.3.a	Design scope and specifications of Patient Health Summary project	20 days	Fri 12/2/05	Thu 12/29/05	
93	D.3.a)1	Determine Patient Health Summary contents	1 mon	Fri 12/2/05	Thu 12/29/05	11
94	D.3.a)2	Determine information access & transmission modes	1 mon	Fri 12/2/05	Thu 12/29/05	11
95	D.3.b	RFP for statewide system	115 days	Fri 1/27/06	Thu 7/6/06	
96	D.3.b)1	Complete specifications / statement of work	6 wks	Fri 1/27/06	Thu 3/9/06	92,12
97	D.3.b)2	Complete & distribute RFP	1 wk	Fri 3/10/06	Thu 3/16/06	96
98	D.3.b)3	Obtain proposals	6 wks	Fri 3/17/06	Thu 4/27/06	97
99	D.3.b)4	Evaluate proposals and select vendors	6 wks	Fri 4/28/06	Thu 6/8/06	98
100	D.3.b)5	Contract with vendor	1 mon	Fri 6/9/06	Thu 7/6/06	99
101	D.3.c	Obtain pilot test sites: Communities / providers / hospitals / ERs	1 mon	Fri 12/30/05	Thu 1/26/06	92
102	D.3.d	Pilot Patient Health Summary	2 mons	Fri 7/7/06	Thu 8/31/06	100,101
103	D.3.e	Modify system for statewide rollout	1 mon	Fri 9/1/06	Thu 9/28/06	102
104	D.3.f	Establish training program	1 mon	Fri 9/29/06	Thu 10/26/06	100,103
105	D.3.g	Establish support/maintenance infrastructure	1 mon	Fri 9/1/06	Thu 9/28/06	97,100,102
106	D.3.h	Rollout Patient Health Summary statewide	12 mons	Fri 10/27/06	Thu 9/27/07	103,104,105,14
107	D.3.i	Administrative Transaction Processing	425 days	Thu 9/1/05	Wed 4/18/07	
108	D.3.i)1	Design scope and specifications of project	20 days	Thu 9/1/05	Wed 9/28/05	

Task #	Outline Level	Task Name	Duration	Start Date	Finish Date	Predecessor Task(s)
109	D.3.i)1.1	Determine supported transactions	1 mon	Thu 9/1/05	Wed 9/28/05	
110	D.3.i)1.2	Determine interfaces required	2 wks	Thu 9/1/05	Wed 9/14/05	
111	D.3.i)2	RFP for statewide system	95 days	Thu 9/29/05	Wed 2/8/06	
112	D.3.i)2.1	Complete specifications and statement of work	4 wks	Thu 9/29/05	Wed 10/26/05	109,110
113	D.3.i)2.2	Complete & distribute RFP	1 wk	Thu 10/27/05	Wed 11/2/05	112
114	D.3.i)2.3	Obtain proposals	6 wks	Thu 11/3/05	Wed 12/14/05	113
115	D.3.i)2.4	Evaluate proposals and select vendor	1 mon	Thu 12/15/05	Wed 1/11/06	114
116	D.3.i)2.5	Contract with vendor	1 mon	Thu 1/12/06	Wed 2/8/06	115
117	D.3.i)3	Obtain pilot test sites: Providers/hospitals and payors	1 mon	Thu 10/27/05	Wed 11/23/05	112
118	D.3.i)4	Pilot administrative transaction processing	2 mons	Thu 2/9/06	Wed 4/5/06	116,117
119	D.3.i)5	Modify system for statewide rollout	6 wks	Thu 4/6/06	Wed 5/17/06	118
120	D.3.i)6	Establish training program	1 mon	Thu 4/6/06	Wed 5/3/06	116,118
121	D.3.i)7	Establish support/maintenance infrastructure	1 mon	Thu 4/6/06	Wed 5/3/06	113,116,118
122	D.3.i)8	Rollout administrative transaction processing statewide	12 mons	Thu 5/18/06	Wed 4/18/07	119,120,121
123	E	Build Technical Services Organization	140 days	Fri 10/2/09	Thu 4/15/10	
124	E.1	Hire staff	140 days	Fri 10/2/09	Thu 4/15/10	
125	E.1.a	Hire Chief Technical Officer	2 mons	Fri 10/2/09	Thu 11/26/09	8
126	E.1.b	Hire 2 Project Managers	1 mon	Fri 11/27/09	Thu 12/24/09	125
127	E.1.c	Hire 2 Administrative Support staff	1 mon	Fri 11/27/09	Thu 12/24/09	125
128	E.1.d	Hire 6 CNS Support staff	2 mons	Fri 12/25/09	Thu 2/18/10	126
129	E.1.e	Hire 2 Customer Service staff	2 mons	Fri 12/25/09	Thu 2/18/10	126
130	E.1.f	Hire 3 Services Support staff	2 mons	Fri 2/19/10	Thu 4/15/10	129
131	E.1.g	Hire 2 Operations staff	2 mons	Fri 2/19/10	Thu 4/15/10	129

APPENDIX K: CRITERIA FOR EVALUATING PROJECTS

The Agency for Healthcare Research and Quality's criteria for evaluating potential HIT projects is based on improving at least one of the following four elements:

- Quality of care provided
- Safety of care provided
- Efficiencies in care
- Effectiveness of care⁴¹

For evaluating the Focused Initiatives in this section and any subsequent initiatives that Wyoming may consider for the future, JSI proposes that the following criteria, which are in line with those of AHRQ, be utilized:

1. Improved Care and Patient Safety Benefits: Clear understanding of the improvement in patient care and/or patient safety must be articulated as goals of an initiative.
2. Improved Efficiencies Benefits: Improvements in the operations of one or more health care entities, as well as minimizing patient disruption, waiting time, or interaction with the health care system for non-care activities.
3. Technical Feasibility: Based on actual real-world examples in health care or deployment of similar technologies in other societal realms and industries. An initiative that requires inventing new technology should be considered but examined extremely carefully for the risks this would entail.
4. Cost: Statement of realistic costs in order to implement and maintain.
5. Technical Interdependencies: This criterion is detailing of the technical requirements for the specific project and any interaction or dependency on statewide network components, other projects, and standards.
6. Organizational Interdependencies: A description of the organizational relationships that are required in order to effect the successful implementation of an initiative. It can be assumed that the WYHIO would be a facilitator of all initiatives.
7. Implementation Requirements: Identification of the requisite capabilities of the data users and data providers in order to implement the initiative. This can include technical capabilities, workflow requirements, and training needs.
8. Support/Operational Requirements: Beyond implementation, all systems and projects have maintenance and support needs in order to successfully operate. This is a description of the support necessary to continue operating a project after it is implemented.
9. Potential Incentives: Beyond the expected benefits of an initiative, this criterion specifies potential incentives for the different parties to an initiative that may be crafted, in order to support implementation and maintenance of a project.
10. Other Considerations: Each project may have unique considerations that should be documented and evaluated in this section.

The table below presents a matrix of the four initiatives and the criteria referenced above. JSI has presented the most salient attributes of each initiative relative to the evaluation criteria. It is critical that the WYHIO uses this or a similar matrix to assess the projects that it may consider for integration onto the EHR Network..

⁴¹ Presentation on the Agency for Healthcare Research and Quality's HIT Initiatives by Scott Young, M.D., HIT Director, at the meeting of Key Stakeholders for the WYHIO, Casper, Wyoming, July 18, 2005.

Factor	Administrative Transaction Processing	EPrescribing	Hospital Portal	Continuity of care record
<p>Benefit: Improved Care and Patient Safety</p>	<p>Substantial savings in administrative costs can be reallocated to patient care.</p>	<p>Reduced risk of wrongful filling of scripts and adverse drug events. Reduced risk of drug-drug and drug-allergy interactions Possibility of:</p> <ul style="list-style-type: none"> ▪ Medication list for patients ▪ Prescribing knowledge base for prescribers ▪ Drug and allergy interaction warnings for prescribers ▪ Public health medication registry 	<p>Increased convenience for providers to access test results, patient status, and discharge summaries would lead to increased timeliness for monitoring of patients.</p>	<p>Reduced misdiagnosis and time savings due to available patient information, such as:</p> <ul style="list-style-type: none"> ▪ Demographics ▪ Problem list and diagnoses ▪ Medication history ▪ Allergies ▪ Interventions ▪ Hospitalization discharge summaries ▪ Insurance information <p>Enhanced continuum of care when patients move from one health care entity to another</p>
<p>Benefit: Improved Efficiencies</p>	<p>From automating transactions from manual processes:</p> <ul style="list-style-type: none"> ▪ Reduction in provider staff time to create claims, inquire as to eligibility and follow-up on claims status ▪ Payers reduce claims processing costs and reduced customer service staff <p>From single network:</p> <ul style="list-style-type: none"> ▪ Savings for all entities managing a single interface rather than multiple <p>Single interpretation and implementation of transaction standards and code sets, rather than multiple</p>	<ul style="list-style-type: none"> ▪ Providing formulary information enables appropriate prescribing available under insurance coverage. ▪ Reduction in pharmacy checking eligibility. ▪ Reduction of pharmacy time spent in calling providers to clarify scripts. ▪ Reduction in administrative errors. ▪ Reduction of data entry at pharmacies. ▪ Facilitates electronic refill/renewal communications. 	<ul style="list-style-type: none"> ▪ Reduction in information requests from providers to hospitals while monitoring patients. ▪ Increased timeliness of making physician orders. ▪ Better use of physician time, by minimizing visits to hospitals. ▪ Potential reduction in unnecessary face-to-face visits with patients. 	<ul style="list-style-type: none"> ▪ Reduced queries to multiple institutions for information. ▪ Reduced duplicative diagnostic/testing procedures. ▪ Reduction in repetitive registrations at multiple locations for patients.

Factor	Administrative Transaction Processing	EPrescribing	Hospital Portal	Continuity of care record
Technical Feasibility	<p><u>High:</u> Already in place in many states and locales. Uses standard HIT transactions and vocabularies.</p>	<p><u>High:</u> Already in place in many states and locales. Uses standard HIT transactions and vocabularies.</p>	<p><u>High:</u> Vendors have developed solutions that facilitate access to health information electronically.</p>	<p><u>Medium:</u> Requires:</p> <ul style="list-style-type: none"> ▪ Agreement on dataset contents ▪ System access to enable providers and hospitals to enter and obtain information. <p>Information recipients could use lower-level technology, such as fax, thereby enabling rapid deployment. Standards exist to facilitate electronic messaging of dataset contents</p>
Cost	Low	Medium	Low	Medium
Technical Interdependencies	<p><u>Providers:</u> Internet access; possible integration with provider administrative systems. <u>Payors:</u> Internet access. <u>Utility Systems:</u> Bi-directional transaction routing between providers and payors.</p>	<p>Providers: Internet access; possible integration with EMRs Pharmacies: Internet access, possible integration with in-house information systems Drug vocabularies. <u>Drug Utility Systems:</u></p> <ul style="list-style-type: none"> ▪ MPI to contain default patient, prescriber, and pharmacy information. ▪ Transaction routing from prescriber to pharmacy. 	<p>Providers: Internet access Hospitals: Internet access; requires web access to legacy systems.</p>	<p>Providers/Hospitals: Internet access; possible integration with EMRs.</p> <p>Utility Systems:</p> <ul style="list-style-type: none"> ▪ MPI to contain default patient and provider information. ▪ Central database to contain information from multiple providers OR MPI to contain pointers to systems with information.
Organizational Interdependencies	<p>Providers and payors must collaborate on standards and business processes, as well as be on the system</p>	<p>Prescribers and pharmacies must be connected to system.</p>	<p>High level of resources required from hospitals. High level of cooperation required from provider/users and hospitals.</p>	<p>High level of cooperation required from multiple health care entities. Provides a basis for expanding into electronic health record.</p>

Factor	Administrative Transaction Processing	EPrescribing	Hospital Portal	Continuity of care record
Implementation Requirements	<u>Medium:</u> Requires development of uniform standards and processes. Entities must have Internet access. Entities must rework extant electronic processing to conform to single network.	<u>Low:</u> Assumed as a web-enabled application. Prescribers must have web access and be trained in application use. Pharmacies must have web access and be trained in application use. Pharmacies without web access could have scripts automatically faxed.	<u>Medium:</u> Technical products exist to facilitate portal development. Some hospital applications may require customized work for enabling web-access. Training of providers would be required.	<u>High:</u> Assumed as a web-enabled application. Providers must have web access and be trained in application use, for making entry of multiple categories of information. Integration with EMRs that can extract information is optimal, but may be the most complicated implementation.
Support/Operational Requirements	<u>Low:</u> Most of system, once implemented runs as automated processes. Operational support required for troubleshooting and exception processing. Proactive diagnostics tool can be implemented on the network to anticipate and resolve potential system issues.	<u>Medium:</u> <ul style="list-style-type: none"> ▪ Changes in medications available for prescribing. ▪ Changes in pharmacies on system. ▪ Changes in prescribers who can use system. ▪ Troubleshooting technical support for users. ▪ High volume of providers expected to use application. 	<u>Medium:</u> <ul style="list-style-type: none"> ▪ Training of providers. ▪ Troubleshooting technical support for users. ▪ Troubleshooting middleware connections between portal and hospital applications. 	<u>Medium:</u> <ul style="list-style-type: none"> ▪ Multiple sets of data must be retained in database. ▪ Changes to providers on system. ▪ Extraction of data from non-standards based EMRs is complicated. ▪ Troubleshooting technical support for users.
Potential Incentives	<u>For Payers:</u> Need for incentives are low; payers are a major beneficiary from initiative. <u>For Providers:</u> Need for incentives are low; payers are a major beneficiary from initiative.	<u>For Providers:</u> Reimbursement for electronic prescribing or for the information processed. Pay for Performance programs linked to appropriate prescribing. Third Party financing from payers and pharmacies. <u>For Pharmacies:</u> Need for incentives are low; pharmacies are a major beneficiary from initiative. <u>For Payers:</u> Need for incentives are low; payers are a major beneficiary from initiative.	<u>For Providers:</u> Time savings accrue to providers and need for incentives may be minimal. <u>For Hospitals:</u> Incentives may be necessary based on pay-for-performance gains from increasing physician access to information.	<u>For Providers and Hospitals:</u> Time savings accrue to providers and need for incentives may be minimal. <u>For Payers:</u> Incentives may be necessary based on pay-for-performance gains from increasing physician access to information.

Factor	Administrative Transaction Processing	EPrescribing	Hospital Portal	Continuity of care record
Other Considerations	<p><u>WYHIO</u>: Must decide on which transactions are to be supported, as well as development consensus on standards interpretations and business processes.</p>	<p><u>WYHIO</u>: Must decide on complexity of ePrescribing adoption. In addition to electronic scripts, this initiative could also contain:</p> <ol style="list-style-type: none"> 1. Medication history and monitoring. 2. Formulary information and limitations. 3. Drug-drug and drug-allergy interaction warnings to prescribers. 4. Knowledge base to assist prescribers. 	<p><u>WYHIO</u>: Can facilitate adoption through:</p> <ol style="list-style-type: none"> 1. Collective purchasing agreements that lead to volume discounts. 2. Organizing support to hospitals for supporting technology. 3. Organizing support to providers for use of systems. 	<p><u>WYHIO</u>: Must decide on:</p> <ol style="list-style-type: none"> 1. Dataset contents. 2. Storage/transportation media to be supported, in addition to electronic access.